



# Orion ONE GNSS Receiver User Manual

V1.0, modified on 2024.12.26

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If you have any questions that can't be solved in this manual, please contact your local SingularXYZ distribution partner. Alternatively, request technical support from SingularXYZ Intelligent Technology Ltd.

Support Email: <u>support@singularxyz.com</u> Support Skype: <u>Support.SingularXYZ</u>

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The SingularXYZ Orion ONE GNSS Receiver (hereinafter O1) User Guide is aimed to help you get familiar with the O1 receiver and start your project effectively. We highly recommend you to read this manual before surveying, even you have used other GNSS RTK receivers before.

# **1.1 About Orion ONE**

With high precision GNSS module inside, Orion ONE GNSS receiver can be applied in RTK mode with all GNSS constellations. Orion ONE receiver has ultra-small size and strong anti-interference ability to make it possible to work even in harsh environments. It is the ideal RTK/GNSS product for surveyors.

To make surveying smarter, SingularXYZ has added a starlight-grade camera and a precise laser module to the Orion ONE GNSS receiver, achieving deep fusion of multiple sensors.

While shrinking the device to the palm size, Orion ONE provides an advanced GNSS engine, immersive AR stakeout, non-contact laser surveying,  $60^{\circ}$  tilt IMU, 15km enhanced UHF, and rich features to empower your tasks.

# **1.2 Receiver Features**

The SingularXYZ 01 GNSS Receiver key features:

- Ultra small and super light
- Size: Φ107mm\*58.7mm
- Weight: 547g
- 1408 channels of simultaneously signal tracking
- Fast charging via Type-C interface
- Cable-free Bluetooth wireless technology
- IP67 waterproof & dustproof
- Full base/rover interoperability
- Integrated IMU sensor
- Starlight-grade Camera, HD Capture in Weak Light Environment
- Laser Injection Power: 2mW~3mW

# 1.3 01 Packing List

This section provides overall O1 receiver packing list, including standard supplies and optional kits based on your requirements.

### Standard



### **Options For Rover**



# Chapter 2 User Interface

This chapter provides general information on environmental requirements, setup, power supply and connection of the O1 receiver.

# 2.1 Environmental Requirements

To keep the receiver with a reliable performance, it is better to use the receiver in safe environmental conditions:

- Operating temperature: -40°C to +65°C
- Storage temperature: -55°C to +85°C
- Out of corrosive fluids and gases
- With a clear view of sky

### 2.2 Front Panel

Receiver front panel contains 3 indicator LEDs and 1 Power button.



### **Front Panel**

# 2.3 Back View



The rear of the Orion ONE contains a laser transmitter and a laser receiver.

# 2.4 Lower Housing

Receiver lower housing contains a Type-C port, TNC connector and a camera.



# 2.5 Power Supply

The receiver is equipped with internal batteries.

- 4200 mAh, up to 12 hours working time
- Fast charge of 3 hours charging time

# Chapter 3 RTK Workflow

This chapter introduces how to conduct RTK Survey with SingularPad Software. SingularPad is professional Android-based surveying software developed by SingularXYZ team. SingularPad is fully functional as a field surveying software, equipped with complete work modes and necessary functions for surveyors. If you need post-processing software, please contact the support email at <support@singularxyz.com> for assistance.

# 3.1 Installation of SingularPad

SingularPad has been pre-installed on SingularXYZ data collector before shipping, if you want to download on your own device, please contact with us.

# 3.2 Create a New Project

Click *Project Manager*, click the *New* to create a new project file and input project name, set coordinates systems parameters and click *OK* to save the project.



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← New Project		← New Project	
Basic Information	Coordinate System Parameters	Basic Information	Coordinate System Parameters
Project Path nal Storag	e/SingularPad/Project $>$	Coordinate System Typ	e Local System >
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Operator	Input	Ellipsoid Parameter	
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Our software has added many countries' coordinate systems, you can find what you need by country name or coordinate system name.

The following steps give an example of how to find predefined coordinate systems of our singularpad software.

Click the button located after *Name* in Coordinate System Parameters interface.



In the Coordinate System Favorites interface, click the *Template* below to enter the Predefined Projections interface.

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Click *Country* to select the country name or enter a keyword after *Search* to find it.

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NAD	BEI GIUM		Cass/South
GRS	DEEDIOIN		Cass/SOuth Ellipsoid USA COUNTY MN
Hot	BOSNIA		Lambert_Conformal_Conic_2SP
NAD	BRAZIL		GDM2000-Cassini-Soldner
GRS	BUIGARIAN		Geocentric-Johor
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After finding the required coordinate system, click *Apply* to add it to coordinate system parameters, click *OK* to apply it to the current project.

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If you don't find what you need in Predefined Projections, you can click **Add** or **Import** to create new coordinate system.



← Coordinate S	ystem		÷	Coordinate S	Syster	n	
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# **3.3 Device Connection**

## 3.3.1 NFC Connection

Equipped with an NFC chip, users can easily connect the O1 receiver to the data collector with just one touch, as shown in the figure below.



### 3.3.2 Bluetooth Connection

After creating a new project, switch to **Device** interface, click **Communication**.



Select the corresponding parameters according to the following requirements

Device Type: GNSS

Device Manufacturer: SingularXYZ

Mode Type: RTK (Orion ONE)

Connection Type: Bluetooth

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Device Type	GNSS >
Device Manufacturer	SingularXYZ >
Model Type	RTK(ORION ONE) >
Connection Type	Bluetooth $>$
Currently Paired Device	

	3124D0029		>
4		DC:0D:30:35:9D:30	



Make sure controller Bluetooth turned on, click below Currently Paired Device to find SN of your O1 receiver. Click *Connect*.

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← Communicatio	on	← Communica	tion
Device Type	gnss $>$	Device Type	gnss >
Device Manufacturer	SingularXYZ >	Device Manufacturer	SingularXYZ >
Model Type	RTK(ORION ONE) >	Model Type	RTK(ORION ONE) >
Connection Type	Bluetooth >	Connection Type	Bluetooth >
Currently Paired Devic	е	Currently Paired Dev	ice
3124D0029	> DC:0D:30:35:9D:30	3124D0029	DC:0D:30:35:9D:30
Conne	ect	Debug	Stop
< ●		•	

After connecting 01 receiver, you can check the information of the receiver (like firmware version) in

#### Device Information.



Tips: If you fail to connect with receiver through SingularPad, you can follow the prompts to enter the system Bluetooth settings interface of the PDA/data collector to ensure that the Bluetooth pairing is successful. Sometimes you need to cancel the device Bluetooth pairing, restart the receiver or SingularPad software and pair again.

### 3.4 Quick setup 01 receiver

Please follow the instructions below to quickly set up your O1 receiver according to the kit type you purchased.

#### For O1 Base & Rover Kit

Refer to Section 3.4.1 Internal Radio Mode for detailed setup instructions.

### For O1 Rover Kit

Refer to Section 3.4.2 PDA CORS Mode for detailed setup instructions.

Ensure that you follow the appropriate section based on your kit to achieve

optimal performance of your O1 receiver.

### 3.4.1 Mode 1 – Internal Radio Mode(01 Base + 01 Rover)

Equipped with an NFC chip, users can easily connect the O1 receiver to the data collector with just one

touch, as shown in the figure below.

If you've purchased 2 units of O1 GNSS receiver, please select one O1 as base and the other as rover. During configuration, you need to connect your PDA device or data collector to the base and rover respectively.

When work as a Base station, SingularPad supports transmit the correction data in Internal Radio mode.

**Internal Radio**: This mode uses internal radio to transmit the correction data from Base to Rover. You need to set Base and Rover with the same protocol and frequency.

Tip: Orion ONE GNSS receiver has two radio versions, U and LU version. U version radio supports many radio protocols whether base or rover, but data transmission distance can only reach 3-5 kilometers under ideal environment; LU version radio only supports CSS radio protocol when set as base, and also supports many radio protocols including CSS radio when set as rover, but data transmission distance can reach 10-15 kilometers under ideal environment. Please contact the sales to confirm which radio version to purchase.

- Protocol: U supports TRIMTALK, TRIMMK3, TT450S, TRANSEOT, SATEL and LU supports only CSS for base transmission
- Frequency: select a channel or customize a frequency, the range of frequency is 410-470MHz.
- Baud rate: 9600 and 19200. This option is to set the baud rate of lemo port.
- Power: High and low (low power will reduce the RTK range)

#### Tips: Condition of the base station setup

#### **Environment**:

Clear outdoor sky view, free from obstructions

Place GPS and radio antennas as high as possible to reduce signal

interference and increase range

#### Avoid:

Obstacles: buildings, vehicles, towers, trees, etc.

Interference: high-power radar, TV, cellular towers, power lines or

electrical facilities

The following steps give an example of how to configure internal radio base mode.

NOTE:

Remember connect the whip antenna to both your base station and rover when you set internal radio work mode.

1. Go to *Device* >> *Base*. Set *Base ID* and choose the *Diff Mode* firstly.

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	Age1 FIXED	<ul> <li>H:0.016</li> <li>27/40 V:0.025</li> </ul>	← Base N	Aode Setting	S	🔶 General Parameter	S
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Static Record	Inspection Accuracy	COM Settings	Datalink		Internal Radio $>$		
			Channel:6 Protocol:TRIN	Frequend ITALK Power:H	cy:460.05 >		
Device Activation	Device Information						
<b>=</b> (	<b>)</b>	8	Share	Save	Start Base	ок	
Project	evice Surve	y loois					
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2. Click Base Startup Mode to select the base startup way

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Base ID: Diff Format:RTCM32 >								
Base Startup Mode Single Point >								
Static								
Disa		Startup	Mod	le	>			
Datal	Single P	oint						
Data	Assigne	d Base Co	ordina	ates	met >			
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IP:		Sel	ver P	011.0000	>			
Base Access Point A0C624112135567								
Chara Cova Ctart Boog								
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*Single Point:* Start the base station at unknown coordinates

**Assigned Base Coordinates:** Start the base station at known coordinates, and you need to enter the latitude, longitude and the height

**Use Current Coordinates:** Automatically start the base station at current coordinates.

Note: Please setup the base station at a known point. Select Base Startup Mode as Assigned Base

Coordinates and input the known point coordinates. Make sure the current coordinates of the instrument is within 50 meters of the known point coordinates.

3. Set *Data Link* as *Internal Radio*. Set parameter settings, Channel, Frequency, Protocol, Baud Rate and Power.





4. When start Base succeed, it will show as below in SingularPad.



After base settings, please disconnect the base device and then search for the SN of rover to connect and configure the rover device. Select the same protocol and frequency with the Base.

The following steps give an example of how to configure internal radio rover mode.

1. Go to **Device** >> **Rover**. Set **Data Link** as **Internal Radio**.



2. *Parameter Settings*. Set Channel, Frequency and Protocol the same as the Base.





3. **Base Coordinates Change Alert**: SingularPad will alert when the base station coordinates change while you are working. This may be because the rover is mistakenly connected to another base station or the base station has been moved.





4. Click *Apply* to start the Rover mode.

After completing the configuration, please check the RTK status in the top status bar. Once the status changes to "FIXED" and the differential delay "age" is within the range of 1-2 seconds, you have obtained reliable centimeter-level RTK positioning.



# 3.4.2 Mode 2 – PDA CORS Mode(Single 01 Rover)

Equipped with an NFC chip, users can easily connect the O1 receiver to the data collector with just one touch, as shown in the figure below.

When works as a rover, SingularPad supports receive the correction data in Phone Internet Mode.

**Phone Internet**: This mode uses the phone internet to transmit the correction data from Base to Rover. Please make sure the PDA device is in good network conditions, such as 4G (SC200 data collector can obtain a 4G network signal by inserting a SIM card), WiFi or hot spot.

1. Go to Device >> Rover. Set Data Link as Phone Internet.



2. Set *Connect Mode*, for O1 receiver supports NTRIP and TCP Client.

**CORS Settings**. Input the server IP, Port, User and Password in the CORS Settings.

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← Parameter Se	ttings
Device Internet	
Connecting Mode	NTRIP >
CORS Settings	:=
IP	47.103.96.216
Port	8080
User	SingularXYZ
Password	
APN Settings	=
Name	Input
User	Input
Password	٥
Ok	
٠ •	

Note:

The IP & port in the picture is only for example, please enter your local CORS account instead. You can purchase a third party RTK corrections service account in your local area to obtain an RTK FIX solution.

3. Click *Get* button on the right to get the mountpoint list and choose the mountpoint.

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← Rover Mod	le Sett	ings	
General Paramete	rs		:=
Datalink Settings			
Datalink		Phone Inter	net >
Connecting Mode:	NTRIP		
IP:47.103.96.216	Serve	r Port:8080	>
User:SingularXYZ	Passv	word:*****	
Mountpoint Settin	gs	G	et
Mountpoint		Off	ice >
RX Data Status			
$\bigcirc$		Start	
Auto Connect to Ne	etwork		0
Share			ly
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Note:

The mount point "Office" in the figure is an example. Please find out the appropriate mount point via the website of your local NTRIP/CORS provider. Make sure that the baseline doesn't exceed 50km.

4. Click *Start* button on the right to receive data from CORS/RTK correction service. Then you can see the rover is receiving data.

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← Rover Mod	le Settings	← Rover №	/lode Settin	gs
General Parameter	rs 🔚	General Param	neters	*
Datalink Settings		Datalink Settin	gs	
Datalink	Phone Internet >	Datalink	F	Phone Internet >
Connecting Mode: IP:47.103.96.216 User:SingularXYZ Mountpoint Setting	NTRIP Server Port:8080 > Password:****** gs Get	Connecting M IP:47.103.96.2 User:Singular Mountpoint Se	ode:NTRIP 16 Server P (YZ Passwo ettings	ort:8080 rd:***** Get
Mountpoint	Office >	Mountpoint		Office >
RX Data Status	Start	RX Data Status		Stop
Auto Connect to Ne	twork 🦳	Auto Connect t	o Network	
Share				
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5. *Auto connect to network*: When this option is opened, SingularPad will connect to network automatically so that user don't need to click start to connect network.

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Datalink		Phone Internet >
Connecting Mode:	NTRIP	
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User:SingularXYZ	Passv	word:*****
Mountpoint Setting	gs	Get
Mountpoint		Office >
RX Data Status		
1398B	11	Stop
Auto Connect to Ne	twork	=0
Base Coordinates ( excluded)	Change	Alert(VRS
Share	Save	Apply
-	•	

6. **Base Coordinates Change Alert**: SingularPad will alert when you connect with different base station. When you are using VRS, please do not turn this on.

Rover IVIO	de Settings	5
Datalink	Pho	one Internet >
Connecting Mode	NTRIP	
IP:47.103.96.216	Server Por	t:8080
User:SingularXYZ	Password	*****
Mountpoint Settin	ngs	Get
Mountpoint		Office >
RX Data Status		
		Oton
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Auto Connect to N	letwork	
Auto Connect to N Base Coordinates excluded)	letwork Change Alert	
Auto Connect to N Base Coordinates excluded) Share	letwork Change Alert Save	(VRS C) Apply

7. Click *Apply* to start the rover mode. After completing the configuration, please check the RTK status in

the top status bar. Once the status changes to "FIXED" and the differential delay "age" is within the range of 1-2 seconds, you have obtained reliable centimeter-level RTK positioning.



# Chapter 4 RTK Survey-field Data Collect

This section describes the basic survey functions of SingularPad, including Point Survey, Laser Survey, Point Stakeout, AR Visual Stakeout, CAD Mapping and etc.

# 4.1 SingularPad Top Status Bar Introduction

After completing your O1 RTK setup, check current RTK solution status at the top pf the SingularPad software.



<b>RTK Solution Status</b>	Description
FIXED	E1 is receiving RTK corrections stably and obtaining a Fixed RTK solution with centimeter-level accuracy.
AUTONOMOUS	Single-point satellite positioning without receiving RTK correction data. The accuracy is around meter-level.
DGNSS	E1 received corrections from the base/CORS, but it needs more time to calculate due to environmental interference or correction data quality. The accuracy is around decimeter-level.
FLOAT	E1 receives corrections from the base/CORS, but due to obstructions or magnetic field interference the signal reception is not very stable and the accuracy is sub-meter level.



# 4.2 Point Survey

In the Survey interface, click **Point Survey** and enter point name, code and antenna height, then click





#### Note:

Our software supports 3 antenna measuring types.

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← Antenna Parameters		$\leftarrow$ Antenna Parameters	
Antenna Measuring Height	1.8 m	Antenna Measuring Height	1.8 m
Antenna Measuring Type Po	ole Height >	Antenna Measuring Type	ole Height $>$
Antenna Height	1.868 <b>m</b>	Antenna Height	1.868 <b>m</b>
Antenna Parameters Antenna Measuring Oric Type R:66 HL1 Used	>	Antenna Parameters OrionONE R:66.7 mm H:48.8 mm HL1:19.2 mm HL2:10.7 m Used list	> m
Phase Center Height		[Pole Height]1.6m	
[Pole Height]1.8m		[Pole Height]1.8m	
[Pole Height]1.7m		[Pole Height]1.7m	
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Pole Height: Typically, select the Antenna Measuring Type as Pole Height and enter the height of your centering pole.

In the floating window of the survey interface, you can see the display information. The default display information is NEH and Base distance, and click the floating window you can set them as you need. You

can also click is to enter the display information settings interface and select the information you need to display. Except default display information, SingularPad supports Longitude, Latitude, Altitude, etc.

9:58 💿 🖪		<b>96%</b>	10:01	() A			💎 🗎 95%
← □ ∉	e1 FIXED 27/4	H:0.018 0 V:0.025	←	Setting	IS		
Name Pt1 🗙	Code Input		Sett	ings	Displa	ay Info	Tool Bar
Work Layer:0	> 1.8+0.0	000m >	Displa N:3449 E:3369 Option	y Items 9293.36 91.686 1s	7	H:14.0 Base di	18 stance:410.198
				Long			Lat
				Altitude			Ant. H
<u>&gt;</u>	۲		Forw	ard Azin	nuth		Speed
				Time		Base	distance(2D)
		0	L	aser Dist	i.	F	Point Dist
				Pt H Dist		Pt Ele	evation Offset
		2m		NRMS			ERMS
¢03		•••		PDOP			HDOP
N:3449294.011 E:336991.543	H:14.117 Base distance	e:409.569	Backs	space	Def	ault	ок
•	•			•			

• Click to select different map types or do map calibration. SingularPad supports Google Map (Standard Map/Satellite Map), OpenStreetMap and WMS Map.

10:01	0				95%
4			٢	2.0	H:0.016
~					V:0.028
Nan	ne Pt1	×c	ode	nput	=
Wor	k Layer:0	>	1	.8+0.00	0m >
	Displa	y Map	,		90*
	None				2/0-
m	Google T	ile Map	(Standa	ard Map	)
~	Google T	ile Map	(Satelli	te Map)	
~	OpenStre	eetMap			
- 9	WMS Ma	p Settir	ng		
15 31	Map Cali	bration			Q
(E al	/			C	
				2	<u>m</u>
				/	
N:344 E:336	9293.99 992.534	0	H:13.4 Base di	90 stance:	409.510
	•	(			

• Click to jump to map center.



- Click to show the all points on the interface.
- Click to enter the point database and view the coordinates of the measured points. You can add, recover, import and export data. After selecting a point, you can view the details and take notes or take photos.

10:05 💿 🖪 📄	▼ 🗎 95%
← Points Data	base 🥊 NEh 📗
Name > Inp	ut 🎦
Pt3 Smooth Point N:3449293.743 E:336991.812	T:2024-11-26 10:05:20.280 Elev:13.591 Code:
Pt2 Smooth Point N:3449293.819 E:336991.986	T:2024-11-26 10:05:15.118 Elev:13.561 Code:
Pt1         Smooth Point           N:3449293.783         E:336991.881	T:2024-11-26 10:05:08.884 Elev:13.495 Code:



Click to enter Settings interface

In *Settings* interface, you can modify *Tolerance Setting* such as solution limit, HRMS limit, VRMS limit and etc. and modify *Smooth* parameters and configure *Settings* options.

10:06 💿 🖬 📃	▼ 🗎 95%	10:06 🛈 🖪	♥ 🛔 95%
$\leftarrow$ Settings		$\leftarrow$ Settings	
Settings Display Info	Tool Bar	Settings Displa	ay Info Tool Bar
Tolerance Setting		Average	
Solution	FIXED >	Survey Delay	Os >
HRMS	0.05m >	Average Points	5 >
VRMS	0.1m >	Horizontal	0.02m >
PDOP	3 >	Vertical	0.03m >
AGE	5s >	More Settings	
Tilt Angle	Unlimited >	Pop Up the Survey Co	nfirmation Page 🔵 🚍
Average		Remind When Point N	lame Repeat 🛛 🧲 🗌
Survey Delay	Os >	Point Name Incremer	nt 1 >
Average Points	5 >	Default Code	Same as Last Point $>$
Default	ок	Default	ок
۰ ۲		•	

In *Display Info* interface, you can set the display information to the floating window, such as longitude, latitude, altitude, etc.

Settings Di	splay Info	Tool Bar	
Long		Lat	
Altitude		Ant. H	
Forward Azimuth	1	Speed	
Time	Base	e distance(2D)	
Laser Dist.		Point Dist	
Pt H Dist	Pt E	evation Offse	
NRMS		ERMS	
PDOP		HDOP	
VDOP		Tilt Angle	
Projection Angle		Pitch	
Backspace	Default	ок	
4			

In *Tool Bar* interface, you can add or delete options that displayed on the point survey interface. You can customize the interface layout to suit your usage habits.



# 4.3 Calibrate Point

When changing the position of the base station, there will be offsets between surveying points base on different base stations. Users can use the Calibrate Point to calibrate the offset.

Go to **Project** > **Calibrate Point**. Add a point measured under the previous base station as **Known Point Coordinates**, and measure the same point under current base station as **GNSS Point Coordinates**.



For the GNSS Point Coordinates, you can click the surveying icon to measure under the current base directly.

Note: Please confirm the RTK status is FIXED.

10:13 🛈 🖬 📃	♥ 🕯 94%	10:14	<u>()</u>				94%	
← Calibrate Poi	nt	2		₩	۲	ê.	H:0.019	
				Age1	FIXED	27/40	V:0.027	
GNSS Point Coordina	ates 🝳 \Xi	Name	ous Bas	se ×	Code	Input		
Name Latitude		Antenna Height			1.8+0.000m >			
Longitude Altitude	>	B 31	°09'58.7	471"N	N	34492	293.832	
Known Point	·8 😑 🗹	L 121	l°17'22.7	064"E	E	336	991.483	
Name	Previous Base	Н		13.11	Elev		13.11	
Northing Easting	thing 3449293.743m ting 336991.812m			Dist. to Ref				
Elevation	13.591m							
Result								
Calibration parameter projects	rs applied to all							
			Save to Point Database				0	
Clear	ок							
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Or measure the GNSS point under the current base station in advance and click to select from the point database.



Then click **OK** to complete the Calibrate Point.



# 4.4 Localization

When starting a new project, if you are using the local small-scale coordinate system, you can use this function to transform the geodetic coordinates system to your local system.

Go to **Project** > **Localization**, add at least 3 pairs of points for the Localization.

Note:

A pair of points are the known local coordinates and the surveying coordinates of the same point.



Click **Add** to add the corresponding pairs. Input the Known Point Coordinates.


Then select the corresponding GNSS coordinates of the known point.

7:34 🗘 🖬 🗘	<b>1</b> 88%	7:40 🌣 🖪 오	<b>a</b> 87%	7:40 🌣 🖪 오	â 87%
← Localization		$\leftarrow$ Coordinate	Select 🎴 🛯 BLH	$\leftarrow$ Localization	
Name	К1	Point Coordinates	Survey Point	Name	К1
Known Point Coordinates	🤕 🧮 🔊	Name > Inp	ut 🏹	Known Point Coordinates	🕑 📰 🤄
Northing	3450141.4360 m	A3 Input Point	T:2024-10-03 19:25:14.000	Northing	3450141.4360 m
Easting	622951.6845 m	E:622947.648	Code:	Easting	622951.6845 m
Elevation	14.3341 🗙	A2 Input Point N:3450138.466	T:2024-10-03 19:23:44.000 Elev:14.349	Elevation	14.3341 🗙
GNSS Point	◎ = 2	E:622946.392	Code:	GNSS Point	🭳 ≔ 🗹
Latitude		A1 Input Point	T:2024-10-03 19:23:10.000 Elev:14 318	Latitude	31°05'28.2453"N
Longitude	>	E:62251.591	Code:	Longitude	4°35'08.2266"W >
Altitude				Altitude	14.318m
Options				Options	
Use Horizontal Control				Use Horizontal Control	
Use Vertical Control				Use Vertical Control	
ок		Add Recover	Import Export	ОК	
۰ ک		•	• •	• •	

Add the remaining point pairs in sequence. You can also enter the known point in point database in advance and select the input points.

7:40 💠 🖬 😋	87%
	on
Data Content	0
K1 B:31"05'28.2453"N L:4"35'08.2266"W H:14.318	HRMS:0.000 VRMS:0.000 N:3450141.436 E:622951.685 Elev:14.334
Add	rt Export Calculate
•	•

After adding all the point pairs, click *Calculate*.

Data Content	
K1	HRMS:0.000 VRMS:0.000
B:31°05'28.2453"N	N:3450141.436
L:4°35'08.2266"W	E:622951.685
H:14.318	Elev:14.334
K2	HRMS:0.000 VRMS:0.000
B:31*09'59.0117*N	N:3450138.462
L:1*17'22.3188*E	E:622946.400
H:14.349	Elev:14.343
K3	HRMS:0.000 VRMS:0.000
B:31*09'58.1023"N	N:3450140.494
L:1*17'22.3539"E	E:622947.653
H:14.324	Elev:14.310
Add	t Export Calculate

Select the convert method and the accuracy limit according to your project requirements.



10:25 💿 🛛 🔷 🔷	92% 10:24 <sup>⊙</sup> □ □ <b>○ ○ ○ ○</b>	10:25 💿 🛛 📄 🔷 🗣 🕯 92%
$\leftarrow$ Localization Settings	← Localization Settings	← Localization Settings
Convert Method H Adjustment + V Ajustment	Convert Method H Adjustment + V Ajustment >	Convert Method H Adjustment + V Ajustment >
Horiz Horizontal Accuracy In Limit 0.1 0.02 0.03 0.05 0.1 0.2 0.5 1	Horizontal Accuracy Limit       0.1m >         Vertical Accuracy Limit       0.1m >	Horiz Vertical Accuracy 1m > Verti 0.1 0.02 0.03 0.05 0.1 0.2 0.5 1 1
ОК	ОК	ОК
< ● ■	< ■	< ● ■

10:24 😟 🖪	🛡 Î 92%
← Localization Set	tings
Convert Method	H Adjustment + V Ajustment
Horizontal Accuracy Limit	0.1m >
Vertical Accuracy Limit	0.1m >



You can click Export Report to save the projected coordinate system parameters. Click *Apply* to apply the localization.

8:14 🌣 🖪 🗘		84%
💪 Localizat	ion Ca	lculating
Result		
Conversion Resi	dual	
К1	HRMS:	0.029 VRMS:-0.000
K2	HRMS	:0.032 VRMS:0.000
К3	HRMS:	0.006 VRMS:-0.000
Ellipsoid Parame	eter	
WGS-84		
Semimajor Axis:	637 1/	f:298.257223563
Projection Parar	neter	
UTM		
Central Meridian		E123°00'00"
Horizontal Adjus	tment	
Horizontal Ad	ljustme	ent(TGO)
Translate Northin	ng(m)	1380.049052
Translate Easting	(m)	49.207755
Rotation		0°04'14.9976"
Scale	1.0	000273161828885
A		
		Apply

## 4.5 Tilt Survey

The O1 GNSS receiver has a built-in IMU module that supports tilt surveying up to 60°. The system will accurately calculate the actual offset based on the tilt angle, reducing the user's burden on centering pole at each measurement.

The tilt function option will appear in each survey/stakeout function interface. You can click to turn this function on/off.

Tilt initialization is required when using it for the first time or when its calibration expires.

The following steps give an example of how to use tilt survey.

1. Open IMU: Go to survey >> Point Survey >> click the button to open.

After clicking the tilt IMU button, the system will prompt you to check the antenna information, please check whether the antenna height is correct.



#### 2. Initialization

After clicking the IMU button, you can follow the guidance on the interface to complete it.

During operation, ensure that the receiver can search for satellites and obtain a fixed RTK solution.

Note: If the receiver is powered off or reset, it will need to be reinitialized.



In survey interface, you can find the bubble and angle value showing how you tilt the pole in real time. To ensure the accuracy, please keep the tilt angle less than 60°. When the pole tilts within 60°, the built-in

IMU precisely calculates the actual offset, the accuracy of which can be accurate to  $\pm 2.5$  cm.



*Tips: Do not shake or rotate the receiver violently, otherwise you need to re-initialize.* 

## 4.6 \*Laser Survey\*

1. Connect Orion ONE receiver to SingularPad software via Bluetooth and ensure a fixed RTK solution.



2. Before using laser surveying, you need to complete IMU initialization for O1 according to the software prompts. When the IMU icon shows Ready, the accuracy of the laser surveying is accurate.

*Tips: Laser surveying is based on IMU, so shake it more times to ensure that the IMU is initialized successfully.* 



3. Turn on the laser surveying function in the Point Survey interface.



Then the O1 laser can be clearly seen.



*Tips: It is recommended to use a bipod for laser survey to reduce the shaking caused by human factors and lead to inaccurate precision.* 



4. Now click the measure button and you can perform laser survey normally. The points measured using

the laser can be viewed in the Points Database(Please refer to section 4.14 to find it).



*Tips: The laser of 01 can reach a distance of about hundreds of meters, but it does not mean that it can measure so far. Generally speaking, 3-5 meters is the best accuracy.* 

#### 4.7 Detail Survey

After completing your O1 RTK setup, check current RTK solution status at the top pf the SingularPad software.

In detail survey interface, both local coordinates and Latitude/Longitude will be displayed when measuring.

- Click to start or stop collecting data
- Click <sup>\$\$</sup> to set settings, display info and tool bar.
- Click to check point database; you can add note, info, arrow drawing and photo.
- Click 🖉 to open IMU to do tilt survey.
- Click to open Fast Code Survey. You can input Remark and Code into it, then click the button that just created to start quick-collecting.

2:25 🌣 🖲 🖪		♥ 🔒 67%
← 📮 🛱		42/43 V:0.028
Name Pt2 ×	Code	Input
Antenna Height		1.8+0.068m >
B 31°09'58.0908"N	N	3449274.006
L 121°17'21.7717"E	Е	336966.42
H 15.981	Elev	15.981
Tilt Angle		4°25'01.2929"
Projection Angle	2	52°52'56.5372"
Dist. to Ref		66.731m



## 4.8 Control Point Survey

By measuring the coordinates of the same point multiple times and taking the average, you can get more accurate coordinates. This function is usually used to measure control points.



- Click to start or stop collecting data.
- Click to set settings, display info and tool bar.
- Click to check point database; you can add note, info, arrow drawing and photo.

#### 4.9 Point Stakeout

Go to *Stake point* interface, add or import the point coordinates you need to stake out, you can also click Button Library to select from the point database.

• Click *Add* to input coordinates

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← Stak	e F	oint		← New Point	
Point Coordinates		To-Stake-Point	Preview Map	Name	Pt1
Name	>	Input		Code	===
				Northing	Input <b>m</b>
				Easting	Input <b>m</b>
				Elevation	Input m
				Property Type	Stake Point >



• Click button library to choose one.

10:53 ⊙ 🛛 ← Stake	e Point		♥ 🗎 89%	2:33	Coord	dinate Ba	itch S	♥ ■ 66% select
Point Coordinates	To-Stake	-Point P	review Map	Nan	ne	> Input		
Name	> Input				Select All(	0)		
					(7) <b>Pt1</b> N:34492 E:33696	Smooth Poir 74.017 6.415	t T:202 Elev:1 Code	4-11-27 14:23:3 5.967 :
					Pt2 N:34492 E:33696	Control Poin 72.473 7.132	t T:2024 Elev:1 Code	4-11-27 14:30:3 5.908 :
					(7) Pt3 N:34492 E:33696	Smooth Poir 74.110 6.779	t T:202 Elev:1 Code	4-11-27 14:32:4 5.963 :
					(7) Pt4 N:34492 E:33696	Smooth Poir 74.108 6.771	t T:202 Elev:1 Code	4-11-27 14:32:4 5.970
					(*************************************	Smooth Poir 74.111 6.770	t T:202 Elev:1 Code	4-11-27 14:32:4 5.977 :
					🕝 Pt6	Smooth Poir	t T:202	4-11-27 14:32:4
Add Da	atabase	Import	Export		Add			ОК
•	٠				•	٠		

• Click Import to import point data in different file types. You can also define a new format according to your needs.

10:53 ⊙ 🛛 ← Stake	e Point		♥ 🛱 89%	10:56 ⊙ ¤ ■ • • • • • • • • • • • • • • • • • •	3%
Point Coordinates	To-Stake	e-Point P	Preview Map	Choose Import File Format Cass Format(dat)	
Name > Input				Point Name,Code,Easting,Northing,Elevation	>
				Distance Unit Meter	>
Add	atabasa	Import	Export	Novt	
	atabase	import	Export		

Select a point to stake out. SingularPad provides a navigation map while staking out points/lines. The software alerts you when you approach the target point to the set range value.

For O1 receivers, you can use the IMU stakeout feature. In IMU stakeout, you can turn on the IMU feature

without keeping the receiver perpendicular to the ground. The maximum tilt angle is 60°.



There is a direction prompt on the floating window.





## 4.10 \*Visual AR Stakeout\*

After completing your O1 RTK setup, check current RTK solution status at the top pf the SingularPad software.

1. Get a fix solution.

When using Visual AR Stakeout, you need to connect to O1's WIFI. So if you are using CORS (using Phone Internet to obtain the network), please insert a SIM card into the controller instead of connecting the controller to WIFI or hotpot. If you are using radio communication (no network required), you don't need to consider these.

- 2. Using Visual AR Stakeout also requires IMU initialization.
- 3. After importing or entering stakeout points, enter the staking interface.

3:35 ⊙ <b>○</b> ᢒ ← Stake F	Point		3:35	Point	◆ 1 95%
Point Coordinates	To-Stake-Point	Preview Map	Point Coordinates	To-Stake-Point	Preview Map
Name >	Input	T_	Name	> Input	T
<b>2</b> N:3449274.997           E:336966.397	Distance Elev:15.2 Code:	e:0.250m 270	Navigate 4.9 E:S 0.397	Share Dis E Deta Cos	ils 0 Stakeout
<b>1</b> N:3449278.599 E:336969.859	Distance Elev:6.83 Code:	e:5.238m 39		Distanc Elev:6.8 Code:	ce:5.243m 339



Then click the AR staking icon, and the controller will automatically jump to WIFI connection interface. Select 01 from the WIFI list and enter the password 12345678 to connect. After connecting, return to the stakeout interface to see the image in the 01 camera

	((	🚴 H:0.012	3:40 ()		94%
94%	Age2 FIXED	40/43 V:0.023	÷	Wi-Fi	۹
Name 3	X Code In	iput 📰		Use Wi-Fi	
Target:2	> 1.	8+0.068m >	•	O1-3124D0019	ð
N To North	E To East	L Cut		E1-2124N0013	ð
0.833m	1.15/m	0.014m	$\widehat{\mathbf{v}}$	Big Mama	ð
		•	$\widehat{\mathbf{v}}$	CMCC-ebn5	ŀ
		Ready	$\widehat{\mathbf{v}}$	ChinaNet-RhVX	Ð
		2	$\widehat{\mathbf{v}}$	JL5	Ô
A		~	$\widehat{\mathbf{v}}$	Shnid	ð
@ <mark>?</mark>		2m	$\widehat{\mathbf{v}}$	XHQDH	ŀ
	⁰` ↑		$\bigtriangledown$	CMCC-NWZ2	₿
Forward:1.390 To Left:0.315	Target Azin Slope(%	nuth:54°15'17.0140" 6):-0.967		ChinaNet-3mbF-5G	

4. Follow the software prompts to ensure the receiver is facing backwards. The software will prompt

you the location of the stakeout point based on the camera



When you approach the point to be staked, the software will mark the location on the screen.



At this time, align the tip of the rod with the position of the stakeout point. Then click the survey button

to stake out.



### **4.11 Line Stakeout**

Go into Line Stake interface, add or import lines you need to stake out.



Add	Import	Export
•	•	

- Click Add to input line parameters
- Click Import to import point data in different file types. You can also define a new format according to your needs.



Choose a line to stakeout, set Offset, Cross-Section Slop and Stakeout by Pile-to-Pile Coordinate parameters.

- Click to jump to next line
- Click to jump to previous line

## 4.12 CAD Mapping and Stakeout

When using this function for the first time, the CAD interface has no layers and floating window to display the features you need to stake.

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Name	Pt9	×	Code	e I	nput	
Layer:0			> '	1	.8+0.0	00m >
( ) (						210
>						2
		9	\$ <sup>(2)</sup>	l	20	<u>).5m</u>
N:344929 E:336994	93.56 1.079	3	H: Ba	12.3 se di	77 stance	:409.824
	•		•			

• Click to create or import a CAD file, supporting \*.dxf, \*.dwg format.

11:24 💿 🛛 📃 🔷 🗬 🕯 85%	
← Import File Setting	5
File Name	
File Type         AutoCAD Format(*.dxf,*.dwg)         Image: Control of the second seco	
Internal Storage/SingularPad/Map	
🎼 Go to internal storage root directory	
崎 Go to program storage directory	
K Go to current project directory	
S Return	
ОК	1
	0

• Click local to draw features, there are 12 types and methods you can choose, follow the prompts

and draw.



• Click on the Find tools. They can help you to work smoothly. For example, to find the intersection points of neighboring circles.



In the CAD interface, you can choose a feature you want to stake, it will show up in blue. You can know the details about it, including length, start point, end point and center point. And choose the way to stakeout.

- Setting: Set the method of stake out, offset distance, interval etc.
- Start station: If you set the start station as 5m, then the final mileage will plus5m.
- Offset: If you set the offset 5m, then you will stake the line 5m away from the line you choose. The plus and minus represent different sides of the line.
- Setting out by pile by coordinate: including station number, station distance and segment
- Station distance: Stake the line at a specified distance, for example, if the line is 40m, you set the specified distance as 8m, then you will stake the line at 8m distance every segment.
- Segment: For example, if you set the segment as 4, then you will stake the line at 4 segments, every segment length is the same.
- Station number: You will stake the line at the station at each interval point. You can stake it out according to the direction.
- Key node: It will stake out the line with starting point, ending point, midpoint, fold point, etc.

#### 4.13 DSM Stakeout

You can stakeout a surface by staking out elevation of each point on the surface.

If you haven't used a surface file before, you need to create one by adding, importing, or selecting from the database.

You can get a preview map of the surface after adding points and don't forget to save it.

At the content list interface, you can find the surfaces you created, and you can edit, share and stake them.



If the current position is not within the design surface, it will prompt "Out of surface!". If the current position is within the design surface, it will show the fill or excavation value.

#### 4.14 Points Database

The points, which are surveyed, staked, added, imported, and input from display map, will be stored in point database. The surveyed points will be shown under one base while surveying. Also, no matter where you need to select a point, all the points of the database are available.

4:35 ✿ ◎ ◘ ■ ← Points Data	ase Superior But and B	4:35 ✿ @	ints Datab	ase 🂡	● 75% NEh BLH
Name > Inpr	ut 🎢	Name	> Input		¥.
Pt11 Smooth Point N:3449274.112 E:336966.766	T:2024-11-27 14:32:54.299 Elev:15.975 Code:	Select	t All <b>(SI)are</b> <b>111</b> Smooth F	Delete	Cancel Range Select
Pt10 Smooth Point N:3449274.112 E:336966.769	T:2024-11-27 14:32:53.299 Elev:15.971 Code:	E:33	49274.112 6966.766 <b>*t10</b> Smooth F	Code: 2 T:2024-11	-27 14:32:5
Pt9 Smooth Point N:3449274.112 E:336966.771	T:2024-11-27 14:32:52.100 Elev:15.977 Code:	E:33	49274.112 6966.769 <b>19</b> Smooth Po	Code: int T:2024-11	-27 14:32:5
Pt8 Smooth Point N:3449274.113 E:336966.767	T:2024-11-27 14:32:51.100 Elev:15.968 Code:	E:33	6966.771	Code: int T:2024-11	1-27 14:32:5
Pt7 Smooth Point N:3449274.114 E:336966.769	T:2024-11-27 14:32:50.600 Elev:15.969 Code:	E:33	49274.113 6966.767 Pt7 Smooth Po	Code: int T:2024-11	-27 14:32:5
Pt6 Smooth Point N:3449274.113	T:2024-11-27 14:32:49.600 Elev:15.975	E:33	49274.114 6966.769 Pt6 Smooth Po	Code:	-27 14:32:4
Add Recover	Import Export	Add	Recover	Import	Export

- Add: Support to add Input Point, and display type supports local coordinate and geodetic coordinate
- Recover: After deleting the points, you can recover them in deleted points interface
- Import: Import points by different formats of files
- Export: Export points by different formats of files
- Search: Enter the name of the point you want share or delete

Tap any point to view the detailed information. The information includes antenna height, solution status, WGS84 Coordinate, local grid coordinate, base id and measure time. If the point has been calibrated, the offset parameters will be displayed.

4:40 🕸 🖲 🖪				175%
$\leftarrow$ Point D	etails			
Name Pt7	×	Code	Input	
Antenna Height			1.8+0.0	)68m >
Solution			FIXED	(44/46)
B 31°09'58.0	)945"N	N	344927	4.114m
L 121°17'21.	7848"E	E	33696	6.769m
Н 15	5.969m	Elev	1	5.969m
Scale Factor			0.9999	253493
Speed	1	Head	ing	0.000
PDOP	0.900	HRMS	S I	0.012m
HDOP	0.400	VRMS	6	0.029m
VDOP	0.800	AGE		1
Average Points	5	Cut-0	ff Angle	5
UTC Time	20	24-11-	27 06:32	:50.600
Photo And Sk	etch		ок	
•		,		

## 4.15 Data Export/Import

SingularPad supports to export/ import data including grid coordinate, Lat/Lon coordinate with various data format, and supports importing \*.dat/\*.csv/\*.kml file and exporting result of \*.dxf/\*.kml/\*.shp/\*.xls/\*.csv.

#### 4.15.1 Import points data

Tap Import data in project interface, there are some predefined data formats, click More to get more predefined formats.

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← Import Data		← Format Select
Data Type	Points Database >	File Format
Choose Import File	Format	Cass Format(dat) Point Name,Code,Easting,Northing,Elevation
Local Coordinat Point Name,Northing,E	es Format(csv,d asting,Elevation,Code	Local Coordinates Format(csv.dat.txt)
Import Parameters		Point Name,Northing,Easting,Elevation,Code
Property Type	Input Point >	Geodetic Coordinates Format(csv,dat,txt)
Distance Unit	Meter >	Point Name,Latitude,Longitude,Altitude,Code
		More



- Data Type: support point database, transformation parameters file and code library
- Import File Format: support \*.csv, \*.dat, \*.txt, \*.kml, etc.
- Distance Unit: support meter, US survey feet and international feet

Besides, you can click now to create a User defined type.

11:45 🛞 🔺	💎 🗎 82%
← Custom Format	
Format Name	Input
Extension Name	dat >
Field Delimiter	Comma(,) >

Custom	Format	Description
--------	--------	-------------

Northing Elevation
Elevation
Longitud

- Format name: Enter the name for the format
- Extension name: support \*.csv, \*.dat, \*.txt, \*xlsx format
- Delimiter: support comma (,), semicolon (;), space (), tab (Tab)

Click to choose elements in the options list, click backspace to eliminate the previous element selected. The elements include: code, northing, easting, elevation, latitude, longitude, altitude. Choose one format to import data. The default export path is internal storage/ SingularPad/import. You can also change to any other path where the file is. Click preview to take an inspection whether the format is right.

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← Import File		← Preview		
File Name		Point Name	Northing	Eastin
File Type Local Coordin	nates > 뒪	Pt1	3449294.210	336993.3
Internal Storage/SingularPad/Imr	nort 1	Pt2	3449294.201	336993.0
		Pt3	3449294.399	336993.
Go to internal storage ro	ot directory	Pt4	3449294.391	336993.0
Go to program storage d	lirectory	Pt5	3449294.346	336992.8
Go to current project dire	ectory	Pt6	3449293.926	336994.3
S Return		Pt7	3449293.816	336994.
X1.txt		Pt8	3449293.737	336994.2
		Pt9	3449290.485	336994.0
		A	3449306.409	336851.3
		A1	3449306.407	336851.3
			0410000 410	0000011
Preview	ОК	Cancel		ок
• •		•	•	

#### 4.15.2 Export points data

Tap Export in Project interface to export point data. Also, click More formats to export the survey points in various formats like stake points/ lines, DXF, SHP, KML, RAW, RW5, HTML, CASS feature result.

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← Export Data	← Format Select
Export Path ernal Storage/SingularPad/Export $\geq$	Road Section Data
File Name Project Name > + Input	File Format
Choose Export File Format	Cass Format(dat) Point Name,Code,Easting,Northing,Elevation
Cass Format(dat) Point Name,Code,Easting,Northing,Elevation	Local Coordinates Format(txt) Point Name,Northing,Easting,Elevation,Code
Export Parametes Distance Unit Meter >	Geodetic Coordinates Format(txt) Point Name,Latitude,Longitude,Altitude,Code
Point Type Enable Survey Point Control Point TPS Point Station Point	Geodetic Coordinates Format[Covariance](txt) Point Name,Latitude,Longitude,Altitude,Code,Covariance Cxx,Covariance Cxz,Covariance Cxz,Covariance
Input Point Cal. Point	Survey Point Data Format[GNSS] (csv)
Time Enable	Point Name,Code,Northing,Easting,Elevation,L atitude,Longitude,Altitude,Local Time,Station Correction x,Station Correction y,Station Correction
Start Time 2024-11-26 00:00:00 Share File Export	New OK

- Export Path: the default export path is internal storage/SingularPad/export; you can also change to any other path where the file is
- File Name: support project name, operator,data, data time
- Export File Format: support \*.csv, \*.dat, \*.txt, \*kml, etc.
- Distance Unit: support meter, US survey feet and international feet
- Road section data: open to export road section data

Besides, you can click New to create a user defined type. The elements include: id, name , code, latitude, longitude, altitude, northing, easting, elevation, N, E, Z, type, local time, UTC time, solution status, AGE, max delay, min delay, use satellites, tracked satellites, cut-off angle, mount point, measurement method, repeat, start data, end time, RMS, HRMS, VRMS, PDOP, VDOP, speed, heading, antenna type, measuring type, measuring height, antenna height, base id, base latitude, base longitude, base altitude, distance to ref, original latitude, original longitude, original altitude, undulation height, station correction h, inclination correction, pitch, roll, yaw, inclined angle, projected angle, stakeout type, target, station, offset, north diff, east diff, elevation diff.

For the points, lines and polygons you surveyed in point survey, you can export dxf file, then you can edit them in third party CAD software, or import to base map to check, or import to CAD to stake. Choose the data that you want to export including survey point, input point, control point, stake point, line and polygon, and the layer properties include name, code and height.

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tension Name	dat
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stom Format Des tions	cription
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tions Point ID Code Line Name Easting Locol Time Backspace	Point Name Code Remark Northing Elevation Point Attributes OK

## Chapter 5 Static Survey

This chapter describes how to conduct static survey through O1 receiver and SingularXYZ Converter software. For static survey, O1 supports 3 data formats: binary XYZ, Rinex 3.02 and Rinex 3.04. SingularXYZ binary format (\*.XYZ) is a raw observation data format and you can convert it to RINEX format via SingularXYZ Converter Software. (Contact SingularXYZ support team for the tool).

If you need post-processing software, please contact the support email at <support@singularxyz.com> for assistance

## 5.1 Static Data Collection

Static survey is mainly used for the control point survey. To reach millimeter accuracy, follow as below:

- At least 3 GNSS receivers are required to form a stable triangulation network.
- It is better to collect static data on the known point.
- Power off the receiver before moving to other observation site.
- For the convenience of post-process static observation raw data, record the station name, receiver SN, antenna height, start and end time for each observation site.

The following steps give an example of static survey.

1. Go to *Device* >> *Static and collect points*. Choose the Record mode, there are two record modes and they can record static data at the same time.



2. Options Settings interface: Input Record name and Point name. Set the Collection Interval, Observation Time and Data Format.



3. Turn on/off the *Loop Record* according to your needs. If this option is turned on, the receiver will delete the earliest recorded data to keep recording when the record space is full.

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	93%	FIXED	40/41	V:0.023		
Mode			Record1 >			
Option Settin	igs					
Name			Singu	larXYZ		
Point Name			singu	ularxyz		
Interval			1S 🔇			
Observation <sup>-</sup>	Observation Time					
Data Format				xyz >		
Circular Reco	ord					
Auto Record	Static Da	ta				
Storage Spac	e			3000		
Antenna Para	ameters					
	St	art				
•						

4. Turn on/off the *Auto Record Static* according to your needs. If this option is turned on, the receiver automatically records static data after it is power on.



5. Set the *Record Space* in the end (unit: MB). It will limit the amount of data that receiver record.

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Mode			Re	cord1 >		
Option Settin	gs					
Name			Singu	larXYZ		
Point Name			singu	ularxyz		
Interval				1S >		
Observation 7	Observation Time 1 hor					
Data Format			XYZ			
Circular Reco	rd					
Auto Record S	Static Da	ta				
Storage Spac	e			3000		
Antenna Para	ameters					
	St	art				
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6. Click *Start* to start static survey.

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ف 🗆 🖒	🗞 H:0.012
93% FIXED	40/41 V:0.023
Mode	Record1 >
Option Settings	
Name	SingularXYZ
Point Name	singularxyz
Interval	1S >
Observation Time	1 hour $>$
Data Format	xyz >
Circular Record	
Auto Record Static Data	
Storage Space	3000
Antenna Parameters	
Start	
• •	

### 5.2 Static Data Download

The raw observation data is saved in internal memory of O1 receiver, when connected with PC via TYPE-C cable, the O1 receiver can work as a USB Flash Disk, which means you can copy the static data to PC directly.

USB flash drive (E) > 1-REC1 > 2023293								
Name	Modified Date	Туре	Size					
1823E00052930339.XYZ	10/20/2023 3:43 AM	XYZ	690 KB					
1823E00052930344.XYZ	10/20/2023 3:45 AM	XYZ	166 KB					
1823E00052930345.XYZ	10/20/2023 3:45 AM	XYZ	147 KB					
1823E00052930547.XYZ	10/20/2023 5:59 AM	XYZ	2,460 KB					
1823E00052930600.XYZ	10/20/2023 6:28 AM	XYZ	5,183 KB					

In addition, you can download the static data via WebUI, connect your PC or phone to the WiFi of the O1 receiver (WLAN name: the SN of O1) and log in the web page in browser via IP 192.168.10.12 (Username: admin, Passwords: admin).

Go to **Work management** >> **File Download**, select the corresponding record name, file type and date to filter and download the static data.

Berka Information -	File D				
Device Configuration -					
	-	tere:	14821		
	-		NT Baild		
Data Transmission					
Data Recording	THE CA		2019-02		
		_	Network		
lerkie Control		Reter	The Name	Tile Star	Question
Omore -	•		102000000000000000000000000000000000000	-	
	•		-	101.758	
	•		-	140,700	
			-	100.00	
			-		Excel Second

## 5.3 RINEX Convert

The raw observation data is saved in internal memory of O1 receiver, when connected with PC via TYPE-C cable, the O1 receiver can work as a USB Flash Disk, which means you can copy the static data to PC directly.

After copy raw observation data to PC, you can convert the data from SingularXYZ binary format (\*.XYZ) to Rinex in SingularXYZ Converter software.

The following steps give an example of Rinex convert.

- 1. Start SingularXYZ Converter software.
- 2. Set the output path and select to import the binary file.



3. After import the binary file, click set then input the marker name and choose the measure type of antenna height, and the antenna type is automatically identified as SITE 1 for O1 receiver

讷 Singula	rXYZ Conversion Tool	v1.1.13.04					-		×
OutputPath	singular								析
	FileName					×	Op	tions	
1	13620250.XYZ	MessageID	Amount	MarkName	singularxyz		set		re
		106	15	AntType	SITO1				
		108	47	Measure	Vertical Height				
		107	36	Medaure					
		109	38	Satellite	GPS				
		12	409		BDS				
					GLONASS				
					GALILEO				
_				_					

4. Click *convert* to start convert XYZ to Rinex, and the Rinex files will be output to the output file path.

Singula	rXYZ Conversion Tool				- 🗆 X
OutputPath	E:\output				📒 En 桥
	FileName	Size	Transition state	Version	Options
1	12010929.XYZ	2.07M	$\bigcirc$	3.02 🗸	set remove
	Select File		e	Conver	l.

#### Note:

The output path of the conversion software and the storage path of the files to be converted can only contain English letters and numbers.

# Chapter 6 Device Upgrade

This chapter describes how to upgrade the firmware of the Orion ONE receiver. If you need some software and firmware that you don't have, please contact the technical team.

## 6.1 Firmware Upgrade

- Power on the receiver and connect the computer to the receiver's WiFi.
   WIFI password: 12345678.
- 2. Open the browser and enter 192.168.10.12 to access the device's web interface.

Username: admin, Password: admin.

	8.10.12			ର ଓ ଜ … 🧔
Singular XYZ	E Version Information		SN:3124D0029 📻	English ~ Logout
Device Information				
Version Information	Device Model:	Orion ONE		
Satellite List	Hardware Version:	12		
Satellite Sky Plot	Firmware Version:	1.0.A10B		
Position Information	Radio Firmware:	A036.01.01		
Status Information	WEB Version:	v1.0		
② Device Configuration	norg.			
🗟 Work Management 🗸				
Firmware				

3. Click "Firmware" to enter the firmware upgrade interface, where you can check the current firmware version of the device, select the corresponding version file, and perform the upgrade.

Singular XYZ	Firmware Upgrade			SN:3124D0029	English ~	Logout
Device information ~						
Oevice Configuration      ✓	Current version:	1.0.A10B				
🗊 Work Management 🗸	Update File;		Select			
Firmware ^		$\frown$				
Firmware Upgrade	Status:	( 🕬 )				
GNSS Upgrade		$\bigcirc$				
		Update				

4. After selecting the upgrade file, click "Upgrade" to start the upgrade process. Once the upgrade is complete, the device will automatically restart. After restarting, you can check if the upgrade was successful.



### 6.2 IMU Upgrade

1. Install the Setup\_Forsense\_IMU\_V1.0.6.exe software on the computer.

# Setup\_Forsense\_IMU\_V1.0.6.exe

Check the software version to make sure it is after December 20th.



2. Power on the ORION ONE receiver, and connect the receiver to the SingularPad software via Bluetooth. Enter the Device Settings interface in the PAD software, select "IMU" for the USB Channel, and click OK.

1:38 💿 🗖 😂		💎 🖥 90%	1:38 🖲 📑 🕸	▼ 🗎 90%
	Age0 No Solution		$\leftarrow$ Device Settings	
	Orion ONE		Enable WIFI	
	-	$\mathbf{R}^{\times}$	IP Address	192.168.10.12
Communicatio	Rover	Base	USB Channel	IMU >
	1.0	_	USB Channel	
$\mathbb{R}$	<u>_</u>	<b></b>	GNSS	
Static Record	Inspection Accuracy	COM Settings	IMU	
	, locaracy		Radio	
			Debug	_
Device Settings	Device Activation	Device Information		
=				
Project	Device Surve	y Tools	ОК	
•	•		•	

3. Use a Type-c to USB cable to connect the ORION ONE receiver to the computer, and open the **Forsense\_IMU\_V1.0.6** software on the computer.

@IMU官网上位机			□ ×
📚 串口功能工具集 🎌 非串口功能工具	(?) ##85	RX: 0	TX: 0
申口号:       COD # Intel         波特率:       9600         连接         周件版本:         N/A         硬件版本:	<ul> <li>● 串口模式 ○ 批量升级 ○ 兼容模式</li> <li>● 串口模式 ○ 批量升级 ○ 兼容模式</li> </ul>	升级	
NA 成板版本: NA 配置前区故障码: NA 校准编区故障码:	□ USB转CAN模块自身升级		
NA 主从机: NA 序列号: NA	升级进度:		
4. In the software, select the corresponding COM port for the receiver, set the baud rate to 921600, and click "Connect".

imu galleigel		- 🗆 ×
S PODEIRE 🕐 SPODEIR	(7. Ha) RX	: 3387 TX: 34
申口号: COELI # CLB-SEELAL CEOM → 皮特率: 921600           時行开           現作級本:           230227<	并微设置          并微绘作           ● 申口模式         ○ 批量升级         ○ 兼容模式           打开文件	开级
42852 北京和本。 L814 和田和区和1995。 0 秋州前区前3945。	X E 设置 □ USB特CAN模块自身升级	
6 主从机: 从机 FF对导: 31325733366013H3027HH 上位机能本: 1.0.6	开级进度:	

In the upgrade operation prompt, click "Open File" and select the IMU upgrade firmware IMU-230227.firmware.

<ul> <li>MUTERLEGER</li> </ul>					- 🗆 ×
S +DURIRA S +POURIR	2 H III				RX: 118732 TX: 34
本43号、 COD11 # USB-SEEAL CID40 ~ 数15年、 022000 ~ 勝行子F 現代版本。 2300227 時代版本。	- <u>并级投复</u> ● 車口模式	〇 批量升级	○ 兼容模式	- 并他的作 文件: D:/RV1126/Z1/JMU/JMU-230227.firmwar 打开文件	re 升版
42652 北氏(和本。 L614 死間(前)(故1969)。 0			↓200里 □USB种CAN模块自身升级		
校准由区(()()()) 0 主从明:		升级进度:		05	
가다. 가구케 약i 31325733306013ff3027ffff		Ē	已升碳数量:N/A	未升级数量: N/A	
上段机版本: 1.0.6 🏓					

## Click Upgrade Button to start upgrade.

@ MUERLEON									- 0 ×
◆中口功检工具用	N BRODELR	(?) #20						RX: 180290	TX: 32234
本ロ号, COM1 # USB 就特本, 921600 第6月 現件版本。	FIELD CODE	升级设置			t l	开展操作 2件: D:/RV1	126/Z1/IMU/IMU-230227.	firmware	
230227		● 串口模式	○ 批量升級	○ 兼容模式			打开文件	取消升级	
硬件版本:									
42652									
成初版本。 L614 配置期区放時時。 0 校測期区放時時。				☐USB转CAN模块自身升级					
٥			升级进度。		11%				
主从机:				正在升级					
1:02471 31325733305013H3027			Ē	2升级数量:0	未升	<b>级数量:</b> 1			

When the progress bar is complete, it indicates that the upgrade is done.

<ul> <li>) MUERLEN</li> <li>※ キロ功能工具</li> </ul>	(7) No.			- D >
#09, Coni x 158-52214, CO46 - 此称 # : 20100 送技 出作版 # : NA 既作成 # :	<ul> <li>→損益至</li> <li>● 申口模式 O</li> </ul>	批量升级 O 推容模式	<mark>井016日</mark> 文件: D:/W1126/Z1/IMU/IMU-230227.fir 打开文件	mare 升级
NA 反复数本。 NA 化面白(乙炔時间。 NA				
225 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)		升级结束	1004	
рия; «А		己升级数量: 1	未升级数量:0	
上位机聚本: 1.0.6 👂				

Restart the ORION ONE receiver to complete the upgrade.