

Connector Types & Coax Cable

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Using the wrong connector or cable is one of the most common and frustrating mistakes when setting up LoRa hardware. This page covers everything you need to know to buy and connect antennas correctly.

SMA vs. RP-SMA

SMA (SubMiniature version A) and RP-SMA (Reverse Polarity SMA) look nearly identical but are **not interchangeable**. Connecting a mismatched pair results in no signal or very poor signal even though the connectors physically engage.

Connector	Male	Female	Common Devices
SMA	Pin in centre, external thread	Socket in centre, internal thread	Heltec V3/V4, RAK WisBlock, many antennas
RP-SMA	Socket in centre, external thread	Pin in centre, internal thread	Some LilyGo devices, Wi-Fi routers, some Meshtastic builds

RP-SMA originates from an FCC convention for consumer Wi-Fi antenna couplings (it is an industry convention, not an FCC mandate for LoRa). It sometimes appears on LoRa boards - notably some LilyGo and inexpensive units - and is not "wrong," but it must be matched to the antenna.

Before buying an antenna: check your device datasheet or photos to confirm whether it uses SMA or RP-SMA. The Heltec V3 and V4 are generally reported to use SMA Male on the board (the antenna plugs SMA Female onto the board connector); verify against the official Heltec datasheet for your exact board revision, since some clones and variants differ.

N-Connector

N-connectors are larger, more weatherproof, and lower-loss than SMA. Used on outdoor base station antennas and feedlines. The ALFA 5 dBi Mini uses N-Male. For base station builds with significant coax runs, N-connector systems are preferred over SMA.

Coax Cable Selection

Coax cable introduces loss that subtracts directly from your effective radiated power and receive sensitivity. At 915 MHz, cable loss is significant for runs over 3 metres. The figures below are the canonical 915 MHz loss values used across this book (sourced from manufacturer datasheets, e.g. Times Microwave for LMR cable). The reference length is **100 ft (~30.5 m)**; the dB/m column is the same value divided to a per-metre basis (per metre = dB/100 ft × 0.0328).

Cable Type	Loss at 915 MHz (dB/100 ft)	Loss at 915 MHz (dB/m)	Use Case
RG174	~28 dB/100 ft	~0.92 dB/m	Short pigtailed only (<30cm); avoid for longer runs
RG316	~26 dB/100 ft	~0.85 dB/m	Short internal pigtailed; better than RG174 but still lossy
RG58	~20 dB/100 ft	~0.66 dB/m	Acceptable for runs up to 3 - 5m
LMR-200	~9.9 dB/100 ft	~0.32 dB/m	Good for runs 3 - 10m; flexible
LMR-400	~3.9 dB/100 ft	~0.13 dB/m	Long runs (>10m) or base stations; less flexible

For a DIY solar repeater with the node inside the enclosure and the antenna immediately outside, a 30cm RG316 pigtail is fine. For a base station where the coax runs 10 metres from the node to the roof antenna, use LMR-200 or LMR-400.

SWR and Cable Quality

Poor-quality connectors and cables produce poor SWR readings even with a good antenna. If your NanoVNA shows unexpectedly high SWR, suspect the cable and connectors before the antenna itself. Wiggle the connector while monitoring - if SWR changes, the connector is the problem.

Weatherproofing Outdoor Connections

Outdoor N-connector and SMA connections must be weatherproofed. Water intrusion corrodes the connector and increases loss. Use self-amalgamating (self-fusing) tape: stretch it over the connector and cable and overlap each wrap by half. It bonds to itself and forms a watertight seal without adhesive. Cover with UV-resistant electrical tape for UV protection.

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