SingularXYZ L1-Laser rover

L1-Laser IMU GNSS RTK Surveying Equipment User Manual

Brand: SingularXYZ | Model: L1-Laser rover

1. Introduction

The SingularXYZ L1-Laser IMU GNSS RTK Surveying Equipment is a professional-grade tool designed for high-precision positioning and measurement in various environments. It integrates advanced GNSS technology with a laser rangefinder and IMU tilt compensation, offering centimeter-level accuracy and enhanced efficiency for surveying tasks, even in challenging conditions.

Figure 1.1: The L1-Laser GNSS Receiver in a surveying scenario, highlighting its non-contact laser measurement capability.

2. Key Features

- **Professional-Grade RTK Precision:** 1408-channel dual-frequency L1/L2 GNSS receiver with 5-second initialization and centimeter-level accuracy. Supports full constellations (GPS, Galileo, GLONASS, BDS,

QZSS, SBAS) with anti-multipath technology.

- **Hybrid Surveying System:** Integrated laser rangefinder for non-contact measurement up to 10m, combined with RTK positioning for inaccessible points.
- **Advanced Tilt Compensation:** Professional-grade MEMS IMU provides ±60° dynamic tilt operation with auto-calibration, delivering 2cm RTK accuracy for pole-free topographic surveys.
- **Long-Range UHF Connectivity:** Built-in 2W UHF transceiver supports 15km radio range between rover and base with RTCM v3/CMR correction. Compatible with third-party base stations.
- **Field-Optimized Connectivity:** 8GB onboard storage, NFC (Touch connection), Bluetooth, USB Type-C, WiFi, TNC Connector, RS232 Serial Port. Web UI for remote configuration and data download. Supports NTRIP/CORS via SingularPad software.
- **Military-Grade Field Reliability:** IP67-rated magnesium alloy housing withstands -40°C to 65°C operation with water/dust resistance and drop protection.

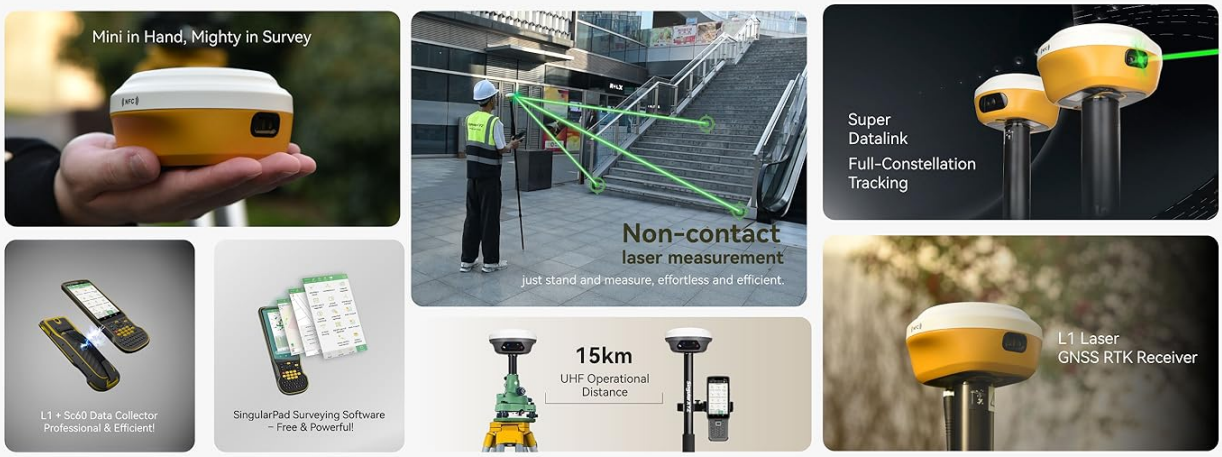


Figure 2.1: Overview of the L1-Laser's key features and capabilities.

3. What's in the Box

The L1-Laser IMU GNSS RTK Surveying Equipment package includes the following components:

- L1 GNSS Receiver
- Transport Case (x1)
- USB-Type C Cable (x2)
- Super Charger (x2)
- Whip Antenna (x1)
- GNSS Adapter (x1)
- SC60 Data Collector (x1)
- Bracket (x1)
- SingularPad Software (x1)
- Quick Start Guide (x1)
- Quick Start Card (x1)

Figure 3.1: All components included in the L1-Laser product package.

4. Setup

4.1 Initial Setup

Before operating the L1-Laser system, ensure all components are present and charged. Connect the SC60 Data Collector to the L1 GNSS Receiver using the provided bracket and cables. Ensure the whip antenna is securely attached to the L1 receiver for optimal signal reception.

Figure 4.1: Proper assembly of the L1 GNSS Receiver and SC60 Data Collector for field use.

4.2 Flexible Work Modes

The L1-Laser supports various work modes to suit different surveying needs:

- **Static Measurement:** Record static data using the 8GB onboard storage. Data can be downloaded via the Web UI.
- **Internal Radio Base & Rover:** Achieve up to 15km range with the built-in UHF radio for real-time kinematic (RTK) corrections.
- **Ntrip Mode:** Connect through Bluetooth to easily access local CORS (Continuously Operating Reference Station) via PDAs.

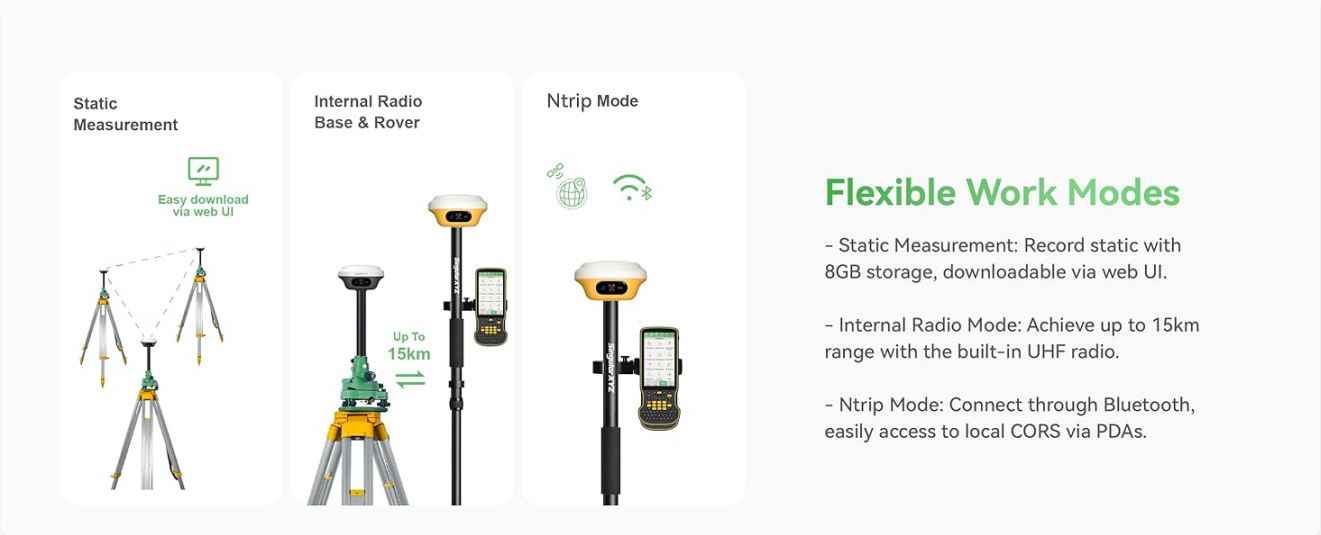


Figure 4.2: Visual representation of the three primary work modes.

4.3 Working with CORS/RTK Correction Service

To use the CORS/RTK Correction Service, follow these steps:

1. Purchase a CORS/RTK Correction Service account in your local area.
2. Ensure your PDA device (phone/tablet/data collector) can access the network and supports Bluetooth connection.
3. Place your L1 GNSS receiver in an open view of the sky.
4. Open SingularPad software.
5. Click "Communication" and connect to your L1 receiver's SN via Bluetooth.
6. Click "Rover" and then "Set Data Link" as Phone Internet. Go to "Connect Mode" and fill in your CORS/RTK Correction Service account details.
7. Click "Get" to obtain the Mount-Point list and select the appropriate one. Click Start and Apply.

Note: Find the appropriate mount point via the website of your local CORS/RTK Correction Service provider. Ensure the baseline is within 50km.

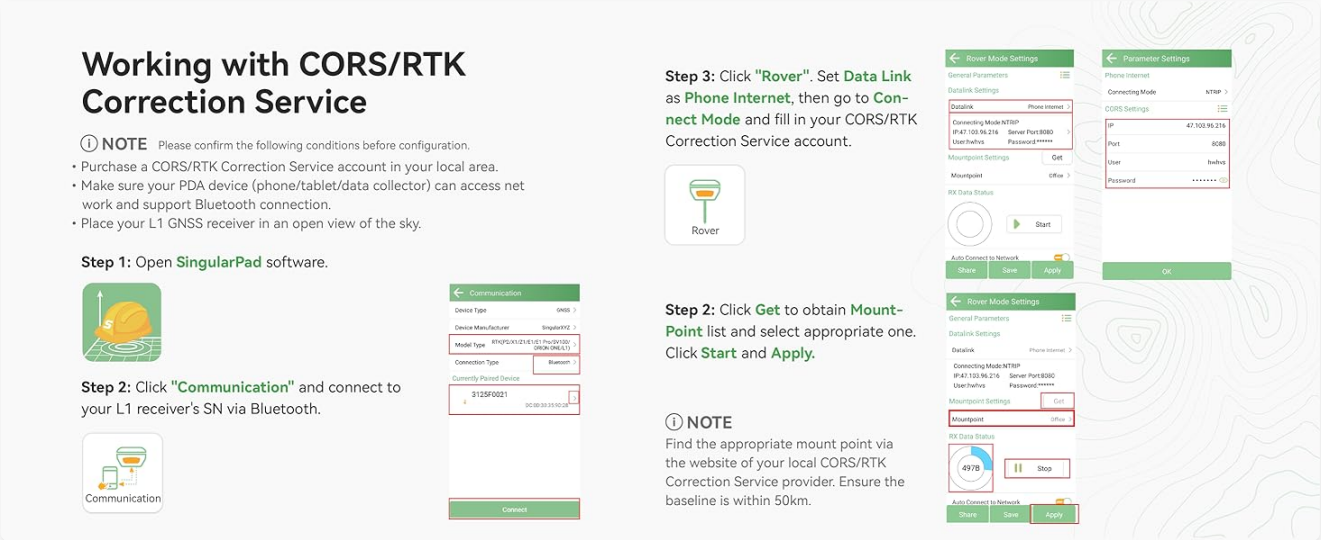


Figure 4.3: Step-by-step guide for CORS/RTK Correction Service setup.

4.4 Working with L1 Rover + Base

For a Rover + Base setup, you will need two L1 GNSS receivers. Designate one as the base and the other as the rover.

1. Connect the L1 base to your PDA. Go to Device > Base.
2. For Base Startup Mode, you can input known point coordinates to set up, or select Single Point mode for automatic setup.
3. Set Datalink as Internal Radio and customize radio channels, frequency, and protocol according to your needs.
4. Save settings and Start Base. The status bar will become Base.
5. Disconnect L1 base and connect to the rover in the software.
6. Go to Device > Rover, set Data Link as Internal Radio.
7. Match and set the same protocol and frequency as the base setting.
8. Click Collection to save settings and click Apply.

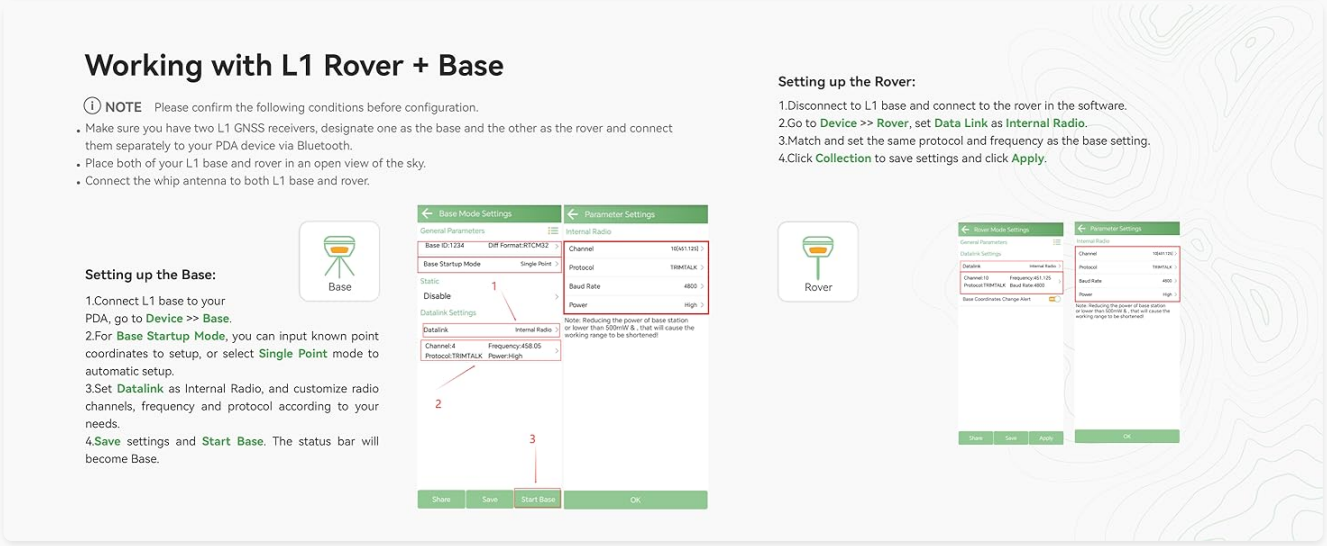


Figure 4.4: Configuration steps for L1 Rover + Base setup.

5. Operating Instructions

5.1 RTK Precision and IMU Tilt Compensation

The L1-Laser provides robust RTK positioning. Its integrated IMU allows for tilt compensation up to ±60°, enabling accurate measurements without needing to perfectly level the pole. This significantly increases survey efficiency, especially in challenging terrains or when measuring inaccessible points.

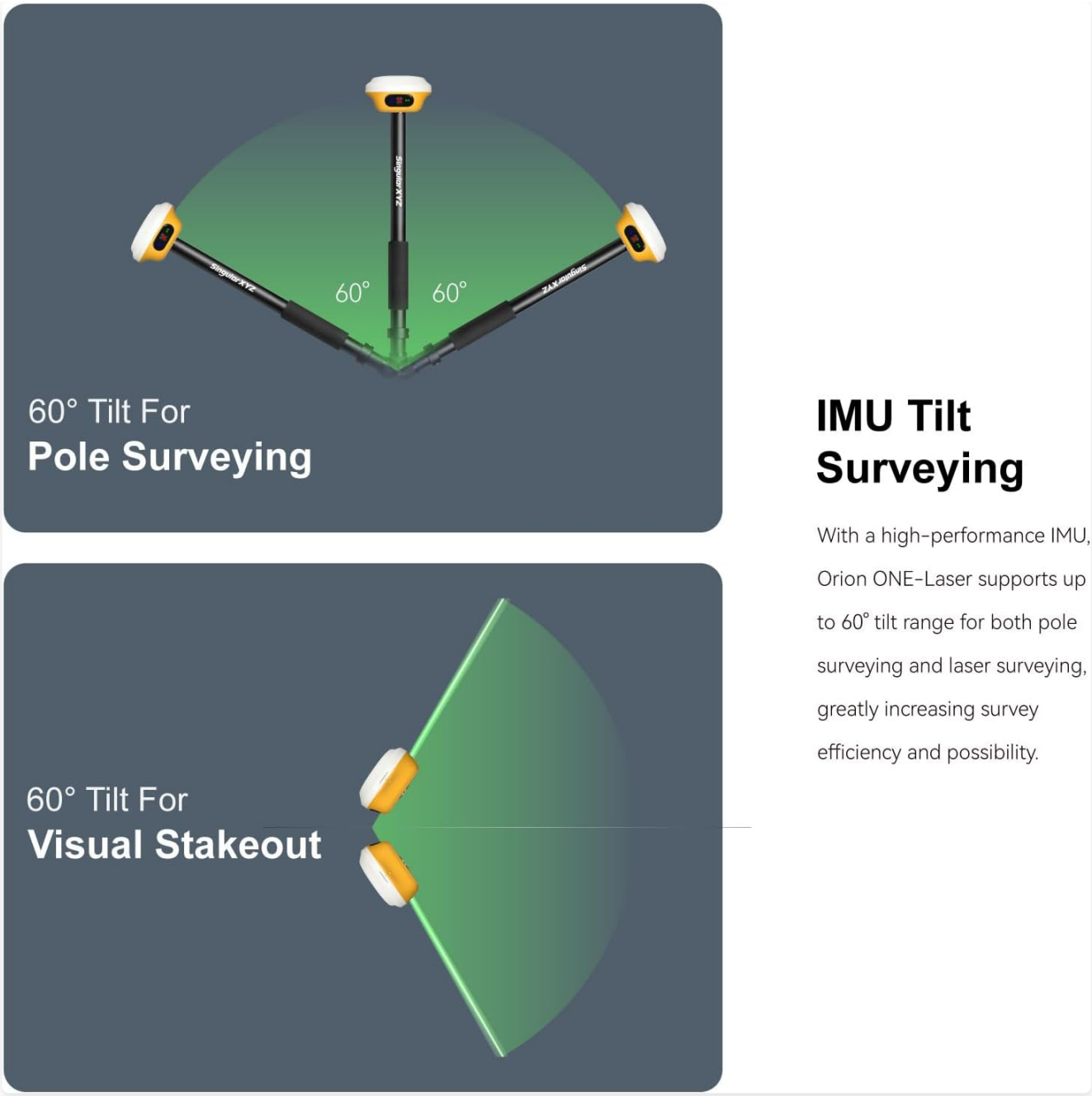


Figure 5.1: Illustration of 60° tilt compensation for pole surveying and visual stakeout.

5.2 Laser Measurement

The integrated laser rangefinder allows for non-contact measurements up to 10 meters. This feature is particularly useful for surveying points that are difficult or hazardous to access, such as power lines, bridge abutments, or points across obstacles. Simply aim the laser at the target point, and the system will combine the laser measurement with RTK positioning for precise coordinates.

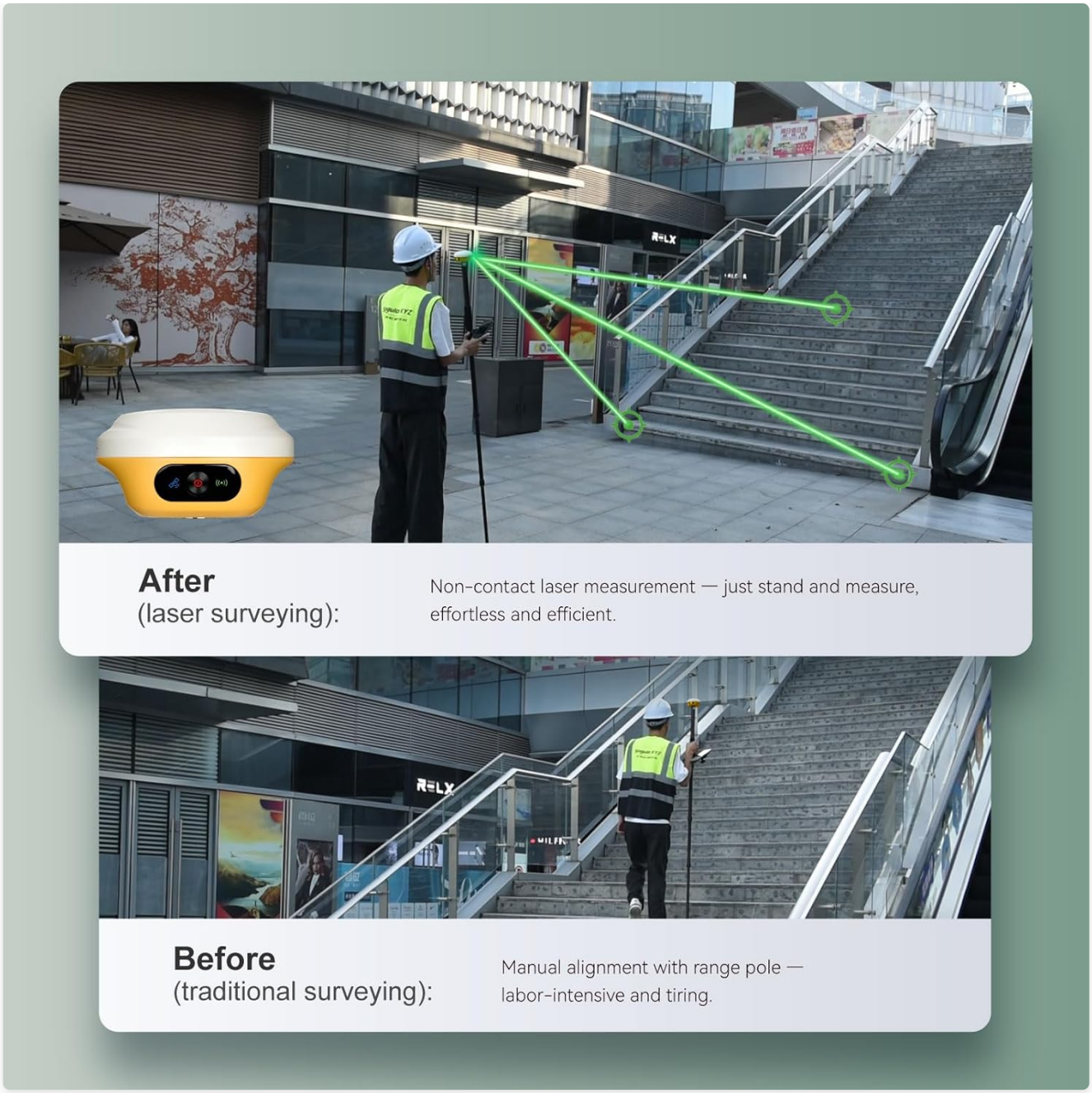


Figure 5.2: Comparison of traditional surveying vs. laser surveying for efficiency.

Figure 5.3: Examples of effortless laser surveying in different scenarios.

5.3 Data Collection and Management

The SC60 Data Collector, running SingularPad software, provides a robust interface for data collection. It features a full physical keyboard and a 5.5" 1080P display for efficient data input and viewing. Data can be stored on the L1-Laser's 8GB internal storage and easily downloaded via its Web UI by connecting to the device's Wi-Fi.

Figure 5.4: The SC60 Data Collector, optimized for field data entry.

Figure 5.5: Data download via Web UI and extended battery life.

5.4 Viewing RTK Positioning Status

After completing your L1 RTK setup, check the current RTK solution status in the top left corner of the SingularPad software:

- **FIXED:** L1 is receiving RTK corrections stably and obtaining a Fixed RTK solution with centimeter-level accuracy.
- **FLOAT:** L1 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.
- **AUTONOMOUS:** Single-point satellite positioning without receiving RTK correction data. The accuracy is around meter-level.

Tip: Before surveying, make sure L1 has a clear sky view, free from obstacles like buildings, trees, cars, and more.

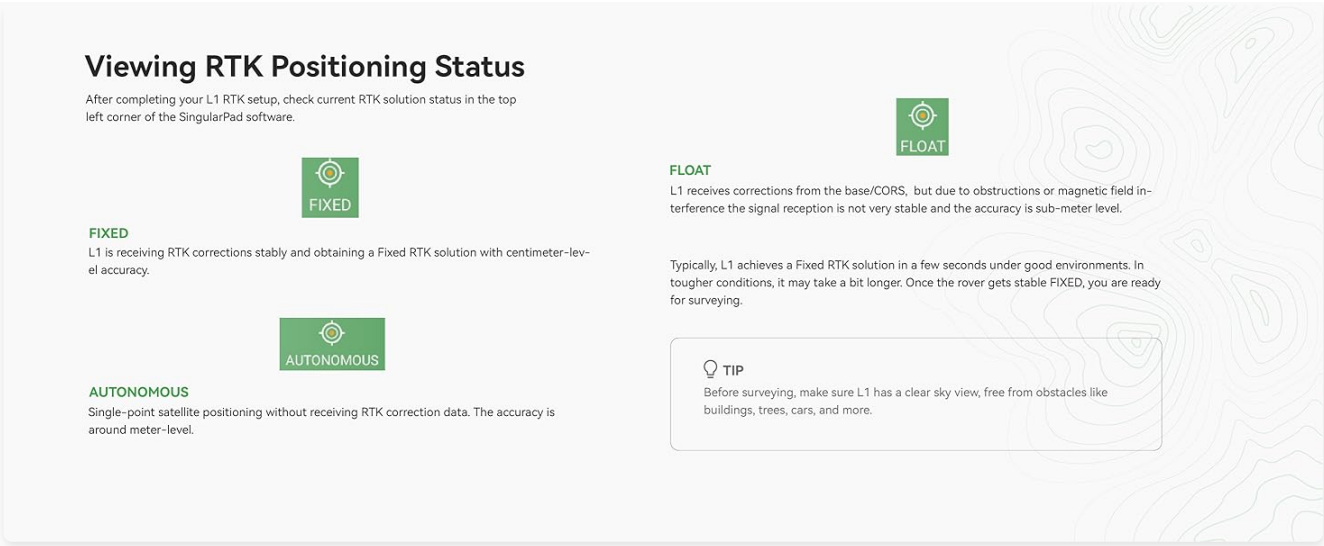


Figure 5.6: Understanding RTK positioning status indicators.

6. Maintenance

Proper maintenance ensures the longevity and optimal performance of your L1-Laser equipment:

- **Cleaning:** Regularly wipe down the device with a soft, damp cloth. Avoid abrasive cleaners or solvents. Ensure the laser aperture and GNSS antenna are free from dirt and debris.
- **Storage:** Store the equipment in its transport case in a cool, dry place when not in use. Avoid extreme temperatures and direct sunlight.
- **Battery Care:** Charge the batteries regularly, even if the device is not in frequent use, to maintain battery health. Avoid fully discharging the batteries for extended periods.
- **Firmware Updates:** Periodically check the SingularXYZ website for firmware updates for both the L1 receiver and the SC60 Data Collector. Keeping the firmware updated ensures access to the latest features and performance improvements.
- **Physical Inspection:** Before each use, inspect cables, connectors, and the housing for any signs of wear or damage.

7. Troubleshooting

If you encounter issues with your L1-Laser equipment, consider the following common troubleshooting steps:

- **No Power:** Ensure batteries are fully charged. Check all cable connections. Try a different charger or USB-C cable.
- **No GNSS Signal:** Ensure the device has a clear view of the sky, free from obstructions like tall buildings or dense foliage. Check antenna connection.
- **RTK Not Fixing (FLOAT/AUTONOMOUS):** Verify base station or CORS connection. Ensure correction data is being received. Check radio/Ntrip settings for correct frequency/mount point. Ensure the baseline distance is within recommended limits.
- **Bluetooth/Wi-Fi Connectivity Issues:** Restart both the L1 receiver and the data collector. Ensure Bluetooth/Wi-Fi is enabled on both devices. Forget and re-pair Bluetooth connections if necessary.
- **Software Malfunction:** Restart the SingularPad software. If the issue persists, restart the SC60 Data Collector. Ensure the software is updated to the latest version.
- **Inaccurate Laser Measurement:** Ensure the laser aperture is clean. Verify the target surface is suitable for

laser reflection.

If these steps do not resolve the issue, please refer to the support section for further assistance.

8. Specifications

Feature	Specification
Item Weight	1.2 pounds
Product Dimensions	4.21 x 4.21 x 2.31 inches
Item Model Number	L1-Laser rover
Batteries	3 9V batteries required (included)
Display Size	1 Inches
Battery Life	12 Hours
Voice Command	Buttons, Keyboard, OCR, Touchscreen
Special Feature	Bluetooth, Touchscreen, Waterproof
Connectivity Technology	Bluetooth, Ethernet, USB, Wi-Fi
Map Type	Worldwide
Audio Output Mode	Digital

9. Warranty and Support

9.1 Warranty Information

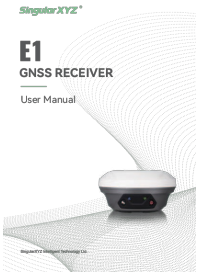
The L1-Laser IMU GNSS RTK Surveying Equipment comes with a**1-year manufacturer's warranty**. Please retain your proof of purchase for warranty claims.

9.2 Technical Support

SingularXYZ is committed to providing reliable support for its products. If you require technical assistance or have questions regarding the equipment's operation, please:

- Refer to the manual included in the package.
- Email the SingularXYZ technical support team for assistance.
- Visit the official SingularXYZ website to get in touch with support.
- Video conference guidance for RTK GNSS survey equipment is also available to assist you.

Related Documents - L1-Laser rover

	SingularXYZ L1 Laser GNSS Receiver Quick Start Guide Comprehensive quick start guide for the SingularXYZ L1 Laser GNSS Receiver, detailing package contents, product features, software integration, RTK and static surveying methods, and warranty information for surveyors.
	SingularXYZ E1-Series GNSS Receiver: Quick Start Guide A concise guide to setting up and using the SingularXYZ E1-Series GNSS Receiver, covering package contents, product features, workflow, and warranty information for high-precision surveying tasks.
	SingularXYZ E1 GNSS Receiver User Manual Comprehensive user manual for the SingularXYZ E1 GNSS Receiver, detailing setup, RTK and static survey workflows, data collection, calibration, and export features for professional surveying applications.
	SingularXYZ Sfaira ONE GNSS Receiver User Manual This user manual provides comprehensive instructions for the SingularXYZ Sfaira ONE GNSS Receiver. It covers setup, connection via SingularPad and SingularSurv, surveying techniques, stake-out procedures, and integration with GIS software like Qfield. Learn to maximize the performance of your GNSS RTK rover.
	SingularXYZ X1 Lite GNSS Receiver: Professional Surveying Equipment Detailed datasheet for the SingularXYZ X1 Lite GNSS Receiver, a cost-effective, high-performance device for professional surveying. Features include multi-constellation support (GPS, BDS, GLONASS, Galileo, QZSS, NavIC, SBAS), advanced RTK capabilities, 60° IMU tilt, IP68 rating, and long battery life, designed for reliability in complex environments.
	SingularXYZ P2 GNSS Receiver User Manual Comprehensive user manual for the SingularXYZ P2 GNSS Receiver, detailing specifications, features, environmental requirements, operation, and contact information.