

# How to get your amateur radio license and become a “ham”

By Tom Smerk, AA6TS

I just noticed that I have written several articles for beginning amateur radio operators, but I have not yet written clear instructions for those who have an interest in ham radio and would like to earn their license and get on the air.

Before we begin, there are three things that need to be considered first:

1. Why are you interested in amateur radio and how do you plan to use it?
2. What is your learning style?
3. What do you expect to learn from the licensing process?

Naturally, I will explain what I mean by all of this.

First of all, by asking about your interests and intended use, I want you to be sure that your expectations are worthy of all of the hard work and preparation you will be going through over the next several months, and that when the time comes when you pass your first exam and are granted your technician class license, ham radio will indeed be everything that you hoped it would be, and you realize that you definitely did the right thing. How do you plan to use your ham radio license? Do you expect to talk to people all over the world? Think again – that privilege requires at least a general class license, so you will need to study even more and take another, more difficult exam. With an “entry level” technician class license, your “voice” privileges are limited to close range simplex operation, or conversations of up to or slightly over 100 miles using a system of repeaters, which are “relay” stations that pick up your transmission and rebroadcast it over a wider area for better coverage. “Better coverage” usually means the next county, not another country. If you do want to contact distant stations, you will have to use CW (morse code), which again means more study, and a long process of regular practice to get your morse code speed up to the point where other person will talk to you. If your CW speed is five words-per-minute and most of the others are at a speed of fifteen to twenty words-per-minute, you will understand what I mean by this! There are a few opportunities for DX (distant) communications for a beginning technician class operator, such as a portion of the 10 meter band. If DX is your goal, you can begin to enjoy long-distance communications with EchoLink and IRLP, which work over the Internet, while you continue to study until you earn your general or amateur extra license.

Some of the things that you CAN do with a technician class license is to carry on local conversations with other hams in the area from home or as you travel, check into nets to meet new people and practice your communications skills, and use your radio to provide a public service by supporting communications at local events such as parades and marathons or to assist in disaster communications. Your main radio will be an FM transceiver, most likely either a mobile or a handheld unit, operating on either VHF or

UHF frequencies or both (you will learn what these and other terms mean as you begin to study for your license). If you want to get involved with DX, or participate in contests or earn awards for contacting a record number of countries or states using voice communications and not morse code (there are several opportunities for DX if you use CW and not voice), you will need a shortwave transceiver that operates on the HF (high frequency) bands. Once again, this will require at least a general class license, the next step up from technician (or better still, an amateur extra license, which is the top level offering all available privileges), so you should plan in advance to reach the higher levels so that the general or extra class license becomes part of your plan, not an unexpected burden. There are HF base (for in-home use) or mobile transceivers that also include VHF and possibly also UHF frequency bands, so you can use the FM section of this radio on local VHF and UHF repeaters right now, use part of the 10 meter band on HF as well as CW on some of the other bands, and continue to study for your general class license so that you can also use the HF bands in your rig.

My second question for you to consider asks “what is your learning style?” There are essentially two main ways you can study for your amateur radio license. One way is to attend a class offered by a local ham radio club. By attending the class, you will learn the knowledge necessary to pass the exam, and usually the class ends with the actual testing session, so you might be able to learn ham radio and pass the exam in just one or two days – if that is your learning style, that is. Another way to learn is self-study. There are many ways to accomplish this. One way is to either download the “question pool” (a printout of all of the possible questions that might appear on the exam, along with the correct answer for each question) from the Internet or to purchase a book containing the question pool, and then memorize all of the correct answers to all of the questions. If you have the ability to memorize things easily, this might work for you. Another method of self-learning is to study books that explain ham radio in detail and relate this theory to the questions that will be asked. This way, rather than just bluntly memorizing answers that may or may not make sense to you, you gain a basic understanding of radio theory and operating procedures that would allow you to make an educated choice to the questions on the exam. And still another way to learn through self-study is to work with a home-study course on cassettes or CDs. This is similar to attending a class, but allows you to listen to the audio presentations at convenient times. Perhaps the best way to learn is to combine all three methods – attempt to memorize the questions while you read through the study books and listen to the cassettes or CDs, and then finish up by attending a class and taking the exam. My point is simply this – give some thought initially to how you think you would have the best chance of learning the material that will be on the exam. There are many different learning styles, so there are as many different teaching methods, and your success will be better if you are honest about evaluating your learning style.

The third question that asks what you expect to learn is based on what we just discussed about the different learning methods available. If you do a good job memorizing the correct answers, you will pass the exam, but it is likely that you may not understand much about the material that was covered. On the other hand, if you take the time to read about radio electronics, theory, principles and procedures, and then apply this

knowledge to choosing the correct answer from the list of possible answers, you will not only get all of the questions correct, but you will also have a solid understanding about the principles of ham radio. This method might take more time than simply memorizing the correct answers, but offers more satisfaction in the long run. Decide up front whether your initial goal is to just pass the test and get licensed, or do you really want to learn and understand? If you do choose to memorize the answers, you can always continue to study ham radio while you are enjoying your operating privileges! I believe that you learn a lot from actual practice, and all of the things that you study in the book may not mean a lot to you until you have actually used your ham radio for several months or several years. Until you learn all of the important information that is necessary to understand, be sure to have reference materials nearby, such as “band plan charts” that will show you what frequencies are available for your technician license class, and also what “modes” (voice, CW or data) are available on each band. When you get your general class license and then amateur extra license, you will have more and more frequencies available to you, but even an amateur extra has to know what parts of each band permit voice contacts and what parts are reserved for data or CW. I have a band plan chart on my wall in front of my operating position to be sure I am always following the rules! Another consideration is how much power you can use on different bands and with different license classes.

Once you have considered these three questions and are comfortable with the answers, you are ready to begin your learning process. Depending on the availability of ham radio clubs in your area and their reputation for being helpful or not, perhaps one of the best ways to begin studying for your amateur radio license is to join an amateur radio club in or near your community. Use the Internet to search for “ham radio club” or “amateur radio club” (adding the name of your town or city as another search word) and then look at their web sites to get an idea of what each club does and who to contact for more information. If you live in Southern California, you can get a comprehensive list of clubs at my web site at [http://tomsmerk.com/radio/?page\\_id=35](http://tomsmerk.com/radio/?page_id=35). You can also use the ARRL license search engine at <http://www.arrl.org/fcc/search> to locate hams in your area. Enter the name of your town or city in the “City” search box on this page to get a list of local licensed hams. Contact a few to get their feelings on clubs in your area. In most communities, there are some clubs that are doing a good job, and there are others that have not made much progress lately. Once you find a good local ham radio club, attend a meeting to meet some of the members. If you like what you see, you can then join the club. While you are there, mention that you are interested in becoming a ham and ask if there is anyone that would be willing to guide you through the process. This is something that hams love to do! (Why do you think I am spending so much time writing this article, and then giving the information away for free?) We even have a name for people that coach beginners – they are called “elmers.” Once you find yourself an elmer, they will take you through the process to help you get your license, and then will to continue to work with you to make sure that you understand how to purchase, set up and operate your new ham station.

If you want to do this on your own without the help of an elmer, you might want to begin learning by reading a book called a “technician license preparation manual.” There are

two good choices – one if you prefer to learn all you can about all of the topics that will be covered on the exam, and another if you choose to go for the memorization process. The longer but more complete method is a book offered by the ARRL (Amateur Radio Relay League) titled “Ham Radio License Manual (Revised 2<sup>nd</sup> Edition) at a cost of approximately \$29.95. If you choose to go the memorization route, my recommendation would be the book “Technician Class by Gordon West,” approximately \$20.95. Both of these books include a CD with practice exams, and both of these books are widely available in bookstores, ham radio and electronics stores, and from several sources on the Internet.

I recommend that you take at least two or three practice exams every day, and make note of the questions that you miss so that you can go back and study these questions so that you won't miss it the next time this question appears. And don't wait until you have read the whole book – begin the practice exams a day or two after you start reading. Naturally you will see questions that you haven't memorized yet, but by seeing them in the practice exam, this will help you memorize these questions. Gordon West also offers an audio course that you can listen to. The audio course is essentially Mr. West reading the questions, telling you the correct answer, and then explaining a little about the question. If you have a hard time learning the material, this audio course will really help you learn!

Once you have purchased either of these books, begin reading and studying the chapters in order. Think about each new topic that is introduced and understand how the information is useful in the field of ham radio. Do not go on to the next section until you are sure that you understand the current information. It is always perfectly all right to read the material more than once to gain a better understanding. Read the exam questions that go with the current subject material and memorize the correct answers as you go. Once you are sure that you understand the information, then it is OK to proceed to the next chapter. The information that you are studying from the books will answer a lot of the questions that you probably have about ham radio, and will tell you all about amateur radio so that you will have a better understanding of your new hobby. At first, you probably knew little about the subject and had a lot of questions, and perhaps some doubt. As you continue to study, your questions are answered and your doubt disappears!

As you read through the chapters, be sure to take a few practice exams each day. In addition to the practice exam software that comes with the book, there are also some good practice tests available for free on the Internet. Two of my favorite ones are AA9PW Amateur Radio Exams at <http://aa9pw.com/radio/java> and [eHam.net](http://eHam.net) and also the online exams at <http://www.eham.net/exams/>. You might want to try either or both of these along with the practice exams on your CD. The more practice exams you take, the better chance you will have of memorizing the questions!

If you cannot afford to purchase either of the books, or choose not to for some other reason, you can obtain a complete list of exam questions from many web sites on the Internet. Just use your search engine to search for “FCC technician class exam question pool.” Save a copy to your hard drive or flash drive and study the questions in

order. The reason that I would rather see you study from the book is that either of the books explains the reasoning behind each of the questions, where the question pools from the Internet only show you the correct answer without any explanation. If you search a little more on the Internet, perhaps you can find a copy of the question pool with a little explanation about each question.

Whether you choose to buy the book or download the question pool, remember that these questions are only good for a four year period, and then a committee meets and publishes a new set of questions that are good for the next four years. At the time this article was written, the current technician class question pool is good from July 1, 2010 until June 30, 2014. After June 30, 2014, you will have to obtain a new set of questions if you have not yet passed your technician class exam. The general class and advanced extra class question pools follow different dates in a similar rotation, so as you upgrade to either general or extra class, check the dates on the question pool to make sure that the questions are for the current period.

After you have read and studied the entire license manual at least once and are getting near perfect passing scores on each of your practice exams, you are ready to schedule your technician class license exam, which is also known as “element 2” (element 1 was the morse code exam, which is no longer necessary and no longer available).

Either ask the ham radio club that you joined about any exam sessions that they have scheduled, or use the ARRL web site at <http://www.arrl.org/find-an-amateur-radio-license-exam-session> to search for testing sessions in your area. Check the information provided to see if you can sign up online or if you need to phone the contact person to make an appointment. The website information or the contact person will tell you what to bring to the exam session. You will need to have an FCC registration number in advance of your exam. You can register for this number at <https://fjallfoss.fcc.gov/coresWeb/publicHome.do> and you will get your “FRN” immediately. Print this screen so that you have a record of your number and bring the printout to your exam session to verify your FRN. Also write down the number. You will need it again for your general class and extra class exams, and also to log on to the FCC web site to check to see what your new call sign is going to be or to make any changes to your profile information. You will also need a current legal accepted photo ID such as a driver’s license, and the fee for the exam, usually \$5 to \$14. If you don’t have a driver’s license, the ARRL website has information on other accepted identification documents at <http://www.arrl.org/what-to-bring-to-an-exam-session>.

Bring two sharp pencils, an eraser and a pen. If you already have a ham radio license and you are upgrading, or if you have a CSCE (Certificate of Successful Completion of Examination) from your last exam but haven’t received your license in the mail yet, then bring either of these documents with you. Finally, a calculator may be necessary to help you with any questions involving math. There are more of these on the general class exam, and quite a few on the extra class exam. If applicable, erase the memory of your calculator in advance. A scientific calculator will be necessary for the general and extra class exams. Make sure that the batteries are charged or replaced!

The exception to scheduling and attending an exam session would be if you enrolled in a one or two day class where the exam is given to all the students at the end of the class. In

this case, your class and your exam are a “package deal!” Most people that take one of these classes pass their exam based only on what they learned that day in the class. Talk about cramming! If you don’t pass, then you can revert to the plan that I have described above. Being able to pass a ham radio exam with only 6 or 8 hours of classroom instruction is a difficult task, but it is possible, and many clubs do it that way. You may have both options available to you and can decide for yourself which will work best for you.

On exam day, arrive 15 minutes early to make sure you can find the location. The testing staff usually does a good job of making you comfortable and welcome. After all, they were once in the same place you are, and they can remember how nervous they were! There will usually be several other people testing with you the same day. The volunteer staff will tell you everything else you need to know – all you have to do is study, and then get there! By the way, remember that these people are volunteering their time to help you get your ham license, so be sure to thank them, and be nice to them. You might even want to bring some donuts or cookies with you to share!

After you pass your exam, you may be given the opportunity to try for the general class exam at the same time for no extra charge. If you feel like this is something you could do, there is no harm in trying. Do not be discouraged if you don’t pass, because after all, you came to get your technician license, not the general class license! If for some reason you do not pass your exam on this attempt, study some more and you may take the exam again on a different day, whenever you feel prepared.

When you successfully pass your exam, you will receive a document called the CSCE (Certificate of Successful Completion of Examination). This is your proof that you have passed the exam. If you are ready to take your next exam, such as general class, before your license arrives from the FCC, you can use this document instead of your technician license as proof that you have passed the technician exam. The CSCE does not allow you to operate your ham radio. You must wait until your call sign appears in the FCC database. After a few days have passed, you can use the FCC web site license query to see if your call sign is listed in the FCC database. To do this, go to <http://fcc.gov> and select the Tools & Data menu. Then click on Data and then Search FCC Databases, and finally, select General Menu License Search – By Licensee. That will bring you to this "License Query" page:

[http://fjallfoss.fcc.gov/General\\_Menu\\_Reports/license\\_search.cfm?accessible=NO&wild\\_select=on](http://fjallfoss.fcc.gov/General_Menu_Reports/license_search.cfm?accessible=NO&wild_select=on). If you see your call sign, write it down, and you are now ready to begin using your ham radio!

## Selecting your equipment

You can purchase your ham radio before or after you pass the license exam. If you purchase it before, you have even more incentive for passing the exam! My suggestion is to wait until you have at least studied the license preparation manual. It contains a lot of useful information that will help you select a radio. It is very difficult to purchase something that you know very little about. In fact, it would be helpful if you allowed a ham radio operator that you trust to help you pick out what you need to get started with your new hobby.

The way I see it, there are three categories of equipment. First is your radio; second is station accessories; and finally, equipment to upgrade your ham station. I will explain this concept more as we investigate each category.

First of all, your main piece of operating equipment is the “transceiver.” Your ham radio is called a transceiver because it is both a transmitter and a receiver. In earlier days, the receiver and transmitter were two separate pieces of equipment.

As I said previously in this article, as a new technician class operator, most of your band privileges are in the VHF and UHF spectrum. The most popular bands are the 2 meter band (144 to 148 MHz), the 1.25 meter band (222 to 225 MHz), the 70 centimeter band (420 to 450 MHz) and the 6 meter band (50.1-54.0 MHz). There are also voice privileges on the 10 meter band from 28.300 to 28.500 MHz. Both the 6 meter and the 10 meter band would require a “HF” (high frequency) radio, but the three most popular bands 2 meter, 1.25 meter and 70 centimeter can be accessed with a common FM transceiver, either base (for home use on AC power), mobile (DC powered for use in autos or can be used at home with a power supply) or handheld (battery operated).

There are various “modes” of operation – AM (amplitude modulation), FM (frequency modulation), SSB (single side-band), CW (continuous wave, better known as “Morse code”) and many data modes. New hams with a technician class license are limited mainly to FM voice and CW on some of the HF bands (with a few exceptions mentioned earlier), as well as some data modes, which we will discuss later. Here is a link to a “band plan” chart that will show you what frequencies are available to you as a technician as well as the band allocations for other ham radio license classes. You should post this near your operating position and refer to it to make sure that you don’t accidentally transmit on a frequency that you are not permitted to use. The chart is available at:

<http://www.dixieham.org/images/bandchart.pdf>. (Note: It is typical of the Internet for these “links” to change or disappear, so let me know if any links in this article don’t work for you.) For a new technician class operator, in addition to the voice (also known as “phone”) privileges mentioned here, there are also frequencies where you can use CW mode (Morse code). On the HF frequencies, you have CW privileges on 80 meters, 40 meters, 15 meters, 10 meters, and on VHF/UHF frequencies on 6 meters, 33 centimeters, 23 centimeters and higher. Don’t be confused when you read this, because, as I explained earlier, as you begin studying your license preparation manual, it will explain all of this information which is new to you.

There are three main configurations your transceiver will come in. A “base station” is a self-contained, larger unit with a built in power supply that is made to sit on a desk or table top and operate on AC power or DC power using a 12-14 volt power supply. A mobile unit connects to a 12-13.8 volt car battery and is intended to be used in a car, but it can also be used at home by getting its power from a separate regulated power supply. The handheld is perhaps the most popular type of radio because it can be used at home, in the car, or walking around, which makes it ideal for hiking, camping, traveling or emergency communication volunteer work, such as at parades or disaster assistance.

Handheld transceivers, commonly referred to as “handi-talkies” or “HT’s” are available as a single band design, dual-band, tri-band, or even quad-band. The least expensive would be the single band. If you want to get one of these, you need to decide what band you will use

the most. This is usually determined by either what repeaters are near your house, what frequencies your ham radio club uses, or what frequencies are used by any organization you belong to, such as RACES, ARES, American Red Cross or Skywarn. RACES and ARES are emergency communications volunteer organizations that use ham radio to assist in times of disaster. Skywarn is sponsored by the National Weather Service and uses ham radio to report severe weather conditions, and the Red Cross is, of course, the Red Cross! We will talk about these organizations later in a different article. For now, I will tell you that the most popular band for beginners is probably the 2 meter band. Dual band HT's are usually not much more money than a single band, and the popular configuration is the 2 meter and 70 centimeter combination, although the 2 meter and 1.25 meter combination is available. My personal radio is a tri-bander – 2 m, 1.25 m and 70 cm, and I would highly recommend this configuration because it gives the user more band choice options. A four band radio is available and offers even more options, but is higher in cost.

With your “handi-talkie,” you should buy a few accessory items. I would recommend that you buy a speaker-mic or a headset-mic, an alkaline battery pack or extra battery, a data cable to connect your radio to your computer, a DC power cable to use your radio in your car, and a cable to connect your radio to a DC power supply. Sometimes the charger that comes with the radio can also be used to power the radio, but be sure to check your manual because there are some radios that cannot be used while they are charging.

Let's talk more about each of these recommended items. The speaker-mic allows you to clip your radio to your belt or to your car's dashboard and then listen and talk through the speaker-mic. Most hams clip this to their collar to get it close to their ear. You can also hold the radio high in the air and talk into your speaker-mic when you are having reception problems. An alkaline battery pack allows you to use common AA flashlight batteries to power your radio. These do not provide as much transmit power or last as long as the rechargeable battery that is included with your radio, but it makes a good backup battery. You could also purchase a second battery pack as a backup option, but these are often costly.

The data cable is necessary if you want to program your radio using software that may be available for free from the Internet. This makes it easier, especially if your radio has 400 memories and you want to fill them all! The DC car cord allows you to plug your radio into the lighter socket in your car to save the battery in the radio. There is sometimes a cable available that allows you to connect your radio to a regulated DC power supply. This could be useful if the included charger is for charging only and cannot be used while operating the radio. In addition, the DC cables usually include fuses to protect the radio.

Other options to consider are a protective case, a more efficient antenna, a mobile antenna such as a trunk mount or magnet mount base to use your radio in your car, and a pole mounted base antenna to give your radio more “gain” when operating at home. The subject of gain antennas are beyond the purpose of this document, so we will discuss them in another article. For now, just get the recommended accessories.

You have two other purchase options rather than buying a handi-talkie portable radio – mobile and base. A mobile FM transceiver is available in the same band configurations – single band through quad-band. The mobile rig could be mounted in your car or used in the house while connected to a regulated 12-14 volt power supply and an external antenna,

such as a base antenna. There are also a few mobile radios that can operate (at reduced power output) from a battery pack and can be used for portable use or backpacking. If you install your radio in your car, you will need to also install a mobile antenna. These come in a variety of mounting options – magnet mount, trunk lip mount, bumper or mirror mount, rain gutter mount, through glass or clipped over the car window, and permanently mounted by drilling a hole in the roof. You can look through ham radio catalogs or discuss your options with a ham radio store to decide which is best for your needs

Another choice of transceivers available to you is the base station. Usually the base station is for the HF frequencies, but there are some that include at least 2 meter and sometimes also 70 centimeter frequencies. This would be nice if you want a radio to use right now with your technician class license and it would also offer the HF frequencies that you could use when you upgrade to general license class.

A base station will need a base antenna to go with it. If you have enough room in your yard, a dipole antenna works well and is inexpensive. A dipole is a long string of two wires connected at the center to a feed line that runs into your house and connects to your transceiver. These dipole antennas usually range from 16.5 feet to 260 feet. The longer the dipole antenna, the lower the frequency you can use with it to transmit and receive on. If you install a short 16.5 dipole for the 10 meter band, it will be difficult to tune in any of the other bands, such as 40 meters or 80 meters, but if you install the longest antenna (260 feet) for the 160 meter band, then it can also be used on the other bands if used with an antenna tuner (see below).

However, most of these frequencies are all for HF SSB or CW use, and do not apply to you as a newly licensed technician. When you upgrade to general class, you can buy your dipole antenna and get on the air with HF. Fortunately, most transceivers have a second antenna connection for the FM bands such as 2 meter through 70 centimeter, and there are vertical antennas available that you can mount on a mast in your back yard. These vertical antennas are as short as a few feet and don't require you to have a lot of property to run a 260 foot antenna!

The base station should come with a microphone and a built in power supply, so all that you need to get going is your antenna and an antenna tuner. Check the specifications on the radio you are interested in because some base stations require a separate regulated power supply, and this can increase the price at least \$100 for a basic power supply or over \$200 for a better one.

An antenna tuner electronically adjusts the simulated length of the antenna to match it to the impedance of the transmitter. Each band requires an antenna of a specific length, determined by a formula. Rather than having to purchase a separate antenna for each band, the antenna tuner adjusts the match between the antenna and the transceiver to allow the antenna to work on more bands than the one it was intended for. As I mentioned earlier, longer antennas can be electronically adjusted to work on frequencies requiring shorter antennas, but it is very difficult to adjust short antennas to work on frequencies requiring longer antennas.

Most base stations are for HF use only, so another purchase option would be to get a handi-talkie or FM mobile radio (or both!) for now, and then add the base station later when

you get your general class license. In fact, I believe that this is what most of the hams do. If you do decide to get a base station that included the technician class bands as well as HF, just remember not to transmit on the HF bands that are not allowed by your license class.

In order to keep this article simple for beginners, I recommend that for now, you purchase only the equipment that I have referred to so far, but as I said earlier, there are also station accessories and equipment to upgrade your ham station that you might consider. Some of the popular station accessories are a SWR/Power meter, an antenna switch, a duplexer or triplexer to allow you to use multiple antennas with a single feed line, an external speaker, and a boom headset-mic or a better base or mobile microphone and headphones for private listening. Upgrade equipment would include interfaces for digital modes such as packet radio, Winlink, or the many “sound card” modes. There are also new radios available with two interesting options, but these new options are too new for me to positively recommend at this time. The first option is a digital radio format called “D-Star.” D-Star is a trademark of Icom America, Inc.. Digital radios offer improved voice and data quality as well as provide additional ways to use ham radios. The other new technology is APRS (automatic packet reporting system), which is related to GPS, which you are perhaps familiar with. An APRS equipped radio will allow others to view your physical location on a map over the Internet. This feature could be handy for tracking delivery drivers or helping to find you in a disaster situation. As a beginner, it is hard to know if you would want or need either of these new options, so I advise you to do some more research and study your choices before making a purchase decision. I can safely say, however, that most of the radios available at this time do not include either of these features, so if you feel that you don’t need D-Star or APRS, you have many more choices.

The last two things to consider when purchasing your equipment is “what brand” and “new or used.” Used equipment is less expensive than new equipment, and usually with all electronic equipment, if it is working when you buy it, it should continue to work. If you are considering used equipment, you should take your time and check out the equipment thoroughly before buying it. If you can, have an experienced ham help you evaluate it. It is better to buy used equipment from an established store who might possibly offer a guarantee, or from someone that you know personally. If neither of these choices are available to you, there are two web sites that are popular places for hams to buy and sell equipment. One is the eHam classifieds at <http://eham.com> which requires you to sign up for a free account before you can access the classified ads. Go ahead and sign up because this site also has some of the best product reviews and evaluations that I have seen, and will no doubt be a valuable resource in helping you make your purchase decision. The other popular source of used equipment is QRZ (<http://qrz.com>). Click on “Swapmeet” from the main menu, and then “Ham Radio Gear For Sale.”

Then there are the obvious choices for used merchandise such as eBay and Craig’s List. These could possibly lead to a good deal on a nice rig, but these sites are also popular for selling used equipment with “problems” or also for outright fraud such as collecting money and not delivering the product. Of course, both sites work hard to protect you from abuse such as this, so just be careful no matter where you shop. If possible, always try to get a guarantee and a return policy, but these are not usually available on used equipment.

As far as which brand to buy, the old saying, “you get what you pay for,” is probably true in this case. There are some good choices among the little known brands, but you will have to

ask a lot of questions and do some research to be able to separate the good choices from the bad. This is where online forums such as those on eHam.com, QRZ.com and Yahoo are good for reading other people's opinions about the many ham radios available. You can usually search by make and model and then get a list of comments and reviews to read. There are some Chinese brands, such as Wouxun, that are becoming popular because they offer a fairly good radio for a good price. A dual-band Wouxun HT will usually cost less than \$130, where a well-known established brand such as Icom, Kenwood or Yaesu will cost more money. Many of the hams I associate with purchase "brand-name" equipment, and perhaps buy a Chinese radio as a second-radio or a backup radio. Some of the popular brands for FM handi-talkies and mobile radios are Icom, Yaesu, Kenwood, Alnico and Jetstream. For base transceivers, Ten-Tec, Elecraft, Icom, Yaesu, Kenwood, and others are good choices, but are in a higher price range.

To sum up and simplify this section, as a new technician class operator, you can begin to enjoy the hobby by purchasing a new or used handi-talkie (HT), either dual-band or tri-band, and enjoy the convenience of being able to carry this radio anywhere that you go and also be able to use it to participate in volunteer activities such as REACT, ARES, RACES or CERT. If you will be operating only from home, a base station is a good choice, but a mobile dual-band (2 meter and 70 centimeter) radio connected to a regulated 12-14 volt power supply and a base antenna will allow you to operate at home, and then move your radio into your car and hook it up to a mobile antenna when you want to use it "on the road." If you are really into ham radio, and you can afford it, then consider getting all three radios – a base station that covers 160 MHz through 450 MHz or higher, a mobile transceiver that covers 160 MHz through 450 MHz or higher, and a dual-band to four-band handi-talkie with D-Star and APRS!

## How to use your radio

For sake of simplicity, since this is a document for newly licensed technician class operators, I will limit this discussion to the modes that are most popular and available to technician class hams.

The first step is to refer to your owners and operating manuals to make sure that you have hooked up all of your equipment correctly. As I have said before, it might be a good idea to enlist the help of an experienced ham at this point. If you are using a handi-talkie, all you have to do is charge the battery and screw on the "rubber duck" antenna, and perhaps plug in the speaker-mic. Fortunately, most mobile and base antennas come "pre-tuned" and can usually be used as soon as they are connected.

The hardest step comes next – programming your radio or selecting a frequency to use. Most radios now come with many memory storage positions that allow you to program all of the popular frequencies and repeaters that you might want to use, and then select them easily with a switch or set of up-down buttons. Programming your radio is not something we can cover in this document because each radio has its individual methods and requirements. We can, however, make some general comments on the topic.

First of all, let's limit this discussion to an FM transceiver, either HT or mobile, covering either a single band of two or more bands. You could enter a frequency following the

instructions in your manual and start talking, but most hams find it more convenient to take the time to “pre-load” the frequencies that they intend to use. These frequencies could be in the form of either “simplex” or “repeaters.” A simplex frequency is when you talk directly to another ham radio user, point-to-point. A repeater is a piece of equipment usually installed in a location that can easily be reached by weaker signals, such as those of handi-talkies, located usually on a mountain top or in a central location. The user connects to repeater on one frequency, and then the repeater amplifies the frequency and rebroadcasts it on a different frequency. This is what is called an “offset.” Fortunately, most of the offsets are standardized, and some radios can even automatically select the offset “input” frequency when you program in the “output” frequency. Other radios require you to enter both frequencies. When using a repeater (and sometimes even when talking simplex), you may need to program a code for the “PL tone” (also known by other names such as “tone squelch” or “CTCSS”). What the tone does is to allow the signal to be heard only to others who are “listening” for signals on this tone. This allows a sort of “privacy,” in fact, that is what the “P” in “PL” stands for - “privacy tone.” Here is a link to another article I wrote that will better explain this more complicated process of programming PL tones: <http://tomsmerk.com/radio/repeaters.pdf>.

In order to keep this document simple, I will refer you to this other article and to your user manual for help in programming your radio. I will mention, however, that most of the hams that I know find it easier to download the programming software (often free) and use it to store the repeater and simplex frequencies into your radio. The file also serves as a backup of the frequencies programmed into your radio.

The next step at this point is to “listen.” Turn on your radio, select a popular local repeater (your club or a fellow ham can help you here), and adjust the squelch. The squelch control on your radio is used to block out the background noise and keep the radio quiet until a transmission is received. Start with the squelch fully off (counterclockwise if this is on a knob) and then turn it up until the background noise goes away and the receiver is quiet. Then when a transmission is received, it will break through the squelch and you will hear the caller’s voice.

Now listen for a day or a few days to others using the frequencies. If you don’t hear much, you can try different frequencies. If your radio has a scan feature, you can let the radio continuously scan all of the frequencies until it stops on an active frequency.

By listening, you will learn a little bit about “etiquette” and the proper way to make a contact and conduct yourself on the amateur radio bands. Once you stop listening and start talking, it is OK if you make mistakes. The ham community is usually very forgiving. After all, we were all once in your position – scared and nervous, but anxious to get going!

One of the ways to get some more time on the air, learn new information, and make new friends and acquaintances is to join a “net.” A net is an on-the-air roll call and round-table discussion that pertains to a particular topic or organization. Radio clubs have nets, as do organizations such as ARES, RACES, Skywarn, SATERN, and the American Red Cross. Nets are also used to pass traffic, another way of saying “exchange messages.” Some nets are held for the purposes of either testing your equipment or making DX contacts. Other nets are used to practice your emergency communications skills. Nets are also popular with special interest groups, hobbyists, and for buying and selling ham radio equipment. Some of

the “special interest” nets might pertain to off-road vehicles, antique ham radios, sailing, flying, surfing, and just about any interest or activity that comes to mind.

Begin by finding out what nets are available. If you belong to any organization or club, ask them if they have weekly nets. If you belong to a Yahoo group or a similar online discussion group, read the messages or the FAQ to learn about any nets that might be available, or else ask the moderator for the group. You can also search online for available nets, either by topic, or by area, or else you can get complete lists of ALL nets, but these can be quite lengthy and confusing to read through!

It is usually best to start with one net on a topic that you are very familiar with or a group or club that you actively participate in. What you need to know is the frequency, the day, the time the check-in begins, or the time the net begins. Some nets go “on-the-air” early, such as a half-hour before the net begins, to allow people to check in early rather than having to wait until their name is called. It is not necessary to check in to a net early, but you do sometimes have that option. For HF nets, you need to know the band and the frequency, and for VHF and UHF nets, you need to know the repeater that will be used (the frequency, offset and PL tone).

You might want to spend your first week on a new net just listening. If you understand the procedure before you actively join in, you are less likely to make any embarrassing mistakes. Before we go on, I should clarify that in the field of ham radio fellowship, there really is no such a thing as an embarrassing mistake. Most hams are forgiving if you do something incorrect, and they will be happy to explain net etiquette to you so that you are better prepared next time. But there are a few individuals out there that tend to take things more seriously, and could possibly say something to embarrass you if you do not follow proper net procedure.

Every net has its own unique protocol, and net procedures differ depending on the nature of the net, but there are certain similarities that we can discuss. Most nets begin with a call to club officers or net officials for news bulletins or information. This is usually followed by a roll call of general net members. How you respond to the roll call depends on how many “go-arounds” the net will have. For example, if the net only has one “go-around,” you will respond to your call sign when it is announced by “net control” and state your traffic. By “state your traffic,” I mean that you will either announce what is new concerning you, mention what you want to buy or sell, give a synopsis of local weather or driving conditions, make comments based on the “theme” of the net, pass along any messages that you are holding for other areas, or simply say “no traffic.” Many nets operate in this “round table” fashion and are focused on discussion and hearing the viewpoint and comments from all of the net members. Others may be brief and consist only of a quick check-in process. Do you see now why it is a good idea to “listen only” the first week?

On a net with two or more “go-arounds,” the first time you name or call sign is announced, you just indicate your presence. For example, I will listen for net control to call out my call sign, and then I will say “This is Tom, AA6TS, from Dulzura, California.” The net control marks you “present” and you are invited to participate in the second “round.” After the first round where all the net members present are “checked in,” call signs are announced sequentially a second time. This time when you hear your call, you might be expected to contribute some information for the net. This is where each net differs from the others. You

might be expected to comment on the topic of discussion for this evening that was announced, either in advance or at the beginning of the net, you might give or receive a signal report, you might have the opportunity to make a DX contact (usually just on a HF net) with another net member, you might pass on a message that you are holding for another area, you might list an item that you have for sale or list an item you are looking for, or make some other contribution to the net based on the guidelines for this particular net. Make sure that you understand this part of net protocol before you decide to speak up and participate. It is OK to make mistakes the first time, but your goal will be to try to make no mistakes and to “fit in” the best you can. Once you speak up that first time, you now become familiar to everyone else on the net, and you are one step closer to being a “regular” net member. The next week, it will be much easier to check in, and by the third week, you will be having a lot of fun and all of the nervousness will have completely disappeared!

Some nets have several more “go-arounds” until net members run out of things to talk about. Some of these nets can last for hours while others are over in ten minutes. Whenever you decide that you want to end your participation in the net, when your name is called, you give your salutations to the group, such as “73 everyone” (best wishes) and announce somehow that you are signing off from the net, such as “I’ll be signing off,” or “I’ll be QRT,” (stop transmitting) or “I’m going to sign out and listen on the side,” or whatever you deem appropriate after listening to how the other more experienced net members handle it. Most nets have a policy that if you don’t check in on a regular basis, your name may be dropped from the roll call. You can always rejoin the net later if this ever happens and you still want to participate.

Now that you know how the net operates, you will want to listen for the net control operator to announce “are there any new net members?” This is where you say your call sign, and then wait to be acknowledged. Once acknowledged, the net control operator will usually want to know your first name and possibly your location (QTH). Your net control operator will let you know what they need. The net control operator might even ask “do you want to be added to the net?”

Sometimes people make mistakes, so next week, if you do not hear your name or call sign called, wait for the net control operator to ask “are there any late or missed net members?” Once you understand how the net operates and decide to join, you should try to check in each week, or daily, if the net occurs every day. Don’t feel bad about missing the net if you have something important to do, but try to check in as often as you can. Now that you are a member of the net, you can look forward to hours of enjoyment using your ham radio. You will keep in touch, make new friends, and learn new things. It is not unusual for ham radio nets to often get together in person for picnics, dinners and barbecues, or to host an annual Christmas party. Also, once you meet people through the nets, you may want to contact them individually at other times for a QSO (chat) or to ask a question or exchange information. You have made a new friend and contact! Another benefit of participating in weekly (or daily) nets is that sometimes, after the net has concluded, net members hang around and talk back and forth among themselves for a while longer. If you like to talk on your ham radio, this is a good way to pick up some more opportunities to do so!

Other than nets, another way to begin talking on your new ham radio is to listen to an invitation for a QSO (contact, or radio conversation). Some hams do this by making an announcement such as “this is AA6TS monitoring.” There might be other reasons for letting

us know they are monitoring the frequency, such as telling a person that has been trying to contact them that they are now available, but most of the time, this means that they are available for a chat. You can come back by stating your call sign and a greeting, such as “AA6TS, this is KJ6NTB. I’m a new ham, and wanted to take the opportunity to say hello.” Do you see how this could lead to an interesting conversation? Just remember to announce your call sign every ten minutes according to FCC regulations, and to give your call sign when ending the conversation. An easy way to give your call sign every ten minutes is by saying “this is AA6TS” or “this is AA6TS, for ID” (but of course, use your own call sign, not mine!)

The third way to make a contact is to try the same thing yourself. Key the mike, say your call sign, and then say “monitoring.” Perhaps someone will come back to you. It might even be another new ham, and then you both will have a lot to talk about! Just be respectful of others who might want to use the frequency, and pause or break occasionally to see if there is anyone else waiting to make a contact. One way of doing this is to say “is there anyone else that would like to use the frequency?” If there is, and you are not finished with your conversation, you could either finish quickly, or you could agree to contact each other on a different frequency or different repeater. Don’t forget to sign off with your call sign.

One more way to make a ham radio contact is to call for another ham that you know. The format for this is “KJ6NTB, this is AA6TS,” or you could say the call sign twice, as in “KJ6NTB, KJ6NTB – this is AA6TS calling.” If the party you are attempting to contact comes back to you, you are on your way. If not, say “No contact, AA6TS clear” but of course, once again, use your own call sign, not mine! If you wish, you could then try contacting a different person.

Now that you are on the air there are two more things to do. First of all, learn to observe proper and courteous operating procedures. Secondly, continue to learn and study both basic operating procedures, as well as begin to study the license preparation guide for the next license class you want to obtain. The ARRL (American Radio Relay League) has two books available for new hams, one cheap and one expensive. You can get “The ARRL Operating Manual” for \$29.95 or the more extensive “ARRL Handbook” for \$49.95 (\$59.95 for hardcover). Both of these are available at your local ham radio store, some electronics and book stores, and from the ARRL online store at <http://www.arrl.org/shop>. The Operating Manual is sometimes offered as a bonus gift when you become an ARRL member. I highly recommend ARRL membership for all new hams because not only can you take advantage of all of the other benefits offered to ARRL members, you also get a great ham radio magazine, “QST,” in your mailbox each month. Note: The “ARRL Handbook” contains more advanced information than it does information for beginners, so although this will become a valuable resource as you continue to learn more about ham radio, it might be too complicated and confusing for brand new hams.

Once you gain experience and become comfortable operating ham radio, be sure to upgrade to general class, and also look into other opportunities such as volunteering for emergency communications or public service work, or getting into new ways of using ham radio, such as packet radio or some of the other digital modes.

The AA6TS web site “Tom’s Radio Shack,” (<http://radio.tomsmerk.com>) has links to a lot more educational resources for ham radio operators of all levels. As you discover other

interesting resources on your own, be sure to let me know so that I can add these links to my web site. Email your useful discoveries to [tom@tomsmerk.com](mailto:tom@tomsmerk.com).

I welcome your comments. Let me know if you found this to document be useful or if you have any questions. You can contact me at [tom@tomsmerk.com](mailto:tom@tomsmerk.com). As they say in ham radio "73" (best wishes)!