



M8 Laser GNSS Receiver User Guide



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Technical Assistance

If you have any question and can't find the answer in this manual, please contact your local dealer from which you purchased the M8. Alternatively, request technical support from MaxNav Technology Website: www.maxnav.com or technical support email: info@maxnav.com. Your feedback about this Guide will help us to improve it with future revisions.

Safety Information

Before using the receiver, please make sure that you have read and understood this User Guide, as well as the safety requirements.

- Connect your devices strictly based on this User Guide
- Install the GNSS receiver in a location that minimizes vibration and moisture
- Avoid falling to ground, or colliding with other items

- Keep a sound ventilation environment
- Change the cable if damaged

Related Regulations

The receiver contains integral Bluetooth® wireless technology. Regulations regarding the use of the datalink vary greatly from country to country. In some countries, the unit can be used without obtaining an end-user license. But in some countries the administrative permissions are required. For license information, please consult your local dealer.

Use and Care

The receiver can withstand the rough treatment that typically occurs in the field. However, the receiver is high-precision electronic equipment and should be treated with reasonable care.

Warning and Caution

An absence of specific alerts does not mean that there are no safety risks involved. A Warning or Caution information is intended to minimize the risk of personal injury and/or damage to the equipment.

WARNING- A Warning alerts you to a potential risk of serious injury to your person and/or damage to the equipment, because of improper operations or wrong settings of the equipment.

CAUTION- A Caution alerts you to a possible risk of damage to the equipment and/or data loss.

Warranty Notice

MaxNav Technology does not warranty devices damage because of force majeure (lighting, high voltage or collision).

MaxNav Technology does not warranty the disassembled devices.

FCC Warning

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: 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

RF Exposure Information

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 and your body.

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1. Introduction

The MaxNav M8 User Guide is aimed to help you get familiar with the M8 laser GNSS receiver and start your project effectively. We highly recommend you to read this manual before surveying, even you have used other GNSS receivers before.

1.1. About the receiver

M8 can be applied in RTK mode with all GNSS constellations. It 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.

1.2. Receiver features

The M8 laser key features:

- Ultra small and super light
 - Size: $\leq 11\text{cm}$
 - Weight: $\leq 500\text{g}$ with internal battery
- 1668 channels of simultaneously tracked satellite signals
- Increased measurement traceability with [®] Quantum[™] algorithm technology
- Cable-free Bluetooth wireless technology
- 2 LEDs, indicating Satellites Tracking and RTK Corrections data
- IP68 Dust- and waterproof for harsh environments
- Calibration-free IMU integrated for Tilt Survey
- Up to 60° tilt with 2.5 cm accuracy
- With two camera, surveyors gain a 3D visual view in topo survey and stake work.
- Support SBAS and PPP service
- Support NFC Fast Connection
- Support super datalink, supports a number of protocols, including Transparent /TT450S/South/Mac/Maxlink/Maxlink+.

With Maxlink and Maxlink+, 5-15km working range is achievable under ideal conditions. (**Note:** Internal Radio mode can only be used for the **rover** station.)

- Support long baseline E-RTK[™] (Beidou B3 signal is included in RTK calculate engine)

1.3. M8 parts list

This section provides overall M8 parts list, including basic supplies and customized kits based on your requirements.

1.3.1 Basic Supply kit

The M8 Basic Supply kit contains one receivers and related accessories

Item	Picture
1* Kits M8 Receivers	
1*GNSS Connector	
1*Charger adapter (EU/USA/UK)	
1*USB—Type-C cable	
2* Whip Antenna (UHF)	
1*2m-Range Pole with yellow bag	

Item	Picture
C50 Controller	
Controller Battery, Charger and Cable	
Controller Bracket	

Optional accessories:

Double Bubbles Tribrach with High Adapter	
1* 30cm Extension bar	

2. Setting up the receiver

This chapter provides general information on environmental requirements, setup, power supply and connection of the M8.

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: -20°C to 65°C
- Storage temperature: -40°C to 85°C
- Out of corrosive fluids and gases
- With a clear view of sky

2.2. Laser & Cameras Specification

To keep the laser with a reliable performance, It is better to use M8 in the conditions that meet the specifications:

Laser specification

- Range: 50m
- Accuracy(room temperature): (3-5)mm + 1ppm
- Measuring Frequency: Classic Value: 3Hz
- Maximum Value: 5Hz
- Laser Injection Power: 0.9mW to 1.5mW
- Working Temperature: -20°C to +50°C
- Storage Temperature: -30°C to +60°C

Cameras specification

- Sensor pixels: 2 cameras with 2 MP global shutter
- Field of view: 75°
- Video frame rate: 30 fps

Image group capture:

- Rate: typically 2 Hz, up to 25Hz
- Max capture time: 60s with an image group size of 60MB

2.3. Front panel

Receiver front panel contains 2 buttons, Power button and Record button. The LEDs display shows the status of differential, satellite tracking and charge indicator. For detailed information, see [3.2](#).



2.4. Lower housing

Receiver lower housing contains a type-c port, UHF radio antenna connector and a threaded insert.

2.5. Power supply

M8 supports internal battery and external power input.

2.5.1 Internal battery

The M8 receiver adopts the rechargeable Lithium-ion battery design that provides you an effective survey workflow. The internal battery typically provide about 16-hour operating time as a rover. However, this operating time varies based on environmental conditions

- Battery Safety

Charge and use the battery only in strict accordance with the instructions below:

- Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.
- Do not expose the battery to fire, high temperature, or direct sunlight.
- Do not immerse the battery in water.
- Do not use or store the battery inside a vehicle during hot weather.
- Do not drop or puncture the battery.
- Do not open the battery or short-circuit its contacts.

- Charging the Lithium-ion Battery

Please obey the following instructions when charging your batteries:

- Charge the battery completely before using it for the first time.
- Fully charge takes approximately 6 hours per battery at room temperature.
- If the battery has been stored for a long time, charge it before your field work.
- Re-charge the battery at least every three months if it is to be stored for long time.

- Dispose of the Lithium-ion Battery

- Discharge a Lithium-ion battery before dispose of it.
- Dispose of batteries is an environmentally sensitive manner, and adhere to any local and national regulations concerning battery disposing or recycling.

WARNING – Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/or property damage.

2.5.2 External Power Supply

The receiver is connected to an external power supply through a Type-C cable, and make sure that use an external power supply with the correct voltage of M8, such as a

5-9V power bank. Over-voltage function cannot protect your M8 if reverse connection.



2.5.3 Charge Battery via M8

M8 GNSS Receiver can work with a Type-C charger, it means you can charge batteries directly.

- Power off M8 receiver with batteries inside;
- Connect M8 receiver to Adaptive charger with type-c cable;
- Receiver charge the battery, the red power led will flashing during charging and will off when battery full



2.6 Pole-mounted setup

To mount the receiver on a range pole as the figure shown below:



- Thread the receiver onto the range pole
- Mount the controller bracket to the pole
- Install the controller into the bracket

Tip: Do not tightly clamp the controller on the Range Pole.

3. General Operation

This chapter introduces all controls for the general operation, including button functions and all LED behaviors on the front panel.

3.1 Button functions

To turn off the receiver, long press the button for 3-4 seconds until all LEDs off.

There are one power button on the front panel.

- Power button:

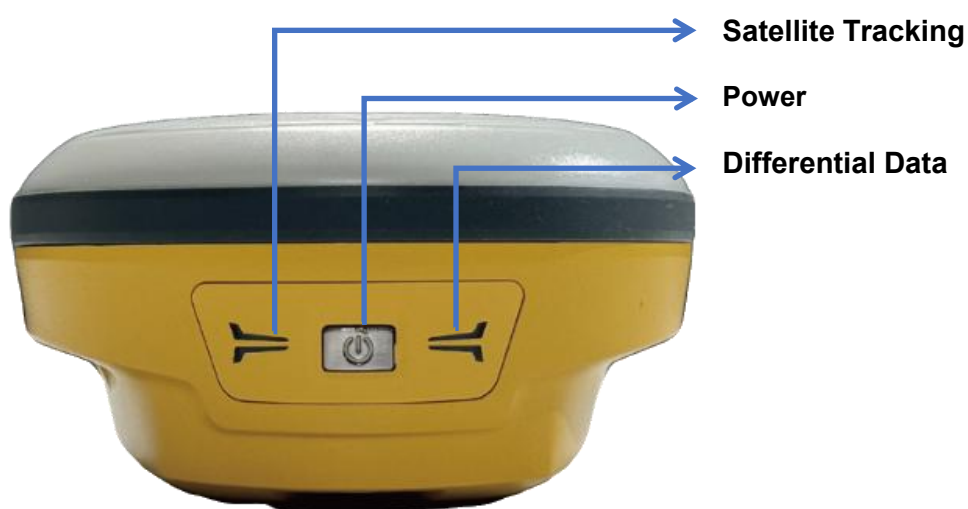
Press the power button for about 1 second to turn on the receiver, the orange indicator lights up fully then turns off. The satellite indicator and differential indicator flash green twice in sequence. The buzzer sounds continuously, then the device powers on.

To turn off the receiver, long press the button for 3-4 seconds until all LEDs off.

3.2 LED behavior

The LEDs on the front panel indicate receiver working status. Generally, a lit or slowly flashing indicates normal operation, and an unlit LED indicates that no operation is

occurring. The following table define each possible LED state:



LEDs	States	Description
Power	Satellite Tracking indicator flashing green, differential data indicator off.	Battery is below 50%
	Satellite Tracking indicator solid green, differential data indicator flashing green.	Battery is above 50% and below 100%.
	Both satellite Tracking indicator and differential data indicator solid green.	Battery is 100%.
Differential Data(right side)	Green light flashes once every 2 seconds.	No satellite received
	Green light flashes twice quickly.	Single Point
	Green light flashes rapidly.	Fixed
Satellite Tracking(left side)	Green light flashes once every 2 seconds.	No satellite received
	Green light flashes twice quickly.	Single Point
	Green light flashes rapidly.	Fixed

3.3 Receiver Web GUI interface

Step 1: Connect Wi-Fi of M8 receiver

Turn on the M8 GNSS receiver and wait for the M8 serial number to appear under the available Wi-Fi networks on your smart phone or office computer.

For example, M8-M81LXXXXX (where xxxxx represents the last five digits of the receiver serial number).

Enter password: **12345678**

Step 2: Login the Web

Select the receiver, open a web browser and then enter the following IP address:

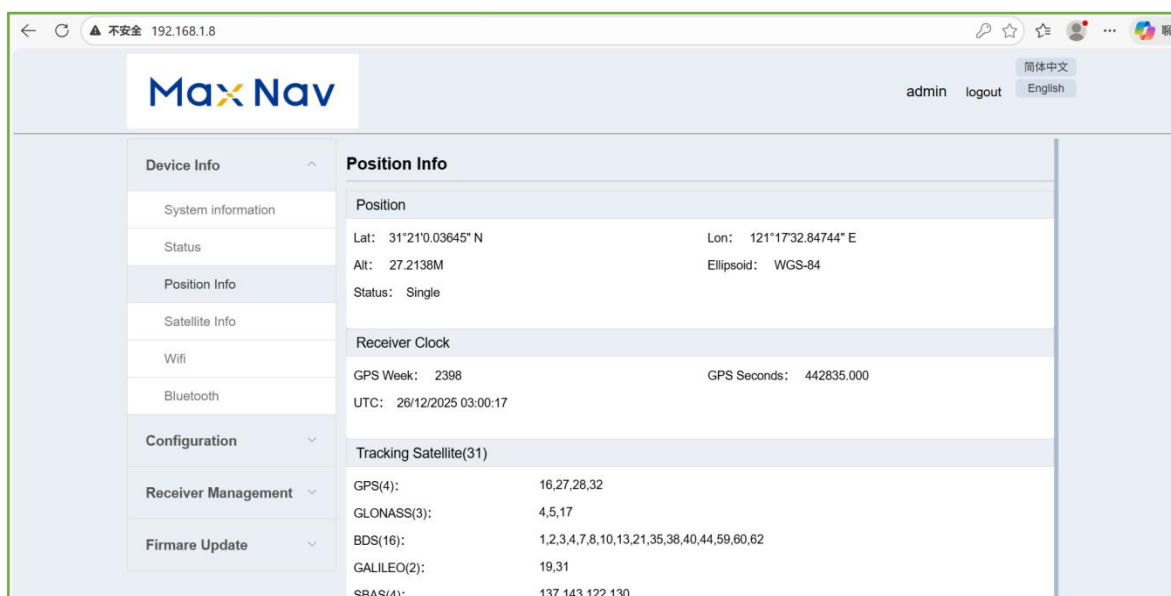
<http://192.168.1.8>

Tip: Most web browsers for computers / laptops and smart phones / PDAs support the receiver Web GUI

Step 3: Enter the default login settings to access the main page

- Username: admin
- Password: admin

After accessing the main page, configuration menus are listed on the left, and receiver's settings on the right. Each configuration menu will be demonstrated in the following sections.



3.3.1 Checking the receiver status

In the section, you can check System information, Status, 4G Network, Bluetooth, Wifi, Position info, satellite info.

(1) System information, includes the basic information includes receiver type, serial number, system firmware version, board firmware version, radio firmware (radio type), front panel firmware (M8 doesn't have front LCD panel), Web version.

(2) Status: Show the device status and data link status, includes work mode, data link, internal storage capacity and current free storage. The default work mode is rover with the new device. Data link status will vary from different work mode, the default is null.

System information	
Receiver Type:	M8
Serial Number:	M81L00129
Firmware Version:	V1.0.3.13
Board Firmware :	650IO-00000-1
Radio Firmware:	1.1.2(QD302F)
Front Panel Firmware:	-
Web Version:	V1.1.2

Status	
Device Status	
Work Mode:	Rover
Data Link:	
Capacity:	4.0GB
Free Storage:	4.0GB
Data Link Status	

(3) WIFI information, shows WIFI name, current Wifi password and Mac address. The Wifi password is 12345678, the client can change the password, click **Save config** to save configuration; Bluetooth information, shows Bluetooth name and Mac address, Bluetooth name cannot be changed

Wifi	
Wifi Name:	M8-M81L02051
Wifi Password:	*****
Mac Address:	F5:C8:7d:41:01:79
Status:	Started
<button>Save Config</button>	

Bluetooth	
Name:	M81L02051
Mac Address:	a4:04:50:a6:41:dd
Status:	Started

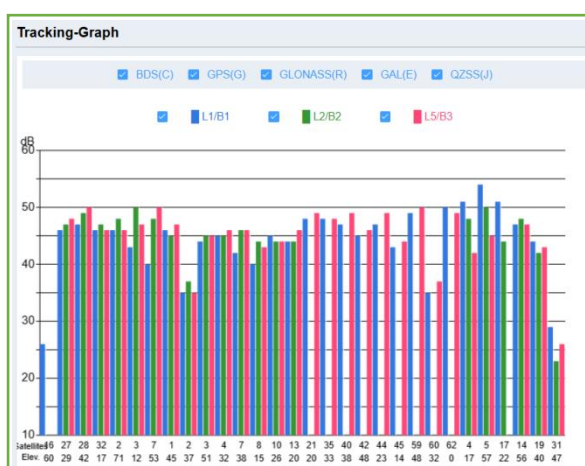
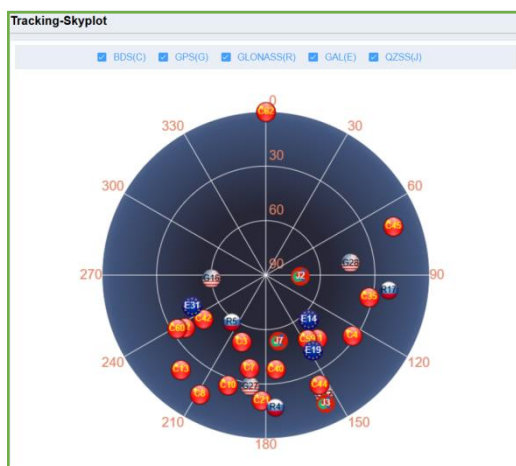
(4) Position info, shows position status, clock status, tracking satellites, used satellites and DOP status.

Position Info	
Position	
Lat: 31°20'59.93903" N	Lon: 121°17'32.90040" E
Alt: 29.5987M	Ellipsoid: WGS-84
Status: Single	
Receiver Clock	
GPS Week: 2398	GPS Seconds: 444306.000
UTC: 26/12/2025 03:24:48	
Tracking Satellite(36)	
GPS(4):	16,27,28,32
GLONASS(4):	4,5,17,18
BDS(18):	1,2,3,4,7,8,10,13,21,35,38,40,42,44,45,59,60,62
GALILEO(3):	14,19,31
SBAS(4):	137,143,144,130
QZSS(3):	2,3,7
IRNSS(0):	
Used Satellite(36)	
GPS(4):	16,27,28,32
GLONASS(4):	4,5,17,18
BDS(18):	1,2,3,4,7,8,10,13,21,35,38,40,42,44,45,59,60,62
GALILEO(3):	14,19,31
SBAS(4):	137,143,144,130
QZSS(3):	2,3,7
IRNSS(0):	

(5) Satellites Info, includes Tracking graph, Tracking skyplot.

Satellite Info						
SV	Type	Elev.	Azim.	L1.	L2.	L5.
16	GPS	59	262	29	0	0
27	GPS	26	188	46	47	48
28	GPS	44	79	47	50	50
32	GPS	19	153	47	47	47
2	QZSS	70	94	46	49	47
3	QZSS	11	156	43	50	48
7	QZSS	53	169	40	48	50
1	BDS	45	141	46	45	47
2	BDS	37	237	32	39	36
3	BDS	51	200	44	45	45
4	BDS	32	125	45	46	47
7	BDS	37	189	41	46	45
8	BDS	16	209	39	45	41
10	BDS	25	199	45	42	44
13	BDS	21	222	43	43	44

Sky View >>>
Tracking-Graph >>>



3.3.2 Configuration

This section includes Satellite tracking, work mode and Antenna setup configuration.

- **Satellite tracking**, includes Smooth Pseudorange, default is OFF; Elevation mask: default is 10 degrees; and every system status, supports to change by customers, click **Enter** to save settings, click **Cancel** to cancel the settings.

Satellite Tracking

Satellite Tracking Setup

Smooth Pseudorange: ☐ ON ☒ OFF

Elevation Mask: degree

System	Status
GPS	☒ ON ☐ OFF
GLONASS	☒ ON ☐ OFF
BDS	☒ ON ☐ OFF
GALILEO	☒ ON ☐ OFF
SBAS	☐ ON ☒ OFF
QZSS	☐ ON ☒ OFF
System	Configure
SBAS	Please select

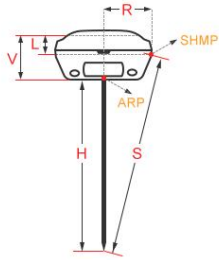
Enter

Cancel

- **Antenna setup**: measure method supports Slant height and vertical height, choose Antenna type, and setup antenna height, click Enter to save configuration.

Antenna Setup

Antenna Setup



Slant height(S):

Measure method: ☒ Slant height(S) ☐ Vertical height(H)

Antenna Type: M8(NGS)

Name	Radius(R)	Distance Measurement (L)	Height from bottom(V)
M8(NGS)	0.0558	0.0172	0.0566

- **Work mode**, includes rover settings.

Rover settings include Ntrip Client (Same with PDA CORS in Mfield) and Radio (Same with internal radio in Mfield).

Work Mode

Mode Setting

☒ Rover ☐ Base

Type	Port	Data stream	Setup
NTRIP Client	25001	-	Setup
Radio	-	-	Setup

(1) Ntrip Client: Set Ntrip version, includes NTRIP v1.0 and NTRIP v2.0, IP, port, username, password, then click **Get List** and select mountpoint, check on **Use**, click **Enter** to apply the Ntrip Client; Check off **Use**, click **Enter** to cancel the work mode.

Port Configuration

NTRIP Client

Status: disconnect

Use: ☒

Ntrip version: NTRIP v1.0

CasterAddress: 140.207.166.210 25001

Username: comnav

Password:

mountpoints: 8KM_K803_RTCM32 Get List

Enter Cancel

When setup the Ntrip Client, you can go to Device Info->Status to check current device status and datalink status.

Device Info

system information

Status

Position Info

Satellite Info

4G network

Wifi

Bluetooth

Configuration

Receiver Management

Status

Device Status

Work Mode: Rover

Data Link: Net

Capacity: 4.0GB

Free Storage: 4.0GB

Data Link Status

Protocol: NtripClient

IP: 140.207.166.210

Port: 25001

mountpoints: 8KM_K803_RTCM32

Status: Link

(2) Radio: The model is RX, set the frequency, minimum interval is 12.5 KHz; the protocol is Transparent; set the power, supports 0.5w, 1w and 2w; check on **Use**, click **Enter** to apply the internal radio; Check off **Use**, click **Enter** to cancel the work mode.

Port Configuration

Radio

Status: disconnect

Use: ☒

Mode: RX

Frequency: 460.05 MHZ

Protocol: Transparent

Power: 2w

Enter Cancel

After setup, you can go to Device Info->Status to check device status.

Device Info	Status
System information	Device Status
Status	Work Mode: Rover Data Link: Radio Capacity: 4.0GB Free Storage: 4.0GB
Position Info	Data Link Status
Satellite Info	Frequency: 460.0500MHZ Protocol: Transparent Baud Rate: 115200 Mode: RX Power: 2W
Wifi	
Bluetooth	
Configuration	
Receiver Management	

3.3.3 Receiver Management

This section includes Data Transfer, Data record, Data Download and Receiver Utility.

3.3.3.1 Data Transfer

Data transfer has four types: Com1, BT, TCP1/WEBNTRIP1, TCP2/WEBNTRIP2.

Data Transfer			
Port Summary			
Type	Port	Data stream	Setup
COM1	Serial Port	-	Setup
BT	-	NMEA	Setup
TCP1/WEBNTRIP1	8080	NMEA	Setup
TCP2/WEBNTRIP2	1121	NMEA	Setup

- **Com1:** This is setup to transfer the data through com1 port of the OEM board inside. You can use serial port cable to check the data transmission (the lemo port is connected to Com1 of the OEM board inside).

(1) Baud rate supports 115200, 57600, 38400, 19200, 9600, the default is 115200.

(2) The supported file formats include raw observation data, NEMA, RTCM3.2, RTCM3.2(MSM5), RTCM3.0, RTD, CMR.

(3) Observation and ephemeris output frequency support 1s, 2s, 5s, 10s and 15s.

The screenshot shows the 'Port Configuration' dialog box. The 'COM1' dropdown is selected. Below it, the 'Use' checkbox is checked. The 'Baud Rate' is set to '115200' and 'Odd/Even' is set to 'ODD'. The 'data stream' is set to 'Raw Observation Data'. The 'RangeCmpb' and 'RawEph' are both set to '1s'. At the bottom right, there are 'Enter' and 'Cancel' buttons.

- **BT:** This is used to output data through the OEM board (connected to the Bluetooth modem), you can output NMEA data via this port, it is the important step to connect the receiver to other brand software.

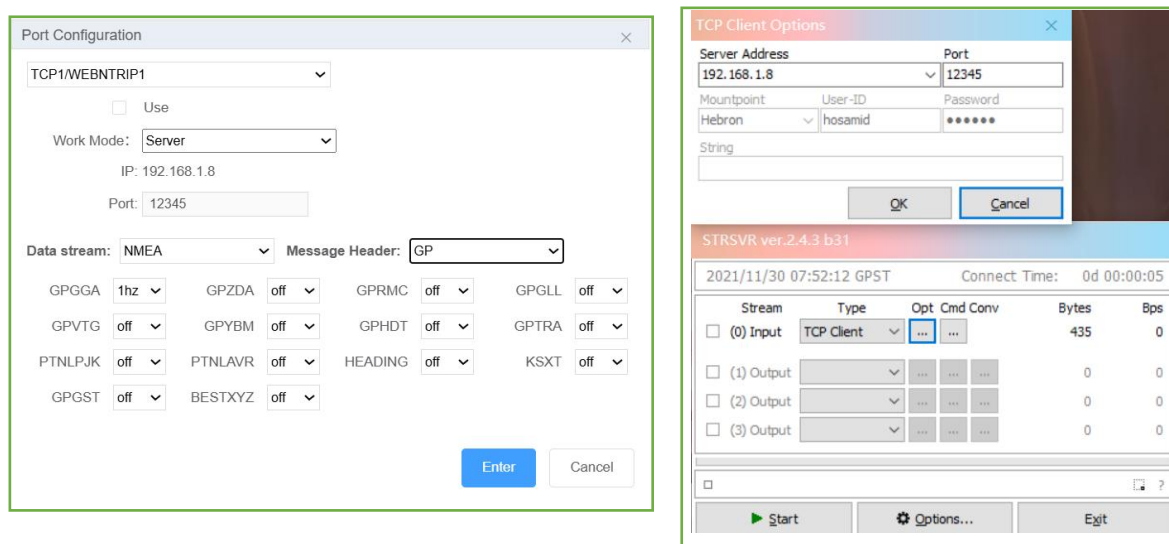
(1) Baud rate supports 115200, 57600, 38400, 19200, 9600, the default is 115200.

(2) The supported file formats include raw observation data, NEMA, RTCM3.2, RTCM3.2(MSM5), RTCM3.0, RTD, CMR.

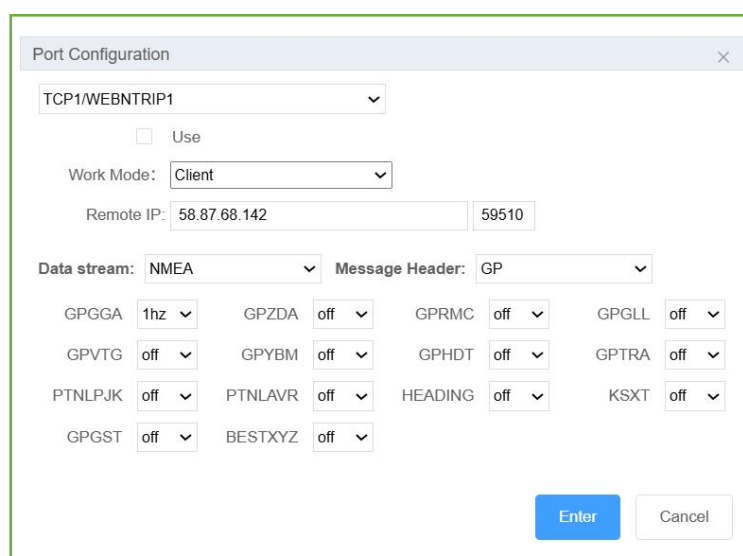
The screenshot shows the 'Port Configuration' dialog box. The 'BT' dropdown is selected. Below it, the 'Use' checkbox is checked. The 'Baud Rate' is set to '115200' and 'Odd/Even' is set to 'ODD'. The 'Data stream' is set to 'Raw Observation Data'. The 'RangeCmpb' and 'RawEph' are both set to '1s'. At the bottom right, there are 'Enter' and 'Cancel' buttons.

- **TCP1/WEBNTRIP1:** You can output data through TCP server, then use TCP client to get data. For example, connect your rover or computer and M8 receiver in the same LAN, setup M8 to output RTCM data via TCP server, and rover receives via TCP client.

The supported file formats include raw observation data, NEMA, RTCM3.2, RTCM3.2(MSM5), RTCM3.0, RTD, CMR.

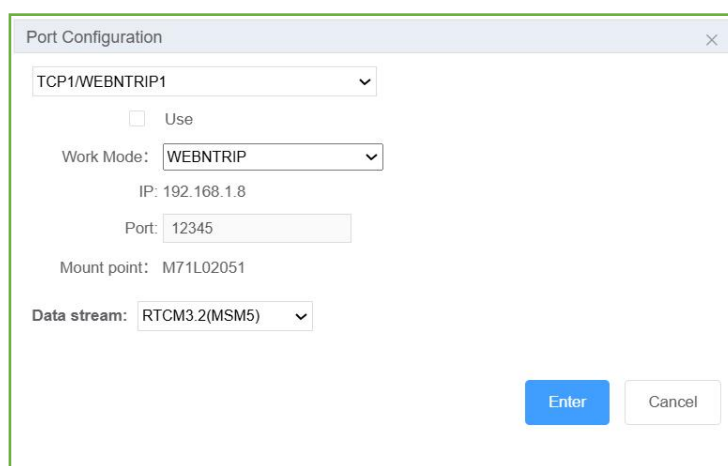


- **TCP Client:** If you have a TCP server with a static IP, you can output the data via TCP Client, then the data will be transmitted to your TCP server. The IP is your PC IP, the port should be mapped. For example, you can output the NMEA data to your TCP Server, then you can check the status of the rover in the office while the rover works in the field.



- **WEBNTRIP:**

WEB configuration: setup the IP 192.168.1.8, port 12345, mountpoint M81L0XXXX, and choose RTCM3.2(MSM5), then check on Use, click Enter, it will transfer data through WIFI



Port Configuration

TCP1/WEBNTRIP1

☐ Use

Work Mode: WEBNTRIP

IP: 192.168.1.8

Port: 12345

Mount point: M71L02051

Data stream: RTCM3.2(MSM5)

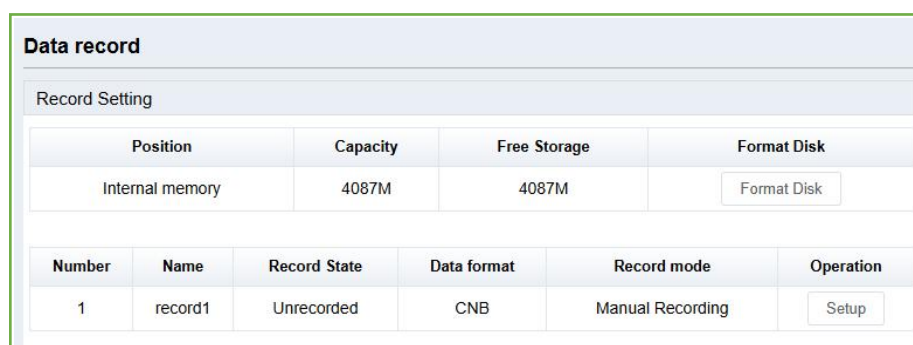
Enter Cancel

3.3.3.2 Data record

This is used to log static data, the data will be saved in the receiver, you can download data via web interface, go to chapter 3.3.3.3 for more information, or you can use USB cable to connect PC and download static data.

In recording setting interface, you can get following information:

- Current internal memory capacity and free storage; you can click Format Disk to format the receiver internal memory;



Data record

Record Setting

Position	Capacity	Free Storage	Format Disk
Internal memory	4087M	4087M	Format Disk

Number	Name	Record State	Data format	Record mode	Operation
1	record1	Unrecorded	CNB	Manual Recording	Setup

- Current record state, data format, record mode.

Click **Setup** to configure the static settings:

- **Name:** You can choose record1, then the file will be saved in record1 folder.
- **Sample Interval:** change the sample interval of observations, the maximum data rate is 20 Hz, the minimum is one observation per minute, it supports 0.05/0.1/0.2/0.5/1/2/5/15/30/60 S
- **File Split:** supports every 15 minutes or 1\2\4\24 hours to save a file, or you can

choose Manual mode, then it will save a one file when you manually stop the record by pressing on the static button, or click the Stop button. If you select 24 as file split, it will create two data files when it occurs to 24 o'clock (UTC Time). One is from start time to 24 o'clock, another is from 0 o'clock to end time.

- **Data format:** Supports CNB, RINEX 2.10, RINEX 3.02
- **Loop:** When storage is full, Yes means delete earliest data and store continually, No means stop recording
- **Storage Space:** Separate storage space in internal memory
- **Record mode:** logging data manual recording or auto recording.
- **Auto recording:** when you set automatically, it will record static data automatically when the receiver tracks satellites, and you can stop recording by pressing the static button on the receiver;
- **Manual recording:** when you set manually, then it will not record data automatically when the receiver tracks satellites, need to press the static button on the receiver. Click Enter to start the recording, and it will save the configuration, you can stop the recording by pressing the static button or click Stop on the interface.

Disk Record Setting

Record State: Unrecorded

Name: record1

Sample Interval: 1s

File Split: 1h

Data format: CNB RINEX2.10 RINEX3.02

Loop: Yes No

Storage Space: 3880

Record mode: Manual Recording

Cancel Start

Disk Record Setting

Record State: Unrecorded

Name: record1

Sample Interval: 1s

File Split: 1h

Data format: CNB RINEX2.10 RINEX3.02

Loop: Yes No

Storage Space: 3880

Record mode: Manual Recording

Cancel Start

3.3.3.3 Data Download

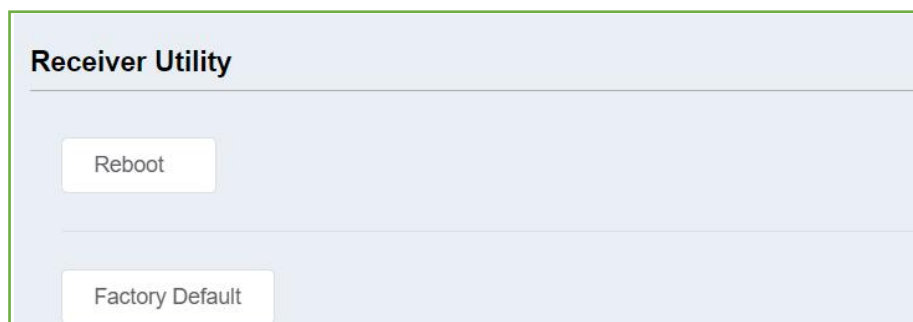
- Firstly, select record Name, File type (CNB\Rinex3.02\Rinex2.10) and the date.
- Then click **Get Data**, you will see data files.

- Click **Download** icon to download the data file you need; or click **Delete** icon to delete this file; click **Select All**, you can select all the data in the current interface, download and delete them in batches. Rinex files include observations and ephemeris and not are zip files.

3.3.3.4 Receiver Utility

In this section, you can control M8 remotely, including:

- Reboot: Restart the receiver
- Factory Default: recover the receiver to factory default setting

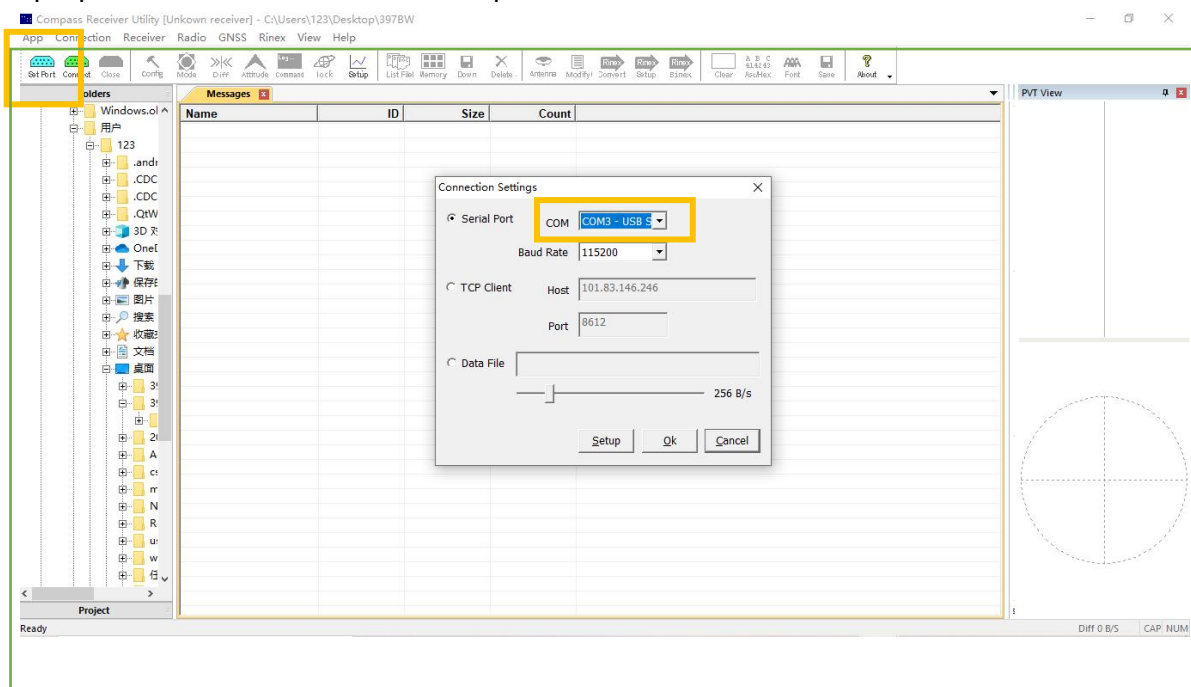


4. Static survey

This chapter describes static survey through M8 receiver and CRU software. For static survey, you cannot change settings through front panel, you can configure it via Compass Receiver Utility (CRU): 1) Receiver configuration; 2) check receiver settings and status; 3) convert data to Rinex format.

4.1 Receiver Configuration

1. Download and install CRU software (ensure the driver is properly installed in your PC):
2. Put a battery in the M8 receiver and turn it on.
3. Connect the receiver with your PC through type-c cable.
4. Click set port in CRU -> select proper serial port in the serial port option-> enter proper baud rate -> click Ok to complete receiver connection.



4.2 Static Data Collection

Static survey is mainly used for the control 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 set Data Log Session as manual on the known point.
- Power off the receiver before moving to other observation site.
- To quickly post-process static observation raw data, write down the station name, receiver SN, antenna height, start and end time for each observation site.

Tip: You can start recording static data in the front panel, it's convenient for you.

4.3 Static Data Download

The raw observation data is saved in internal memory of M8 receiver, when connected with PC via USB cable, the M8 receiver can work as a USB Flash Disk, which means you can copy or cut static data to PC directly.



Tips:

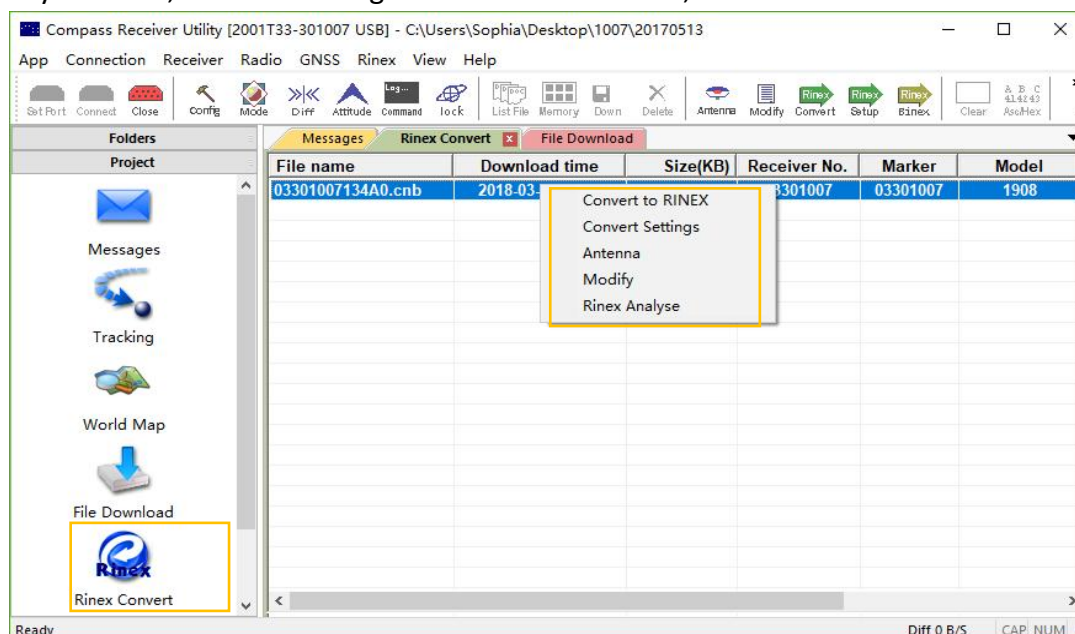
1. Default memory for M8 receiver is 8GB, and 16GB, 32GB optional.
2. The receiver will stop recording raw data if the internal memory runs out.

4.4 RINEX Convert

After copy raw observation data to PC, you can convert the data from MaxNav binary format (*.cnb) to RINEX in CRU software.

1. Start CRU software;
2. Click **Folders** and select the path of your CNB data;
3. Click Rinex Convert to check all raw data on main window. Right click on the file to

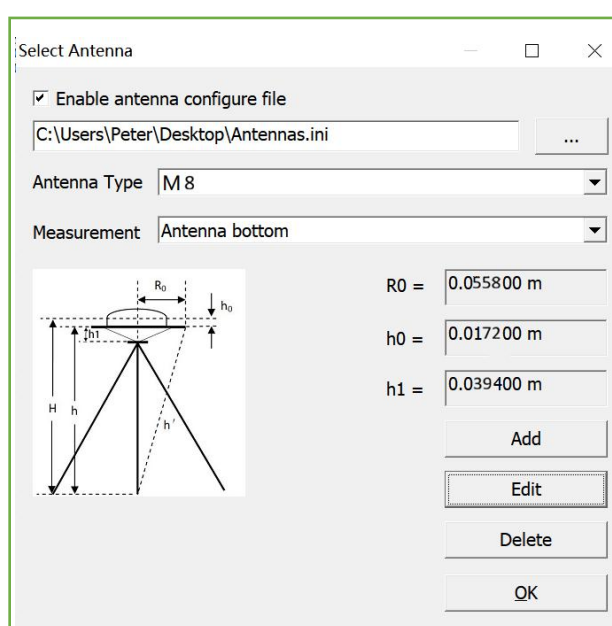
modify antenna, Convert Settings and Convert to RENIX, or use fast icon in standard bar.



4. Click  to select the **Antenna Type** and **Measurement**. If you cannot find M8 antenna.

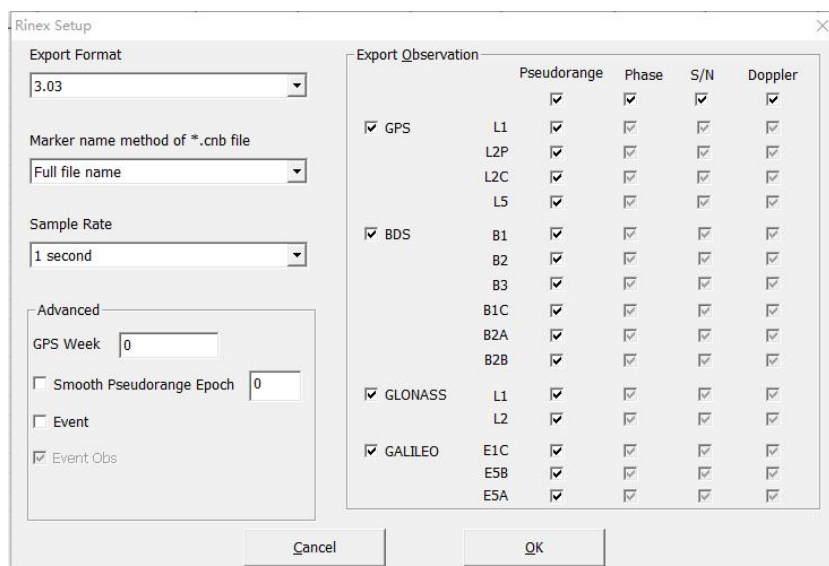
1) Input the value of R_0 (horizontal offset from measurement mark to phase center), h_0 (vertical offset from measurement mark to phase center) and h_1 (vertical offset from measurement mark to receiver bottom). R_0 is 0.062m, h_0 is 0.016m and h_1 is 0.054m respectively for M8 receiver;

2) Or check **Enable antenna configure file** to select **Antennas.ini** file to select Antenna type again. You can also add, edit and delete antenna types based on your requirement.





- Click  to change **Convert Settings**, mainly export format and export observation information.



Rinex Setup

Export Format: 3.03

Marker name method of *.cnb file: Full file name

Sample Rate: 1 second

Advanced:

GPS Week: 0

☐ Smooth Pseudorange Epoch: 0

☐ Event

☒ Event Obs

Export Observation:

		Pseudorange	Phase	S/N	Doppler
☒ GPS	L1	☒	☒	☒	☒
	L2P	☒	☒	☒	☒
	L2C	☒	☒	☒	☒
	L5	☒	☒	☒	☒
☒ BDS	B1	☒	☒	☒	☒
	B2	☒	☒	☒	☒
	B3	☒	☒	☒	☒
	B1C	☒	☒	☒	☒
	B2A	☒	☒	☒	☒
	B2B	☒	☒	☒	☒
☒ GLONASS	L1	☒	☒	☒	☒
	L2	☒	☒	☒	☒
☒ GALILEO	E1C	☒	☒	☒	☒
	E5B	☒	☒	☒	☒
	E5A	☒	☒	☒	☒

Buttons: Cancel, OK

Tip: In some Post Processing software, the BeiDou observations cannot be processed, you can uncheck the BeiDou B1,B2,B3 observations.



- Click  to Convert to RINEX, the RINEX data will be save in the same path as raw observation data.

5. Real-Time Kinematic Survey (RTK)

This chapter introduces how to conduct RTK Survey with Mfield Software, including software installation, start a new project, receiver connection and RTK working modes (CORS).

5.1 Installation of Mfield

Mfield is available on Google play, you can download for free and install the software to MaxNav controller C50.

Also you can download the latest version from our website:

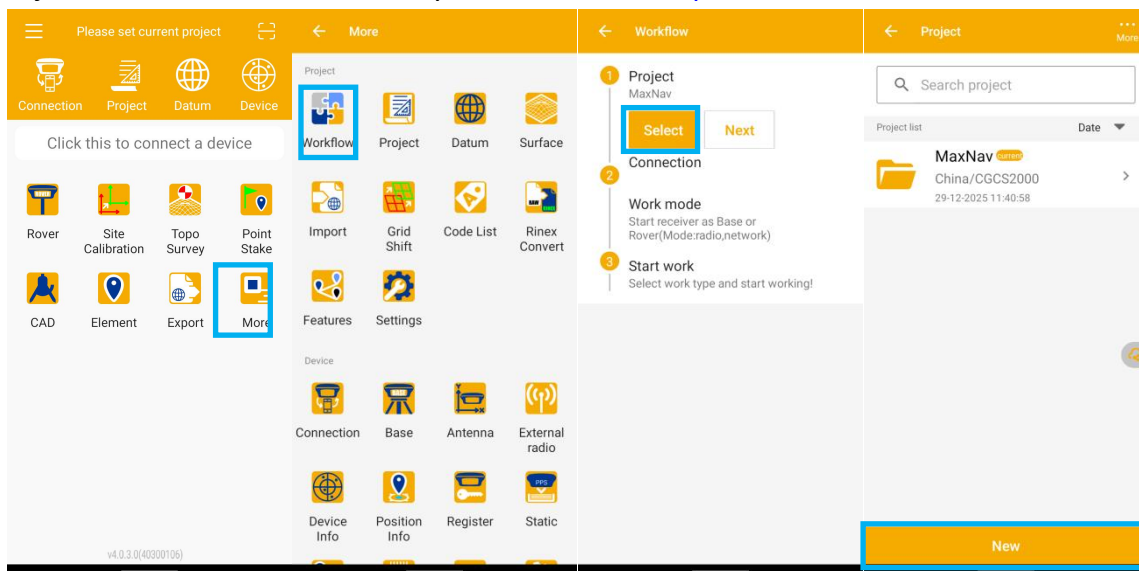
<https://www.maxnav.com/>

5.2 Wizard function in Mfield

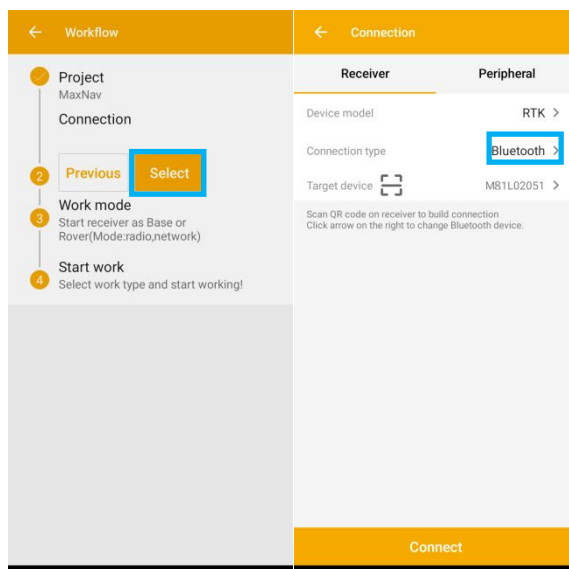
Follow the Wizard, you can quickly learn the general workflow of Mfield , also you can quick start your survey by this function no matter you are experienced one or new user.

In Project menu, tap Wizard.

1. **Project:** Click **More->Workflow->Select**, go into Project interface to create or select a project. For detailed information, you can refer to [chapter 5.3](#).

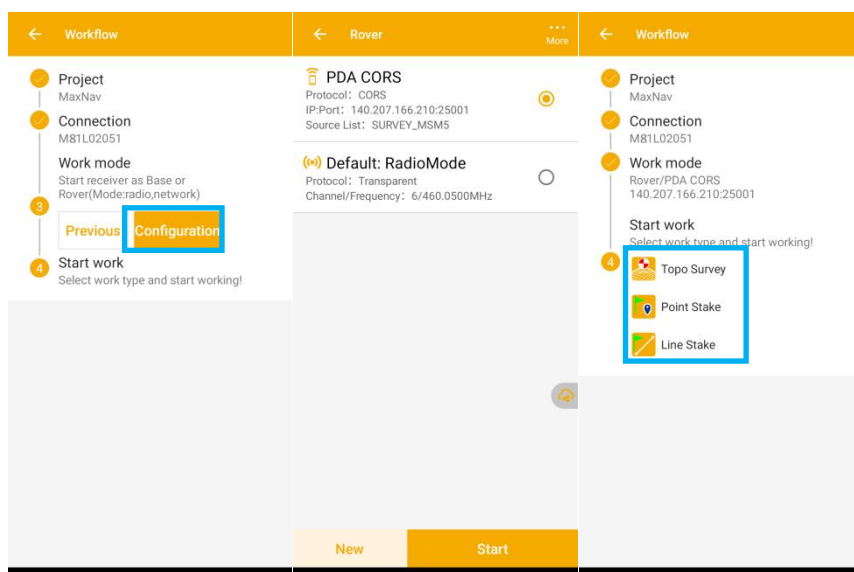


2. **Connection:** Click **Select** to go into connection interface. Because M8 has one camera, You can choose connect M8 with Mfield via WiFi, For detailed information, you can refer to [chapter 5.4](#).



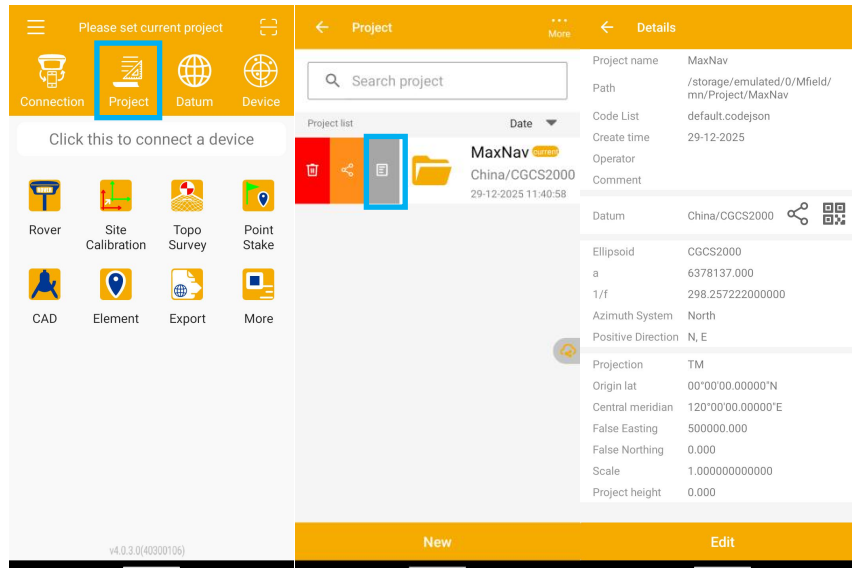
3. **Work mode:** Click **Configuration** to go into Quick Setup interface to start your receiver as Rover. For detailed information, you can refer from [chapter 5.5](#).

You start your receiver as Rover, then you can start work directly of topo survey or stakeout



5.3 Start a New Project

Click **Project**, you can use the same Datum with last project, choose a datum in store and scan QR code from other controller to add Datum, even sharing project with cloud.



If you want to start work with receiver, you should select one project with datum information.

In Project interface, you can click **New** to add a new project or click  to open the previous project. It also supports to backup your project file by uploading your Cloud account, and download from it. If you delete the projects accidentally, you can recover them from Recycle Bin.

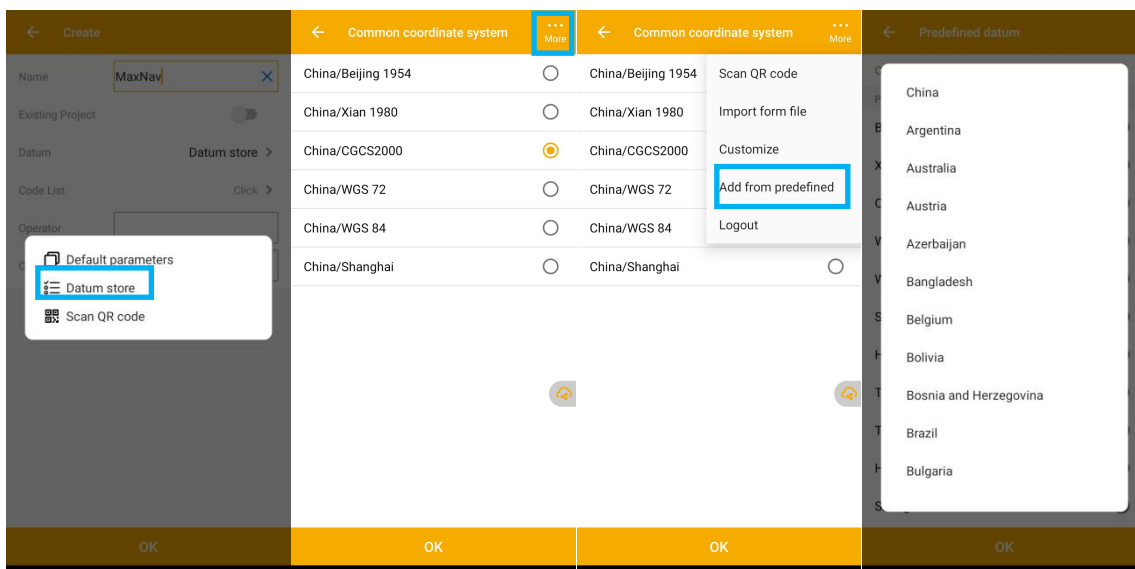
Mfield supports to order the project by date and name, in order or reverse order.

If you have added one project, you can click **View** or click the project name in the main interface to check the current project details, including Project name, store path, and datum parameters. Click the **QR** to share your datum information to others. Besides, click Edit to change the datum parameters, also, you can change in the Datum interface.

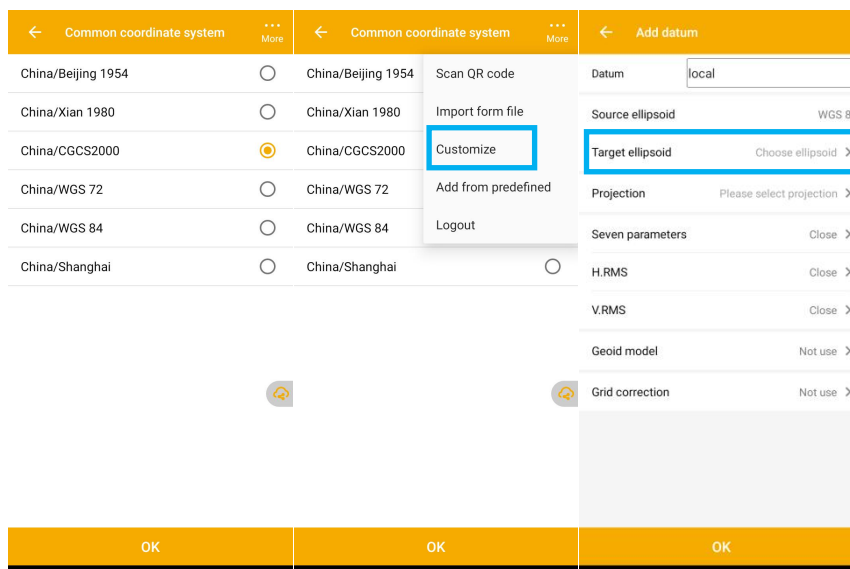
You can select a code list when you create a project, for more information, pls refer to [Chapter 5.3](#).

To edit datum parameters, Mfield supports three methods: Use last project, Datum store, Scan QR code.

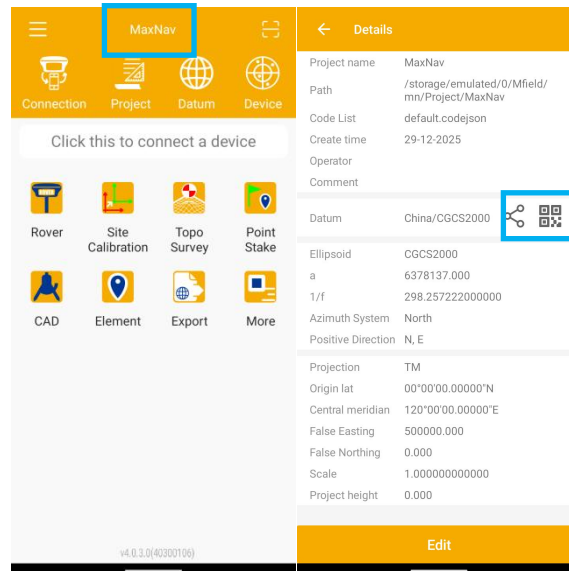
- **Select a Predefined datum:** You can select datum directly from the list. Mfield currently has 49 countries datum and will add more afterwards.



- Create a User defined datum: If you cannot find datum you want in the list, follow instructions below to add one: select Target Ellipsoid, Projection for your datum, and even seven parameters, geoid model based on your request.



- Share Datum via QR code.
- After you build a project, press the project name, it will generate a QR code. Users can use the Scan function in the main interface to access the coordinate system.

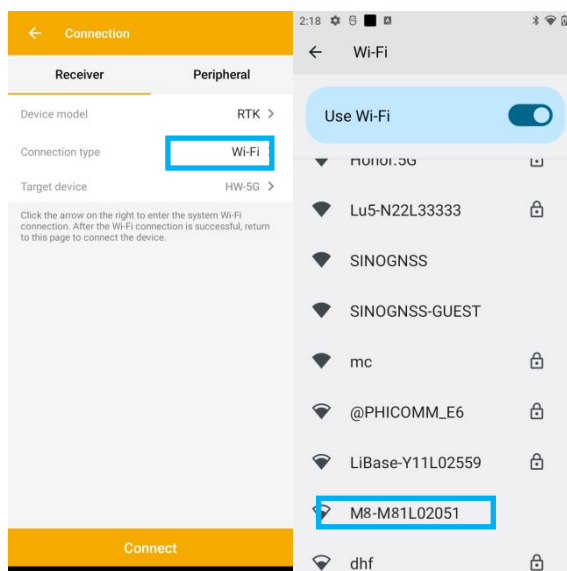
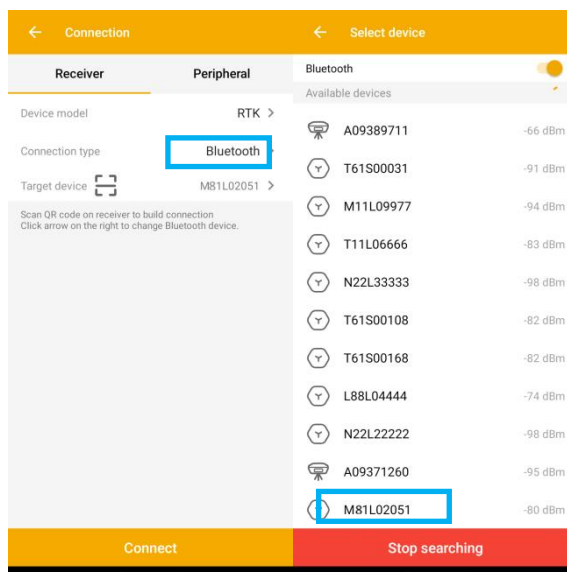


5.4 Connection

To connect Mfield with M8, click **More**, tap **Connection** to go into WiFi or Bluetooth connection interface.

- Make sure device WiFi or Bluetooth turned on;
- Click Find device—select SN of your M8 —allow pair. If you use Bluetooth, you need to pair. If you use WiFi, the password is 12345678.

After connect MaxNav receiver, you can check the device version in Device Info.



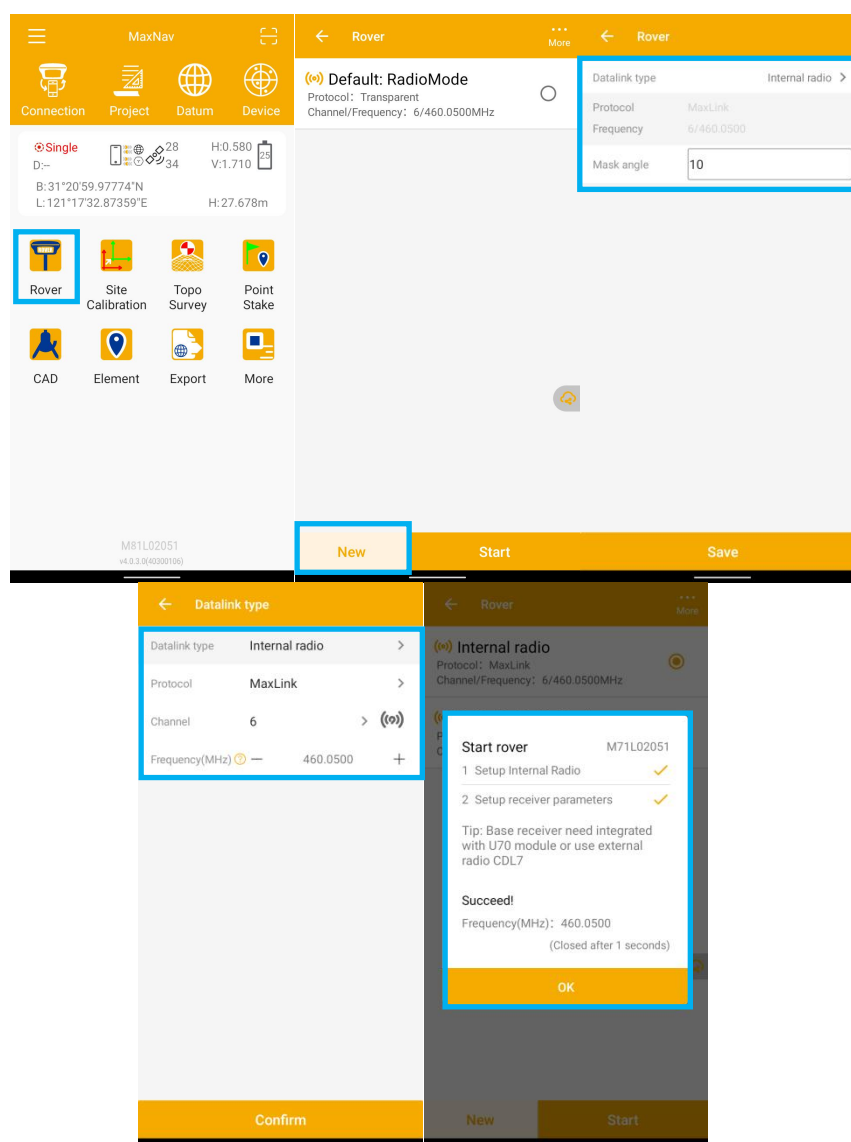
After connected successfully, the top will show the positioning status.

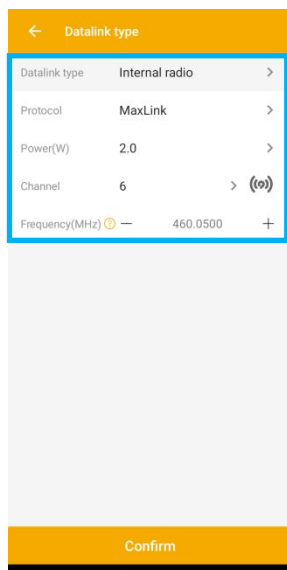
Tip: If you are failed to connect with receiver through Mfield, you can just follow prompt info to go into the device Bluetooth setting interface to make sure Bluetooth paired successfully. Sometimes you need restart the receiver or Mfield Software.

5.5 Work Mode

5.5.1 Start Rover with internal radio mode

- Connect Mfield with M8 receiver via WiFi or Bluetooth based on [Chapter 5.4](#).
- Set same protocol and frequency with Base receiver.
- The current status on the bottom will change from Single to Fixed.





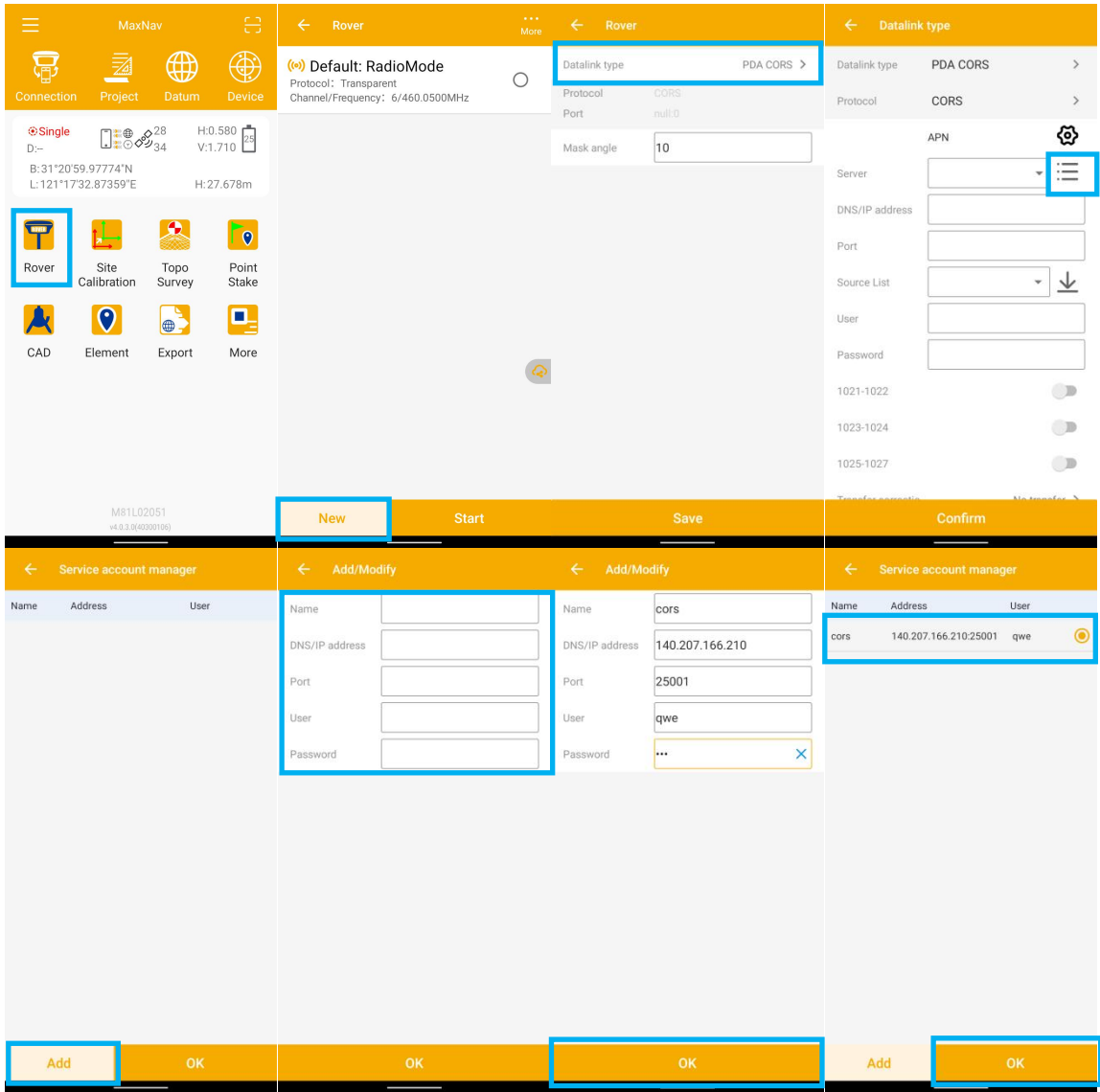
- Protocol and channel: Set protocol and frequency for the radio; M8 supports Transparent /TT450S/South/Mac/Maxlink/Maxlink+ protocol, It can work with some other brands' RTK.

Tips: M8 need to work with latest [OS firmware 1.0.3](#), and [Mfield 4.0.3](#), Please confirm with us if you have problems

5.5.2 PDA CORS mode

For internal GSM need insert a SIM card to receiver, for PDA CORS need make sure controller can access to Internet.

You should enter the server IP and Port. In addition, enter User (login name) and Password to get Source List.

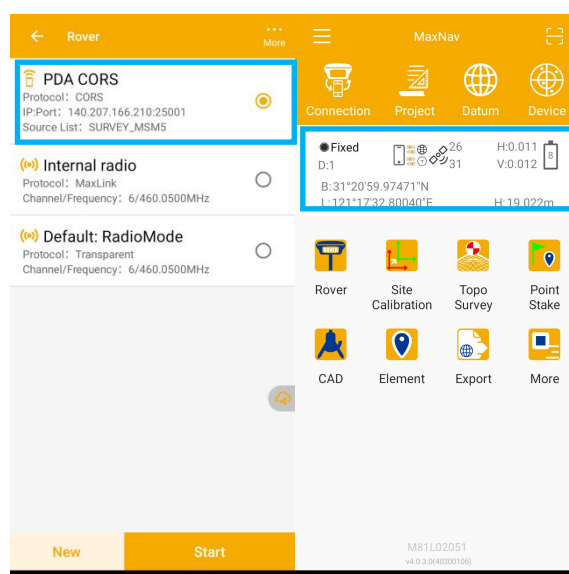


The screenshot shows the 'Datalink type' configuration screen. It includes fields for 'Datalink type' (set to PDA CORS), 'Protocol' (set to CORS), 'APN' (with a gear icon for modification), 'Server' (set to cors), 'DNS/IP address' (140.207.166.210), 'Port' (25001), 'Source List' (SURVEY_MSMS with a dropdown arrow), 'User' (qwe), and 'Password' (masked). At the bottom, there are three message range toggles: 1021-1022, 1023-1024, and 1025-1027. A 'Confirm' button is at the very bottom.

Annotations with arrows point to the following elements:

- APN gear icon: Press to modify the APN for SIM card
- Server dropdown: Add your CORS info to list, press to select
- Source List dropdown arrow: Press to get source list and select mount point
- 1021-1022 toggle: 1021-1027 message is only available for PDA CORS mode, the message is used for datum correction for CORS.

- Enter CORS Name 、 DNS/IP address and port -> enter User and password.
- Click Source List and select the proper source
- After Confirm succeed, the diff LED on receiver will flash, and software can get a fixed result.
- It also provides TCP protocol.



Tip: L-Band is only for PPP function, using PPP function can get the station coordinates directly, and there is no limit with the distance of stations, the accuracy can be up to 3-5cm.

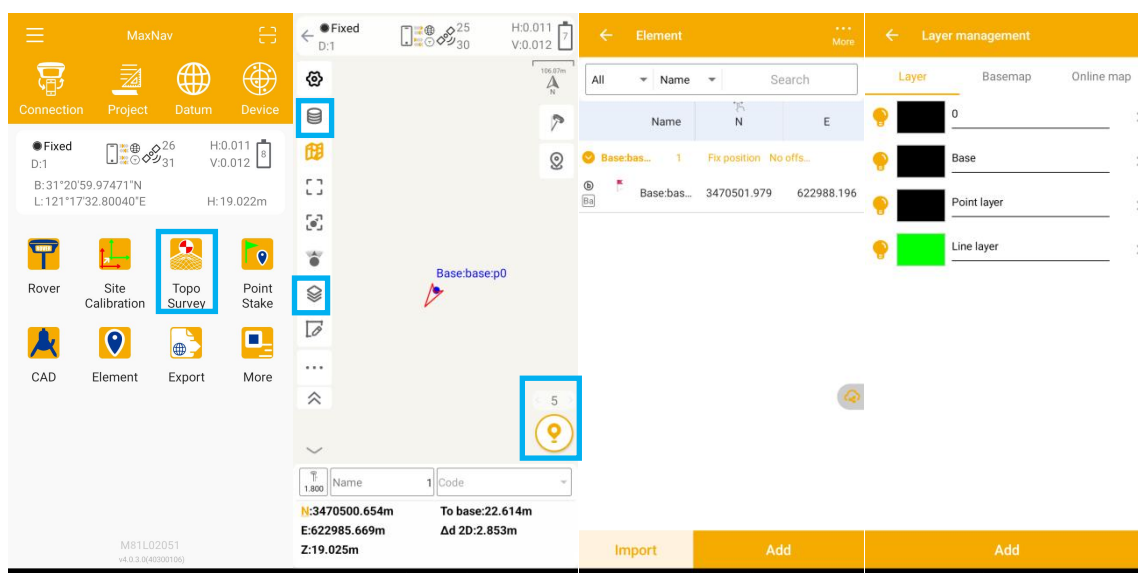
6. Basic Survey Functions

This section describes the basic survey functions of Mfield, including point measurement, Topo survey, Auto survey, Area survey, Static, PPK, staking, site calibration, import and export measured points. You should make sure your Mfield version supports to connect M8.

6.1 Topo survey

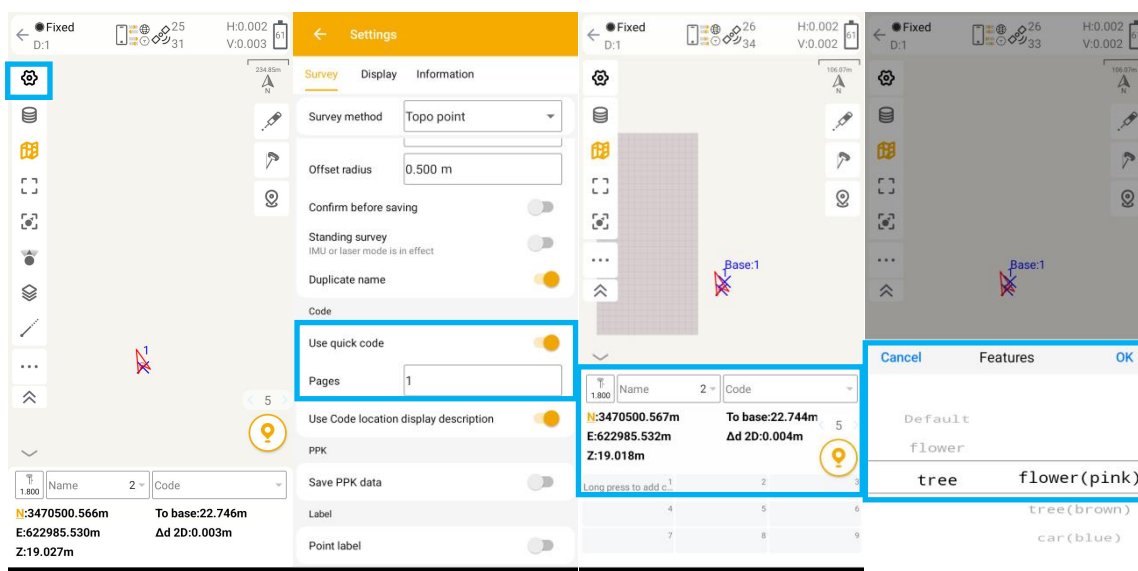
Click Topo Survey-> enter point name, ->click  to start or stop collecting data.

- You can quickly change antenna height in the survey interface.
- Tap Elem to check point coordinates.
- Tap Layer to show the layers you want display on map

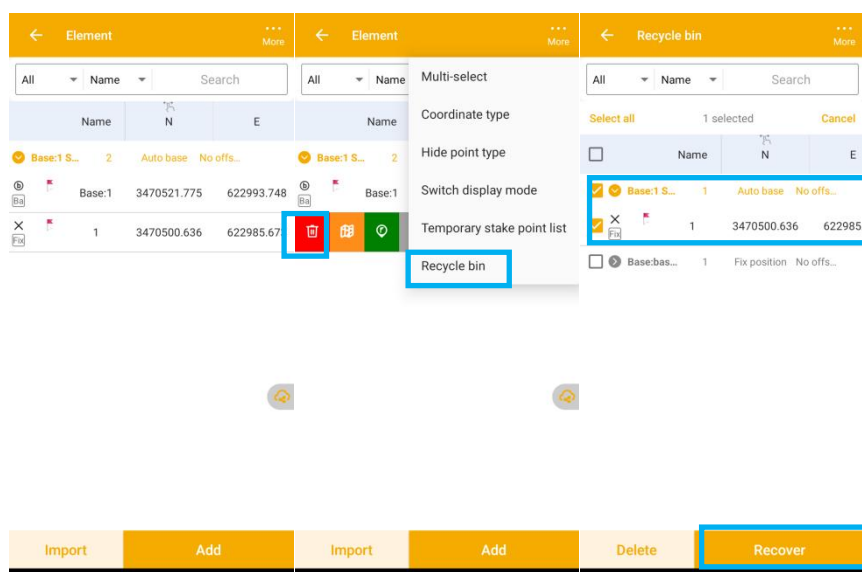


 : Click this to show the whole points on the interface.

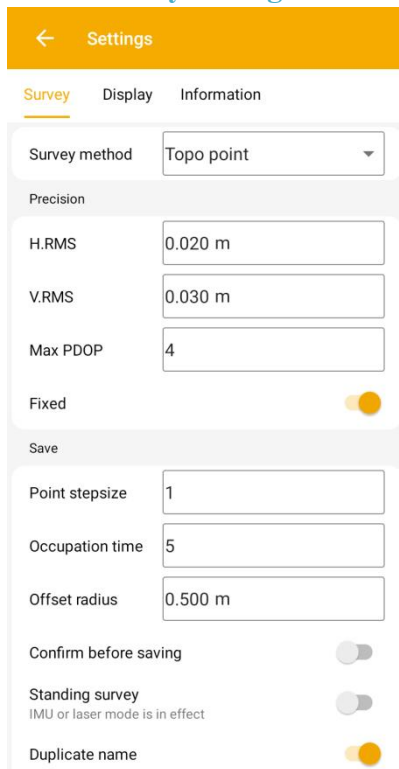
 : If the arrow is out of sight on the interface, you can click this to locate the receiver position, then the arrow will be shown on the interface.



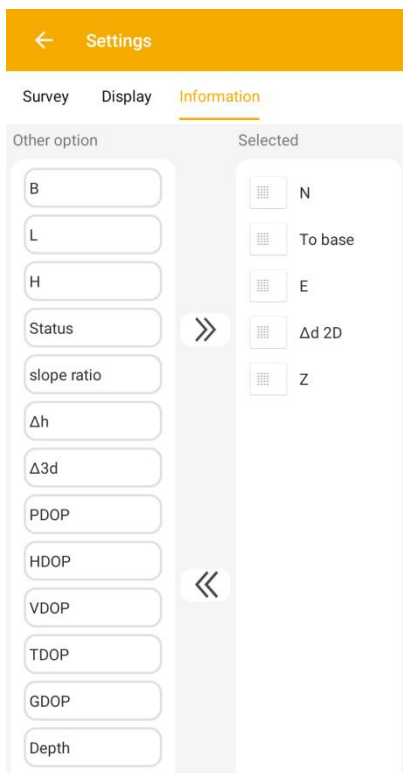
- Fast survey by pressing Code: Tap the code in nine panels, will survey the point directly.
- Go into code management interface to modify code list, then you can choose code to use in nine panels.
- Recover deleted points in Recycle Bin.



6.1.1 Survey settings



- **H.RMS\V.RMS**: point accuracy need higher than the value;
- **Fixed**: only fixed result can be saved;
- **Point stepsize**: for point name;
- **Occupation time**: measure times for one point;
- **Offset radius**: point cannot offset bigger than the value during measure;
- **Stake range**: show circle when close to target point;
- **Duplicate name**: allow point name same;



- **Display option**: Items which can be shown in the survey interface, 8 items are the most.
- **N, E, Z**: plane coordinates, displayed in a vertical column by default
- **B, L, H**: latitude, longitude, ellipsoid height.
- **Status**: receiver RTK solution status, includes searching, single, float, fixed.
- **To base**: Distance from receiver current position to the base.
- **Δd**: Distance from receiver current position to last surveyed point.
- **Δh**: Height difference from current position to last surveyed point.

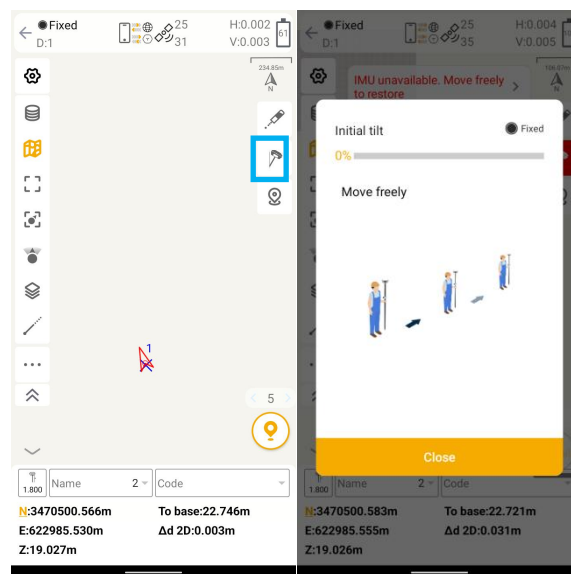
6.1.2 IMU Measurement

Tilt survey option will appear when receiver supports for tilt survey, it is available for MaxNav Technology M8 laser RTK, use IMU sensor.

According to the IMU sensor, M8 can meet the requirement of high precision measurement. When the tilts within 60° , the built-in sensor based IMU precisely calculates the actual offset, which accuracy can up to 2.5 cm.

Initialization

If you power off the receiver or freset it, need to initialize again. After open IMU button, you can follow the guidance in interface to complete it. During operation, make receiver can search the satellites and get a fixed solution.



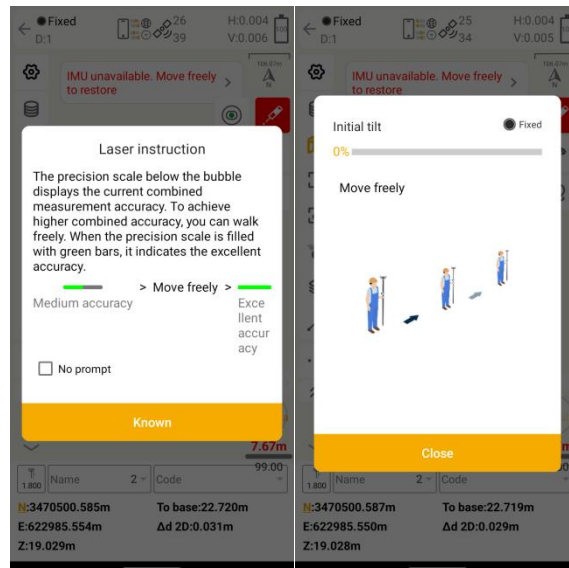
Keep the receiver stationary move freely with receiver

In survey interface, you can find the bubble and angle value shows the pole you tilt. For more accuracy, angle less than 60° will be better.

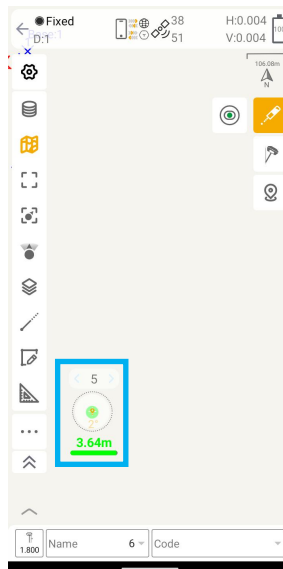
Tip: Do not shake or rotate the receiver violently, otherwise you need to re-initialize

6.1.3 Laser Measurement

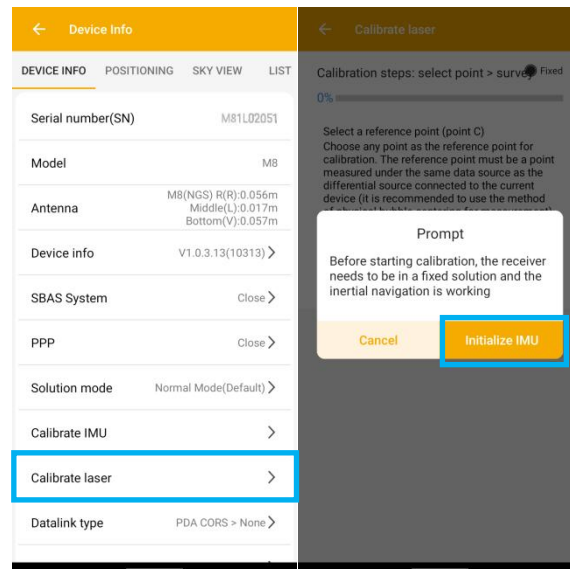
When you first time or long time no use, It may need to you initialize the laser. Go to topo survey, you will find laser button turn red. Make the receiver get fix and click it and do the Initialization.



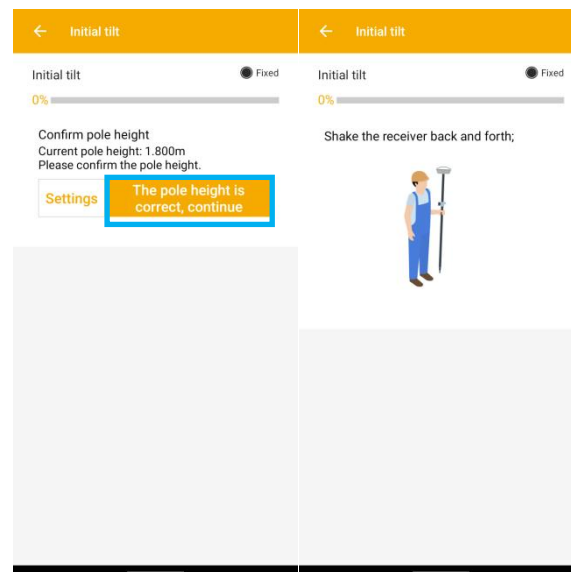
When you finish the Initialization, it will turn green. You can go to point stake to stake point B out to check laser accuracy.



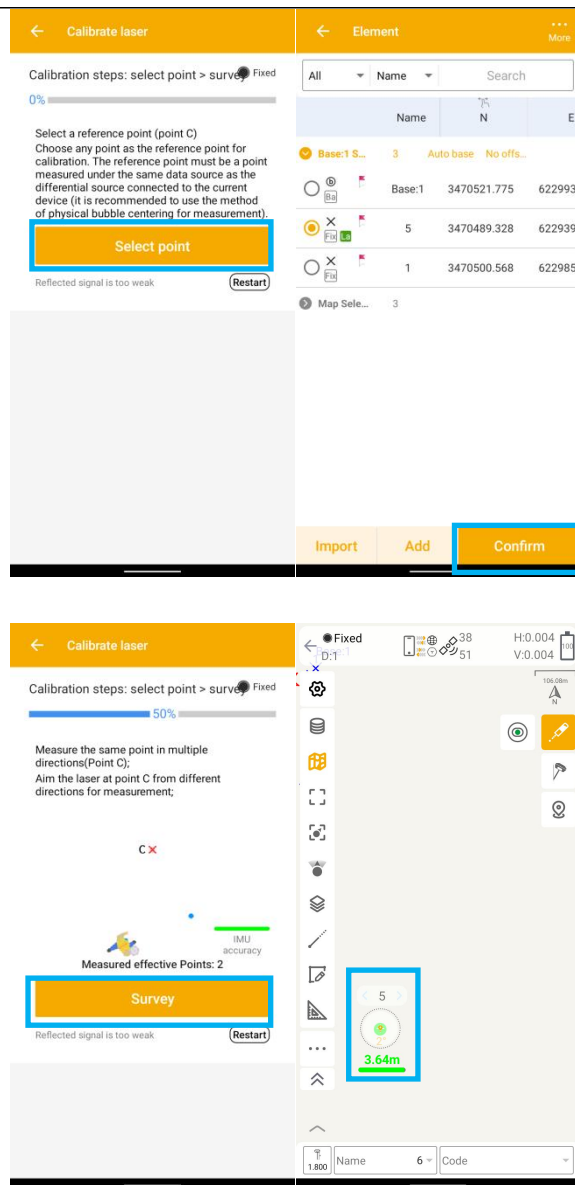
If you feel the accuracy of laser is not good, you need to go to Device >> Device info >> Calibrate Laser, start tile mode in survey interface and follow the steps to initialize the IMU. During operation, make receiver can search the satellites and get a fixed solution.



- a) Making sure it gets fixed status
- b) Because laser measurement is based on IMU module, you need to initialize IMU first, shake the receiver back and forth and finish IMU initialization.



- c) Then choose a base point B, handle the Laser receiver to measure the same point B 5 times from different directions. You'd better do laser initialization within 3 meters to decrease laser offset.



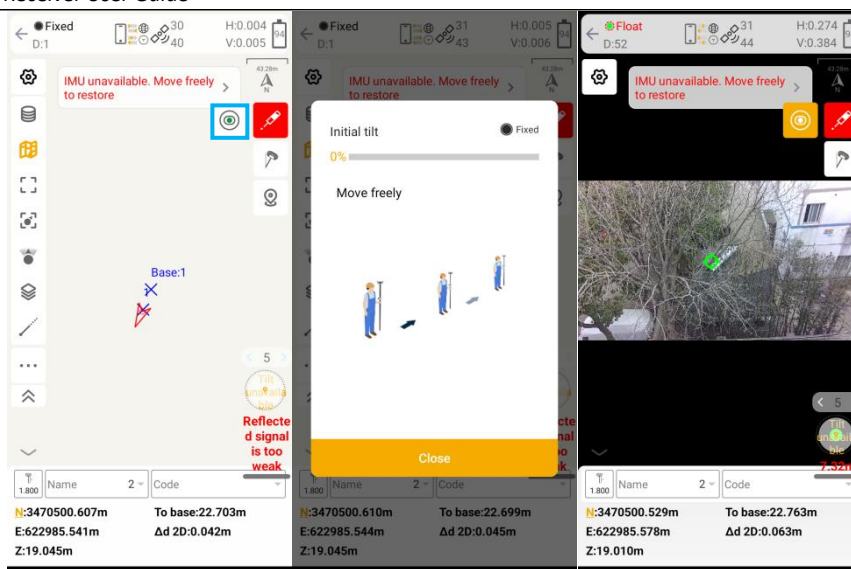
d) When you finish laser initialization, you can go to point stake to stake point B out to check laser accuracy.

In survey interface, you can find the bubble and angle value shows the pole you tilt, also laser distance. For more accuracy, angle should less than 60° , it will be better. And the laser icon will turn green, it means laser is ready to work.

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

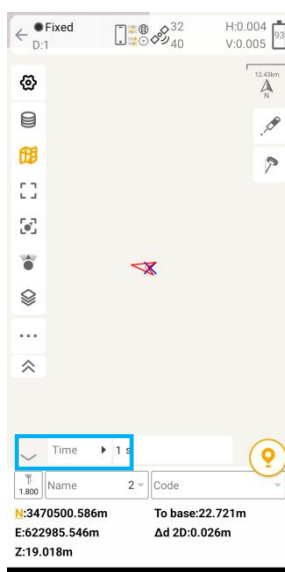
6.1.4 Visual Measurement

When you finish IMU and laser calibration, you can click camera button to start visual measurement. Camera can be switched on to help during measurement.



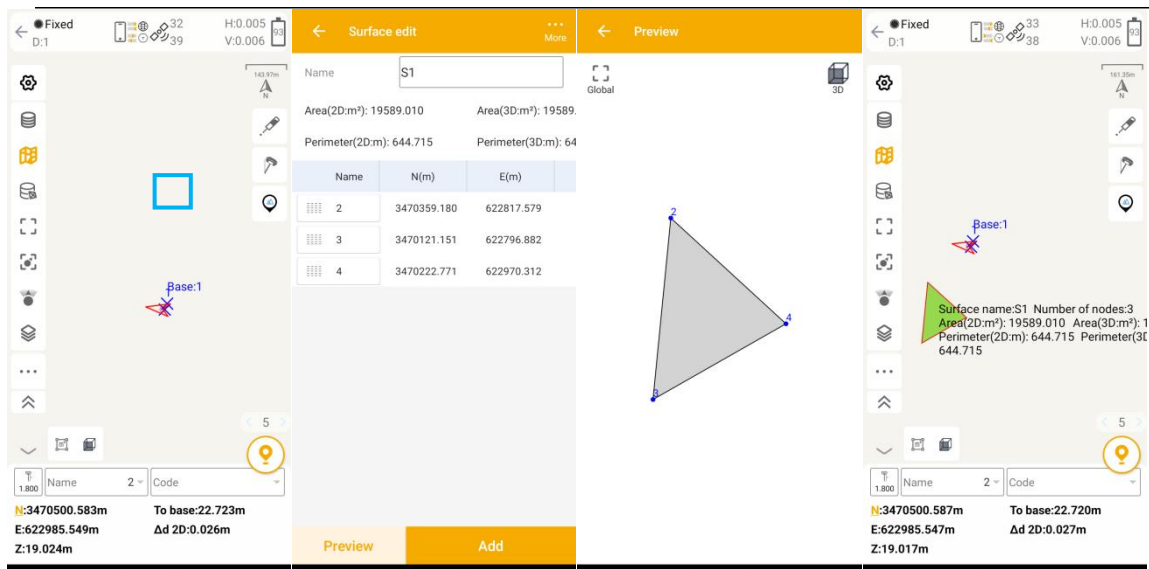
6.2 Auto survey/Area survey

For Auto survey, it supports automatic and continuous survey according to Time or Distance.



For Area survey, it can compute area directly after getting points.

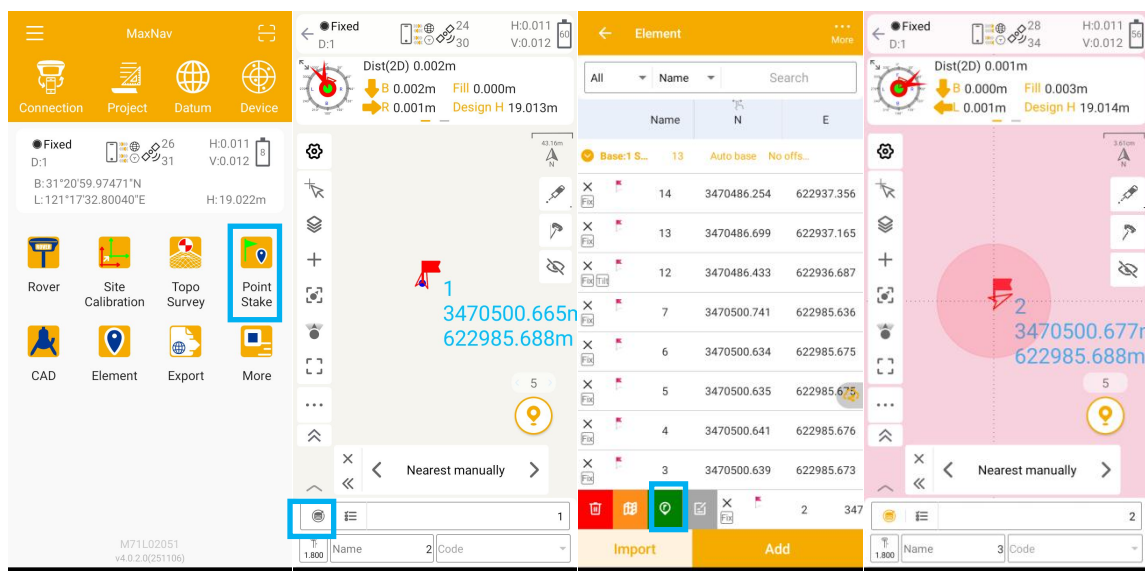
Press  , it will show the coordinate information, press  , it will show the area result, press  , it will show the shape on map.



6.3 Stake Points/Lines

6.3.1 Stakeout Points

Go into Stake point interface, click to choose a point and tap Stake. Mfield provides a navigation map when staking point. If you are close to the target point enough, it will alarm you based on the alarm range you set.



Various navigation info choices

Tip: Mfield supports to select the point on the screen directly, including the surveyed points and points from the background layer, when you click the point on the map, it will change to

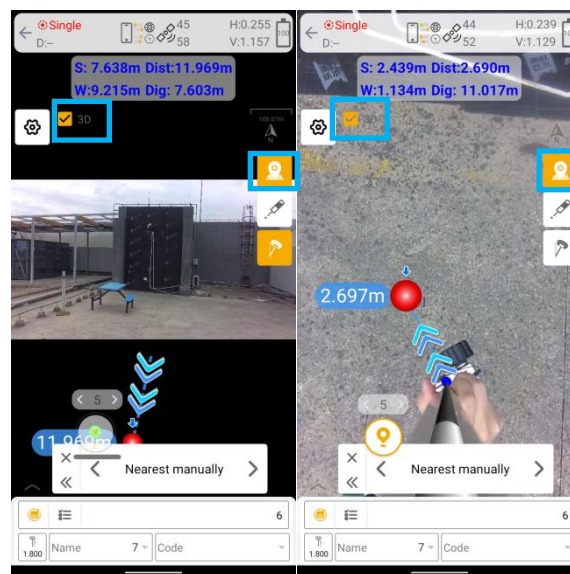
this point automatically, so you can stake it. For the points selected from background layer, they will be saved to the Element as the **Map Selected Point** type

Tip: keep your receiver vertical to the ground.

In the IMU staking, you can open IMU function, and don't need to keep the receiver vertical to the ground, and the tilt angle supports maximum to 60 degrees.

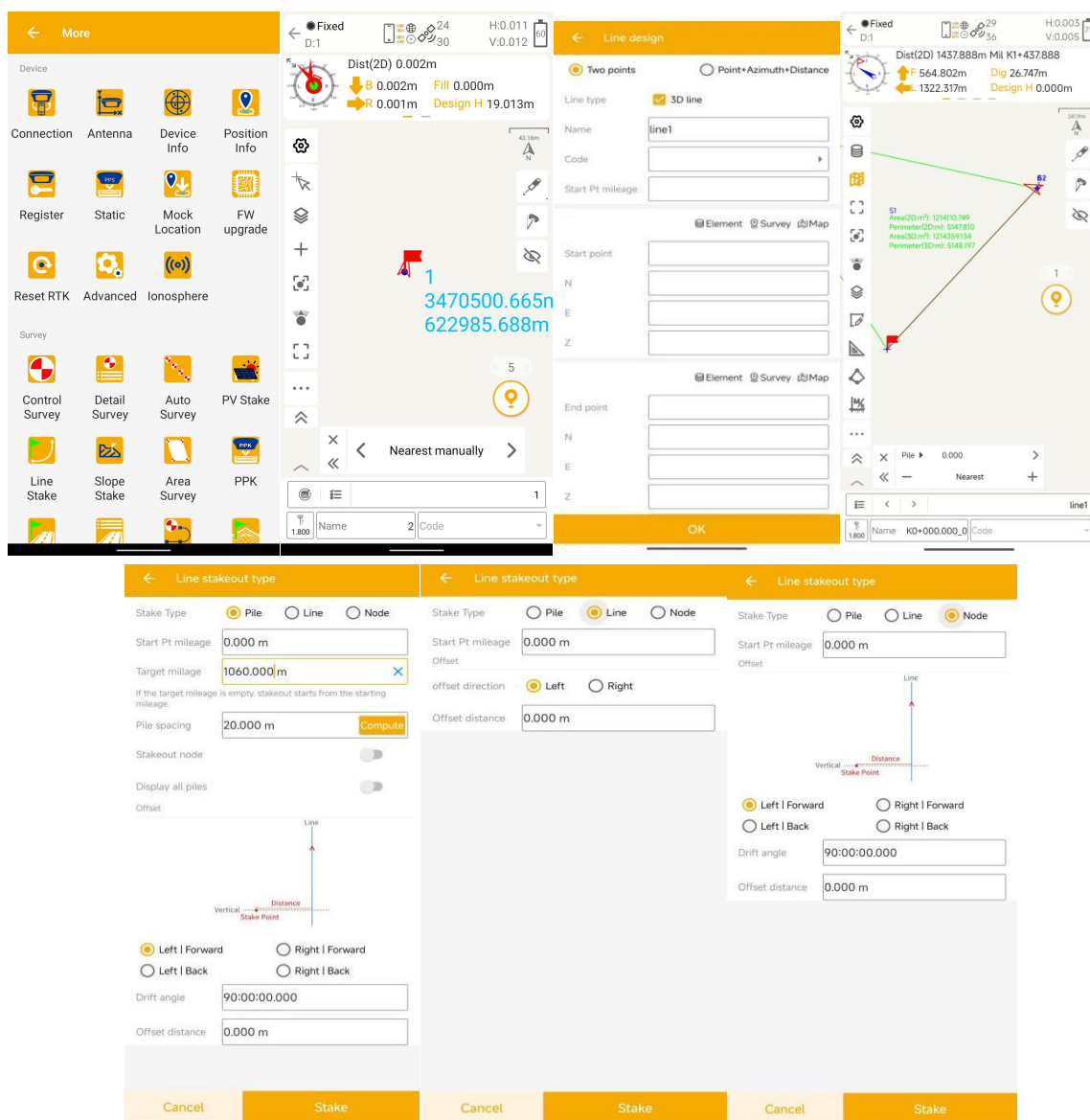
6.3.2 Visual Stakeout

Visual Stake: Connect the M8 and click on the Visual icon to enter visual stake mode. It support 2D/3D stake. And it will switch bottom camera according to the distance to target coordinate.



6.3.3 Stake line

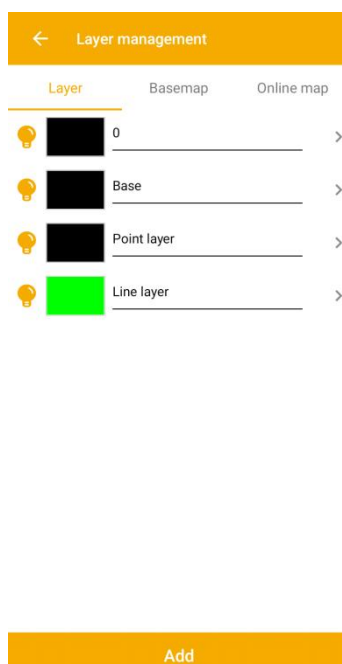
For staking lines, click  -> add line (Two points or Point + Azimuth + Distance) -> click  -> Choose one line and click Stake. The default method to stake is 'To line', press method to choose a method you want.



7. CAD

In Mfield , we can import CAD file to do survey and stake out work.

Survey layer: Modify the colour and font size of measured points, release points, map points, visible status of the input points layer, point symbols, point names, elevation and code labels in the measurement layer.



Global: All elements on the diagram are centred.

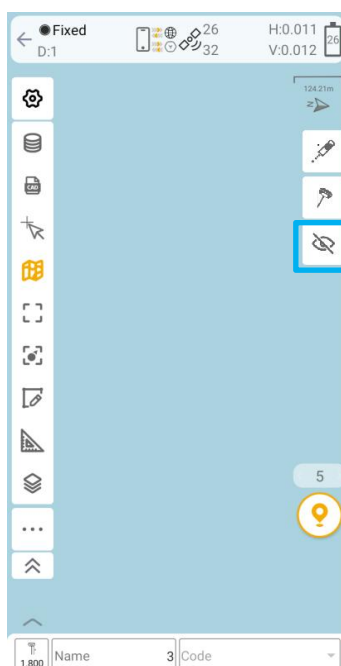
Center: Click to turn on real-time centering, and the current position is centred in the middle of the CAD interface.

Follow: Click to turn on the view mode, the CAD drawing orientation changes according to the handbook orientation.

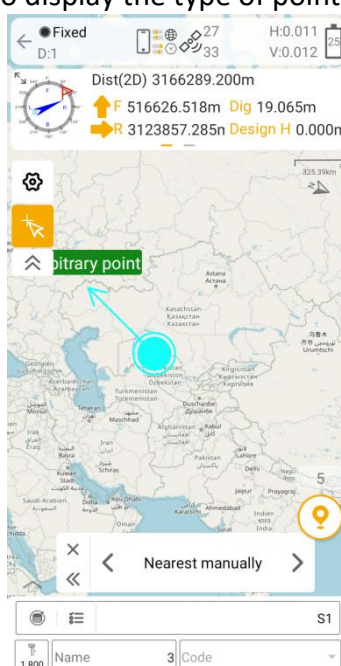
Settings: Go to Setup Options for Measurement, Sampling, Road, PPK, CAD, and Information Fields.

Elem: Access to the point library to view measured point information.

Invisible point: There are two modes: visible point mode and hidden point mode. In visible point mode, all the points in the CAD interface will be displayed, while in hidden point mode, all the points in the CAD interface will not be displayed.



Capture: Click the Snap button to display the type of point currently being snapped.



Fetch: Extract feature points from CAD drawings, providing: points, centers, nodes.

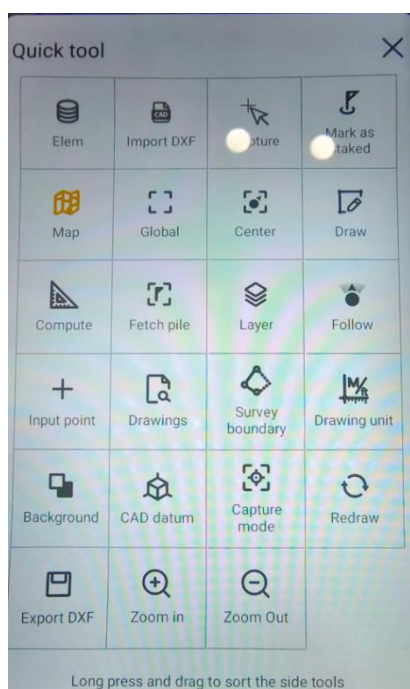
Vision: After connecting the vision receiver and the CAD enters the release mode, after selecting the release target on the CAD, the vision image is switched on and the virtual points are displayed on the image.

CAD function support measure and stakeout.

Stake points: Use arrow to select points

Measure point: Click measure icon to save current coordinate

7.1 CAD Menu



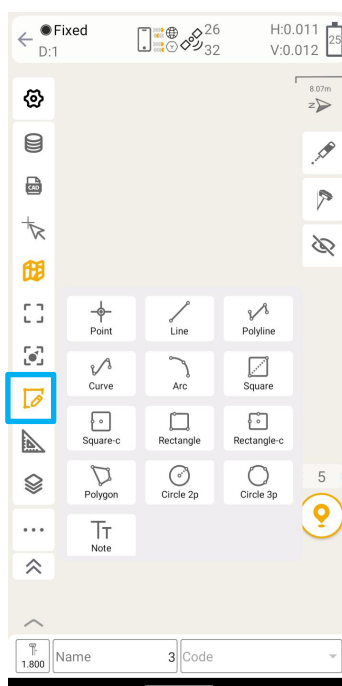
Background: Edit background color, supports white, black, gray, black is by default, after you change the color, it will not change when you restart the software or switch project;

CAD Datum: In most cases, the user uses the world coordinate system by default. If the user coordinate system is set, for example, for the convenience of drawing, the coordinate system is moved to the plan view of an object. In this case, the user should select User coordinate system in Mfield.

Capture mode: After you check on these items, when the selection tool approached you can capture them easily.

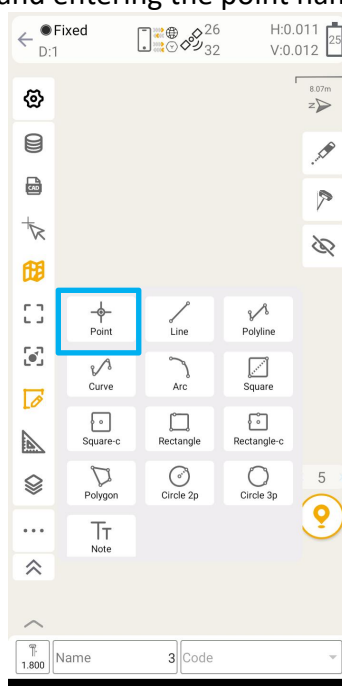
Redraw: When the CAD file is not refreshed at the real time, you can click Redraw to refresh file.

7.2 CAD Drawing



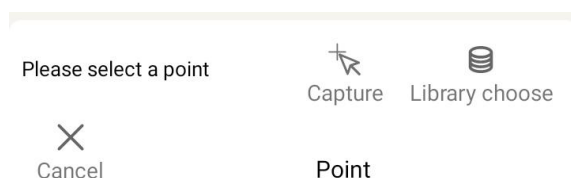
7.2.1 Point

Points can be drawn by clicking on the map, selecting points with the Capture tool, or selecting points from Element, and entering the point name.

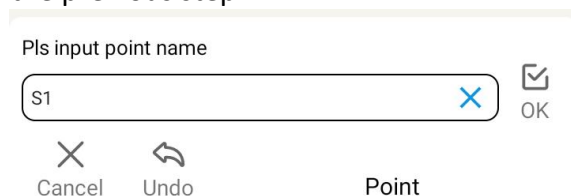


The drawing steps are as follows:

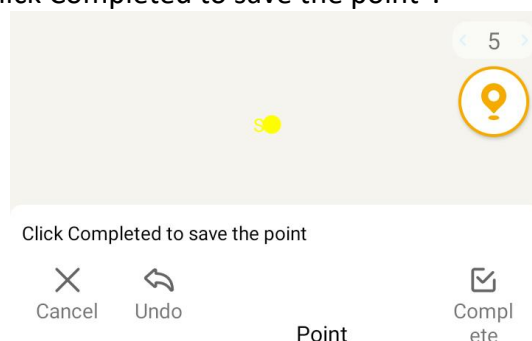
- 1) You can select points by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected points will be displayed in yellow. Click Cancel can exit the point drawing operation.



2) The bottom prompts "Pls input point name". Enter the name of the drawing point. Click Undo to return to the previous step.



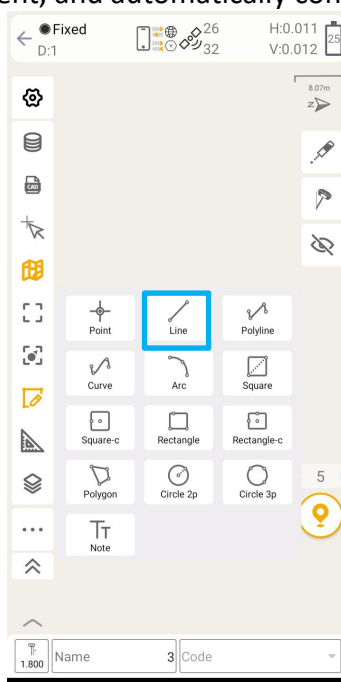
3) Click OK, a red point name will appear on the selected point, and the bottom of the interface will prompt "Click Completed to save the point".



4) Click Completed to complete the point drawing operation.

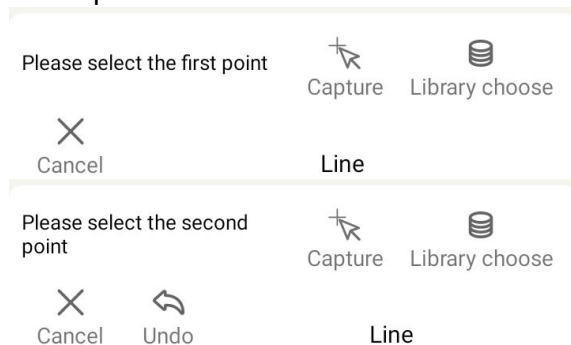
7.2.2 Line

You can select two points by clicking on the map, selecting 2 points with the Capture tool, or selecting 2 points from Element, and automatically connect them to draw a line.

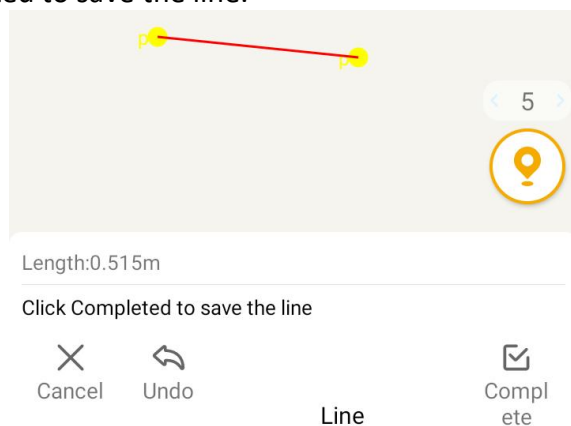


The drawing steps are as follows:

1) Select the first point by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel, which will exit the drawing mode. Clicking Undo will cancel the selected point.



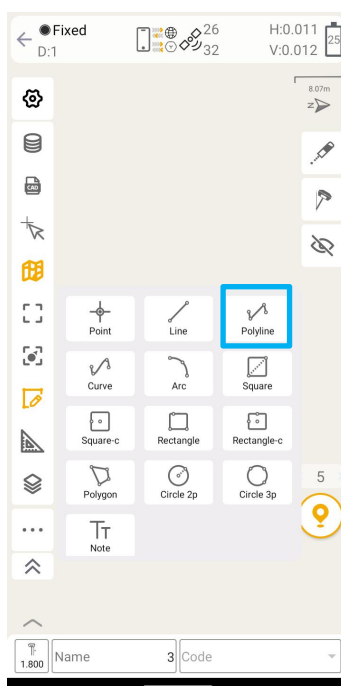
2) After completing the first point, you will be prompted to select the second point, which is the same as the first point. After completing the point selection, you will be prompted below to click Completed to save the line.



3) After clicking Completed, the line is successfully created.

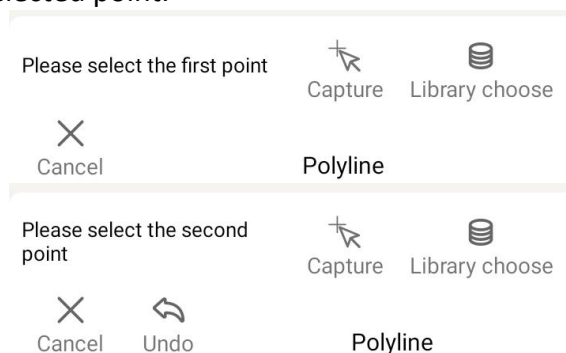
7.2.3 Polyline

You can select multiple points by clicking on the map, selecting points with the Capture tool, or selecting points from Element. They will be automatically connected into polyline in the order of selection.

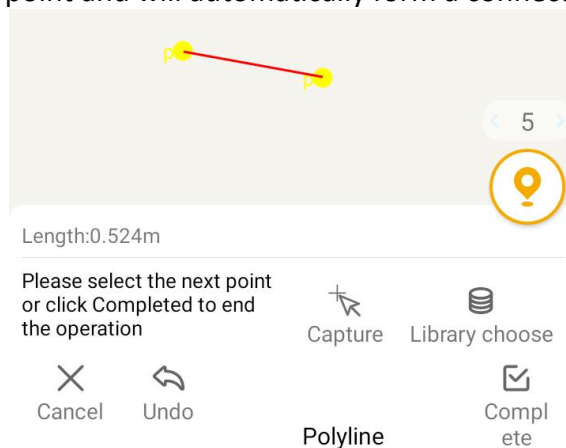


The drawing steps are as follows:

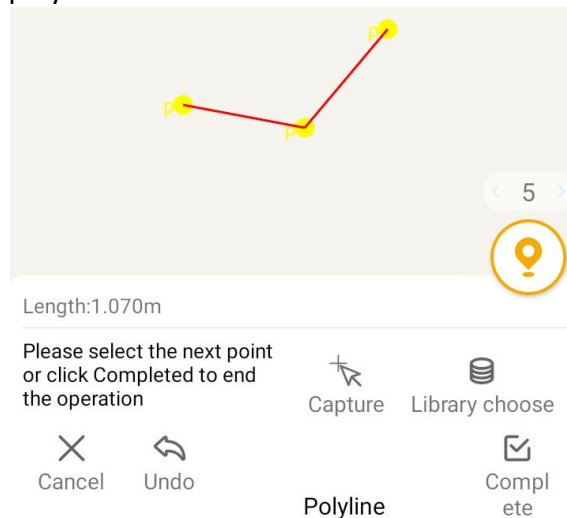
1) Select the first point by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel, which will exit the drawing mode. Clicking Undo will cancel the selected point.



2) After completing the first point, you will be prompted to select the second point, which is the same as the first point and will automatically form a connection with the first point.

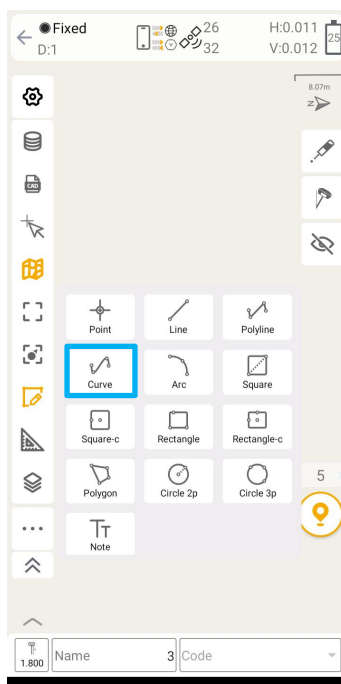


3) After completing the selection of the second point, you will be prompted below to select the next point or click Completed. You can continue to select points or click Completed to save the polyline.



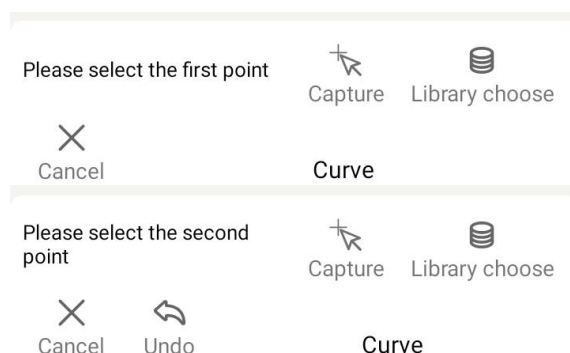
7.2.4 Curve

You can select multiple points by clicking on the map, selecting points with the Capture tool, or selecting points from Element. They will be automatically connected into curve in the order of selection.

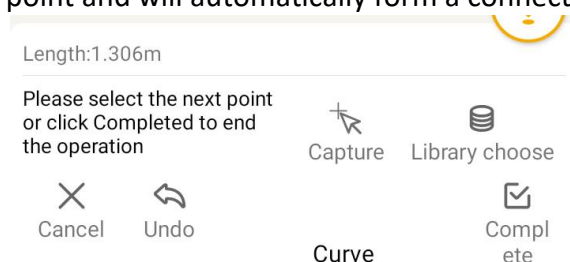


The drawing steps are as follows:

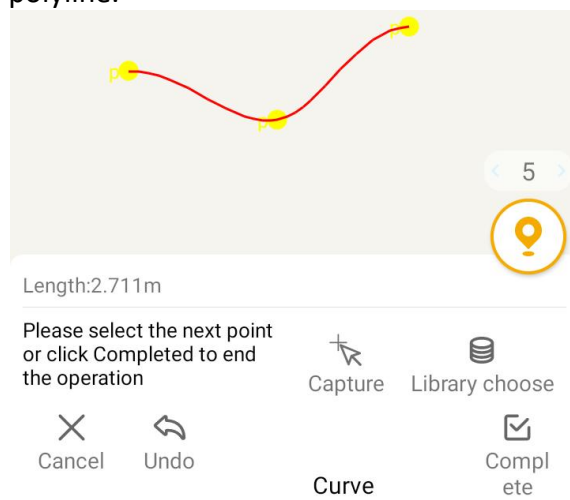
1) Select the first point by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel, which will exit the drawing mode. Clicking Undo will cancel the selected point.



2) After completing the first point, you will be prompted to select the second point, which is the same as the first point and will automatically form a connection with the first point.

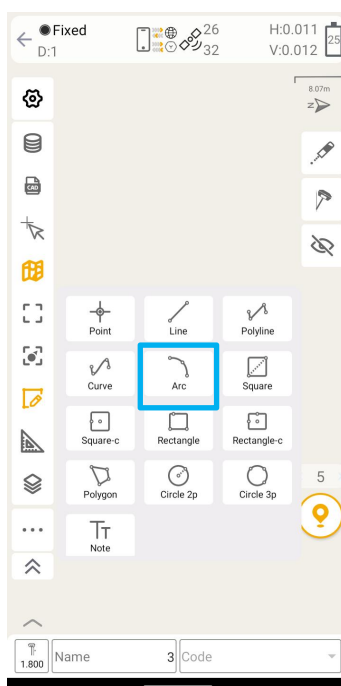


3) After completing the selection of the second point, you will be prompted below to select the next point or click Completed. You can continue to select points or click Completed to save the polyline.



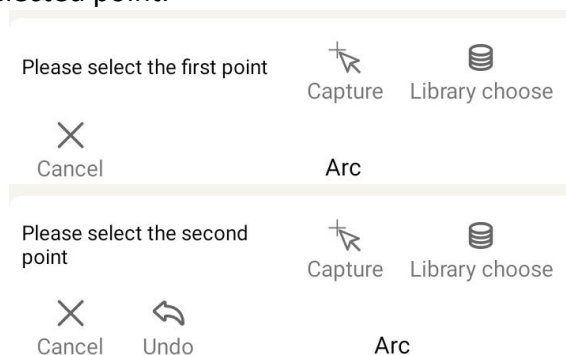
7.2.5 Arc

You can select multiple points by clicking on the map, selecting points with the Capture tool, or selecting points from Element. They will be automatically connected into Arc in the order of selection.

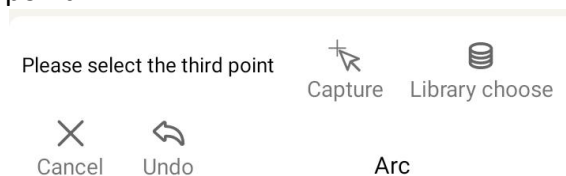


The drawing steps are as follows:

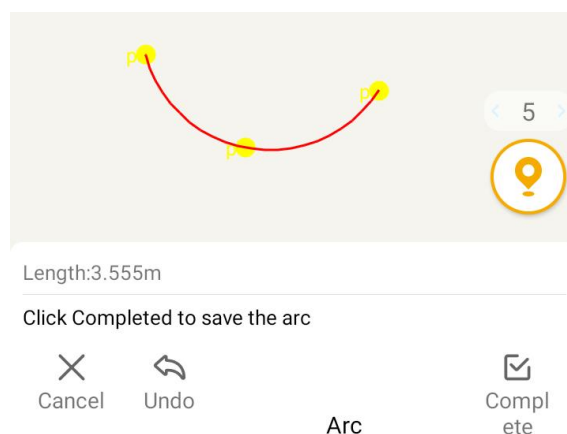
1) Select the first point by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel, which will exit the drawing mode. Clicking Undo will cancel the selected point.



2) After completing the first point, you will be prompted to select the second point, which is the same as the first point.

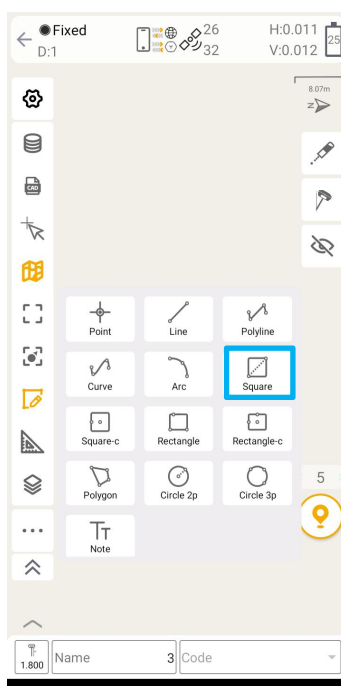


3) After completing the selection of the second point, you will be prompted below to select the third point. After selecting the point, connect it with the first two points to form an arc. Click Completed to complete the operation.



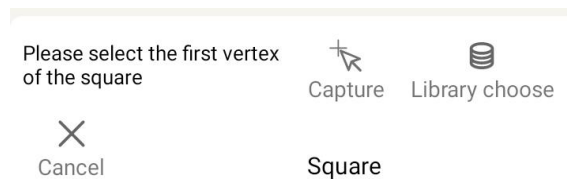
7.2.6 Square

You can select the first vertex and the second vertex of the square to complete the square by clicking on the map, selecting points with the Capture tool, or selecting points from Element.

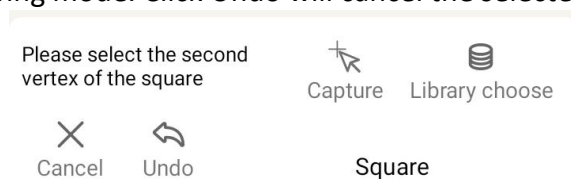


The drawing steps are as follows:

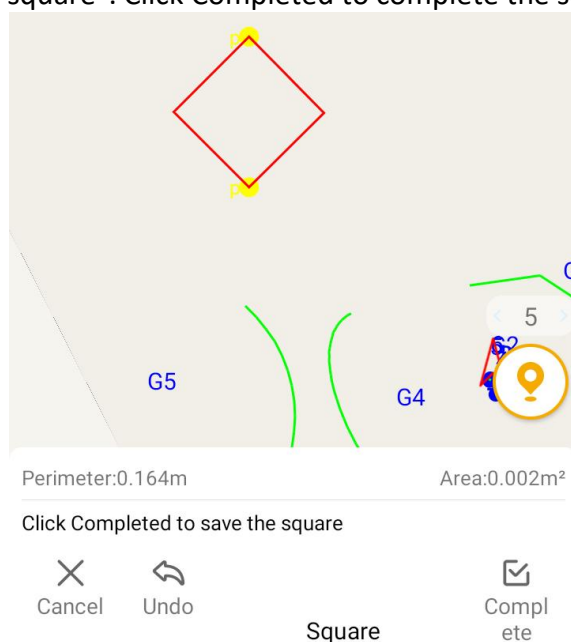
1) Select the first vertex of the square by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel to exit the drawing mode.



2) After completing the first point selection, select the second vertex by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel to exit the drawing mode. Click Undo will cancel the selected point.

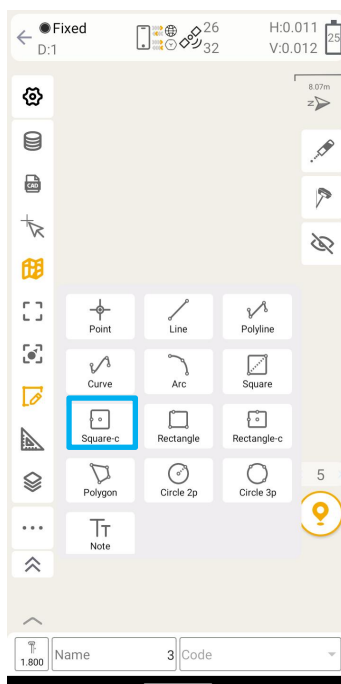


3) After completing the selection of the second vertex, the bottom prompts "Click Completed to save the square". Click Completed to complete the square drawing.



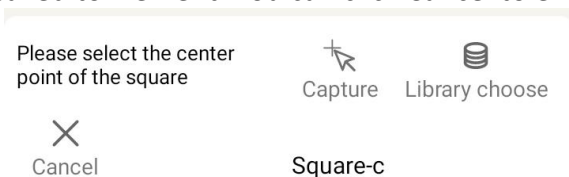
7.2.7 Square-c

You can select the center point and the border points to form a square by clicking on the map, selecting points with the Capture tool, or selecting points from Element.

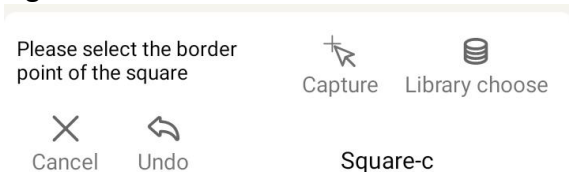


The drawing steps are as follows:

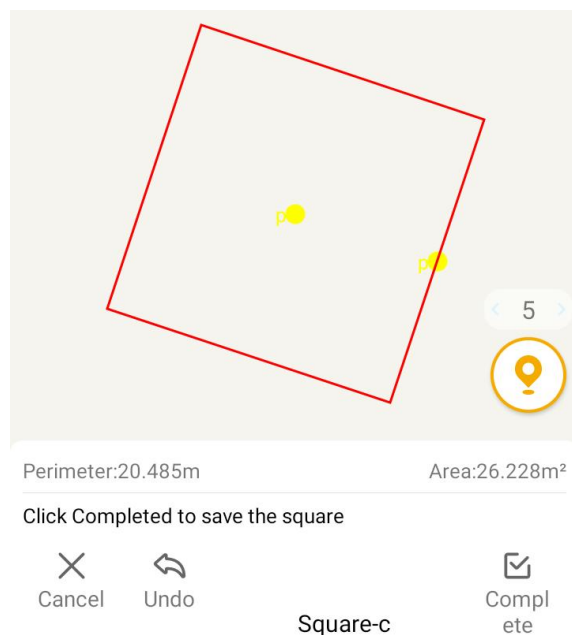
1) Select the center point of the square by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel to exit the drawing mode.



2) After completing the center point selection, select the square border point by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel to exit the drawing mode. Click Undo will cancel the selected point.

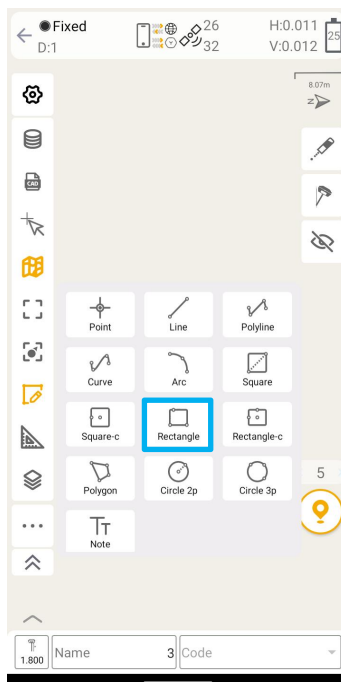


3) After completing the selection of the square border point, the bottom prompts "Click Completed to save the square". Click Completed to complete the square drawing.



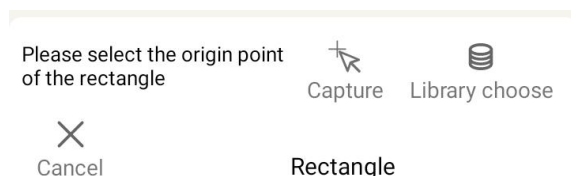
7.2.8 Rectangle

You can select the origin point of the rectangle, the width limit point and the height limit point to complete the rectangle by clicking on the map, selecting points with the Capture tool, or selecting points from Element.

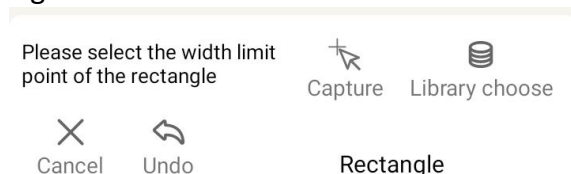


The drawing steps are as follows:

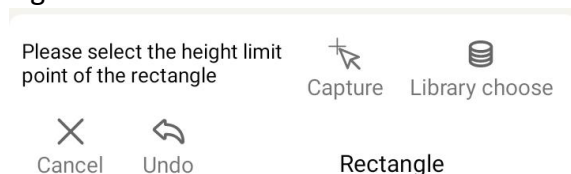
- 1) Select the origin point of the rectangle by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel to exit the drawing mode.



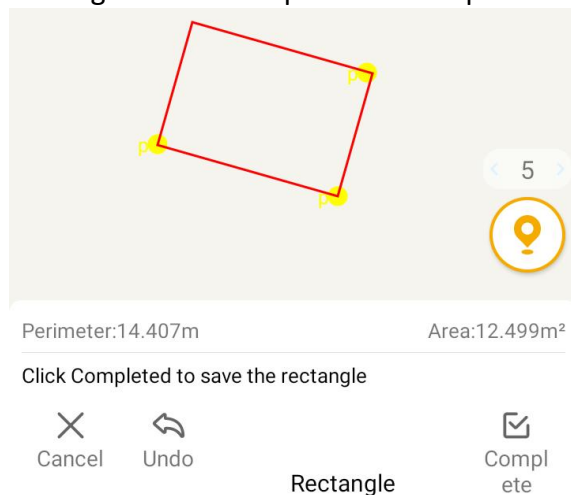
2) After completing the origin point selection, select the width limit point by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel to exit the drawing mode. Click Undo will cancel the selected point.



3) After completing the width limit point selection, select the height limit point by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel to exit the drawing mode. Click Undo will cancel the selected point.

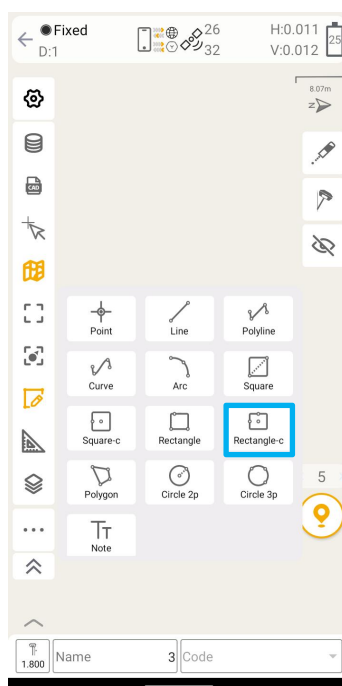


4) After completing the selection of the height limit point, the bottom prompts "Click Completed to save the rectangle". Click Completed to complete the rectangle drawing.



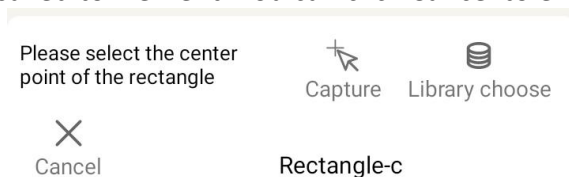
7.2.9 Rectangle-c

You can select the center point of the rectangle, the width limit point and the height limit point to complete the rectangle by clicking on the map, selecting points with the Capture tool, or selecting points from Element.

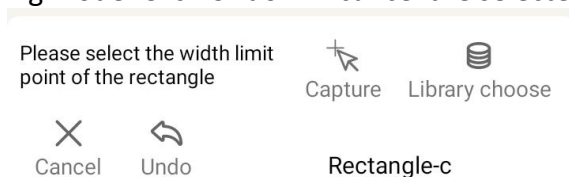


The drawing steps are as follows:

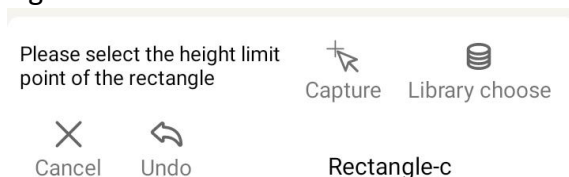
1) Select the center point of the rectangle by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel to exit the drawing mode.



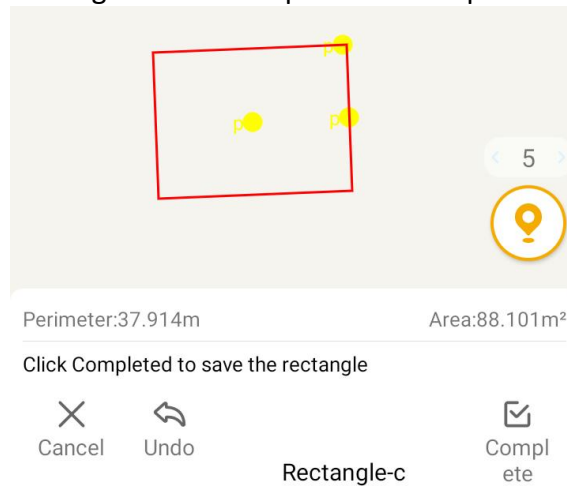
2) After completing the center point selection, select the width limit point by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel to exit the drawing mode. Click Undo will cancel the selected point.



3) After completing the width limit point selection, select the height limit point by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel to exit the drawing mode. Click Undo will cancel the selected point.

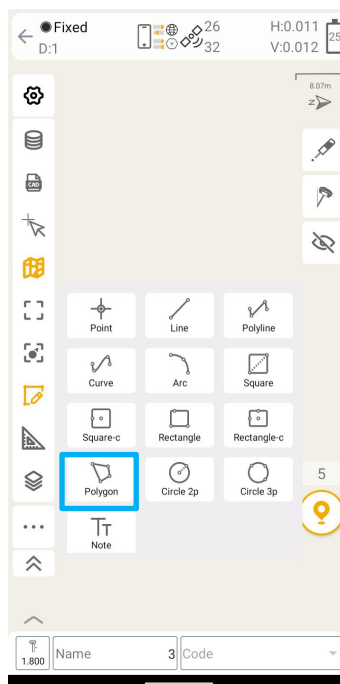


4) After completing the selection of the height limit point, the bottom prompts "Click Completed to save the rectangle". Click Completed to complete the rectangle drawing.



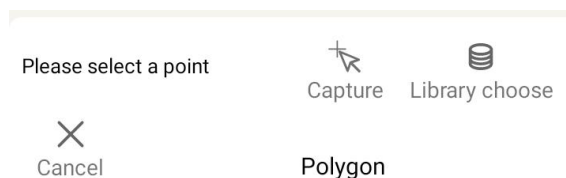
7.2.10 Polygon

You can select multiple points by clicking on the map, selecting points with the Capture tool, or selecting points from Element. They will be automatically connected into polygon in the order of selection.

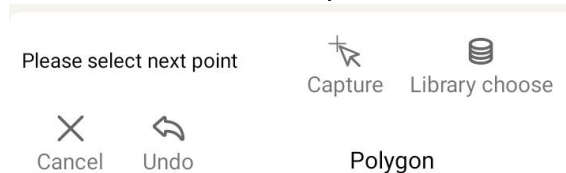


The drawing steps are as follows:

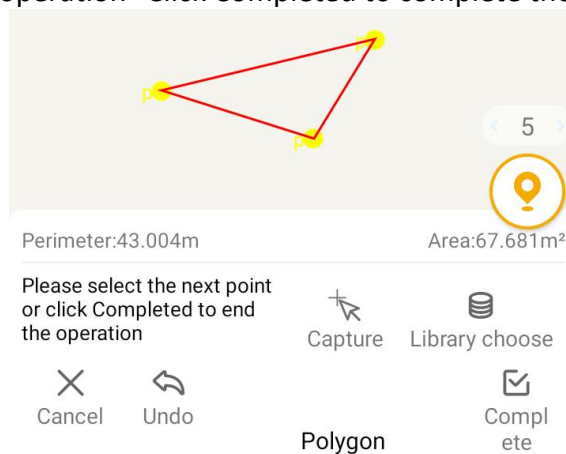
1) Select the first point by clicking on the map, selecting points with the Capture tool, or selecting points from Element. The selected point will be displayed in yellow and will not be saved to Element. You can click Cancel, which will exit the drawing mode. Clicking Undo will cancel the selected point.



2) After completing the first point, you will be prompted to select the next point, which is the same as the first point and will automatically form a connection with the first point.



3) Repeat the second step. The bottom prompts "Please select the next point or click Completed to end the operation" Click Completed to complete the drawing of the polygon.



7.2.11 Circle 2p

Draw a circle with the distance between two points as the radius by clicking on the map, selecting points with the Capture tool, or selecting points from Element.