

# Amateur Radio

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Amateur radio communication has been around for more than 130 years. Learning to communicate using radio waves is fascinating, and the community of amateur radio operators is friendly and welcoming. This fun, interactive hobby can last a lifetime.

Amateur radio operators use radio frequency to transmit voice, text, image, and data communications. A radio wave is generated by a transmitter and picked up by a receiver. This system allows the average citizen to communicate across the club, community, country, or world. About three million amateur radio operators across the world use this skill daily. The United States has more than 700,000 licensed operators, so there are plenty of folks who are willing to listen!

Radio waves were discovered in 1888 by Heinrich Rudolf Hertz. Communicating with radio waves evolved and by the beginning of the 1900s, the system we use today was developed. A measurement of a sound wave frequency, or hertz, is named after him.

Amateur radio operators are also called “hams.” Hams typically use the amateur radio bands to communicate during an emergency, train others about radio operation, communicate with other hams, and test equipment. Amateur radio operation is a subgroup of commercial radio and is non-commercial. That is great because you will not hear any advertisements while you are on the air.

Ham operators are frequently involved in transmitting information during local and national disasters. Natural disaster organizations such as the Federal Emergency Management Agency (FEMA), American Red Cross, and Salvation Army provide reliable communications during these times. Ham operators can quickly



Amateur radio transmitter/receiver with push-to-talk microphone and two radio walkie-talkies.

## PLAN YOUR PROJECT

Use this idea starter AND publication 4-H 365 *Self-Determined Project Guide* as the starting place for your 4-H self-determined project. The *Self-Determined Project Guide* is available from your county OSU Extension office or on the Web at [ohio4h.org/selfdetermined](http://ohio4h.org/selfdetermined). You may choose to do a little or a lot depending on your level of interest. Be sure to register your project with your county OSU Extension office.



spread information to those who need it. For example, let's say a region is affected by a hurricane. Traditional communication lines are down, and people cannot communicate as they regularly would. Ham operators, however, can receive and transmit vital information directly through air waves. They do not depend on being part of a network the way cell phones and the internet do.



Ham radio antenna

Ham operators can communicate with other operators around the world. It is common practice for ham operators to keep a log of all their contacts—with date, time, frequency, call sign, location, and so forth. Ham operators can even communicate with the International Space Station!

All operators must pass a test to earn a federal license governed by the Federal Communications Commission (FCC). This test ensures that operators have a basic understanding of electricity, operating rules, and how to use the equipment. License requirements for operating amateur radio vary from country to country. Operators can use voice, text, pictures, and data communication methods. The most common method, however, is voice transmission over the frequency modulation (FM), or the FM radio band.



A Morse key used to transmit Morse Code.

The FM radio band has a consistent signal strength. This band also uses a higher frequency range and a bigger bandwidth than AM radio. Because of this, it transmits more information and sounds clearer than the AM band.

Before 1990, individuals who wanted an amateur radio license needed to know Morse code. Many amateur radio operators know Morse code, but it is not a requirement anymore. Morse code is a series of short and long taps of sound (called dots and dashes) and silence using an electric wire. This method was used to send messages before it was possible to transmit human speech. Each letter and number had its own series of dots, dashes, or both.

Amateur radio operators have call signs, similar to a license plate on a car. Call signs have letters and numbers. Each operator's call sign has a prefix. The prefix consists of either a one-letter (K, N, or W) or two-letter prefix (AA-AL, KA-KZ, NA-NZ, WA-WZ). A number in the middle (0-9) represents a geographic location. Then, a one-, two-, or three-letter suffix follows. Many operators put their call signs on their cars.



In the past, many amateur radio operators had very tall antennas in their yard or on their house. Now, most connect over the internet and do not need antennas. Some operators have small antennas for their cars so they can connect while traveling. If there is a power outage, most operators have backup generators, battery-operated equipment, or solar panels to charge both the generator and batteries.

Amateur radio is an extremely popular hobby. The United States has over 2,000 amateur radio clubs. Amateur radio is constantly changing and evolving. Operators are looking for ways to incorporate coding, apps, and drones into amateur radio operation.

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## AREAS OF INTEREST AND THINGS TO DO

Every self-determined 4-H project can be broken down into areas of interest. These are the specific things members want to address during their project adventures. Using 4-H 365 *Self-Determined Project Guide*, identify at least three areas of interest with at least three activities per area to explore. Take your ideas from the list below or make up your own.

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### History

- Research how communication has changed over the centuries by reading “A Brief History of Communication” at [localhistories.org/a-brief-history-of-communication/](http://localhistories.org/a-brief-history-of-communication/). Make a timeline to share with your club.
- Explain the different situations of ham operators during World I and World War II. Start your research at [hamradioprep.com/history-of-ham-radio](http://hamradioprep.com/history-of-ham-radio). Write a summary of each situation.
- Study how women contributed to amateur radio at [themarysue.com/female-ham-radio-operators](http://themarysue.com/female-ham-radio-operators). Create a poster showing the impacts they made.
- Explore how amateur radio has helped in various emergencies at [arrl.org/amateur-radio-emergency-communication](http://arrl.org/amateur-radio-emergency-communication). Share what you learn with club members or friends in another group.



An Army mobile field radio still usable today with modifications.

### Licenses

- Explore the three types of licenses at [arrl.org/ham-radio-licenses](http://arrl.org/ham-radio-licenses). Explain their differences to your project helper.
- Successfully complete one of the license tests—Technician, General, or Amateur Extra. The Technician license is the entry-level license. Make a copy of your license and keep it with this project.
- Explore the rules and regulations for operating amateur radios at [arrl.org/fcc-rules-and-regulations](http://arrl.org/fcc-rules-and-regulations). Bookmark this site so you can refer to it easily.
- A record of your contacts is not required by the FCC, but you might find it useful anyway. Find out more about keeping a log at [arrl.org/keeping-a-log](http://arrl.org/keeping-a-log) and create one of your own.
- Learn about call signs and what each letter and number means. If you could create a vanity call sign, what would yours be? Find out if it is available at [arrl.org/advanced-call-sign-search](http://arrl.org/advanced-call-sign-search).

### Equipment

- Prepare a list of items needed to communicate over amateur radio. Include the basics and accessories, and the price of each item.
- Visit [dummies.com/programming/ham-radio/how-to-operate-a-ham-radio-in-an-emergency](http://dummies.com/programming/ham-radio/how-to-operate-a-ham-radio-in-an-emergency) and become familiar with handling an emergency using amateur radio. Print the list of the steps and keep it handy.
- Make a poster of the various abbreviations and common terms used in Ham Radio culture. Check out this glossary at [arrl.org/ham-radio-glossary](http://arrl.org/ham-radio-glossary).
- Explore the different safety hazards associated with radio transmissions. Make a list of five hazards and how to prevent or avoid them. Start your research at [arrl.org/safety](http://arrl.org/safety).
- Amateur radio operators sometimes use diagrams to show how their components are connected. A standardized symbol represents each item. Review these electronic schematic symbols at [radioing.com/hamstart/symbols.html](http://radioing.com/hamstart/symbols.html). Print this page so you can refer to them as needed.

### Career Development

- Participate and volunteer in a local ham radio event with a parent or other trusted adult. Start by searching online for a “ham radio event near me.”

- Give a demonstration on various radio communications at a club or county event. For example, show how to communicate with other 4-H members across the United States or around the world, or show how to help those in a natural disaster.
- Interview or shadow a local ham radio operator. Keep track of what you learn and share your findings with your project helper. Be sure to send a thank-you note after your visit.
- Visit [arrl.org](http://arrl.org) and search using the keyword “careers.” Explore three careers that use amateur radio skills. Record in a journal what you like about each one, what kind of post-high school education is needed (trade, college, or something else), and which courses to take in school now to help you reach this goal.
- Connect and communicate over amateur radio with another 4-H member or other group member in a different county or state. Log the date, time, who you spoke with, and a summary of what was discussed.

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## RELATED RESOURCES

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“22 Things You Can Do with Amateur Radio: Technology That’s as Cool as You Want to Make It,” [flysnf.org/wp-content/uploads/2022/10/ham-Radio-Flyer.pdf](https://flysnf.org/wp-content/uploads/2022/10/ham-Radio-Flyer.pdf)

This ARRL video gives a short but thorough overview of amateur radio: [youtu.be/wDn-6SDxyD4](https://youtu.be/wDn-6SDxyD4)

The National Association for Amateur Radio, [arrl.org](http://arrl.org)  
Federal Communications Commission, [fcc.gov](http://fcc.gov)

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