

Amateur Radio Technician License Training

Welcome to 2023 Amateur
Radio Technician Class License
Training

Amateur Radio Technician License Training

These presentations are sponsored by:

**Mendocino Auxiliary Communications Service (MACS)
Office of Emergency Services**

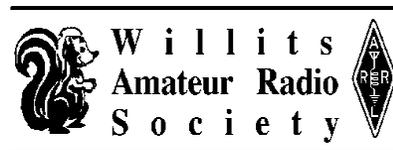
Mendocino County Amateur Radio Communications Service (McARCS)

Willits Amateur Radio Society (WARS)

Adventist Health

Public Health of Mendocino County

Long Valley Health Center



**LONG VALLEY
HEALTH CENTER**



Topics on Exam

Section	Contents	Questions on Exam	Questions in Pool	Covered in Session
T1	FCC Rules and Regulations	6	67	Session 5
T2	<i>Operating Procedures</i>	3	36	Session 4
T3	Radio Wave Propagation	3	34	Session 2
T4	<i>Amateur Radio Practices</i>	2	24	Session 4
T5	Electrical Principles	4	52	Session 1
T6	Electronic Components	4	47	Session 1
T7	Practical Circuits	4	43	Session 3
T8	Signals and Emissions	4	48	Session 3
T9	Antennas and Feedlines	2	24	Session 3
T0	Safety	3	36	Session 2

Operating procedures

Covered in this section:

- **FM and repeaters**
- **Making a contact**
- **Emergency operations**

FM and repeaters

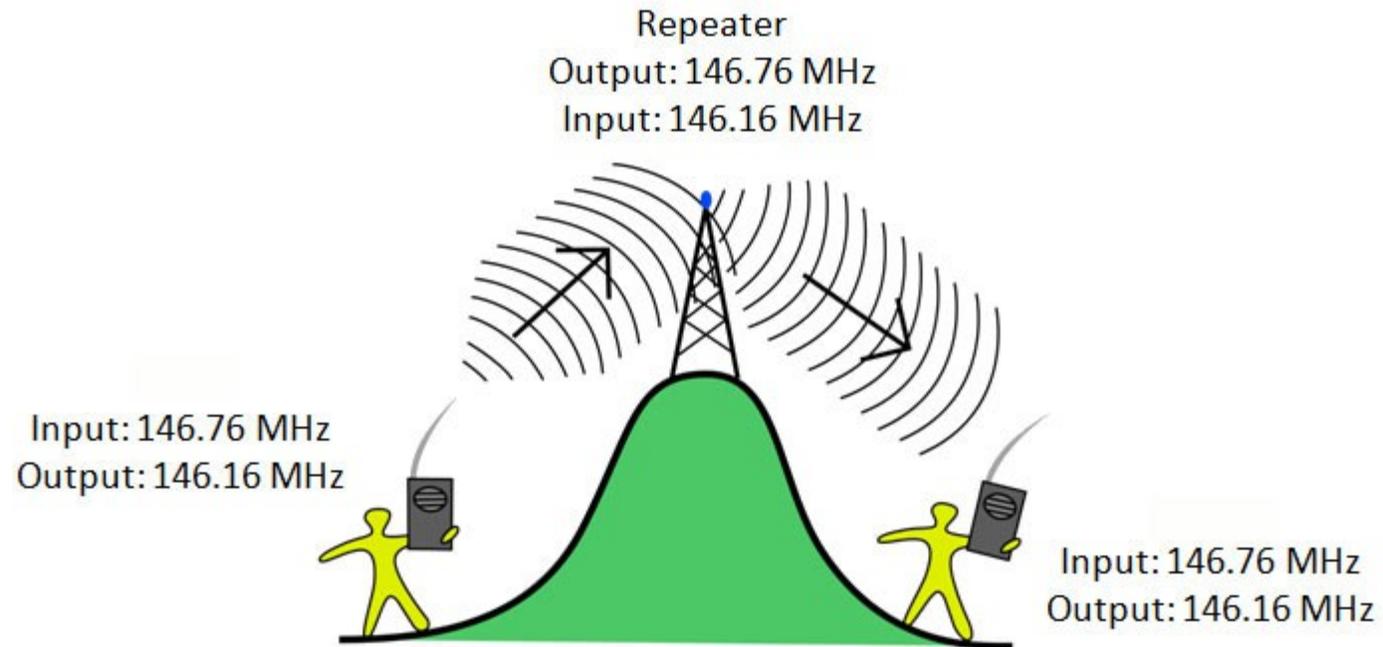
FM operations:

- **Direct contact on “simplex”**
- **Simplex = an amateur station that is transmitting and receiving on the same frequency**
- **Range of simplex communications limited**
- **Repeaters can extend range**

FM and repeaters

Repeaters:

- Repeaters listen on one frequency, transmit on another (duplex)
- Squelch function mutes the receiver audio when a signal is not present
- Carrier vs tone squelch



FM and repeaters

For repeater operations you need to know:

- **Open to all users?**
- **Repeater transmit and receive frequencies**
- **Repeater offset (may be + or -)**
- **Does repeater use carrier or tone squelch (CTCSS/DCS)?**
- **Repeater directory or on-line listing**
- **Check offset and tone/code settings if unable to access repeater you can hear**

FM and repeaters

Standard frequency offsets for VHF/UHF bands:

Band	Frequency	Standard offset
2 meters	146 MHz	+/- 600 KHz
1 ¼ meters	222 MHz	+/- 1.6 MHz
70 centimeters	450 MHz	+/- 5.0 MHz

FM and repeaters

Band plans:

- **Voluntary guidelines for different modes/activities within band**
- **Established by hams, not FCC**
- **Include designated simplex channels, suggested calling frequencies**
- **146.520 MHz national FM calling frequency on 2-meter band**

FM and repeaters

Repeater do's and don'ts:

- **Keep transmissions fairly short with breaks in between**
- **Avoid unnecessary traffic during busy times**
- **Switch to simplex frequency, if feasible**
 - Simplex channels designated in the VHF/UHF band plans so stations can communicate without tying up a repeater
 - Use transceiver “reverse” function to listen on repeater input

FM and repeaters

Linked repeater networks:

- **Repeaters can be linked (radio, dedicated line, internet)**
- **Signal received by one repeater is transmitted by all**
- **IRLP (internet relay/radio linking project) repeaters linked by internet**
 - Command codes to IRLP repeaters sent by DTMF tone
 - DTMF = dual tone multi frequency = signaling with pairs of audio tones

FM and repeaters

Digital voice:

- **Most FM repeaters are analog**
- **Increasing number of digital voice mode repeaters**
- **Digital Mobile Radio (DMR)**
 - DMR talk group users share channel but not heard by others
 - Program radio with group ID or code to join talk group
 - “Color code” used must match the repeater color code for access

FM and repeaters

Other repeater reminders:

- **All over-the-air transmissions must be identified, even tests**
- **Over deviation may make signal into repeater distorted on voice peaks**
 - Talking too loudly, speak more softly or back off microphone

Section questions:

What is a common repeater frequency offset in the 70 cm band?

- A. Plus or minus 5 MHz
- B. Plus or minus 600 kHz
- C. Minus 600 kHz
- D. Plus 600 kHz

Section questions:

What term describes an amateur station that is transmitting and receiving on the same frequency?

- A. Full duplex
- B. Duplex
- C. Simplex
- D. Multiplex

Section questions:

Which of the following could be the reason you are unable to access a repeater whose output you can hear?

- A. Improper transceiver offset
- B. You are using the wrong CTCSS tone
- C. You are using the wrong DCS code
- D. All of these choices are correct

Section questions:

What term describes the use of a sub-audible tone transmitted along with normal voice audio to open the squelch of a receiver?

- A. Carrier squelch
- B. Tone burst
- C. DTMF
- D. CTCSS

Section questions:

How can you join a digital repeater's "talkgroup"?

- A. Register your radio with the local FCC office
- B. Program your radio with the group's ID or code
- C. Join the repeater owner's club
- D. Sign your call after the courtesy tone

Making a Contact

Procedures for making a contact:

- **Some slight differences between HF and VHF/UHF**
- **First step is to listen, don't interrupt on-going contact**
- **No special claims to a frequency**
 - Two stations transmitting on the same frequency interfere? Negotiate continued use of the frequency
- **Before transmitting:**
 - Listen
 - Ask if frequency is in use
 - Make sure you're within your band limits

Making a Contact

On the HF bands:

- **Call “CQ” to invite any station to respond**
- **Respond to CQ by transmitting other station’s call followed by yours**

Making a Contact

On repeaters:

- **CQ not used on repeaters**
- **Station gives their call sign, followed by the word “monitoring” = station is listening on a repeater and looking for a contact**
- **To contact a station with known call, transmit their call, followed by yours**

Making a Contact

Other procedural signals:

- **Three letter “Q” signals used to abbreviate**
- **Originated as shorthand for CW**
- **QRM = receiving interference from other stations**
- **QSY = changing frequency**

Section questions:

Which of the following applies when two stations transmitting on the same frequency interfere with each other?

- A. The stations should negotiate continued use of the frequency
- B. Both stations should choose another frequency to avoid conflict
- C. Interference is inevitable, so no action is required
- D. Use subaudible tones so both stations can share the frequency

Section questions:

Which of the following is required when making on-the-air test transmissions?

- A. Identify the transmitting station
- B. Conduct tests only between 10 p.m. and 6 a.m. local time
- C. Notify the FCC of the transmissions
- D. All of these choices are correct

Section questions:

How is a VHF/UHF transceiver's "reverse" function used?

- A. Reduce power output
- B. Increase power output
- C. Listen on a repeater's input frequency
- D. Listen on a repeater's output frequency

Section questions:

What is an appropriate way to call another station on a repeater if you know the other station's call sign?

- A. Say “break, break” then say the station's call sign
- B. Say the station's call sign then identify with your call sign
- C. Say CQ three times then the other station's call sign
- D. Wait for the station to call CQ then answer it

Section questions:

Which Q signal indicates that you are receiving interference from other stations?

- A. QRM
- B. QRN
- C. QTH
- D. QSB

Emergency Operations

Emergency communication procedures:

- **FCC rules ALWAYS must be followed**
- **May operate beyond privileges only if immediate danger to life/property**

Emergency Operations

National EmComm organizations:

- **Radio Amateur Civil Emergency Service (RACES)**
 - An FCC part 97 amateur radio service for civil defense communications during national emergencies
- **Amateur Radio Emergency Service (ARES)**
 - Licensed amateurs who voluntarily registered their qualifications and equipment for communications duty in the public service

Emergency Operations

Emergency net operations:

- **Communication handled in “net”**
- **Net control station (NCS) directs the communications**
- **Transmit only when directed by the net control station, unless you are reporting an emergency**
- **Begin transmission with "Priority" or "Emergency" followed by call for urgent contact with net control**

Emergency Operations

Message handling:

- **Messages exchanged by net stations = traffic**
- **Pass messages exactly as received**
- **“Preamble” contains tracking information**
- **Radiogram “check” = # of words/word equivalents in the text**
- **Spell unusual words using standard phonetics**

Phonetic Alphabet

A – alpha

B – bravo

C – charlie

D – delta

E – echo

F – foxtrot

G – golf

H – hotel

I – india

J – juliet

K – kilo

L – lima

M – mike

N – november

O – oscar

P – papa

Q – quebec

R – romeo

S – sierra

T – tango

U – uniform

V – victor

W – whiskey

X – x-ray

Y – yankee

Z – zulu

Emergency Operations

Be prepared for emergencies:

- **Spare batteries for hand-held radios**
- **Optional AA cell holder for hand-held when recharging isn't possible**
- **12V rechargeable battery is good backup power**
- **12V battery may be recharged by running vehicle or PV**



Section questions:

Which of the following is a characteristic of good emergency traffic handling?

- A. Passing messages exactly as received
- B. Making decisions as to whether messages are worthy of relay or delivery
- C. Ensuring that any newsworthy messages are relayed to the news media
- D. All of these choices are correct

Section questions:

Which of the following is standard practice when you participate in a net?

- A. When first responding to the net control station, transmit your call sign, name, and address as in the FCC database
- B. Record the time of each of your transmissions
- C. Unless you are reporting an emergency, transmit only when directed by the net control station
- D. All of these choices are correct

Section questions:

What is RACES?

- A. An emergency organization combining amateur radio and citizens band operators and frequencies
- B. An international radio experimentation society
- C. A radio contest held in a short period, sometimes called a “sprint”
- D. An FCC part 97 amateur radio service for civil defense communications during national emergencies

Section questions:

What is meant by the term “check” in in a radiogram header?

- A. The number of words or word equivalents in the text portion of the message
- B. The call sign of the originating station
- C. A list of stations that have relayed the message
- D. A box on the message form that tells you the message was received and/or relayed

Section questions:

Are amateur station control operators ever permitted to operate outside the frequency privileges of their license class?

- A. No
- B. Yes, but only when part of a FEMA emergency plan
- C. Yes, but only when part of a RACES emergency plan
- D. Yes, but only in situations involving the immediate safety of human life or protection of property

Section questions:

What is the Amateur Radio Emergency Service (ARES)?

- A. A group of licensed amateurs who have voluntarily registered their qualifications and equipment for communications duty in the public service
- B. A group of licensed amateurs who are members of the military and who voluntarily agreed to provide message handling services in the case of an emergency
- C. A training program that provides licensing courses for those interested in obtaining an amateur license to use during emergencies
- D. A training program that certifies amateur operators for membership in the Radio Amateur Civil Emergency Service

Operating Procedures

End of Subelement 2

Amateur Radio Technician License Training

These presentations are sponsored by:

**Mendocino Auxiliary Communications Service (MACS)
Office of Emergency Services**

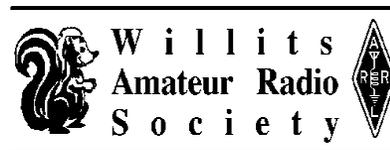
Mendocino County Amateur Radio Communications Service (McARCS)

Willits Amateur Radio Society (WARS)

Adventist Health

Public Health of Mendocino County

Long Valley Health Center



**LONG VALLEY
HEALTH CENTER**



T7, T8, T0 review

Covered in those sections:

Station Equipment

Signals and Modulation Modes

Electrical & RF Energy Safety

T7 section questions:

Which of the following describes combining speech with an RF carrier signal?

- A. Impedance matching
- B. Oscillation
- C. Modulation
- D. Low-pass filtering

T7 section questions:

What device increases the transmitted output power from a transceiver?

- A. An RF power amplifier
- B. A voltage divider
- C. An impedance network
- D. An impedance network

T7 section questions:

Which of the following measurements are commonly made using a multimeter?

- A. Voltage and resistance
- B. Signal strength and noise
- C. Impedance and reactance
- D. All these choices are correct

T7 section questions:

What is a symptom of RF feedback in a transmitter or transceiver?

- A. Excessive SWR at the antenna connection
- B. The transmitter will not stay on the desired frequency
- C. Frequent blowing of power supply fuses
- D. Reports of garbled, distorted, or unintelligible voice transmissions

T8 section questions:

Which of the following types of emission has the narrowest bandwidth?

- A. FM voice
- B. SSB voice
- C. CW
- D. Slow-scan TV

T8 section questions:

Which of the following are inputs to a satellite tracking program?

- A. The satellite transmitted power
- B. The Keplerian elements
- C. The last observed time of zero Doppler shift
- D. All of these choices are correct

T8 section questions:

What an amateur radio station that connects other amateur stations to the internet?

- A. A gateway
- B. A repeater
- C. A beacon
- D. A digipeater

T8 section questions:

What is FT8?

- A. A wideband FM voice mode
- B. A digital mode capable of low signal-to-noise operation
- C. An eight channel multiplex mode for FM repeaters
- D. A digital slow scan TV mode with forward error correction and automatic color compensation

T0 section questions:

Where should a fuse or circuit breaker be installed in a 120V AC power circuit?

- A. In series with the hot conductor only
- B. In series with the hot and neutral conductors
- C. In parallel with the hot conductor only
- D. In parallel with the hot and neutral conductors

T0 section questions:

Why should you avoid attaching an antenna to a utility pole?

- A. The antenna will not work properly because of induced voltages
- B. The 60 Hz radiations from the feed line may increase the SWR
- C. The antenna could contact high-voltage power lines
- D. All of these choices are correct

T0 section questions:

At which of the following frequencies does maximum permissible exposure have the lowest value?

- A. 3.5 MHz
- B. 440 MHz
- C. 50 MHz
- D. 1296 MHz