Overlanding Radio Discussion

Summary: CB, FRS, GMRS, Rugged Radio, & Ham

CB: CB was the only practical two-way radio system for the individual consumer, and served several subsets of users such as truck drivers, radio hobbyists, and those in need of short-range radio communications, such as electricians, plumbers, and carpenters, who needed to communicate between job site and main office. While some users have moved on to other radio services. The 27 MHz frequencies used by CB, which require a relatively long aerial and tend to propagate poorly indoors, discourage the use of handheld radios. Maximum power output: 4W for AM, 12W Single Side Band (SSB). Common CB transmission ranges: 2' antenna= 2-3mi; 3' = 3-4mi, 4' = 4-6mi

FRS (UHF): The **Family Radio Service** (**FRS**) is an improved walkie-talkie---often today referred to as HT (hand-talkie)---radio system authorized in the United States since 1996. This personal radio service uses channelized frequencies around 462 and 467 MHz in the ultra high frequency (UHF) band using 22 channels/frequencies. FCC requires a "fixed antenna" with maximum power output of between 0.5-2.0W. Normal transmission ranges: 0.3-1.0 miles.

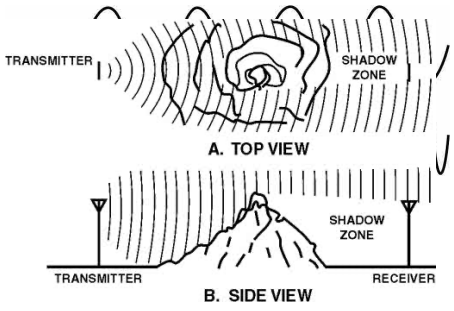
GMRS(UHF): The **General Mobile Radio Service** (**GMRS**) is a land-mobile FM UHF radio service designed for short-distance two-way communication. GMRS radios are typically handheld portable devices much like Family Radio Service (FRS) radios, and they share 30 channels with a frequency band with FRS near 462 and 467 MHz. It requires a license in the United States ($35, no test, 10 years). Power output is between 0.5-50.0W. Expected ranges: 1.0-2.0 miles. To achieve the 50W output you will need a dash-mount radio. There are many options. As an aside; the Eastern Sierra 4x4 Club (https://www.easternsierra4x4club.com) requires a radio and prefers a GMRS ("*A GMRS radio is required. If you do not have a GMRS radio we can loan you one for that run. A ham radio is also OK. We use GMRS channel 21*")



Rugged Radio: In November of 2020 (11/24/20) the FCC issued a citation to Rugged Race Products (RRP) to stop selling 6 of the radios they have been selling for years. RRP is now marketing GMRS-type radios, and no longer the most common previous models that violate FCC regulations. The best overlanding option with RRP would be a dash-mounted 25-50W GMRS radio. If you buy a new RRP radio, it will not work with their previous VHF models because the frequencies are different. Those frequencies used to be in the 150MHz-157MHz range.

HAM VHF/UHF (144-148MHz & 420-450MHz): The **2-meter** amateur radio band is a portion of the VHF radio spectrum, comprising frequencies stretching from 144 MHz to 148 MHz. On VHF frequencies such as 2-meters, antenna height greatly influences how far one can talk. The 70 cm amateur radio band is in the UHF radio spectrum, comprising frequencies from 420 MHz to 450 MHz. VHF vs UHF Which is Better?:The two frequency ranges (also called "frequency bands") used in most two-way radios are VHF (Very High Frequency), and UHF (Ultra High Frequency). We are often asked "Is VHF or UHF better?" Neither is inherently better, they each have strong points and weaknesses. VHF frequencies can penetrate objects better than UHF. VHF can also travel farther. If a VHF wave and a UHF wave were transmitted over an area without barriers, the VHF wave would travel almost twice as far.

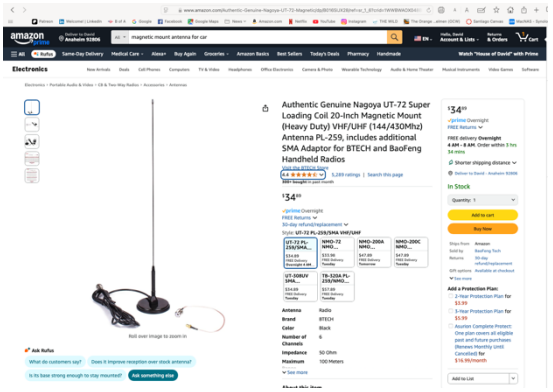
Obstructions: Remember we said you might only get 4 miles range or less? Radios signals are sometimes blocked by solid objects. Metal is not your friend when it comes to radio communications. Radio waves generally won't pass through it. Ever wonder why microwaves don't pass through the glass door? Did you notice the glass door has a metal mesh with very small holes? Microwaves are extremely high frequency with small signal waves. Although microwaves are small, they are still bigger than the tiny holes in the metal mesh. The metal mesh keeps the microwaves from passing outside the



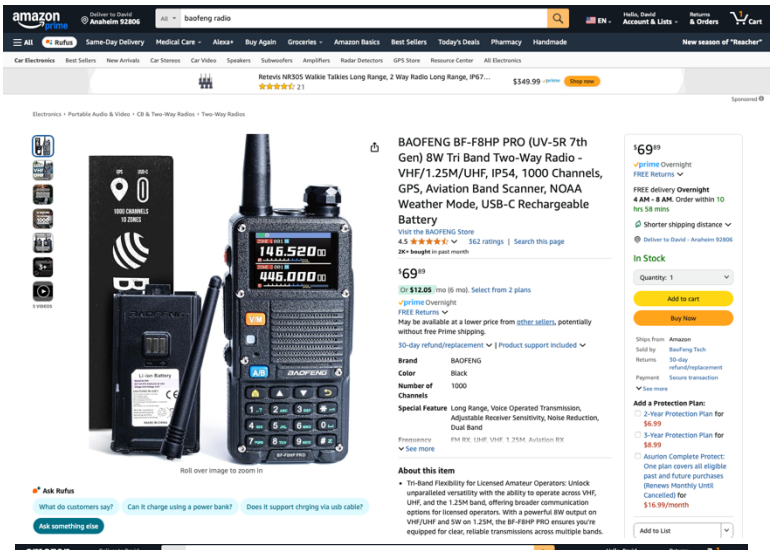
oven. Another consideration is hills. If you live in an area with **hills, they are like metal, no radio signal will pass through them.**

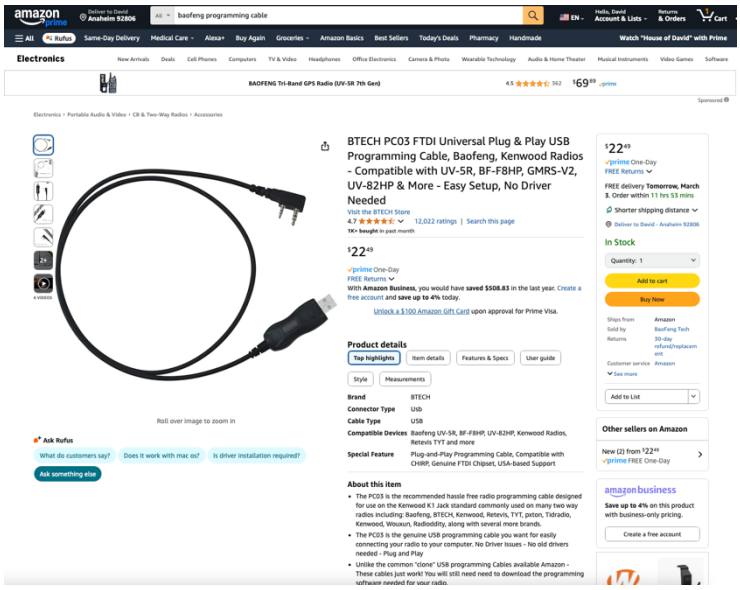
Recommendation for lowest cost comms capability:

1. Magnetic Mount antenna for mounting on the roof or hood of the vehicle. ***Nagoya UT-72 Super Loading Coil 19-Inch Magnetic Mount (Heavy Duty) VHF/UHF (144/430Mhz) Antenna PL-259, Includes Additional SMA Adaptor for BTECH and BaoFeng Handheld Radios***



2. Handheld radio: ***BAOFENG BF-F8HP (UV-5R 3rd Gen) 8-Watt Dual Band Two-Way Radio (136-174MHz VHF & 400-520MHz UHF) Includes Full Kit with Large Battery***
3. Cable for programing radio: ***BTECH PC03 FTDI Genuine USB Programming Cable for BTECH, BaoFeng, Kenwood, and AnyTone Radio***
    a. 1. Install CHIRP software (latest build .exe) from their website (linked from btech site url is in the included instruction sheet)
    2. Plugin the cable and wait for windows to install drivers
    3. Start CHIRP software from your start menu
    4. Select 'Radio'->'download from radio'
    5. In the open dialog window select your port, radio manufacturer and model number
    6. You will see progress bar and when it is done there will be a new tab with your radio's config open
    7. Save your original config just in case you need to go to it.
    8. With your config tab selected go to 'Radio'->'import from stock config' and select which bad file you want to load
    9. Pop-up window will open with list of bends and memory locations, use controls on pop-up window to modify list as you need and press OK. Take advantage of buttons under 'adjust new location', these will alter all addresses in the list for you. Press OK when done
    10. Verify that your address list is what you want and go to 'radio'->'update to radio'
    11. Answer whatever prompts you get and let it rip. You will see progress bar going. When it is done, your radio is ready to be used with updated channel list.





4. Download and install free CHIRP programing software from the BaofengTech web-site (https://baofengtech.com/software/). The standard club frequencies can be made available (not sure how just yet) and this will allow for a common reference to which channel is being used during each event.

5. How to get your HAM Technician License?:
    a. Technician questions are fairly easy, but you should study and prepare, and not just try and "wing it". I personally used a study book by Gordon West (look up Gordon West Technician on Amazon).
    b. Exams can now be taken in person or fully remotely now using Zoom. One place is: https://glaarg.org/remote-sessions-faqs/
6. Repeaters
    a. Ham: RepeaterBook App on IOS of Andriod
    b. GMRS: www.myGMRS.com

RM-100
Frequency Programming

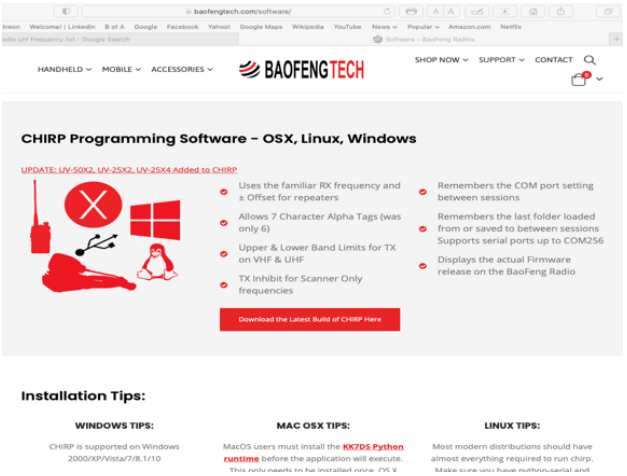
updated December 12, 2017

Content provided is included for the sole purpose of providing educational information on a passive basis. Frequencies shown have been compiled from various sources. It is the end user's repsonsibility to observe FCC regulations for proper use and programming of any radio frequency.



Channel	Name	Frequency	Tone
0	RGDRLY	152.960	
1	WTHRMN	151.625	
2	BFGRLY	151.715	
3	BAJAPTS	154.980	
4	NETWORK	151.685	
5	CHECKRS	151.925	
6	FAIR	150.860	
7	YOKOHAM	153.110	
8	RGDRLY	152.960	
9	CHKRS 2	151.505	
10	BFGPITS	153.395	
11	MAG 7	153.380	
12	RESCUE	155.160	
13	CORE	153.245	
14	PRIVATE	156.675	DCS 023N
15	SANDLMO	152.510	
16	BITD	151.490	
17	KOH1	157.450	

exhibit 3

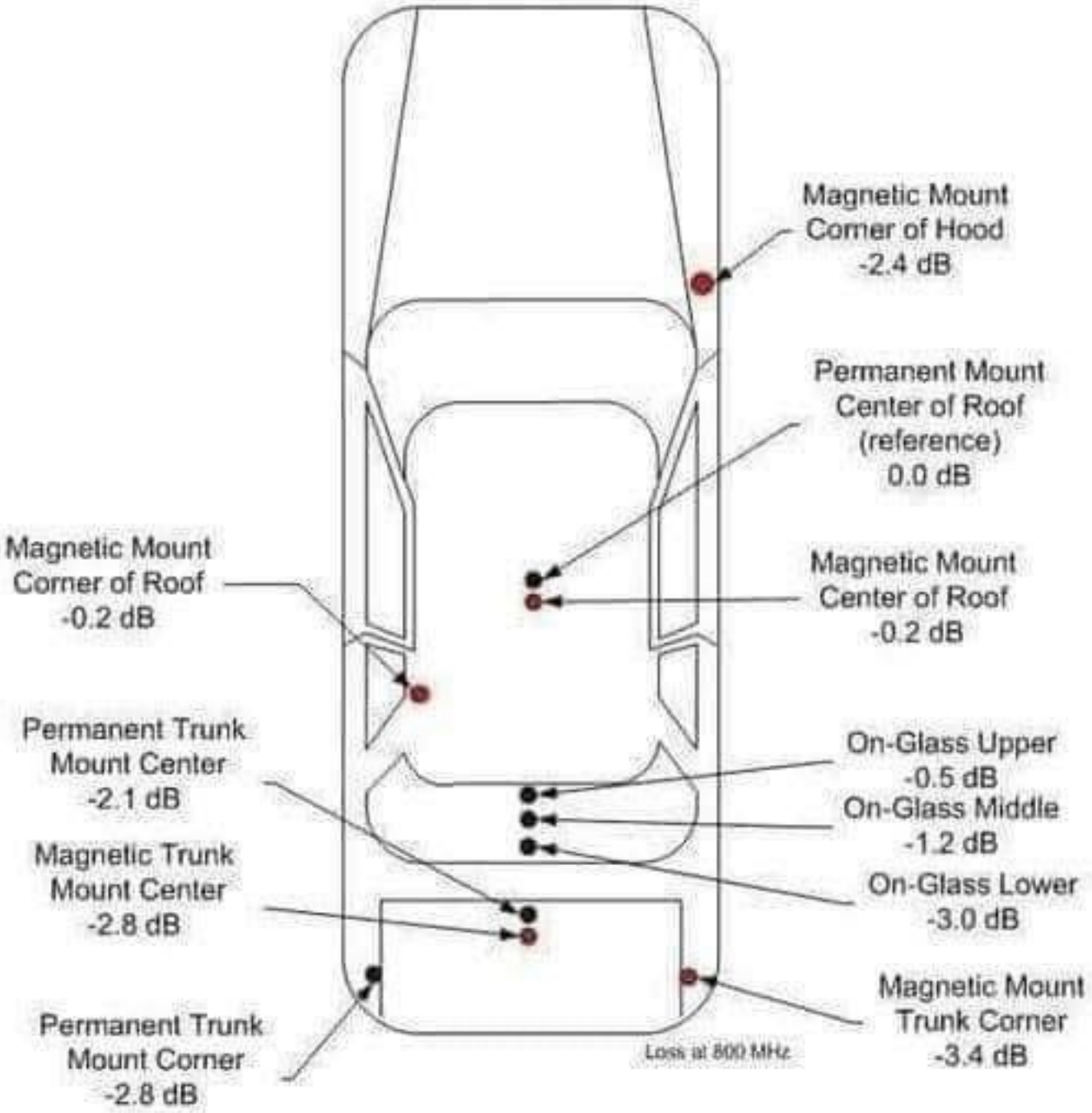


	Name	Receive Frequency	Transmit Frequency
1	SoCalTLCA	146.535	146.535
2	Overlanding	146.46	146.46
3	Wildns1	146.5	146.5
4	Wildns2	446	446
5	KNX107	450.7	
6	KFI640	450.725	

FRS Authorized Frequencies					
Location	Name	Frequency	Mode	BW	PWR
1	FRS 1	462.5625	NFM	12.5	2W
2	FRS 2	462.5875	NFM	12.5	2W
3	FRS 3	462.6125	NFM	12.5	2W
4	FRS 4	462.6375	NFM	12.5	2W
5	FRS 5	462.6625	NFM	12.5	2W
6	FRS 6	462.6875	NFM	12.5	2W
7	FRS 7	462.7125	NFM	12.5	2W
8	FRS 8	467.5625	NFM	12.5	.5W
9	FRS 9	467.5875	NFM	12.5	.5W
10	FRS 10	467.6125	NFM	12.5	.5W
11	FRS 11	467.6375	NFM	12.5	.5W
12	FRS 12	467.6625	NFM	12.5	.5W
13	FRS 13	467.6875	NFM	12.5	.5W
14	FRS 14	467.7125	NFM	12.5	.5W
15	FRS 15	462.5500	NFM	12.5	2W
16	FRS 16	462.5750	NFM	12.5	2W
17	FRS 17	462.6000	NFM	12.5	2W
18	FRS 18	462.6250	NFM	12.5	2W
19	FRS 19	462.6500	NFM	12.5	2W
20	FRS 20	462.6750	NFM	12.5	2W
21	FRS 21	462.7000	NFM	12.5	2W
22	FRS 22	462.7250	NFM	12.5	2W

GMRS Authorized Frequencies					
Location	Name	Frequency	Mode	BW	PWR
1	GMRS 1	462.5625	FM	20Khz	5W
2	GMRS 2	462.5875	FM	20Khz	5W
3	GMRS 3	462.6125	FM	20Khz	5W
4	GMRS 4	462.6375	FM	20Khz	5W
5	GMRS 5	462.6625	FM	20Khz	5W
6	GMRS 6	462.6875	FM	20Khz	5W
7	GMRS 7	462.7125	FM	20Khz	5W
8	GMRS 8	467.5625	NFM	12.5Khz	.5W
9	GMRS 9	467.5875	NFM	12.5Khz	.5W
10	GMRS 10	467.6125	NFM	12.5Khz	.5W
11	GMRS 11	467.6375	NFM	12.5Khz	.5W
12	GMRS 12	467.6625	NFM	12.5Khz	.5W
13	GMRS 13	467.6875	NFM	12.5Khz	.5W
14	GMRS 14	467.7125	NFM	12.5Khz	.5W
15	GMRS 15	462.5500	FM	20Khz	50W
16	GMRS 16	462.5750	FM	20Khz	50W
17	GMRS 17	462.6000	FM	20Khz	50W
18	GMRS 18	462.6250	FM	20Khz	50W
19	GMRS 19	462.6500	FM	20Khz	50W
20	GMRS 20	462.6750	FM	20Khz	50W
21	GMRS 21	462.7000	FM	20Khz	50W
22	GMRS 22	462.7250	FM	20Khz	50W
23	GMRS 550/15R	462.5500 +5TX	FM	20Khz	50W
24	GMRS 575/16R	462.5750 +5TX	FM	20Khz	50W
25	GMRS 600/17R	462.6000 +5TX	FM	20Khz	50W
26	GMRS 625/18R	462.6250 +5TX	FM	20Khz	50W
27	GMRS 650/19R	462.6500 +5TX	FM	20Khz	50W
28	GMRS 675/20R	462.6750 +5TX	FM	20Khz	50W
29	GMRS 700/21R	462.7000 +5TX	FM	20Khz	50W
30	GMRS 725/22R	462.7250 +5TX	FM	20Khz	50W

Mobile Antenna Mounting Consideration



A typical 5/8 wave 145 MHz (2 meter) antenna requires a ground plane of at least 42" in diameter. At 450 MHz just 15" is required and at 800 MHz a minimum of 8" is considered sufficient.

In terms of mounting mobile antennas on a vehicle, there are five general locations: the roof, front fender, rear fender, trunk and rear window glass (although other glass mount locations may be used). Of these, the center of an automobile roof is considered the best for mobile antenna placement, followed by the center of the trunk lid, the fenders, and then on-glass mounting.