

### LAS:

This folder contains point cloud raw data. For Alpha3D, the point cloud raw data will be saved in **Riegl** folder automatically. Other folders are useless as they were designed for other LiDAR system.

ightarrow Y 📜 > This	s PC > DATA	(D:) > Data > @@2019-05-23-201852	> LAS		~ Ü	Search LAS
		Name	Date modified	Туре	Size	
Quick access		<b>5010</b> c	5/23/2019 8:18 PM	File folder		
🔚 Desktop	*	9012c	5/23/2019 8:18 PM	File folder		
🔈 Downloads	*	HDL32	5/23/2019 8:18 PM	File folder		
🗎 Documents	*	Riegl	5/29/2019 6:41 AM	File folder		
E Pictures	*	VLP16	5/23/2019 8:18 PM	File folder		
📕 Alpha3D		VZ400	5/23/2019 8:18 PM	File folder		
Document		VZ2000	5/23/2019 8:18 PM	File folder		
March 2019 Budapest	t					
📕 内部资料						
	@2019-05-23-	201852\LAS\RiegI				
✓	@2019-05-23- View	201852\LAS\Riegl			_	
✓   ↓   ↓     ✓   ↓   D:\Data\@@     Home   Share	View	201852\LAS\RiegI (D:) > Data > @@2019-05-23-201852	> LAS > Riegl		v Ŭ	Search Rie
<ul> <li>✓ ■ =   D:\Data\@@</li> <li>Home Share</li> <li>→ ~ ↑ ■ &gt; This</li> </ul>	View		> LAS > Riegl Date modified	Туре	マ ひ Size	`
<ul> <li>✓ ■ =   D:\Data\@@</li> <li>Home Share</li> <li>→ ~ ↑ ■ &gt; This</li> </ul>	View	(D:) > Data > @@2019-05-23-201852 Name	Date modified	1	Size	Search Rie
<ul> <li>✓ ■ =   D:\Data\@@</li> <li>Home Share</li> <li>→ ~ ↑ ■ &gt; This</li> </ul>	View	(D:) > Data > @@2019-05-23-201852	-	Type RXP File		Search Rie
✓     ✓     D\Data\@0       Home     Share       →     ✓     ▲       This     ✓	View PC > DATA	(D:) > Data > @@2019-05-23-201852 Name	Date modified	1	Size	Search Rie
<ul> <li>✓ ■ =   D\Data\@0</li> <li>Home Share</li> <li>→ &lt; ↑ ■ &gt; This</li> <li>Quick access</li> <li>Desktop</li> </ul>	View SPC > DATA *	(D:) > Data > @@2019-05-23-201852 Name	Date modified	1	Size	Search Rie
✓     →     D:\Data\@@       Home     Share       →     ✓     ▲       ✓     ↓     ▲       ✓     ↓     ↓       ✓     ↓       ✓<	View PC > DATA * *	(D:) > Data > @@2019-05-23-201852 Name	Date modified	1	Size	Search Rie
✓     ✓     D:\Data\@@       Home     Share       →     ✓     ▲       ✓     ▲     ▲       ✓     ▲     ▲       ✓     ▲     ▲       ✓     ▲     ▲       ✓     ▲     ▲       ✓     ▲     ▲       ✓     ▲     ▲       ✓     ▲     ▲       ✓     ▲     ▲       ▲     Quick access       ▲     Desktop       ▲     Downloads       ⑧     Documents	View SPC > DATA # # #	(D:) > Data > @@2019-05-23-201852 Name	Date modified	1	Size	Search Rie

PARA:

This folder contains four initial parameter files. For Alpha3D, this folder should contains below listed files after all data processing.

I I I I I I I I I I I I I I I I I I I	2019-05-23- View	201852\PARA			- 🗆	× ~ ?
← → 🗸 ↑ 📕 > This F	PC > DATA	(D:) > Data > @@2019-05-23-201852 > PARA	۱.		<ul><li>ン O Search PA</li></ul>	P
📌 Quick access 🔚 Desktop	A	Name Other State Control Name Other State Control Name Name Name Name Name Name Name Name	Date modified 5/29/2019 5:31 AM 1/15/2019 9:28 AM	Type CRD File 看图王 PNG 图片	Size 3 KB 11 KB	
<ul> <li>Downloads</li> <li>Documents</li> <li>Pictures</li> <li>Alpha3D</li> </ul>	A A A	Alpha3D-03-CAR-SJ-20181120.EP PCPRPara.pz	2/25/2019 10:34 A 2/25/2019 1:49 PM		1 KB 1 KB	

**Initial Folder** 



le Home Share Vie	w					
ightarrow 🔶 🔸 🚹 $ ightarrow$ This PC $ ightarrow$	DATA	(D:) > Data > @@2019-05-27-181857 > PARA			∨ Ü Sea	rch PA
Quick access		Name	Date modified	Туре	Size	
Desktop	*	📕 Data	5/29/2019 7:56 AM	File folder		
Downloads	*	20190529.db	5/29/2019 7:56 AM	Data Base File	184 KB	
		🚔 20190529.kml	5/29/2019 7:56 AM	KML	122 KB	
Documents	*	S 20190529_Line.kml	5/29/2019 7:56 AM	KML	32 KB	
E Pictures	*	20190529071913042.crd	5/29/2019 7:19 AM	CRD File	3 KB	
📕 Alpha3D		1 Alpha3D-03-CAR-SJ-20181120(Lever arm	1/15/2019 9:28 AM	看图王 PNG 图片	11 KB	
Document		Alpha3D-03-CAR-SJ-20181120.EP	2/25/2019 10:34 A	EP File	1 KB	
March 2019 Budapest		guanxi.txt	5/29/2019 7:56 AM	Text Document	164 KB	
内部资料		INSPose.dd	5/29/2019 7:56 AM	DD File	111 KB	
		OrbitPose.txt	5/29/2019 7:56 AM	Text Document	74 KB	
狊 This PC		PCPRPara.pz	2/25/2019 1:49 PM	PZ File	1 KB	
A360 Drive						

### After processing folder

#### POST:

This folder should contain both IE project file and POS file which generated after IE processing. The initial **POST** folder is empty.

.   <b>⊘ ]</b> . <del>.</del>		@@2019-05-23-201852\PO	ST		-		×
File Home Share View	,						~ (
$\leftarrow \rightarrow \checkmark \uparrow $ > This PC >	DATA (D:) > Data > @@	₽2019-05-23-201852 > PO	ST		~ Ü	Search PO.	. P
	Name	Date	Туре	Size	Length		
🖈 Quick access			-				
🍠 This PC			This folder is empty.				
A360 Drive							
🔚 Desktop							
Documents							
Downloads							

#### ROVER:

This folder contains GNSS data and IMU data which recorded by Alpha3D. These two files will automatically save in this folder.

		-201852\ROVER			- 🗆 ×
File Home Share		(D) > Data > @@2010.05.22.201952			V C Search RO P
$\leftarrow \rightarrow \checkmark \uparrow \blacksquare $ This	PC / DAIA	.(D:) > Data > @@2019-05-23-201852	/ KOVEK		V 🖸 Search RO 🔎
		Name	Date modified	Туре	Size
📌 Quick access		2019-05-23-201852 I.txt	5/23/2019 8:59 PM	Text Document	27.059 KB
🔚 Desktop	*	2019-05-23-201852_T.txt	5/23/2019 8:59 PM	Text Document	9,975 KB
🐌 Downloads	*		0/20/2010 000 1111		5,51510
Documents	*				
hictures	*				



### SYNC:

### This folder contains **log** data and **trig** data of Alpha3D.

	C > DATA (D:) > Data > @@2019-05-2	23-201852 > SYNC		~ Ŭ	Search SY 🖇
1.0.1	Name	Date modified	Туре	Size	
📌 Quick access	log	5/23/2019 8:18 PM	File folder		
This PC	📜 trig	5/29/2019 5:18 AM	File folder		
A360 Drive					
🔚 Desktop					
Documents					

For Alpha3d, this folder is empty.

ile Home Share	View				$\sim$
-> 👻 🕇 📕 > Thi	s PC > DATA (D:) > Data > @@2019-0	5-23-201852 > TRACE		~ Ū	Search TR 🔎
	Name	Date modified	Туре	Size	
📌 Quick access					
📙 Desktop	*	This folder is emp	ty.		
🚺 Downloads	A				
🗎 Documents	A				
🔚 Pictures	A				
Alpha3D					

### 5.2.2.2 Base Data Processing

GNSS data of base station is saved in receiver. Take CHC i80 as example, there are three download methods. First is USB mode download, copy static data form repo folder into computer; Second is Webpage mode download. Connect computer with receiver via Wi-Fi and input <a href="http://192.168.1.1">http://192.168.1.1</a> to log in. Both username and password are **ftp**; Third is ftp mode download. Connect computer with receiver via Wi-Fi and input <a href="http://192.168.1.1">http://192.168.1.1</a> to log in. Both username and password are **ftp**; Third is ftp mode download. Connect computer with receiver via Wi-Fi and input <a href="http://192.168.1.1">http://192.168.1.1</a> in **My Computer**. Both username and password are **ftp**.

CHC i80 will export HCN file which need to be converted using **CHCData** software. Detailed steps are shown below:

Click "Import" to import an HCN file:



igation 🔍 🔍	Observation File								•
fanagement	ID Fil	e Nuse Statio	n Antenna Keight[n]	Neight Reduced[n]	Measure To	Reduce Method	Antenna Type	Antenna Marafacturer	e l
	• 0	pen						×	
	+	+ 📙 « D	ATA (D:) > @@2019-	06-01-131954 > BASE	~ 0	Search BASE		Q	
	Org	anize + New fold	jer				H • 🗖	0	
		A360 Drive ^	Name	^	Date modified	Type	Size		
		Desktop	Rinex		6/11/2019 8:24 A3 6/2/2019 3:33 AM			0,603 KB	
		Downloads Music Pictures Videos 系统文件 (C:) DATA (D:) Seagate Expansion	¢			TRAFFIC		2	

Right click HCN file and click "Antenna Setting". Input measured antenna height and select "Center of Bumper", finally click "Phase Center" – "OK".

Antenna Information	n
Height[m]	1.5
Manufacturer	CHCNav 🗸
Туре	CHCI80 $\checkmark$
Measure To	Center Of Bumper 🗸 🗸 🗸
Reduce Method	🗹 Phase Center(Default:Bottom)
Apply Selection	
Apply To	Current File $\sim$
Type	Height Measure To
Reduce Metho	d
	OK Cancel

 Right click HCN file and click "RINEX Option". Change "RINEX version" as 3.02, change "Interval" as 0.2 and change "Splitting Interval" as 14400.

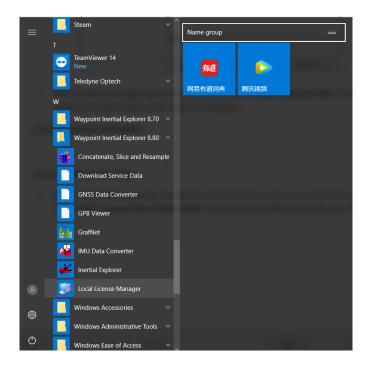


Setting		
Quality Check	V Frequency	
RINEX Option Receiver	L1/G1/B1	True
Project Setting	L2/G2/B2	True
-	L5/G3/B3	True
	✓ General	
	RINEX Version	3.02
	Interval[s]	0.2
	Split File	False
	Splitting Interval[s]	14400
	✓ Observation Type	
	C(Pseudorange)	True
	L(Carrier Phase)	True
	D(Doppler)	True
	S (SNR)	True
	∨ Satellite System	
	GPS	True
	GLONASS	True
	BDS	True
	GALILEO	True
	GPS	
	GrS	
	OK Cancel	Apply To Advance Current File $\sim$

• After all above settings, right click HCN file and click "**Convert Selected Files**". A new Rinex folder will be generated under original catalogue:

### 5.2.2.3 License Activation

 Click Windows and find the "Local License Manager" under Waypoint Inertial Explorer 8.80 folder.





• Enter activation code here and click **Activate** to complete activation.

繴 NovAtel Local License Manager		-		$\times$
Local Licenses Returned Licenses Inertial Explorer Inertial Explorer Activate License License Server: https://license. Ready	License Activation Activate Activator Info: <u><i>i. e. John Doe's PC</i></u> novatel. com:443		Antiva	 t a
Ready				

If you want to log out, go to Local Licenses and click **Return**.

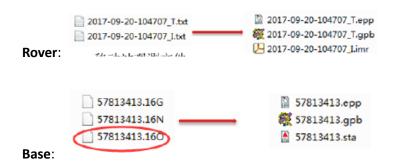
### 5.2.2.4 Data Format Conversion

Double click IE icon to begin work. Before start POS processing, the data format of both base and rover need to be converted. Click **"Tools - Convert Raw GNSS to GPB"** to add all needed files and finally click **"Convert"**.

🗯 Convert Raw GNSS data to GPB		_		$\times$
Receiver Lype/Format	ns Info			
Folder: D:\@@2019-06-01-131954\BASE\Rinex\			<u>G</u> et Fo	older
Source Files	Convert Files			
Eilter: *.obs;*.1?o;*.0?o;*.1?d;*.0?d	File Name	Rece	iver	
	D:\@@2019-06-01-131954\BASE\Rin	nex\10 RINE	0	
	Remove	View		>
Add All		T1011		
Auto Add Recursively	<u>C</u> onvert Hel	p About		ose



### Comparison before and after format conversion:



Notice: When convert rover files, double click IMU file and select SPAN Model as SPAN KVH1750.

<ul> <li>Decode RANGE_1/RANGECMP_1 log</li> <li>Verbose messaging mode</li> <li>Create separate file for each MARKNTIME record</li> <li>Show receiver status event warnings</li> <li>Write GPB gaps to summary</li> <li>Create trajectory files for supported records</li> <li>Ignore clock model status for MARKNTIME records</li> <li>Ignore week number check for RAWIMU records</li> <li>L2C phase correction: 0.25 (cycles)</li> </ul>	
Decode RANGE_1/RANGECMP_1 log     Verbose messaging mode     Create separate file for each MARKNTIME record     Show receiver status event warnings     Write GPB gaps to summary     Create trajectory files for supported records     Ignore clock model status for MARKNTIME records     Ignore week number check for RAWIMU records     L2C phase correction: 0.25 (cycles)	
Verbose messaging mode     Create separate file for each MARKNTIME record     Show receiver status event warnings     Write GPB gaps to summary     Create trajectory files for supported records     Ignore clock model status for MARKNTIME records     Ignore week number check for RAWIMU records     L2C phase correction: 0.25 (cycles)	KVH1750 💌
Create separate file for each MARKNTIME record Show receiver status event warnings Write GPB gaps to summary Create trajectory files for supported records Ignore clock model status for MARKNTIME records Ignore week number check for RAWIMU records L2C phase correction: 0.25 (cycles)	
<ul> <li>Show receiver status event warnings</li> <li>Write GPB gaps to summary</li> <li>Create trajectory files for supported records</li> <li>Ignore clock model status for MARKNTIME records</li> <li>Ignore week number check for RAWIMU records</li> <li>L2C phase correction: 0.25 (cycles)</li> </ul>	trument (DMI)
Create trajectory files for supported records Ignore clock model status for MARKNTIME records Ignore week number check for RAWIMU records L2C phase correction: 0.25 (cycles)	nce: 1.96 (m)
Ignore clock model status for MARKNTIME records Ignore week number check for RAWIMU records L2C phase correction: 0.25 (cycles)	evolution: 2000 (ticks)
Ignore week number check for RAWIMU records L2C phase correction: 0.25 (cycles)	
L2C phase correction: 0.25 (cycles)	
Static/Kinematic Mode	
Factory Defaults OK Cancel	

### 5.2.2.5 POS Processing

Click "File - New Project - Project Wizard" to create an IE project.



Project Wiza	rd	×
	Welcome to the Project N The Preject Wicard allows you to easily create a new	
	Click "Next" to continue or "Cancel" to exit this Wizz	ard

 Give it a directory location and project name. For convenience, it is recommend saving project in **POST** folder. Click **Next.**

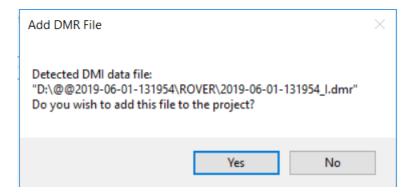
Project Wizard	×
Project Info Please enter project name and location	
Project:	
D:\@@2019-06-01-131954\POST\Las_Vegas.proj	Create
< Back Next >	Cancel



 Choose gpb file of GNSS and imr file from IMU. These two files can be found in ROVER folder.

Project Wizard		×
Remote (Rover) Data The GNSS data file can be a GPB file, raw GNSS receiver data o	r raw SPAN IMU data file	
GNSS Data File (GPB, Raw GNSS or Raw SPAN IMU):		
D:\@@2019-06-01-131954\ROVER\2019-06-01-131954_T.gpb		Browse
☑ I have IMU data file in Waypoint (IMR) format IMU Data File:		
D:\@@2019-06-01-131954\ROVER\2019-06-01-131954_I.imr		Browse
-		
	< Back Next >	Cancel

After clicking Next, an information will pop up which ask to add dmr file. Click NO as it's an empty file unless Alpha3D connect to ODOmeter this sensor.





For remote antenna height, keep all values as default and no need to change. Click **Next**.

D:\@@2019-06-01-	131954\ROVER\2(	019-06-01-131954	L_T.gpb		
Antenna Height					
-	N/A		View STA File		
Antenna profile:	Generic	~	Info		
		Measured to			
Measured height:	0.000 m	○ ARP			
ARP to L1 offset:	0.000 m	L1 Phase			
Applied height:	0.000 m	Compute F	rom Slant		

For base data, IE supports two options to load: First is from base station and second is download via PPP mode. Also, the precise file can also be downloaded to improve accuracy. Click **Next**.

oject Wizard	×
Base (Master) Station Option You can choose whether or not to include base station data in your project. Please select a source for the precise files if you plan to perform PPP processing.	4
I would like to add base station data	
O I would like to do PPP processing (requires precise files; no base station will be added)	
Precise Files      Ownload precise files	
Add existing precise files from disk	
O Do not add precise files	
Click "Next" to continue	
< Back	lext > Cancel



 IE supports maximum 32 base stations data for one project. Click "Add Station from File" and click Next to add base station data.

Base (Master) Stations You can add a maximur	n of 32 base stations	s to your project			4
Action to Perform:	Base Stations C	Currently in Project:			
Add Station from File Add Station from Download Edit Station Remove Station Finish	Name	File			
Description					
Add base station from GN: Select "Finish" when you are		station data			
			< Back	Next >	Cancel
ject Wizard			< Back	Next >	Cancel
	<b>ata From a File</b> be a GPB file or a ra	aw GNSS receiver d		Next >	
Base (Master) Station Da The GNSS data file can SNSS Data File (GPB or Raw	be a GPB file or a ra			Next >	
ject Wizard Base (Master) Station Di The GNSS data file can GNSS Data File (GPB or Raw D:\@@2019-06-01-131954	be a GPB file or a ra			Next >	×

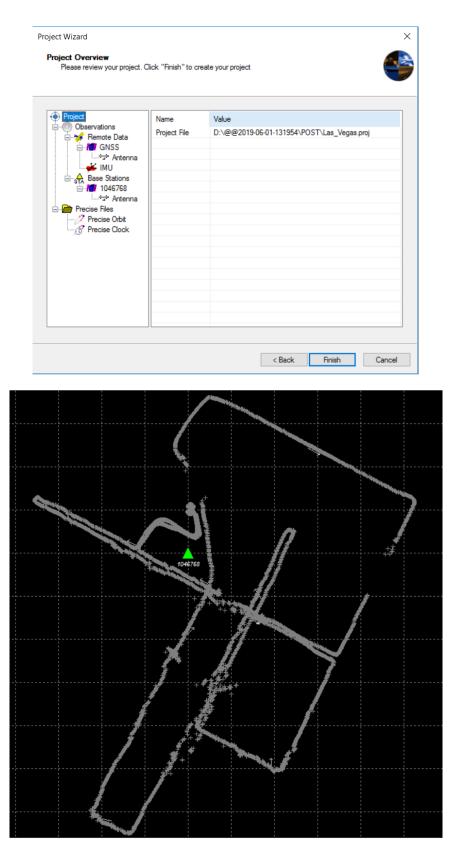


 For base station data, the coordinates, ellipsoidal height and datum information are needed. Enter the measured height value and choose relative measure type. Click Next.

ject Wizar Base (Mas Please	ster) Sta					na details. Click "N	ext" to conti	nue	4
Base Static	n								
1: 104676	68		$\sim$	Name	1046768	Disabl	ed		
File: D:\@	@@2019-	06-0	)1-1319	54\BA	SE\Rinex\104	6768152M.gpb			
						-			
Coordinate Latitude:			36	10	22.25669	Court antions	<b> _</b>		
	North	<u> </u>	115	08	26.79936	Coord. options			
Longitude:		~	588.9		1	Save to Favorit	es		
Ellipsoidal I	<u> </u>		300.30		m	MCCRA			
Datum:	WGS84			~	Proc Datum:	WG584			
Epoch:					year				
Antenna H	eight								
From statio	n file:	CH	ICI80, N	IONE		View STA F	le		
Antenna pr	ofile:	CH	IC180			√ Info			
		_			Measured	ito			
Measured	- (		364	m	OARP				
ARP to L1			131	m	●L1 Ph	ase Centre			
Applied hei	ight:	1.8	364	m	Compu	te From Slant			
iect Wizar				_		L	< Back	Next >	Cancel
Base (Mas	ter) Sta			32 bas	e stations to yo	bur project	< Back	Next >	Cancel
Base (Mas	ster) Sta n add a m				e stations to yo		< Back	Next >	Cancel
Base (Mas You car action to Pe	ster) Sta n add a m form: from File	axir	num of		Stations Curren		< Back	Next >	Cancel
Base (Mas You car ction to Pe	ster) Sta n add a m form: from File from Dov	axir	num of	Base \$	Stations Curren	tly in Project:			
Case (Mass You can Add Station Add Station Edit Station Remove Stat	ater) Star n add a m aform: from File from Dov ation	axir	num of	Base S	Stations Curren	tly in Project: File			
Asse (Mass You can action to Pe Add Station Edit Station Remove Station Remove Station Thish	ater) Sta n add a m aform: from File from Dov ation	vnlo	ad	Base 5 Nam 1046	Stations Curren	tly in Project: File D:\@@2019-06-			
Action to Pe Add Station Add Station Calific	n add a m form: from File from Dov ation	vnlo	ad	Base 5 Nam 1046	Stations Curren	tty in Project: File D:\@@2019-06-			



Finally, the project wizard will show details of this project. Click **Finish** to load trajectory.

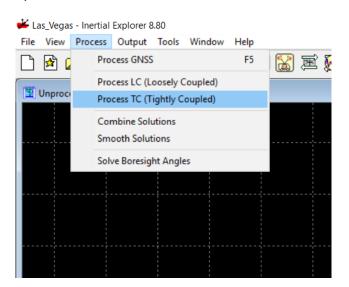




### 5.2.2.6 GPS/INS Combine Processing

The IE software supports two INS processing dialogues: Loosely Coupled & Tightly Coupled. Loosely Coupled is a two-step process which is not suitable if GPS signal is bad; Tightly Coupled is a one-step process which always be chose in mobile mapping solution. Here take tightly coupled dialogue as an example:

Click Process - Process TC (Tightly Coupled) to start processing. Select Multi-pass to improve accuracy and enter lever arm values in below. Click Process.

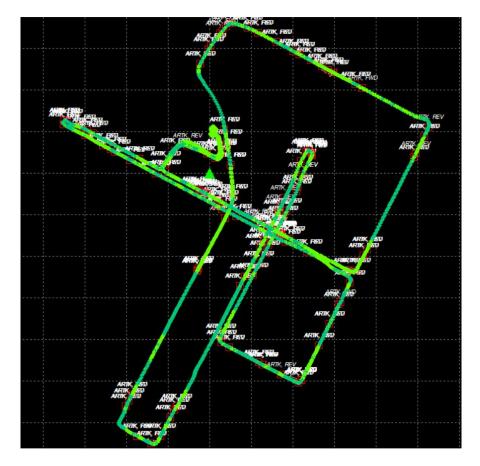


Process Tightly Coupled	×
Processing Method	O Precise Point Positioning (PPP)
Processing Direction	⊖Reverse ☑ Multi-pass
Processing Settings Profile SPAN Ground Vehicle (KVH1750) Datum WGS84	Filter Profiles     Advanced GNSS     Advanced IMU
IMU Installation	Vehicle Profile
Lever Arm Offset (IMU to GNSS antenna)           X:         Y:         Z:           0.000         m         0.000         m	Z to ARP (a) Z to Phase Centre
Body to IMU Rotation (order: Z, X, Y) X: 0.000 deg Y: 0.000 deg	Z: 0.000 deg 0.000 deg
Processing Information Description: TC (1)	User: Unknown
	Process 🔽 Save Settings 🗨 Cancel



Time	566613.8	2055		Status	Progress	
Epochs	1004	#<4	1		Processing Forward KF	
#Sats	18	#84	1	Fixed 25 10 V		
Hodis Lat.	36	10	23,8669	Notifications		
Lat. Long.	-115	08	25,6880	GNSS-IMU TC 1 - Las_Vega	as [Forward] ***	
Height	590.953	Uo	20.0000	Starting Coarse Alignment		
Speed	0.750	COG	315.3			
speed	East	North	315.3 Up			
SD	0.008	0.008	0.017			
Roll	0.008	0.008	0.017			
Pitch	0.000	0.00				
Yaw	0.000	0.00				
Yaw-COG PosMisc	44.655	VelMisc	0.000	566459.2: Corrected measure 566462.2: \$\$\$ GNSS data erro	ment errors by removing L1 [	c
٢			>	566528.0: \$\$\$ GNSS data erro 566528.0: Corrected measure 566588.6: \$\$\$ GNSS data erro 566588.6: Corrected measure	ment errors by removing L1 D rs detected-will try and reject	
ocessing (	GNSS-IMU	TC 2 - Las	Vegas [Re			
Time	568157.0	2055		Status	Progress Processing Reverse KF	
Epochs	1	#<4	1	Fixed 25 10	riocessing reverse in	
#Sats	20	#BL	1			
Lat.	36	10	23.7980	Notifications		_
Long.	-115	08	25.6761	*** GNSS-IMU TC 2 - Las_Vegi Starting Coarse Alignment	as [Reverse]	
Height	590.934			Statung Coarse Algriment		
Speed	0.869	COG	241.6			
	East	North	Up			
	0.014	0.019	0.033			
SD	0.014	0.015				
	0.000	0.00				
Roll						
Roll Pitch	0.000	0.00				
SD Roll Pitch Yaw Yaw-COG	0.000 0.000 0.000	0.00 0.00		5001577: Pasidual DMS in 0	Man Paliability is 4.2 Page	
Roll Pitch Yaw	0.000 0.000 0.000	0.00 0.00	0.000	: IMU->GNSS lever a : Lever arm values fix	e interval set to 0.2 0.000 0.000 0.000 RBV rol m is (x,y,z): 0.000, 0.000 0.0 ed (not solved)	a
Roll Pitch Yaw Yaw-COG	0.000 0.000 0.000 118.432	0.00 0.00 0.00	0.000	: GNSS default updat : Cardinal rotations: ( : IMU->GNSS lever a : Lever am values fix : IMR file: D:\@@20	e interval set to 0.2 0.000 0.000 0.000 RBV rot m is (x,y,z): 0.000, 0.000 0.0	

• When processing finished, the trajectory should be shown in interface:





## 5.2.2.7 Export POS File

Click **Output - Export Wizard** to export POS result.

举 Stewart_New - Inert	ial Explorer 8.80		
File View Process	Output Tools Window Help		
	Plot Results Plot Multi-Base	F7	M 🔯
Smoothed TC Cor	Export Wizard		
	Build HTML Report		
	Export to Google Earth		
	Export to RIEGL POF/POQ		
	Export to SBET		
	Export to Waypoint Legacy Format		
	Export to DXF		

• Choose **HUACE Pos** profile which should be copied into **export\_templates** folder under IE folder. For example: C:\NovAtel\InertialExplorer870\resources\export\_templates.

Export Coordinates Wizard	×
Export File:	
@2019-06-01-131954\POST\Stewart_New.PosT Browse	
Source	
Epochs O Features/Stations O Static Sessions	
Profile	
SGPGGA Airbome Camera Stations Airbome Camera Stations (IMU) Geographic GrafNet (Network) GrafNet (Traverse) Grid (Selectable) HUACE Pos IGI AEROCTRL IGI AEROCTRL IGI AEROCTRL HDG Leica Pegasus	
Moving Baseline (Local Level) PNAV C-File	
PNAV J-File	
New Modify Delete Rename Copy	
< Back Next > Finish Canc	el



### Select Use processing datum and click Next

Select Output Coordinate Datum	
Select Datum Use processing datum Datum: WGS84	
Convert to another datum WGS84 Conversion from processing datum to other datum: Automatic (use default) WGS84 to WGS84 (Same)	
<ul> <li>Do not convert elevation (leave in processing datum)</li> <li>Use input datum (convert back to input coordinate system) Datum: WGS84</li> </ul>	
< Back Next > Finish Cancel	

Select suitable grid which used for transformation.

Zone:		CM = -117.00	000000		
Zone: 1 Select State P		CM = -117.00	00000		
Zone: N	V East (2701)	$\sim$			
Enter Grid Coo	rdinates				
Easting (X):				_	
Northing (Y):		Metres	S	$\sim$	
Height (Z):					



Select Time Interval as 0.005s, ensure below lever arm values are correct. Click Finish to export POS file which used for next step processing.

		IMU Epoch Settin	gs			×
		Limit Exported	Time Range			
		Range # S	Start Time (seconds)	End Time (secon		Add
		Export Interval	Options			
		Binary trajecto	ry interval 0.0050	(s)		
		Time Interv		(s)		
		O Distance Ir	1.0	[m]		
		Transfer IMU (				
		X: 0.05 Y: 0.12 Z: 0.57	0 (m)		SENSOR	
			De altr	Nexts	David	Const
			< Back	Next >	Finish	Cancel
Source: SolFile: ProcessIn Datum:	Stewart_New Inertial Explorer Vers HUACE_Pos GNSS/INS Epochs(S D:\@@2019-06-01-1; fto: Stewart_New by Ur WGS84 Name 1046768, Stat	moothed TC Comi 31954\POST\Stew known on 6/11/201	art_New.cts			
An La Remote: IMU to GN3 x= Body to Se xF IMU->Seco	htenna height 1.726 m, at, Lon, El Hgt 36 10 22 Antenna height 0.000 ISS Antenna Lever Arm =0.059, y=0.120, z=0.5 ensor Rotations: Rot=0.000, yRot=0.000 ondary Sensor Lever A	to L1PC [CHCl80( .25522, -115 08 26 ) m, to L1PC [Gene s: 76 m (x-right, y-fwo , zRot=0.000 degre rms:	.89080, 583.445 m [WGS8 eric(NONE)]			
Map project Defined g	ction Info: grid: UTM, Zone 11					
SeqNum 0 48 1 48 2 48 3 48	GPSTime North	(m) (m) 9 667234.3824 9 667234.3824 9 667234.3824 9 667234.3824 9 667234.3824	(deg) (deg) (m/s 585.267 36.1732959650 585.267 36.1732959652	5 -115.1404942395 9 -115.1404942396 4 -115.1404942397 9 -115.1404942400	(deg) 0.0025 -0.43058 0.0025 -0.42769 0.0027 -0.42587 0.0028 -0.42521 0.0022 -0.42534	ding Project Name Q 3.71070 -7.23330 Stewart_New 3.71099 -7.23296 Stewart_New 3.71113 -7.23303 Stewart_New 3.71113 -7.23335 Stewart_New 3.71078 -7.23369 Stewart_New 3.71028 -7.23385 Stewart_New

1 1 1

1

1 1 1

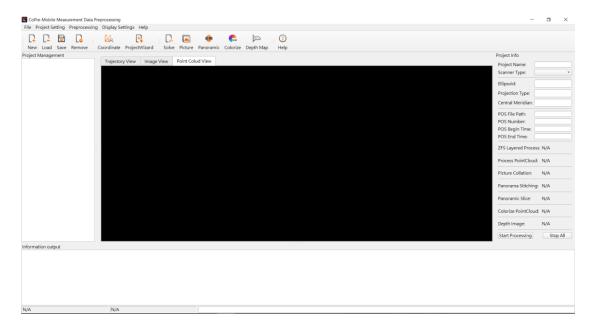
1 1



# 5.3 CoPre - Point Cloud Processing Software

# 5.3.1 CoPre Software Overview

CoPre is a CHC designed one-button data pre-processing software enables both point cloud processing and panorama image collation. It also supports lots of powerful functions such as custom coordinate system, panorama stitching, point cloud colorized and depth image. Meanwhile, it can download & browse real-time map and manually select area which more interested from raw data based on GPS signal value, which is convenient and flexible for realizing the solution of the original scanner data. The static data can be automatically filtered during the solution process, and the data can be backed up multiple times and supported by distance filtering, gray value filtering and skip noise filtering.



# 5.3.2 CoPre Quick Guide

## 5.3.2.1 Import Project

Click **New** to import data project folder which start with "@@" and click **Select Folder**:



N/A

#### Software Overview

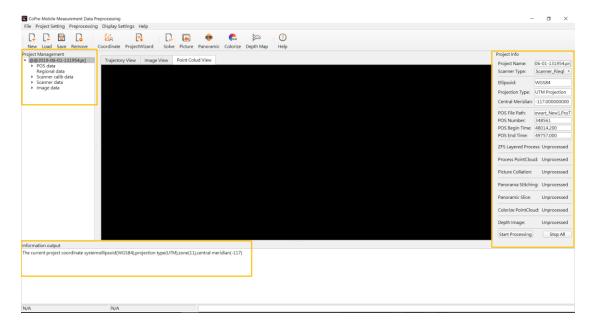
t Management	Traind	· · · · ·					Project Info	
	Trajed New project file path					×	Project Name:	
	$\leftarrow \rightarrow \checkmark \uparrow \Rightarrow \uparrow$	his PC > DATA (D:)	~ Ö	Search DATA (D:)		P	Scanner Type:	
							Ellipsoid:	
	Organize • New fold				-	0	Projection Type:	
	Rinex ^	Name	Date modified	Туре	Size	^	Central Meridian:	
		@@2019-05-25-180554	5/26/2019 3:10 AM	File folder			POS File Path:	
	A360 Drive	@@2019-05-30-210608	5/31/2019 9:20 AM	File folder			POS Number:	
	Desktop	@@2019-06-01-131954	6/11/2019 8:36 AM	File folder			POS Begin Time:	
	Documents	360Downloads	2/18/2019 10:41 A	File folder			POS End Time:	
	Downloads	360安全浏览器下载	5/25/2019 7:41 AM	File folder				
	Music	2019-4-3—92520.mpwf	4/3/2019 9:45 AM	File folder			ZFS Layered Process	:: N/A
		Andrei_Wuhan_Training	5/8/2019 3:16 PM	File folder			Process PointCloud:	N/A
	🔀 Pictures	BaiduNetdiskDownload	6/21/2019 9:07 AM	File folder				19/0
	B Videos	📕 bin	3/4/2019 8:40 AM	File folder		_	Picture Collation:	N/A
	🐛 系统文件 (C:)	ca1aa0b12572cd34e6334dbe5a98f0f3	5/14/2019 8:43 PM	File folder				
	DATA (D:)	📕 chcqc	3/5/2019 5:59 PM	File folder		~	Panorama Stitching:	N/A
	Network *	<				>	Panoramic Slice:	N/A
	Folde	@@2019-06-01-131954					Colorize PointCloud	N1/A
					-			n/A
			L	Select Folder	Cance	81	Depth Image:	N/A
							Start Processing	Stop

• The custom coordinate system interface should pop up. Ensure Ellipsoid and Projection information are correct, then click **Confirm**.

CoPre	Cust	tom Coor	dinat	e System	L					×
Elli	psoid	d Projec	tion	Datum Transform	Plane Calibration	Elevation Fitting	Geoid Model	Plane Grid		
Elli	psoic	l Name:	WG	S84						•
^	Ellip	soid								
	Nar	me			WGS84					
	а				6378137					
	1/f				298.257223563					
	Sele	ct							Confirm	Cancel

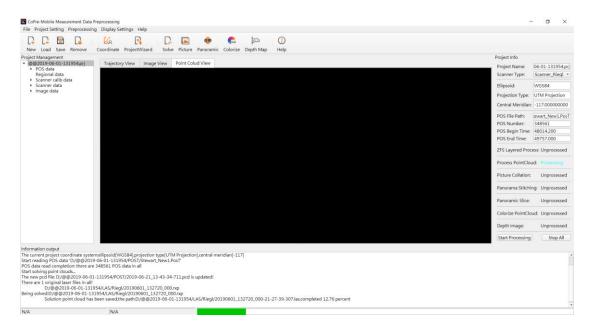


In project wizard interface, keep all settings as default and click Next. Next page is a processing flow which supports automatically processing data. Here we choose manually processing data so click Finished. The interface will show project information on right side and relative files will be read automatically if they saved in correct folders before.



### 5.3.2.2 Solve Point Cloud Data

 Click Solve to automatically start raw lidar data (rxp format) processing. It will generate las format point cloud data in Riegl folder.





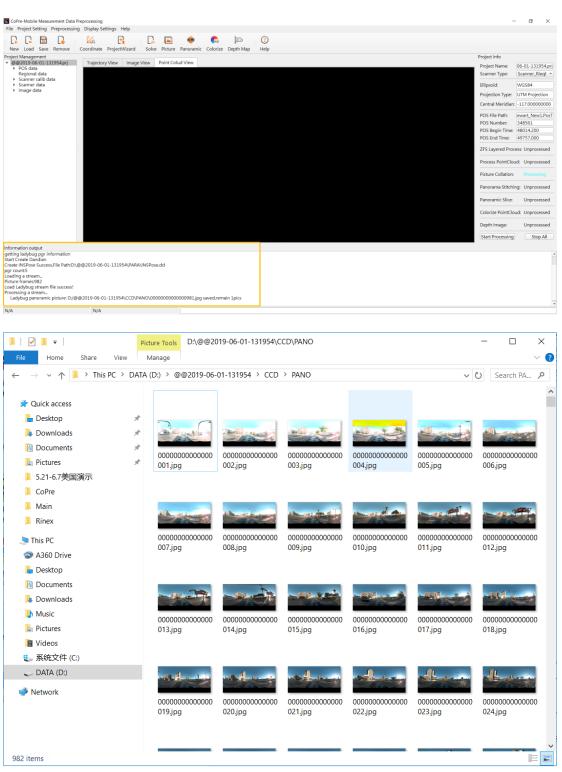
🛃 🖡 =   D:\@@2019-0 File Home Share	View					- ×
> -> 🕆 📜 -> This Po	C > DATA (D	0:) > @@2019-06-01-131954 > LAS > Rieg	I		∨ Ö Sear	ch Rie 🔎
		Name	Date modified	Туре	Size	
📌 Quick access		ColorLas	6/11/2019 9:40 AM	File folder		
늘 Desktop	*	@@2019-06-01-131954.kml	6/11/2019 9:23 AM	KML	94 KB	
🔈 Downloads	*	20190601_132720_000.rxp	6/1/2019 1:43 PM	RXP File	13.775.825	
Documents	*	Sector 20190601_132720_000-21-27-39-307.las	6/21/2019 3:49 PM	LAS Laser Point File	307.435 KB	
🔚 Pictures	*	Sector 20190601_132720_000-21-27-53-063.las	6/21/2019 3:50 PM	LAS Laser Point File	307,435 KB	
5.21-6.7美国演示		Section 20190601_132720_000-21-28-06-162.las	6/21/2019 3:50 PM	LAS Laser Point File	307,435 KB	
📙 CoPre		Section 20190601_132720_000-21-28-20-900.las	6/21/2019 3:51 PM	LAS Laser Point File	307,435 KB	
📕 Main		Science 20190601_132720_000-21-28-34-294.las	6/21/2019 3:51 PM	LAS Laser Point File	307,435 KB	
Rinex		验 20190601_132720_000-21-28-46-333.las	6/21/2019 3:51 PM	LAS Laser Point File	307,435 KB	
		🐿 20190601_132720_000-21-29-00-270.las	6/21/2019 3:52 PM	LAS Laser Point File	307,435 KB	
🧢 This PC		🐿 20190601_132720_000-21-29-12-224.las	6/21/2019 3:52 PM	LAS Laser Point File	307,435 KB	
A360 Drive		🐿 20190601_132720_000-21-29-27-826.las	6/21/2019 3:53 PM	LAS Laser Point File	307,435 KB	
🔚 Desktop		S0190601_132720_000-21-29-42-048.las	6/21/2019 3:53 PM	LAS Laser Point File	307,435 KB	
📔 Documents		S0190601_132720_000-21-29-56-007.las	6/11/2019 8:49 AM	LAS Laser Point File	307,435 KB	
🔈 Downloads		S0190601_132720_000-21-30-09-306.las	6/11/2019 8:50 AM	LAS Laser Point File	307,435 KB	
🜗 Music		S0190601_132720_000-21-30-21-777.las	6/11/2019 8:51 AM	LAS Laser Point File	307,435 KB	
Pictures		😼 20190601_132720_000-21-30-34-249.las	6/11/2019 8:52 AM	LAS Laser Point File	307,435 KB	
Videos		😼 20190601_132720_000-21-30-49-227.las	6/11/2019 8:53 AM	LAS Laser Point File	307,435 KB	
🏭 系统文件 (C:)		20190601_132720_000-21-31-03-381.las	6/11/2019 8:54 AM	LAS Laser Point File	307,435 KB	
		20190601_132720_000-21-31-15-719.las	6/11/2019 8:55 AM	LAS Laser Point File	307,435 KB	
🧅 DATA (D:)		20190601_132720_000-21-31-29-619.las	6/11/2019 8:56 AM	LAS Laser Point File	307,435 KB	
🕩 Network		20190601_132720_000-21-31-42-745.las	6/11/2019 8:57 AM	LAS Laser Point File	307,435 KB	
		Section 20190601_132720_000-21-31-55-785.las	6/11/2019 8:58 AM	LAS Laser Point File	307,435 KB	
		20190601_132720_000-21-32-07-759.las	6/11/2019 8:59 AM	LAS Laser Point File	307,435 KB	
		20190601_132720_000-21-32-21-785.las	6/11/2019 9:00 AM	LAS Laser Point File	307,435 KB	
		20190601_132720_000-21-32-36-476.las	6/11/2019 9:01 AM	LAS Laser Point File	307,435 KB	

# 5.3.2.3 Picture Collation

Click **Picture** to prepare picture collation. Ensure sequence number is start from 1 and keep all settings as default. Click **Start Collation**. Detailed progress is shown in below information box. It will generate jpg format picture in **PANO** folder.

Picture Collation	? ×
Sequence number	Start Collation Reduction
000000000000000000000000000000000000000	Update Pose Stop
ladybug Size	
Width: 8192	Height: 4096
Panoramic slice	
Slice Size 2608	Initial Angle 45
✔ Left Side ✔ Right S	ide Slice Number 4
✔ Front Side ✔ Back Si	de Start Slice Stop Slice



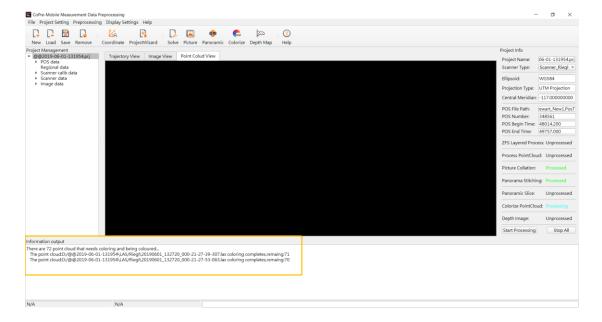




# 5.3.2.4 Point Cloud Colorized

Click **Colorize** to start point cloud colorized. Both needed files will be automatically read in software and click **Start** to begin. It will generate colorized las format point cloud data in **ColorLas** folder.

ile Path		
INSPose File: ):/@@2019-06-01-131954/PARA/INSPose.	dd Lo	ad
PCPRPara File: /@@2019-06-01-131954/PARA/PCPRPara.p	pz Lo	ad
CameraParam File: 0002019-06-01-131954/PARA/Camera.cal	ib Lo	ad
Color Type: <ul> <li>Vehicle Data</li> <li>UAV Data</li> <li>Start</li> </ul>	St	op



ightarrow 🔶 🔸 This	PC > DATA	(D:) > @@2019-06-01-131954 > LAS > Riegl	> ColorLas		マ ひ Sea	rch Col 🔎
-		Name	Date modified	Туре	Size	
Quick access	*	Section 20190601_132720_000-21-27-39-307.las	6/21/2019 4:22 PM	LAS Laser Point File	307,435 KB	
E Desktop	<i>,</i> -	🐏 20190601_132720_000-21-27-53-063.las	6/21/2019 4:23 PM	LAS Laser Point File	307,435 KB	
Downloads	*	🐿 20190601_132720_000-21-28-06-162.las	6/21/2019 4:23 PM	LAS Laser Point File	307,435 KB	
Documents	*	20190601_132720_000-21-28-20-900.las	6/21/2019 4:23 PM	LAS Laser Point File	307,435 KB	
E Pictures	*	🐿 20190601_132720_000-21-28-34-294.las	6/11/2019 9:24 AM	LAS Laser Point File	307,435 KB	
] 5.21-6.7美国演示		😼 20190601_132720_000-21-28-46-333.las	6/11/2019 9:25 AM	LAS Laser Point File	307,435 KB	
CoPre		😼 20190601_132720_000-21-29-00-270.las	6/11/2019 9:25 AM	LAS Laser Point File	307,435 KB	
📙 Main		N 20190601_132720_000-21-29-12-224.las	6/11/2019 9:25 AM	LAS Laser Point File	307,435 KB	
Rinex		20190601_132720_000-21-29-27-826.las	6/11/2019 9:25 AM	LAS Laser Point File	307,435 KB	
		验 20190601_132720_000-21-29-42-048.las	6/11/2019 9:26 AM	LAS Laser Point File	307,435 KB	



# 6 Alpha3D Operation Quick Guide

# 6.1 Pre-Requirement for Installation

In order to install and use Alpha3D, the following requirements must be covered:



For safety, at least 2 persons to lift and mount the unit.



A vehicle with roof bar to assemble system.



A base station to post-processing data.

# 6.2 Operation Steps

First, assemble extension with roof bar which above the vehicle and then mount Alpha3D system, detailed steps please check Part 3.6.1. Make sure all screws are tightened and then remove the protective cap of laser scanner.

Second, use power cable to connect Alpha3D and battery box. Plug one cable side into DC24 interface and another side into battery power output interface. Press controller box button to switch on battery.

Third, set a base station at a known point and start static mode which used to post-process trajectory. Notice, if you use CORS data as base here, this step can ignore but the final data accuracy is depending on the length of base line.

Fourth, park vehicle in an open sky area and long-press button to power on system. After WiFi is connected, using CoCapture to start work. Detailed steps please check Part 5.1.4.

**Notice:** Before start scanning, the IMU system needs both static and kinematic alignments. First is do a static alignment: Click **NEW PROJECT** in CoCapture to start record time. Keep both car and system as stable for 5 minutes to make a proper static alignment. Then, take a 3 minutes figure-eight route driving to make a proper kinematic alignment. Finally, click START to capture laser data two minutes before entering scanning area. Similarly, both static and kinematic alignments are also needed when scanning finished, but the order is different: take another 3 minutes figure-eight route driving first and finally keep stable for another 5 minutes.

Finally, when work is finished, mount protective cap first for safety. Then, disassemble battery cable, unit and roof rack extension in order. Make sure all accessories are kept in container.



# 6.3 Data Pre-Processing Steps

Pre-processing is the first stage in the data processing process which can generate trajectory, point cloud and panoramic pictures finally. During this process, there are two software will be used: Inertial Explorer and CoPre. Inertial Explorer is first used to combine both base and rover data to generate trajectory POS file. Detailed steps please check *Part 5.2.2*. CoPre is second software used to process raw lidar data to generate point cloud and panoramic pictures. Detailed steps please check *Part 5.3.2*.



# **7** Safety Directions

# 7.1 General Requirements

LiDAR system is a complex and precise surveying system. During daily carry, transport, use and store process, only correct using and proper maintenance can ensure the accuracy of unit and extend the durable years of unit. There are follow requirements need to be noticed:

- Users are not allowed to disassemble unit by self. If unit occurred problems, please contact CHC support team first.
- Please use original battery and accessories. If use non-original battery, the charger may
  occur explode or burning accidents. Non-original accessories are not eligible for warranty.
- When using charger to charging unit, please keep away from fire, inflammables and explosive materials in order to avoid fire or other serious consequences.
- Please don't abandon waste batteries and It should be disposed in accordance with local regulations as special wastes.
- Please follow user manual's steps to connect device with cable. Pay attention to plug all accessories tightly and turn on all switches in order.
- Don't plug in or pull out any cables without power off.
- Don't keep using any broken cables. Please pay and replace new cables immediately to avoid any unnecessary damage.
- Protect the device from strongly impact and shake.
- Please use rugged weather cover or umbrella for waterproof if necessary.
- Please back device to container timely after using. Make sure the device and container are dry before return unit.
- If user needs using device for very long time or under special environment conditions such as high humidity environment, please contact CHC support center first. Generally, the device occur malfunction under special conditions is not covered by the product warranty.

# 7.2 System Delivery Tips

- Alpha3D is equipped with special instrument container. During vehicle transit, please put container or device on seat with people to care about in order to avoid vibration.
- During shipping process, in order to avoid damage by mis-operation of staff, user should inform relative staff that Alpha3D is a precise instrument and it needs transport carefully with fragile label.
- If using express service to transport device, the instrument container needs an outer



carton and filling with shock absorbing cotton or foam inside. Buy a special insurance and labeled as dangerous package.

 Alpha3D should be used and storage by special person and don't rent device to other people.

# 7.3 Alpha3D Using Tips

- During usage process, Alpha3D must be handled with care in order to avoid dirty and scratch. Don't sit on instrument container or packing box.
- After work finished outside, user should clean device's surface regularly (3-5 days) with wet tissue or alcohol cotton cloth. In addition, user should also check whether screws & external cables are fixed.
- After long time storage, user should do power-on test regularly (1 month) to check whether the function is correct.
- System using temperature is -10  $^\circ\!\mathrm{C}$  +40  $^\circ\!\mathrm{C}$  and using humidity is less than 80%RH. No condensation.
- During assemble and test process, please put unit on cabinet or special shelf, and covered by dust covers. The scanner part should cover by dust cap.
- If Alpha3D is disassemble or loose, it should be re-calibrated before next time work.
- If any part of device occurred rotation difficulty, don't rotate forcedly. If Alpha3D is break down, it should not be used to avoid damage increase and user should ask professional staff for indoor maintenance. Don't disassemble device outdoor.
- If face rain or snow during field work, please put device into container immediately. Don't work under low temperature in winter in order to avoid water vapor condensation inside.

# 7.4 Alpha3D Storage

- When Alpha3D is not in use, the battery should be handled with care and it cannot be placed upside down as it's an accumulator. The screws side should in upward.
- Alpha3D should store in dry warehouse tidily and try to avoid long-time storage.
- Alpha3D storage room should clean, dry, bright and excellent ventilation. Please place device in flat or upright in order to avoid transformation.



# FCC WARNING STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The device has been evaluated to meet general RF exposure requirement. This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

# **CHC** Navigation

Building D, NO. 599 Gaojing Road, Qingpu District, 201702 Shanghai, China

Tel: +86 21 542 60 273 | Fax: +86 21 649 50 963 Email: sales@chcnav.com | support@chcnav.com Skype: chcnav\_support Website: www.chcnav.com