Other Radio Services Hams Ought to Know About

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Access video: **https://tinyurl.com/42ae5273**

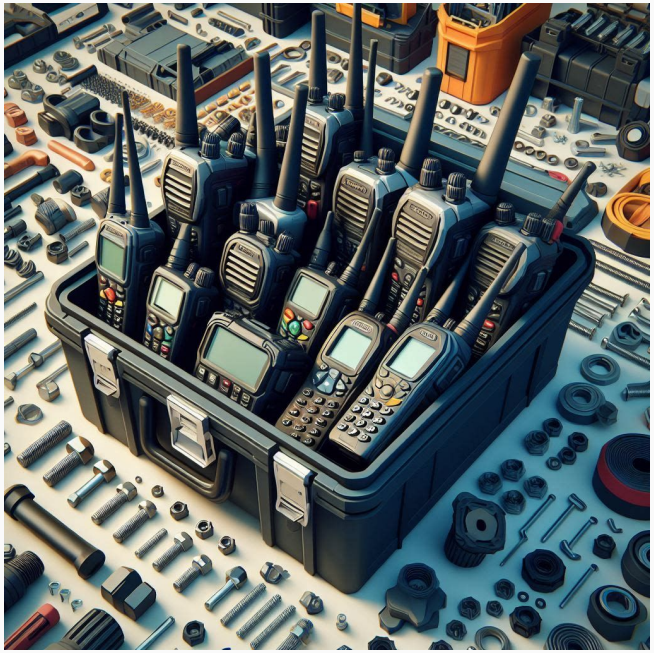
Why not ham radio?

Ham radio is not the best tool for every application.

What about:

- Family members, friends, and neighbors who don't have (or won't get) a ham radio license?
- Radios for minor roles (parking attendants, housekeeping) at public service events?
- Cheap/disposable communications for kids?

Here are five radio services to consider.



Other personal radio services

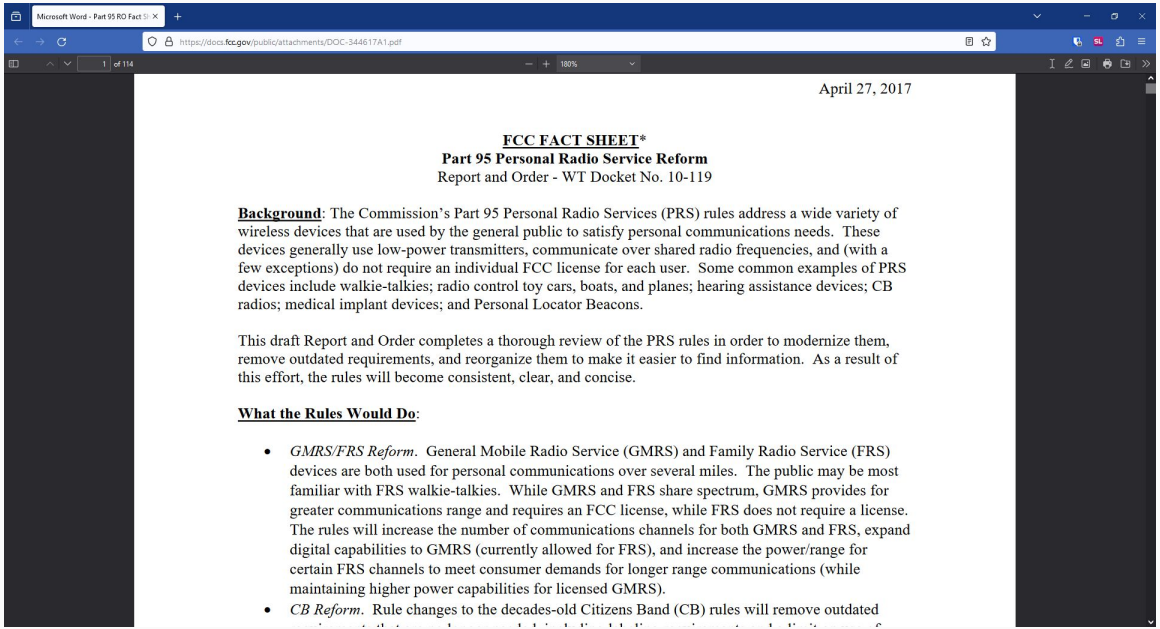
Five services to be aware of:

- Citizens Band Radio Service (CBRS)
- General Mobile Radio Service (GMRS)
- Family Radio Service (FRS)
- Multi-Use Radio Service (MURS)
- 900 MHz Industrial, Scientific, and Medical (ISM)

There was a major rewrite of Part 95 in September 2017.

The ARRL published a page summarizing a few of the changes, and the full detail can be found in an April 27, 2017 FCC Fact Sheet.

Additional updates to the rules were made September 2021.



April 27, 2017

FCC FACT SHEET*
Part 95 Personal Radio Service Reform
Report and Order - WT Docket No. 10-119

Background: The Commission's Part 95 Personal Radio Services (PRS) rules address a wide variety of wireless devices that are used by the general public to satisfy personal communications needs. These devices generally use low-power transmitters, communicate over shared radio frequencies, and (with a few exceptions) do not require an individual FCC license for each user. Some common examples of PRS devices include walkie-talkies; radio control toy cars, boats, and planes; hearing assistance devices; CB radios; medical implant devices; and Personal Locator Beacons.

This draft Report and Order completes a thorough review of the PRS rules in order to modernize them, remove outdated requirements, and reorganize them to make it easier to find information. As a result of this effort, the rules will become consistent, clear, and concise.

What the Rules Would Do:

- *GMRS/FRS Reform*. General Mobile Radio Service (GMRS) and Family Radio Service (FRS) devices are both used for personal communications over several miles. The public may be most familiar with FRS walkie-talkies. While GMRS and FRS share spectrum, GMRS provides for greater communications range and requires an FCC license, while FRS does not require a license. The rules will increase the number of communications channels for both GMRS and FRS, expand digital capabilities to GMRS (currently allowed for FRS), and increase the power/range for certain FRS channels to meet consumer demands for longer range communications (while maintaining higher power capabilities for licensed GMRS).
- *CB Reform*. Rule changes to the decades-old Citizens Band (CB) rules will remove outdated

ARRL: FCC Personal Radio Service Revisions Will Affect GMRS, FRS, CB, Other Part 95 Devices, 4/28/2017
https://tinyurl.com/arrlpart95

FCC: Fact Sheet - Part 95 Personal Radio Service Reform - R&O - WT Docket N. 10-119, 4/27/2017
https://tinyurl.com/fccpart95changes

Citizens Band Radio Service (CBRS)

Citizens Band Radio Service (CBRS)

Created September 11, 1958 with 23 channels, from the former 11-meter amateur radio band. Expanded to 40 channels in 1977.

Regulated by FCC Part 95 Subpart D

CB is “a mobile and fixed two-way voice communication service for facilitating personal, business or voluntary public service activities, including communications to provide assistance to highway travelers.”

License-free for personal or business use

Frequencies and modes:
- 26.965 to 27.405 MHz, 40 channels
- AM, FM, and SSB modes permitted
- **FM is new in US as of 9/2021**

Max power:
- 4 watts AM and FM
- 12 watts PEP SSB
- **Measured at the antenna connector - previous AM ERP limit is gone, high gain antennas are allowed (omni, beam, dipole)**

Restrictions:
- **Distance limit (250 km/155.3 mi) removed 9/2017**
- International comms still prohibited, except Canadian GRS (CB)
- No soliciting or advertising goods or services (incl. buy/sell/trade)
- No music, whistling, sound effects
- No political advertising/campaigning (campaign business ops OK)
- Channel 9 (27.065 MHz) reserved for emergency use
- Antenna height limited to 60 ft, or 20 ft above the highest point of the building or tree on which it is mounted, whichever is highest
- 5 minute QSO time limit; 1 minute break required

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Pros:

- Simple AM mobiles are inexpensive (<$75)
- Equipment and accessories are widely available
- Channel 9 still a direct line to emergency aid, mainly in rural areas
- Anyone can use it: no license, no ID, no formalities

Cons:

- All channels subject to significant congestion during HF openings
- Language/content often not appropriate for kids
- Portable equipment exists, but it’s big and clunky
- AM equipment is particularly susceptible to engine noise

When to consider:

- Local communications, particularly in rural areas, challenging terrain
- Long distance skywave, dependent on propagation

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CB is “a mobile and fixed two-way voice communication service for facilitating personal, business or voluntary public service activities, including communications to provide assistance to highway travelers.”

CBRS permitted emissions:

Designator	Description
A3E	[A] AM double sideband full carrier [3] single analog channel [E] telephony, voice, sound broadcasting
H3E	[H] AM single sideband, full carrier [3] single analog channel [E] telephony, voice, sound broadcasting
J3E	[J] AM single sideband, suppressed carrier [3] single analog channel [E] telephony, voice, sound broadcasting
R3E	[R] AM single sideband, reduced or controlled carrier [3] single analog channel [E] telephony, voice, sound broadcasting
F3E	[F] angle-modulated, straight FM [3] single analog channel [E] telephony, voice, sound broadcasting

CBRS equipment must transmit at minimum either AM voice (A3E) or SSB voice (J3E, R3E, H3E), and may optionally transmit FM voice (F3E).

SSB: Must support USB, may optionally support LSB.

General Mobile Radio Service (GMRS)
Family Radio Service (FRS)

General Mobile Radio Service (GMRS)

Created July 31, 1987 from the previous Class A/B Citizens Band Radio Services (460-470 MHz, 1948)

Regulated by FCC Part 95 Subpart E

GMRS is “a mobile two-way voice communication service, with limited data applications, for facilitating activities of individual licensees and their family members, including, but not limited to, voluntary provision of assistance to the public during emergencies and natural disasters.”

License required
- Covers licensee and immediate family
- Currently $35 for 10 years

Frequencies and modes:
- 462 to 467 MHz, up to 50 watts
- AM is authorized, but virtually all approved equipment is FM
- 30 channels, restricted by station type & power
  - » 8 repeater channels, 8 GMRS exclusive channels
  - » 22 channels shared with license-free FRS
- **Limited use of data for text and GPS info (new 9/2017)**

Max power, bandwidth varies by channel and station type

Restrictions:
- Data applications heavily restricted
- **Voice scrambling now illegal (2011-ish)**
- Max output power as low as 0.5 watts on some channels
- Some channels have geographical restrictions in northern US
- No soliciting or advertising goods or services (incl. buy/sell/trade)
- No music, whistling, sound effects
- No political advertising/campaigning (campaign business ops OK)

Immediate family is no longer limited to the “same household.”

GMRS has no **control operators** in the ham radio sense - the licensee does not need to directly oversee the operations of family members. Each adult operating under the license is their own control operator, and they are responsible for their transmissions and compliance with the rules.

§ 95.1743 Minor GMRS operators.

Operators under the age of 18 will not be held personally responsible, pursuant to § 95.343, for improper operation of a GMRS repeater or base station. The holder of the individual license under which the minor operates is solely responsible for any improper operation that occurs while an individual under the age of 18 is operating the station.

(c) ***Individuals who may operate a GMRS station.*** This paragraph establishes who may operate a GMRS station under the authority of an individual license.

(1) Any individual who holds an individual license may operate his or her GMRS stations.

(2) Any individual who holds an individual license may allow his or her immediate family members to operate his or her GMRS station or stations. Immediate family members are the licensee's spouse, children, grandchildren, stepchildren, parents, grandparents, stepparents, brothers, sisters, aunts, uncles, nieces, nephews, and in-laws.

(3) Any individual who holds an individual license may allow anyone to operate his or her GMRS station if necessary to communicate an emergency message.

(4) Any non-individual person that holds a grandfathered GMRS license may allow individuals to operate its grandfathered GMRS station(s) only in accordance with the following paragraphs:

(i) A partnership may allow its partners and employees to operate its GMRS station(s).

(ii) A corporation may allow its officers, directors, members and employees to operate its GMRS station(s).

(iii) An association may allow its members and employees to operate its GMRS station(s).

(iv) A governmental unit may allow its employees to operate its GMRS station(s).

(d) ***Individual licensee duties.*** The holder of an individual license:

(1) Shall determine specifically which individuals, including family members, are allowed to operate (*i.e.*, exercise operational control over) its GMRS station(s) (*see* paragraph (c) of this section);

(2) May allow any person to use (*i.e.*, benefit from the operation of) its GMRS repeater, or alternatively, may limit the use of its GMRS repeater to specific persons;

(3) May disallow the use of its GMRS repeater by specific persons as may be necessary to carry out its responsibilities under this section.

General Mobile Radio Service (GMRS)

Created July 31, 1987 from the previous Class A/B Citizens Band Radio Services (460-470 MHz, 1948)

Regulated by FCC Part 95 Subpart E

GMRS is “a mobile two-way voice communication service, with limited data applications, for facilitating activities of individual licensees and their family members, including, but not limited to, voluntary provision of assistance to the public during emergencies and natural disasters.”

Pros:

· Equipment readily available at retail stores, Amazon
· License covers the whole family, no test, no technical skill needed
· Offers many of the same FM voice capabilities as 70 cm ham, including many open-access repeaters
· Popular: Widespread adoption and good repeater coverage
· Can talk to unlicensed FRS users

Cons:

· Limited user training still required - station ID, basic rules
· Not all repeaters are open-access
· Equipment and operating procedures add complexity

When to consider:

· Family emergency comm plan
· Mobile radios for vacations
· Handhelds, repeaters for around-town use
· Daily family communications

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Regulated by FCC Part 95 Subpart E

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GMRS permitted emissions:

Designator	Description
A1D	[A] AM double sideband full carrier [1] digital, on-off or quantized, no modulation [D] data, telemetry, telecommand
F1D	[F] angle-modulated, straight FM [1] digital, on-off or quantized, no modulation [D] data, telemetry, telecommand
G1D	[G] angle-modulated, phase modulation [1] digital, on-off or quantized, no modulation [D] data, telemetry, telecommand
H1D	[H] AM single sideband, full carrier [1] digital, on-off or quantized, no modulation [D] data, telemetry, telecommand
J1D	[J] AM single sideband, suppressed carrier [1] digital, on-off or quantized, no modulation [D] data, telemetry, telecommand
R1D	[R] AM single sideband, reduced or controlled carrier [1] digital, on-off or quantized, no modulation [D] data, telemetry, telecommand
A3E	[A] AM double sideband full carrier [3] single analog channel [E] telephony, voice, sound broadcasting

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Created July 31, 1987 from the previous Class A/B Citizens Band Radio Services (460-470 MHz, 1948)

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GMRS is “a mobile two-way voice communication service, with limited data applications, for facilitating activities of individual licensees and their family members, including, but not limited to, voluntary provision of assistance to the public during emergencies and natural disasters.”

GMRS permitted emissions:

Designator	Description
F3E*	[F] angle-modulated, straight FM [3] single analog channel [E] telephony, voice, sound broadcasting
G3E*	[G] angle-modulated, phase modulation [3] single analog channel [E] telephony, voice, sound broadcasting
H3E	[H] AM single sideband, full carrier [3] single analog channel [E] telephony, voice, sound broadcasting
J3E	[J] AM single sideband, suppressed carrier [3] single analog channel [E] telephony, voice, sound broadcasting
R3E	[R] AM single sideband, reduced or controlled carrier [3] single analog channel [E] telephony, voice, sound broadcasting
F2D	[F] angle-modulated, straight FM [2] digital, with modulation [D] data, telemetry, telecommand
G2D	[G] angle-modulated, phase modulation [2] digital, with modulation [D] data, telemetry, telecommand

*All GMRS equipment must have the ability to transmit emission F3E or G3E.

Family Radio Service (FRS)

Created in 1996 using existing GMRS interstitial frequencies

Regulated by FCC Part 95 Subpart B

FRS is “A short-distance two-way voice communication service, with limited data applications, between low power hand-held radios, for facilitating individual, family, group, recreational and business activities.”

License-free for personal or business use

Frequencies and modes:
- 462 to 467 MHz, FM only, **up to 2 watts**
- 22 channels, all shared with GMRS
- **Limited use of data for short text messaging and GPS position information (new 9/2017)**

Max power, bandwidth:
- 0.5 or 2 watts max depending on channel
- 12.5 kHz max bandwidth all channels

Restrictions:
- Data applications heavily restricted
- **Voice scrambling now illegal (2011-ish)**
- Max output power as low as 0.5 watts on some channels
- No detachable/external antennas on FRS radios

Family Radio Service (FRS)

Created in 1996 using existing GMRS interstitial frequencies

Regulated by FCC Part 95 Subpart B

FRS is “A short-distance two-way voice communication service, with limited data applications, between low power hand-held radios, for facilitating individual, family, group, recreational and business activities.”

FRS permitted emissions:

Designator	Description
F3E	[F] angle-modulated, straight FM [3] single analog channel [E] telephony, voice, sound broadcasting
G3E	[G] angle-modulated, phase modulation [3] single analog channel [E] telephony, voice, sound broadcasting
F2D	[F] angle-modulated, straight FM [2] digital, with modulation [D] data, telemetry, telecommand
G2D	[G] angle-modulated, phase modulation [2] digital, with modulation [D] data, telemetry, telecommand

Radios capable of any other emission types cannot be type accepted for FRS.

Exception: As of the September 2017 rule changes, FRS equipment can incorporate unlicensed Part 15 functionality such as Wi-Fi and Bluetooth, provided that the Part 15 functions are compliant with applicable rules.

FRS vs GMRS

FRS	vs	**GMRS**
HT's	*Radio types*	HT's, mobiles
0.5 to 2 watts ERP*	*Power limit*	0.5 to 50 watts
Non removable, vertically polarized, gain cannot exceed 2.15 dBi	*Antenna limits*	Removable antennas permitted unless radio is data capable (messaging/GPS). No specific limits on antenna height, design, or gain.
No repeater access	*Repeaters*	8 repeater channels
22, all shared with GMRS	*Channels*	22 simplex + 8 repeater inputs

* Radios which were type-accepted as GMRS or FRS/GMRS combo prior to the September 2017 rule changes, which feature non-removable antennas, and operate with 2 watts ERP on the 462/467 MHz interstitial or 462 MHz primary GMRS frequencies, may be operated without a GMRS license. Operation of these radios on repeaters (467 MHz primary) or FRS/GMRS combos with more than two watts transmitter output power, requires a GMRS license.

FRS vs GMRS

FRS	vs	**GMRS**
HT's	*Radio types*	HT's, mobiles
0.5 to 2 watts ERP*	*Power limit*	0.5 to 50 watts
Non removable, vertically polarized, gain cannot exceed 2.15 dBi	*Antenna limits*	Removable antennas permitted unless radio is data capable (messaging/GPS). No specific limits on antenna height, design, or gain.
No repeater access	*Repeaters*	8 repeater channels
22, all shared with GMRS	*Channels*	22 simplex + 8 repeater inputs
Sure	*Roger beep*	Please no

* Radios which were type-accepted as GMRS or FRS/GMRS combo prior to the September 2017 rule changes, which feature non-removable antennas, and operate with 2 watts ERP on the 462/467 MHz interstitial or 462 MHz primary GMRS frequencies, may be operated without a GMRS license. Operation of these radios on repeaters (467 MHz primary) or FRS/GMRS combos with more than two watts transmitter output power, requires a GMRS license.

Channel	Notes	RX	TX	Max Bandwidth	Max Power	
1	**462 MHz Interstitial Channels** Low-power general use • Mobiles, hand-held portable, or base stations • Permanent home stations are considered base stations when communicating with mobiles, portables, and other bases • Shared GMRS + FRS	462.5625 MHz	462.5625 MHz	20 kHz GMRS, 12.5 kHz FRS	5 W ERP GMRS, 2 W ERP FRS	Recommended for Portables and FRS Interoperability
2		462.5875 MHz	462.5875 MHz	20 kHz GMRS, 12.5 kHz FRS	5 W ERP GMRS, 2 W ERP FRS	
3		462.6125 MHz	462.6125 MHz	20 kHz GMRS, 12.5 kHz FRS	5 W ERP GMRS, 2 W ERP FRS	
4		462.6375 MHz	462.6375 MHz	20 kHz GMRS, 12.5 kHz FRS	5 W ERP GMRS, 2 W ERP FRS	
5		462.6625 MHz	462.6625 MHz	20 kHz GMRS, 12.5 kHz FRS	5 W ERP GMRS, 2 W ERP FRS	
6		462.6875 MHz	462.6875 MHz	20 kHz GMRS, 12.5 kHz FRS	5 W ERP GMRS, 2 W ERP FRS	
7		462.7125 MHz	462.7125 MHz	20 kHz GMRS, 12.5 kHz FRS	5 W ERP GMRS, 2 W ERP FRS	
8	**467 MHz Interstitial Channels** Low-power portable radios only • Hand-held portable radios only • Shared GMRS + FRS	467.5625 MHz	467.5625 MHz	12.5 kHz both services	0.5 W ERP both services	
9		467.5875 MHz	467.5875 MHz	12.5 kHz both services	0.5 W ERP both services	
10		467.6125 MHz	467.6125 MHz	12.5 kHz both services	0.5 W ERP both services	
11		467.6375 MHz	467.6375 MHz	12.5 kHz both services	0.5 W ERP both services	
12		467.6625 MHz	467.6625 MHz	12.5 kHz both services	0.5 W ERP both services	
13		467.6875 MHz	467.6875 MHz	12.5 kHz both services	0.5 W ERP both services	
14		467.7125 MHz	467.7125 MHz	12.5 kHz both services	0.5 W ERP both services	
15	**462 MHz Main Channels** Repeater outputs · High-power simplex for all station types • Mobiles, hand-held portable, base, and fixed • Permanent home stations are considered base stations when communicating with mobiles, portables, and other bases; fixed stations if only communicating with other fixed stations • Shared GMRS + FRS	462.5500 MHz	462.5500 MHz	20 kHz GMRS, 12.5 kHz FRS	50 W TX, 15 W TX fixed, 2W ERP FRS	Recommended for Full Power Mobile and "Base" Type Home Stations
16		462.5750 MHz	462.5750 MHz	20 kHz GMRS, 12.5 kHz FRS	50 W TX, 15 W TX fixed, 2W ERP FRS	
17		462.6000 MHz	462.6000 MHz	20 kHz GMRS, 12.5 kHz FRS	50 W TX, 15 W TX fixed, 2W ERP FRS	
18		462.6250 MHz	462.6250 MHz	20 kHz GMRS, 12.5 kHz FRS	50 W TX, 15 W TX fixed, 2W ERP FRS	
19		462.6500 MHz	462.6500 MHz	20 kHz GMRS, 12.5 kHz FRS	50 W TX, 15 W TX fixed, 2W ERP FRS	
20		462.6750 MHz	462.6750 MHz	20 kHz GMRS, 12.5 kHz FRS	50 W TX, 15 W TX fixed, 2W ERP FRS	
21		462.7000 MHz	462.7000 MHz	20 kHz GMRS, 12.5 kHz FRS	50 W TX, 15 W TX fixed, 2W ERP FRS	
22		462.7250 MHz	462.7250 MHz	20 kHz GMRS, 12.5 kHz FRS	50 W TX, 15 W TX fixed, 2W ERP FRS	
15R / 23	**467 MHz Main Channels** Repeater inputs · High-power simplex for fixed stations only • Mobiles, hand-held portable, control, and fixed • Mobiles and portables may only communicate to repeaters - no simplex • Home stations are control stations when using repeaters • Fixed stations are simplex only • May be used for repeater RF linking • GMRS only, no FRS use	462.5500 MHz	467.5500 MHz	20 kHz	50 W TX, 15W TX fixed	
16R / 24		462.5750 MHz	467.5750 MHz	20 kHz	50 W TX, 15W TX fixed	
17R / 25		462.6000 MHz	467.6000 MHz	20 kHz	50 W TX, 15W TX fixed	
18R / 26		462.6250 MHz	467.6250 MHz	20 kHz	50 W TX, 15W TX fixed	
19R / 27		462.6500 MHz	467.6500 MHz	20 kHz	50 W TX, 15W TX fixed	
20R / 28		462.6750 MHz	467.6750 MHz	20 kHz	50 W TX, 15W TX fixed	
21R / 29		462.7000 MHz	467.7000 MHz	20 kHz	50 W TX, 15W TX fixed	
22R / 30		462.7250 MHz	467.7250 MHz	20 kHz	50 W TX, 15W TX fixed	

GMRS and FRS channel grid as of 3/3/2024

GMRS Start-Up Process

1. **Get a license** - https://mygmrs.com/help/get-gmrs-license
   a. Application is submitted through the FCC ULS using your existing FRN
   b. Pay the fee, $35 for 10 years
   c. Processing time is typically 2-3 business days
   d. FCC Form 605F provides a temporary operating permit, valid upon submission of the GMRS application to the FCC and for up to 90 days thereafter. Temporary call "WT" plus residence or business phone number. - https://transition.fcc.gov/Forms/Form605/605f.pdf

2. **Register at MyGMRS.com**. Their database updates weekly – It may take up to 2 weeks before they will recognize your GMRS call sign. (womp, womp)

3. **Search for nearby repeaters** and add them to your radio's programming
   a. **Open System** - anyone with a license can use this repeater, no permission needed
   b. **Permission Required** - you must first submit an access request through MyGMRS and obtain approval from the system owner before using this repeater
   c. **REACT Only** - for REACT team members, emergencies, and traveler assistance only
   d. **Members Only (Paid)** - access to the repeater requires payment of membership fees

GMRS Start-Up Process

4. **Train your users**. Practice on a simplex channel first.
   a. How to turn the radio on and off
   b. How to adjust the volume
   c. How to change channels and which one to pick
   d. Making a call
   e. Answering a call
   f. Identifying transmissions
   g. Basic troubleshooting

5. **Go on the air**!

462.675 MHz is historically regarded as an emergency or traveler assistance channel within the GMRS service, though no regulation limits this channel to emergency use. While commonly used for non-emergency purposes, many REACT-affiliated repeaters still operate on this frequency.

When practical, it is a good idea to program 462.675 MHz (CH 20) and its 467.675 MHz pair (CH 20R/28) with a transmit PL of 141.3 and no receive PL. Today, this is commonly known as the GMRS “travel channel.”

REACT INTERNATIONAL, INC.

Public Service Through Communications

MyGMRS.com

MyGMRS.com is the de facto official clearinghouse for GMRS repeater listings and access requests in the United States.

MyGMRS is the Repeaterbook.com of the GMRS world.

Repeaterbook lists *a few* GMRS repeaters, but MyGMRS.com should be considered the primary resource.

Repeater	Location	State	Type	RX Frequency	TX PL	RX PL
Foxhill 650	Augusta County	VA	Open System	462.6500 MHz	131.8	none
Bluefield	Bluefield	VA	Open System	462.7250 MHz	141.3	141.3
WQWV679	Charlottesville	VA	Open System	462.5500 MHz	110.9	110.9
Chesapeake-575	Chesapeake	VA	Permission Required	462.5750 MHz	unlisted	unlisted
CHSPK-CM	Chesapeake	VA	Open System	462.6000 MHz	71.9	71.9
Covington1	Covington	VA	Open System	462.6500 MHz	67	67
Dumfries625	Dumfries	VA	Open System	462.6250 MHz	100	100
Eagle Rock 1	Eagle Rock	VA	Open System	462.6500 MHz	67	67
Farnham 625	Farnham	VA	Open System	462.6250 MHz	100	100
Alum Ridge 650	Floyd	VA	Open System	462.6500 MHz	141.3	141.3
Battlefield	Fredericksburg	VA	Open System	462.5500 MHz	67	67
Blue Mountain	Front Royal	VA	Permission Required	462.6000 MHz	unlisted	unlisted
W4CUL - CARA	Gordonsville	VA	Open System	462.6750 MHz	123	123
Green Bay 625	Green Bay	VA	REACT Only	462.6750 MHz	123	123
Tabb	Hampton	VA	Open System	462.6500 MHz	114.8	114.8
Varina	Henrico	VA	Open System	462.5750 MHz	203.5	203.5
Oak Hill 650	Herndon	VA	Open System	462.5500 MHz	136.5	136.5
Iron Gate	Iron Gate	VA	Open System	462.5500 MHz	136.5	136.5
West Piney	Ivanhoe	VA	Members Only (Paid)	462.5750 MHz	unlisted	173.8
Gleaves Knob	Ivanhoe	VA	Members Only (Paid)	462.5750 MHz	unlisted	173.8
WRYJ328	Lexington	VA	Open System	462.6250 MHz	131.8	131.8
Shenandoah 575	Luray	VA	Open System	462.5750 MHz	141.3	141.3
Montross550	Montross	VA	Open System	462.5500 MHz	100	100
Pulaski 550	Pulaski	VA	Permission Required	462.5500 MHz	unlisted	141.3
SW Richmond	Richmond	VA	Permission Required	462.5750 MHz	unlisted	unlisted
Richmond West	Richmond	VA	Permission Required	462.6250 MHz	unlisted	unlisted
Downtown Roanok	Roanoke	VA	Open System	462.6250 MHz	146.2	146.2
Roanoke Valley	Roanoke	VA	Open System	462.6750 MHz	146.2	146.2
Snowville725	Snowville	VA	Open System	462.7250 MHz	179.9	179.9
WRXZ575	South Boston	VA	Open System	462.6000 MHz	107.2	107.2
WQWV679	Stanardsville	VA	Open System	462.5750 MHz	110.9	110.9
Elliot Knob	Staunton	VA	Open System	462.6000 MHz	123	123
Bald Rock	Verona	VA	Open System	462.7000 MHz	123	123
Warrenton	Warrenton	VA	Permission Required	462.7250 MHz	146.2	146.2
Warrenton Lakes	Warrenton	VA	Open System	462.6000 MHz	none	none
Woodlawn 625	Woodlawn	VA	Open System	462.6250 MHz	none	none
Woodlawn 675	Woodlawn	VA	Open System	462.6750 MHz	none	none

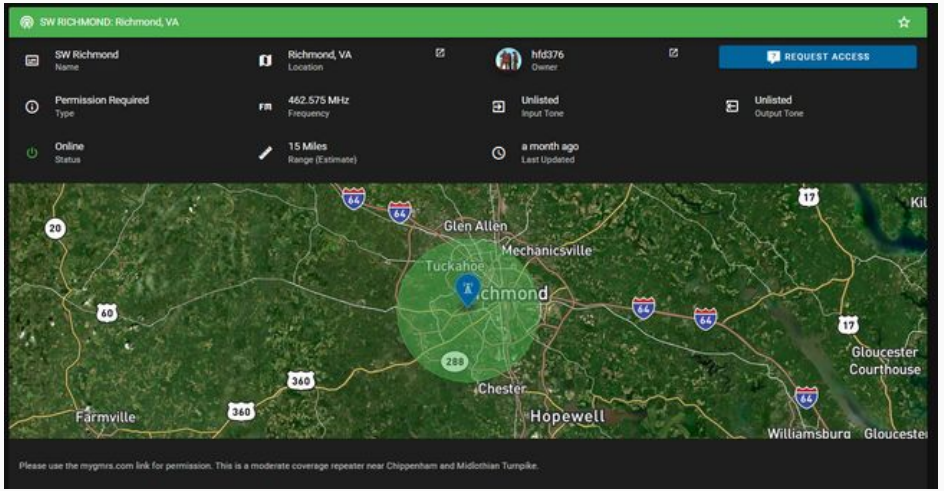
GMRS Repeater Types

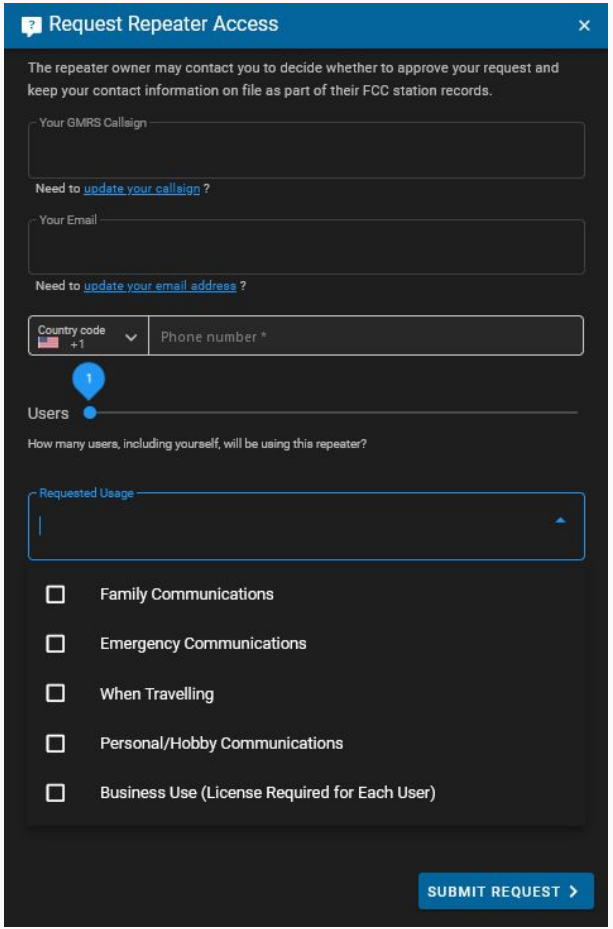
Open System - anyone with a license can use this repeater, no permission needed

Permission Required - you must first submit an access request through MyGMRS and obtain approval from the system owner before using this repeater

REACT Only - for REACT teams, emergencies and traveler assistance only

Members Only (Paid) - access to the repeater requires payment of membership fees





Requesting access to a GMRS repeater is easy.

Provide:

- GMRS call sign
- E-mail address
- Contact phone number
- Number of users who will be accessing the repeater
- The type of usage - family/emergency/etc.
- Additional details about your requested use

On some systems, the owner may assign you one or more unit numbers or other identifiers to use while operating on that repeater.

If your contact information, usage, or number of users changes, let the system owner know. They can be contacted through MyGMRS.

If you make frequent use of a repeater, you might ask if there is any way you can support its operation. Unlike ham repeaters that often have club backing, most GMRS repeaters are privately owned.

General Mobile Radio Service (GMRS)

Created July 31, 1987 from the previous Class A/B Citizens Band Radio Services (460-470 MHz, 1948)

Regulated by FCC Part 95 Subpart E

GMRS is “a mobile two-way voice communication service, with limited data applications, for facilitating activities of individual licensees and their family members, including, but not limited to, voluntary provision of assistance to the public during emergencies and natural disasters.”

Business use of GMRS:

· Former Class A/B CBRS stations licensed to businesses on GMRS frequencies before July 31, 1987 are grandfathered in to the GMRS service, and may allow their employees to operate within the GMRS service for business purposes using the business GMRS license.

· No new licenses are issued to businesses after 7/31/1987. Existing licenses can continue to renew without modification.

· Business use of GMRS is not specifically prohibited or restricted, but does require each radio user to have a GMRS license, which may be cost prohibitive.

· FRS or a Part 90 business radio license would be more appropriate and more cost effective in most scenarios.

Multi-Use Radio Service (MURS)

Multi-Use Radio Service (MURS)

Created November 13, 2000 from a portion of the Part 90 business band service.

Regulated by FCC Part 95 Subpart J

GMRS is “a mobile two-way voice communication service, with limited data applications, for facilitating activities of individual licensees and their family members, including, but not limited to, voluntary provision of assistance to the public during emergencies and natural disasters.”

License-free for personal and business use

Frequencies and modes:
- 151 to 154 MHz, 5 channels
- Voice, data, and image modes permitted
- AM and FM (virtually all equipment is FM)

Max power, bandwidth:
- 11.25 kHz or 20 kHz depending on channel
- Max power 2 watts all channels

Restrictions:
- Antenna height limited to 60 feet above ground or 20 feet above building or structure to which the antenna is mounted.
- Must not operate as a repeater station or signal booster
- Prohibition includes simplex repeaters or “parrots”
- No store-and-forward data applications (digipeaters)

Multi-Use Radio Service (MURS)

Created November 13, 2000 from a portion of the Part 90 business band service.

Regulated by FCC Part 95 Subpart J

GMRS is “a mobile two-way voice communication service, with limited data applications, for facilitating activities of individual licensees and their family members, including, but not limited to, voluntary provision of assistance to the public during emergencies and natural disasters.”

Pros:
- Channels 1-3 potentially less congested than FRS
- Supports some data and telemetry applications
- Equipment is relatively low cost
- No licensing formality, no technical skill needed

Cons:
- Channels 4-5 congested with legacy Part 90 users
- Limited frequency options

Potential uses:
- Family communications - VHF alternative to FRS
- Business communications
- Deployment at public service events - minor roles

Multi-Use Radio Service (MURS)

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GMRS is “a mobile two-way voice communication service, with limited data applications, for facilitating activities of individual licensees and their family members, including, but not limited to, voluntary provision of assistance to the public during emergencies and natural disasters.”

Some legacy Part 90 users licensed to MURS frequencies as of November 13, 2000 are authorized to continue operation “under terms identical to those of such nullified part 90 authorizations, including any associated rule waivers.”

MURS incorporates two legacy Part 90 color dot channels in common use by businesses.

Channel	Frequency	Type
Red Dot	151.625 MHz	VHF
Purple Dot	151.955 MHz	VHF
Blue Dot	154.570 MHz	MURS
Green Dot	154.600 MHz	MURS
White Dot	462.575 MHz	GMRS
Black Dot	462.625 MHz	GMRS
Orange Dot	462.675 MHz	GMRS
Brown Dot	464.500 MHz	UHF
Yellow Dot	464.550 MHz	UHF
J Dot	467.7625 MHz	UHF
K Dot	467.8125 MHz	UHF
Silver Star	467.850 MHz	UHF
Gold Star	467.875 MHz	UHF
Red Star	467.900 MHz	UHF
Blue Star	467.925 MHz	UHF

Image source: BuyTwoWayRadios.com

There are five channels available to MURS users:

Channel	Name	Frequency	Bandwidth	Power
1	MURS-1	151.8200 MHz	11.25 kHz	2 W
2	MURS-2	151.8800 MHz	11.25 kHz	2 W
3	MURS-3	151.9400 MHz	11.25 kHz	2 W
4	Blue	154.5700 MHz	20 kHz	2 W
5	Green	154.6000 MHz	20 kHz	2 W

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MURS permitted emissions:

Designator	Description
A1D	[A] AM double sideband full carrier [1] digital, on-off or quantized, no modulation [D] data, telemetry, telecommand
A2B	[A] AM double sideband full carrier [2] digital, with modulation [B] telegraphy for machine copy (RTTY, fast morse)
A3E	[A] AM double sideband full carrier [3] single analog channel [E] telephony, voice, sound broadcasting selective calling and tone-operated squelch permitted
F2B	[F] angle-modulated, straight FM [2] digital, with modulation [B] telegraphy for machine copy (RTTY, fast morse)
F2D	[F] angle-modulated, straight FM [2] digital, with modulation [D] data, telemetry, telecommand
F3E	[F] angle-modulated, straight FM [3] single analog channel [E] telephony, voice, sound broadcasting selective calling and tone-operated squelch permitted
G3E	[G] angle-modulated, phase modulation [3] single analog channel [E] telephony, voice, sound broadcasting selective calling and tone-operated squelch permitted

900 MHz Industrial, Scientific, and Medical (ISM) band radios

900 MHz ISM Radios

900 MHz ISM radios are digital transceivers with frequency hopping spread spectrum (FHSS) technology. No license is required, and power is limited to 1 watt TX power, 4 watts ERP.

These radios operate in the 902 to 928 MHz Industrial, Scientific, and Medical band, one of several created for license-free applications in May 1985.

- Not encrypted, but hard to monitor due to FHSS
- They are also capable of radio-to-radio calls, text messaging
- Public groups can be monitored easily by FHSS ISM radios
- Private groups and 1:1 calls require more effort for monitoring

These are currently the only digital radios available for personal or business use without a license.

900 MHz ISM Radios

Pros:

- About as secure as you can get without actual encryption.
- Some radios are ruggedized and can tolerate a little abuse.

Cons:

- Radios are expensive ($230 to $600 per unit)
- Limited selection of radios
- Documentation, marketing, support are aimed at business users

When to consider:

- When you need crystal clear personal or business comms
- Secure-ish communication via private calls, FHSS digital
- Operation in an environment with high RF noise
- Looking for something more obscure, away from other users
- Money is burning a hole in your pocket

International Communications

International Communications

US CBRS and Canadian GRS

· US stations can talk to US and Canada
· US radios may be used while visiting Canada, under RIC-18 General Radio Service rules
· Canadian GRS stations can talk to Canada, US
· GRS radios may be used by Canadian citizens visiting the US, under FCC Part 95D rules
· Same channels, modes, power limits
· No special procedures for cross-border use

US CB use in Mexico

· No official 27 MHz CB allocation in Mexico
· Limited operating authority (3 channels) for tourists by special permit, valid for 180 days - channels 9,10,11

US FRS/GMRS and Canadian GMRS

· Rules don't address TX to stations across int'l borders
· US FRS radios meet Canadian GMRS standards, may be used while visiting Canada
· US GMRS radios *may* meet Canadian GMRS standards; if so, may also be used
· US geographical limits along Canadian border do not apply in Canada (hmm)
· No special procedures for cross-border US
· Only channels 1-22 exist in Canada - no 467 MHz main channels, no repeaters

US FRS/Mexican FRS

· All transmitters must be certified for use in Mexico.
  » The Internet says "strictly enforced, don't risk it"
· Same 22 channels, 5 watt limit.

Summary

Summary · Thank You · KG4PEQ@rats.net

	CBRS	**GMRS**	**FRS**	**MURS**	**900 MHz ISM**
Radio types	HT, mobile, base	HT, mobile	HT only	HT, mobile	HT only
Band	HF - 27 MHz	UHF - 462-467 MHz	UHF - 462-467 MHz	VHF - 151-154 MHz	UHF - 902-928 MHz
Technology	Analog voice Voice Paging	Analog voice Limited data/messaging	Analog voice Limited data/messaging	Analog voice Data/messaging Image Telemetry	Digital voice Text messaging
License	None	$35 for 10 years Covers licensee & family	None	None	None
Power limit	4 watts TX AM/FM 12 watts TX SSB	0.5 to 5 W ERP interstitial 50 W TX main channels	0.5 to 2 watts ERP	2 watts TX	1 watt (30 dBm) TX 4 watts (36 dBm) EIRP
Repeaters	No repeaters	8 repeater channels	No repeaters	No repeaters	Range extenders
Channels	40	22 simplex 8 repeater inputs	22, all shared with GMRS	5	Nearly infinite (FHSS)
Antenna limits	60 feet, or 20’ above building or tree to which antenna is mounted	FAA limits apply	2.15 dBi gain max 27 or 33 dBm max ERP No detachable/external	60 feet, or 20’ above building or structure to which antenna is mounted	Refer to FCC Part 15 Max 36 dBm EIRP Attached (removable)