Vehicle and Mobile Builds

Vehicle-Mounted Meshtastic Node Build

A vehicle-mounted mesh node extends your coverage as you drive and creates a mobile relay point that dramatically improves network coverage in areas you travel through regularly.

Vehicle Safety Warnings (Read First)

- **Never mount a node, antenna, or route cabling in or across an airbag (SRS) deployment zone** - this includes the dashboard top, steering-wheel hub, A-pillars, windshield header, knee bolster, and seat-side panels. In a crash these areas deploy with explosive force; an object placed there can be thrown into occupants or prevent the airbag from working. Keep all hardware and wiring clear of airbag locations - check your vehicle manual for "SRS"/"AIRBAG" markings before drilling, mounting, or routing cable.
- **Fuse every power tap at the source.** Install the in-line fuse within ~15 cm (6 in) of the 12V tap/battery, before any long wire run, and size it to protect the wire gauge. A fuse placed near the load does not protect the upstream conductor from a short-to-chassis fire. Never tap airbag, ABS, or other safety/critical circuits.
- **Do not compose or read messages while driving.** Distracted driving is dangerous and illegal in many areas - let a passenger handle messaging, or read messages only when safely stopped.

Design Goals for Vehicle Installations

- **Always-on:** Powered by the vehicle's 12V system; operational whenever the vehicle is running (or parked)
- **External antenna:** Roof or trunk-lid mounted magnetic base antenna for maximum range

- **Phone integration:** Bluetooth connection to your smartphone lets a passenger handle messaging, or lets you read messages only when safely stopped. Do not compose or read messages while driving.
- **GPS:** Live position updates to the mesh from the vehicle's actual location

Hardware Bill of Materials

Component	Recommended	Approx. Cost
LoRa node	LILYGO T-Beam v1.2 (classic) or T-Beam Supreme (higher-spec)	Classic ~$35-45; Supreme ~$50-65 (Rokland/LILYGO listings, as of 2026-06-08)
External antenna	True 915 MHz magnetic-mount whip with a ground plane (the vehicle roof). Note: the Taoglas FXP73 is a 2.4 GHz flexible adhesive PCB antenna, NOT a 915 MHz mag-mount, and does not provide its own ground plane - do not substitute it here.	$25-40
Antenna cable	SMA to SMA, 5m, LMR-195 (a 5 m LMR-195 run loses ~1.7 dB at 915 MHz, ~0.36 dB/m - keep it as short as practical, or step up to LMR-240 to roughly halve the loss)	$15-20 (current listings, as of 2026-06-08)
Power supply	12V to 5V USB buck converter (3A is generous headroom)	$8-12 (current listings, as of 2026-06-08)
Enclosure	Small project box or 3D-printed dash mount	$5-15
USB cable	USB-A to USB-C, 30cm, right-angle	$5

Antenna Mounting Options

The antenna location has the biggest impact on performance:

- **Roof magnetic base** - Best option. Full ground plane, maximum height. Requires routing cable through door jamb or sunroof. Use self-closing weatherstrip tape to seal around cable.
- **Trunk lid lip mount** - Good compromise. Lower than roof but cleaner install. Use trunk lid pass-through grommets.
- **Dashboard mount (inside)** - Acceptable for temporary use or urban environments where range is less critical. An interior antenna behind glass suffers attenuation - plain auto glass costs roughly a few dB at 915 MHz, but metallized/IR-reflective ("Low-E")

windshields can attenuate far more than 10 dB and may block the signal almost entirely. The bigger limitation is the lack of a clean external ground plane. **Never place the node or antenna in an airbag deployment zone (dashboard top, windshield header, A-pillar) - see the safety warnings above.**

Power Wiring

```
12V vehicle fuse panel
 → In-line fuse (sized to the wire gauge), installed within ~15 cm of the tap
 → Buck converter (12V to 5V/3A)
 → USB-C to T-Beam or other node

Recommended wiring gauge: 18 AWG minimum
Fuse sizing: choose the fuse to protect the WIRE, not just the device draw -
an 18 AWG conductor should be protected by a fuse no larger than ~5-7A.
Do not increase the fuse rating to stop nuisance blows without also
increasing the wire gauge.
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Place the in-line fuse within a few inches (~15 cm) of the 12V tap/source, before any long wire run, so the entire downstream conductor is protected against a short-to-chassis fire (standard automotive fuse-placement practice). Use an add-a-circuit fuse tap on a non-critical accessory circuit, fuse on the supply side, and secure and grommet wires away from heat and moving parts. If you are not confident wiring into the vehicle, have it installed professionally. Never tap airbag, ABS, or other safety circuits.

Tap from a switched 12V source (ignition-switched) so the node powers off when the vehicle is off. Alternatively, use an always-on source if you want the node to continue operating as a parked relay - but ensure your vehicle battery won't be drained. Add a low-voltage disconnect (LVD) module inline between the 12V tap and the buck converter so the node load is cut before the battery is depleted. For a flooded lead-acid starter battery, set the cutoff around ~12.2-12.4V resting (a starter battery shouldn't routinely be drawn much lower, or the vehicle may not start); the exact threshold depends on battery type. Be aware that any always-on load can leave the vehicle unable to start if left long enough.

Configuration for Mobile Use

```
# Device role for a mobile/vehicle node (ROUTER_CLIENT was retired in
# firmware 2.3.15 - use CLIENT, or CLIENT_MUTE if it should not rebroadcast):
meshtastic --set device.role CLIENT
```

```
# Position update interval for moving vehicle (60 seconds):
meshtastic --set position.position_broadcast_secs 60

# Ensure GPS is enabled for live position (gps_mode enum, not the old boolean):
meshtastic --set position.gps_mode ENABLED

# Keep BLE active for the phone connection. Note: 0 is NOT "always on" - it
# is the default 1-minute timeout. To keep BLE active longer, set a large
# value, e.g. one day:
meshtastic --set power.wait_bluetooth_secs 86400
```

Portable Go-Kit: Field-Deployable Mesh Node

A go-kit is a self-contained, rapidly deployable mesh node in a single weather-resistant case. It powers up in under 2 minutes. Runtime depends entirely on the battery, the node role, and display use: with the 12V 20Ah LiFePO4 pack specified below, a low-power RAK4631 will run for many days to weeks (see the corrected Power Budget); a small portable pack in client mode would give the shorter 12-48 hour figures sometimes quoted for compact kits.

Go-Kit Design Philosophy

The go-kit must satisfy three constraints:

1. **One-bag portability:** Everything fits in a carry-on-sized case. Target weight under 10 lbs including battery.
2. **Rapid deployment:** Someone with basic training should be able to set it up correctly in under 5 minutes.
3. **12+ hour autonomous operation:** Sufficient for most emergency activations without resupply.

Go-Kit Bill of Materials

Component	Choice	Notes
Case	Pelican 1510 or Nanuk 935	Carry-on size, weatherproof. The Nanuk 935 is the carry-on equivalent of the Pelican 1510; the smaller Nanuk 910 holds far less and is not interchangeable.
LoRa node	RAK4631 WisBlock	Lowest power; best for battery runtime
Battery	20Ah LiFePO4 12V (Dakota Lithium or Battle Born)	~256 Wh (12.8V nominal × 20Ah). Powers the node via the buck converter below - this pack runs a RAK4631 for weeks, not hours. Fuse and disconnect required (see safety note).

Component	Choice	Notes
Inline fuse + disconnect	Fuse holder sized to wiring + master switch	Fuse the battery positive lead at the battery terminal and add a master disconnect (see safety note below).
Charge controller	Victron MPPT 75/10	12/24V solar charge controller for the 12V LiFePO4 pack. Requires a solar panel with Vmp well above battery voltage (nominal 12V panel, Vmp ~18V).
12V→5V buck/USB regulator	12V to 5V USB buck converter	Required. The RAK4631 is a 3.3V nRF52 board powered via its USB/5V input - never feed 12V directly to the board. Wiring path: battery → fuse → MPPT → 12V bus → buck → 5V USB → RAK4631.
Solar panel	~25W foldable, nominal 12V (Vmp ~18V)	For extended deployments. Must have Vmp ~18V to work with the 75/10 on a 12V battery - a 5V USB-style panel will NOT work with this MPPT controller.
Antenna	915 MHz-tuned antenna (BNC base)	Use a proper 902-928 MHz antenna. A quarter-wave whip is only ~8 cm at 915 MHz; a generic 40 cm telescoping whip is non-resonant here (~1.2 wavelengths, high VSWR, poor performance). If you want collapsible, use one specifically tuned/loaded for the 902-928 MHz band.
Antenna cable	SMA to BNC, 3m	Allows antenna placement away from case
Display	OLED on RAK1921 module	Shows node status without phone

Battery safety: A 20Ah LiFePO4 cell can deliver hundreds of amps into a short - an unfused lead in a metal-tooled kit is an arc-flash and burn hazard. Fuse the battery positive at the terminal (sized to the wiring), include a master disconnect, and secure the battery so it cannot shift and short against tools or the case.

Power Budget

```
RAK4631 system current depends heavily on role:
 - CLIENT / low-duty roles can average low single-digit to ~15 mA.
 - ROUTER / repeater role keeps the radio in continuous RX and disables sleep;
   community measurements report ~80-100 mA constant for a RAK19007 + RAK4631
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```
   in router mode. Measure your own setup before sizing.

Battery energy (use the pack's real voltage):
 - 12V LiFePO4 (12.8V nominal) x 20Ah = ~256 Wh
 - Capacity-based runtime (voltage-independent): 20,000 mAh / I_avg
     * at 15 mA (low-duty): ~1,333 h theoretical
     * at 100 mA (router): ~200 h theoretical
 - Derate ~2x for self-discharge, conversion losses, and TX:
   roughly 600+ h low-duty, ~100 h in router role.

For a 24-hour deployment:
 - Low-duty need: 24h * 15mA = 360 mAh
 - Router need:   24h * 100mA = 2,400 mAh
 - A 20Ah pack covers either easily; a 2Ah 18650 bank lasts ~5 days
   ONLY at ~15 mA - in router/repeater role (~100 mA) it lasts ~20 h.
   Measure your node's actual average current to size the pack.
```

Deployment Checklist

- Place case on stable surface or tripod
- Extend or mount antenna (highest practical point - window, pole, rooftop)
- Connect antenna cable to node SMA connector
- Verify the battery positive lead is fused, then connect battery to charge controller; power the node through the 12V→5V buck regulator (never 12V direct to the board)
- Verify node powers on and OLED shows status
- Connect phone via Bluetooth and verify node joins network
- Send test message to confirm operation
- Note power level (if solar available, deploy panel south-facing)

Labeling and Documentation

Every component should be labeled inside the kit:

- Node ID and short name (on a label inside the lid)
- Channel key (in a sealed envelope or QR code sticker). Note: channel encryption is permitted for unlicensed Part 15 operation at stock RAK4631 power. It would be prohibited only if the kit were ever operated under an amateur (Part 97) license.
- Quick-start laminated card with 7 deployment steps
- Contact info for the kit owner
- Inventory list with last-check date