

# ARRL Amateur Radio Education & Technology Program

## Unit 8—FCC Rules and Regulations

### Radios

When you tune an AM or FM radio to your favorite music station, you go to a spot or frequency on the tuning dial. There are many stations in the range of frequencies across that dial. Each radio station is on one frequency in the range of frequencies or “electromagnetic waves.” Other frequencies in this range or “spectrum,” include microwaves, X-rays and ultraviolet waves.

Amateur Radio is only a small part of the airwaves because there are many other users. You may be thinking: “Who decides where Amateur Radio frequencies and my favorite music station will be?” That’s a good question.

Radio signals can be heard all over the world. So there must be a way to share the bands. The International Telecommunication Union (ITU) decides what radio services around the world get to use the communications frequencies. ITU decides what frequencies the many radio services will use.

### Why is there Amateur Radio?

The ITU has known for many years about hams helping during emergencies or disasters. The Federal Communications Commission (FCC) decides for the United States how frequency bands will be shared by radio services in the US. The FCC makes the rules in the US for Amateur Radio. The amateur radio rules are called Part 97. They cover station operations, technical rules and emergency communications.

To earn the privilege of sending a radio signal over the airwaves in the US, you must pass an exam to earn a Technician license, you will pass a 35-question exam. It covers a little about how radios work and FCC rules. A person with a Technician license can usually talk to people about 50 miles away, or with some special radios, around the world. The Technician exam does not include a Morse code test unless a person wants to take one. You can earn a higher class license by passing a 5 word-per-minute Morse code exam. This license lets you talk around the world with simple radios. A new amateur may earn a Technician, Technician with Morse code, General or Amateur Extra license, but each exam is a little harder.

### The Five Principles

Part 97 of the FCC Rules lists five purposes of the amateur service:

*97.1(a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications.*

Amateur Radio is known for doing emergency communications. Communications often break down during hurricanes, earthquakes, tornadoes, airplane crashes and other disasters. Amateur Radio is often the first communications at an emergency. Red Cross and other groups depend on radio amateurs.

Amateurs may not take any type of pay for operating their radio stations. Hams help free of charge. They can help with search-and-rescue in the mountains or do communications at the New York City Marathon!

Why do hams work so hard if they can't be paid? It makes them feel good! It's like when you help your grandmother, only on a much bigger scale. Hams operate their stations to help others and for fun. They can't talk on the air about business.

*97.1(b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.*

Amateurs experiment with antennas and radios. Many amateurs love to learn about their radios. The FCC likes for amateurs to do this.

*97.1(c) Encouragement and improvement of the amateur service through rules which provide for advancing skills in both the communications and technical phases of the art.*

Amateurs do special radio training for emergencies. They want to keep their skills sharp.

*97.1(d) Expansion of the existing reservoir within the amateur radio service of trained operators, technicians and electronics experts.*

Amateurs try to stay trained and be skilled. The USA needs more amateurs who know communications skills.

*97.1(e) Continuation and extension of the amateur's unique ability to enhance international goodwill.*

Hams talk with amateurs in other countries every day. They do this by walking into their ham shacks. World peace is very important today. Amateurs can make friends all over the world and spread goodwill.

Amateur Radio is a way to be friendly with other people everywhere.

To review what you just learned:

The five purposes the FCC lists for the amateur service are to recognize the value of emergency communication skills, advance the radio art, improve communication and technical skills, to increase the number of trained radio operators and electronics experts, and to improve international goodwill.

When you are on the air, you will follow FCC rules. It is the FCC's duty to ensure that amateurs to operate their stations without interfering with other radio services. All amateurs must pass an exam before the FCC will give a license for amateur station operation.

***(Teachers Note: Go to Lesson 8.1)***

## The Amateur Service

The FCC says that the *amateur service* is:

“A radio-communication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest.”

*Pecuniary* is related to money or pay. It is against the rules to be paid for operating your amateur radio station.

An *amateur operator* is a person who has been given a license from the FCC for the amateur radio service.

The FCC defines an *amateur station* as:

“A station licensed in the amateur service, including the apparatus necessary for carrying on radio communications.”

An Amateur Radio license is really two licenses in one. It is an *operator license* and a *station license*. The operator license is one that lets you operate a station. This license lets you control the transmissions of an amateur station.

The station license lets you have an amateur station and equipment. It also lists the call sign for that station. The FCC calls this license an amateur *operator/primary station license*.

The person holding the station license is responsible for the proper operation in accordance with FCC rules of a station. One piece of paper covers both the operator and the station license.

When you enter an amusement park or other place, you may find the security people won't let you carry your hand-held radio. They may not understand Amateur Radio, and may have security concerns.

You can use your Amateur Radio license as soon as the FCC grants you a license. They will post details about your license in their electronic database. Once they do, you don't have to wait for your license document to arrive in the mail before you get on the air. You can check the FCC database on one of the Internet license “servers”. There is a call sign lookup service on *ARRLWeb*: <http://www.arrl.org/fcc/fcclook.php3>.

Your license will arrive in the mail. It is a good idea to make a copy of it to put in your wallet or purse. You are using the *operator license* portion when you serve as the control operator of a station. (You'll learn more about this.)

You should post your license, or a photocopy of it, in your station. You will be proud of earning the license, so display it! A copy of the license on the wall makes your station look more “official.” You must have a copy of your license for inspection by any US government official or the FCC. Don't lose the original license!

FCC amateur licenses are good for a term of 10 years. You should always renew your license for another 10 years before it expires. You should apply about 60 to 90 days before the present one expires. If your license is dated September 2000, it expires in September 2010. Use an FCC Form 605 to renew your license. Always attach a photocopy of your current license.

If you do forget to renew your license, you have up to two years to apply. After this two-year *grace period*, you will have to take the exam again. Your license is not valid

during a two-year grace period. You may not operate an amateur station with an expired license. All the grace period means is that the FCC will renew the license if you apply during that time, and you don't have to re-take an exam.

If you move or change your name, you will need to change your license. Tell the FCC about your new address or name by using an FCC Form 605, and attach a photocopy of your license. Mail it to the FCC in Gettysburg, PA. You can also inform the FCC by going through their Web site at <http://www.fcc.gov/wtb/uls>.

FCC 605 Main Form		Quick-Form Application for Authorization in the Ship, Aircraft, Amateur, Restricted and Commercial Operator, and General Mobile Radio Services		Approved by OMB 3001-0060 See instructions for public docket access
1) Radio Service Code: <b>HA</b>				
Application Purpose (Select one only): 2) RE - Renewal Only      WD - Withdrawal of Application MO - Modification      RM - Renewal/Modification      EA - Expedited License AM - Amendment      CA - Cancellation of License      AU - Administrative Update				
3) If this request is for a Developmental License or STA (Special Temporary Authorization) enter the appropriate code and attach the required exhibit as described in the instructions. Otherwise enter "N" (Not Applicable). <b>N</b>   <b>B</b>   <b>B</b>   <b>A</b>				
4) If this request is for an Amendment or Withdrawal of Application, enter the file number of the pending application currently on file with the FCC. <b>File Number:</b>				
5) If this request is for a Modification, Renewal Only, Renewal/Modification, Cancellation of License, Duplicate License, or Administrative Update, enter the call sign, serial number for Commercial Operator of the pending FCC license. If this is a request for cancellation of DC & DC Operator License, enter serial number of DC. <b>Call Sign/Serial #:</b> <b>W1RJB</b>				
6) If this request is for a New, Amendment, Renewal Only, or Renewal/Modification, enter the radio band. <b>Radio Band:</b> <b>M</b>   <b>D</b>				
7) Does this request a waiver of the Commission's rules? If "Y," attach the required supporting documentation. <b>N</b>   <b>Y</b>   <b>NA</b>   <b>BO</b>				
8) Are attachments (other than associated schedules being filed with this application)? <b>N</b>   <b>Y</b>   <b>NA</b>   <b>BO</b>				
Application/License Information				
9) FCC Registration Number (FRN): <b>0003357399</b>				
10) Applicant/Licensee is (Select one): <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Government Entity <input type="checkbox"/> Other <input type="checkbox"/> Incorporated Association <input type="checkbox"/> Trust <input type="checkbox"/> Sole Proprietorship <input type="checkbox"/> Limited Liability Corporation <input type="checkbox"/> Joint Venture <input type="checkbox"/> Partnership <input type="checkbox"/> Government Entity <input type="checkbox"/> Other				
11) First Name of individual: <b>Larry</b>   Last Name: <b>Wolfgang</b>   Suffix: <b>I</b>				
12) Date of Birth (required for Commercial Operators including Restricted Radiotelephone): <b>01/11/1959</b>				
13) Entity Name (if other than individual):				
14) Attention To:				
15) Street Address: <b>225 Main Street</b>				
16) City: <b>Newington</b>   State: <b>CT</b>   Zip Code: <b>06111</b>   Country: <b>USA</b>				
17) Telephone Number: <b>860-594-0200</b>   21) FAX Number:				
22) E-mail Address: <b>w1rjb@arrl.net</b>				
FCC 605 - Main Form October 2002 - Page 1				

Ship Applications/Licensees Only	
23) Enter new name of vessel:	
Fee Status: 24) Is the applicant/ licensee exempt from FCC application fees? <b>(N) Yes</b>   <b>(B)</b> 25) Is the applicant/ licensee exempt from FCC regulatory fees? <b>(N) Yes</b>   <b>(B)</b>	
General Certification Statements	
1) The Applicant/ licensee waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by himself or otherwise, and requests an authorization in accordance with this application.	
2) The Applicant/ licensee certifies that all statements made in this application and in the exhibits, attachments, or documents incorporated by reference are material, are part of this application, and are true, complete, correct, and make no good faith.	
3) Neither the Applicant/ licensee nor any member thereof is a foreign government or a representative thereof.	
4) The Applicant/ licensee certifies that neither the applicant/ licensee nor any other party to the application is subject to a denial of Federal benefits pursuant to Section 5031 of the Antitrust Abuse Act of 1980, 21 U.S.C. § 881, because of a conviction for possession or distribution of a controlled substance. This certification does not apply to applications filed in accordance with Section 1.2003 of the rules, 47 CFR § 1.2003. See Section 1.2003 of the rules, 47 CFR § 1.2003 for the definition of "party to the application" as used in this certification.	
5) Amateur or GMRB Applicant/ licensee certifies that the construction of the station would NOT be an action which is likely to have a significant environmental effect. (see the Commission's rules 47 CFR Sections 1.1301-1.1319 and Section 97.13a) rules (available at <a href="http://www.fcc.gov/ces/cesrules.html">http://www.fcc.gov/ces/cesrules.html</a> ).	
6) Amateur Applicant/ licensee certifies that they have READ AND WILL COMPLY WITH Section 97.13(c) of the Commission's rules (available at <a href="http://www.fcc.gov/ces/cesrules.html">http://www.fcc.gov/ces/cesrules.html</a> ) regarding the RADIOFREQUENCY BROADCAST SATELLITE and the amateur service sector of ORBIT (Butterfly Number 65 available at <a href="http://www.fcc.gov/ces/cesrules.html">http://www.fcc.gov/ces/cesrules.html</a> ).	
Certification Statements For GMRB Applicant/ Licensees	
1) Applicant/ licensee certifies that he or she is coming eligible under Rule Section 90.5 of the Commission's rules.	
2) Applicant/ licensee certifies that he or she is at least 18 years of age.	
3) Applicant/ licensee certifies that he or she will comply with the requirement that use of frequencies 42.000, 467.000, 467.700 and 467.700 MHz is not permitted near the Canadian border north of Line A and East of Line C. These frequencies are used through Canada and for FM broadcasting in the United States.	
4) Non-individual applicant/ licensee certifies that they have NOT changed frequency or channel plans, type of antenna, antenna height, location of feed line, number of mobile units, area of mobile operation, or increase in power.	
Signature 26) Title or Printed Name of Party Authorized to Sign First Name: <b>Larry</b>   Last Name: <b>Wolfgang</b>   Suffix: 27) Title: Signature: <i>Larry D. Wolfgang</i>   28) Date: <b>9/18/2003</b>	
Failure to Sign this Application May Result in Denial of the Application And Forfeiture of Any Fees Paid	
WILLFUL FALSE STATEMENTS MADE ON THIS FORM OR ANY ATTACHMENTS ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (18 USC 1011 AND 18 USC 1012) AND RESTRICTION OF ANY FUTURE LICENSE OR CONSTRUCTION PERMIT (18 USC 1011 AND 18 USC 1012) AND OR FORFEITURE (18 USC 1011 AND 18 USC 1012).	
FCC 605 - Main Form October 2002 - Page 2	

To get a Form 605, call the FCC at 800-418-3676. You can also write to: Federal Communications Commission, Forms Distribution Center, 2803 52nd Avenue, Hyattsville, MD 20781 (write "Form 605" on the envelope). Or you can go to the Internet at: <http://www.fcc.gov/formpage.html>.

The ARRL/VEC has the Form 605. Write to: ARRL/VEC, Form 605, 225 Main Street, Newington, CT 06111-1494. (Please send a large business sized stamped, self-addressed envelope with your request.)

## The Control Operator

A **control operator** is any licensed amateur who is responsible for the station's transmission. The control operator operates the Amateur Radio station and follows the rules. Only a licensed ham may be the control operator of an amateur station. If another licensed radio amateur operates your station with your permission, he or she becomes the control operator. Any licensed amateur chosen by the station licensee can be the control operator.

Who is responsible for the proper operation of an amateur station? Both the control operator and the station licensee. An example would be your friend, as the control operator, and you as the station licensee. If you let another licensed ham operate your station, you are responsible for its proper operation.

If you let another amateur with a higher class license than yours control your station,

he or she may use the privileges of his or her license.

If you are the control operator at the station of another amateur who has a higher class of license than yours, you can use only the privileges of your license.

A control operator must be present at the station **control point** whenever a transmitter is operating. The control point is the location at which the control operator function is performed.

There is one time when a transmitter may be operated without a control operator being present. Some types of stations, such as repeater stations, may be operated by automatic control. In this case there is no control operator at the transmitter control point.

What kind of station records should you keep? The FCC says you do not have to keep any about the operation of your station. Many amateurs like to keep a station logbook. They write down dates, call signs, names and towns of the hams they contact.

Hams confirm contacts by sending "QSL cards." (You'll learn about these, later.) A logbook is an easy way to keep what you'll need to fill out QSL cards.

DATE	FREQ	MODE	POWER	TIME	STATION WORKED	REPORT SENT	RECD	TIME OFF	BY	COMMENTS	DL	DL	DL
14 NOV	146.73	FM	S	17:45	WB3JOS	59	59	17:40		Boronia, CT Sean	X	X	
18 NOV	80.12	FM	50	21:23	N3KFC			21:23		Hazleton, PA Jack	X	X	
18 NOV	147.585	FM	25	03:24	W8BEM					Hillington, CT Steve	X	X	
22 NOV	145.45	FM	S	16:55	NB3JCO	59	59	17:03		Hemington, CT Annie	X	X	
22 NOV	28.125	CW	100	18:04	XZ3A	599	499	19:04		MYANMAR! Bill	ASFAV	X	X
22 NOV	28.085	CW	100	20:02	KC4AAA	469	599	20:03		SOUTH POLE! Big Ripup		X	
23 JAN	5.0	FM	50	23:35	K9MGH	FN31	FN31			ARRL JANUARY VHF CONTEST			
23 JAN	5.0	FM	50	00:40	W2XW	FN31	FN31			"		X	
23 JAN	14.4	FM	75	19:44	VE2SAG	FN31	FN31			"		X	X
23 JAN	22.2	FM	50	19:48	VE2SAG	FN31	FN31			"		X	X
23 JAN	42.0	FM	150	19:46	VE2SAG	FN31	FN31			"		X	X
21 JUNE	147.99	FM	25	16:05	N1TEZ	59	59	16:10		Mike - via VO-14		X	
23 JUNE	12.7	FM	50	18:11	A31GW	59	59	16:12		Sue in Newington, CT - OO-14		X	X
24 JUNE	29.7	FM	25	15:50	WB3JOS	59	59	15:53		Flas near London - via RS-13		X	
24 JUNE	72.1	FM	150	01:06	S720X	55	57	01:05		Dave in Dayton - AO-27		X	
										Saw Tone DXpedition OSCAR10		X	

(Teachers Note: Go to Lesson 8.2)

## Amateur License Classes

People wanting to get a new Amateur Radio license can try to pass the test for one of three license classes. These licenses are Technician, General and Amateur Extra. Each test gets harder. If you pass the harder ones you will get more **frequency privileges**. These privileges include more frequency space and more modes of operation.

The first FCC Amateur Radio license is a Technician license. This "beginner's" license is given to those who pass an exam that shows they can operate an Amateur Radio transmitter safely and properly.

**The Technician exam** covers some very basic radio questions and some rules in Part 97. With a little study you'll soon be ready to pass the Technician exam.

Anyone (except an agent of a foreign government, such as a spy) can try for an Amateur Radio operator license. There are no age limits.

As a **Technician**, you can use all amateur bands above 50 MHz! You'll use repeaters, packet radio and satellites to relay your signals over a wider area. You can do

emergency communications. You can even send messages for your unlicensed friends (called *third-party communications*). You can allow them to talk over your radio (more on this later).

The following page lists the frequency ranges for the most popular amateur bands. This table also shows the types of operation, called “emission privileges” for each license class. **The U.S. Amateur Bands** table will be referred to again later. The information contained on this page is very important and you need to become very familiar with how to get information from the chart.

If you decide to learn Morse code and pass a 5 word-per-minute code test, you will earn a Technician license with Morse code credit. A Certificate of Successful Completion of Examination showing you passed a Morse code exam lets you use frequencies for worldwide communication. You’ll get to use some frequencies below 30 megahertz (MHz) – called the HF Novice bands.

If you pass the Morse code exam, you will be issued a Certificate of Successful Completion of Examination (CSCE). Keep this paper in a safe place.

## The Technician Exam

The Technician class exam consists of a 35-question written test. You can study every question in the question pool that could make up an exam. A Question Pool Committee named by the Volunteer Examiner Coordinators make up the question pools for all amateur exams. The FCC allows Volunteer Examiners to choose the questions for an amateur exam. But the questions must be those that are in the VEC Question Pool.

## Technician Privileges

When operating, you must stay within your assigned **frequency bands**. Amateurs talk about these frequency bands by length of their radio waves, called wavelength. Each band is divided for the different classes of license. The bands are also divided for **emission** modes, or types of signals from the transmitter.

We use the metric system of measurement in electronics. You need to know that *kilohertz* and *megahertz* are measures of a radio frequency. The *hertz* (Hz) is the math unit for frequency. Kilo means thousand. Mega means million.

We can list any of the amateur frequency bands in either kilohertz or megahertz. For example:

- the 15-meter band can be listed as 21.100 - 21.200 MHz, or as 21,100 - 21,200 kHz.
- the 10-meter band can be listed as 28.100 - 28.500 MHz, or as 28,100 - 28,500 kHz.

## Emission Privileges

Amateur operators transmit many types of signals. These include Morse code, radioteletype, voice communications and even television pictures. An **emission** is any radio-frequency (RF) signal from a transmitter.

There is a way to list the types of signals (or emissions) on the amateur bands. Different modes are given labels, called emission types.

You should be familiar with the emission types. The FCC lists the types of emissions each class of amateur licensee can use – this is called **emission privileges**. An emission privilege is permission from the FCC to use a certain type of emission. This could be Morse code or voice, called single-sideband phone. As a Technician, you can use all of the emission types on at least one frequency band. The emission types that are listed by the FCC are:

- CW — Morse code.
- Data — Computer communications, using digital computers.
- Image — Television.
- MCW — Morse code using audio tones.
- Phone — Voice (speech) communications. Some are called single-sideband phone.
- Pulse — Communications using a particular varied signal.
- RTTY — Printed by machine, and is called Narrow-band direct-printing.
- SS — Spread-spectrum communications. A signal is spread across a wide

part of a band.

- Test — Transmissions containing no information.

On 80, 40 and 15 meters, Technician licensees with Morse code credit may transmit only Morse code (CW). The transmitter makes this Morse code signal by turning on and off (*keying*) the signal from a CW (continuous-wave) transmitter.

On 10 meters, Technician licensees with Morse code credit may use CW from 28.1 to 28.5 MHz, may also transmit RTTY (radioteletype) and data from 28.1 to 28.3 MHz, and transmit single-sideband phone from 28.3 to 28.5 MHz.

Hams often list radioteletype (RTTY) and packet radio or other data emissions as *digital communications*. These are signals received and automatically printed or shown on a computer screen. Data going from one amateur radio operator's computer to another amateur radio operator's computer is an example of digital communications.

Data can also be telemetry and telecommands. Telemetry is a signal sent from a faraway place, such as a satellite. The telemetry tells details about the station and its operating conditions, such as voltage. Telecommands are signals sent to a remote station, such as a satellite, to control what the station is doing.

## Frequency Privileges

As you can see from **The U.S. Amateur Bands** chart, Technician class operators can use *all frequency privileges* in the amateur service *above 50 MHz*. They may use up to 1500-watts peak envelope power (PEP) output on these bands.

Technicians who pass a 5-wpm code test can use the same privileges that Novice licensees have on the HF Novice bands. Novice and Technician with Morse code operators are limited to 200 watts PEP output on the HF bands. These bands are:

- On the 80-meter band, 3675 to 3725 kHz, CW only.
- On the 40-meter band, 7100 to 7150 kHz, CW only. (In ITU Region 2 only. ITU Region 2 includes all of North America, the Caribbean and the Eastern Pacific, including Hawaii.)
- On the 15-meter band, 21,100 to 21,200 kHz, CW only.
- On the 10-meter band, 28.1 to 28.3 MHz, CW, RTTY and data; and 28.3 to 28.5 MHz, CW and SSB phone.

Technician class licensees may operate on the VHF and UHF bands listed below. They can also operate on other bands that are higher in frequency. For a bigger list of amateur frequency privileges, including the microwave bands where frequency is measured in gigahertz, see *The FCC Rule Book*. All Technician class and higher licensees have these privileges. Note that the frequencies listed here are for ITU Region 2 only.

- On the 50-MHz (6-meter) band:
  - On 50.0 to 50.1 MHz, only CW is allowed.
  - On 50.1 MHz to 54.0 MHz all emission types except pulse — CW, RTTY, data, MCW, test, phone and image — are authorized.
- On the popular 144-MHz (2-meter) band:
  - On 144.0 to 144.1 MHz, CW only.



- On 144.1 to 148 MHz, all emission types (except pulse, but including image transmissions).

Although the 2-meter band is best known for repeater and packet operation, hams also use it for such *weak-signal activities* like meteor scatter, moonbounce and aurora.

- On the 222-MHz (11/4-meter) band:  
All emission types (except pulse) from 222.0 to 225.0 MHz.
- On the 420-MHz (70-cm) band:  
All emission types (except pulse) from 420 to 450 MHz.  
This band is popular for image communications. That is because it is the lowest frequency band where fast-scan TV (FSTV) — also known as Amateur TV (ATV) — can be transmitted. This mode is very much like regular TV, with full-motion video.
- On the 902-MHz (33-cm) band:  
All emission types from 902 to 928 MHz.
- On the 1240-MHz (23-cm) band:  
All emission types (except pulse) from 1240 to 1300 MHz.
- On the 2300-MHz (13-cm) band:  
All emission types from 2300 to 2310 and 2390 to 2450 MHz.

## **Transmitter Power**

Technician class operators may operate with a *maximum peak envelope power* (PEP) output of 1500 W (W stands for watts). We use the word *maximum* because the FCC Rules also say:

“An amateur station must use the minimum power necessary to carry out the desired communications.”

The FCC says *peak envelope power* is:

“The average power supplied to the antenna transmission line by a transmitter during one RF cycle at the crest of the modulation envelope.”

*Modulation envelope* means the way the signal moves when it is transmitted. A signal increases and decreases when it is transmitted. We find the highest point, or maximum output-signal level. Then we look at one wave cycle of the radio-frequency (RF) signal. Then we measure the average power during that time.

The FCC’s maximum power rules also say:

- All who may operate in the 80, 40 and 15-meter Novice subbands may use a maximum of 200 watts PEP.
- Technicians who may operate on the Novice bands (those who have passed

a 5-wpm code test) are limited to 200 W PEP on the 10-meter Novice sub band, 28.1 to 28.5 MHz.

- Beacons (you'll learn about this later) are limited to 100 W PEP output.
- Stations near some military groups may use a maximum of 50 W PEP on the 450-MHz band.

The maximum transmitter output power allowed in the amateur service is 1500 W (watts) PEP output. Amateurs rarely use more than 200 watts on the VHF and UHF bands.

The FCC Rules say an amateur station must use the *minimum* transmitter power needed for reliable communication. If you don't need 200 watts to contact someone, don't! If you contact another amateur station and learn that your signal is loud, turn down your transmitter power.

### **RTTY Sending Speed**

When transmitting one of the digital codes, there are sending-speed limits. The codes include Baudot, AMTOR and ASCII.

In the 28 to 50-MHz range (the 10-meter band), the highest sending speed (symbol rate) for a RTTY or packet transmission is 1200 bauds (bits per second).

On the 6-meter and 2-meter bands, (between 50 and 222 MHz), the maximum sending speed for a RTTY or data or packet transmission is 19.6 kilobauds.

Above 222 MHz, the maximum RTTY or packet sending speed is 56 kilobauds.

*( Teacher Note: Go to Lesson 8.3)*

### **Frequency Sharing**

So that all amateurs and other radio services (such as the police) have room to operate, we share frequencies. We also share to prevent interference with each other. If two amateur stations want to use the same frequency, both stations have an equal right to do so.

The FCC can change the privileges of your amateur license any time they decide that is needed. This might happen if your station causes interference to another station with a primary allocation (more about this later) and you can't fix the interference. The FCC might put limits on the time, power or frequency that you operate.

The FCC also assigns users of frequency bands as first or second (primary or secondary) users. The FCC wants us to share without interference.

### **Primary and Secondary Allocations**

The amateur service has many different frequency bands. Some are given to amateurs on a primary basis. Some are given to amateurs on a secondary basis. Amateurs can use a frequency band as a secondary user only if they do not cause harmful interference to primary users of that frequency band. A station in a secondary service must not cause harmful interference to, and must accept interference from, stations in a primary service.

By sharing our frequencies with several other services, including the US military, hams can have more spectrum. If the military is a primary user on a band, amateurs must not interfere with their operating.

## Repeater Frequency Coordination

A **repeater station** is a special amateur station. It automatically retransmits the signals of other stations. The FCC asks repeaters to coordinate frequencies with the help of **frequency coordinators**. Frequency coordinators are ham volunteers.

The FCC has ruled that if a frequency coordinator has coordinated one repeater but not the other, the licensee of the *uncoordinated* repeater is responsible for fixing any interference. If both repeaters are coordinated, or if neither is, then both licensees are equally responsible for fixing the interference.

*(Teachers Note: Go to Lesson 8.4)*

## You Have A License!

Well, the big day is finally here. The FCC has granted your license and you have your new call sign! You can operate an amateur station. Now you are ready to put your very own amateur station on the air!

As the proud owner of a new Amateur Radio license, you can't wait to make your first contact! You will use the information you learned for the exam.

When you get your new ticket "hot off the press," make a few photocopies of it. Then put the original license in a safe place. It's a good idea to put one of those copies in your wallet or purse. That magic piece of paper is your *operator license*. It lets you operate a station within your Technician license privileges. It is also your *station license* – it tells the call sign for your station.



## Call Signs

The FCC gives out US call signs in several different types. You may get a call sign that is a "one-by-three." This is a letter followed by a number and then three more letters. An example of a Technician license is N1NAG. You may also get a call sign that is a "two-by-three." An example of a Technician license is KB1DCO. The letters before the number are the call sign *prefix*. The letters after the number are the call sign *suffix*.

Amateur Extra class amateurs may have "two-by-two," "one-by-two" or "two-by-one" call signs. Examples of Extra class call signs are AA1GW, N1RL and WR1B.

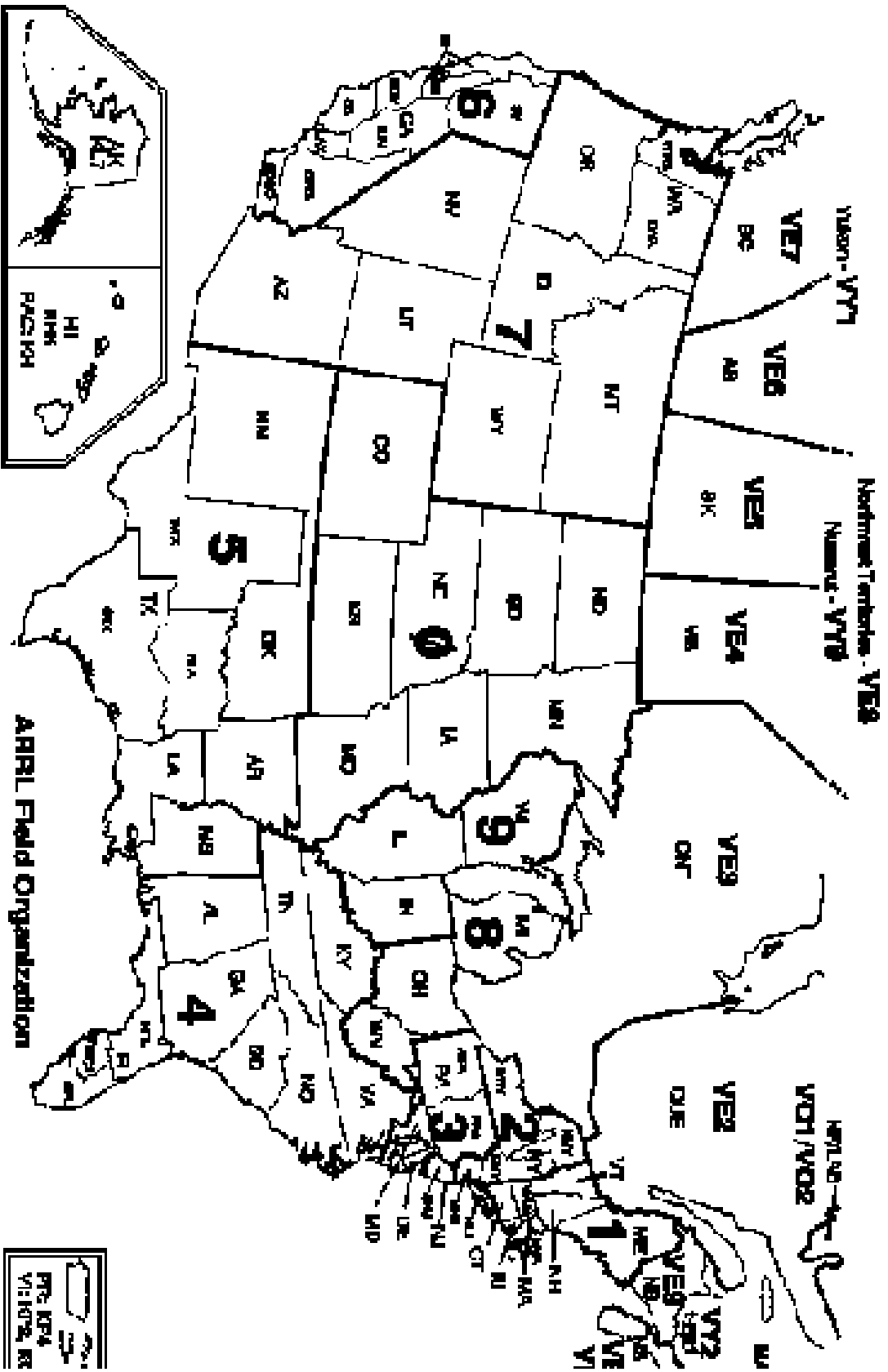
Once you have a call sign, you may keep it as long as you want to (unless your license expires or is revoked). Or you can change your call sign when you earn a higher license class.

The first letter of a US call will always be A, K, N or W. These letters are assigned to the United States as amateur call-sign prefixes. Other countries use other prefixes —

LA2UA is a Norwegian call sign, and VU2HO is from India.

The number in a US call sign shows the district where the call was first issued. The following map shows the 10 US call districts.

Amateurs may keep their calls when they move from one district to another. This means the number is not always a sign of where an amateur is. It tells only where he or she was living when the license was first issued. For example, WB3IOS received her license in Pennsylvania, in the third call district, but she now lives in Connecticut, the first district.



PRG KP4  
VOT1/K2

## Operating Guidelines

### Time for Station Identification

FCC rules state that you must identify your station call sign every 10 minutes or less during a contact. The rules also say you must give your call sign at the end of a contact. If you are talking back and forth to someone, and each comment is less than 10 minutes, you do not have to say your call sign each time.

Under FCC Rules, you must clearly give the source of your transmission to anyone receiving them. This is call station identification. An amateur communication that does not have the required station identification is called *unidentified communications or signals*. This is against the rules.

You should not press the push-to-talk button on your radio or microphone to test how your signal is working. If you want to know whether your radio signal works to a repeater -- to test access to a repeater -- and you do this without giving a station identification, it is called an illegal unidentified transmission. That is against the rules.

No station may transmit a call sign it is not authorized to use. You can't make up a call sign! You can't use some other amateur's call sign without permission.

You don't *have* to transmit your call sign at the *beginning* of a contact. But it will help you get a radio contact. Unless you give your call sign, the other stations may not know who you are!

You do not have to transmit both your call sign and the other ham's call sign when you are talking with another ham. You only have to transmit your own. But if you are doing *third-party communications* with a station in a foreign country, you have to transmit both call signs at the end of the contact. (You'll learn more about third-party communications later.)

Let's look at an example of how to identify an Amateur Radio station. WB8IMY and WR1B have been talking for 45 minutes. Each operator has already transmitted his call four times -- once after each 10-minute interval. Each should now transmit his call one more time as they sign off, for a total of five times during the QSO. (*QSO* means a two-way contact or communication with another ham.)

What if the QSO had lasted only 8 minutes? Each station would have transmitted their call sign only once (at the end of the communication).

You may identify more often than this to make it easier to communicate. But the rules say only that you identify every 10 minutes, and at the end of a contact.

On voice, identification is like this:  
"This is WB8IMY."

In Morse code, use this:  
"DE WR1B"  
"DE" means "*from*" in French).

Suppose you have a Technician license. Pretend you also have a Certificate of Successful Completion of Examination (CSCE) showing that you have passed the Morse

code exam. What special identification procedures must you follow when you operate on the HF bands? No special procedure is needed. Just give your call sign.

By the way, Morse code is the one emission mode that may always be used to transmit your station identification. It doesn't matter what frequency you use, or what mode you use. You may use Morse code to send your station identification.

You can use any language to communicate with other amateurs. Amateur Radio gives you a great opportunity to practice your "foreign" language skills. They will be very helpful with questions you may have. They will be happy you are trying to speak their language. When you give your station identification, however, you must use English.

The FCC prefers that hams use the phonetic alphabet for station identification. The phonetic alphabet helps you identify your station. The ITU phonetic alphabet uses words that are known around the world as substitutes for letters. This makes it easier for all hams around the world to understand the letters.

See **Table 8.3** for the phonetic alphabet. You should not use "cute" words or phrases to identify your station when you are talking with amateurs who don't know the English language very well. They may not understand you or your call sign.

**Table 8.3**

**Standard ITU Phonetics**

<i>Letter</i>	<i>Word</i>	<i>Pronunciation</i>
A	Alfa	<b>AL</b> FAH
B	Bravo	<b>BRAH</b> VOH
C	Charlie	<b>CHAR</b> LEE
D	Delta	<b>DELL</b> TAH
E	Echo	<b>ECK</b> OH
F	Foxtrot	<b>FOKS</b> TROT
G	Golf	GOLF
H	Hotel	HOH <b>TELL</b>
I	India	<b>IN</b> DEE AH
J	Juliett	<b>JEW</b> LEE ETT
K	Kilo	<b>KEY</b> LOH
L	Lima	<b>LEE</b> MAH
M	Mike	MIKE
N	November	NO <b>VEM</b> BER
O	Oscar	<b>OSS</b> CAH
P	Papa	PAH <b>PAH</b>
Q	Quebec	KEH <b>BECK</b>
R	Romeo	<b>ROW</b> ME OH
S	Sierra	SEE <b>AIR</b> RAH
T	Tango	<b>TANG</b> GO
U	Uniform	<b>YOU</b> NEE FORM
V	Victor	<b>VIK</b> TAH
W	Whiskey	<b>WISS</b> KEY
X	X-Ray	<b>ECKS</b> RAY
Y	Yankee	<b>YANG</b> KEY
Z	Zulu	<b>ZOO</b> LOO

**Note:** The **boldfaced** syllables are emphasized. The pronunciations shown in this table were designed for those who speak any of the international languages. The pronunciations given for "Oscar" and "Victor" may seem awkward to English-speaking people in the US.

There are two exceptions to the station identification rules. The first is when you transmit signals to control a model craft, such as a plane or boat.

### **Remote Control of Model Craft**

Amateurs can use radio links to control model craft. This is called “telecommand” (control) of model craft. Most model control activity is done on the 6-meter band. You would need a Technician license to do this activity. Remote control operation has these rules:

- the amateur may transmit unidentified communications to control a model aircraft. The control transmitter must have a label showing the station’s call sign and the licensee’s name and address.
- control signals are not considered codes and ciphers. (Amateurs may not make up “secret codes” that hide the meaning of their communications.)
- transmitter power cannot exceed 1 watt.

### **Space Stations**

An amateur may transmit unidentified communications from a *space station*. Space stations are stations more than 50 km (kilometers) above the Earth’s surface!

Orbiting Satellites Carrying Amateur Radio (OSCARs) relay signals between amateur operators on the Earth (*Earth stations*). The satellite does not have to transmit a station call sign. Operators transmitting to the satellite do have to transmit their call signs, however!

### **Points of Communications**

Who can you talk to with your new license? The FCC defines “points of communication” as the kinds of radio stations you may talk with. It’s pretty simple: *You may converse with all amateur stations at any time.* This includes amateurs in foreign countries, unless either amateur’s government prohibits the communications.

The FCC must okay any communication with any stations not licensed in the amateur service. An example is during Radio Amateur Civil Emergency Service (RACES) operation. During an emergency, an official RACES station may do civil-defense communications with US Government stations authorized to conduct civil-defense communications.

### **Broadcasting**

Amateur Radio is a two-way communications service. Amateur Radio stations may *not do broadcasting*. Broadcasting is transmitting information intended for reception by the general public, either direct or relayed. An amateur is never allowed to broadcast information intended for the general public.

The FCC rules don’t allow *one-way communications* or broadcasting information of general interest to other amateurs. Amateur stations may transmit one-way signals while in beacon operation or radio-control operation.



But the rules don't apply when life or property is in immediate danger. One-way transmissions are not considered broadcasting (which is normally not allowed) when there is an emergency. (You will learn more about emergency communications later.)

## **Beacon Stations**

A *beacon station* is a transmitter that lets amateurs know a band is open to different parts of the world or country. In the amateur service, beacons are used to study how radio-waves work. The FCC defines a beacon station as an amateur station transmitting communications for the purposes of observation of propagation and reception or other related experimental activities.

The FCC Rules for beacons are:

- Automatically controlled beacon stations are limited to certain parts of the 28, 50, 144, 222 and 432-MHz amateur bands, and all amateur bands above 450 MHz.
- The transmitter power of a beacon must not exceed 100 W (watts).
- Technician and higher class licensees can operate a beacon station.

## **Other Permitted One-Way Transmissions**

Other one-way communications that the rules allow are:

- brief transmissions necessary to make adjustments to a station;
- brief transmissions necessary to establishing two-way communications with other stations;
- transmissions necessary to help persons learning, or improving proficiency in, the international Morse code; and
- transmissions necessary to disseminate information bulletins (these are to be directed only to amateurs and must consist solely of subject matter of direct interest to the amateur service).

*(Teachers Note: Go to Lesson 8.5)*

## **Third-Party Communications**

A message sent between two amateur stations for someone else is called *third-party communication*. (Many hams call it *third-party traffic*.) For example, sending a message from your sister to your grandmother is third-party communication.

The control operator of one station (the first party) sends communication to the control operator of another station (the second party) for someone else (the third party). A third party is a person who is sent a message by amateur communications who is not the control operator who is sending the message.

Third-party communications of a personal nature is okay. But passing messages for business or work is not. You may not receive any type of pay for transmitting or receiving third-party communication.

You can pass third-party messages to other stations in the United States. Outside the US, FCC Rules greatly limit third party communication. It is allowed when the US has a *third party agreement* with another country, or the third party is qualified to be a control operator. International third-party communication is not allowed except when:

- communicating with a person in a country with which the US shares a third-party agreement, or
- in cases of emergency where there is an immediate threat to lives or property, or
- the third party is eligible to be a control operator of the station.

**Table 8.4** lists countries that have a third-party communications agreement with the US at the time this book was printed. The ARRL Web lists these countries. Sometimes temporary agreements are made for special events.

You may allow an unlicensed person to participate in Amateur Radio from your station. This is *third-party participation*. It is another kind of third-party communication.

You (as control operator) must always be present to make sure the unlicensed person follows all the rules. You must continuously monitor and supervise the third party's participation. This lets your family members and friends enjoy some of the excitement of Amateur Radio. They can speak into the microphone or even send Morse code messages on a keyboard, if you are present to control the radio.

What if you are allowing a non-amateur friend use your station to talk to someone in the US, and a foreign station breaks in? Have your friend wait while you check if the US has a third-party agreement with the foreign station's government.

There is another important rule about third-party participation. If the unlicensed person was an amateur operator whose license was suspended or revoked by the FCC, that person may not participate in any amateur communication. You can't allow that person to talk into the microphone of your transmitter or operate your Morse code key or computer keyboard.

**Table 8.4**

**International Third-Party Traffic — Proceed With Caution**

Occasionally, DX stations may ask you to pass a third-party message to a friend or relative in the States. This is all right as long as the US has signed an official third-party traffic agreement with that particular country, or the third party is a licensed amateur. The traffic must be noncommercial and of a personal, unimportant nature. During an emergency, the US State Department will often work out a special temporary agreement with the country involved. But in normal times, never handle traffic without first making sure it is legally permitted.

***US Amateurs May Handle Third-Party Traffic With:***

C5	The Gambia	J7	Dominica	XE	Mexico
CE	Chile	J8	St Vincent and the Grenadines	YN	Nicaragua
CO	Cuba	JY	Jordan	YS	El Salvador
CP	Bolivia	LU	Argentina	YV	Venezuela
CX	Uruguay	OA	Peru	ZP	Paraguay
D6	Federal Islamic Republic of the Comoros	PY	Brazil	ZS	South Africa
DU	Philippines	TA	Turkey	3DAØ	Swaziland
EL	Liberia	TG	Guatemala	4U1ITU	ITU Geneva
GB*	United Kingdom	TI	Costa Rica	4U1VIC	VIC, Vienna
HC	Ecuador	T9	Bosnia-Herzegovina	4X	Israel
HH	Haiti	V2	Antigua and Barbuda	6Y	Jamaica
HI	Dominican Republic	V3	Belize	8R	Guyana
HK	Colombia	V4	St Christopher and Nevis	9G	Ghana
HP	Panama	V6	Federated States of Micronesia	9L	Sierra Leone
HR	Honduras	V7	Marshall Islands	9Y	Trinidad & Tobago
J3	Grenada	VE	Canada		
J6	St Lucia	VK	Australia		
		VR6**	Pitcairn Island		

**Notes:**

\*Third-party traffic permitted between US amateurs and special-events stations in the United Kingdom having the prefix GB only, with the exception that GB3 stations are not included in this agreement.

\*\*Since 1970, there has been an informal agreement between the United Kingdom and the US, permitting Pitcairn and US amateurs to exchange messages concerning medical emergencies, urgent need for equipment or supplies, and private or personal matters of island residents.

Please note that the Region 2 Division of the International Amateur Radio Union (IARU) has recommended that international traffic on the 20 and 15-meter bands be conducted on the following frequencies:

14.100-14.150 MHz    21.150-21.200 MHz  
14.250-14.350 MHz    21.300-21.450 MHz

The IARU is the alliance of Amateur Radio societies from around the world; Region 2 comprises member-societies in North, South and Central America, and the Caribbean.

Note: At the end of an exchange of third-party traffic with a station located in a foreign country, FCC-licensed amateurs must also transmit the call sign of the foreign station as well as their own call sign.

## Business Communications

Amateur communication is noncommercial radio communication between amateur stations. Amateur Radio is only for personal use and without *pecuniary interest* or business reasons. *Pecuniary* means pay or money of any type.

This tells us that amateur operators should not conduct any type of business communications. An exception is that schoolteachers may use Amateur Radio stations as part of their classroom instruction.

## Other Assorted Rules

Under FCC Rules, amateurs may not transmit music of any form. This means you can't play a song from your favorite tape or CD for your friend to hear. You can't play the piano and have it transmitted over the air. Be careful not to transmit *unintentional* music, either. For example, be careful not to have a broadcast radio playing in the background when you pick up the microphone to talk with someone.

There is one exception to the "No Music" rule. If you get permission from NASA to retransmit the audio from a space shuttle for other amateurs to hear, and during that time NASA or the astronauts play some music over the air, you won't get in trouble.

Amateurs may not use obscene or indecent language. Remember that anyone of any age can hear your transmission if they happen to tune to your transmitting frequency. Depending on your operating frequency and other conditions, your signals can be heard around the world. While there is no list of prohibited obscene or indecent words, you should avoid any questionable language.

You can't use codes or ciphers to hide the meaning of transmissions. But there is a special rule for this when special requirements are met. You can't make up a "secret" code to send messages over the air to a friend. Control signals transmitted for remote control of model craft are not considered codes or ciphers. Neither are telemetry signals, such as from a satellite to tell about its condition. A space station —satellite — control operator can use specially coded signals to control the satellite.

Amateurs may not cause *malicious (harmful) interference* to other communications of any type. This means to amateur communications or to non-amateur communications. You may not like the other operator's practices. Or you may believe he or she is not following the FCC rules. But you cannot interfere with their communications. Repeatedly transmitting on a frequency already occupied by a group of amateurs, such as in a net operation, is harmful or malicious interference. A transmission that disturbs other communications is called harmful interference.

Amateurs may not transmit *false or deceptive signals*, such as a distress call when no emergency exists. You must not, for example, start calling **MAYDAY** (an international distress signal) unless you are in a life-threatening situation. That would be a false or deceptive signal. If there is a life or property threatening emergency, it is okay to transmit SOS or MAYDAY.

## Emergency Communications

The FCC not only permits, but also encourages, licensed hams to assist in emergencies. If a disaster disrupts normal communications systems in an area the amateur service is regulated by the FCC, it says:

“When normal communication systems are overloaded, damaged or disrupted because a disaster has occurred, or is likely to occur . . . an amateur station may make transmissions necessary to meet essential communication needs and facilitate relief actions.”

Part 97.405 says:

- (a) No provision of these rules prevents the use by an amateur station in distress of any means at its disposal to attract attention, make known its condition and location, and obtain assistance.
- (b) No provision of these rules prevents the use by a station, in the exceptional circumstances described in paragraph (a), of any means of radio communication at its disposal to assist a station in distress.

If you're near a hurricane or blizzard, and you offer communications to local authorities, you can do whatever you need to help with the emergency. This includes allowing a doctor to operate your radio or helping the Red Cross find out about damage.

In a major disaster, the FCC may change its Rules. It may make a declaration of a *temporary state of communication emergency*. The declaration will include special conditions or rules to be observed during the emergency.

## Distress Calls

If you should require immediate emergency help, and you're using a voice (telephony) mode, call **MAYDAY**. Use whatever frequency works best to get an answer.

“MAYDAY” is from the French language: *m'aidez* means help me.

On CW (telegraphy), use **SOS** to call for help. Repeat this call a few times, and pause for any station to answer. Identify the transmission with your call sign. Repeat this until you receive an answer. In a life or property-threatening emergency, you may send a distress call on *any* frequency -- even outside of your license privileges. Even outside the amateur bands. But only if you think doing this will bring help faster.

Be ready give information:

- *The location of the emergency*, with enough detail to permit rescuers to locate it.
- *The nature of the distress*.
- *The type of assistance required* (medical, evacuation, food, clothing or other aid).
- *Any other information* to help locate the emergency area.

If you receive a distress signal, you are also allowed to transmit on *any* frequency to provide assistance.

## **Space Stations and Earth Stations**

The FCC defines a *space station* as “An amateur station located more than 50 km (about 30 miles) above the Earth’s surface.” This means amateur satellites, the Space Shuttle, the International Space Station and any future operations by astronauts in space.

Any licensed ham can be the licensee or control operator of a space station. Any licensed amateur may operate through or communicate with a space station if their transmissions take place on frequencies for that license class.

*Earth stations* are stations on the Earth’s surface, or within 50 km of it. They do communications with *space stations* or with other Earth stations by using satellites in space. Any amateur can be the control operator of an Earth station if the frequencies are okay for his or her license class. Special frequencies are set aside for Earth stations. The 6-meter band may not be used by Earth stations for satellite communications.

## **Official Notices of Violation**

The FCC handles law and order in radio operation in the US. The International Telecommunication Union (ITU) sets up international rules for all countries to follow. Both sets of rules are used for Amateur Radio in the United States.

If you receive an official notice from the FCC informing you that you have violated a rule, what do you do? You do whatever the notice tells you to do. Usually this will be some change to your station and you will respond to the FCC about what corrective change you have taken.

Amateur Radio operators have always done *self-policing* – police our own bands. We are known for our good operating skills and our technical skills. The FCC has praised the amateur service for this. Maybe we follow the rules because of our sense of pride, accomplishment, fellowship, loyalty and concern. Amateur Radio is more than a hobby to most amateurs.

*(Teachers Note: Go to Lessons 8.6 and 8.7)*