

Setup and Operate Your First Ham Radio Station

Well seeing that you have come here you may be planning to put your amateur radio station together. If this is your first amateur radio station after having passed your Technician Class License Exam, or higher Class, first the Charter Oak Radio Society (C.O.R.S.) would like to congratulate you on your License. You may also have come here just looking into what it takes to put a station together to help you decide if Amateur Radio is right for you. What-ever the case is I hope these tips and information that C.O.R.S. has put together.

First let's start out saying that Ham Radio is vast and there are many aspects to this hobby. One can go a lifetime and still find that there is always something to learn about this hobby. There may be many questions that you have and one of the best things to find is a good Elmer or Mentor. Find a good local club in your area and ask them as well. For the most part you will find other hams a useful resource, as all hams have started from the very beginning. The ARRL has many useful books for purchase that can assist you as well.

Here are some of the topics that C.O.R.S. will discuss in this article

What equipment do I need?

What radio should I get?

What kind of antenna?

What bands should I operate on?

What are the bands for Technician class operator?

What power supply should I use?

Why do I need a power supply?

What kind of coax should I buy?

What types of connectors do I need for coax?

Should I operate mobile only, base station, both?

What about lightning protection and grounding?

Operating in an EMERGENCY situation!

What kinds and types of tools will I need?

Where can I get help if I need it?

C.O.R.S. will attempt to answer these questions or at least get you going in the right direction! You will have to do your research as to what rig, what antenna to build or buy, what rating power supply and many other questions that only you can answer. What is right for my station setup may not be the same thing you want or need. If you came here to get brand and model recommendations, stop reading now, but if you want a good general idea of how to set up your first ham station then read on.....

This article is in no way intended to be all inclusive and would be impossible to cover all aspects of a Ham Radio Station, but is intended to make you ask yourself questions so you can be a better than average ham radio operator! If you ask yourself a question that you can't answer, then to get the answer....is up to you! Do your research!

Introduction

Before we start on setting up your station let's start with a little background. Let's assume that you do not have the slightest idea about what your station needs, and that you have no idea where to start to build your station. Ham radio can be a very technical "hobby" and knowing some basic electronics, electricity, and some very simple laws of physics will help. Some study manuals do not help very much in this respect when it comes to setting up a new ham radio station because they are designed to help you pass the exam and do not to teach you thousands of other things you need to know that won't be on the exam questions. These "other" things you need to know will come with time and much help from either your research on the internet, books, (yes, you will have to do lots of reading and more study now that you have your license), ham friends, and many other sources. *"Any knowledge gained by extra study on your part will make you a much better and respected operator and will help you advance in ham radio. We all were not born knowing everything, so it will take time and lots of effort on your part along with the help of others. Don't expect to learn it all from the internet....you will need to buy....yes...buy reference books that are great teaching tools for all the information you may need.* Books that are recommended are the "ARRL Operating Manual", and the ARRL Antenna Book 22nd Ed

Equipment, tools, space, the "shack" and safety precautions basics.

Most new hams today are starting out in ham radio with a Technician class license. This license opens the door to much ham radio fun. You should remember that you now have all ham operator privileges from the 6 meter ham band and every ham band higher in frequency. Plus, you also have limited privileges on some of the HF bands including **CW only** on 80, 40, 15 meters and CW plus VOICE on a portion of 10 meters. So using this information, you should have already decided whether you will start out on HF or 6 meters and above or the lower frequency bands you now have. Most new hams start out on 2 meters, the most popular VHF ham band.

All of the information below will apply to either set up, HF or VHF/UHF.

A 2 meter ham station usually consists of a small transceiver, a power supply, swr/power meter, coax leading outside to the antenna and connecting cables from each piece of equipment along with a station ground and something to set it on, and of course, don't forget a good comfortable chair and a pen and writing pad!
Display your license proudly on the wall or the desk!

One of the most important things you can do first is to familiarize yourself with ALL of your ham radio station equipment.

This includes everything from your antenna to the equipment and the desk the equipment is sitting on. Many new hams start out without being totally at ease with their new ham transceiver with all those buttons, knobs, switches, etc, so get that operators manual out and "memorize" it. By knowing what each function does, you will have a great start at some real on the air fun.

Now assuming you have at least read the operators manual for the radio and your antenna and understand what they do and don't do, then it is time to start getting that station on the air. Plan, plan, and more planning will help you get it all going. Think everything out completely, but don't overthink the plan. Many new operators way overthink their station, then confusion sets in.

It is usually best to install and tune the antenna as the last step in the process of setting up a new ham station. It is fine to put it together and find a good high location for it, but don't mount it in its final position just yet. It will most likely require some adjusting for best performance.

You may already have figured out to hook everything up to the radio including the antenna...but....DON'T transmit...yet!...Is your antenna tuned properly according to the instructions that came with it???. Have you checked the SWR? If you know the answers to these questions....still...you need to wait until your station is completely set up.

Do you even have an SWR meter? If not, **buy** or borrow one **designed for the bands and frequencies you will use** and get that antenna tuned after your station is ready to go. If you need help, use its manual. If you still need help, get a local ham to help you.

You will need to run 50 ohm low loss coaxial cable from your antenna to the radio location inside your house to a location called your "shack". Use low loss types for runs over about 15 feet. An excellent recommendation for very low loss coax is the **LMR-400 type** if your run is over about 15 feet and especially if you plan on operating on 2 meters or the 70cm bands. LMR-240 type coax is also very low loss at hf frequencies. It can be found at the LMR-400 link above also. If you have clicked the link, you have found that, YES, LMR-400 is expensive, but remember that you want the rf from your radio **at the antenna and not lost in the cheaper coax especially on the 2 and 70cm bands!** Bottom line, get the lowest loss per foot coax you can afford for your specific application!

Your radio location of course is of your choosing, and can be anywhere inside your home that has access to AC power, and an entry point for the antenna coax and other wires that may be needed. The closer your radio is to the outside antenna, the better and you will save on the expense of the lower loss coax!

You will also need to install a good station ground just outside the entry point of the coax. Get a good copper ground rod, 8 feet long and drive it into the ground just outside the entry point of a window or where it enters your shack. Keep in mind that the distance from the ground rod should be as short as possible from it to the equipment inside. It is never a good idea to have a long distance from the equipment to the ground rod...remember..as short as possible. Now run very heavy (large conductor like # 8 size) if you can get it or as large as you can afford.

The idea here is to have the least resistance to current flow as possible. The larger the wire the less resistance. The longer the wire, the more resistance is usually the case. Connect all of your equipment using whatever connectors needed to this single ground wire using short

lengths if possible. Use the largest size wire that will fit the ground connections of your equipment.

It is also advisable to install a surge protector with several AC outlets on it for AC power connections for your station equipment.

Use metal water pipes as an alternate ground if you don't have access to a ground rod.

Install a [switch in the antenna coax](#) that switches the antenna to ground if at all possible. This helps with lightning protection.

You will need to have a "place" to set your equipment. This is called your operating position and is located in your "shack". It can be located just about any place in your "shack" as needed. It should be located at or near a window or other location that has easy access to the ground rod and the outside world for antenna coax, etc as mentioned above. The operating position can be a desk, table top, closet shelf, etc. Leave plenty of space between the desk and the wall for running wires, coax, etc.

Try to plan the layout of your station equipment on the desk, counter top, etc for future expansion...believe me...you will later need some more space if you start out with a very small working area. Again, plan, plan and more planning.

Now that all of your equipment is set up, refer back to those operating instructions on the radio, power supply and the antenna to refresh your memory.

Assuming that you have your [antenna](#) connected to the swr meter and it to the radio, you are ready to tune the antenna for best performance.

Use the instructions that came with the antenna for this...and use **LOW POWER**, when adjusting it. **Don't forget to ID when testing!** Get help from a local ham if needed.

After you have adjusted the antenna, then you can mount it in it's final position. Recheck the swr again using low power and if all is OK, mount it in it's final location. Your ready to get on the air!

[Suggested tools and simple test equipment and accessories you may need for your ham station.](#)

A good swr/power meter rated for your station frequencies and power level.

A good volt, ohm milliamp meter or digital meter that can measure continuity, resistance, voltage and current. Your choice. Get help from a local ham to help you decide what you may need. This is not a must have piece of station equipment but certainly comes in handy when troubleshooting coax problems, power, etc.

Assorted hand tools and soldering equipment:

Soldering gun rated at least 150 watts for soldering coax connectors plus solder.

Soldering iron, your choice depending on your needs. YES, you may have to learn to solder. Paying someone else for their labor to solder can get expensive!

Wire cutters, assorted pliers, screwdriver assortment, assorted wrenches, socket sets, as needed.

Electrical tape.

(You may have some or all of these on hand anyway.) Many different hand tools will be required if you get into antenna building or other projects later on. Don't forget, you will need a good source for hand tools and if you can't find what you need locally, your local hardware store is a fantastic source for just about any hand tool you will ever need

Headphones for quiet times with the family around. [More info here](#) on station accessories, tools, etc.

Maintain absolute CONTROL over your ham station. Disconnect the microphone when you are not around especially if you have kids. **You are responsible for the station anytime it transmits.**

ON THE AIR!

Here is an example of just a couple of random things you need to know more about assuming you have a station set up with little or no on the air operating on the ham bands.

During your first contact on the air, you get the question from the other operator....."How is my modulation?".....You would not know how to answer him if you did not know the meaning of the word "modulation"! Look it up...you will hear that word often....learn all you can about "modulation".

Here is another example:

He asks....."What polarity is your antenna?"

So you can see, if you had not learned some very basic things about ham radio in the past...then you would not be able to answer him correctly...you would have to ask him to define those strange words to you. At least, now you are asking the questions and hopefully.....learning!

Don't get me wrong, your first few contacts on the air most likely will be with total strangers who know nothing about you other than the call sign you gave them and maybe your first name. They are not there to TEST you! They do not know if you have a Phd in Physics or whether you are an electronics engineer, a school kid, a teacher, a construction worker, janitor or whatever! Most of them don't care one way or the other...they just want to meet and make new contacts and friends on the air. The only way they have of finding out more about you and your technical ability is by asking YOU questions. Details about your personal background and theirs can be learned in later contacts BUT....**be careful with giving very personal information over the air....the ham bands are open to all ears with a receiver! If you are not of legal age...be even more careful! It might even be wise that you have a parent present when you are actually on the air if you are not of legal age. Don't**

give your exact address over the air if you are under age! If the other operator wants your address, there are many methods of looking it up....off the air.

The first few contacts that you make may not be aware that you are a "newbie" to the ham bands until they start asking questions like in the above examples. When they get good answers from you, then they will know that you are well informed! When you make a new contact, don't be afraid to let him/her know you are new to ham radio.

So before we go further...an important thing you need to do in setting up your first ham radio station is learn all you can **FIRST!** Knowing some very basic, basic electronics is a great help. No that was not a mistake...the word basic was repeated twice on purpose! One of the most basic electronic skills is learning how to solder.....have you learned yet? How to use a simple VOM....what's that....see....you need to learn more than just what may have been on the exam.....do a search on the internet for terms, phrases, etc that are unfamiliar to you.....there are many good aids out there to help you learn. Here is a "test" for you...what is a VFO? Don't know....then look it up.

What is a PL259? What is an SO239....What is coax? Why all the different antennas? Where should I start and how? Questions, questions, questions...they all have answers that you will need to know.

Getting your station setup!

What band or bands should I operate on?

What bands are the most popular for the Tech Operator?

What kind of power supply if any will I need?

Up in the air about antennas!

Consider your family when setting up and using your equipment!

Lightning protection and grounding!

A bit about your authorized bands.

Up until the time before the new rule changes that allowed Techs to operate on the 10 meter ham band, 2 meters was and may still remain the most popular ham band!

Operation on 10 meters is very dependent on ionospheric conditions, (skip), the time of year, and very dependent on the 11 year Solar cycle which at the time of this writing (2008) is at a bottoming out portion of the cycle but gradually increasing in activity. When 10 meters really starts to open up with the increasing sun spot activity associated with the 11 year Solar cycle, then it may well be one of the most popular ham bands for you! Just give it time and you will see how easy it will be to make contacts worldwide using low power and simple antennas.

Since you are a Technician class ham, you now have privileges on portions of some HF bands plus ALL privileges on all ham bands from 50mhz and higher. [More info on your bands here.](#)

You need to decide if you want to operate on just the "upper" vhf bands and above (50mhz and above), or also use your new privileges on HF also or get the best of all worlds using all of your privileges on all of your allowed bands.

This is **your decision** and will be based on many variables in your lifestyle, property layout, budget, equipment needs, etc and really can't be answered by anyone but you.

If you decide to operate HF only, then you will have 10 meter voice and CW, plus **CW only** on the lower HF bands of 80, 40, 15 and 10 meters. You DO NOT HAVE ANY VOICE PRIVILEGES ON ANY HF BAND EXCEPT A PART OF 10 METERS!

So your **hf transceiver** will have to be capable of operation from at least 80 meters thru 10 meters using voice modes (ssb) AND CW. **NO...CW IS NOT A REQUIREMENT....**but if you use it....you will have to know it....so learn it! Reading between the lines you may ask, "Well, If I have privileges on the HF bands, then why can't I use ssb (voice) on the other bands besides 10 meters?

Simple answer.....**THE FCC PART 97 RULES! NO IFS ANDS OR BUTS!** You should already know this.

You are required by the FCC as a licensed Amateur Radio Operator to have access to Part 97...do you have a copy or do you know how to get access to one?

To help you out here, just click **[this link](#)** and download and save to your computer.

Now back to transceivers!

Most transceivers on the market, new and used come with both modes, CW and SSB, and some have other modes also and may have a coverage from 160 meters thru 10 meters. Some do not include 160 meters. **[Shop around](#)** and let the buyer beware when buying used equipment and consider the source wisely!

Most stock transceivers for HF come standard with 100 watts output. Remember, you are limited with your output on the HF bands as a Technician class ham....check and know the FCC rules. This is required by the FCC under Part 97!

These transceivers usually are radios with 100 watts as standard output.

Some multimode, all band radios cover it all on all ham bands but are much more expensive and come with many "bells and whistles" that you may or may not want.

As a word of caution, all those extra bells and whistles will not make your station any better if you are a poor operator and don't know how to use them properly. And even then, they may make only marginal improvements!

And above all, don't be tempted to get out of your portion of the band....remember.....the FCC may be watching over your shoulders!

Operating only on 2 meter repeaters.

Simplex operation

Base station or mobile:

Let's pretend for a moment that you have decided to operate only on [2 meters and/or the 440 ham bands](#) from a base station (your home) for a start, like most new hams do until you can get some experience under your belt and intend to study more to get your General class license as soon as you can.

You will need a transceiver, that covers the 2 meter ham band or a dual band radio that covers also the 440 ham band plus they should be capable of working thru [repeaters](#) using PL tones. The cheapest way out would be a single band radio for say...2 meters only, if money is an object. They can be had in either small low powered handheld (ht) units operated from internal batteries (rechargeable), or small external power supplies for base station use or the more standard and more powerful mobile mount size. The larger and more powerful type radios for mobile use have to be powered by the vehicle battery (DC) or used as a base station with an external power supply that converts standard AC power to DC to supply the radio.

These more powerful radios are designed for mobile use and do not come with an external power supply so it will have to be purchased also.

So what should you buy for a power supply to use the radio in a base station?

The first thing you need to know is the operating voltage and current consumption of the radio on full output transmit.....so how do you find that out?

Hopefully you will have the instructions, operating manual, etc that came with the radio....it should tell you in its specifications section. If you don't have the "specs", then do a search on the internet using the brand and model number of the radio and the word "operating manual", "manual", "users manual", "specifications", etc.

Look for voltage requirements and transmitter current, etc.

Most standard sized mobile radios require 12 to 15 volts **DC**. If the transmitter "pulls" 10 amps on full output transmit, then look for an external power supply that will handle **AT LEAST** that amount as a continuous rating....**AT 12 TO 15 VOLTS DC**. Never try to save money by buying a power supply that supplies **LESS** than the full rated output of your radio! **You WILL NOT SAVE MONEY** when your radio says...**NO!**

It is a good idea to get a power supply with 25 to 50% more output than is needed by the radio so as not to overload it. **It must be fully regulated** meaning that the DC power coming out of it is very "pure" with very little voltage changes under full load. **Do not use a power supply that is not regulated**. It may produce very "dirty" rf and may harm the internal circuits of the radio, so trying to save some money will cost dearly in the long run! Just make certain the power supply "specs" can be matched up with the "specs" of the radio requirements then go with a higher amp rating than your radio requires on transmit under full load like FM. If it seems like a bargain price, then maybe you should do more research....stay away from "too good to be true" pricing unless you have a more experience ham to help you make the decision.

It is worth mentioning that if you buy an older HF radio from the used market that many of them come with built in power supplies. Do your research.

Antennas for the New Ham Station!

The ham station antenna is the MOST important part of the station!

The first decision you will have to make is whether or not you intend to talk just locally using repeaters on 2 meters or the 440 band or also use your privileges on HF also.....or both.

We can define "local" communications using repeaters on 2 meters and 440 as follows: By local, this usually means within just a few miles, 10 miles to a 100 or so from your station depending on many variables. There is really no definition for the term "local" when it comes to amateur radio when looking at the big picture.....around the city, county, state, nation, other countries, the moon.....farther! But on the VHF and UHF bands, like 2 meters or the 440 band, you will be very proud of your station if you can "get out" 50 miles or more on simplex. You can talk much farther with very good repeaters with their antennas set at high elevations.

Most of the very inexpensive homebrew or commercial antennas, if mounted outside up as high as you can get them, will fill your needs. Even the simple ground plane type antenna works well for most local communications. However, if you don't yet have the skills to build a good effective antenna, then buy a good vertical base antenna that is "[ready made](#)" that suits your operating bands.

What if you don't have a way to mount an antenna outside up high?

Here is your chance to experiment with simple homebrew antennas! Many hams are very restricted do to several reasons when it comes to antennas and their locations.

If you are within a few miles of a 2 meter repeater, then it should be able to "hear" your signal even with a simple antenna mounted inside your "shack". Check out the simple 2 meter antennas on the [antenna project page](#) on this web site.

Antennas with no gain like the ground plane type will do a remarkable job over flat terrain or even from inside the shack but you may want to "spare no expense" (up to a point), by buying or building an antenna that has several db of gain for extended range and better coverage. Your antenna decision will depend on your terrain, location of nearby buildings, etc. Higher above ground is always better on VHF and as a general rule also on HF. Always look for dbd rather than dbi in the specs of the ads. The "d" in dbd stands for dipole. Some antenna makers use the dbi gain figures (free space), to make the antenna "appear" to have more gain than it actually does when compared to the standard "reference" dipole. So an antenna rated as 5 dbd would have more "gain" than the same antenna rated as 5dbi when compared to the standard.....the dipole.

Building your own 2 meter antenna can be lots of fun, and easier than you think and may **OUT PERFORM** the same type of antenna on the commercial market. It will be **MUCH** cheaper than a commercial made equal. You will need very little "test equipment" for

building one that you will be proud to say, "I built it myself". Basically all you would need would be a good swr/power meter usable on 2 meters and a few hand tools and materials plus your ham station transceiver. See the [antenna projects](#) on this web site and look under "50mhz and up" for several homebrew antenna plans and projects.

What about mobile only operating using VHF/UHF repeaters? What antennas should I choose?

This is mostly a personal choice, but an effective mobile antenna really needs some gain to help you get your signal out better. Choosing a gain type antenna to an otherwise non-gain antenna situation, helps the radio signal that you are transmitting be heard better. Plus as a bonus, you will usually hear the other stations further. At the present time, there are just too many options and models to choose from, so shop around and find what best fits your needs.

Vertical or horizontal polarization antennas?

Why the difference between the two...why not just one type of "polarity"?

Here is a simple way of looking at polarity as related to antennas:

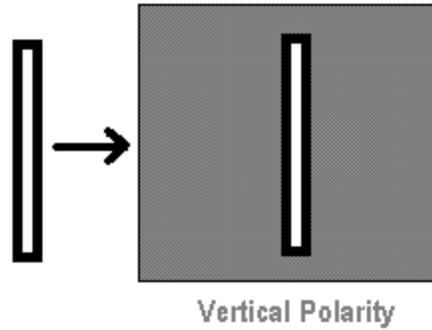
Imagine you have a "beam" of light energy (the transmitted signal), coming from a transmitter antenna and the "beam" is perfectly straight up and down (vertical polarity), in the form of this > | This energy is being transmitted over some distance and does not spread...sort of like a laser beam.

Now place a solid object that is much larger than the "source beam" between it and a receiver antenna that is trying to see it, that looks like this > ____ Now imagine the horizontal ____ has a slit cut into it from one end to the other so as to allow energy (rf) to pass thru it. The two lines represented here are now at opposite "polarity" to each other. One is vertical and the other is horizontal. There would only be a very tiny area where the two intersect if they were in the form of a plus sign.

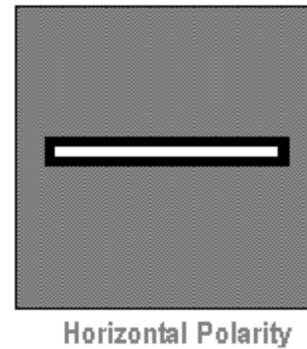
Below is a drawing that may help you understand better:

Vertical Polarity VS Horizontal

On the right, the vertical polarity wave is on the left of the gray square and going toward the "antenna" that is vertically polarized. You should see that it will "fit" within the "antenna" in the square. The arrow represents the direction of travel.



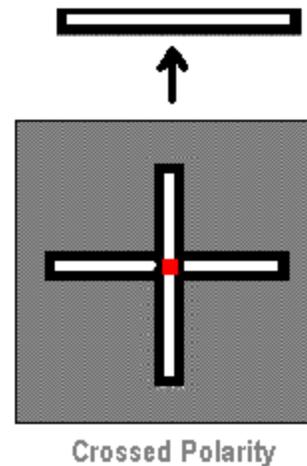
In the next section of this drawing below, the horizontal wave is going toward the horizontally polarized "antenna" represented in the gray square. Direction of travel represented by the arrow.



The signal will "pass" into the receiving antenna without loss in both examples above. Each will "fit" the respective "space" needed.

Down below bottom right, you will see that if the "polarity" of the transmitted antenna signal and the receive antenna is crossed, (crossed polarization) then only a very small portion of the original transmitted signal represented by red will be passed into the antenna. This analogy works for both receive and transmit.

Both receive and transmit antennas must be the same polarity to get the signal.



N4UJW

Analogy of vertical and horizontal polarity

So using this analogy, if both the transmitter antenna and the receive antenna are the same "polarity" either vertical or horizontal, then the maximum amount of energy (rf) is passed to the antennas thru the imaginary "slit". Both antennas are in the same plane relative to the earth.

If you plan on strictly using repeaters and talking to mobiles and simplex (station to station), locally using FM, then build or buy an antenna that is vertically polarized. This is due to the difficulty of mounting horizontally polarized antennas on vehicles so vertical polarity is almost always used on FM. If you want more range to repeaters in different

directions, then go with a vertically polarized Yagi (beam) or a high gain vertical mounted up as high as you can get it.

If you plan on using SSB on the lower portion of 2 meters, then horizontal polarity is the way to go. Most SSB operators on 2 meters use horizontal polarization unless they are extremely close to each other. Remember that due to "cross polarization", like in the drawing example above, both the receive and transmit station must use the same polarity antenna.

If you really want to increase your usable range, then look into the [Yagi types](#) (beams). They can be built or bought with gains exceeding 10 to 15 times or more over standard ground planes or "no gain" type antennas and depending on their polarity relative to the ground, can be used with much fun. An antenna with a gain of 10dBd will give you an erp (effective radiated power), of about 500 watts using a 50 watt signal to the antenna input assuming no losses in the feedline! As a general rule, horizontal Yagi types are used on the lower ssb portions of the band and vertical types are used in most other portions including repeater use. A rotor that will handle the weight of the Yagi will also be required to "aim" the antenna toward the other station. NO...you don't need those rotors costing hundreds of dollars...just a plain simple "Radio Shack" TV rotor should work well for most Yagi type antennas. Always do your research on antenna weights, wind loads, etc before buying a rotor.

Operating Simplex!

Operating simplex (station to station direct without repeaters), can be a very fun way of using ham radio. It's just a means or method that you use to "talk" station to station where both stations on each end of the conversation are on the same frequency and no repeater is involved. **Actually, it is the preferred method, if you can reach the other station using simplex rather than using a repeater.**

Both the transmitter and receive frequency are the same and no offsets are used as in repeater operation. Range is usually less than when using repeaters except under really good band conditions. DX'ing on 2 meters for distant station contacts can be really a challenge and loads of fun.

A warning worth remembering!

Portions of the ham bands including 10 meters are set aside for simplex operations. **As a Technician class ham, you are not allowed on these 10 meter FM frequencies....you would be illegal and out of your portion of the band!** See the [band plans](#) for simplex frequencies for each ham band. Learn the simplex frequencies for your operating privileges!

Never operate in the simplex mode on repeater input or output frequencies. You will cause severe interference and disruption to their operation and if it continues to happen on other than an accidental basis, you may hear from the FCC. Even under band conditions where you may not be able to hear the repeater, **it may hear you if you are within it's receive range!** So try to remember to stay off repeater frequencies using simplex. (End of warning).....use the band plan.

If you can communicate using simplex with the station you want, there is NO NEED to use

a repeater unless you are having difficulty receiving the other station or he is having trouble hearing you. If your signal can be heard well by the other station using simplex and you can hear him well, then stay there and don't tie up an entire repeater system, especially in a busy metro area. This is just plain common sense! Try first if you must, to make contact on a repeater the other station may be monitoring, then if a contact is made and you know you can use simplex between you and him.....use it! Let the repeater remain open to do it's job.....repeating....for those who can't use simplex.

What kind of coaxial cable do I need for operation on 2 meters or higher frequencies?

The output stage of your radio and most modern transceivers will require that you attach 50 ohm type coaxial cable (also shortened to the word "coax" between the radio "antenna" connector and the antenna.

This is the main and only "pipeline" for getting the rf energy that your radio produces to the antenna where it is radiated over the air. This "link" in your *total antenna system* is probably **second in importance of station equipment**. Remember that your antenna should be considered the *first most important*, then the coax. Not counting you, the operator!

If these two combined parts of your station are poor, so will be your signal over the air and received and transmitted signals will be weaker or not heard at all compared to a good antenna system. All of the components and devices between the antenna connector on the radio up to and including the antenna is called your **antenna system**.

The idea of having a good low loss antenna system which consists of the antenna and it's feedline (the coax), and an efficient antenna, will certainly enhance your station's performance, so try to pick coax types that have the least loss in db per foot, like the [LMR-400 type](#), that you can afford at your operating frequency relative to the required length you need to get the signal to the antenna. This means that you should not be afraid to try a higher loss per foot type coax if you have **very short runs** to the antenna. There is a happy medium when it comes to station expense....don't over do it unless you have money to burn! Just because you have a brand new roll of ultra low loss coax in a 100 foot roll connected to an antenna 10 feet away from the transceiver would not only be wasteful and expensive...but it would make little to no difference in your signal on the other end compared to a regular 10 foot length of less expensive higher loss coax. It's your money....burn it if you want to. If you can make at least a 3 to 6db or more change for the better by reducing the loss incurred in the feedline using the more expensive coax, then by all means consider it...otherwise...don't bother.

See this article for more on [Coaxial Cable Characteristics and Data](#) then come back here when you are done. It will help you compare different coax types and the amount of loss each type has for a specified number of feet at a particular frequency.

Using repeaters in times of EMERGENCY!

Rush hour times of the day in major metro areas or even in rural areas are usually the times that major auto accidents happen and may require emergency radio traffic on the

repeater by hams reporting emergencies or needing police, fire, rescue, etc assistance for whatever reason. Always keep your NORMAL repeater transmissions SHORT and PAUSE FOR SEVERAL SECONDS BEFORE ANSWERING THE OTHER STATION DURING NORMAL RUSH HOUR TIMES!

This gives valuable time in between transmissions for an emergency call to get into the repeater. If the emergency call can not be heard because everyone using the repeater is "Quick Keying", then lives may be lost.....**seconds sometimes count!**

Dialing 911 using a repeater!

Lots of repeater systems are set up with a direct phone patch to 911 police, fire, etc which can be accessed by the entry of a few key pad strokes on the mic.

This gives the ham operator reporting the emergency from his car or where ever he may be mobile or portable, direct access to the needed emergency people via a direct phone patch to them using the repeater to access the 911 number directly. Several seconds or even minutes can be shaved from the process of breaking into an ongoing conversation and getting the other station/s to relay the emergency over their telephone.....if they have one..... by using the direct entry 911 function of the repeater system! If you have ever had to get vital life saving information to emergency responders, you know that seconds count and the more people between the source of the emergency and the emergency responders can make for confusion with the much needed details of the emergency. **Check with your repeater trustee or owner to see if it has this function and learn how to operate it.....**it may save someone's life in the future...maybe even yours! It is imperative that the 911 operator knows that you and he/she are using radio as part of the connection. Make them understand that both people talking at the same time will not work like on a regular telephone conversation. Each party must say "over" when they want to hear the other party. It is the responsibility of the ham radio operator to key and unkey his mic to accomplish the transmission of both sides of the emergency contact. The 911 operator has no control over your radio...only you. Remember, you are the control operator of your station.

If you hear an EMERGENCY in progress on the radio, listen carefully first and listen some more. Take notes if possible...and do not interrupt the station if he has already made a confirmed contact that will relay the emergency information. Only contact the sender of the emergency IF and ONLY IF you can assist him with the emergency. If 10 stations try to talk all at once to him....no one will hear anything!

If he is having difficulty in being heard attempting to get anyone's ATTENTION to report the emergency, then assist him in any way you can to relay his emergency message to the proper people. Of great importance is the exact location of the emergency, and then the exact nature of it, how many people involved, is there a fire, address, etc.

An emergency dispatcher getting a location of "**There's a car wreck on highway 59, and people are hurt badly**" is NOT enough information!

Highway 59 may be 1000 miles long! Give mile markers, distance and direction from land marks, stores, intersections, etc. How many people? How many vehicles involved.

In short, don't make the emergency dispatcher guess who, what, where, when, etc.

Give them as much **exact** information as you can to help speed up rescue operations. Saving time.....saves life!

Which direction from what or where on highway 59. Is there a highway mile marker, billboard, cross street, landmarks, bridge, overpass, railroad tracks, guesstimate as to mileage from last town you passed thru, on which side of the road, North, South, East, West, etc that can be used to find the location with faster accuracy? Give the 911 operator the information as if you were on the receiving end of the conversation.

THE FEW SECONDS YOU USE TO GATHER EXACT DETAILS MAY SAVE MINUTES FOR EMERGENCY RESPONDERS AND MAYBE LIVES!

Normal Amateur Radio Repeater Operations and suggestions for use.

I guess there is no real definition of "Normal Amateur use" when it comes to activity on ham repeaters. Your local repeater/s may be idle for hours on end with nothing but the routine repeater CW or voice "ID".

Then around the time of "rush hour" when all of those poor working guys and gals who are attempting to get ahead of those credit card bills have either started or ended their day driving to or from their work "QTH", and all of a sudden, the repeater gets very busy with idle chit chat. I suppose this could be considered "Normal Use" by most hams. The subjects of conversations spoken on ham repeaters are as varied as the number of total hams licensed in the U.S., so almost anything goes on ham repeaters. Keyword in the last sentence.....**almost**, within the bounds of Part 97 FCC rules & regs!

In cases of "open" nets, roundtables, etc that are scheduled on repeater systems that you may join in, then feel free to use them. There are many "scheduled" drive time roundtables or nets on repeaters scattered over the entire country and by joining into the conversations as your turn comes, or just listening, can really make the drive time fly and be very enjoyable. You may even get to meet one of your close friends whom you have never seen in person, over a cup of coffee on the way.

Many repeater systems have practice nets for passing emergency traffic and are "Directed Nets", meaning that you listen to ALL of the instructions of the net control operator before you key the microphone. He will inform everyone within range of the repeater on its proper use and procedures during the net. Listen up!

Don't break into an ongoing **emergency net** UNLESS YOU HAVE EMERGENCY TRAFFIC RELATING TO LIFE AND LIMB such as reporting a car accident, fire, etc. Again, just common sense! Only join the net when requested by the net control operator. He will give many chances for "other stations" to join in. Just be patient!

Another use of repeaters in many areas is the buying and selling nets for ham equipment. Kind of like ebay over the air without the ebay. Normally equipment bids are not made over the air. Transactions are done directly between buyer and seller. Usually they are directed by a control operator of the net. (It's his or her turn this week).

Users are allowed to "post" their wants, needs, for sale items, trades, etc over the air and sometimes hundreds of people are listing...kind of like fishing...you never know what will bite that hook! Some of the larger repeater systems maintain a web page of postings on the internet and you can always go to it to see if that "whiz bang thing a ma jig" you are "needing" is for sale by anyone and where to get it.

The same types of swap, sell and trade nets are also on the HF bands every week or so and sometimes...thousands are listening.....speaking of HF.....

Setting up your station for HF use:

As a Technician class license holder you now have portions of 80, 40, 15 and 10 meters as operating bands on HF.

Not only do you have to decide on a "rig", (your radio), but you have to decide on a good antenna, build it or buy it, where to put it, how high above ground for the antenna, what bands you want to operate on, etc.

If you want to operate only on 10 meters for the time being using your new voice privileges on ssb, then of course you will need space OUTSIDE. HF antennas as a general rule do not function well inside, due to surrounding metals or conductive surfaces of all kinds within the home and hf antennas are much larger.

A standard 10 meter dipole put up in the horizontal fashion or even the inverted V fashion, will take up about 16 feet or so in the horizontal length and needs to be at least 2 times that length above ground for best performance. This type of antenna can be homebrewed with very little expense. ([see HF antenna projects here](#))

Assuming that you have decided to build your own HF antenna for 10 meters, you will need a good swr/power meter for tuning the antenna for best performance on 10 meters or possibly you have decided to also use CW on the other bands like 80, 40, and 15 meters. Either way, most antennas will require some tuning for best performance....even those right out of the box! The swr/power meter will give you the needed readings for physically tuning the antenna length for best performance.

One good choice of an "all band" standard size antenna for HF (80 thru 10 meters) would be what is called a multiband doublet. This is a multiband antenna. You can see plans for it on the [antenna projects](#) page. There are many others also. Many great [commercial made antennas](#) are also an option!

You will need an "antenna tuner" to go along with it and it needs to be fed with twinlead or ladder line and then you will have an "all band" antenna that will be very easy to build

with little investment other than a good "[antenna tuner](#)". If you're not familiar with how antenna tuners operate, then just read this article on [how to use antenna tuners](#). It also contains a diagram for setting up your hf station when you become a General class ham! A must read!

Of course you also have the option of buying commercial wire type antennas, Yagis, and verticals that can be used very effectively on HF. You have many decisions to make when attempting to get on HF due to the lengths of the antennas at HF frequencies and your space limitations! *You can't get 10 gallons of water into a 5 gallon bucket*, however, there are many limited space type antennas like the TAK-tenna that can really help you get a good signal out. See the [TAK-tenna review](#) on this web site....it works great and is only about 30 inches by 30 inches! It will give you all the bands from 40 meters thru 10 meters in one small antenna used with a tuner. Many hams who have tried it....love it for it's small size! Keep in mind though that it is designed for restricted or limited space operation and is not a physically stretched out antenna as would be required using the standard dipole formula that you should have learned. Electrically, it is the same, but physically it is not. It fits it's design purpose to a "T"! Get one if you are restricted with antenna space on HF. It, like all antennas is a compromise. Full size antennas are the best.

Coaxial cable for HF:

The technical requirements for coax at HF frequencies is not nearly as stringent as on the upper VHF and bands higher frequencies, so 50-52ohm types, the RG58 and RG8 and X "types" will work well for you. These are the [50 to 52 ohm types](#) that your radio will require. Try not to use the 75 ohm types you may have heard of. They are much cheaper, but you may encounter swr problems due to the automatic mismatch with the 50 ohm impedance the transmitter requires! If your are a perfectionist, then money should be no object and you can get the most expensive coax with the lowest rf loss per foot, but you will be wasting lots of money in most ham antenna installations!

IMPORTANT...USE HIGH QUALITY CABLE CONNECTORS (PL-259s)

You can't expect such good results with your ham station on the air or in the future unless you use good high quality PL-259 connectors to begin with. There are many PL-259 connectors on the ham radio market that come from overseas that are not high quality silver coated types with good insulation like Teflon. They are *cheap* copies with little or no quality control and marked up to outrageous prices and sold to those who don't know any better!

Many hams, to save a dime, are using their old worn out corroded connectors over and over that will eventually cause them a huge headache. Don't be one of them. Never skimp on rf connectors...they are your "pathway" to getting a great signal out!

"So I recommend that you use new high quality silver coated/brass connectors whenever possible. I personally have some silver coated PL-259s that I bought in the mid 1960s and they

are just as good now as 50 plus years ago!!!! You can't skimp on quality!" You can quote me on that! N4UJW

There is an excellent source of high quality PL-259 connectors made from brass with a silver coating and Teflon insulation that can be found at [Amateur Radio Supply](#) and at a price that is hard to beat. Check them out there! You will be glad you did not skimp on quality to save a few dimes!

What about lightning protection and grounding safety?

An overview of **Lightning Protection for Ham Radio Stations.**

Presented by the Polyphaser Company (Considered experts in their field)

[\(This is a pdf file. You will need the Adobe Reader to see it.](#)

Consider your family (if you have one), when setting up and using your ham station equipment!

If you are fortunate enough to have very understanding people in your home, then you don't really have to worry too much about how the station is set up to make it pleasing to the eye or how or when to use it.

But just consider that if you are not that fortunate, then you may have to compromise a bit to make everyone happy including yourself.

Most ham radio equipment (modern) is very small and easily placed in a very small area. This author's "station" including computer equipment fits on top of a desk with about 4 X 3 feet dimensions or less. The actual station covering 160 thru 2 meters fits in an area of about the size of a 2 foot cube on that desk! Of course my station may not be typical, it could be larger or smaller than yours. I have no doubt that you will change your station layout many times before you are pleased with it. Most computer desks make for nice setups for a modest ham station....so does an old wooden door across a couple of saw horses...it's your station.

Turn that "noise" down!

I do a lot of listening as do most hams at odd hours when the family is asleep or when they do not want to be disturbed by all that "noise" coming from "those" radios.....so this is quickly eliminated with a simple set of headphones! You may want to consider adding a pair to your station. Most transceivers have a headphone or external speaker jack.....use it when possible. Get yourself a comfortable set of headphones that cover both ears with soft cushions that cover the entire ear. This will help in reducing outside noises in the "shack" or nearby noises created within the home. Don't forget though that some of the "noises" from the family, may be important to hear....like the phone ringing....call to eat....knock at the door, etc.

One of the most annoying "sounds" coming from the speaker of a ham radio to lots of family members is that "Morse code stuff"! Enter headphones...problem gone! Data modes can also be very "noisy" to other members of the family....headphones again.

I think you get the point....compromise....if at all possible!.....they live there too!

Where can I get more personal help if I need it with my ham station setup?

Make some good local ham friends on the air who have more experience!

When you start out making contacts over the air, you will soon learn that there are other operators out there that have much more experience than you do. You will not only be talking to other new Technician class operators, but you will have contacts with Tech Plus, Generals, Advanced and Extra class operators. Many of them will have half a century or more experience with ham radio! Get to know your contacts. Ask the more experienced hams to help you with your questions. Some may even help you with your antenna installations and all they expect is a nice thank you, cool drink in the summer, warm one in the winter and maybe a nice meal or a snack. You can make some great lasting friendships by having an "antenna raising party" using some of your new ham friends. Get the OK from the wife before hand....just a word of warning!

One thing I have learned in all my years in ham radio is the fact that when I do a simple favor for ham friends, it is most often returned to me by them many times over. The sharing of information and ideas and friendship among ham radio operators worldwide has existed from the beginning of ham radio over 100 years ago. **Continue with the tradition by attempting to help another ham whenever possible.** You will be glad you did. Many great friendships have been brought about by contacts on the air and the volunteers for help when needed.

Lots of hams belong to local ham radio clubs and joining a club can be of great value to you in expanding your circle of ham friends that can help you and you will get many friends for life in the process. Most of the "old timers" love to help when they can and they enjoy being an "Elmer" and "spouting off" their wisdom. Listen to them, ask questions.....you will learn.

To find ham radio clubs in your area just do a search on the ARRL web site at www.arrl.org Look for the "Clubs" section at top of their home page.

I hope this article has helped you in some small way in setting up or planning your first ham radio station. Just try to think everything out...planning and more planning and you will have a station you will be proud of that will put your hard earned call sign ON THE AIR!

DON'T LET YOUR LICENSE GATHER DUST.....USE IT!

Then whenever possible, invite some of your non-ham friends over to your "shack", then you can show them just how much fun they could be having if they were a ham....like you! Next, set yourself a goal..... learn something new about ham radio every day...and use that to your advantage in advancing in Ham Radio! Have FUN!

More good info for [Chosing Your First Radio and Getting on the Air!](#)

