NOVICE AND TECHNICIAN CLASSES

THE RADIO AMATEUR'S

LICENSE MANUAL

- F.C.C. REGULATIONS
- A STUDY GUIDE FOR THE AMATEUR EXAMS
- RENEWING AND MODIFYING STATION LICENSES
- HOW TO GET YOUR AMATEUR RADIO LICENSES

50¢

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The Novice License

• The Novice Class license offers an ideal way to get started in amateur radio — reduced code speed and simplified written examination. It grants a portion of amateur privileges on an "apprenticeship" basis for one year. This chapter explains the new license in detail and contains sample questions for the written exam.

As an incentive to encourage a greater number of people to engage in the hobby of amateur radio, the Federal Communications Commission has established, effective July 1, 1951, a Novice Class of license with greatly reduced requirements and only a few of the privileges available to amateurs. This class of license might well be termed an apprenticeship. It has a term of but one year, compared with the five-year terms of other amateur licenses, and the objective is to give a newcomer a period of a year of actual on-the-air experience or training in amateur operation so that he may develop his skills toward one of the permanent classes of license more rapidly than he would by textbook study and audio-ocillator code practice.

Examination for the Novice Class license may be taken at any of the regular FCC examining points mentioned in Chapter 1, or by mail if the applicant is more than 125 miles airline from an examining point where exams are offered at least four times yearly, or if he is physically disabled, or if he is in military service and unable to appear at the designated time (See Chapter 5).

Requirements for the Novice license are the passing of a code test in sending and receiving at the rate of 5 words per minute, and a written examination in the most elementary aspects of amateur regulations and theory.

The privileges which are available to the Novice licensee are:

3700–3750 kc. — telegraphy
26,960–27,230 kc. — telegraphy
145–147 Mc. — telegraphy or voice

In addition, the transmitter used by a Novice licensee must be crystal-controlled, and may not have an input exceeding 75 watts. Of course, the Novice may operate portable or mobile on any of these frequencies (See Chapter 8).

The most important point concerning the Novice license is that it is valid for only one year and may not be renewed. Before the end of his license term the Novice must qualify for one of the other grades of amateur license, or go off the air. He may try for a General Class license (or Conditional Class, if eligible to take the mail examination) in which case he must pass the standard amateur examination, both 13 words per minute in code and the regular exam on theory and regulations or he may try for a Technician license, in which case he gets credit for the code test (if the test was taken before an FCC examiner) and has to pass only the additional standard exam on theory and regulations, and he may take this test by mail if he is eligible to do so under the conditions specified earlier. He may not try for an Advanced or Extra Class license, of course, since experience as a Novice operator does not qualify for the service requirements for those licenses.

Anyone who is a citizen of the United States may apply for the Novice license, except a person who holds or ever has held an amateur license of any class. Thus a Novice not only is unable to renew his license at the end of its term, but he may not again apply for Novice privileges. If an applicant for Novice privileges feels that he can pass the standard written examination for amateur licenses but is unable to meet the 13 w.p.m. code requirement, he may simultaneously apply also for the Technician Class of license, taking the 5 w.p.m. code test, the elementary Novice written exam, and the standard written exam.

A Novice may operate any FCC-licensed amateur radio station, but only to the extent of the privileges available to the Novice and similarly available to the licensee of the station being operated. For example, he may visit a station licensed to a Conditional, General, Advanced or Extra Class licensee, and operate it provided the transmitter is crystal-controlled, is limited to 75 watts input or less, and is working in the bands specified for the Novice. A Novice may not operate a station licensed to a Technician, since the latter's privileges do not include Novice bands; similarly, a Technician may not operate a station licensed to a Novice, since the Technician's operator authority does not extend to the Novice bands, and the Novice's station license does not grant authority to work above 220 Mc.

As stated, the written examination for the Novice license is quite simple. It consists of about 20 questions dealing with basic amateur regulations, and certain points of theory and technique. The questions are of the "multiple-choice" type, as explained in Chapter 1. There are no diagrams required. Following is a set of questions similar to those which are asked in the examination. If you

are thoroughly able to answer each of these sample questions, you will have no difficulty in passing the written exam. However, in any event we recommend additional study of at least the technical material in *How to Become a Radio Amateur* (50¢) and preferably of the introductory chapters of *The Radio Amateur's Handbook* ($2.50), both available postpaid from the ARRL, West Hartford 7, Conn.

(The references in parentheses at the end of answers to regulatory questions are to appropriate sections of the amateur rules or the Communications Act.)

1. What is the maximum input power permitted to the final stage of the transmitter in a station licensed to the holder of a Novice Class license or operated by such an operator?

The maximum input power permitted a Novice is 75 watts. (§ 12.23)

2. What is the maximum penalty for a violation of the rules and regulations of the Federal Communications Commission?

A fine of up to $500 for each day during which the offense occurs, suspension of operator license, and revocation of station license. (Act, § 502)

3. On what frequency bands may the holder of a Novice Class license operate an amateur radio station?

3700–3750 kc.
26.96–27.23 Mc.
145–147 Mc.
(§ 12.23)

4. On what frequency bands may the holder of a Novice Class license operate an amateur radiotelephone station?

145–147 Mc. (§ 12.23)

5. What is the log of an amateur station, and what information is required to be entered therein? How long must it be preserved?

The log of an amateur station is the written record of transmissions. The log must show:

1) the date and time of transmission
2) the signature of each licensed operator operating the equipment and the name of any person not holding a license who speaks over a radiotelephone transmitter
3) call of the station called
4) the input power to the transmitter
5) the frequency band used
6) the type of emission used
7) the location of the station at the time of transmission
8) the message traffic handled

Information such as the input power, frequency band, type of emission, location of station, need be entered only once provided the conditions are not changed. Similarly, one entry of the date need not be repeated for other transmissions made on that date. If the station is mobile, the approximate geographic location can be indicated in the log.

The log of an amateur station must be preserved for at least one year following the last date of entry. Similarly, any message traffic handled must be kept on file for at least one year. (§ 12.136)

6. What is the term of an amateur Novice Class license? Under what conditions may this license be renewed?

The term of an amateur Novice Class license is one year. (§ 12.29)

It may not be renewed under any conditions. [§ 12.27(b)]

7. What are the rules and regulations regarding the transmission of improper language, false signals, or malicious interference?

The transmission of obscene, indecent or profane language, or of false or deceptive signals or call letters, or of malicious interference is expressly prohibited and there are heavy penalties for violation. (§§ 12.157, 12.158, 12.160)

8. What are the rules and regulations regarding purity and stability of emissions?

Below 144 megacycles, spurious radiations must be reduced in accordance with good engineering practice, and must not cause interference to near-by receivers of good engineering design not tuned to the transmitter. Voice modulation of a transmitter must not cause spurious emissions; the maximum modulation percentage is 100. Simultaneous frequency modulation and amplitude modulation is not permitted. The frequency of the signal transmitted must be as constant as the state of the art permits. (§ 12.133)

9. What method of frequency control is required to be used in the transmitter of a station licensed to the holder of a Novice Class license?

The frequency must be crystal-controlled. (§ 12.23)

10. What are the rules and regulations regarding the measurement of the frequencies of the emissions of an amateur radio station?

Regular measurement of the frequency of the transmitter is required. This measurement must be by means independent of the means used to control the transmitting frequency and must be of sufficient accuracy to ensure operation within the frequency band used. (§12.135)

11. Who may be permitted to operate the transmitter of an amateur radio station licensed to the holder of a Novice Class license?

Any amateur radio operator except of the Technician Class. (§12.28)

12. Under what circumstances may an amateur radio station be used by a person who does not hold a valid license?

A person not properly licensed may not *operate* an amateur station. However, he may speak over the microphone of an amateur radiotelephone station provided a duly-licensed operator is present to control the emissions. (§ 12.28)

13. What is the maximum permissible percentage of modulation of an amateur radiotelephone station?

One hundred per cent. (§ 12.133)

14. At what intervals must an amateur station be identified by the transmission of its call sign? May any transmission be made without identification of the station?

An amateur station must identify its call sign at the beginning and end of each transmission and at least every ten minutes if a single transmission lasts longer than ten minutes. No transmission by itself may be made without identification of the station, except that during a sequence of transmissions each less than three minutes long, the call sign needs to be given only once each ten minutes as well as at the beginning and end of the work. (§ 12.82)

15. Under what conditions is notice of portable or mobile operation required to be given, and to whom in each case?

Notice of intended portable operation, or mobile operation, must be given the FCC Engineer-in-Charge of the inspection district in which such portable or mobile operation is contemplated only when the operation is or is expected to be for a period longer than 48 hours. (§ 12.91)

16. What are the recognized abbreviations for: kilocycles, megacycles, Eastern Standard Time, Greenwich Mean Time, continuous wave, frequency modulation, amplitude modulations?

kilocycles — kc.
megacycles — Mc.
Eastern Standard Time — EST
Greenwich Mean Time — GMT
continuous wave — c.w.
frequency modulation — f.m.
amplitude modulation — a.m.

17. What is the relationship between a fundamental frequency and its second harmonic; its third harmonic, etc.?

The second harmonic is twice the frequency of the fundamental, the third harmonic is three times the fundamental frequency, and so on. A harmonic is always related to its fundamental frequency by an integral multiplier; i.e., 2, 3, 4, 5, 6, etc.

18. What is the relationship between a cycle, a kilocycle, and a megacycle?

1 kilocycle = 1000 cycles
1 megacycle = 1000 kilocycles = 1,000,000 cycles

19. What instrument is used to measure: electrical potential; electrical current; electrical power; electrical energy?

Electrical potential is measured by a voltmeter.

Electrical current is measured by an ammeter, milliammeter, or microammeter.

Electrical power is measured by a wattmeter.

Electrical energy is measured by a watt-hour meter.

20. What is the purpose of: a modulator; an amplifier; a rectifier; a filter?

A modulator is used to vary the amplitude, frequency or phase of the radio-frequency output of a transmitter for the purpose of transmitting information.

An amplifier is used to increase the amplitude, or power level, of a signal.

A rectifier is used to change alternating current into pulsating direct current.

The purpose of a filter is to attenuate undesired frequencies while simultaneously passing, without appreciable attenuation, a desired band of frequencies and/or direct current. *Examples:* The power-supply "smoothing filter," which eliminates the alternating-current ripple from the output of a rectifier but permits direct current to flow with little or no attenuation; the "low-pass" filter, which attenuates all frequencies (such as harmonics in the output of a transmitter) above a given frequency but passes all lower frequencies.

21. What is meant by: amplification; modulation; detection; attenuation?

Amplification is the process of increasing the amplitude, or power level, of a signal.

Modulation is the process of varying the amplitude, frequency or phase of the radio-frequency output of a transmitter. Modulation is normally employed for the purpose of transmitting information. However, it may also occur inadvertently, as in the case of "hum" modulation of a signal resulting from ripple in the output of an insufficiently-filtered d.c. power supply.

Detection or demodulation is the process of extracting the information contained in the modulation on a radio-frequency signal.

Attenuation is a reduction in amplitude.

22. What is the purpose of: a radio-frequency choke; an audio-frequency choke; a filter choke?

The purpose of a radio-frequency choke is to oppose the flow of radio-frequency current while permitting direct current and audio frequencies to flow without appreciable opposition.

The purpose of an audio-frequency choke is to oppose the flow of audio-frequency currents while permitting direct current to flow.

The purpose of a filter choke is to aid in smoothing the direct-current output of a rectifier.

23. How is the actual power input to the tube or tubes supplying energy to the antenna of an amateur transmitter determined?

The input power is determined by measuring the direct-current plate voltage and the d.c. plate current to the tube or tubes in the final stage in the transmitter. The power input is equal to the plate voltage multiplied by the plate current in amperes. *Example:* Two tubes in the final stage of the transmitter take 50 milliamperes each, at a plate voltage of 500 volts. The total plate current is $2 \times 50 = 100$ milliamperes, or 0.1 ampere. The power input is therefore $500 \times 0.1 = 50$ watts.

24. Why are a rectifier and filter required in the plate power supply system of an amateur transmitter when operated from alternating current?

The amateur regulations require that an adequately-filtered plate supply be used on transmitters operating below 144 Mc. The rectifier is used to convert the alternating current into direct current. However, its d.c. output is pulsating, not constant, and the filter must be used to smooth out the pulsations so that the output is essentially "pure" — that is, free from pulsations or "ripple."

25. What is a frequency multiplier?

A frequency multiplier is a device that delivers output at an integral multiple (i.e., 2, 3, 4 times, etc.) of the applied frequency. The output of a frequency multiplier is consequently on a frequency that is a harmonic of the fundamental (applied) frequency.

26. What are the undesirable effects of overmodulation in radiotelephony?

Overmodulation results in the generation of spurious sidebands — that is, frequencies lying outside the band of frequencies or "channel" actually required for transmitting the information contained in the modulation. These spurious frequencies, called "splatter," will interfere with communication on near-by channels and may even lie outside an amateur band. At close range they may also cause interference with broadcast reception.

27. What is meant by a "parasitic" oscillation?

A parasitic oscillation is one not essential to the operation of the equipment and usually occurring on a frequency considerably removed from the operating frequency.

28. What is the purpose of a "key-click filter" and when should it be used?

The purpose of a key-click filter is to reduce spurious radiation generated when keying a radiotelegraph transmitter. It should be used whenever required for suppressing such spurious radiations.

(The code test for the Novice Class license consists of 25 five-letter words, mostly common ones. No punctuation marks or numerals are included. To pass, the applicant must copy at least 25 consecutive letters accurately.)