Accessories and Peripherals

Displays for LoRa Nodes

Adding a display to a LoRa node provides visual feedback on mesh status, incoming messages, and GPS coordinates - without requiring a phone connection. Different display types make different tradeoffs between power consumption, visibility, and cost.

Built-in Display Options

Many popular LoRa boards ship with or can be fitted with a display:

Board	Display Type	Size	Power Draw	Sunlight Readable
Heltec WiFi LoRa 32 V3	OLED (SSD1306)	0.96" 128x64	+15-20 mA when on	Poor
T-Beam (all versions)	OLED (SSD1306)	0.96" 128x64	+15-20 mA when on	Poor
T-Echo	E-Ink (1.54")	1.54" 200x200	~0 mA when static	Excellent
RAK WisBlock + RAK14000	E-Ink (2.13")	2.13" 250x122	~0 mA when static	Excellent

OLED Displays

SSD1306-based 0.96" OLED displays are inexpensive and common. They connect via I2C (SDA/SCL pins) and are natively supported by Meshtastic and MeshCore firmware.

- **Advantages** - High contrast, works in complete darkness, fast refresh
- **Disadvantages** - Poor in direct sunlight, draws 15-20 mA continuously when on (significant for battery nodes), limited lifespan (~10,000 hours of use before degradation)
- **Power tip** - Set screen timeout to 30-60 seconds (`meshtastic --set display.screen_on_secs 30`) to minimize power draw. Set to 0 to disable the screen completely on solar/battery nodes.
- **Adding to a bare board** - Many ESP32 boards have I2C headers that accept standard 0.96" OLED modules. Connect VCC, GND, SDA (GPIO 21), SCL (GPIO 22) on most ESP32 boards. Check your board's pinout.

E-Ink Displays

Electronic ink displays consume power only when the display content changes. Once updated, the image is held with zero power consumption - ideal for battery-operated nodes.

- **Advantages** - Zero standby power, excellent sunlight readability, long battery life, full image visible even when battery is critically low
- **Disadvantages** - Slow refresh (1-2 seconds), ghosting artifacts after many refreshes, limited to black/white (no grayscale on basic modules), higher cost than OLED
- **Best use cases** - Handheld nodes where you need to read position and messages in direct sunlight; any node where battery life is the priority

TFT Color Displays

Color TFT displays (ST7789, ILI9341) provide higher resolution and color, but draw significantly more power (30-80 mA). Generally not recommended for battery-powered LoRa nodes but suitable for always-powered room server displays or status panels. Some T-Deck devices (a complete LoRa device with keyboard and color display) use TFT displays.

Adding an External Display to an Existing Node

Most ESP32 and nRF52840 LoRa boards support adding an external I2C OLED. Steps:

1. Identify I2C pins on your board (SDA, SCL, 3.3V, GND) from the board's pinout documentation
2. Connect a 0.96" SSD1306 OLED module: VCC to 3.3V, GND to GND, SDA to SDA, SCL to SCL
3. In Meshtastic: Config → Display → enable Display → save
4. The display should activate after reboot

GPS Modules for LoRa Nodes

GPS provides automatic position reporting for mesh mapping and navigation. Many boards include an integrated GPS; for those that don't, external GPS modules can be added via UART or I2C.

Integrated GPS vs External Module

Approach	Boards	Pros	Cons
Integrated GPS	T-Beam, T-Echo, some RAK boards	All-in-one, no wiring	Higher cost, harder to disable to save power
External UART GPS	Any board with UART pins	Flexible, replaceable, can be positioned for best sky view	Wiring required, adds bulk
GPS from phone via BLE	Any (Meshtastic only)	No hardware needed	Requires active phone connection; phone must remain near node

Popular External GPS Modules

Module	Interface	TTFF (cold)	Current Draw	Notes
u-blox NEO-M8N	UART	26s	23 mA	Excellent sensitivity; widely supported
Quectel L76K	UART	30s	18 mA	Used in newer T-Beam boards; compact
u-blox MAX-M8Q	UART	26s	15 mA	Compact form factor; patch antenna
ATGM336H	UART	35s	20 mA	Inexpensive Chinese alternative; adequate for most uses
GT-U7 (NEO-6M clone)	UART	60s+	45 mA	Very inexpensive; poor sensitivity; not recommended

TTFF = Time To First Fix from a cold start in open sky conditions.

Wiring an External UART GPS

Most GPS modules use 3.3V logic and UART at 9600 baud. Connect:

- GPS VCC → 3.3V on LoRa board
- GPS GND → GND on LoRa board
- GPS TX → UART RX pin on LoRa board
- GPS RX → UART TX pin on LoRa board (needed only if sending commands to GPS)

Configure in Meshtastic: Config → Position → GPS Mode = Enabled; GPS RX pin = RX pin number from your board's pinout.

GPS Power Management

GPS is one of the largest power consumers on a LoRa node. For battery-powered nodes:

- **Disable GPS if fixed position is configured** - A repeater at a known location doesn't need active GPS
- **Increase GPS update interval** - For slow-moving applications, a 60-300 second GPS update interval with smart beaconing works well
- **GPS power gating** - Some boards route GPS power through a GPIO-controlled switch. Meshtastic can be configured to power-cycle the GPS between fixes, reducing average consumption to under 5 mA
- **AGPS data** - Pre-loading almanac data via the Meshtastic app when connected to internet reduces cold start time from 30-60 seconds to 2-5 seconds

Keyboards, Buttons, and Input Devices

Adding physical input to a LoRa node enables sending messages and navigating menus without a phone. Input options range from simple push buttons to full QWERTY keyboards.

Canned Messages with a Rotary Encoder

The Meshtastic Canned Messages module supports a rotary encoder for scrolling through preset messages and a push button for sending. This is the most practical hardware UI upgrade for a fixed node.

Rotary Encoder Wiring (typical)

```
Encoder CLK (A) → GPIO 39
Encoder DT (B) → GPIO 40
Encoder SW (button) → GPIO 41
Encoder VCC → 3.3V
Encoder GND → GND
```

GPIO pin numbers are board-specific. The KY-040 rotary encoder module (~$1-2) is the most common choice.

Configuration

```
meshtastic --set canned_message.enabled true
meshtastic --set canned_message.inputbroker_pin_a 39
meshtastic --set canned_message.inputbroker_pin_b 40
meshtastic --set canned_message.inputbroker_event_press MSG_INPUT_EVENT_SELECT
meshtastic --set canned_message.messages "OK|On my way|At destination|Need help|ETA 5 min"
```

T-Deck: Integrated QWERTY Device

The LilyGO T-Deck is a complete Meshtastic/LoRa device with an integrated small QWERTY keyboard, color TFT touchscreen, trackball, LoRa radio, and optional GPS. It's the closest thing to a dedicated LoRa messenger device:

- Native keyboard input for typing full messages without a phone
- Color display shows message history, node list, and map
- Runs Meshtastic firmware with full touchscreen UI
- Built-in 2000 mAh battery; approximately 8-12 hours active use
- Price: approximately $50-70
- Limitation: higher power consumption than OLED nodes; not ideal for solar/battery long-term deployment

WisBlock Input Module (RAK14001/RAK14004)

For WisBlock-based nodes, RAKwireless offers input modules that provide RGB LEDs and push buttons in a standardized form factor. The RAK14004 includes a 4x4 keypad interface. These mount directly to the WisBlock base board without wiring.

Simple Button for Alert Sending

A momentary push button connected to a user-accessible GPIO pin can trigger the Meshtastic alert feature - pressing the button sends a preset alert message to the channel. Useful for panic buttons, check-in buttons, or man-down alerts in safety applications.

```
meshtastic --set canned_message.send_bell true
```

With this setting and the button wired to the configured GPIO, one button press sends the first canned message immediately, without needing to scroll through the list.