

Basic Radio and Radio Waves

Chapters T2, T3, T5, G5, G6

Radio Signals and Waves / Radio Equipment Basics / Types of Radios and Radio Circuits / Transmitters, Receivers, Tranceivers / Digital Modes / HF Station Installation

Radio Signals and Waves

(T3B01) What is the name for the distance a radio wave travels during one complete cycle?

ANSWER:

(T3B04) How fast does a radio wave travel through free space?

ANSWER:

(T3B05) How does the wavelength of a radio wave relate to its frequency?

ANSWER:

(T3B06) What is the formula for converting frequency to approximate wavelength in meters?

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(T3B06) What is the formula for converting frequency to approximate wavelength in meters?

ANSWER:

(T3B07) What property of radio waves is often used to identify the different frequency bands?

ANSWER:

T3B08) What are the frequency limits of the VHF spectrum?

ANSWER:

(T3B09) What are the frequency limits of the UHF spectrum?

ANSWER:

(T3B10) What frequency range is referred to as HF?

ANSWER:

(T3B11) What is the approximate velocity of a radio wave as it travels through free space?

ANSWER:

(T5C05) What is the unit of frequency?

ANSWER:

(T5C06) What does the abbreviation "RF" refer to?

ANSWER:

(T1B09) Why should you not set your transmit frequency to be exactly at the edge of an amateur band or sub-band?

ANSWER:

(T8A01) Which of the following is a form of amplitude modulation?

ANSWER:

(T8A02) What type of modulation is most commonly used for VHF packet radio transmissions?

ANSWER:

(T8A03) Which type of voice mode is most often used for long-distance (weak signal) contacts on the VHF and UHF bands?

ANSWER:

(T8A04) Which type of modulation is most commonly used for VHF and UHF voice repeaters?

ANSWER:

(T2B05) What might be the problem if a repeater user says your transmissions are breaking up on voice peaks?

ANSWER:

(T8A05) Which of the following types of emission has the narrowest bandwidth?

ANSWER:

(T8A06) Which sideband is normally used for 10 meter HF, VHF, and UHF single-sideband communications?

ANSWER:

(T8A07) What is an advantage of single sideband (SSB) over FM for voice transmissions?

ANSWER:

(T8A08) What is the approximate bandwidth of a single sideband (SSB) voice signal?

ANSWER:

(T8A09) What is the approximate bandwidth of a VHF repeater FM phone signal?

ANSWER:

(T8A10) What is the typical bandwidth of analog fast-scan TV transmissions on the 70 cm band?

ANSWER:

(T8A11) What is the approximate maximum bandwidth required to transmit a CW signal?

ANSWER:

G8A02 -- What is the name of the process that changes the phase angle of an RF signal to convey information?

ANSWER:

G8A03 -- What is the name of the process which changes the instantaneous frequency of an RF wave to convey information?

ANSWER:

G8A05 -- What type of modulation varies the instantaneous power level of the RF signal?

ANSWER:

G8A07 -- Which of the following phone emissions uses the narrowest bandwidth?

ANSWER:

G8A11 -- What is the modulation envelope of an AM signal?

ANSWER:

Radio Equipment Basics

(T7A07) What is meant by "PTT"?

ANSWER:

(T1F09) What type of amateur station simultaneously retransmits the signal of another amateur station on a different channel or channels?

ANSWER:

(T7A06) What device converts the RF input and output of a transceiver to another band?

ANSWER:

(T7A08) Which of the following describes combining speech with an RF carrier signal?

ANSWER:

(T7A11) Where is an RF preamplifier installed?

ANSWER:

G4D08 -- What frequency range is occupied by a 3 kHz LSB signal when the displayed carrier frequency is set to 7.178 MHz?

ANSWER:

G4D09 -- What frequency range is occupied by a 3 kHz USB signal with the displayed carrier frequency set to 14.347 MHz?

ANSWER:

G4D10 -- How close to the lower edge of the phone segment should your displayed carrier frequency be when using 3 kHz wide LSB?

ANSWER:

G4D11 -- How close to the upper edge of the phone segment should your displayed carrier frequency be when using 3 kHz wide USB?

ANSWER:

G7C12 -- What is the frequency above which a low-pass filter's output power is less than half the input power?

ANSWER:

G7C14 -- The bandwidth of a band-pass filter is measured between what two frequencies?

ANSWER:

G7C15 -- What term specifies a filter's attenuation inside its passband?

ANSWER:

G7C13 -- What term specifies a filter's maximum ability to reject signals outside its passband?

ANSWER:

G7B07 -- Which of the following are basic components of a sine wave oscillator?

ANSWER:

G7B09 -- What determines the frequency of an LC oscillator?

ANSWER:

G7C16 -- Which of the following is a typical application for a Direct Digital Synthesizer?

ANSWER:

G7C05 -- Which of the following is an advantage of a direct digital synthesizer (DDS)?

ANSWER:

G8A04 -- What emission is produced by a reactance modulator connected to a transmitter RF amplifier stage?

ANSWER:

G8B01 -- Which mixer input is varied or tuned to convert signals of different frequencies to an intermediate frequency (IF)?

ANSWER:

G8B11 -- What combination of a mixer's Local Oscillator (LO) and RF input frequencies is found in the output?

ANSWER:

G8B03 -- What is another term for the mixing of two RF signals?

ANSWER:

G8B04 -- What is the stage in a VHF FM transmitter that generates a harmonic of a lower frequency signal to reach the desired operating frequency?

ANSWER:

(T7A01) Which term describes the ability of a receiver to detect the presence of a signal?

ANSWER:

(T7A02) What is a transceiver?

ANSWER:

(T7A03) Which of the following is used to convert a radio signal from one frequency to another?

ANSWER:

(T7A04) Which term describes the ability of a receiver to discriminate between multiple signals?

ANSWER:

(T7A05) What is the name of a circuit that generates a signal at a specific frequency?

ANSWER:

Transmitters, Receivers and Transceivers

(T7C01) What is the primary purpose of a dummy load?

ANSWER:

(T7C12) What does a dummy load consist of?

ANSWER:

(T4B01) What may happen if a transmitter is operated with the microphone gain set too high?

ANSWER:

(T4B02) Which of the following can be used to enter the operating frequency on a modern transceiver?

ANSWER:

(T4B03) What is the purpose of the squelch control on a transceiver?

ANSWER:

(T4B04) What is a way to enable quick access to a favorite frequency on your transceiver?

ANSWER:

(T4B05) Which of the following would reduce ignition interference to a receiver?

ANSWER:

(T4B12) Which of the following could be used to remove power line noise or ignition noise?

ANSWER:

G4A17 -- What happens as the noise reduction control level in a receiver is increased?

ANSWER:

(T4B06) Which of the following controls could be used if the voice pitch of a single-sideband signal seems too high or low?

ANSWER:

(T4B07) What does the term "RIT" mean?

ANSWER:

(T4B08) What is the advantage of having multiple receive bandwidth choices on a multimode transceiver?

ANSWER:

(T4B09) Which of the following is an appropriate receive filter bandwidth for minimizing noise and interference for SSB reception?

ANSWER:

(T4B10) Which of the following is an appropriate receive filter bandwidth for minimizing noise and interference for CW reception?

ANSWER:

(T4B11) What is the function of automatic gain control, or AGC?

ANSWER:

(T7A09) What is the function of the SSB/CW-FM switch on a VHF power amplifier?

ANSWER:

(T4B13) Which of the following is a use for the scanning function of an FM transceiver?

ANSWER:

(T7A10) What device increases the low-power output from a handheld transceiver?

ANSWER:

(T7B01) What can you do if you are told your FM handheld or mobile transceiver is over-deviating?

ANSWER:

(T7C05) Why do most solid-state amateur radio transmitters reduce output power as SWR increases?

ANSWER:

G4D07 -- How much must the power output of a transmitter be raised to change the S meter reading on a distant receiver from S8 to S9?

ANSWER:

G7C03 -- What circuit is used to process signals from the RF amplifier and local oscillator then send the result to the IF filter in a superheterodyne receiver?

ANSWER:

G7C04 -- What circuit is used to combine signals from the IF amplifier and BFO and send the result to the AF amplifier in some single sideband receivers?

ANSWER:

G7C07 -- What is the simplest combination of stages that implement a superheterodyne receiver?

ANSWER:

G7C08 -- What circuit is used in analog FM receivers to convert IF output signals to audio?

ANSWER:

G7C09 -- What is the phase difference between the I and Q signals that software-defined radio (SDR) equipment uses for modulation and demodulation?

ANSWER:

G7C10 -- What is an advantage of using I and Q signals in software-defined radios (SDRs)?

ANSWER:

G7C11 -- What is meant by the term "software defined radio" (SDR)?

ANSWER:

G8B02 -- If a receiver mixes a 13.800 MHz VFO with a 14.255 MHz received signal to produce a 455 kHz intermediate frequency (IF) signal, what type of interference will a 13.345 MHz signal produce in the receiver?

ANSWER:

G8B09 -- Why is it good to match receiver bandwidth to the bandwidth of the operating mode?

ANSWER:

G4A14 -- What is likely to happen if a transceiver's ALC system is not set properly when transmitting AFSK signals with the radio using single sideband mode?

ANSWER:

G4A16 -- How does a noise blanker work?

ANSWER:

G4B15 -- What type of transmitter performance does a two-tone test analyze?

ANSWER:

G4B07 -- What signals are used to conduct a two-tone test?

ANSWER:

G4D01 -- What is the purpose of a speech processor as used in a modern transceiver?

ANSWER:

G4D02 -- Which of the following describes how a speech processor affects a transmitted single sideband phone signal?

ANSWER:

G4A05 -- What is a reason to use Automatic Level Control (ALC) with an RF power amplifier?

ANSWER:

G4A07 -- What condition can lead to permanent damage to a solid-state RF power amplifier?

ANSWER:

G4A08 -- What is the correct adjustment for the load or coupling control of a vacuum tube RF power amplifier?

ANSWER:

G4A09 -- Why is a time delay sometimes included in a transmitter keying circuit?

ANSWER:

G4A12 -- Which of the following is a common use for the dual VFO feature on a transceiver?

ANSWER:

G4A03 -- What is normally meant by operating a transceiver in "split" mode?

ANSWER:

G4A04 -- What reading on the plate current meter of a vacuum tube RF power amplifier indicates correct adjustment of the plate tuning control?

ANSWER:

G4D03 -- Which of the following can be the result of an incorrectly adjusted speech processor?

ANSWER:

G7B08 -- How is the efficiency of an RF power amplifier determined?

ANSWER:

G7B10 -- Which of the following describes a linear amplifier?

ANSWER:

G7B11 -- For which of the following modes is a Class C power stage appropriate for amplifying a modulated signal?

ANSWER:

G7B01 -- What is the reason for neutralizing the final amplifier stage of a transmitter?

ANSWER:

G7B10 -- Which of the following describes a linear amplifier?

ANSWER:

G7C01 -- Which of the following is used to process signals from the balanced modulator THEN send them to the mixer in some single sideband phone transmitters?

ANSWER:

G7C02 -- Which circuit is used to combine signals from the carrier oscillator and speech amplifier then send the result to the filter in some single sideband phone transmitters?

ANSWER:

G8A08 -- Which of the following is an effect of overmodulation?

ANSWER:

G2A12 -- What control is typically adjusted for proper ALC setting on an amateur single sideband transceiver?

ANSWER:

G8A10 -- What is meant by the term flat-topping when referring to a single-sideband phone transmission?

ANSWER:

G8B06 -- What is the total bandwidth of an FM phone transmission having 5 kHz deviation and 3 kHz modulating frequency?

ANSWER:

G8B07 -- What is the frequency deviation for a 12.21 MHz reactance modulated oscillator in a 5 kHz deviation, 146.52 MHz FM phone transmitter?

ANSWER:

G4A01 -- What is the purpose of the "notch filter" found on many HF transceivers?

ANSWER:

G4A02 -- What is one advantage of selecting the opposite or "reverse" sideband when receiving CW signals on a typical HF transceiver?

ANSWER:

G4A11 -- Which of the following is a use for the IF shift control on a receiver?

ANSWER:

G4A13 -- What is one reason to use the attenuator function that is present on many HF transceivers?

ANSWER:

G4C12 -- Which of the following is an advantage of a receiver DSP IF filter as compared to an analog filter?

ANSWER:

G4D04 -- What does an S meter measure?

ANSWER:

G4D05 -- How does a signal that reads 20 dB over S9 compare to one that reads S9 on a receiver, assuming a properly calibrated S meter?

ANSWER:

G4D06 -- Where is an S meter found?

ANSWER:

Digital Modes

(T4A02) How might a computer be used as part of an amateur radio station?

ANSWER:

(T4A06) Which of the following connections might be used between a voice transceiver and a computer for digital operation?

ANSWER:

(T4A07) How is a computer's sound card used when conducting digital communications?

ANSWER:

(T4A04) -- Which computer sound card port is connected to a transceiver's headphone or speaker output for operating digital modes?

ANSWER:

(T8C11) What name is given to an amateur radio station that is used to connect other amateur stations to the Internet?

ANSWER:

(T8D01) Which of the following is a digital communications mode?

ANSWER:

(T8D13) What is FT8?

ANSWER:

(T8D02) What does the term APRS mean?

ANSWER:

(T8D05) Which of the following is an application of APRS (Automatic Packet Reporting System)?

ANSWER:

(T8D03) Which of the following devices is used to provide data to the transmitter when sending automatic position reports from a mobile amateur radio station?

ANSWER:

(T8D06) What does the abbreviation "PSK" mean?

ANSWER:

(T8D07) Which of the following best describes DMR (Digital Mobile Radio)?

ANSWER:

(T8D08) Which of the following may be included in packet transmissions?

ANSWER:

(T8D09) What code is used when sending CW in the amateur bands?

ANSWER:

(T8D11) What is an ARQ transmission system?

ANSWER:

(T8D10) Which of the following operating activities is supported by digital mode software in the WSJT suite?

ANSWER:

G8A01 -- How is an FSK signal generated?

ANSWER:

G8A12 -- Which of the following narrow-band digital modes can receive signals with very low signal-to-noise ratios?

ANSWER:

G2E11 -- Which of the following is characteristic of the FT8 mode of the WSJT-X family?

ANSWER:

G2E15 -- Which of the following is a requirement when using the FT8 digital mode?

ANSWER:

G8A09 -- What type of modulation is used by the FT8 digital mode?

ANSWER:

G8C02 -- Which digital mode is used as a low-power beacon for assessing HF propagation?

ANSWER:

G8C09 -- What does the number 31 represent in "PSK31"?

ANSWER:

G8C11 -- How are the two separate frequencies of a Frequency Shift Keyed (FSK) signal identified?

ANSWER:

G2E01 -- Which mode is normally used when sending an RTTY signal via AFSK with an SSB transmitter?

ANSWER:

G8C03 -- What part of a packet radio frame contains the routing and handling information?

ANSWER:

G8C04 -- Which of the following describes Baudot code?

ANSWER:

G2E06 -- What is the most common frequency shift for RTTY emissions in the amateur HF bands?

ANSWER:

G8C07 -- How does the receiving station respond to an ARQ data mode packet containing errors?

ANSWER:

G8C05 -- In the PACTOR protocol, what is meant by an NAK response to a transmitted packet?

ANSWER:

G2E13 -- Which communication system sometimes uses the Internet to transfer messages?

ANSWER:

G8B08 -- Why is it important to know the duty cycle of the mode you are using when transmitting?

ANSWER:

G8C10 -- How does forward error correction (FEC) allow the receiver to correct errors in received data packets?

ANSWER:

G8B10 -- What is the relationship between transmitted symbol rate and bandwidth?

ANSWER:

G2E07 -- What segment of the 80-meter band is most commonly used for digital transmissions?

ANSWER:

G2E05 -- What is the standard sideband used to generate a JT65, JT9, or FT8 digital signal when using AFSK in any amateur band?

ANSWER:

G4A15 -- Which of the following can be a symptom of transmitted RF being picked up by an audio cable carrying AFSK data signals between a computer and a transceiver?

ANSWER:

G2E14 -- What could be wrong if you cannot decode an RTTY or other FSK signal even though it is apparently tuned in properly?

ANSWER:

G2E09 -- How do you join a contact between two stations using the PACTOR protocol?

ANSWER:

G2E02 -- How can a PACTOR modem or controller be used to determine if the channel is in use by other PACTOR stations?

ANSWER:

G8A06 -- Which of the following is characteristic of QPSK31?

ANSWER:

G8C12 -- Which type of code is used for sending characters in a PSK31 signal?

ANSWER:

G8C08 -- Which of the following statements is true about PSK31?

ANSWER:

G2E08 -- In what segment of the 20-meter band are most PSK31 operations commonly found?

ANSWER:

G2E03 -- What symptoms may result from other signals interfering with a PACTOR or WINMOR transmission?

ANSWER:

G8C06 -- What action results from a failure to exchange information due to excessive transmission attempts when using PACTOR or WINMOR?

ANSWER:

G8B05 -- What is the approximate bandwidth of a PACTOR-III signal at maximum data rate?

ANSWER:

G1E11 -- On what bands may automatically controlled stations transmitting RTTY or data emissions communicate with other automatically controlled digital stations?

ANSWER:

G1E03 -- What is required to conduct communications with a digital station operating under automatic control outside the automatic control band segments?

ANSWER:

G2E10 -- Which of the following is a way to establish contact with a digital messaging system gateway station?

ANSWER:

G8C14 -- Which of the following describes a waterfall display?

ANSWER:

G8C13 -- What is indicated on a waterfall display by one or more vertical lines on either side of a digital signal?

ANSWER:

Station Installation

T5A06 -- How much voltage does a mobile transceiver typically require?

ANSWER:

T4A11 -- Where should the negative return connection of a mobile transceiver's power cable be connected?

ANSWER:

T4A03 -- Why should wiring between the power source and radio be heavy-gauge wire and kept as short as possible?

ANSWER:

T4A08 -- Which of the following conductors provides the lowest impedance to RF signals?

ANSWER:

G4C01 -- Which of the following might be useful in reducing RF interference to audio frequency devices?

ANSWER:

G8B12 -- What process combines two signals in a non-linear circuit or connection to produce unwanted spurious outputs?

ANSWER:

G4C02 -- Which of the following could be a cause of interference covering a wide range of frequencies?

ANSWER:

G4C03 -- What sound is heard from an audio device or telephone if there is interference from a nearby single sideband phone transmitter?

ANSWER:

(T4A01) What must be considered to determine the minimum current capacity needed for a transceiver power supply?

ANSWER:

G4C04 -- What is the effect on an audio device when there is interference from a nearby CW transmitter?

ANSWER:

(T4A09) -- Which of the following could you use to cure distorted audio caused by RF current on the shield of a microphone cable?

ANSWER:

T7B12 -- What should be the first step to resolve cable TV interference from your ham radio transmission?

ANSWER:

(T7B02) -- What would cause a broadcast AM or FM radio to receive an amateur radio transmission unintentionally?

ANSWER:

(T7B04) -- Which of the following is a way to reduce or eliminate interference from an amateur transmitter to a nearby telephone?

ANSWER:

(T4A10) -- What is the source of a high-pitched whine that varies with engine speed in a mobile transceiver's receive audio?

ANSWER:

(T7B05) -- How can overload of a non-amateur radio or TV receiver by an amateur signal be reduced or eliminated?

ANSWER:

(T7B06) -- 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?

ANSWER:

(T7B08) -- What should you do if something in a neighbor's home is causing harmful interference to your amateur station?

ANSWER:

(T7B09) -- What is a Part 15 device?

ANSWER:

G4C05 -- What might be the problem if you receive an RF burn when touching your equipment while transmitting on an HF band, assuming the equipment is connected to a ground rod?

ANSWER:

G4C06 -- What effect can be caused by a resonant ground connection?

ANSWER:

G4C11 -- What technique helps to minimize RF "hot spots" in an amateur station?

ANSWER:

G4C08 -- Which of the following would reduce RF interference caused by common-mode current on an audio cable?

ANSWER:

(T7B07) -- Which of the following can reduce overload to a VHF transceiver from a nearby FM broadcast station?

ANSWER:

(T7B03) -- Which of the following can cause radio frequency interference?

ANSWER:

G4C09 -- How can a ground loop be avoided?

ANSWER:

G4C10 -- What could be a symptom of a ground loop somewhere in your station?

ANSWER:

G4E03 -- Which of the following direct, fused power connections would be the best for a 100 watt HF mobile installation?

ANSWER:

G4E04 -- Why is it best NOT to draw the DC power for a 100 watt HF transceiver from a vehicle's auxiliary power socket?

ANSWER:

G4E05 -- Which of the following most limits an HF mobile installation?

ANSWER:

G4E07 -- Which of the following may cause receive interference in a radio installed in a vehicle?

ANSWER:

G7C06 -- What should be the impedance of a low-pass filter as compared to the impedance of the transmission line into which it is inserted?

ANSWER:
