STARTER GUIDE

HAM RADIO VS GMRS VS MESHTASTIC

Ham radio, GMRS, family walkie-talkies and Meshtastic all come up when people talk about staying in touch without cell service. Each has its own rules and its own radios. Here's how they compare, and why many hams use more than one.

Printed from www.cqdeck.com/learn/ham-gmrs-meshtastic. The page always has the latest version.

Side by side

How the four compare

	HAM RADIO	GMRS	FRS	MESHTASTIC
License	Yes, after a test	Yes, no test	None	None
Cost	$35 FCC fee plus a small exam fee; lasts 10 years	$35; lasts 10 years	Just the radios	Just the devices, about $30 to $100 each
Who can use it	Only you; family members need their own	You and your immediate family	Anyone	Anyone
What you send	Voice, Morse code, digital modes and more	Voice, plus short text and location bursts	Voice, plus short text and location bursts	Short text messages and locations
Reach	Across town on repeaters, farther on HF and satellites	A few miles radio to radio, farther through repeaters	Usually under 2 miles	A mile or more per hop, relayed node to node
Radios	Any radio covering the ham bands, even one you build	Radios certified for GMRS	Radios certified for FRS	LoRa devices for the US 915 MHz band
Repeaters	Thousands, open to any ham	Some, often private: ask first	None	None needed: nodes relay for each other

Which one fits?

- To talk with family on a trip or around the neighborhood with no test, start with FRS radios. GMRS adds more power, better antennas and repeaters, and one $35 license covers the family.
- To talk with people beyond your circle, across town or around the world, and to learn how radio works, get your ham license. The Technician exam is 35 multiple-choice questions.
- To send text messages where there's no cell service, with no license, try Meshtastic. It works as long as other nodes are within reach.
- Many hams use all three: ham radio for the hobby, GMRS or FRS so the family can reach them, and Meshtastic for texting.

Ham radio

Amateur radio is the broadest of these: voice, Morse code and digital modes, from local VHF and UHF to HF bands that reach around the world, plus satellites. Every operator earns a license by passing a test.

- There are three license classes: Technician, General and Extra. Each one opens more bands.
- Your license is yours alone, so family members need their own. A guest can talk on the air while you supervise as the licensed operator.
- You can use any radio that covers the ham bands, including one you build or modify yourself.
- Messages can't be encrypted or hidden, and ham radio can't be used for business or paid work.
- Give your call sign at the end of each contact and at least every 10 minutes during one.

YOU NEED	To pass the Technician exam at an in-person or online session. The FCC fee is $35 and the license lasts 10 years.
GOOD FOR	Meeting people on the air, emergency service, experimenting, and everything in the guide to ways to use your license.

TRY IT **How to get your license** cqdeck.com/learn/get-your-license

Ways to use your license cqdeck.com/learn/ways-to-use-your-license

GMRS

The General Mobile Radio Service is for personal and family communication on UHF channels near 462 and 467 MHz. There's no test: you apply online, pay $35, and the license covers your immediate family for 10 years.

- You must be 18 or older to apply. The license also covers your spouse, children, grandchildren, parents, grandparents, siblings, stepchildren, stepparents, aunts, uncles, nieces, nephews and in-laws.
- GMRS shares 22 channels with FRS and adds repeater channels, so GMRS and FRS radios can talk to each other.
- Radios must be certified for GMRS. A radio that can also transmit on ham bands can't be certified, so a ham handheld like the UV-5R isn't legal on GMRS, and GMRS radios don't cover the ham bands.
- Mobile and base radios can run up to 50 watts on the main channels, and handhelds usually put out about 5. Unlike FRS, you can use a better antenna.
- Repeaters stretch a handheld's range across a city or county. Many are privately owned, so ask the owner before using one. The myGMRS directory lists them.
- Say your GMRS call sign at the end of a conversation and at least every 15 minutes during a long one.
- Talk in plain language: no codes, though 10 codes are fine. GMRS users can't talk with ham stations except in an emergency.

YOU NEED	An FCC account, the $35 application in the FCC's License Manager, and radios certified for GMRS.
GOOD FOR	Families, road trips, camping and neighborhood groups.

TRY IT **myGMRS repeater directory** https://mygmrs.com/

FRS, MURS and CB: no license needed

Anyone can use these three services with radios certified for them. They're simple and deliberately low-powered.

The license-free radio services

	FRS	MURS	CB
Channels	22 UHF channels shared with GMRS	5 VHF channels near 151 and 154 MHz	40 channels near 27 MHz
Power	2 watts (half a watt on channels 8 to 14)	2 watts	4 watts, or 12 watts on single sideband
Antenna	Built in	External antennas allowed	External antennas allowed
Often used by	Families and groups at events	Farms, ranches and small businesses	Truckers and off-roaders

- Use a radio certified for the service you're on. A ham handheld like the UV-5R can listen to all of these, but it isn't legal to transmit on them.
- CB channel 9 is for emergencies and traveler help, and channel 19 is the unofficial highway channel.

Meshtastic

Meshtastic is free, open-source software that turns small LoRa radios into a text-messaging network. It runs without a license in the 902 to 928 MHz band, and every node can pass messages along for others, so a message can hop across town without cell service or the internet.

- Most people pair a node with their phone over Bluetooth and type in the Meshtastic app. Some nodes have their own screen and keyboard.
- A message can hop through up to 3 other nodes by default, and 7 at most. How far each hop reaches depends on height: often a mile or two between handhelds in town, and much farther between nodes on rooftops and hills.
- It carries text, not voice: short messages of about 200 characters, plus positions and sensor readings.

- The default channel is shared by everyone nearby and its key is public, so treat it like a public chat. Private channels and direct messages are encrypted.
- It only works if other nodes are in range. MeshMap shows nodes that report to the internet, and local mesh groups often put nodes on high spots.
- MeshCore is a similar project that runs on the same hardware, but its nodes can't talk to Meshtastic nodes.

YOU NEED A LoRa device sold for the US 915 MHz band, usually $30 to $100, and the free app. No license.

GOOD FOR Texting at events, on trails or when phones are down, and tinkering.

TRY IT **Meshtastic: getting started** https://meshtastic.org/docs/getting-started/

MeshMap https://meshmap.net/

Meshtastic with a ham license

902 to 928 MHz is also the 33 centimeter ham band, where Technicians have full privileges. Meshtastic has a licensed mode for hams.

- Turn on Licensed amateur radio in the app and set your long name to your call sign. Your node then sends your call sign regularly.
- Licensed mode lets you run more power than license-free nodes may.
- Your messages must go out unencrypted, as ham rules require. That keeps you off the usual encrypted channels, so many hams simply run a regular node, which needs no license.

TRY IT **Meshtastic ham FAQ** https://meshtastic.org/docs/faq/#amateur-radio-ham

Using them together

- No radio is legal for both ham and GMRS use, so keep one for each.
- FRS and GMRS radios share channels, so a family can mix them. Only the GMRS radios need the license.
- Agree on a channel and a time to listen before you need it. A radio plan only works if everyone knows where to tune.

Sources

FCC rule 95.1705: GMRS licenses and who may operate https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-95/subpart-E/section-95.1705

FCC rule 95.1731: permitted GMRS uses https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-95/subpart-E/section-95.1731

FCC rule 95.1733: prohibited GMRS uses https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-95/subpart-E/section-95.1733

FCC rule 95.1751: GMRS station identification https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-95/subpart-E/section-95.1751

FCC rule 95.1761: GMRS radio certification https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-95/subpart-E/section-95.1761

FCC rule 95.1767: GMRS power limits https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-95/subpart-E/section-95.1767

FCC rule 95.567: FRS power https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-95/subpart-B/section-95.567

FCC rule 95.2767: MURS power https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-95/subpart-J/section-95.2767

FCC rule 95.967: CB power https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-95/subpart-D/section-95.967

FCC rule 97.113: prohibited amateur transmissions https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-97/subpart-B/section-97.113

Meshtastic FAQ: amateur radio https://meshtastic.org/docs/faq/#amateur-radio-ham

Meshtastic: encryption https://meshtastic.org/docs/overview/encryption/