

# Meshtastic Channel Number Selection Guide

Meshtastic has two distinct concepts that are easy to confuse. The **LoRa Frequency Slot** (`lora.channel_num`) selects the single center frequency the radio transmits on. This is separate from the up-to-8 **logical Channels** (each with its own name and PSK, indexes 0-7), which **all share the same frequency**. Adding logical channels gives you separate encrypted message streams — it does **not** change your RF frequency, provide RF isolation, or avoid collisions. Only changing the frequency slot (or the modem preset) actually moves you to a different frequency.

## How the Frequency Is Chosen

Meshtastic does **not** compute the center frequency from a logical channel number using a simple base + spacing formula. Instead, the firmware divides the region's band into a fixed number of **frequency slots** (slot width = the preset's bandwidth) and picks one slot:

- If `lora.channel_num` is **0 / UNSET** (the factory default), the firmware computes a **hash of the PRIMARY channel's NAME** (a djb2 hash in `RadioInterface.cpp`) and uses it to select a slot.
- If `lora.channel_num` is set to **1-104**, that value is an **absolute slot index** and overrides the name hash.

For the **US 902-928 MHz band with the LongFast preset, the bandwidth is 250 kHz**, which yields **104 frequency slots** of 250 kHz each across the 26 MHz usable band. (125 kHz is the bandwidth of the Long Moderate / Long Slow presets, not LongFast — those presets have more slots.)

```
# US region, LongFast preset
# Bandwidth (slot width): 250 kHz
# Number of frequency slots: 104

# Default channel_num = 0/UNSET -> frequency comes from a HASH of
# the PRIMARY channel NAME, NOT from a linear base+offset formula.
# The default LongFast channel name hashes to slot 20 = 906.875 MHz.

# Slot-to-frequency formula (only when you set an explicit slot):
```

```
# freq_MHz = freq_start + (slot * bandwidth) + (bandwidth / 2)
# US: freq_start = 902.0 MHz, bandwidth = 0.250 MHz, slot is 1-based (1..104)
#
# Example, default LongFast slot 20:
# 902.0 + (20 * 0.250) + 0.125 ... is reached via the name hash,
# giving the documented default of 906.875 MHz.
```

Note that **906.875 MHz corresponds to frequency slot 20** (the result of hashing the default channel name), *not* "channel 0." There is no `base 902.0 + channel × 0.125` linear progression, and the slot index is not limited to 0-7 — those are the logical channels, a completely separate concept.

## Why Change the Default Slot?

Most Meshtastic nodes ship on the default LongFast channel, which hashes to slot 20 (906.875 MHz). If your area already has significant Meshtastic traffic, you may benefit from staying on the default to maximize connectivity with existing nodes. However, if:

- You're running a private community network that wants to operate on its own frequency (note: changing frequency means those nodes can no longer hear the default mesh, and vice versa)
- You've identified interference at the default frequency with an SDR
- You want to operate on a less crowded frequency in a dense metropolitan area

...then setting an explicit frequency slot (or choosing a different primary channel name that hashes to a different slot) makes sense. Changing logical channels alone will **not** do this — logical channels all share the same frequency.

## Frequency Coordination

For all nodes in your community network to hear each other, they must transmit on the **same frequency** — meaning the same modem preset *and* the same frequency slot (which means either the same primary channel name, since the name-hash sets the slot, or the same explicitly set `lora.channel_num`). They must also share the same channel name/PSK to decode each other's traffic. Keep a community coordination document:

```
# Check current frequency slot:
meshtastic --get lora.channel_num
```

```
# Set an explicit frequency slot (absolute slot index, 1-104 for US LongFast):
meshtastic --set lora.channel_num 3

# This selects frequency SLOT 3, an absolute slot - NOT an offset added
# to 906.875. For US LongFast (250 kHz):
# 902.0 + (3 * 0.250) + 0.125 = 903.375 MHz
#
# Setting channel_num to 0 reverts to the channel-name hash (default).
```

# Bandwidth and Frequency-Slot Separation

Two independent networks on the same band coexist by transmitting on **different frequency slots** (set via different slot numbers, or different primary channel names that hash to different slots). Separating two networks by  $\geq 2$  slots reduces adjacent-channel interference, but it does **not** give complete RF isolation — LoRa's spectral skirts extend beyond the nominal bandwidth and the 902–928 MHz band is shared ISM spectrum, so some interference is always possible. (Separate channel names/PSKs alone provide only *logical* separation — same frequency, same airtime, same collisions.) Practical guideline:

Modem Preset	Bandwidth (slot width)	Separation for substantial isolation
LongFast	250 kHz	$\geq 1$ slot (250 kHz); $\geq 2$ slots (500 kHz) for better margin
MediumFast	250 kHz	$\geq 1$ slot (250 kHz); $\geq 2$ slots (500 kHz) for better margin
ShortFast	250 kHz	$\geq 1$ slot (250 kHz); $\geq 2$ slots (500 kHz) for better margin
ShortTurbo	500 kHz	$\geq 1$ slot (500 kHz); $\geq 2$ slots (1000 kHz) for better margin

If two networks operate on adjacent slots with the same bandwidth, they'll still experience some adjacent-channel interference and won't be completely isolated. Remember that putting your network on a different frequency slot from the local default mesh means the two networks can no longer relay for each other — that's the intended trade-off when you want a private frequency.

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