

## Technician Class HAM License Test Bank

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### *T1 - FCC Rules, descriptions and definitions for the Amateur Radio Service, operator and station license responsibilities: 6 Qs*

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T1A - Amateur Radio Service: purpose and permissible use of the Amateur Radio Service; operator/primary station license grant; where FCC rules are codified; basis and purpose of FCC rules; meanings of basic terms used in FCC rules; interference; spectrum management

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#### **Which of the following is a purpose of the Amateur Radio Service as stated in the FCC rules and regulations?**

- A. Providing personal radio communications for as many citizens as possible
- B. Providing communications for international non-profit organizations
- C. *Advancing skills in the technical and communication phases of the radio art*
- D. All of these choices are correct

#### **Which agency regulates and enforces the rules for the Amateur Radio Service in the United States?**

- A. FEMA
- B. The ITU
- C. The FCC
- D. Homeland Security

#### **Which part of the FCC regulations contains the rules governing the Amateur Radio Service?**

- A. Part 73
- B. Part 95
- C. Part 90
- D. Part 97

#### **Which of the following meets the FCC definition of harmful interference?**

- A. Radio transmissions that annoy users of a repeater
- B. Unwanted radio transmissions that cause costly harm to radio station apparatus
- C. *That which seriously degrades, obstructs, or repeatedly interrupts a radio communication service operating in accordance with the Radio Regulations*
- D. Static from lightning storms

#### **Which of the following is a purpose of the Amateur Radio Service rules and regulations as defined by the FCC?**

- A. *Enhancing international goodwill*
- B. Providing inexpensive communication for local emergency organizations
- C. Training of operators in military radio operating procedures
- D. All of these choices are correct

#### **Which of the following services are protected from interference by amateur signals under all circumstances?**

- A. Citizens Radio Service
- B. Broadcast Service
- C. Land Mobile Radio Service
- D. *Radionavigation Service*

#### **What is the FCC Part 97 definition of telemetry?**

- A. An information bulletin issued by the FCC
- B. A one-way transmission to initiate, modify or terminate functions of a device at a distance
- C. *A one-way transmission of measurements at a distance from the measuring instrument*
- D. An information bulletin from a VEC

#### **Which of the following entities recommends transmit/receive channels and other parameters for auxiliary and repeater stations?**

- A. Frequency Spectrum Manager
- B. *Frequency Coordinator*
- C. FCC Regional Field Office
- D. International Telecommunications Union

#### **Who selects a Frequency Coordinator?**

- A. The FCC Office of Spectrum Management and Coordination Policy
- B. The local chapter of the Office of National Council of Independent Frequency Coordinators
- C. *Amateur operators in a local or regional area whose stations are eligible to be auxiliary or repeater stations*
- D. FCC Regional Field Office

#### **What is the FCC Part 97 definition of an amateur station?**

- A. *A station in the Amateur Radio Service consisting of the apparatus necessary for carrying on radio communications*
- B. A building where Amateur Radio receivers, transmitters, and RF power amplifiers are installed
- C. Any radio station operated by a non-professional
- D. Any radio station for hobby use

#### **When is willful interference to other amateur radio stations permitted?**

- A. Only if the station being interfered with is expressing extreme religious or political views
- B. *At no time*
- C. Only during a contest
- D. At any time, amateurs are not protected from willful interference

**Which of the following is a permissible use of the Amateur Radio Service?**

- A. Broadcasting music and videos to friends
- B. Providing a way for amateur radio operators to earn additional income by using their stations to pass messages
- C. Providing low-cost communications for start-up businesses
- D. *Allowing a person to conduct radio experiments and to communicate with other licensed hams around the world*

**What is the FCC Part 97 definition of telecommand?**

- A. An instruction bulletin issued by the FCC
- B. A one-way radio transmission of measurements at a distance from the measuring instrument
- C. *A one-way transmission to initiate, modify or terminate functions of a device at a distance*
- D. An instruction from a VEC

**What must you do if you are operating on the 23 cm band and learn that you are interfering with a radiolocation station outside the United States?**

- A. *Stop operating or take steps to eliminate the harmful interference*
- B. Nothing, because this band is allocated exclusively to the amateur service
- C. Establish contact with the radiolocation station and ask them to change frequency
- D. Change to CW mode, because this would not likely cause interference

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T1B - Authorized frequencies: frequency allocations; ITU regions; emission modes; restricted sub-bands; spectrum sharing; transmissions near band edges

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**What is the ITU?**

- A. An agency of the United States Department of Telecommunications Management
- B. *A United Nations agency for information and communication technology issues*
- C. An independent frequency coordination agency
- D. A department of the FCC

**Why are the frequency assignments for some U.S. Territories different from those in the 50 U.S. States?**

- A. *Some U. S. Territories are located in ITU regions other than region 2*
- B. Territorial governments are allowed to select their own frequency allocations
- C. Territorial frequency allocations must also include those of adjacent countries
- D. Any territory that was in existence before the ratification of the Communications Act of 1934 is exempt from FCC frequency regulations

**Which frequency is within the 6 meter band?**

- A. 49.00 MHz
- B. *52.525 MHz*
- C. 28.50 MHz
- D. 222.15 MHz

**Which amateur band are you using when your station is transmitting on 146.52 MHz?**

- A. *2 meter band*
- B. 20 meter band
- C. 14 meter band
- D. 6 meter band

**Which 70 cm frequency is authorized to a Technician Class license holder operating in ITU Region 2?**

- A. 53.350 MHz
- B. 146.520 MHz
- C. *443.350 MHz*
- D. 222.520 MHz

**Which 23 cm frequency is authorized to a Technician Class licensee?**

- A. 2315 MHz
- B. *1296 MHz*
- C. 3390 MHz
- D. 146.52 MHz

**What amateur band are you using if you are transmitting on 223.50 MHz?**

- A. 15 meter band
- B. 10 meter band
- C. 2 meter band
- D. *1.25 meter band*

**Which of the following is a result of the fact that the amateur service is secondary in some portions of the 70 cm band?**

- A. *U.S. amateurs may find non-amateur stations in the bands, and must avoid interfering with them*
- B. U.S. amateurs must give foreign amateur stations priority in those portions
- C. International communications are not permitted on 70 cm
- D. Digital transmissions are not permitted on 70 cm

**Why should you not set your transmit frequency to be exactly at the edge of an amateur band or sub-band?**

- A. To allow for calibration error in the transmitter frequency display
- B. So that modulation sidebands do not extend beyond the band edge
- C. To allow for transmitter frequency drift
- D. *All of these choices are correct*

**Which of the bands above 30 MHz that are available to Technician Class operators have mode-restricted sub-bands?**

- A. The 6 meter, 2 meter, and 70 cm bands
- B. The 2 meter and 13 cm bands
- C. *The 6 meter, 2 meter, and 1.25 meter bands*
- D. The 2 meter and 70 cm bands

**What emission modes are permitted in the mode-restricted sub-bands at 50.0 to 50.1 MHz and 144.0 to 144.1 MHz?**

- A. *CW only*
- B. CW and RTTY
- C. SSB only
- D. CW and SSB

**Why are frequency assignments for U.S. stations operating maritime mobile not the same everywhere in the world?**

- A. Amateur maritime mobile stations in international waters must conform to the frequency assignments of the country nearest to their vessel
- B. *Amateur frequency assignments can vary among the three ITU regions*
- C. Frequency assignments are determined by the captain of the vessel
- D. Amateur frequency assignments are different in each of the 90 ITU zones

**Which emission may be used between 219 and 220 MHz?**

- A. Spread spectrum
- B. *Data*
- C. SSB voice
- D. Fast-scan television

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T1C - Operator licensing: operator classes; sequential, special event, and vanity call sign systems; international communications; reciprocal operation; station license and licensee; places where the amateur service is regulated by the FCC; name and address on FCC license database; license term; renewal; grace period

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**Which type of call sign has a single letter in both its prefix and suffix?**

- A. Vanity
  - B. Sequential
  - C. *Special event*
  - D. In-memoriam
- T1C02 (B)

**Which of the following is a valid US amateur radio station call sign?**

- A. KMA3505
- B. *W3ABC*
- C. KDKA
- D. 11Q1176

**What types of international communications are permitted by an FCC-licensed amateur station?**

- A. *Communications incidental to the purposes of the amateur service and remarks of a personal character*
- B. Communications incidental to conducting business or remarks of a personal nature
- C. Only communications incidental to contest exchanges, all other communications are prohibited
- D. Any communications that would be permitted by an international broadcast station

**When are you allowed to operate your amateur station in a foreign country?**

- A. *When the foreign country authorizes it*
- B. When there is a mutual agreement allowing third party communications
- C. When authorization permits amateur communications in a foreign language
- D. When you are communicating with non-licensed individuals in another country

**Which of the following is a vanity call sign which a technician class amateur operator might select if available?**

- A. *K1XXX*
- B. KA1X
- C. W1XX
- D. All of these choices are correct

**From which of the following locations may an FCC-licensed amateur station transmit, in addition to places where the FCC regulates communications?**

- A. From within any country that belongs to the International Telecommunications Union
- B. From within any country that is a member of the United Nations
- C. From anywhere within in ITU Regions 2 and 3
- D. *From any vessel or craft located in international waters and documented or registered in the United States*

**What may result when correspondence from the FCC is returned as undeliverable because the grantee failed to provide the correct mailing address?**

- A. Fine or imprisonment
- B. *Revocation of the station license or suspension of the operator license*
- C. Require the licensee to be re-examined
- D. A reduction of one rank in operator class

**What is the normal term for an FCC-issued primary station/operator amateur radio license grant?**

- A. Five years
- B. Life
- C. *Ten years*
- D. Twenty years

**What is the grace period following the expiration of an amateur license within which the license may be renewed?**

- A. *Two years*
- B. Three years
- C. Five years
- D. Ten years

**How soon after passing the examination for your first amateur radio license may you operate a transmitter on an amateur service frequency?**

- A. Immediately
- B. 30 days after the test date
- C. *As soon as your operator/station license grant appears in the FCC's license database*
- D. You must wait until you receive your license in the mail from the FCC

**If your license has expired and is still within the allowable grace period, may you continue to operate a transmitter on amateur service frequencies?**

- A. *No, transmitting is not allowed until the FCC license database shows that the license has been renewed*
- B. Yes, but only if you identify using the suffix GP
- C. Yes, but only during authorized nets
- D. Yes, for up to two years

**Who may select a desired call sign under the vanity call sign rules?**

- A. Only licensed amateurs with general or extra class licenses
- B. Only licensed amateurs with an extra class license
- C. Only an amateur licensee who has been licensed continuously for more than 10 years
- D. *Any licensed amateur*

**For which license classes are new licenses currently available from the FCC?**

- A. Novice, Technician, General, Advanced
- B. Technician, Technician Plus, General, Advanced
- C. Novice, Technician Plus, General, Advanced
- D. *Technician, General, Amateur Extra*

**Who may select a vanity call sign for a club station?**

- A. Any Extra Class member of the club
- B. Any member of the club
- C. Any officer of the club
- D. Only the person named as trustee on the club station license grant

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T1D - Authorized and prohibited transmission: communications with other countries; music; exchange of information with other services; indecent language; compensation for use of station; retransmission of other amateur signals; codes and ciphers; sale of equipment; unidentified transmissions; broadcasting

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**With which countries are FCC-licensed amateur stations prohibited from exchanging communications?**

- A. Any country whose administration has notified the ITU that it objects to such communications
- B. Any country whose administration has notified the ARRL that it objects to such communications
- C. Any country engaged in hostilities with another country
- D. Any country in violation of the War Powers Act of 1934

**On which of the following occasions may an FCC-licensed amateur station exchange messages with a U.S. military station?**

- A. During an Armed Forces Day Communications Test
- B. During a Memorial Day Celebration
- C. During an Independence Day celebration
- D. During a propagation test

**When is the transmission of codes or ciphers that hide the meaning of a message allowed by an amateur station?**

- A. Only during contests
- B. Only when operating mobile
- C. Only when transmitting control commands to space stations or radio control craft
- D. Only when frequencies above 1280 MHz are used

**What is the only time an amateur station is authorized to transmit music?**

- A. When incidental to an authorized retransmission of manned spacecraft communications
- B. When the music produces no spurious emissions
- C. When the purpose is to interfere with an illegal transmission
- D. When the music is transmitted above 1280 MHz

**When may amateur radio operators use their stations to notify other amateurs of the availability of equipment for sale or trade?**

- A. When the equipment is normally used in an amateur station and such activity is not conducted on a regular basis
- B. When the asking price is \$100.00 or less
- C. When the asking price is less than its appraised value
- D. When the equipment is not the personal property of either the station licensee or the control operator or their close relatives

**What, if any, are the restrictions concerning transmission of language that may be considered indecent or obscene?**

- A. The FCC maintains a list of words that are not permitted to be used on amateur frequencies
- B. Any such language is prohibited
- C. The ITU maintains a list of words that are not permitted to be used on amateur frequencies
- D. There is no such prohibition

**What types of amateur stations can automatically retransmit the signals of other amateur stations?**

- A. Auxiliary, beacon, or Earth stations
- B. Auxiliary, repeater, or space stations
- C. Beacon, repeater, or space stations
- D. Earth, repeater, or space stations

**In which of the following circumstances may the control operator of an amateur station receive compensation for operating the station?**

- A. When engaging in communications on behalf of their employer
- B. When the communication is incidental to classroom instruction at an educational institution
- C. When re-broadcasting weather alerts during a RACES net
- D. When notifying other amateur operators of the availability for sale or trade of apparatus

**Under which of the following circumstances are amateur stations authorized to transmit signals related to broadcasting, program production, or news gathering, assuming no other means is available?**

- A. Only where such communications directly relate to the immediate safety of human life or protection of property
- B. Only when broadcasting communications to or from the space shuttle
- C. Only where noncommercial programming is gathered and supplied exclusively to the National Public Radio network
- D. Only when using amateur repeaters linked to the Internet

**What is the meaning of the term "broadcasting" in the FCC rules for the amateur services?**

- A. Two-way transmissions by amateur stations
- B. Transmission of music
- C. Transmission of messages directed only to amateur operators
- D. Transmissions intended for reception by the general public

**When may an amateur station transmit without identifying?**

- A. When the transmissions are of a brief nature to make station adjustments
- B. When the transmissions are unmodulated
- C. When the transmitted power level is below 1 watt
- D. When transmitting signals to control a model craft

**Under which of the following circumstances may an amateur radio station engage in broadcasting?**

- A. Under no circumstances
- B. When transmitting code practice, information bulletins, or transmissions necessary to provide emergency communications
- C. At any time as long as no music is transmitted
- D. At any time as long as the material being transmitted did not originate from a commercial broadcast station

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T1E - Control operator and control types: control operator required; eligibility; designation of control operator; privileges and duties; control point; local, automatic and remote control; location of control operator

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**When is an amateur station permitted to transmit without a control operator?**

- A. When using automatic control, such as in the case of a repeater
- B. When the station licensee is away and another licensed amateur is using the station
- C. When the transmitting station is an auxiliary station
- D. Never

**Who may a station licensee designate to be the control operator of an amateur station?**

- A. Any U.S. citizen or registered alien
- B. Any family member of the station licensee
- C. Any person over the age of 18
- D. *Only a person for whom an amateur operator/primary station license grant appears in the FCC database or who is authorized for alien reciprocal operation*

**Who must designate the station control operator?**

- A. *The station licensee*
- B. The FCC
- C. The frequency coordinator
- D. The ITU

**What determines the transmitting privileges of an amateur station?**

- A. The frequency authorized by the frequency coordinator
- B. The class of operator license held by the station licensee
- C. The highest class of operator license held by anyone on the premises
- D. *The class of operator license held by the control operator*

**What is an amateur station control point?**

- A. The location of the station's transmitting antenna
- B. The location of the station transmitting apparatus
- C. *The location at which the control operator function is performed*
- D. The mailing address of the station licensee

**Under what type of control do APRS network digipeaters operate?**

- A. *Automatic*
- B. Remote
- C. Local
- D. Manual

**When the control operator is not the station licensee, who is responsible for the proper operation of the station?**

- A. All licensed amateurs who are present at the operation
- B. Only the station licensee
- C. Only the control operator
- D. *The control operator and the station licensee are equally responsible*

**Which of the following is an example of automatic control?**

- A. *Repeater operation*
- B. Controlling the station over the Internet
- C. Using a computer or other device to automatically send CW
- D. Using a computer or other device to automatically identify

**What type of control is being used when the control operator is at the control point?**

- A. Radio control
- B. Unattended control
- C. Automatic control
- D. *Local control*

**Which of the following is an example of remote control as defined in Part 97?**

- A. Repeater operation
- B. *Operating the station over the Internet*
- C. Controlling a model aircraft, boat or car by amateur radio
- D. All of these choices are correct

**Who does the FCC presume to be the control operator of an amateur station, unless documentation to the contrary is in the station records?**

- A. The station custodian
- B. The third party participant
- C. The person operating the station equipment
- D. *The station licensee*

**When, under normal circumstances, may a Technician Class licensee be the control operator of a station operating in an exclusive Extra Class operator segment of the amateur bands?**

- A. *At no time*
  - B. When operating a special event station
  - C. As part of a multi-operator contest team
  - D. When using a club station whose trustee is an Extra Class operator licensee
- T1F - Station identification; repeaters; third party communications; club stations; FCC inspection

**What type of identification is being used when identifying a station on the air as Race Headquarters?**

- A. *Tactical call sign*
- B. An official call sign reserved for RACES drills
- C. SSID
- D. Broadcast station

**When using tactical identifiers such as "Race Headquarters" during a community service net operation, how often must your station transmit the station's FCC-assigned call sign?**

- A. Never, the tactical call is sufficient
- B. Once during every hour
- C. *At the end of each communication and every ten minutes during a communication*
- D. At the end of every transmission

**When is an amateur station required to transmit its assigned call sign?**

- A. At the beginning of each contact, and every 10 minutes thereafter
- B. At least once during each transmission
- C. At least every 15 minutes during and at the end of a communication
- D. *At least every 10 minutes during and at the end of a communication*

**Which of the following is an acceptable language to use for station identification when operating in a phone sub-band?**

- A. Any language recognized by the United Nations
- B. Any language recognized by the ITU
- C. *The English language*
- D. English, French, or Spanish

**What method of call sign identification is required for a station transmitting phone signals?**

- A. Send the call sign followed by the indicator RPT
- B. *Send the call sign using CW or phone emission*
- C. Send the call sign followed by the indicator R
- D. Send the call sign using only phone emission

**Which of the following formats of a self-assigned indicator is acceptable when identifying using a phone transmission?**

- A. KL7CC stroke W3
- B. KL7CC slant W3
- C. KL7CC slash W3
- D. *All of these choices are correct*

**Which of the following restrictions apply when a non-licensed person is allowed to speak to a foreign station using a station under the control of a Technician Class control operator?**

- A. The person must be a U.S. citizen
- B. *The foreign station must be one with which the U.S. has a third party agreement*
- C. The licensed control operator must do the station identification
- D. All of these choices are correct

**Which indicator is required by the FCC to be transmitted after a station call sign?**

- A. /M when operating mobile
- B. /R when operating a repeater
- C. / followed the FCC Region number when operating out of the region in which the license was issued
- D. */KT, /AE or /AG when using new license privileges earned by CSCE while waiting for an upgrade to a previously issued license to appear in the FCC license database*

**What type of amateur station simultaneously retransmits the signal of another amateur station on a different channel or channels?**

- A. Beacon station
- B. Earth station
- C. *Repeater station*
- D. Message forwarding station

**Who is accountable should a repeater inadvertently retransmit communications that violate the FCC rules?**

- A. *The control operator of the originating station*
- B. The control operator of the repeater
- C. The owner of the repeater
- D. Both the originating station and the repeater owner

**To which foreign stations do the FCC rules authorize the transmission of non-emergency third party communications?**

- A. *Any station whose government permits such communications*
- B. Those in ITU Region 2 only
- C. Those in ITU Regions 2 and 3 only
- D. Those in ITU Region 3 only

**How many persons are required to be members of a club for a club station license to be issued by the FCC?**

- A. At least 5
- B. *At least 4*
- C. A trustee and 2 officers
- D. At least 2

**When must the station licensee make the station and its records available for FCC inspection?**

- A. At any time ten days after notification by the FCC of such an inspection
- B. *At any time upon request by an FCC representative*
- C. Only after failing to comply with an FCC notice of violation
- D. Only when presented with a valid warrant by an FCC official or government agent

## T2 - Operating Procedures: 3 Qs

T2A - Station operation: choosing an operating frequency; calling another station; test transmissions; procedural signs; use of minimum power; choosing an operating frequency; band plans; calling frequencies; repeater offsets

**What is the most common repeater frequency offset in the 2 meter band?**

- A. Plus 500 kHz
- B. *Plus or minus 600 kHz*
- C. Minus 500 kHz
- D. Only plus 600 kHz

**What is the national calling frequency for FM simplex operations in the 70 cm band?**

- A. 146.520 MHz
- B. 145.000 MHz
- C. 432.100 MHz
- D. *446.000 MHz*

**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

**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

**How should you respond to a station calling CQ?**

- A. Transmit CQ followed by the other station's call sign
- B. Transmit your call sign followed by the other station's call sign
- C. *Transmit the other station's call sign followed by your call sign*
- D. Transmit a signal report followed by your call sign

**What must an amateur operator do when making on-air transmissions to test equipment or antennas?**

- A. *Properly identify the transmitting station*
- B. Make test transmissions only after 10:00 p.m. local time
- C. Notify the FCC of the test transmission
- D. State the purpose of the test during the test procedure

**Which of the following is true when making a test transmission?**

- A. Station identification is not required if the transmission is less than 15 seconds
- B. Station identification is not required if the transmission is less than 1 watt
- C. Station identification is only required once an hour when the transmissions are for test purposes only
- D. *Station identification is required at least every ten minutes during the test and at the end of the test*

**What is the meaning of the procedural signal "CQ"?**

- A. Call on the quarter hour
- B. A new antenna is being tested (no station should answer)
- C. Only the called station should transmit
- D. *Calling any station*

**What brief statement is often transmitted in place of "CQ" to indicate that you are listening on a repeater?**

- A. The words "Hello test" followed by your call sign
- B. *Your call sign*
- C. The repeater call sign followed by your call sign
- D. The letters "QSY" followed by your call sign

**What is a band plan, beyond the privileges established by the FCC?**

- A. *A voluntary guideline for using different modes or activities within an amateur band*
- B. A mandated list of operating schedules
- C. A list of scheduled net frequencies
- D. A plan devised by a club to indicate frequency band usage

**Which of the following is an FCC rule regarding power levels used in the amateur bands, under normal, non-distress circumstances?**

- A. There is no limit to power as long as there is no interference with other services
- B. No more than 200 watts PEP may be used
- C. Up to 1500 watts PEP may be used on any amateur frequency without restriction
- D. *While not exceeding the maximum power permitted on a given band, use the minimum power necessary to carry out the desired communication*

**Which of the following is a guideline to use when choosing an operating frequency for calling CQ?**

- A. Listen first to be sure that no one else is using the frequency
- B. Ask if the frequency is in use
- C. Make sure you are in your assigned band
- D. *All of these choices are correct*

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T2B – VHF/UHF operating practices: SSB phone; FM repeater; simplex; splits and shifts; CTCSS; DTMF; tone squelch; carrier squelch; phonetics; operational problem resolution; Q signals

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**What is the term used to describe an amateur station that is transmitting and receiving on the same frequency?**

- A. Full duplex communication
- B. Diplex communication
- C. *Simplex communication*
- D. Multiplex communication

**What is the term used to describe the use of a sub-audible tone transmitted with normal voice audio to open the squelch of a receiver?**

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

**Which of the following describes the muting of receiver audio controlled solely by the presence or absence of an RF signal?**

- A. Tone squelch
- B. *Carrier squelch*
- C. CTCSS
- D. Modulated carrier

**Which of the following common problems might cause you to be able to hear but not access a repeater even when transmitting with the proper offset?**

- A. The repeater receiver may require an audio tone burst for access
- B. The repeater receiver may require a CTCSS tone for access
- C. The repeater receiver may require a DCS tone sequence for access
- D. *All of these choices are correct*

**What determines the amount of deviation of an FM (as opposed to PM) signal?**

- A. Both the frequency and amplitude of the modulating signal
- B. The frequency of the modulating signal
- C. *The amplitude of the modulating signal*
- D. The relative phase of the modulating signal and the carrier

**What happens when the deviation of an FM transmitter is increased?**

- A. *Its signal occupies more bandwidth*
- B. Its output power increases
- C. Its output power and bandwidth increases
- D. Asymmetric modulation occurs

**What could cause your FM signal to interfere with stations on nearby frequencies?**

- A. *Microphone gain too high, causing over-deviation*
- B. SWR too high
- C. Incorrect CTCSS Tone
- D. All of these choices are correct

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

- A. *Common courtesy should prevail, but no one has absolute right to an amateur frequency*
- B. Whoever has the strongest signal has priority on the frequency
- C. Whoever has been on the frequency the longest has priority on the frequency
- D. The station which has the weakest signal has priority on the frequency

**Which of the following methods is encouraged by the FCC when identifying your station when using phone?**

- A. *Use of a phonetic alphabet*
- B. Send your call sign in CW as well as voice
- C. Repeat your call sign three times
- D. Increase your signal to full power when identifying

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

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

**Which Q signal indicates that you are changing frequency?**

- A. QRU
- B. *QSY*
- C. QSL
- D. QRZ

**Under what circumstances should you consider communicating via simplex rather than a repeater?**

- A. *When the stations can communicate directly without using a repeater*
- B. Only when you have an endorsement for simplex operation on your license
- C. Only when third party traffic is not being passed
- D. Only if you have simplex modulation capability

**Which of the following is true of the use of SSB phone in amateur bands above 50 MHz?**

- A. It is permitted only by holders of a General Class or higher license
  - B. It is permitted only on repeaters
  - C. *It is permitted in at least some portion of all the amateur bands above 50 MHz*
  - D. It is permitted only on when power is limited to no more than 100 watts
- T2C – Public service: emergency and non-emergency operations; applicability of FCC rules; RACES and ARES; net and traffic procedures; emergency restrictions

**When do the FCC rules NOT apply to the operation of an amateur station?**

- A. When operating a RACES station
- B. When operating under special FEMA rules
- C. When operating under special ARES rules
- D. *Never, FCC rules always apply*

**What is one way to recharge a 12-volt lead-acid station battery if the commercial power is out?**

- A. Cool the battery in ice for several hours
- B. Add acid to the battery
- C. *Connect the battery in parallel with a vehicle's battery and run the engine*
- D. All of these choices are correct

**What should be done to insure that voice message traffic containing proper names and unusual words are copied correctly by the receiving station?**

- A. The entire message should be repeated at least four times
- B. Such messages must be limited to no more than 10 words
- C. *Such words and terms should be spelled out using a standard phonetic alphabet*
- D. All of these choices are correct

**What do RACES and ARES have in common?**

- A. They represent the two largest ham clubs in the United States
- B. Both organizations broadcast road and weather information
- C. Neither may handle emergency traffic supporting public service agencies
- D. *Both organizations may provide communications during emergencies*

**Which of the following describes the Radio Amateur Civil Emergency Service (RACES)?**

- A. A radio service using amateur frequencies for emergency management or civil defense communications
- B. A radio service using amateur stations for emergency management or civil defense communications
- C. An emergency service using amateur operators certified by a civil defense organization as being enrolled in that organization
- D. *All of these choices are correct*

**Which of the following is an accepted practice to get the immediate attention of a net control station when reporting an emergency?**

- A. Repeat the words SOS three times followed by the call sign of the reporting station
- B. Press the push-to-talk button three times
- C. *Begin your transmission by saying "Priority" or "Emergency" followed by your call sign*
- D. Play a pre-recorded emergency alert tone followed by your call sign

**Which of the following is an accepted practice for an amateur operator who has checked into an emergency traffic net?**

- A. Provided that the frequency is quiet, announce the station call sign and location every 5 minutes
- B. Move 5 kHz away from the net's frequency and use high power to ask other hams to keep clear of the net frequency
- C. *Remain on frequency without transmitting until asked to do so by the net control station*
- D. All of the choices are correct

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

- A. *Passing messages exactly as received*
- B. Making decisions as to whether or not messages should be relayed or delivered
- C. Communicating messages to the news media for broadcast outside the disaster area
- D. All of these choices are correct

**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 if necessary in situations involving the immediate safety of human life or protection of property*

**What is the preamble in a formal traffic message?**

- A. The first paragraph of the message text
- B. The message number
- C. The priority handling indicator for the message
- D. *The information needed to track the message as it passes through the amateur radio traffic handling system*

**What is meant by the term "check" in reference to a formal traffic message?**

- A. *The check is a count of the number of words or word equivalents in the text portion of the message*
- B. The check is the value of a money order attached to the message
- C. The check is a list of stations that have relayed the message
- D. The check is a box on the message form that tells you the message was received

**What is the Amateur Radio Emergency Service (ARES)?**

- A. *Licensed amateurs who have voluntarily registered their qualifications and equipment for communications duty in the public service*
- B. 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

## *T3 - Radio wave characteristics: properties of radio waves; propagation modes: 3 Qs*

T3A - Radio wave characteristics: how a radio signal travels; fading; multipath; wavelength vs. penetration; antenna orientation

**What should you do if another operator reports that your station's 2 meter signals were strong just a moment ago, but now they are weak or distorted?**

- A. Change the batteries in your radio to a different type
- B. Turn on the CTCSS tone
- C. Ask the other operator to adjust his squelch control
- D. *Try moving a few feet or changing the direction of your antenna if possible, as reflections may be causing multi-path distortion*

**Why are UHF signals often more effective from inside buildings than VHF signals?**

- A. VHF signals lose power faster over distance
- B. *The shorter wavelength allows them to more easily penetrate the structure of buildings*
- C. This is incorrect; VHF works better than UHF inside buildings
- D. UHF antennas are more efficient than VHF antennas

**What antenna polarization is normally used for long-distance weak-signal CW and SSB contacts using the VHF and UHF bands?**

- A. Right-hand circular
- B. Left-hand circular
- C. *Horizontal*
- D. Vertical

**What can happen if the antennas at opposite ends of a VHF or UHF line of sight radio link are not using the same polarization?**

- A. The modulation sidebands might become inverted
- B. *Signals could be significantly weaker*
- C. Signals have an echo effect on voices
- D. Nothing significant will happen

**When using a directional antenna, how might your station be able to access a distant repeater if buildings or obstructions are blocking the direct line of sight path?**

- A. Change from vertical to horizontal polarization
- B. *Try to find a path that reflects signals to the repeater*
- C. Try the long path
- D. Increase the antenna SWR

**What term is commonly used to describe the rapid fluttering sound sometimes heard from mobile stations that are moving while transmitting?**

- A. Flip-flopping
- B. *Picket fencing*
- C. Frequency shifting
- D. Pulsing

**What type of wave carries radio signals between transmitting and receiving stations?**

- A. *Electromagnetic*
- B. Electrostatic
- C. Surface acoustic
- D. Magnetostrictive

**Which of the following is a likely cause of irregular fading of signals received by ionospheric reflection?**

- A. Frequency shift due to Faraday rotation
- B. Interference from thunderstorms
- C. *Random combining of signals arriving via different paths*
- D. Intermodulation distortion

**Which of the following results from the fact that skip signals refracted from the ionosphere are elliptically polarized?**

- A. Digital modes are unusable
- B. *Either vertically or horizontally polarized antennas may be used for transmission or reception*
- C. FM voice is unusable
- D. Both the transmitting and receiving antennas must be of the same polarization

**What may occur if data signals propagate over multiple paths?**

- A. Transmission rates can be increased by a factor equal to the number of separate paths observed
- B. Transmission rates must be decreased by a factor equal to the number of separate paths observed
- C. No significant changes will occur if the signals are transmitting using FM
- D. *Error rates are likely to increase*

**Which part of the atmosphere enables the propagation of radio signals around the world?**

- A. The stratosphere
- B. The troposphere
- C. *The ionosphere*
- D. The magnetosphere

T3B - Radio and electromagnetic wave properties: the electromagnetic spectrum; wavelength vs. frequency; velocity of electromagnetic waves; calculating wavelength

**What is the name for the distance a radio wave travels during one complete cycle?**

- A. Wave speed
- B. Waveform
- C. *Wavelength*
- D. Wave spread

**What property of a radio wave is used to describe its polarization?**

- A. *The orientation of the electric field*
- B. The orientation of the magnetic field
- C. The ratio of the energy in the magnetic field to the energy in the electric field
- D. The ratio of the velocity to the wavelength

**What are the two components of a radio wave?**

- A. AC and DC
- B. Voltage and current
- C. *Electric and magnetic fields*
- D. Ionizing and non-ionizing radiation

**How fast does a radio wave travel through free space?**

- A. *At the speed of light*
- B. At the speed of sound
- C. Its speed is inversely proportional to its wavelength
- D. Its speed increases as the frequency increases

**How does the wavelength of a radio wave relate to its frequency?**

- A. The wavelength gets longer as the frequency increases
- B. *The wavelength gets shorter as the frequency increases*
- C. There is no relationship between wavelength and frequency
- D. The wavelength depends on the bandwidth of the signal

**What is the formula for converting frequency to approximate wavelength in meters?**

- A. Wavelength in meters equals frequency in hertz multiplied by 300
- B. Wavelength in meters equals frequency in hertz divided by 300
- C. Wavelength in meters equals frequency in megahertz divided by 300
- D. *Wavelength in meters equals 300 divided by frequency in megahertz*

**What property of radio waves is often used to identify the different frequency bands?**

- A. *The approximate wavelength*
- B. The magnetic intensity of waves
- C. The time it takes for waves to travel one mile
- D. The voltage standing wave ratio of waves

**What are the frequency limits of the VHF spectrum?**

- A. 30 to 300 kHz
- B. *30 to 300 MHz*
- C. 300 to 3000 kHz
- D. 300 to 3000 MHz

**What are the frequency limits of the UHF spectrum?**

- A. 30 to 300 kHz
- B. 30 to 300 MHz
- C. 300 to 3000 kHz
- D. *300 to 3000 MHz*

**What frequency range is referred to as HF?**

- A. 300 to 3000 MHz
- B. 30 to 300 MHz
- C. *3 to 30 MHz*
- D. 300 to 3000 kHz

**What is the approximate velocity of a radio wave as it travels through free space?**

- A. 3000 kilometers per second
- B. *300,000,000 meters per second*
- C. 300,000 miles per hour
- D. 186,000 miles per hour

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T3C - Propagation modes: line of sight; sporadic E; meteor and auroral scatter and reflections; tropospheric ducting; F layer skip; radio horizon

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**Why are direct (not via a repeater) UHF signals rarely heard from stations outside your local coverage area?**

- A. They are too weak to go very far
- B. FCC regulations prohibit them from going more than 50 miles
- C. *UHF signals are usually not reflected by the ionosphere*
- D. They collide with trees and shrubbery and fade out

**Which of the following might be happening when VHF signals are being received from long distances?**

- A. Signals are being reflected from outer space
- B. Signals are arriving by sub-surface ducting
- C. Signals are being reflected by lightning storms in your area
- D. *Signals are being refracted from a sporadic E layer*

**What is a characteristic of VHF signals received via auroral reflection?**

- A. Signals from distances of 10,000 or more miles are common
- B. *The signals exhibit rapid fluctuations of strength and often sound distorted*
- C. These types of signals occur only during winter nighttime hours
- D. These types of signals are generally strongest when your antenna is aimed west

**Which of the following propagation types is most commonly associated with occasional strong over-the-horizon signals on the 10, 6, and 2 meter bands?**

- A. Backscatter
- B. *Sporadic E*
- C. D layer absorption
- D. Gray-line propagation

**Which of the following effects might cause radio signals to be heard despite obstructions between the transmitting and receiving stations?**

- A. *Knife-edge diffraction*
- B. Faraday rotation
- C. Quantum tunneling
- D. Doppler shift

**What mode is responsible for allowing over-the-horizon VHF and UHF communications to ranges of approximately 300 miles on a regular basis?**

- A. *Tropospheric scatter*
- B. D layer refraction
- C. F2 layer refraction
- D. Faraday rotation

**What band is best suited for communicating via meteor scatter?**

- A. 10 meters
- B. *6 meters*
- C. 2 meters
- D. 70 cm

**What causes tropospheric ducting?**

- A. Discharges of lightning during electrical storms
- B. Sunspots and solar flares
- C. Updrafts from hurricanes and tornadoes
- D. *Temperature inversions in the atmosphere*

**What is generally the best time for long-distance 10 meter band propagation via the F layer?**

- A. *From dawn to shortly after sunset during periods of high sunspot activity*
- B. From shortly after sunset to dawn during periods of high sunspot activity
- C. From dawn to shortly after sunset during periods of low sunspot activity
- D. From shortly after sunset to dawn during periods of low sunspot activity

**What is the radio horizon?**

- A. *The distance over which two stations can communicate by direct path*
- B. The distance from the ground to a horizontally mounted antenna
- C. The farthest point you can see when standing at the base of your antenna tower
- D. The shortest distance between two points on the Earth's surface

**Why do VHF and UHF radio signals usually travel somewhat farther than the visual line of sight distance between two stations?**

- A. Radio signals move somewhat faster than the speed of light
- B. Radio waves are not blocked by dust particles
- C. *The Earth seems less curved to radio waves than to light*
- D. Radio waves are blocked by dust particles

**Which of the following bands may provide long distance communications during the peak of the sunspot cycle?**

- A. Six or ten meters
- B. 23 centimeters
- C. 70 centimeters or 1.25 meters
- D. All of these choices are correct

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## *T4 - Amateur radio practices and station set up: 2 Qs*

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T4A – Station setup: connecting microphones; reducing unwanted emissions; power source; connecting a computer; RF grounding; connecting digital equipment; connecting an SWR meter

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**Which of the following is true concerning the microphone connectors on amateur transceivers?**

- A. All transceivers use the same microphone connector type
- B. *Some connectors include push-to-talk and voltages for powering the microphone*
- C. All transceivers using the same connector type are wired identically
- D. Un-keyed connectors allow any microphone to be connected

**How might a computer be used as part of an amateur radio station?**

- A. For logging contacts and contact information
- B. For sending and/or receiving CW
- C. For generating and decoding digital signals
- D. *All of these choices are correct*

**Which is a good reason to use a regulated power supply for communications equipment?**

- A. *It prevents voltage fluctuations from reaching sensitive circuits*
- B. A regulated power supply has FCC approval
- C. A fuse or circuit breaker regulates the power
- D. Power consumption is independent of load

**Where must a filter be installed to reduce harmonic emissions from your station?**

- A. *Between the transmitter and the antenna*
- B. Between the receiver and the transmitter
- C. At the station power supply
- D. At the microphone

**Where should an in-line SWR meter be connected to monitor the standing wave ratio of the station antenna system?**

- A. *In series with the feed line, between the transmitter and antenna*
- B. In series with the station's ground
- C. In parallel with the push-to-talk line and the antenna
- D. In series with the power supply cable, as close as possible to the radio

**Which of the following would be connected between a transceiver and computer in a packet radio station?**

- A. Transmatch
- B. Mixer
- C. *Terminal node controller*
- D. Antenna

**How is a computer's sound card used when conducting digital communications using a computer?**

- A. The sound card communicates between the computer CPU and the video display
- B. The sound card records the audio frequency for video display
- C. *The sound card provides audio to the microphone input and converts received audio to digital form*
- D. All of these choices are correct

**Which type of conductor is best to use for RF grounding?**

- A. Round stranded wire
- B. Round copper-clad steel wire
- C. Twisted-pair cable
- D. *Flat strap*

**Which of the following could you use to cure distorted audio caused by RF current flowing on the shield of a microphone cable?**

- A. Band-pass filter
- B. Low-pass filter
- C. Preamplifier
- D. *Ferrite choke*

**What is the source of a high-pitched whine that varies with engine speed in a mobile transceiver's receive audio?**

- A. The ignition system
- B. *The alternator*
- C. The electric fuel pump
- D. Anti-lock braking system controllers

**Where should the negative return connection of a mobile transceiver's power cable be connected?**

- A. *At the battery or engine block ground strap*
- B. At the antenna mount
- C. To any metal part of the vehicle
- D. Through the transceiver's mounting bracket

**What could be happening if another operator reports a variable high-pitched whine on the audio from your mobile transmitter?**

- A. Your microphone is picking up noise from an open window
- B. You have the volume on your receiver set too high
- C. You need to adjust your squelch control
- D. *Noise on the vehicle's electrical system is being transmitted along with your speech audio*

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T4B - Operating controls: tuning; use of filters; squelch function; AGC; repeater offset; memory channels

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**What may happen if a transmitter is operated with the microphone gain set too high?**

- A. The output power might be too high
- B. *The output signal might become distorted*
- C. The frequency might vary
- D. The SWR might increase

**Which of the following can be used to enter the operating frequency on a modern transceiver?**

- A. *The keypad or VFO knob*
- B. The CTCSS or DTMF encoder
- C. The Automatic Frequency Control
- D. All of these choices are correct

**What is the purpose of the squelch control on a transceiver?**

- A. To set the highest level of volume desired
- B. To set the transmitter power level
- C. To adjust the automatic gain control
- D. *To mute receiver output noise when no signal is being received*

**What is a way to enable quick access to a favorite frequency on your transceiver?**

- A. Enable the CTCSS tones
- B. *Store the frequency in a memory channel*
- C. Disable the CTCSS tones
- D. Use the scan mode to select the desired frequency

**Which of the following would reduce ignition interference to a receiver?**

- A. Change frequency slightly
- B. Decrease the squelch setting
- C. *Turn on the noise blanker*
- D. Use the RIT control

**Which of the following controls could be used if the voice pitch of a single-sideband signal seems too high or low?**

- A. The AGC or limiter
- B. The bandwidth selection
- C. The tone squelch
- D. *The receiver RIT or clarifier*

**What does the term "RIT" mean?**

- A. Receiver Input Tone
- B. *Receiver Incremental Tuning*
- C. Rectifier Inverter Test
- D. Remote Input Transmitter

**What is the advantage of having multiple receive bandwidth choices on a multimode transceiver?**

- A. Permits monitoring several modes at once
- B. *Permits noise or interference reduction by selecting a bandwidth matching the mode*
- C. Increases the number of frequencies that can be stored in memory
- D. Increases the amount of offset between receive and transmit frequencies

**Which of the following is an appropriate receive filter bandwidth to select in order to minimize noise and interference for SSB reception?**

- A. 500 Hz
- B. 1000 Hz
- C. *2400 Hz*
- D. 5000 Hz

**Which of the following is an appropriate receive filter bandwidth to select in order to minimize noise and interference for CW reception?**

- A. *500 Hz*
- B. 1000 Hz
- C. 2400 Hz
- D. 5000 Hz

**Which of the following describes the common meaning of the term "repeater offset"?**

- A. The distance between the repeater's transmit and receive antennas
- B. The time delay before the repeater timer resets
- C. *The difference between the repeater's transmit and receive frequencies*
- D. Matching the antenna impedance to the feed line impedance

**What is the function of automatic gain control or AGC?**

- A. *To keep received audio relatively constant*
- B. To protect an antenna from lightning
- C. To eliminate RF on the station cabling
- D. An asymmetric goniometer control used for antenna matching

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## *T5 - Electrical principles: math for electronics; electronic principles; Ohm's Law: 4 Qs*

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T5A - Electrical principles, units, and terms: current and voltage; conductors and insulators; alternating and direct current

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**Electrical current is measured in which of the following units?**

- A. Volts
- B. Watts
- C. Ohms
- D. *Amperes*

**Electrical power is measured in which of the following units?**

- A. Volts
- B. *Watts*
- C. Ohms
- D. Amperes

**What is the name for the flow of electrons in an electric circuit?**

- A. Voltage
- B. Resistance
- C. Capacitance
- D. *Current*

**What is the name for a current that flows only in one direction?**

- A. Alternating current
- B. *Direct current*
- C. Normal current
- D. Smooth current

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**What is the electrical term for the electromotive force (EMF) that causes electron flow?**

- A. *Voltage*
- B. Ampere-hours
- C. Capacitance
- D. Inductance

**How much voltage does a mobile transceiver usually require?**

- A. *About 12 volts*
- B. About 30 volts
- C. About 120 volts
- D. About 240 volts

Which of the following is a good electrical conductor?

- A. Glass
- B. Wood
- C. *Copper*
- D. Rubber

Which of the following is a good electrical insulator?

- A. Copper
- B. *Glass*
- C. Aluminum
- D. Mercury

What is the name for a current that reverses direction on a regular basis?

- A. *Alternating current*
- B. Direct current
- C. Circular current
- D. Vertical current

Which term describes the rate at which electrical energy is used?

- A. Resistance
- B. Current
- C. *Power*
- D. Voltage

What is the basic unit of electromotive force?

- A. *The volt*
- B. The watt
- C. The ampere
- D. The ohm

What term describes the number of times per second that an alternating current reverses direction?

- A. Pulse rate
- B. Speed
- C. Wavelength
- D. *Frequency*

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T5B - Math for electronics: conversion of electrical units; decibels; the metric system

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How many milliamperes is 1.5 amperes?

- A. 15 milliamperes
- B. 150 milliamperes
- C. *1,500 milliamperes*
- D. 15,000 milliamperes

What is another way to specify a radio signal frequency of 1,500,000 hertz?

- A. *1500 kHz*
- B. 1500 MHz
- C. 15 GHz
- D. 150 kHz

How many volts are equal to one kilovolt?

- A. One one-thousandth of a volt
- B. One hundred volts
- C. *One thousand volts*
- D. One million volts

How many volts are equal to one microvolt?

- A. *One one-millionth of a volt*
- B. One million volts
- C. One thousand kilovolts
- D. One one-thousandth of a volt

Which of the following is equivalent to 500 milliwatts?

- A. 0.02 watts
- B. *0.5 watts*
- C. 5 watts
- D. 50 watts

If an ammeter calibrated in amperes is used to measure a 3000-milliampere current, what reading would it show?

- A. 0.003 amperes
- B. 0.3 amperes
- C. *3 amperes*
- D. 3,000,000 amperes

If a frequency readout calibrated in megahertz shows a reading of 3.525 MHz, what would it show if it were calibrated in kilohertz?

- A. 0.003525 kHz
- B. 35.25 kHz
- C. *3525 kHz*
- D. 3,525,000 kHz

How many microfarads are 1,000,000 picofarads?

- A. 0.001 microfarads
- B. *1 microfarad*
- C. 1000 microfarads
- D. 1,000,000,000 microfarads

What is the approximate amount of change, measured in decibels (dB), of a power increase from 5 watts to 10 watts?

- A. 2 dB
- B. *3 dB*
- C. 5 dB
- D. 10 dB

What is the approximate amount of change, measured in decibels (dB), of a power decrease from 12 watts to 3 watts?

- A. -1 dB
- B. -3 dB
- C. *-6 dB*
- D. -9 dB

What is the approximate amount of change, measured in decibels (dB), of a power increase from 20 watts to 200 watts?

- A. *10 dB*
- B. 12 dB
- C. 18 dB
- D. 28 dB

Which of the following frequencies is equal to 28,400 kHz?

- A. *28.400 MHz*
- B. 2.800 MHz
- C. 284.00 MHz
- D. 28.400 kHz

If a frequency readout shows a reading of 2425 MHz, what frequency is that in GHz?

- A. 0.002425 GHz
- B. 24.25 GHz
- C. *2.425 GHz*
- D. 2425 GHz

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T5C - Electronic principles: capacitance; inductance; current flow in circuits; alternating current; definition of RF; DC power calculations; impedance

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**What is the ability to store energy in an electric field called?**

- A. Inductance
- B. Resistance
- C. Tolerance
- D. *Capacitance*

**What is the basic unit of capacitance?**

- A. *The farad*
- B. The ohm
- C. The volt
- D. The henry

**What is the ability to store energy in a magnetic field called?**

- A. Admittance
- B. Capacitance
- C. Resistance
- D. *Inductance*

**What is the basic unit of inductance?**

- A. The coulomb
- B. The farad
- C. *The henry*
- D. The ohm

**What is the unit of frequency?**

- A. *Hertz*
- B. Henry
- C. Farad
- D. Tesla

**What does the abbreviation "RF" refer to?**

- A. *Radio frequency signals of all types*
- B. The resonant frequency of a tuned circuit
- C. The real frequency transmitted as opposed to the apparent frequency
- D. Reflective force in antenna transmission lines

**What is a usual name for electromagnetic waves that travel through space?**

- A. Gravity waves
- B. Sound waves
- C. *Radio waves*
- D. Pressure waves

**What is the formula used to calculate electrical power in a DC circuit?**

- A. *Power (P) equals voltage (E) multiplied by current (I)*
- B. Power (P) equals voltage (E) divided by current (I)
- C. Power (P) equals voltage (E) minus current (I)
- D. Power (P) equals voltage (E) plus current (I)

**How much power is being used in a circuit when the applied voltage is 13.8 volts DC and the current is 10 amperes?**

- A. *138 watts*
- B. 0.7 watts
- C. 23.8 watts
- D. 3.8 watts

**How much power is being used in a circuit when the applied voltage is 12 volts DC and the current is 2.5 amperes?**

- A. 4.8 watts
- B. *30 watts*
- C. 14.5 watts
- D. 0.208 watts

**How many amperes are flowing in a circuit when the applied voltage is 12 volts DC and the load is 120 watts?**

- A. 0.1 amperes
- B. *10 amperes*
- C. 12 amperes
- D. 132 amperes

**What is meant by the term impedance?**

- A. *It is a measure of the opposition to AC current flow in a circuit*
- B. It is the inverse of resistance
- C. It is a measure of the Q or Quality Factor of a component
- D. It is a measure of the power handling capability of a component

**What are the units of impedance?**

- A. Volts
- B. Amperes
- C. Coulombs
- D. *Ohms*

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## T5D – Ohm's Law: formulas and usage

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**What formula is used to calculate current in a circuit?**

- A. Current (I) equals voltage (E) multiplied by resistance (R)
- B. *Current (I) equals voltage (E) divided by resistance (R)*
- C. Current (I) equals voltage (E) added to resistance (R)
- D. Current (I) equals voltage (E) minus resistance (R)

**What formula is used to calculate voltage in a circuit?**

- A. *Voltage (E) equals current (I) multiplied by resistance (R)*
- B. Voltage (E) equals current (I) divided by resistance (R)
- C. Voltage (E) equals current (I) added to resistance (R)
- D. Voltage (E) equals current (I) minus resistance (R)

**What formula is used to calculate resistance in a circuit?**

- A. Resistance (R) equals voltage (E) multiplied by current (I)
- B. *Resistance (R) equals voltage (E) divided by current (I)*
- C. Resistance (R) equals voltage (E) added to current (I)
- D. Resistance (R) equals voltage (E) minus current (I)

**What is the resistance of a circuit in which a current of 3 amperes flows through a resistor connected to 90 volts?**

- A. 3 ohms
- B. *30 ohms*
- C. 93 ohms
- D. 270 ohms

**What is the resistance in a circuit for which the applied voltage is 12 volts and the current flow is 1.5 amperes?**

- A. 18 ohms
- B. 0.125 ohms
- C. *8 ohms*
- D. 13.5 ohms

**What is the resistance of a circuit that draws 4 amperes from a 12-volt source?**

- A. *3 ohms*
- B. 16 ohms
- C. 48 ohms
- D. 8 Ohms

**What is the current flow in a circuit with an applied voltage of 120 volts and a resistance of 80 ohms?**

- A. 9600 amperes
- B. 200 amperes
- C. 0.667 amperes
- D. 1.5 amperes

**What is the current flowing through a 100-ohm resistor connected across 200 volts?**

- A. 20,000 amperes
- B. 0.5 amperes
- C. 2 amperes
- D. 100 amperes

**What is the current flowing through a 24-ohm resistor connected across 240 volts?**

- A. 24,000 amperes
- B. 0.1 amperes
- C. 10 amperes
- D. 216 amperes

**What is the voltage across a 2-ohm resistor if a current of 0.5 amperes flows through it?**

- A. 1 volt
- B. 0.25 volts
- C. 2.5 volts
- D. 1.5 volts

**What is the voltage across a 10-ohm resistor if a current of 1 ampere flows through it?**

- A. 1 volt
- B. 10 volts
- C. 11 volts
- D. 9 volts

**What is the voltage across a 10-ohm resistor if a current of 2 amperes flows through it?**

- A. 8 volts
- B. 0.2 volts
- C. 12 volts
- D. 20 volts

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## *T6 - Electrical components: semiconductors; circuit diagrams; component functions: 4 Qs*

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T6A - Electrical components: fixed and variable resistors; capacitors and inductors; fuses; switches; batteries

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**What electrical component is used to oppose the flow of current in a DC circuit?**

- A. Inductor
- B. Resistor
- C. Voltmeter
- D. Transformer

**What type of component is often used as an adjustable volume control?**

- A. Fixed resistor
- B. Power resistor
- C. Potentiometer
- D. Transformer

**What electrical parameter is controlled by a potentiometer?**

- A. Inductance
- B. Resistance
- C. Capacitance
- D. Field strength

**What electrical component stores energy in an electric field?**

- A. Resistor
- B. Capacitor
- C. Inductor
- D. Diode

**What type of electrical component consists of two or more conductive surfaces separated by an insulator?**

- A. Resistor
- B. Potentiometer
- C. Oscillator
- D. Capacitor

**What type of electrical component stores energy in a magnetic field?**

- A. Resistor
- B. Capacitor
- C. Inductor
- D. Diode

**What electrical component is usually composed of a coil of wire?**

- A. Switch
- B. Capacitor
- C. Diode
- D. Inductor

**What electrical component is used to connect or disconnect electrical circuits?**

- A. Magnetron
- B. Switch
- C. Thermistor
- D. All of these choices are correct

**What electrical component is used to protect other circuit components from current overloads?**

- A. Fuse
- B. Capacitor
- C. Inductor
- D. All of these choices are correct

**Which of the following battery types is rechargeable?**

- A. Nickel-metal hydride
- B. Lithium-ion
- C. Lead-acid gel-cell
- D. All of these choices are correct

**Which of the following battery types is not rechargeable?**

- A. Nickel-cadmium
- B. Carbon-zinc
- C. Lead-acid
- D. Lithium-ion

## T6B – Semiconductors: basic principles and applications of solid state devices; diodes and transistors

**What class of electronic components is capable of using a voltage or current signal to control current flow?**

- A. Capacitors
- B. Inductors
- C. Resistors
- D. Transistors

**What electronic component allows current to flow in only one direction?**

- A. Resistor
- B. Fuse
- C. Diode
- D. Driven Element

**Which of these components can be used as an electronic switch or amplifier?**

- A. Oscillator
- B. Potentiometer
- C. Transistor
- D. Voltmeter

**Which of the following components can be made of three layers of semiconductor material?**

- A. Alternator
- B. Transistor
- C. Triode
- D. Pentagrid converter

**Which of the following electronic components can amplify signals?**

- A. Transistor
- B. Variable resistor
- C. Electrolytic capacitor
- D. Multi-cell battery

**How is the cathode lead of a semiconductor diode usually identified?**

- A. With the word cathode
- B. With a stripe
- C. With the letter C
- D. All of these choices are correct

**What does the abbreviation LED stand for?**

- A. Low Emission Diode
- B. Light Emitting Diode
- C. Liquid Emission Detector
- D. Long Echo Delay

**What does the abbreviation FET stand for?**

- A. Field Effect Transistor
- B. Fast Electron Transistor
- C. Free Electron Transition
- D. Field Emission Thickness

**What are the names of the two electrodes of a diode?**

- A. Plus and minus
- B. Source and drain
- C. Anode and cathode
- D. Gate and base

**What are the three electrodes of a PNP or NPN transistor?**

- A. Emitter, base, and collector
- B. Source, gate, and drain
- C. Cathode, grid, and plate
- D. Cathode, drift cavity, and collector

**What are the three electrodes of a field effect transistor?**

- A. Emitter, base, and collector
- B. Source, gate, and drain
- C. Cathode, grid, and plate
- D. Cathode, gate, and anode

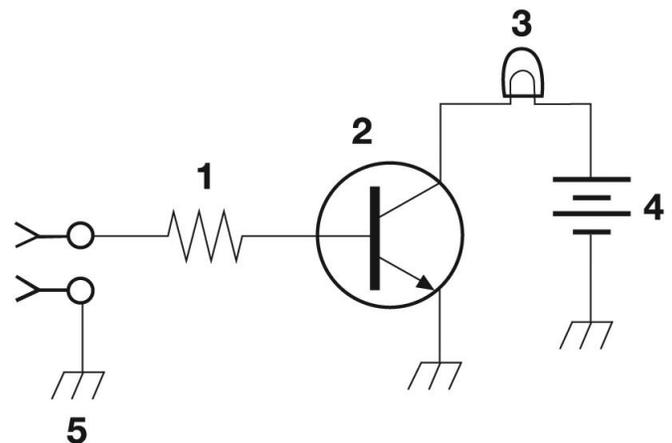
**What is the term that describes a transistor's ability to amplify a signal?**

- A. Gain
- B. Forward resistance
- C. Forward voltage drop
- D. On resistance

## T6C - Circuit diagrams; schematic symbols

**What is the name for standardized representations of components in an electrical wiring diagram?**

- A. Electrical depictions
- B. Grey sketch
- C. Schematic symbols
- D. Component callouts



**Figure T-1**

**What is component 1 in figure T1?**

- A. Resistor
- B. Transistor
- C. Battery
- D. Connector

**What is component 2 in figure T1?**

- A. Resistor
- B. Transistor
- C. Indicator lamp
- D. Connector

**What is component 3 in figure T1?**

- A. Resistor
- B. Transistor
- C. Lamp
- D. Ground symbol

What is component 4 in figure T1?

- A. Resistor
- B. Transistor
- C. *Battery*
- D. Ground symbol

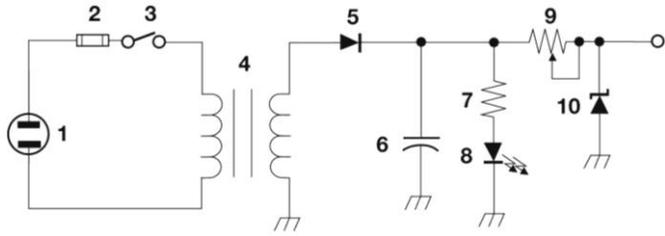


Figure T-2

What is component 6 in figure T2?

- A. Resistor
- B. *Capacitor*
- C. Regulator IC
- D. Transistor

What is component 8 in figure T2?

- A. Resistor
- B. Inductor
- C. Regulator IC
- D. *Light emitting diode*

What is component 9 in figure T2?

- A. Variable capacitor
- B. Variable inductor
- C. *Variable resistor*
- D. Variable transformer

What is component 4 in figure T2?

- A. Variable inductor
- B. Double-pole switch
- C. Potentiometer
- D. *Transformer*

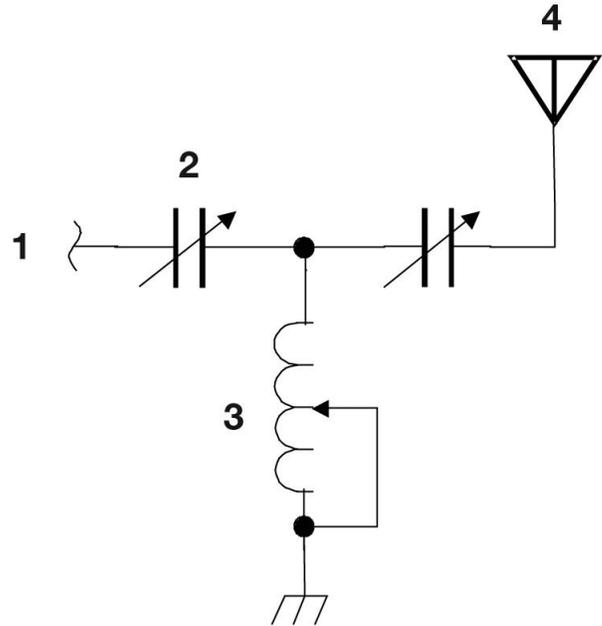


Figure T-3

What is component 3 in figure T3?

- A. Connector
- B. Meter
- C. Variable capacitor
- D. *Variable inductor*

What is component 4 in figure T3?

- A. *Antenna*
- B. Transmitter
- C. Dummy load
- D. Ground

What do the symbols on an electrical circuit schematic diagram represent?

- A. *Electrical components*
- B. Logic states
- C. Digital codes
- D. Traffic nodes

Which of the following is accurately represented in electrical circuit schematic diagrams?

- A. Wire lengths
- B. Physical appearance of components
- C. *The way components are interconnected*
- D. All of these choices are correct

---

T6D - Component functions: rectification; switches; indicators; power supply components; resonant circuit; shielding; power transformers; integrated circuits

---

Which of the following devices or circuits changes an alternating current into a varying direct current signal?

- A. Transformer
- B. *Rectifier*
- C. Amplifier
- D. Reflector

What best describes a relay?

- A. A switch controlled by an electromagnet
- B. A current controlled amplifier
- C. An optical sensor
- D. A pass transistor

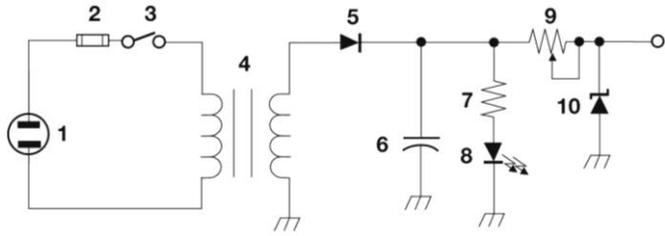


Figure T-2

What type of switch is represented by component 3 in figure T2?

- A. Single-pole single-throw
- B. Single-pole double-throw
- C. Double-pole single-throw
- D. Double-pole double-throw

Which of the following can be used to display signal strength on a numeric scale?

- A. Potentiometer
- B. Transistor
- C. Meter
- D. Relay

What type of circuit controls the amount of voltage from a power supply?

- A. Regulator
- B. Oscillator
- C. Filter
- D. Phase inverter

What component is commonly used to change 120V AC house current to a lower AC voltage for other uses?

- A. Variable capacitor
- B. Transformer
- C. Transistor
- D. Diode

Which of the following is commonly used as a visual indicator?

- A. LED
- B. FET
- C. Zener diode
- D. Bipolar transistor

Which of the following is used together with an inductor to make a tuned circuit?

- A. Resistor
- B. Zener diode
- C. Potentiometer
- D. Capacitor

What is the name of a device that combines several semiconductors and other components into one package?

- A. Transducer
- B. Multi-pole relay
- C. Integrated circuit
- D. Transformer

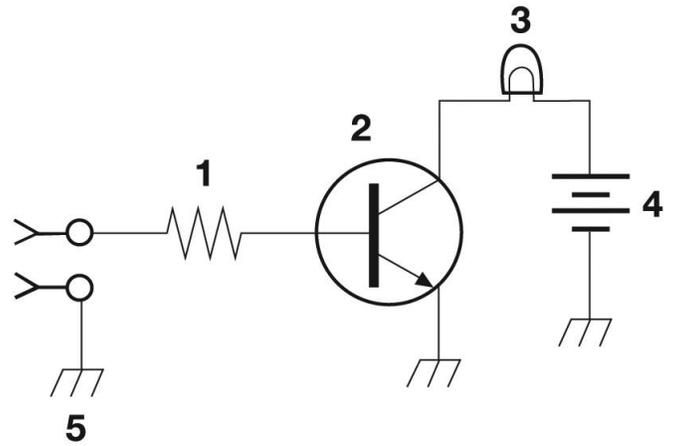


Figure T-1

What is the function of component 2 in Figure T1?

- A. Give off light when current flows through it
- B. Supply electrical energy
- C. Control the flow of current
- D. Convert electrical energy into radio waves

What is a simple resonant or tuned circuit?

- A. An inductor and a capacitor connected in series or parallel to form a filter
- B. A type of voltage regulator
- C. A resistor circuit used for reducing standing wave ratio
- D. A circuit designed to provide high fidelity audio

Which of the following is a common reason to use shielded wire?

- A. To decrease the resistance of DC power connections
- B. To increase the current carrying capability of the wire
- C. To prevent coupling of unwanted signals to or from the wire
- D. To couple the wire to other signals

***T7 - Station equipment: common transmitter and receiver problems; antenna measurements; troubleshooting; basic repair and testing: 4 Qs***

T7A – Station equipment: receivers; transmitters; transceivers; modulation; transverters; low power and weak signal operation; transmit and receive amplifiers

Which term describes the ability of a receiver to detect the presence of a signal?

- A. Linearity
- B. Sensitivity
- C. Selectivity
- D. Total Harmonic Distortion

**What is a transceiver?**

- A. A type of antenna switch
- B. A unit combining the functions of a transmitter and a receiver
- C. A component in a repeater which filters out unwanted interference
- D. A type of antenna matching network

**Which of the following is used to convert a radio signal from one frequency to another?**

- A. Phase splitter
- B. Mixer
- C. Inverter
- D. Amplifier

**Which term describes the ability of a receiver to discriminate between multiple signals?**

- A. Discrimination ratio
- B. Sensitivity
- C. Selectivity
- D. Harmonic Distortion

**What is the name of a circuit that generates a signal of a desired frequency?**

- A. Reactance modulator
- B. Product detector
- C. Low-pass filter
- D. Oscillator

**What device takes the output of a low-powered 28 MHz SSB exciter and produces a 222 MHz output signal?**

- A. High-pass filter
- B. Low-pass filter
- C. Transverter
- D. Phase converter

**What is meant by term "PTT"?**

- A. Pre-transmission tuning to reduce transmitter harmonic emission
- B. Precise tone transmissions used to limit repeater access to only certain signals
- C. A primary transformer tuner use to match antennas
- D. The push to talk function which switches between receive and transmit

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

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

**Which of the following devices is most useful for VHF weak-signal communication?**

- A. A quarter-wave vertical antenna
- B. A multi-mode VHF transceiver
- C. An omni-directional antenna
- D. A mobile VHF FM transceiver

**What device increases the low-power output from a handheld transceiver?**

- A. A voltage divider
- B. An RF power amplifier
- C. An impedance network
- D. All of these choices are correct

**Where is an RF preamplifier installed?**

- A. Between the antenna and receiver
- B. At the output of the transmitter's power amplifier
- C. Between a transmitter and antenna tuner
- D. At the receiver's audio output

---

T7B – Common transmitter and receiver problems: symptoms of overload and overdrive; distortion; causes of interference; interference and consumer electronics; part 15 devices; over and under modulation; RF feedback; off frequency signals; fading and noise; problems with digital communications interfaces

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**What can you do if you are told your FM handheld or mobile transceiver is over-deviating?**

- A. Talk louder into the microphone
- B. Let the transceiver cool off
- C. Change to a higher power level
- D. Talk farther away from the microphone

**What would cause a broadcast AM or FM radio to receive an amateur radio transmission unintentionally?**

- A. The receiver is unable to reject strong signals outside the AM or FM band
- B. The microphone gain of the transmitter is turned up too high
- C. The audio amplifier of the transmitter is overloaded
- D. The deviation of an FM transmitter is set too low

**Which of the following may be a cause of radio frequency interference?**

- A. Fundamental overload
- B. Harmonics
- C. Spurious emissions
- D. All of these choices are correct

**Which of the following is a way to reduce or eliminate interference by an amateur transmitter to a nearby telephone?**

- A. Put a filter on the amateur transmitter
- B. Reduce the microphone gain
- C. Reduce the SWR on the transmitter transmission line
- D. Put a RF filter on the telephone

**How can overload of a non-amateur radio or TV receiver by an amateur signal be reduced or eliminated?**

- A. Block the amateur signal with a filter at the antenna input of the affected receiver
- B. Block the interfering signal with a filter on the amateur transmitter
- C. Switch the transmitter from FM to SSB
- D. Switch the transmitter to a narrow-band mode

**Which of the following actions should you take if a neighbor tells you that your station's transmissions are interfering with their radio or TV reception?**

- A. Make sure that your station is functioning properly and that it does not cause interference to your own radio or television when it is tuned to the same channel
- B. Immediately turn off your transmitter and contact the nearest FCC office for assistance
- C. Tell them that your license gives you the right to transmit and nothing can be done to reduce the interference
- D. Install a harmonic doubler on the output of your transmitter and tune it until the interference is eliminated

**Which of the following may be useful in correcting a radio frequency interference problem?**

- A. Snap-on ferrite chokes
- B. Low-pass and high-pass filters
- C. Band-reject and band-pass filters
- D. All of these choices are correct

**What should you do if something in a neighbor's home is causing harmful interference to your amateur station?**

- A. Work with your neighbor to identify the offending device
- B. Politely inform your neighbor about the rules that prohibit the use of devices which cause interference
- C. Check your station and make sure it meets the standards of good amateur practice
- D. All of these choices are correct

**What is a Part 15 device?**

- A. An unlicensed device that may emit low powered radio signals on frequencies used by a licensed service
- B. A type of amateur radio that can legally be used in the citizen's band
- C. A device for long distance communications using special codes sanctioned by the International Amateur Radio Union
- D. A type of test set used to determine whether a transmitter is in compliance with FCC regulation 91.15

**What might be the problem if you receive a report that your audio signal through the repeater is distorted or unintelligible?**

- A. Your transmitter may be slightly off frequency
- B. Your batteries may be running low
- C. You could be in a bad location
- D. All of these choices are correct

**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. Reports of garbled, distorted, or unintelligible transmissions
- D. Frequent blowing of power supply fuses

**What might be the first step to resolve cable TV interference from your ham radio transmission?**

- A. Add a low pass filter to the TV antenna input
- B. Add a high pass filter to the TV antenna input
- C. Add a preamplifier to the TV antenna input
- D. Be sure all TV coaxial connectors are installed properly

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T7C – Antenna measurements and troubleshooting: measuring SWR; dummy loads; coaxial cables; feed line failure modes

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**What is the primary purpose of a dummy load?**

- A. To prevent the radiation of signals when making tests
- B. To prevent over-modulation of your transmitter
- C. To improve the radiation from your antenna
- D. To improve the signal to noise ratio of your receiver

**Which of the following instruments can be used to determine if an antenna is resonant at the desired operating frequency?**

- A. A VTVM
- B. An antenna analyzer
- C. A Q meter
- D. A frequency counter

**What, in general terms, is standing wave ratio (SWR)?**

- A. A measure of how well a load is matched to a transmission line
- B. The ratio of high to low impedance in a feed line
- C. The transmitter efficiency ratio
- D. An indication of the quality of your station's ground connection

**What reading on an SWR meter indicates a perfect impedance match between the antenna and the feed line?**

- A. 2 to 1
- B. 1 to 3
- C. 1 to 1
- D. 10 to 1

**What is the approximate SWR value above which the protection circuits in most solid-state transmitters begin to reduce transmitter power?**

- A. 2 to 1
- B. 1 to 2
- C. 6 to 1
- D. 10 to 1

**What does an SWR reading of 4:1 indicate?**

- A. Loss of -4dB
- B. Good impedance match
- C. Gain of +4dB
- D. Impedance mismatch

**What happens to power lost in a feed line?**

- A. It increases the SWR
- B. It comes back into your transmitter and could cause damage
- C. It is converted into heat
- D. It can cause distortion of your signal

**What instrument other than an SWR meter could you use to determine if a feed line and antenna are properly matched?**

- A. Voltmeter
- B. Ohmmeter
- C. Iambic pentameter
- D. Directional wattmeter

**Which of the following is the most common cause for failure of coaxial cables?**

- A. Moisture contamination
- B. Gamma rays
- C. The velocity factor exceeds 1.0
- D. Overloading

**Why should the outer jacket of coaxial cable be resistant to ultraviolet light?**

- A. Ultraviolet resistant jackets prevent harmonic radiation
- B. Ultraviolet light can increase losses in the cable's jacket
- C. Ultraviolet and RF signals can mix together, causing interference
- D. Ultraviolet light can damage the jacket and allow water to enter the cable

**What is a disadvantage of air core coaxial cable when compared to foam or solid dielectric types?**

- A. It has more loss per foot
- B. It cannot be used for VHF or UHF antennas
- C. It requires special techniques to prevent water absorption
- D. It cannot be used at below freezing temperatures

**Which of the following is a common use of coaxial cable?**

- A. Carrying dc power from a vehicle battery to a mobile radio
- B. Carrying RF signals between a radio and antenna
- C. Securing masts, tubing, and other cylindrical objects on towers
- D. Connecting data signals from a TNC to a computer

**What does a dummy load consist of?**

- A. A high-gain amplifier and a TR switch
- B. A non-inductive resistor and a heat sink
- C. A low voltage power supply and a DC relay
- D. A 50 ohm reactance used to terminate a transmission line

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T7D – Basic repair and testing: soldering; using basic test instruments; connecting a voltmeter, ammeter, or ohmmeter

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**Which instrument would you use to measure electric potential or electromotive force?**

- A. An ammeter
- B. A voltmeter
- C. A wavemeter
- D. An ohmmeter

**What is the correct way to connect a voltmeter to a circuit?**

- A. In series with the circuit
- B. In parallel with the circuit
- C. In quadrature with the circuit
- D. In phase with the circuit

**How is an ammeter usually connected to a circuit?**

- A. In series with the circuit
- B. In parallel with the circuit
- C. In quadrature with the circuit
- D. In phase with the circuit

**Which instrument is used to measure electric current?**

- A. An ohmmeter
- B. A wavemeter
- C. A voltmeter
- D. An ammeter

**What instrument is used to measure resistance?**

- A. An oscilloscope
- B. A spectrum analyzer
- C. A noise bridge
- D. An ohmmeter

**Which of the following might damage a multimeter?**

- A. Measuring a voltage too small for the chosen scale
- B. Leaving the meter in the milliamps position overnight
- C. Attempting to measure voltage when using the resistance setting
- D. Not allowing it to warm up properly

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

- A. SWR and RF power
- B. Signal strength and noise
- C. Impedance and reactance
- D. Voltage and resistance

**Which of the following types of solder is best for radio and electronic use?**

- A. Acid-core solder
- B. Silver solder
- C. Rosin-core solder
- D. Aluminum solder

**What is the characteristic appearance of a cold solder joint?**

- A. Dark black spots
- B. A bright or shiny surface
- C. A grainy or dull surface
- D. A greenish tint

**What is probably happening when an ohmmeter, connected across an unpowered circuit, initially indicates a low resistance and then shows increasing resistance with time?**

- A. The ohmmeter is defective
- B. The circuit contains a large capacitor
- C. The circuit contains a large inductor
- D. The circuit is a relaxation oscillator

**Which of the following precautions should be taken when measuring circuit resistance with an ohmmeter?**

- A. Ensure that the applied voltages are correct
- B. Ensure that the circuit is not powered
- C. Ensure that the circuit is grounded
- D. Ensure that the circuit is operating at the correct frequency

**Which of the following precautions should be taken when measuring high voltages with a voltmeter?**

- A. Ensure that the voltmeter has very low impedance
- B. Ensure that the voltmeter and leads are rated for use at the voltages to be measured
- C. Ensure that the circuit is grounded through the voltmeter
- D. Ensure that the voltmeter is set to the correct frequency

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***T8 - Modulation modes: amateur satellite operation; operating activities; non-voice communications: 4 Qs***

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T8A – Modulation modes: bandwidth of various signals; choice of emission type

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**Which of the following is a form of amplitude modulation?**

- A. Spread-spectrum
- B. Packet radio
- C. *Single sideband*
- D. Phase shift keying

**What type of modulation is most commonly used for VHF packet radio transmissions?**

- A. FM
- B. SSB
- C. AM
- D. Spread Spectrum

**Which type of voice mode is most often used for long-distance (weak signal) contacts on the VHF and UHF bands?**

- A. FM
- B. DRM
- C. SSB
- D. PM

**Which type of modulation is most commonly used for VHF and UHF voice repeaters?**

- A. AM
- B. SSB
- C. PSK
- D. FM

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

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

**Which sideband is normally used for 10 meter HF, VHF and UHF single-sideband communications?**

- A. *Upper sideband*
- B. Lower sideband
- C. Suppressed sideband
- D. Inverted sideband

**What is the primary advantage of single sideband over FM for voice transmissions?**

- A. SSB signals are easier to tune
- B. SSB signals are less susceptible to interference
- C. *SSB signals have narrower bandwidth*
- D. All of these choices are correct

**What is the approximate bandwidth of a single sideband voice signal?**

- A. 1 kHz
- B. *3 kHz*
- C. 6 kHz
- D. 15 kHz

**What is the approximate bandwidth of a VHF repeater FM phone signal?**

- A. Less than 500 Hz
- B. About 150 kHz
- C. *Between 10 and 15 kHz*
- D. Between 50 and 125 kHz

**What is the typical bandwidth of analog fast-scan TV transmissions on the 70 cm band?**

- A. More than 10 MHz
- B. *About 6 MHz*
- C. About 3 MHz
- D. About 1 MHz

**What is the approximate maximum bandwidth required to transmit a CW signal?**

- A. 2.4 kHz
- B. *150 Hz*
- C. 1000 Hz
- D. 15 kHz

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T8B - Amateur satellite operation; Doppler shift, basic orbits, operating protocols; control operator, transmitter power considerations; satellite tracking; digital modes

---

**Who may be the control operator of a station communicating through an amateur satellite or space station?**

- A. Only an Amateur Extra Class operator
- B. A General Class licensee or higher licensee who has a satellite operator certification
- C. Only an Amateur Extra Class operator who is also an AMSAT member
- D. *Any amateur whose license privileges allow them to transmit on the satellite uplink frequency*

**How much transmitter power should be used on the uplink frequency of an amateur satellite or space station?**

- A. The maximum power of your transmitter
- B. *The minimum amount of power needed to complete the contact*
- C. No more than half the rating of your linear amplifier
- D. Never more than 1 watt

**Which of the following are provided by satellite tracking programs?**

- A. Maps showing the real-time position of the satellite track over the earth
- B. The time, azimuth, and elevation of the start, maximum altitude, and end of a pass
- C. The apparent frequency of the satellite transmission, including effects of Doppler shift
- D. *All of these answers are correct*

**Which amateur stations may make contact with an amateur station on the International Space Station using 2 meter and 70 cm band amateur radio frequencies?**

- A. Only members of amateur radio clubs at NASA facilities
- B. *Any amateur holding a Technician or higher class license*
- C. Only the astronaut's family members who are hams
- D. You cannot talk to the ISS on amateur radio frequencies

**What is a satellite beacon?**

- A. The primary transmit antenna on the satellite
- B. An indicator light that shows where to point your antenna
- C. A reflective surface on the satellite
- D. *A transmission from a space station that contains information about a satellite*

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

- A. The weight of the satellite
- B. *The Keplerian elements*
- C. The last observed time of zero Doppler shift
- D. All of these answers are correct

**With regard to satellite communications, what is Doppler shift?**

- A. A change in the satellite orbit
- B. A mode where the satellite receives signals on one band and transmits on another
- C. *An observed change in signal frequency caused by relative motion between the satellite and the earth station*
- D. A special digital communications mode for some satellites

**What is meant by the statement that a satellite is operating in mode U/V?**

- A. The satellite uplink is in the 15 meter band and the downlink is in the 10 meter band
- B. *The satellite uplink is in the 70 cm band and the downlink is in the 2 meter band*
- C. The satellite operates using ultraviolet frequencies
- D. The satellite frequencies are usually variable

**What causes spin fading when referring to satellite signals?**

- A. Circular polarized noise interference radiated from the sun
- B. *Rotation of the satellite and its antennas*
- C. Doppler shift of the received signal
- D. Interfering signals within the satellite uplink band

**What do the initials LEO tell you about an amateur satellite?**

- A. The satellite battery is in Low Energy Operation mode
- B. The satellite is performing a Lunar Ejection Orbit maneuver
- C. *The satellite is in a Low Earth Orbit*
- D. The satellite uses Light Emitting Optics

**What is a commonly used method of sending signals to and from a digital satellite?**

- A. USB AFSK
- B. PSK31
- C. *FM Packet*
- D. WSJT

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T8C – Operating activities: radio direction finding; radio control; contests; linking over the Internet; grid locators

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**Which of the following methods is used to locate sources of noise interference or jamming?**

- A. Echolocation
- B. Doppler radar
- C. *Radio direction finding*
- D. Phase locking

**Which of these items would be useful for a hidden transmitter hunt?**

- A. Calibrated SWR meter
- B. *A directional antenna*
- C. A calibrated noise bridge
- D. All of these choices are correct

**What popular operating activity involves contacting as many stations as possible during a specified period of time?**

- A. *Contesting*
- B. Net operations
- C. Public service events
- D. Simulated emergency exercises

**Which of the following is good procedure when contacting another station in a radio contest?**

- A. Be sure to sign only the last two letters of your call if there is a pileup calling the station
- B. Work the station twice to be sure that you are in his log
- C. *Send only the minimum information needed for proper identification and the contest exchange*
- D. All of these choices are correct

**What is a grid locator?**

- A. *A letter-number designator assigned to a geographic location*
- B. A letter-number designator assigned to an azimuth and elevation
- C. An instrument for neutralizing a final amplifier
- D. An instrument for radio direction finding

**How is access to an IRLP node accomplished?**

- A. By obtaining a password which is sent via voice to the node
- B. *By using DTMF signals*
- C. By entering the proper Internet password
- D. By using CTCSS tone codes

**What is the maximum power allowed when transmitting telecommand signals to radio controlled models?**

- A. 500 milliwatts
- B. *1 watt*
- C. 25 watts
- D. 1500 watts

**What is required in place of on-air station identification when sending signals to a radio control model using amateur frequencies?**

- A. Voice identification must be transmitted every 10 minutes
- B. Morse code ID must be sent once per hour
- C. *A label indicating the licensee's name, call sign and address must be affixed to the transmitter*
- D. A flag must be affixed to the transmitter antenna with the station call sign in 1 inch high letters or larger

**How might you obtain a list of active nodes that use VoIP?**

- A. From the FCC Rulebook
- B. From your local emergency coordinator
- C. *From a repeater directory*
- D. From the local repeater frequency coordinator

**How do you select a specific IRLP node when using a portable transceiver?**

- A. Choose a specific CTCSS tone
- B. Choose the correct DSC tone
- C. Access the repeater autopatch
- D. *Use the keypad to transmit the IRLP node ID*

**What name is given to an amateur radio station that is used to connect other amateur stations to the Internet?**

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

**What is meant by Voice Over Internet Protocol (VoIP) as used in amateur radio?**

- A. A set of rules specifying how to identify your station when linked over the Internet to another station
- B. A set of guidelines for working DX during contests using Internet access
- C. A technique for measuring the modulation quality of a transmitter using remote sites monitored via the Internet
- D. A method of delivering voice communications over the Internet using digital techniques

**What is the Internet Radio Linking Project (IRLP)?**

- A. A technique to connect amateur radio systems, such as repeaters, via the Internet using Voice Over Internet Protocol
- B. A system for providing access to websites via amateur radio
- C. A system for informing amateurs in real time of the frequency of active DX stations
- D. A technique for measuring signal strength of an amateur transmitter via the Internet

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T8D – Non-voice communications: image signals; digital modes; CW; packet; PSK31; APRS; error detection and correction; NTSC

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**Which of the following is an example of a digital communications method?**

- A. Packet
- B. PSK31
- C. MFSK
- D. All of these choices are correct

**What does the term “APRS” mean?**

- A. Automatic Packet Reporting System
- B. Associated Public Radio Station
- C. Auto Planning Radio Set-up
- D. Advanced Polar Radio System

**Which of the following devices provides data to the transmitter when sending automatic position reports from a mobile amateur radio station?**

- A. The vehicle speedometer
- B. A WWV receiver
- C. A connection to a broadcast FM sub-carrier receiver
- D. A Global Positioning System receiver

**What type of transmission is indicated by the term NTSC?**

- A. A Normal Transmission mode in Static Circuit
- B. A special mode for earth satellite uplink
- C. An analog fast scan color TV signal
- D. A frame compression scheme for TV signals

**Which of the following is an application of APRS (Automatic Packet Reporting System)?**

- A. Providing real time tactical digital communications in conjunction with a map showing the locations of stations
- B. Showing automatically the number of packets transmitted via PACTOR during a specific time interval
- C. Providing voice over Internet connection between repeaters
- D. Providing information on the number of stations signed into a repeater

**What does the abbreviation PSK mean?**

- A. Pulse Shift Keying
- B. Phase Shift Keying
- C. Packet Short Keying
- D. Phased Slide Keying

**What is PSK31?**

- A. A high-rate data transmission mode
- B. A method of reducing noise interference to FM signals
- C. A method of compressing digital television signals
- D. A low-rate data transmission mode

**Which of the following may be included in packet transmissions?**

- A. A check sum which permits error detection
- B. A header which contains the call sign of the station to which the information is being sent
- C. Automatic repeat request in case of error
- D. All of these choices are correct

**What code is used when sending CW in the amateur bands?**

- A. Baudot
- B. Hamming
- C. International Morse
- D. Gray

**Which of the following can be used to transmit CW in the amateur bands?**

- A. Straight Key
- B. Electronic Keyer
- C. Computer Keyboard
- D. All of these choices are correct

**What is an ARQ transmission system?**

- A. A special transmission format limited to video signals
- B. A system used to encrypt command signals to an amateur radio satellite
- C. A digital scheme whereby the receiving station detects errors and sends a request to the sending station to retransmit the information
- D. A method of compressing the data in a message so more information can be sent in a shorter time

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## T9 - Antennas and feed lines: 2 Qs

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T9A – Antennas: vertical and horizontal polarization; concept of gain; common portable and mobile antennas; relationships between antenna length and frequency

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**What is a beam antenna?**

- A. An antenna built from aluminum I-beams
- B. An omnidirectional antenna invented by Clarence Beam
- C. An antenna that concentrates signals in one direction
- D. An antenna that reverses the phase of received signals

**Which of the following is true regarding vertical antennas?**

- A. The magnetic field is perpendicular to the Earth
- B. The electric field is perpendicular to the Earth
- C. The phase is inverted
- D. The phase is reversed

**Which of the following describes a simple dipole mounted so the conductor is parallel to the Earth's surface?**

- A. A ground wave antenna
- B. A horizontally polarized antenna
- C. A rhombic antenna
- D. A vertically polarized antenna

**What is a disadvantage of the "rubber duck" antenna supplied with most handheld radio transceivers?**

- A. It does not transmit or receive as effectively as a full-sized antenna
- B. It transmits a circularly polarized signal
- C. If the rubber end cap is lost it will unravel very quickly
- D. All of these choices are correct

**How would you change a dipole antenna to make it resonant on a higher frequency?**

- A. Lengthen it
- B. Insert coils in series with radiating wires
- C. Shorten it
- D. Add capacitive loading to the ends of the radiating wires

**What type of antennas are the quad, Yagi, and dish?**

- A. Non-resonant antennas
- B. Loop antennas
- C. Directional antennas
- D. Isotropic antennas

**What is a good reason not to use a "rubber duck" antenna inside your car?**

- A. Signals can be significantly weaker than when it is outside of the vehicle
- B. It might cause your radio to overheat
- C. The SWR might decrease, decreasing the signal strength
- D. All of these choices are correct

**What is the approximate length, in inches, of a quarter-wavelength vertical antenna for 146 MHz?**

- A. 112
- B. 50
- C. 19
- D. 12

**What is the approximate length, in inches, of a 6 meter 1/2-wavelength wire dipole antenna?**

- A. 6
- B. 50
- C. 112
- D. 236

**In which direction is the radiation strongest from a half-wave dipole antenna in free space?**

- A. Equally in all directions
- B. Off the ends of the antenna
- C. Broadside to the antenna
- D. In the direction of the feed line

**What is meant by the gain of an antenna?**

- A. The additional power that is added to the transmitter power
- B. The additional power that is lost in the antenna when transmitting on a higher frequency
- C. The increase in signal strength in a specified direction when compared to a reference antenna
- D. The increase in impedance on receive or transmit compared to a reference antenna

**What is a reason to use a properly mounted 5/8 wavelength antenna for VHF or UHF mobile service?**

- A. It offers a lower angle of radiation and more gain than a 1/4 wavelength antenna and usually provides improved coverage
- B. It features a very high angle of radiation and is better for communicating via a repeater
- C. The 5/8 wavelength antenna completely eliminates distortion caused by reflected signals
- D. The 5/8 wavelength antenna offers a 10-times power gain over a 1/4 wavelength design

**Why are VHF or UHF mobile antennas often mounted in the center of the vehicle roof?**

- A. Roof mounts have the lowest possible SWR of any mounting configuration
- B. Only roof mounting can guarantee a vertically polarized signal
- C. A roof mounted antenna normally provides the most uniform radiation pattern
- D. Roof mounted antennas are always the easiest to install

**Which of the following terms describes a type of loading when referring to an antenna?**

- A. Inserting an inductor in the radiating portion of the antenna to make it electrically longer
- B. Inserting a resistor in the radiating portion of the antenna to make it resonant
- C. Installing a spring at the base of the antenna to absorb the effects of collisions with other objects
- D. Making the antenna heavier so it will resist wind effects when in motion

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T9B – Feed lines: types of feed lines; attenuation vs. frequency; SWR concepts; matching; weather protection; choosing RF connectors and feed lines

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**Why is it important to have a low SWR in an antenna system that uses coaxial cable feed line?**

- A. To reduce television interference
- B. To allow the efficient transfer of power and reduce losses
- C. To prolong antenna life
- D. All of these choices are correct

**What is the impedance of the most commonly used coaxial cable in typical amateur radio installations?**

- A. 8 ohms
- B. 50 ohms
- C. 600 ohms
- D. 12 ohms

**Why is coaxial cable used more often than any other feed line for amateur radio antenna systems?**

- A. It is easy to use and requires few special installation considerations
- B. It has less loss than any other type of feed line
- C. It can handle more power than any other type of feed line
- D. It is less expensive than any other types of feed line

**What does an antenna tuner do?**

- A. It matches the antenna system impedance to the transceiver's output impedance
- B. It helps a receiver automatically tune in weak stations
- C. It allows an antenna to be used on both transmit and receive
- D. It automatically selects the proper antenna for the frequency band being used

**What generally happens as the frequency of a signal passing through coaxial cable is increased?**

- A. The apparent SWR increases
- B. The reflected power increases
- C. The characteristic impedance increases
- D. The loss increases

**Which of the following connectors is most suitable for frequencies above 400 MHz?**

- A. A UHF (PL-259/SO-239) connector
- B. A Type N connector
- C. An RS-213 connector
- D. A DB-25 connector

**Which of the following is true of PL-259 type coax connectors?**

- A. They are preferred for microwave operation
- B. They are water tight
- C. They are commonly used at HF frequencies
- D. They are a bayonet type connector

**Why should coax connectors exposed to the weather be sealed against water intrusion?**

- A. To prevent an increase in feed line loss
- B. To prevent interference to telephones
- C. To keep the jacket from becoming loose
- D. All of these choices are correct

**What might cause erratic changes in SWR readings?**

- A. The transmitter is being modulated
- B. A loose connection in an antenna or a feed line
- C. The transmitter is being over-modulated
- D. Interference from other stations is distorting your signal

**What electrical difference exists between the smaller RG-58 and larger RG-8 coaxial cables?**

- A. There is no significant difference between the two types
- B. RG-58 cable has less loss at a given frequency
- C. RG-8 cable has less loss at a given frequency
- D. RG-58 cable can handle higher power levels

**Which of the following types of feed line has the lowest loss at VHF and UHF?**

- A. 50-ohm flexible coax
- B. Multi-conductor unbalanced cable
- C. Air-insulated hard line
- D. 75-ohm flexible coax

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## ***T0 - Electrical safety: AC and DC power circuits; antenna installation; RF hazards: 3 Qs***

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TOA – Power circuits and hazards: hazardous voltages; fuses and circuit breakers; grounding; lightning protection; battery safety; electrical code compliance

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**Which of the following is a safety hazard of a 12-volt storage battery?**

- A. Touching both terminals with the hands can cause electrical shock
- B. Shorting the terminals can cause burns, fire, or an explosion
- C. RF emissions from the battery
- D. All of these choices are correct

**How does current flowing through the body cause a health hazard?**

- A. By heating tissue
- B. It disrupts the electrical functions of cells
- C. It causes involuntary muscle contractions
- D. All of these choices are correct

**What is connected to the green wire in a three-wire electrical AC plug?**

- A. Neutral
- B. Hot
- C. Safety ground
- D. The white wire

**What is the purpose of a fuse in an electrical circuit?**

- A. To prevent power supply ripple from damaging a circuit
- B. To interrupt power in case of overload
- C. To limit current to prevent shocks
- D. All of these choices are correct

**Why is it unwise to install a 20-ampere fuse in the place of a 5-ampere fuse?**

- A. The larger fuse would be likely to blow because it is rated for higher current
- B. The power supply ripple would greatly increase
- C. Excessive current could cause a fire
- D. All of these choices are correct

**What is a good way to guard against electrical shock at your station?**

- A. Use three-wire cords and plugs for all AC powered equipment
- B. Connect all AC powered station equipment to a common safety ground
- C. Use a circuit protected by a ground-fault interrupter
- D. All of these choices are correct

**Which of these precautions should be taken when installing devices for lightning protection in a coaxial cable feed line?**

- A. Include a parallel bypass switch for each protector so that it can be switched out of the circuit when running high power
- B. Include a series switch in the ground line of each protector to prevent RF overload from inadvertently damaging the protector
- C. Keep the ground wires from each protector separate and connected to station ground
- D. Ground all of the protectors to a common plate which is in turn connected to an external ground

**What safety equipment should always be included in home-built equipment that is powered from 120V AC power circuits?**

- A. A fuse or circuit breaker in series with the AC hot conductor
- B. An AC voltmeter across the incoming power source
- C. An inductor in series with the AC power source
- D. A capacitor across the AC power source

**What kind of hazard is presented by a conventional 12-volt storage battery?**

- A. It emits ozone which can be harmful to the atmosphere
- B. Shock hazard due to high voltage
- C. Explosive gas can collect if not properly vented
- D. All of these choices are correct

**What can happen if a lead-acid storage battery is charged or discharged too quickly?**

- A. The battery could overheat and give off flammable gas or explode
- B. The voltage can become reversed
- C. The memory effect will reduce the capacity of the battery
- D. All of these choices are correct

**What kind of hazard might exist in a power supply when it is turned off and disconnected?**

- A. Static electricity could damage the grounding system
- B. Circulating currents inside the transformer might cause damage
- C. The fuse might blow if you remove the cover
- D. You might receive an electric shock from the charged stored in large capacitors

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TOB – Antenna safety; tower safety; erecting an antenna support; overhead power lines; installing an antenna

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**When should members of a tower work team wear a hard hat and safety glasses?**

- A. At all times except when climbing the tower
- B. At all times except when belted firmly to the tower
- C. At all times when any work is being done on the tower
- D. Only when the tower exceeds 30 feet in height

**What is a good precaution to observe before climbing an antenna tower?**

- A. Make sure that you wear a grounded wrist strap
- B. Remove all tower grounding connections
- C. Put on a climbing harness and safety glasses
- D. All of the these choices are correct

**Under what circumstances is it safe to climb a tower without a helper or observer?**

- A. When no electrical work is being performed
- B. When no mechanical work is being performed
- C. When the work being done is not more than 20 feet above the ground
- D. Never

**Which of the following is an important safety precaution to observe when putting up an antenna tower?**

- A. Wear a ground strap connected to your wrist at all times
- B. Insulate the base of the tower to avoid lightning strikes
- C. Look for and stay clear of any overhead electrical wires
- D. All of these choices are correct

**What is the purpose of a gin pole?**

- A. To temporarily replace guy wires
- B. To be used in place of a safety harness
- C. To lift tower sections or antennas
- D. To provide a temporary ground

**What is the minimum safe distance from a power line to allow when installing an antenna?**

- A. Half the width of your property
- B. The height of the power line above ground
- C. 1/2 wavelength at the operating frequency
- D. So that if the antenna falls unexpectedly, no part of it can come closer than 10 feet to the power wires

**Which of the following is an important safety rule to remember when using a crank-up tower?**

- A. This type of tower must never be painted
- B. This type of tower must never be grounded
- C. This type of tower must never be climbed unless it is in the fully retracted position
- D. All of these choices are correct

**What is considered to be a proper grounding method for a tower?**

- A. A single four-foot ground rod, driven into the ground no more than 12 inches from the base
- B. A ferrite-core RF choke connected between the tower and ground
- C. Separate eight-foot long ground rods for each tower leg, bonded to the tower and each other
- D. A connection between the tower base and a cold water pipe

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

- A. The antenna will not work properly because of induced voltages
- B. The utility company will charge you an extra monthly fee
- C. The antenna could contact high-voltage power wires
- D. All of these choices are correct

**Which of the following is true concerning grounding conductors used for lightning protection?**

- A. Only non-insulated wire must be used
- B. Wires must be carefully routed with precise right-angle bends
- C. Sharp bends must be avoided
- D. Common grounds must be avoided

**Which of the following establishes grounding requirements for an amateur radio tower or antenna?**

- A. FCC Part 97 Rules
  - B. Local electrical codes
  - C. FAA tower lighting regulations
  - D. Underwriters Laboratories' recommended practices
- TOB12 (C)

**Which of the following is good practice when installing ground wires on a tower for lightning protection?**

- A. Put a loop in the ground connection to prevent water damage to the ground system
- B. Make sure that all bends in the ground wires are clean, right angle bends
- C. Ensure that connections are short and direct
- D. All of these choices are correct

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TOC - RF hazards: radiation exposure; proximity to antennas; recognized safe power levels; exposure to others; radiation types; duty cycle

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**What type of radiation are VHF and UHF radio signals?**

- A. Gamma radiation
- B. Ionizing radiation
- C. Alpha radiation
- D. Non-ionizing radiation

**Which of the following frequencies has the lowest value for Maximum Permissible Exposure limit?**

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

**What is the maximum power level that an amateur radio station may use at VHF frequencies before an RF exposure evaluation is required?**

- A. 1500 watts PEP transmitter output
- B. 1 watt forward power
- C. 50 watts PEP at the antenna
- D. 50 watts PEP reflected power

**What factors affect the RF exposure of people near an amateur station antenna?**

- A. Frequency and power level of the RF field
- B. Distance from the antenna to a person
- C. Radiation pattern of the antenna
- D. All of these choices are correct

**Why do exposure limits vary with frequency?**

- A. Lower frequency RF fields have more energy than higher frequency fields
- B. Lower frequency RF fields do not penetrate the human body
- C. Higher frequency RF fields are transient in nature
- D. The human body absorbs more RF energy at some frequencies than at others

**Which of the following is an acceptable method to determine that your station complies with FCC RF exposure regulations?**

- A. By calculation based on FCC OET Bulletin 65
- B. By calculation based on computer modeling
- C. By measurement of field strength using calibrated equipment
- D. All of these choices are correct

**What could happen if a person accidentally touched your antenna while you were transmitting?**

- A. Touching the antenna could cause television interference
- B. They might receive a painful RF burn
- C. They might develop radiation poisoning
- D. All of these choices are correct

**Which of the following actions might amateur operators take to prevent exposure to RF radiation in excess of FCC-supplied limits?**

- A. Relocate antennas
- B. Relocate the transmitter
- C. Increase the duty cycle
- D. All of these choices are correct

**How can you make sure your station stays in compliance with RF safety regulations?**

- A. By informing the FCC of any changes made in your station
- B. By re-evaluating the station whenever an item of equipment is changed
- C. By making sure your antennas have low SWR
- D. All of these choices are correct

**Why is duty cycle one of the factors used to determine safe RF radiation exposure levels?**

- A. It affects the average exposure of people to radiation
- B. It affects the peak exposure of people to radiation
- C. It takes into account the antenna feed line loss
- D. It takes into account the thermal effects of the final amplifier

**What is the definition of duty cycle during the averaging time for RF exposure?**

- A. The difference between the lowest power output and the highest power output of a transmitter
- B. The difference between the PEP and average power output of a transmitter
- C. The percentage of time that a transmitter is transmitting
- D. The percentage of time that a transmitter is not transmitting

**How does RF radiation differ from ionizing radiation (radioactivity)?**

- A. RF radiation does not have sufficient energy to cause genetic damage
- B. RF radiation can only be detected with an RF dosimeter
- C. RF radiation is limited in range to a few feet
- D. RF radiation is perfectly safe

**If the averaging time for exposure is 6 minutes, how much power density is permitted if the signal is present for 3 minutes and absent for 3 minutes rather than being present for the entire 6 minutes?**

- A. 3 times as much
- B. 1/2 as much
- C. 2 times as much
- D. There is no adjustment allowed for shorter exposure times