New Ham Guide

Carroll County Amateur Radio Club
A nonprofit, equal opportunity organization
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Introduction

Congratulations on getting your license. This document discusses setting up a station for HF work -160 M to 6 M - and provides information and questions to consider as you get into the hobby and set up your first station.

Considerations

While we all want a super station with multiple beams on towers, radios, amps, etc., the reality is that most of us have constraints. High on the list is budget. You must decide what you can afford to get started and of course, as time passes you can save up to add equipment. Deciding how much you can spend now is your starting point. Other considerations may include HOA restrictions as antenna choices may be limited by their rules. Even without an HOA, the physical layout of your lot and house, and local code restrictions, will dictate what you can and cannot do.

Consider the location of your house and yard and where you could place antenna supports. Are trees available to use? Be aware of power lines.

Inside the house you need to plan for a shack location. Sometimes this is a dedicated room, other times it is just a spot on your desk to place a radio. You need to factor in access to power, as well as feedline placement.

And above all else- clear all plans with your significant other.

Antenna

New hams should consider building their first antenna. Nothing beats the thrill of a contact made with equipment you built yourself, and this is a good place to save money. A good first antenna can be made with little to no expense.

As you learned while studying for your license, there are many types of antenna. A simple wire dipole or vertical antenna works extremely well. It has been said many times, and is true, that "you can work the world on a wire and 100 watts". It can take some time and patience, but it is doable and a good way to get started.

Your land will help dictate your choice of first antenna. If you have open, flat space with no trees, a vertical with radials is a good choice. If there are trees to act as masts, then a dipole will work well and may be easy to erect. There are many options advertised for these types of antenna, but they are all just variations of the same basic design- the dipole. The real decision comes down to whether you want a resonant antenna or a non-resonant.

Resonant antenna are somewhat more difficult to build (but not hard), but are easier to operate. It is easier to build an antenna if you have, or can borrow, a SWR meter or antenna analyzer. Non-resonant antenna are easy to build, but require the use of an external tuner. The tuner can be manual or automatic, mounted at the antenna or placed in the shack. Either way it adds cost.

HF activity takes place on several bands, depending on propagation (discussed later). At this point in the Solar Cycle, you will find most activity on 20, 40, and 80-meter bands. An antenna to handle all three would be a good choice.

Important points to remember

Avoid power poles and lines. Voltages are lethal!

Try not to place your antenna near metal as this will alter the radiation pattern and affect tuning. Trees and vegetation do not interfere with HF.

Antenna choices are determined by your desired HF activities, but you also need to keep in mind the appearance of your home, your budget, and your physical ability to install the antenna.

Remember that antennas have high voltages at the ends. This is important to remember with verticals where radials are on the ground and can be touched by children and pets in the yard. Make certain the elements of your antenna are safely out of reach.

The 160 M band is special only because of the wavelength involved. The rules are generally the same, but a quarter wave vertical will be about 130 feet high: not so easy to build. A horizontal dipole requires 260 feet of space and should be 1/4 wavelength above ground.

6 Meters is also a bit special. Some activity takes place with FM, vertically polarized signals (local communication) but many activities also take place with horizontally polarized signals and typically require a beam. This special band is a topic for its own discussion.

After you get used to operating on HF and have a better idea of your specific goals, you can think about adding towers with beams, etc.

Because the decision on antenna choice has so many variables, it is impossible to make specific recommendations. At the end of this discussion is a list of resources. Most helpful are the ARRL Handbook and the ARRL Antenna book. Feel free to contact some local hams who could visit your location and help with suggestions.

Feed Line

There are two basic types of feed lines - coax and ladder line. If using ladder line, there are a few points to remember. Twist the ladder line as it comes down from the antenna into the shack. This helps negate external factors, such as common mode coupling, from affecting the your radio. Stay away from metal throughout the latter line's run.

A commercial tuner or match box may combine both a balanced to unbalanced converter (BALUN) and impedance matcher in the same box. As ladder line is balanced and typically 450 Ohm for ham use, conversion to 50 Ohm unbalanced coax jumper is required to match your radio. Tuners can be inside the shack or outside at the antenna, and you can separate the functions depending on how you want your antenna system laid out. There are many choices when it comes to laying out your first antenna system; how you choose to do it is up to you. They all work equally well and each has advantages and disadvantages. Choose the one that works best for you and your situation.

When using coax remember that any coax outside the house should be UV resistant and must be waterproof. *Connections must be waterproof as well.* If you plan to run the coax underground, it should be rated for direct burial.

All cable has loss, but coax tends to have more than ladder line but tends to be easier to work with. Short runs are not so much a problem, but longer runs will lower your signal getting to, and coming from the antenna. Lower loss coax is typically larger diameter, and therefore heavier. If you are making a horizontal dipole supported on the ends alone, consider a smaller diameter coax to hang down to the ground, then use larger diameter coax to run back to the shack. Also consider mechanical strength at the center where the cable attaches.

For lightening safety, and some claim lower noise, all feed line must be grounded at the base of a vertical antenna, or where the coax reaches the ground from a horizontal antenna. Where the feed line enters the house, you should make a common-point ground entrance panel. It should tie together the grounds from feed line(s), power mains, cable TV, and your landline telephone to a good earth ground.

Shack

Your shack needs to be a place you want to spend time. It should be in a quiet location so that the family does not disturb you, and you don't disturb them. You will need access to power and easy access to feedlines. Phone and internet are desirable. Some people put the shack in a barn or shed. Most put the shack in the house. The advantages of each are obvious. Trudging out to a barn in the middle of the night through snow is a pain, but the seclusion may well be worth it.

Desk space is necessary. You will want a place for your radio and power supply. The radio needs to be in a position such that you can easily reach it to work the controls. A surface where you can write, take notes, etc. is helpful with a location for a computer (keyboard, mouse and monitor) that is easy to reach and see. Plan for future expansion. At first you may have just one radio but as time goes on you may wish to add a second radio, as well as accessories, so plan ahead.

If you have young children, you should secure your shack. You are responsible for the correct operation of the station and need to prevent curious fingers from touching controls and making transmissions.

In addition to the essentials (radio, power, desk) there are some accessories that make operating easier. An easy to read clock helps. Better are two clocks: one for local time and one for UTC. Of course, most computer resources have time displays.

You should have the band plan and frequency chart easy to see. The ARRL's chart quickly and easily shows your allowed frequencies and the ARRL band plan shows where activities are usually taking place. (Please see the links at the end of this article.)

A computer is very useful, almost a necessity. Logging can be done with pen and paper, but it is easiest to accomplish on the computer. A computer log makes it easier to sort by call, location, date, etc. You can keep track of awards and other goals easily. Many logging programs are available; many are free. Most connect to the radio so frequency and mode are automatically entered. The logging program also records QSO date and time. All you need to do is enter the call sign. More complex programs will also control the radio, control antenna switches and rotators, etc. Consider starting with a simpler program and then upgrading once you are familiar with operating HF and have a better idea of your future plans. Web resources include:

- QRZ.com let's you search other hams by call sign. When you hear a call, you can easily see who it is and where he is located. You to create your own free web page where you can put in a biography, a list of your equipment, or any other information you'd like to share. Other resources are available including ham related news and feature article and used equipment for sale. Many hams have pictures of their shacks and antenna- a good place to get some ideas for your own shack.
- DXWatch.com has a list of "spots". Hams will post call signs of stations they have just contacted so you can see who is on air and at what frequency. There are other similar spotting sites, but DXWatch has good filters making it easy to see exactly what you want. The Ham Contest Calendar and DXpedition pages show upcoming events of interest.

You can connect your computer to your radio for rig control and the use of digital modes, but how you connect depends on your radio. Modern rigs have USB connections with internal sound cards. Older rigs need connections to your computer's soundcard from the mic and speaker connections or via Terminal Node Controller (TNC). Refer to your radio's manual for instructions.

Digital modes are driven by software. Free software includes FLDigi and WSJT. FLDigi provides most digital modes in one simple program. WSJT provides several weak signal modes, including the very popular FT-8. There are also commercial programs that make it easier to connect your radio and set up logging, rig control, and digital modes for those who don't want to fiddle around with computer settings.

Power is typically from mains through a switching power supply. Other options such as battery and solar can be used. It is a matter of your own personal choice. Power, and everything connected to power must be grounded.

Radios

There are myriad choices. You can spend from $100 up to $13,000. You can build one or buy one. Most HF transceivers cover from 160M to 6M and some, often referred to as a 'shack in a

box', also do VHF/UHF: everything you need in one unit. Your choice of a radio depends on your needs, desires and budget. However, there are no bad choices. If you buy a radio you don't like you can always sell it or keep it as a spare.
Major considerations include:

- Budget
- New or used?
- Build (kit or scratch) vs assembled
- QRP (low power) vs full power (typically 100 Watts)
- Portable or base
- Full mechanical controls (more buttons and knobs means more expensive, larger) or menu driven
- Technology: conventional analog vs SDR vs hybrid

In general, the trend for new radios is toward hybrid or SDR. However, the majority of radios in use are still conventional analog. Contests are won, and awards are obtained, without using the latest, greatest high-tech gear. Don't worry if your budget limits you to an older, simpler model; you will make lots of contacts.

When choosing a radio nothing beats hands-on experience. Ham Radio Outlet in Delaware or Virginia usually display several models from the major manufacturers. Most hams are happy to have you visit their shacks or you can visit a major ham show, such as the Xenia Hamfest, or the Orlando Hamcation. Each brand has its own 'feel' so try a few and get an idea of what feels comfortable.

Write down a list of what you need, and what you may want. For example, if you think you will be using CW, a radio with specific filters for CW would be nice. If your antenna is home-made, or not very wide band, then an internal auto tuner might be nice. Consider a built-in soundcard and USB connection if digital modes are a possibility.

As you look at radios, make notes. There is no way you will remember each radio's features, what you liked, and what you didn't. After you narrow down the choices to a final few, look for reliable product reviews, such as in QST or on eham.com.

Station Accessories

While these are fun and sometimes helpful, most are unnecessary. In some cases, you can buy or build your own. Please make sure your equipment is electrically safe and meets FCC specifications.
A partial list includes

- Microphone - Most transceivers come with a mic. If you spend a few minutes adjusting the internal equalizer and processor you will get good reports on your audio quality. An aftermarket mic may give better audio quality, but the main reason to buy one would be to allow hands-free use. You can use a mic on a stand, or on a headset boom. With such a mic you can use VOX or a PTT switch (hand held or foot switch).

- Headphones - allow you to work without disturbing the rest of the family. Headphones usually make audio easier to hear and understand, especially weak signals with a lot of background noise. Many models have a boom attachment for a mic.
- External speaker - Gives better audio quality than the typically small internal speaker. Some come with built in DSP.
- Audio equalizers and processors - not as necessary with newer radios as these circuits are typically a part of the radio.
- Clocks - for local time and UTC
- RF Switches (RF Feedlines, bandpass filters) - necessary with multiple antennae or radios
- Rotor control - for when you buy that tower and beam
- RF Monitors - there are a number of monitoring devices that look at output power, SWR, waveform, etc. While fun to watch, in general they aren't needed, especially with modern radios. Most radios have meters that show power out and SWR so you can operate safely.

Using it all

The goal is to make contacts. Your equipment is just part of the solution. Before turning anything on be aware of what is possible. Become familiar with the usual patterns of propagation. At this point in the solar cycle (Winter, 2019) daytime propagation is good on 20M and 40M. As a general rule, in the evening propagation improves on 40M and nighttime propagation is good on 40M and 80M. Spring and Fall are typically better. These are just generalities. Be familiar with propagation patterns and learn about the many software programs and on-line services that predict propagation.

Be aware of the types of activities on the HF bands. Some hams are on air just to make contacts. Others are looking for long conversations (rag chewing). You will find special event stations commemorating an historical event or activity. Many hams are interested in reaching goals such as working all 50 states, working all foreign countries, etc. Some like to participate in Parks on the Air or Summits on the Air where one makes contacts with hams working portable from parks and summits. There are public service nets, and nets for those wishing to make points. Listen to the net first to get a feel for how it works, then jump in. You cannot make a mistake.

Regarding contests, make sure you are familiar with their protocols before you reply to a call so that you have the appropriate information needed. You can see the rules using the Contest Calendar (link below).

The key is to listen first, then listen some more. Make sure you understand what each contest or activity requires for an exchange. If you are looking to make contacts with foreign countries, or specific states, then a contest is a good choice. Just remember the ham in the contest is in a hurry. No chit-chat, just the exchange info, a thanks/good luck, then move on.

If you listen up and down the band, you will hear stations calling CQ. Sometimes you hear CQ Contest, or CQ special event, etc. Listen to a few replies, get a feel for what is happening, then reply to the CQ with your call sign. Enjoy!

Sometimes you will hear 'CQ up'. This means the operator is working split. If he just says up, assume he is up 5 KHz. If he announces 'CQ up 10', then he is up 10 KHz, etc. many QSOs,

when he is done with his current QSO he will say QRZ. That means he is CQing again. Answer as you would a CQ.

Confirming contacts (QSL)

Paper QSL cards are still common. You can make your own cards, or order from a professional service. There are general specifications, but feel free to personalize your cards. Cards can be sent by mail with some hams requesting a Self Addressed, Stamped Envelope (SASE) for the return card. Cards can go direct mail or by a card collection and forwarding service - bureau – for example, the ARRL. There are online QSL services for many DXpeditions. For electronic QSL exchange, Logbook of the World from ARRL is widely used. eQSL and QRZ are also used for electronic QSL exchange and contact confirmation.

Awards

Some people just enjoy making QSOs. Others target the many awards offered by many organizations. Most operators enjoy some of each. Awards to consider include

- Worked All States - The major WAS award comes from the ARRL. There are other organizations that have similar awards. Variations include WAS on each of the 5 major bands (80, 40, 20, 15, 10 M) or WAS on all three modes (phone, digital, CW).
- Worked All Continents
- Worked All Zones
- Worked All Counties
- DXCC - this is DX Century Club. You must work 100 distinct DX entities. Of course, you can go for all 340 entities.
- Islands on the Air
- Summits on the Air
- Special Event - many of these are single station operations and offer a special QSL certificate. Some are more involved and have awards for contacts with a series of participating stations.
- WPX - awards for QSOs with 300-400 distinct prefixes
- Contests - there are many different contests and there may be one every weekend. You can have fun just trying to compete. As you get more interested, there are websites dedicated to the art of contesting.

Resources

1. ARRL Handbook
2. ARRL Antenna Book
3. QRZ.com
4. http://www.arrl.org/logbook-of-the-world
5. http://www.arrl.org/band-plan
6. http://www.arrl.org/files/file/Regulatory/Band%20Chart/Band%20Chart%208_5%20X%2011%20Color.pdf
7. https://www.contestcalendar.com/weeklycont.php
8. https://www.ng3k.com/Misc/adxo.html

9. DXWatch.com
10. FLDigi- http://www.w1hkj.com
11. WSJT- https://physics.princeton.edu/pulsar/k1jt/wsjtx.html
12. eham.com