

Amateur (HAM) Radio Service – A guide to Radio, Antenna and Coax selection and Installation

With Amateur (HAM) radio there are a lot of options for radios, antennas and coax. The first is whether you want a handheld (walkie talkie) or a mobile radio that installs in your vehicle. There are advantages and disadvantages with both. Amateur Radios as a whole have a significant advantage over CB radios with the maximum output power limit of up to 1500 watts vs. a maximum power limit of 4 watts for CB radios. Obviously with more power comes more range. There is also a big advantage with the higher frequencies available with Amateur radio. The antennas become smaller and are much more efficient. The major manufacturers are Yeasu, Kenwood and ICOM. There are other manufacturers of HAM radios that are okay and the cost difference between those and the major manufacturers can be significant.

Handheld HAM radios have some advantages over installed (mobile) radios such as that it is portable and no installation is necessary. The disadvantages are that a handheld has significantly less output power than an installed (mobile) radio, is battery operated, a very poor performing antenna and if operated within a vehicle further performance issues will be present due to the vehicle's metal body.

Some improvements to a handheld radio can be made. The poor performing antenna can be replaced with a high performance antenna, or by using a magnetic mount mobile antenna that would temporarily attach to the vehicle's exterior metal body. For the performance antenna on the handheld, make sure you purchase the correct connector type either SMA male or SMA female. (A coax (feed line) would run from the magnetic mount to inside the vehicle and connect to the handheld radio, also temporary. This would improve the antenna performance by using a better performing mobile antenna. Also with the antenna outside the vehicle, it would eliminate the vehicle's metal body from interfering with the signal from inside the vehicle. Another simple improvement can be made by powering the handheld radio from a charging adaptor that plugs into the cigarette lighter.

Vehicle installed (mobile) radios have a big advantage over CB radios; they have much more output power. A typical mobile radio is 25-50 watts but some go up to 75 watts. There are two big disadvantages with a mobile radio. The first is that it needs to be installed. The second is where to install it. The radio needs to be installed in a convenient location so that access to the controls is accessible and so you can easily hear the audio from the speaker. Most installable HAM radios have a jack for a remote mounted speaker and this might provide a little more flexibility with the where to install it question. The typical install locations are on the dash, under the dash, overhead, on a roll bar or an aftermarket mounting system.

There is another type of vehicle installed radios that provide much more flexibility. These are radios that have a detachable face. The detachable face has all of the controls and display but not the speaker. Many of these types of radios have some controls built into the microphone. The controls can be frequency or memory selection, output power adjust and some other lesser important features. With this system, the main unit can be mounted anywhere such as under the driver or passenger seats. These remote face is small and light weight and can be mounted in any of many locations. The microphone

most of these types of radios plug into the remote face. Depending upon the installation location, it could be inconvenient to have the microphone plugged directly into the remote face. In this case a microphone extension cable could be used to more conveniently route and position the microphone.

Selecting an antenna is just as important as selecting the radio. The better the antenna the better the performance you will get from the radio. It is best to install the antenna on a metal surface so that there is a good ground plane. However, with HAM radio, if using the 2 meter (144MHz) and/or the 70cm (440MHz) bands it is possible to install the antenna without a ground plane, connection to the body of the vehicle or without a ground connection. In this case the antenna length needs to be a half wave length. For the 2 meter band the antenna length is 1 meter. For the 70cm band the length is 35cm. There are also a few specialized antennas that no ground plane is required.

The type of coax is critical for 2 meter operation and even more critical for 70cm operation. High loss coax can have a significant impact to the output power at the antenna. High loss coax is like a garden hose full of holes. By the time the water gets to the end, there is not much water coming out. The higher the radio frequency more losses will be realized in the coax or by comparison, the more holes in the garden hose. For this, it is important to use low loss coax with these HAM bands.

Two more important considerations are the length and conductor type. The length of coax should not be much longer than necessary. The longer the coax the more losses that there will be. If the antenna will be installed on the spare tire mount or tailgate then a high flex coax needs to be used. Due to the repetitive motion, a solid center conductor coax will break over time. A stranded center conduct coax should be used with this type of antenna installation. I use ABR Industries type 240 in my vehicles.

The installed traditional or remote mount radios need to have the unit powered by the vehicles electrical system. It is best to connect the radio directly to the battery. Additional wire may need to be added to the wire harness provided with the radio. The two wires (positive and negative) should be twisted together from the radio all the way to the battery. The twist rate should be about one or more twists per inch. This helps eliminate unwanted interference from any other of the vehicles electronic or electrical systems to the radio which is heard through the HAM radio's audio speaker.

HAM radios have a lot of features. So much so that the features would not be easy to explain in a simple write up such as this. Many common and useful features are included in most HAM radios. Some additional (extra) features are dual radios (basically two in one) where you can monitor two frequencies at the same time. Multiband is another feature where you can have 70cm and 2m and perhaps 6m and 10m in a quad band radio. Then there are options with modes (modulation) types. The most common is FM and what our club uses. Other models are: AM, SSB, different forms of digital, CW (Morse code) and even types of video.

Good sources for news, articles, equipment swap-and-shop and product reviews is eHAM.net, arrl.org/what-is-ham-radio and hamradioschool.com.

When it comes to the radio needs for our club, 2 meter band and FM mode. Any other non-standard features (options) are up to you and how involved you want to be with HAM radio outside the club.

The cost of a radio can range from less than \$50.00 for a starter handheld radio to many hundreds of dollars to multiband and multimode radios with lots of features. It just depends on what you are looking for in a radio both short term and long term. Below are some examples of some radios and antennas

Handheld HAM Radio examples:

Yeasu: FT-60R around \$150.00

Kenwood: TH-K20A (VHF only) around \$140.00

BaoFeng: UV-5R around \$30.00

Traditional HAM Radios examples:

Yeasu: FTM-3100R around \$150.00

Kenwood: TM-V71A around \$450.00

ICOM: IC-2730A around \$325.00

Anytone: AT-778UV around \$130.00

TYT: TH8600 minim around \$140.00

Remote head HAM Radio examples:

Yeasu: FTM-300XD around \$470.00

Kenwood: TM-V710GA around \$550.00

ICOM: ID-4100A around \$350.00

TYT: TH7800 around \$250.00

HAM Radio Antenna examples:

Diamond for handheld: SRH77CA around \$25.00

Comet for handheld: SMA-24 around \$25.00

Diamond for mobile: NR770HA around \$50.00 (antenna only)

Comet for mobile: HP-32FHN around \$90.00 (antenna only)

Diamond (magnetic mount) for mobile: SPM35 around \$40.00 (mount & coax)

Comet (magnetic mount) for mobile: M-24M around \$40.00 (mount, antenna & coax)