LILYGO T-Echo Meshtastic 915MHz LoRa Wireless GPS RTC NFC TTGO Development Board with BME280 Pressure Sensor

LILYGO T-Echo Meshtastic Development Board

User Manual

Model: T-Echo Meshtastic 915MHz LoRa Wireless GPS RTC NFC TTGO Development Board with BME280 Pressure Sensor

1. Product Overview

The LILYGO T-Echo is a versatile development board designed for wireless communication and data acquisition, primarily supporting Meshtastic firmware. It integrates a 915MHz LoRa module for long-range communication, GPS for positioning, RTC (Real-Time Clock), and NFC capabilities. This specific kit includes a BME280 sensor, providing environmental data such as temperature and pressure.



Figure 1.1: LILYGO T-Echo Meshtastic Development Board with antenna.

Key features include:

- Adaptability to Meshtastic firmware for mesh networking.
- Integrated BME280 temperature and pressure sensor for environmental monitoring.
- NRF52840 Advanced Bluetooth 5 multi-protocol SoC, supporting Thread and Zigbee.
- LoRa SX1262 Transceiver for long-range, low-power wireless communication.
- 1.54-inch E-Paper Display for low-power information display.
- L76K Multi-System Positioning GNSS module (GPS, GLONASS, BeiDou, QZSS).

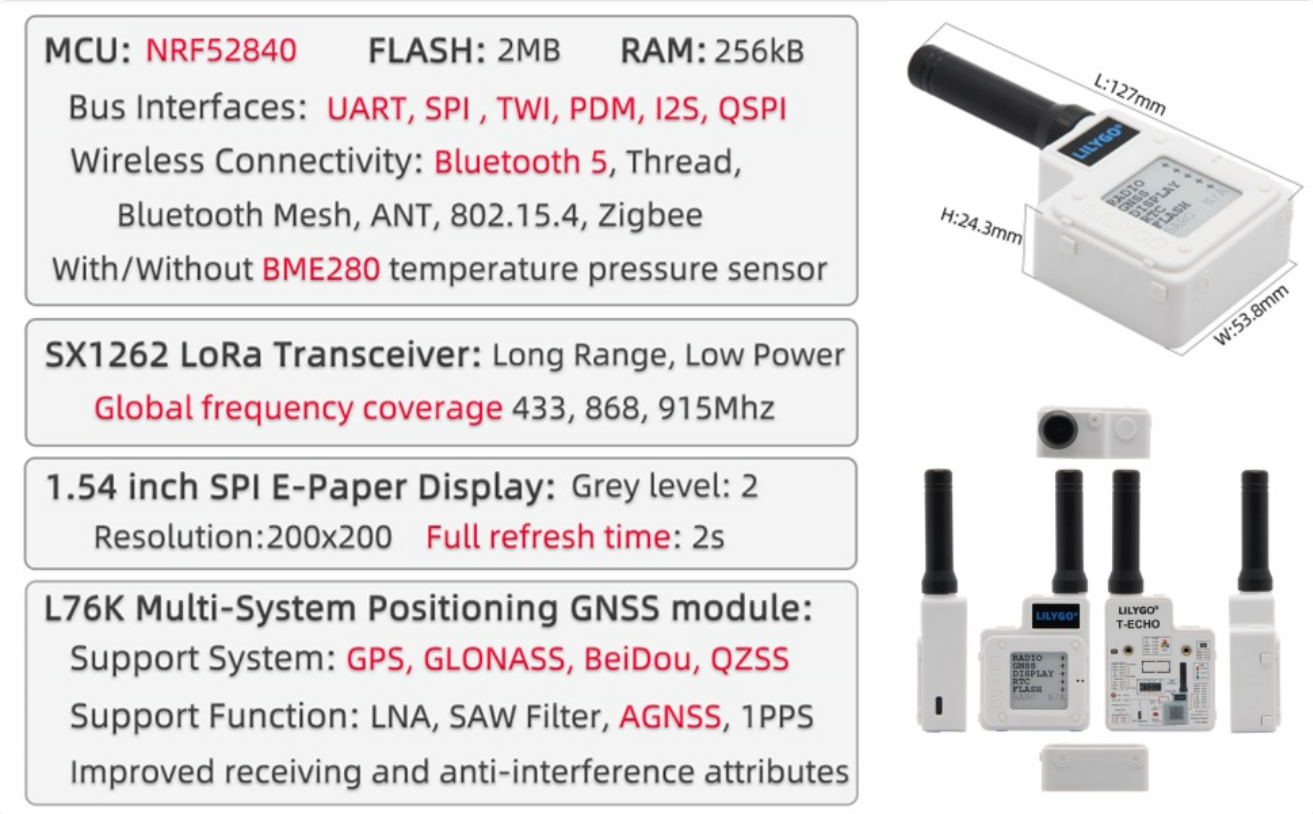


Figure 1.2: Overview of LILYGO T-Echo technical specifications including MCU, LoRa, Display, and GNSS details.

2. Setup Guide

Follow these steps to set up your LILYGO T-Echo development board:

1. **Unboxing:** Carefully remove the T-Echo device and any included accessories, such as the USB-C cable, from the packaging.
2. **Antenna Attachment:** Screw the provided antenna onto the SMA connector on the top of the T-Echo device. Ensure it is securely fastened but do not overtighten.
3. **Power Connection:** Connect the USB-C cable to the USB-C port on the side of the T-Echo. Connect the other end of the cable to a 5V USB power source (e.g., computer USB port, USB wall adapter). The device will power on automatically.
4. **Initial Boot:** The e-paper display will show initial boot information. If using Meshtastic firmware, it will display network status or a warning if no aircraft data is available.



Figure 2.1: LILYGO T-Echo device shown with its accompanying USB-C charging cable.



Figure 2.2: The LILYGO T-Echo kit, including the BME280 sensor chip.

3. Operating Instructions

The LILYGO T-Echo features two primary buttons and LED indicators for operation:

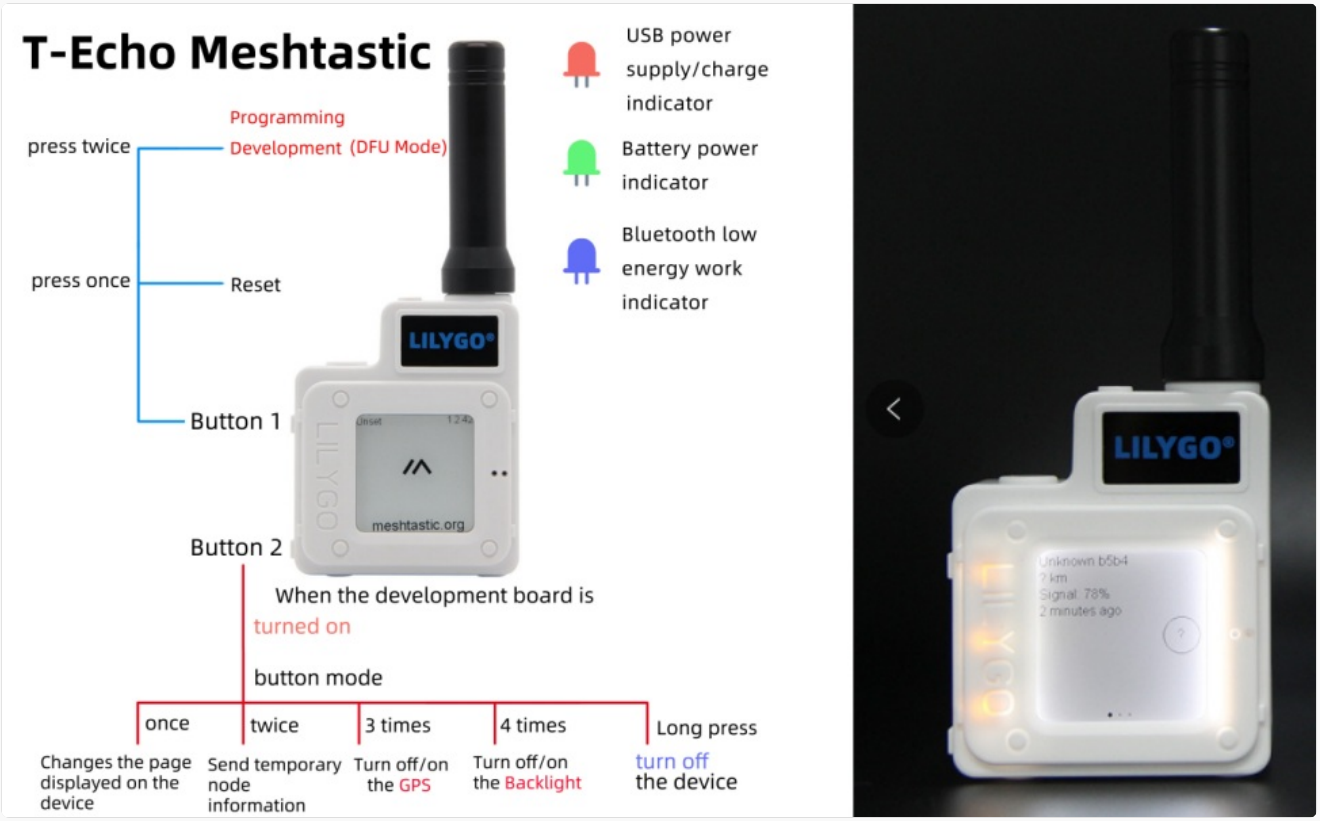


Figure 3.1: Diagram illustrating button functions and LED indicators on the LILYGO T-Echo.

3.1. Button Functions

- **Button 1:**
  - Press once: Resets the device.
  - Press twice: Enters Programming (DFU) Mode for firmware updates.
- **Button 2 (when device is turned on):**
  - Press once: Changes the page displayed on the device's e-paper screen.
  - Press twice: Sends temporary node information.
  - Press 3 times: Turns GPS on/off.
  - Press 4 times: Turns the backlight on/off.
  - Long press: Turns off the device.

3.2. LED Indicators

- **Red LED:** USB power supply/charge indicator.
- **Green LED:** Battery power indicator.
- **Blue LED:** Bluetooth low energy work indicator.

3.3. Connecting to a Mobile Device

The T-Echo can connect to a mobile application (e.g., Meshtastic app) via Bluetooth for configuration and message exchange.



Figure 3.2: LILYGO T-Echo communicating wirelessly with a smartphone running a Meshtastic application.

3.4. Application Scenarios

The LILYGO T-Echo is suitable for various applications, including:

- DIY creation and prototyping.
- LoRa networking and communication.
- GPS positioning and tracking.
- IoT terminal control.
- STEM education projects.

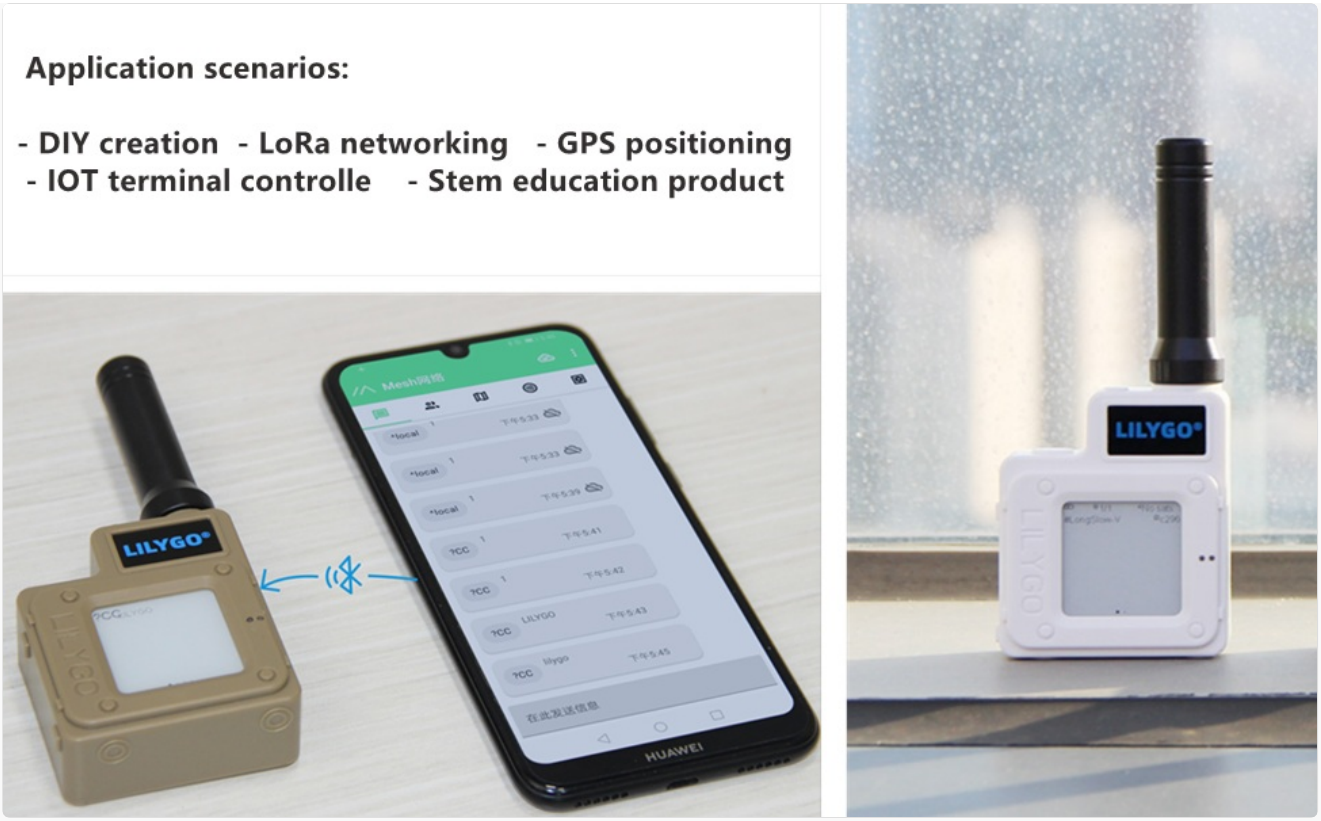


Figure 3.3: Visual representation of various application scenarios for the LILYGO T-Echo.

4. Maintenance

To ensure the longevity and optimal performance of your LILYGO T-Echo, consider the following maintenance guidelines:

- **Cleaning:** Use a soft, dry cloth to clean the device. Avoid using liquid cleaners or abrasive materials.
- **Storage:** Store the device in a cool, dry place away from direct sunlight and extreme temperatures.
- **Battery Care:** Recharge the device regularly using the provided USB-C cable. Avoid fully discharging the battery frequently to prolong its lifespan.
- **Firmware Updates:** Periodically check for firmware updates from the official LILYGO GitHub repository (github.com/Xinyuan-LilyGO/LilyGO-T-Echo). Updating firmware can provide new features, bug fixes, and performance improvements.

5. Troubleshooting

If you encounter issues with your LILYGO T-Echo, consider the following common troubleshooting steps:

- **Device Not Powering On:** Ensure the USB-C cable is securely connected to both the device and a working power source. Check the power source for functionality.
- **No Display Output:** Verify the device is powered on. If the backlight is off, press Button 2 four times to toggle it. The e-paper display has a low refresh rate, so changes may not be instantaneous.
- **Bluetooth Connectivity Issues:** Ensure Bluetooth is enabled on your mobile device. Restart both the T-Echo and your mobile device. Confirm the Bluetooth low energy work indicator (blue LED) is active.
- **LoRa Communication Problems:** Check that the antenna is properly attached. Ensure both devices are within range and configured to the same frequency (915MHz for this model).
- **GPS Not Acquiring Signal:** Ensure the device has a clear view of the sky. GPS signal acquisition can take several minutes, especially during the first use or after a long period of inactivity.

For further assistance or specific technical inquiries, please refer to the official GitHub repository or contact LILYGO support directly. The GitHub page provides detailed pin maps and development resources.



Figure 5.1: Detailed pin map for the LILYGO T-Echo nRF52840 board, useful for advanced troubleshooting and development.

6. Specifications

Component	Detail
MCU	NRF52840
Flash Memory	2MB
RAM	256KB
Bus Interfaces	UART, SPI, TWI, PDM, I2S, QSPI
Wireless Connectivity	Bluetooth 5, Thread, Bluetooth Mesh, ANT, 802.15.4, Zigbee
LoRa Transceiver	SX1262 (Long Range, Low Power)
LoRa Frequency Coverage	433, 868, 915MHz
Display	1.54 inch SPI E-Paper Display (Grey level: 2, Resolution: 200x200, Full refresh time: 2s)
GNSS Module	L76K Multi-System Positioning (GPS, GLONASS, BeiDou, QZSS)
Sensor	BME280 Temperature and Pressure Sensor (included in this kit)
Dimensions (approx.)	L: 127mm, W: 53.8mm, H: 24.3mm
First Available Date	December 11, 2024

7. Warranty and Support

For warranty information, please refer to the purchase documentation or contact the seller directly. LILYGO provides support and resources through their official channels.

Manufacturer: LILYGO

Official GitHub Repository: For technical documentation, firmware, and community support, visit github.com/Xinyuan-LilyGO/LilyGO-T-Echo.

If you have any questions or suggestions about the product, please feel free to contact the seller or LILYGO. They will endeavor to answer your questions as soon as possible.

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