02 - RouteTrack Pi — Connecting GPS Hardware

Date: December 24th, 2025
Category: Raspberry Pi / GPS / Hardware

Backlink: RouteTrack Pi – Initial Setup & Networking

Project Context

This page documents the **physical GPS hardware selection and connection phase** of the RouteTrack Pi project.

At this stage, the Raspberry Pi has:

- A verified Raspberry Pi OS Lite (64-bit) installation
- Stable headless SSH access
- Multiple Wi-Fi networks configured with automatic failover
- Reliable cooling and power

The goal of this phase is to **introduce the GPS hardware only**, verify that it is detected correctly by the operating system, and prepare the system for GPS daemon (`gpsd`) integration in the next phase.

No GPS services are configured on this page.

GPS Hardware Used

Device: GlobalSat BU-353N USB GPS Receiver

The GlobalSat BU-353N was selected due to its long-standing Linux compatibility, high sensitivity, and suitability for vehicle-based deployments.

Key characteristics:

- USB-powered (no external power required)
- High-sensitivity GPS receiver
- NMEA 0183 output
- Built-in magnetic mount for vehicle use
- Water-resistant housing (IPX6)
- Wide operating temperature range
- Native compatibility with Linux, macOS, Windows, and Android

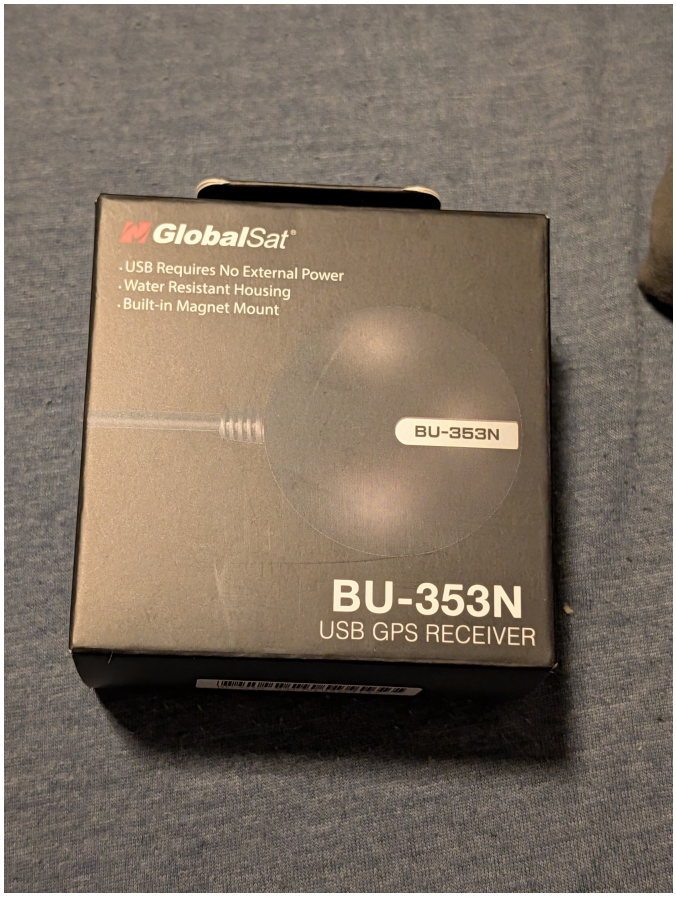
This model is commonly used with `gpsd` and does not require proprietary drivers.

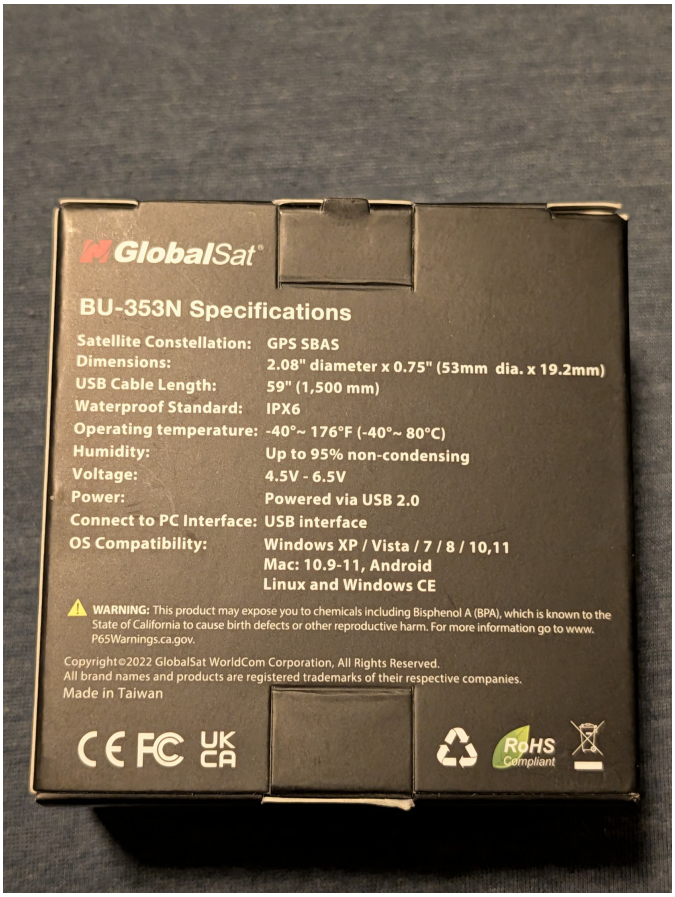
GPS Hardware Photos

The following photos document the exact GPS hardware used for this project.

Photos included:

- Retail packaging (front)
- Retail packaging (specifications)
- OS compatibility indicators
- Model and part number label


GlobalSat
· USB Requires No External Power
· Water Resistant Housing
· Built-in Magnet Mount
BU-353N
BU-353N
USB GPS RECEIVER


GlobalSat
BU-353N Specifications
Satellite Constellation: GPS SBAS
Dimensions: 2.08" diameter x 0.75" (53mm dia. x 19.2mm)
USB Cable Length: 59" (1,500 mm)
Waterproof Standard: IPX6
Operating temperature: -40°~ 176°F (-40°~ 80°C)
Humidity: Up to 95% non-condensing
Voltage: 4.5V - 6.5V
Power: Powered via USB 2.0
Connect to PC Interface: USB interface
OS Compatibility: Windows XP / Vista / 7 / 8 / 10,11
Mac: 10.9-11, Android
Linux and Windows CE
WARNING: This product may expose you to chemicals including Bisphenol A (BPA), which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.
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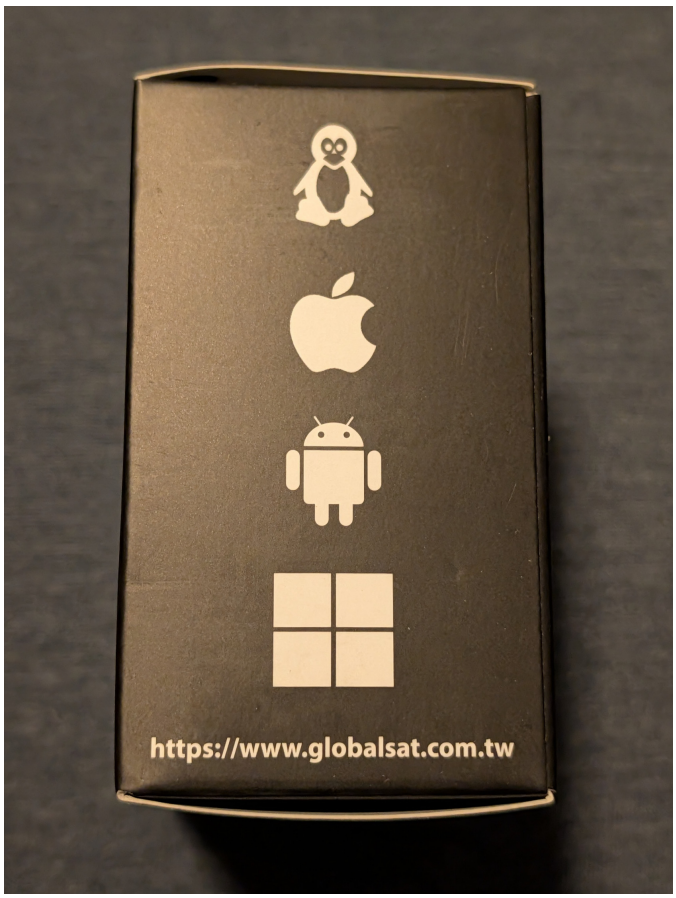
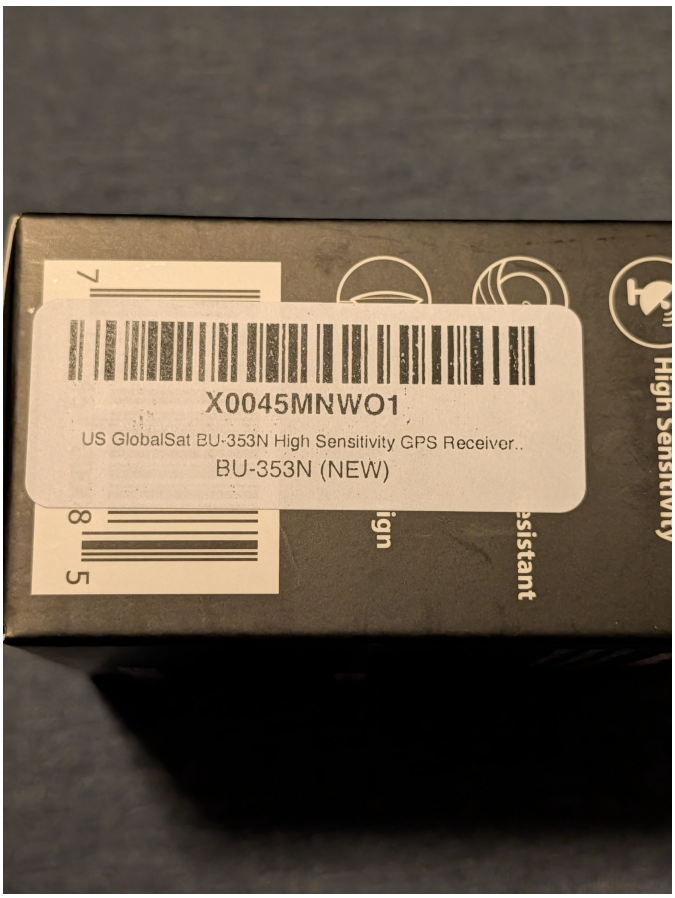
CE FC UK CA
RoHS Compliant


https://www.globalsat.com.tw


X0045MNWO1
US GlobalSat BU-353N High Sensitivity GPS Receiver..
BU-353N (NEW)
High Sensitivity

Physical Connection

The GPS receiver was connected directly to the Raspberry Pi using a standard USB port.

Connection notes:

- No drivers were installed manually
- The device powered on immediately upon connection
- No GPIO wiring or configuration was required
- The receiver will ultimately be mounted in a vehicle using the integrated magnetic base

At this point, the GPS device is physically present but not yet consumed by any software services.

USB Device Detection

After connecting the GPS receiver, the system was checked to ensure that the USB device was detected correctly by the Linux kernel.

The following commands are used to validate USB detection:

```
lsusb
```

```
ls -l /dev/ttyUSB*
```

```
dmesg | grep -i tty
```

Expected results:

- The GlobalSat device appears in `lsusb`
- A serial device (typically `/dev/ttyUSB0`) is created
- Kernel messages indicate a USB-to-serial adapter attachment

Here is the results of those commands:

```
zippyb@pi-gps:~ $ lsusb
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 001 Device 002: ID 0424:2514 Microchip Technology, Inc. (formerly SMSC) USB 2.0 Hub
Bus 001 Device 003: ID 0424:2514 Microchip Technology, Inc. (formerly SMSC) USB 2.0 Hub
Bus 001 Device 004: ID 067b:23a3 Prolific Technology, Inc. ATEN Serial Bridge
Bus 001 Device 005: ID 0424:7800 Microchip Technology, Inc. (formerly SMSC)
zippyb@pi-gps:~ $ ls -l /dev/ttyUSB*
crw-rw---- 1 root dialout 188, 0 Dec  4 08:47 /dev/ttyUSB0
zippyb@pi-gps:~ $ dmesg | grep -i tty
[    0.000000] Kernel command line: coherent_pool=1M 8250.nr_uarts=1 snd_bcm2835.enable_headphones=0 cgroup_disable=memo
ry snd_bcm2835.enable_headphones=1 snd_bcm2835.enable_hdmi=1 snd_bcm2835.enable_hdmi=0  vc_mem.mem_base=0x3ec00000 vc_me
m.mem_size=0x40000000  console=ttyS0,115200 console=tty1 root=PARTUUID=2d2b4bd2-02 rootfstype=ext4 fsck.repair=yes rootw
ait cfg80211.ieee80211_regdom=US
[    0.000220] printk: legacy console [tty1] enabled
[    1.867168] 3f201000.serial: ttyAMA1 at MMIO 0x3f201000 (irq = 99, base_baud = 0) is a PL011 rev2
[    1.868772] serial serial0: tty port ttyAMA1 registered
[    1.872902] printk: legacy console [ttyS0] disabled
[    1.874206] 3f215040.serial: ttyS0 at MMIO 0x3f215040 (irq = 71, base_baud = 50000000) is a 16550
[    1.875851] printk: legacy console [ttyS0] enabled
[    8.032914] systemd[1]: Created slice system-getty.slice - Slice /system/getty.
[    8.070313] systemd[1]: Created slice system-serial\x2dgetty.slice - Slice /system/serial-getty.
[    8.184134] systemd[1]: Expecting device dev-ttyS0.device - /dev/ttyS0...
[   11.463691] usb 1-1.1.2: pl2303 converter now attached to ttyUSB0
[   16.822058] Bluetooth: RFCOMM TTY layer initialized
zippyb@pi-gps:~ $
```

GPS Data Flow Overview

Before configuring any services, it is important to understand the intended data flow:

```
USB GPS Receiver
    ↓
Linux USB-Serial Driver
    ↓
/dev/ttyUSB*
    ↓
gpsd
    ↓
Applications / Logging / Web UI
```

This project uses `gpsd` as the central interface between raw GPS data and higher-level applications.

Configuration and validation of `gpsd` will be covered in the next phase.

Current Status

At the conclusion of this phase:

- GPS hardware has been physically connected

- USB device detection has been verified
- No drivers or custom configuration were required
- No GPS services have been enabled yet

The system is now ready for GPS daemon installation and validation.

Next Steps

The next phase of the project will cover:

- Installing `gpsd` and GPS client utilities
- Verifying socket activation
- Confirming live GPS fixes using `gpspipe`
- Validating TPV and satellite data

Revision #7
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