

Technician Radio License Statement Study
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<http://www.theorybin.com/Radio.htm>

This is a Statement view of the FCC Element-2 Technician license exam - 46 pages.
This version of the FCC test expires in July 2014.

This **Simplified** list is designed for the knowledge statements of the learning style that wants information, and not just memorizing the answers.

(Calculations are added and calculators are recommended at the testing)

It is intended to improve the comprehension of amateur radio, in a style that feeds the capacity of learning which has problems with an unreliable memory. This way, we learn the only right answer, instead of the right one and three wrong answers.

Study here, and then take an exam offered by many of the Ham Operator websites.

**2010 Technician Class Question Pool Syllabus
396 questions in 35 sections**

SUBELEMENT T1 - 6 Exam Group Questions

- A - Amateur Radio services;
- B - Authorized frequencies;
- C - Operator classes and station call signs;
- D - Authorized and prohibited transmissions
- E - Control operator and control types;
- F - Station identification and operation standards;

T1A - Amateur Radio services

T1A01

For whom is the Amateur Radio Service intended?

Persons who are interested in radio technique solely with a personal aim and without pecuniary interest.

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T1A02

What agency regulates and enforces the rules for the Amateur Radio Service in the United States?

The FCC

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T1A03

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

Part 97

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T1A04

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

That which seriously degrades, obstructs, or repeatedly interrupts a radio

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T1A05

What is the FCC Part 97 definition of a space station?

An amateur station located more than 50 km (31 mi) above the Earth's surface

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T1A06

What is the FCC Part 97 definition of telecommand?

A one-way transmission to initiate, modify or terminate functions of a device at a distance

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T1A07

What is the FCC Part 97 definition of telemetry?

A one-way transmission of measurements at a distance from the measuring instrument

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T1A08

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

Frequency Coordinator

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T1A09

Who selects a Frequency Coordinator?

Amateur operators in a local or regional area whose stations are eligible to be auxiliary or repeater stations

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T1A10

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

A station in an Amateur Radio Service consisting of the apparatus necessary for carrying on radio communications

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T1A11

Which of the following stations transmits signals over the air from a remote receive site to a repeater for retransmission?

Auxiliary station

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T1B - Authorized frequencies

T1B01

What is the ITU?

A United Nations agency for information and communication technology issues

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T1B02

North American amateur stations are located in which ITU region?

Region 2

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T1B03

Which frequency is within the 6 meter band?

52.525 MHz ($300/52.525 = 5.71$ meters or $300/6 = 50$ mhz)

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T1B04

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

2 meter band ($300/146.52 = 2.04$ meters)

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T1B05

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

443.350 MHz ($300/.7 = 428.5$ or $300/443.35 = .676$ meters)

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T1B06

Which 23 cm frequency is authorized to a Technician Class operator license?

1296 MHz ($300/.23 = 1304$ or $300/1296 = .231$ meters)

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T1B07

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

1.25 meter band ($300/223.5 = 1.34$ meters)

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T1B08

What do the FCC rules mean when an amateur frequency band is said to be available on a secondary basis?

Amateurs may not cause harmful interference to primary users

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T1B09

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**

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T1B10

Which of the bands available to Technician Class operators have mode-restricted subbands?

The 6 meter, 2 meter, and 1.25 meter bands

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T1B11

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?

CW only

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T1C - Operator classes and station call signs

T1C01

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

Special event

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T1C02

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

W3ABC

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T1C03

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

Communications incidental to the purposes of the amateur service and remarks of a personal character

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T1C04

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

When the foreign country authorizes it

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T1C05

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?

Stop operating or take steps to eliminate the harmful interference

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T1C06

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

From any vessel or craft located in international waters and documented or registered in the United States

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T1C07

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

Revocation of the station license or suspension of the operator license

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T1C08

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

Ten years

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T1C09

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

Two years

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T1C10

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

As soon as your name and call sign appear in the FCC's ULS database

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T1C11

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

No, transmitting is not allowed until the ULS database shows that the license has been renewed

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T1D - Authorized and prohibited transmissions

T1D01

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

Any country whose administration has notified the ITU that it objects to such communications

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T1D02

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

During an Armed Forces Day Communications Test

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T1D03

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

Only when transmitting control commands to space stations or radio control craft

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T1D04

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

When incidental to an authorized retransmission of manned spacecraft communications

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T1D05

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

When the equipment is normally used in an amateur station and such activity is not conducted on a regular basis

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T1D06

Which of the following types of transmissions are prohibited?

Transmissions that contain obscene or indecent words or language

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T1D07

When is an amateur station authorized to automatically retransmit the radio signals of other amateur stations?

When the signals are from an auxiliary, repeater, or space station

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T1D08

When may the control operator of an amateur station receive compensation for operating the station?

When the communication is incidental to classroom instruction at an educational institution

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T1D09

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?

Only where such communications directly relate to the immediate safety of human life or protection of property

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T1D10

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

Transmissions intended for reception by the general public

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T1D11

Which of the following types of communications are permitted in the Amateur Radio Service?

Brief transmissions to make station adjustments

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T1E - Control operator and control types

T1E01

When must an amateur station have a control operator?

Only when the station is transmitting

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T1E02

Who is eligible to be the control operator of an amateur station?

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

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T1E03

Who must designate the station control operator?

The station licensee

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T1E04

What determines the transmitting privileges of an amateur station?

The class of operator license held by the control operator

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T1E05

What is an amateur station control point?

The location at which the control operator function is performed

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T1E06

Under which of the following types of control is it permissible for the control operator to be at a location other than the control point?

Automatic control

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T1E07

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

The control operator and the station licensee are equally responsible

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T1E08

What type of control is being used for a repeater when the control operator is not present at a control point?

Automatic control

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T1E09

What type of control is being used when transmitting using a handheld radio?

Local control

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T1E10

What type of control is used when the control operator is not at the station location but can indirectly manipulate the operating adjustments of a station?

Remote

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T1E11

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

The station licensee

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T1F - Station identification and operation standards

T1F01

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

Tactical call

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T1F02

When using tactical identifiers, how often must your station transmit the station's FCC-assigned call sign?

Every ten minutes

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T1F03

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

At least every 10 minutes during and at the end of a contact

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T1F04

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

The English language

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T1F05

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

Send the call sign using CW or phone emission

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T1F06

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**

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T1F07

Which of the following restrictions apply when appending a self-assigned call sign indicator?

It must not conflict with any other indicator specified by the FCC rules or with any call sign prefix assigned to another country

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T1F08

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

Never

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T1F09

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

Repeater station

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T1F10

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

The control operator of the originating station

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T1F11

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

Any station whose government permits such communications

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T1F12

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

At least 4

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T1F13

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

Any time upon request by an FCC representative

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SUBELEMENT T2 - 3 Exam Group Questions

A - Station operation

B - VHF/UHF operating practices

C - Public service

T2A - Station operation

T2A01

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

Plus or minus 600 kHz

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T2A02

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

446.000 MHz ($300/.7 = 428.5$ or $300/446 = .672$ meters)

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T2A03

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

Plus or minus 5 MHz

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T2A04

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

Say the station's call sign then identify with your call sign

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T2A05

What should you transmit when responding to a call of CQ?

The other station's call sign followed by your call sign

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T2A06

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

Properly identify the transmitting station

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T2A07

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

Station identification is required at least every ten minutes during the test and at the end

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T2A08

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

Calling any station

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T2A09

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

Say your call sign

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T2A10

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

A voluntary guideline for using different modes or activities within an amateur band

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T2A11

What are the FCC rules regarding power levels used in the amateur bands?

An amateur must use the minimum transmitter power necessary to carry out the desired communication

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T2B – VHF/UHF operating practices

T2B01

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

Simplex communication

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T2B02

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?

CTCSS

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T2B03

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

Carrier squelch

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T2B04

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

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T2B05

What determines the amount of deviation of an FM signal?

The amplitude of the modulating signal

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T2B06

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

Its signal occupies more bandwidth

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T2B07

What should you do if you receive a report that your station's transmissions are causing splatter or interference on nearby frequencies?

Check your transmitter for off-frequency operation or spurious emissions

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T2B08

What is the proper course of action if your station's transmission unintentionally interferes with another station?

Properly identify your transmission and move to a different frequency

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T2B09

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

Use of a phonetic alphabet

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T2B10

What is the "Q" signal used to indicate that you are receiving interference from other stations?

QRM

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T2B11

What is the "Q" signal used to indicate that you are changing frequency?

QSY

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T2C – Public service

T2C01 (C) [97.103(a)]

What set of rules applies to proper operation of your station when using amateur radio at the request of public service officials?

FCC Rules

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Deleted T2C02 (D) [97.113 and FCC Public Notice DA 09-2259]

Who must submit the request for a temporary waiver of Part 97.113 to allow amateur radio operators to provide communications on behalf of their employers during a government sponsored disaster drill?

D. The government agency sponsoring the event

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Deleted T2C03 (C) [97.113]

When is it legal for an amateur licensee to provide communications on behalf of their employer during a government sponsored disaster drill or exercise?

C. Only when the FCC has granted a government-requested waiver

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T2C04

What do RACES and ARES have in common?

Both organizations may provide communications during emergencies

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T2C05

What is the Radio Amateur Civil Emergency Service?

A radio service using amateur stations for emergency management or civil defense communications

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T2C06

Which of the following is common practice during net operations to get the immediate attention of the net control station when reporting an emergency?

Begin your transmission with "Priority" or "Emergency" followed by your call sign

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T2C07

What should you do to minimize disruptions to an emergency traffic net once you have checked in?

Do not transmit on the net frequency until asked to do so by the net control station

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T2C08

What is usually considered to be the most important job of an amateur operator when handling emergency traffic messages?

Passing messages exactly as written, spoken or as received

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T2C09

When may an amateur station use any means of radio communications at its disposal for essential communications in connection with immediate safety of human life and protection of property?

When normal communications systems are not available

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T2C10

What is the preamble in a formal traffic message?

The information needed to track the message as it passes through the amateur radio traffic handling system

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T2C11

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

The check is a count of the number of words or word equivalents in the text portion of the message

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SUBELEMENT T3 - 3 Exam Group Questions

- A - Radio wave characteristics
- B - Radio and electromagnetic wave properties
- C - Propagation modes

T3A - Radio wave characteristics

T3A01

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?

Try moving a few feet, as random reflections may be causing multi-path distortion

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T3A02

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

The shorter wavelength allows them to more easily penetrate the structure of buildings

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T3A03

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

Horizontal

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T3A04

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?

Signals could be significantly weaker

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T3A05

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?

Try to find a path that reflects signals to the repeater

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T3A06

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

Picket fencing

~~

T3A07

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

Electromagnetic

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T3A08

What is the cause of irregular fading of signals from distant stations during times of generally good reception?

Random combining of signals arriving via different path lengths

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T3A09

Which of the following is a common effect of "skip" reflections between the Earth and the ionosphere?

The polarization of the original signal is randomized

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T3A10

What may occur if VHF or UHF data signals propagate over multiple paths?

Error rates are likely to increase

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T3A11

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

The ionosphere

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T3B - Radio and electromagnetic wave properties

T3B01

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

Wavelength

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T3B02

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

Frequency

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T3B03

What are the two components of a radio wave?

Electric and magnetic fields

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T3B04

How fast does a radio wave travel through free space?

At the speed of light

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T3B05

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

The wavelength gets shorter as the frequency increases

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T3B06

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

Wavelength in meters equals 300 divided by frequency in megahertz

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T3B07

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

The approximate wavelength

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T3B08

What are the frequency limits of the VHF spectrum?

30 to 300 MHz

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T3B09

What are the frequency limits of the UHF spectrum?

300 to 3000 MHz

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T3B10

What frequency range is referred to as HF?

3 to 30 MHz

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T3B11

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

300,000,000 meters per second

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T3C - Propagation modes

T3C01

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

UHF signals are usually not reflected by the ionosphere

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T3C02

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

Signals are being refracted from a sporadic E layer

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T3C03

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

The signals exhibit rapid fluctuations of strength and often sound distorted

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T3C04

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?

Sporadic E

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T3C05

What is meant by the term "knife-edge" propagation?

Signals are partially refracted around solid objects exhibiting sharp edges

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T3C06

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

Tropospheric scatter

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T3C07

What band is best suited to communicating via meteor scatter?

6 meters

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T3C08

What causes "tropospheric ducting"?

Temperature inversions in the atmosphere

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T3C09

What is generally the best time for long-distance 10 meter band propagation?

During daylight hours

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T3C10

What is the radio horizon?

The distance at which radio signals between two points are effectively blocked by the curvature of the Earth

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T3C11

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

The Earth seems less curved to radio waves than to light

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SUBELEMENT T4 - Exam Group Questions

A – Station setup

B - Operating controls

T4A – Station setup

T4A01

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

Some connectors include push-to-talk and voltages for powering the microphone

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T4A02

What could be used in place of a regular speaker to help you copy signals in a noisy area?

Set of headphones

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T4A03

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

It prevents voltage fluctuations from reaching sensitive circuits

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T4A04

Where must a filter be installed to reduce harmonic emissions?

Between the transmitter and the antenna

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T4A05

What type of filter should be connected to a TV receiver as the first step in trying to prevent RF overload from a nearby 2 meter transmitter?

Band-reject filter

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T4A06

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

Terminal node controller

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T4A07

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

The sound card provides audio to the microphone input and converts received audio to digital form

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T4A08

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

Flat strap

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T4A09

Which would you use to reduce RF current flowing on the shield of an audio cable?

Ferrite choke

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T4A10

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

The alternator

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T4A11

Where should a mobile transceiver's power negative connection be made?

At the battery or engine block ground strap

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T4B - Operating controls

T4B01

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

The output signal might become distorted

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T4B02

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

The keypad or VFO knob

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T4B03

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

To mute receiver output noise when no signal is being received

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T4B04

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

Store the frequency in a memory channel

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T4B05

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

Turn on the noise blanker

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T4B06

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

The receiver RIT or clarifier

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T4B07

What does the term "RIT" mean?

Receiver Incremental Tuning

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T4B08

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

Permits noise or interference reduction by selecting a bandwidth matching the mode

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T4B09

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

2400 Hz

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T4B10

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

500 Hz

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T4B11

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

The difference between the repeater's transmit and receive frequencies

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SUBELEMENT T5 - 4 Exam Group Questions

A - Electrical principles

B - Math for electronics

C - Electronic principles

D - Ohm's Law

T5A - Electrical principles

T5A01

Electrical current is measured in which of the following units?

Amperes

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T5A02

Electrical power is measured in which of the following units?

Watts

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T5A03

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

Current

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T5A04

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

Direct current

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T5A05

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

Voltage

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T5A06

How much voltage does a mobile transceiver usually require?

About 12 volts

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T5A07

Which of the following is a good electrical conductor?

Copper

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T5A08

Which of the following is a good electrical insulator?

Glass

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T5A09

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

Alternating current

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T5A10

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

Power

~~

T5A11 (A)

What is the basic unit of electromotive force?

The volt

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T5B - Math for electronics

T5B01

How many milliamperes is 1.5 amperes?

1,500 milliamperes

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T5B02

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

1500 kHz

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T5B03

How many volts are equal to one kilovolt?

One thousand volts

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T5B04

How many volts are equal to one microvolt?

One one-millionth of a volt

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T5B05

Which of the following is equivalent to 500 milliwatts?

0.5 watts

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T5B06

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

3 amperes

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T5B07

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

3525 kHz

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T5B08

How many microfarads are 1,000,000 picofarads?

1 microfarad (micro - nano - pico)

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T5B09

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

3 dB (10log - 5log = .3bel)

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T5B10

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

6 dB (12log - 3log = .6bel)

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T5B11

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

10 dB (200log - 20log = 1.0bel)

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T5C - Electronic principles

T5C01

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

Capacitance (caution - see T5C03 magnetic field)

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T5C02

What is the basic unit of capacitance?

The farad

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T5C03

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

Inductance (caution - see T5C01 electric field)

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T5C04

What is the basic unit of inductance?

The Henry

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T5C05

What is the unit of frequency?

Hertz

~~

T5C06

What is the abbreviation that refers to radio frequency signals of all types?

RF

~~

T5C07

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

Radio waves

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T5C08

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

Power (P) equals voltage (E) multiplied by current (I) ($P=I \cdot E$)

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T5C09

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

138 watts ($P=I \cdot E$)

~~

T5C10

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

30 watts ($P=I \cdot E$)

~~

T5C11

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

10 amperes ($I=P/E$)

~~

T5D – Ohm's Law

T5D01

What formula is used to calculate current in a circuit?

Current (I) equals voltage (E) divided by resistance (R) ($I=E/R$)

~~

T5D02

What formula is used to calculate voltage in a circuit?

Voltage (E) equals current (I) multiplied by resistance (R) ($E=I/R$)

~~

T5D03

What formula is used to calculate resistance in a circuit?

Resistance (R) equals voltage (E) divided by current (I) ($R=E/I$)

~~

T5D04

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

30 ohms ($R=E/I$)

~~

T5D05

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

8 ohms ($R=E/I$)

~~

T5D06

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

3 ohms ($R=E/I$)

~~

T5D07

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

1.5 amperes ($I=E/R$)

~~

T5D08

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

2 amperes ($I=E/R$)

~~

T5D09

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

10 amperes ($I=E/R$)

~~

T5D10

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

1 volt ($E=I*R$)

~~

T5D11

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

10 volts ($E=I*R$)

~~

T5D12

What is the voltage across a 10-ohm resistor if a current of 2 amperes flows through it?
20 volts ($E=I*R$)

~~

SUBELEMENT T6 - 4 Exam Groups Questions

- A - Electrical components
- B - Semiconductors
- C - Circuit diagrams
- D - Component functions

T6A - Electrical components

T6A01

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

Resistor

~~

T6A02

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

Potentiometer

~~

T6A03

What electrical parameter is controlled by a potentiometer?

Resistance

~~

T6A04

What electrical component stores energy in an electric field?

Capacitor

~~

T6A05

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

Capacitor

~~

T6A06

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

Inductor

~~

T6A07

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

Inductor

~~

T6A08

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

Switch

~~

T6A09

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

Fuse

~~

T6A10

What is the nominal voltage of a fully charged nickel-cadmium cell?

1.2 volts

~~

T6A11

Which battery type is not rechargeable?

Carbon-zinc

~~

T6B – Semiconductors

T6B01

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

Transistors

~~

T6B02

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

Diode

~~

T6B03

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

Transistor

~~

T6B04

Which of these components is made of three layers of semiconductor material?

Bipolar junction transistor

~~

T6B05

Which of the following electronic components can amplify signals?

Transistor

~~

T6B06

How is a semiconductor diode's cathode lead usually identified?

With a stripe

~~

T6B07

What does the abbreviation "LED" stand for?

Light Emitting Diode

~~

T6B08

What does the abbreviation "FET" stand for?

Field Effect Transistor

~~

T6B09

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

Anode and cathode

~~

T6B10

Which semiconductor component has an emitter electrode?

Bipolar transistor

~~

T6B11

Which semiconductor component has a gate electrode?

Field effect transistor

~~

T6B12

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

Gain

~~

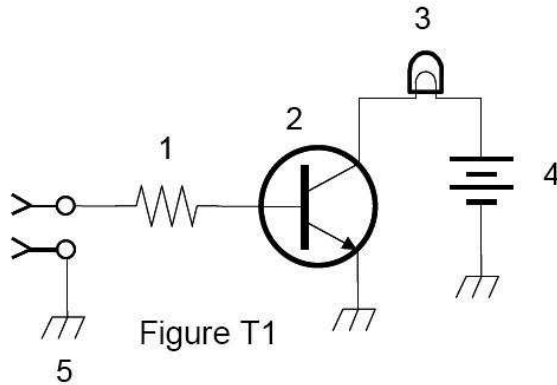
T6C - Circuit diagrams

T6C01

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

Schematic symbols

~~



T6C02

What is component 1 in figure T1?

Resistor

~~

T6C03

What is component 2 in figure T1?

Transistor

~~

T6C04

What is component 3 in figure T1?

Lamp

~~

T6C05

What is component 4 in figure T1?

Battery

~~

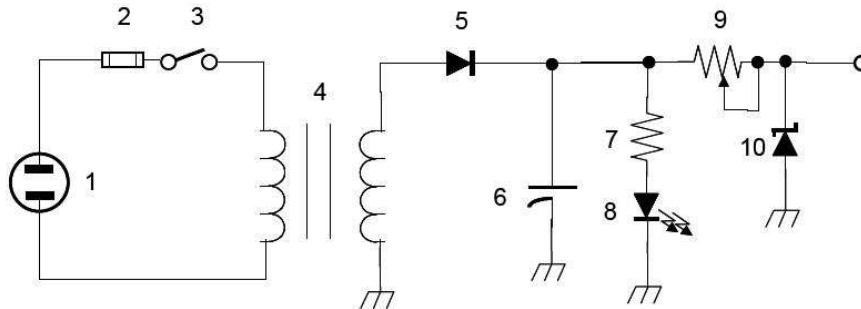


Figure T2

T6C06

What is component 6 in figure T2?

Capacitor

~~

T6C07

What is component 8 in figure T2?

Light emitting diode

~~

T6C08

What is component 9 in figure T2?

Variable resistor

~~

T6C09

What is component 4 in figure T2?

Transformer

~~

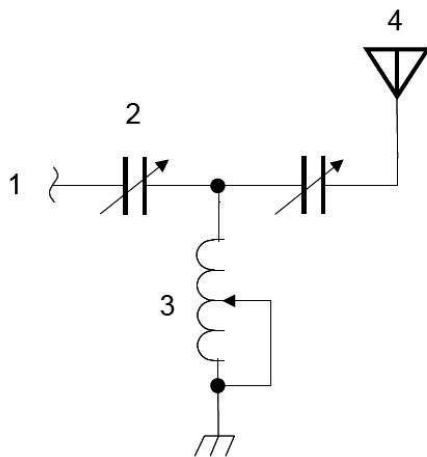


Figure T3

T6C10

What is component 3 in figure T3?

Variable inductor

~~

T6C11

What is component 4 in figure T3?

Antenna

~~

T6C12

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

Electrical components

~~

T6C13

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

The way components are interconnected

T6D - Component functions

T6D01

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

Rectifier

~~

T6D02

What best describes a relay?

A switch controlled by an electromagnet

~~

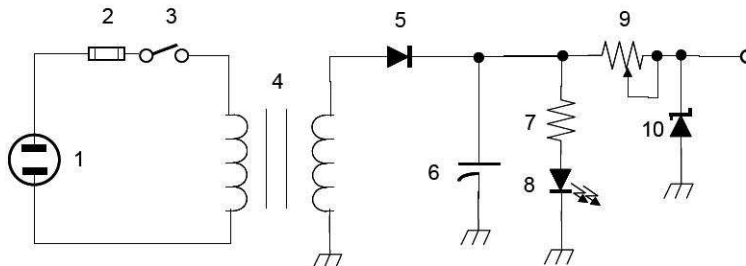


Figure T2

T6D03

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

Single-pole single-throw

~~

T6D04

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

Meter

~~

T6D05

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

Regulator

~~

T6D06

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

Transformer

~~

T6D07

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

LED

~~

T6D08

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

Capacitor

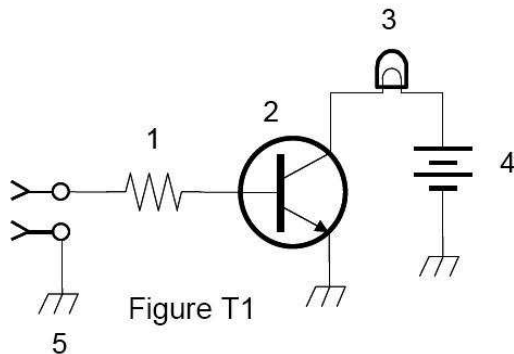
~~

T6D09

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

Integrated circuit

~~



T6D10

What is the function of component 2 in Figure T1?

Control the flow of current

~~

T6D11

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

Carry RF signals between a radio and antenna

~~

SUBELEMENT T7 - 4 Exam Group Questions

- A - Station radios
- B - Common transmitter and receiver problems
- C - Antenna measurements and troubleshooting
- D - Basic repair and testing

T7A - Station radios

T7A01

What is the function of a product detector?
Detect CW and SSB signals

~~

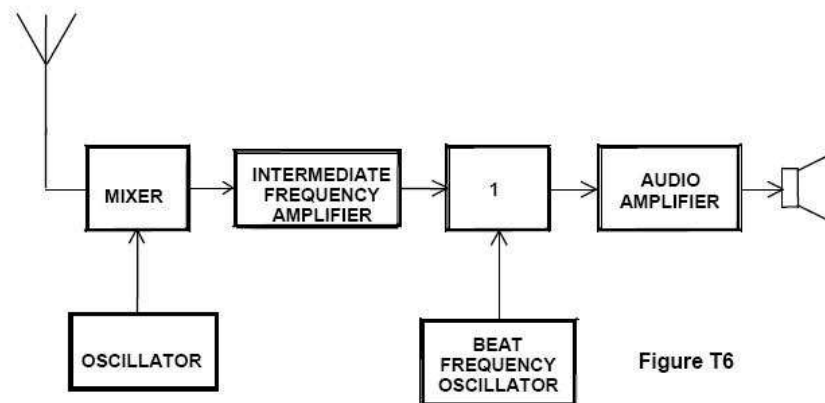


Figure T6

T7A02

What type of receiver is shown in Figure T6?

Single-conversion superheterodyne

~~

T7A03

What is the function of a mixer in a superheterodyne receiver?

To shift the incoming signal to an intermediate frequency

~~

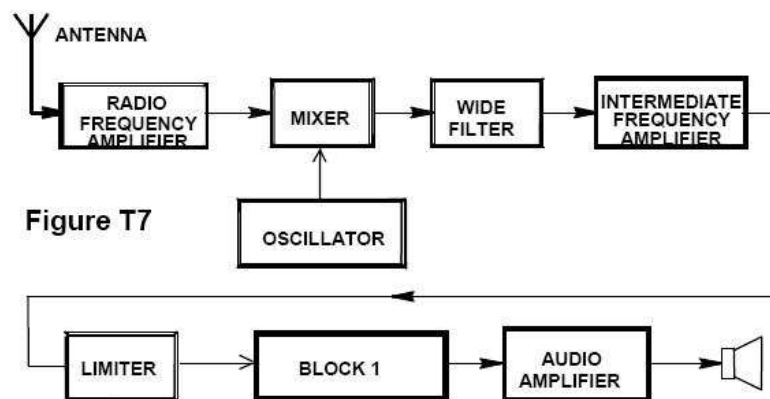


Figure T7

T7A04

What circuit is pictured in Figure T7, if block 1 is a frequency discriminator?

An FM receiver

~~

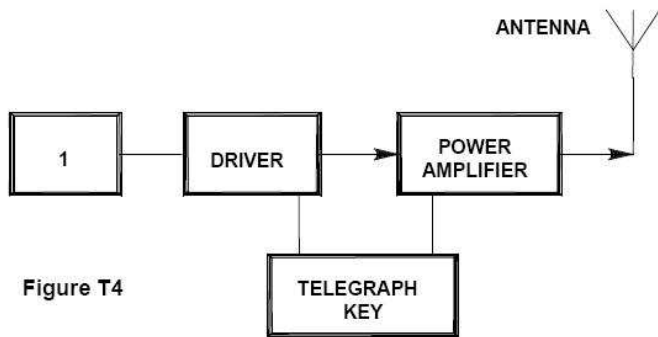


Figure T4

T7A05

What is the function of block 1 if figure T4 is a simple CW transmitter?

Oscillator

~~

T7A06

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

Transverter

~~

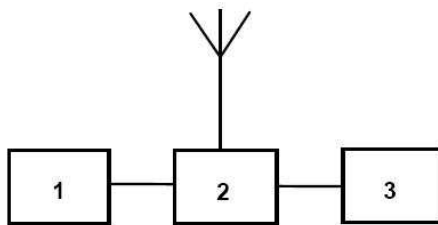


Figure T5

T7A07

If figure T5 represents a transceiver in which block 1 is the transmitter portion and block 3 is the receiver portion, what is the function of block 2?

A transmit-receive switch

~~

T7A08

Which of the following circuits combines a speech signal and an RF carrier?

Modulator

~~

T7A09

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

A multi-mode VHF transceiver

~~

T7A10

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

An RF power amplifier

~~

T7A11

Which of the following circuits demodulates FM signals?

Discriminator

~~

T7A12

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

Selectivity

~~

T7A13

Where is an RF preamplifier installed?

Between the antenna and receiver

~~

T7B – Common transmitter and receiver problems

T7B01

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

Talk farther away from the microphone

~~

T7B02

What is meant by fundamental overload in reference to a receiver?

Interference caused by very strong signals

~~

T7B03

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**

~~

T7B04

What is the most likely cause of interference to a non-cordless telephone from a nearby transmitter?

The telephone is inadvertently acting as a radio receiver

~~

T7B05

What is a logical first step when attempting to cure a radio frequency interference problem in a nearby telephone?

Install an RF filter at the telephone

~~

T7B06

What should you do first if someone tells you that your station's transmissions are interfering with their radio or TV reception?

Make sure that your station is functioning properly and that it does not cause interference to your own television

~~

T7B07

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**

~~

T7B08

What should you do if a "Part 15" device in your 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 require him to stop using the device if it causes interference
- C. Check your station and make sure it meets the standards of good amateur practice
- D. **All of these choices are correct**

~~

T7B09

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

Noise on the vehicle's electrical system is being transmitted along with your speech audio

~~

T7B10

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**

~~

T7B11

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

Reports of garbled, distorted, or unintelligible transmissions

~~

T7B12

What does the acronym "BER" mean when applied to digital communications systems?

Bit Error Rate

~~

T7C – Antenna measurements and troubleshooting

T7C01

What is the primary purpose of a dummy load?

To prevent the radiation of signals when making tests

~~

T7C02

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

An antenna analyzer

~~

T7C03

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

A measure of how well a load is matched to a transmission line

~~

T7C04

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

1 to 1

~~

T7C05

What is the approximate SWR value above which the protection circuits in most solidstate transmitters begin to reduce transmitter power?

2 to 1

~~

T7C06

What does an SWR reading of 4:1 mean?

An impedance mismatch

~~

T7C07

What happens to power lost in a feedline?

It is converted into heat

~~

T7C08

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

Directional wattmeter

~~

T7C09

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

Moisture contamination

~~

T7C10

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

Ultraviolet light can damage the jacket and allow water to enter the cable

~~

T7C11

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

It requires special techniques to prevent water absorption

~~

T7D – Basic repair and testing

T7D01

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

A voltmeter

~~

T7D02

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

In parallel with the circuit

~~

T7D03

How is an ammeter usually connected to a circuit?

In series with the circuit

~~

T7D04

Which instrument is used to measure electric current?

An ammeter

~~

T7D05

What instrument is used to measure resistance?

An ohmmeter

~~

T7D06

Which of the following might damage a multimeter?

Attempting to measure voltage when using the resistance setting

~~

T7D07

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

Voltage and resistance

~~

T7D08

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

Rosin-core solder

~~

T7D09

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

A grainy or dull surface

~~

T7D10

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

The circuit contains a large capacitor

~~

T7D11

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

Ensure that the circuit is not powered

~~

SUBELEMENT T8 - 4 Exam Group Questions

A – Modulation modes

- B - Amateur satellite operation
- C – Operating activities
- D – Non-voice communications

T8A – Modulation modes

T8A01

Which of the following is a form of amplitude modulation?

Single sideband

~~

T8A02

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

FM

~~

T8A03

Which type of voice modulation is most often used for long-distance or weak signal contacts on the VHF and UHF bands?

SSB

~~

T8A04

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

FM

~~

T8A05

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

CW

~~

T8A06

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

Upper sideband

~~

T8A07

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

SSB signals have narrower bandwidth

~~

T8A08

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

3 kHz

~~

T8A09

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

Between 5 and 15 kHz

~~

T8A10

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

About 6 MHz

~~

T8A11

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

150 Hz

~~

T8B - Amateur satellite operation

T8B01

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

Any amateur whose license privileges allow them to transmit on the satellite uplink frequency

~~

T8B02

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

The minimum amount of power needed to complete the contact

~~

T8B03

Which of the following can be done using an amateur radio satellite?

Talk to amateur radio operators in other countries

~~

T8B04

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?

Any amateur holding a Technician or higher class license

~~

T8B05

What is a satellite beacon?

A transmission from a space station that contains information about a satellite

~~

T8B06

What can be used to determine the time period during which an amateur satellite or space station can be accessed?

A satellite tracking program

~~

T8B07

With regard to satellite communications, what is Doppler shift?

An observed change in signal frequency caused by relative motion between the satellite and the earth station

~~

T8B08

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

The satellite uplink is in the 70 cm band and the downlink is in the 2 meter band

~~

T8B09

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

Rotation of the satellite and its antennas

~~

T8B10

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

The satellite is in a Low Earth Orbit

~~

T8B11

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

FM Packet

~~

T8C – Operating activities

T8C01

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

Radio direction finding

~~

T8C02

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

A directional antenna

~~

T8C03

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

Contesting

~~

T8C04 (C)

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

Send only the minimum information needed for proper identification and the contest exchange

~~

T8C05

What is a grid locator?

A letter-number designator assigned to a geographic location

~~

T8C06

For what purpose is a temporary "1 by 1" format (letter-number-letter) call sign assigned?

For operations in conjunction with an activity of special significance to the amateur community

~~

T8C07

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

1 watt

~~

T8C08

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

A label indicating the licensee's name, call sign and address must be affixed to the transmitter

~~

T8C09

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

From a repeater directory

~~

T8C10

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

Use the keypad to transmit the IRLP node ID

~~

T8C11

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

A gateway

~~

T8D – Non-voice communications

T8D01

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**

~~

T8D02

What does the term APRS mean?

Automatic Position Reporting System

~~

T8D03

Which of the following is normally used when sending automatic location reports via amateur radio?

A Global Positioning System receiver

~~

T8D04

What type of transmission is indicated by the term NTSC?

An analog fast scan color TV signal

~~

T8D05

Which of the following emission modes may be used by a Technician Class operator between 219 and 220 MHz?

Data

~~

T8D06

What does the abbreviation PSK mean?

Phase Shift Keying

~~

T8D07

What is PSK31?

A low-rate data transmission mode

~~

T8D08

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**

~~

T8D09

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

International Morse

~~

T8D10

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**

~~

T8D11

What is a "parity" bit?

An extra code element used to detect errors in received data

~~

SUBELEMENT T9 - 2 Exam Groups Questions

A – Antennas

B - Feedlines

T9A – Antennas

T9A01

What is a beam antenna?

An antenna that concentrates signals in one direction

~~

T9A02

Which of the following is true regarding vertical antennas?

The electric field is perpendicular to the Earth

~~

T9A03

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

A horizontally polarized antenna

~~

T9A04

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

It does not transmit or receive as effectively as a full-sized antenna

~~

T9A05

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

Shorten it

~~

T9A06

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

Directional antennas

~~

T9A07

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

Signals can be significantly weaker than when it is outside of the vehicle

~~

T9A08

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

19 ($300/146 = 2.05$ meter, $2/4 = .5$ meter, $.5 * 39$ inch per meter = 19.5 inch)

~~

T9A09

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

112 ($6/2 = 3$ meter, $3 * 39$ inch per meter = 117 inch)

~~

T9A10

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

Broadside to the antenna

~~

T9A11

What is meant by the gain of an antenna?

The increase in signal strength in a specified direction when compared to a reference antenna

~~

T9B - Feedlines

T9B01

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

To allow the efficient transfer of power and reduce losses

~~

T9B02

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

50 ohms

~~

T9B03

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

It is easy to use and requires few special installation considerations

~~

T9B04

What does an antenna tuner do?

It matches the antenna system impedance to the transceiver's output impedance

~~

T9B05

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

The loss increases

~~

T9B06

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

A Type N connector

~~

T9B07

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

The are commonly used at HF frequencies

~~

T9B08

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

To prevent an increase in feedline loss

~~

T9B09

What might cause erratic changes in SWR readings?

A loose connection in an antenna or a feedline

~~

T9B10

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

RG-8 cable has less loss at a given frequency

~~

T9B11

Which of the following types of feedline has the lowest loss at VHF and UHF?

Air-insulated hard line

~~

SUBELEMENT T0 - 3 Exam Group Questions

- A – AC power circuits
- B – Antenna installation
- C - RF hazards

T0A – AC power circuits

T0A01

Which is a commonly accepted value for the lowest voltage that can cause a dangerous electric shock?

30 volts

~~

T0A02

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**

~~

T0A03

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

Safety ground

~~

T0A04

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

To interrupt power in case of overload

~~

T0A05

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

Excessive current could cause a fire

~~

T0A06

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**

~~

T0A07 (D)

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

Ground all of the protectors to a common plate which is in turn connected to an external ground

~~

T0A08

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

Connect the battery to a car's battery and run the engine

~~

T0A09

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

Explosive gas can collect if not properly vented

~~

T0A10

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

The battery could overheat and give off flammable gas or explode

~~

T0A11

Which of the following is good practice when installing ground wires on a tower for lightning protection?

Ensure that connections are short and direct

~~

T0A12

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

You might receive an electric shock from stored charge in large capacitors

~~

T0A13

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

A fuse or circuit breaker in series with the AC "hot" conductor

~~

T0B – Antenna installation

T0B01

When should members of a tower work team wear a hard hat and safety glasses?

At all times when any work is being done on the tower

~~

T0B02

What is a good precaution to observe before climbing an antenna tower?

Put on a climbing harness and safety glasses

~~

T0B03

Under what circumstances is it safe to climb a tower without a helper or observer?

Never

~~

T0B04

Which of the following is an important safety precaution to observe when putting up an antenna tower?

Look for and stay clear of any overhead electrical wires

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T0B05

What is the purpose of a gin pole?

To lift tower sections or antennas

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T0B06

What is the minimum safe distance from a power line to allow when installing an antenna?

So that if the antenna falls unexpectedly, no part of it can come closer than 10 feet to the power wires

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T0B07

Which of the following is an important safety rule to remember when using a crank-up tower?

This type of tower must never be climbed unless it is in the fully retracted position

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T0B08

What is considered to be a proper grounding method for a tower?

Separate eight-foot long ground rods for each tower leg, bonded to the tower and each other

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T0B09

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

The antenna could contact high-voltage power wires

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T0B10

Which of the following is true concerning grounding conductors used for lightning protection?

Sharp bends must be avoided

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T0B11

Which of the following establishes grounding requirements for an amateur radio tower or antenna?

Local electrical codes

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T0C - RF hazards

T0C01

What type of radiation are VHF and UHF radio signals?

Non-ionizing radiation

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T0C02

Which of the following frequencies has the lowest Maximum Permissible Exposure limit?

50 MHz

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T0C03

What is the maximum power level that an amateur radio station may use at VHF frequencies before an RF exposure evaluation is required?

50 watts PEP at the antenna

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T0C04

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**

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T0C05

Why do exposure limits vary with frequency?

The human body absorbs more RF energy at some frequencies than at others

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T0C06

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**

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T0C07

What could happen if a person accidentally touched your antenna while you were transmitting?

They might receive a painful RF burn

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T0C08

Which of the following actions might amateur operators take to prevent exposure to RF radiation in excess of FCC-supplied limits?

Relocate antennas

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T0C09

How can you make sure your station stays in compliance with RF safety regulations?

By re-evaluating the station whenever an item of equipment is changed

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T0C10

Why is duty cycle one of the factors used to determine safe RF radiation exposure levels?

It affects the average exposure of people to radiation

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T0C11

What is meant by "duty cycle" when referring to RF exposure?

The ratio of on-air time to total operating time of a transmitted signal

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