SUBELEMENT T4

Station setup

[2 Exam Questions]

PREPPERNET

T4A01
WHAT MUST BE CONSIDERED TO DETERMINE THE MINIMUM CURRENT CAPACITY NEEDED FOR A TRANSCEIVER POWER SUPPLY?

A. Efficiency of the transmitter at full power output

B. Receiver and control circuit power

C. Power supply regulation and heat dissipation

D. All of these choices are correct

PREPPERNET

All of these things, efficiency of the load, the load power usage, the regulation method (such as switched vs linear), and the ability to dissipate heat will affect the current capacity needed for a transceiver's power supply.

Both the receiver and transmitter are load, and the regulation method of the power supply can be a load as well.

PREPPERNET

T4A02
HOW MIGHT A COMPUTER BE USED AS PART OF AN AMATEUR RADIO STATION?

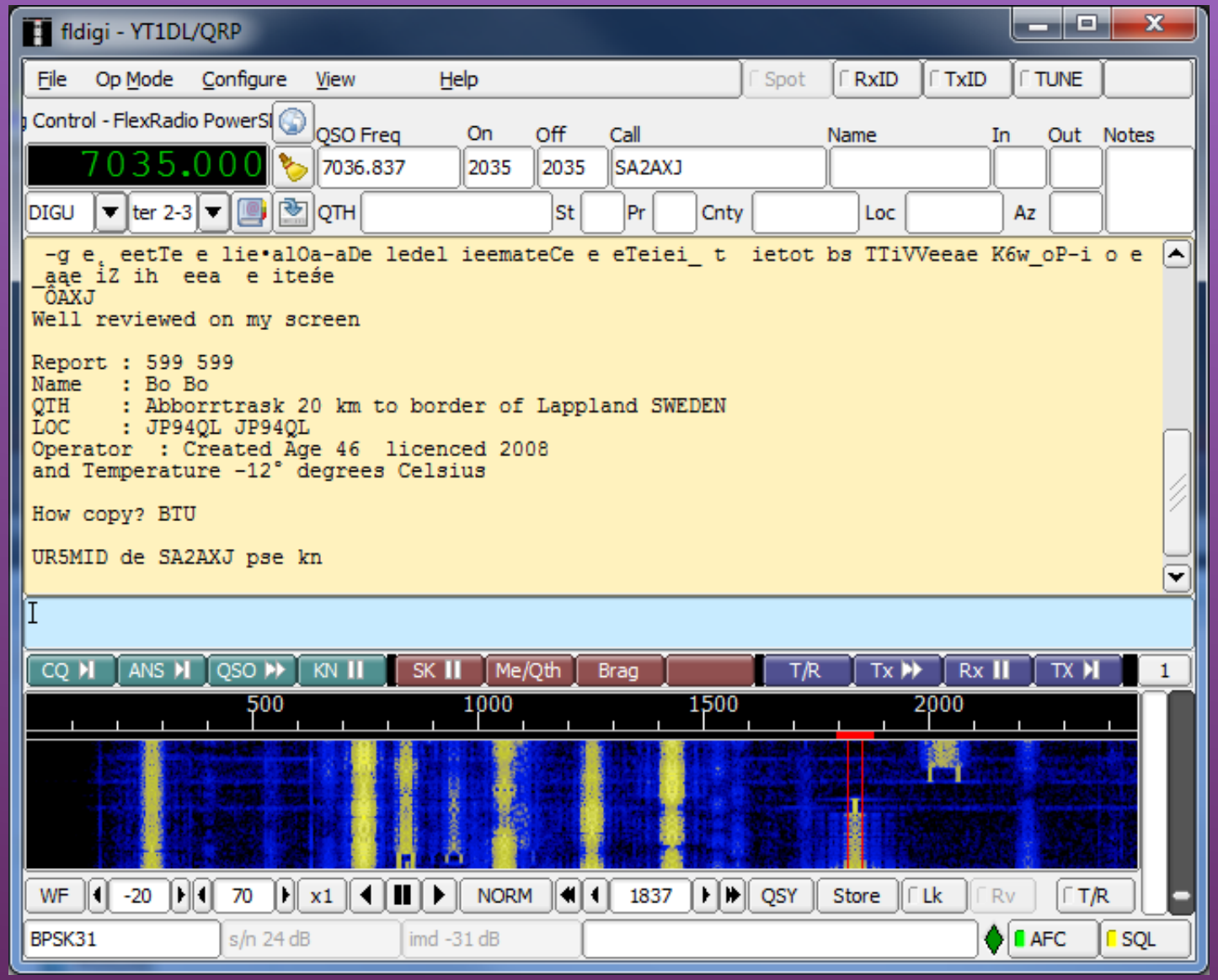
A. For logging contacts and contact information

B. For sending and/or receiving CW

C. For generating and decoding digital signals

D. All of these choices are correct

PREPPERNET



Computers are used for logging call signs (contacts) and contact information (like band, mode, and frequency).

Computers can send and receive CW (Morse Code).

Besides Morse, there are other digital modes that computers can generate and decode, including keyboard-to-keyboard modes like PSK31 and RTTY.

PREPPERNET

T4A03
WHY SHOULD WIRING BETWEEN THE POWER SOURCE AND RADIO BE HEAVY-GAUGE WIRE AND KEPT AS SHORT AS POSSIBLE?

A. To avoid voltage falling below that needed for proper operation

B. To provide a good counterpoise for the antenna

C. To avoid RF interference

D. All of these choices are correct

PREPPERNET

Power connections should be:

<u>Heavy gauge</u> because heavier gauge wires can conduct more current and have less resistance for a given length.

<u>Short as possible</u> because even heavy gauge wire has some resistance, and the longer the wire the more resistance the connection will have.

The more resistance the connection has the more the voltage will drop.

So to get the least resistance, and the least voltage drop, you want <u>short heavy gauge wire</u>.

A radio or other electronic device may fail to operate properly or even be damaged if a supply line is so long that the voltage on the other end is below a minimum required level.

PREPPERNET

T4A04
WHICH COMPUTER SOUND CARD PORT IS CONNECTED TO A TRANSCEIVER'S HEADPHONE OR SPEAKER OUTPUT FOR OPERATING DIGITAL MODES?

A. Headphone output

B. Mute

C. Microphone or line input

D. PCI or SDI

PREPPERNET

Even though the question is about digital modes, it is asking about audio connections which are very often used for digital modes on amateur radio even though they are analog connections.

Remember that headphones and speakers are output devices. Therefore a headphone or speaker output is an output port.

A microphone or line input port is an input port.

PREPPERNET

T4A05
WHAT IS THE PROPER LOCATION FOR AN EXTERNAL SWR METER?

A. In series with the feed line, between the transmitter and antenna

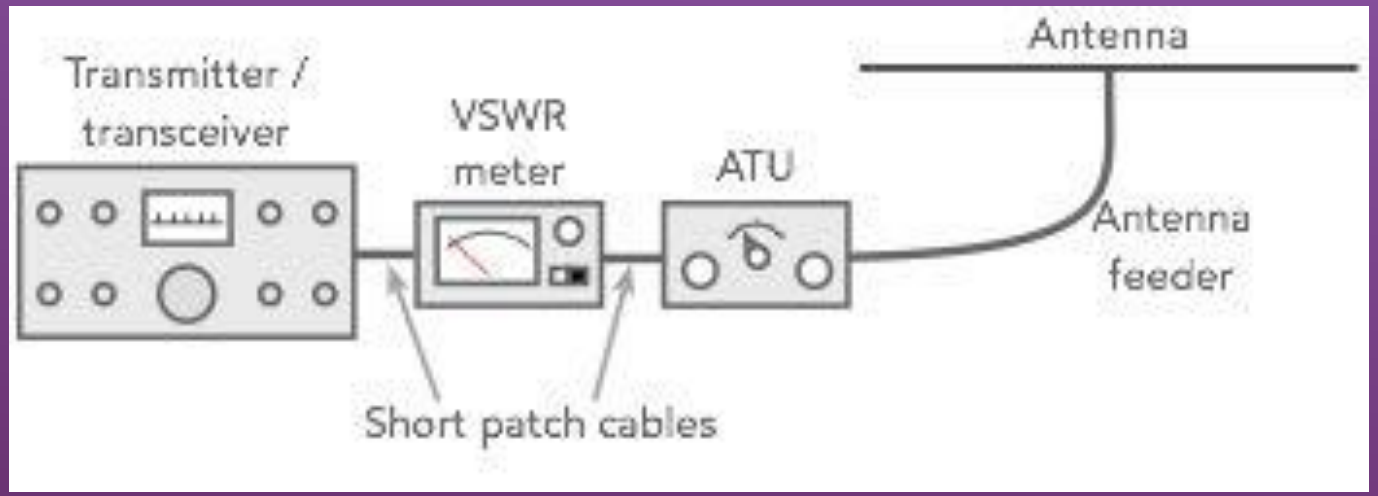
B. In series with the station's ground

C. In parallel with the push-to-talk line and the antenna

D. In series with the power supply cable, as close as possible to the radio

Since the SWR (standing wave ratio) has to do with the quality of the radio frequency signal's match between the impedance of the input to the output, it makes no sense to put it in the station's ground, or push-to-talk line, or in the power supply cable.

Typically, an SWR meter is placed close to the transmitter, so you can tell if the antenna system (antenna and transmission line) is well matched to your transmitter. So it goes in series with the feed line, between the transmitter and antenna tuner.



PREPPERNET

It should be noted that VHF/UHF radios typically do not require a SWR meter. The antennas for these radios are typically tuned at the factory.

If you decide to homebrew an antenna, it is suggested that you initially test the antenna with an antenna analyzer to the middle of the band…adjust (trim or lengthen) the antenna as necessary before getting on the air.

PREPPERNET

T4A06
WHICH OF THE FOLLOWING CONNECTIONS MIGHT BE USED BETWEEN A VOICE TRANSCEIVER AND A COMPUTER FOR DIGITAL OPERATION?

A. Receive and transmit mode, status, and location

B. Antenna and RF power

C. Receive audio, transmit audio, and push-to-talk (PTT)

D. NMEA GPS location and DC power

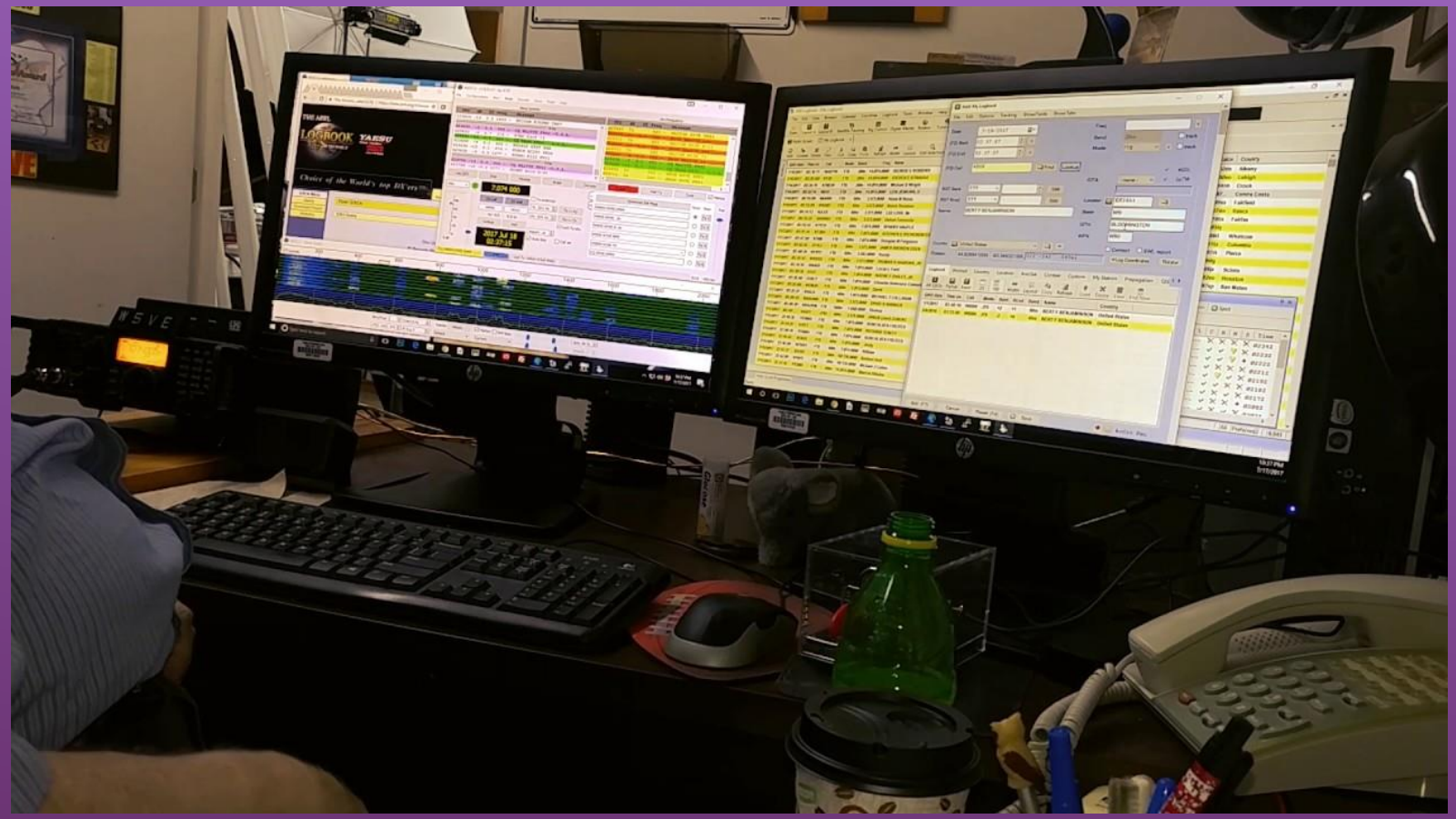
PREPPERNET

Just remember that a large number of digital modes (most of the ones used on HF, if not all) can be encoded and decoded by the simple sound card in a reasonably modern computer. For example, RTTY uses AFSK and can easily be decoded from audio by modern computers. Even Slow Scan TV can be encoded and decoded as audio by desktops, laptops, tablets, and smartphones!

Therefore, the only answer here that makes any sense is receive audio, transmit audio, and push-to-talk, the last one so computer software can key and unkey the transmitter without the need to do so manually.

Often even a computer's microphone and speaker next to the microphone and speaker of the radio is sufficient to encode and decode digital signals as audio, but obviously this method is more error prone so using audio cables is highly preferable for avoiding errors due to noise in the room.

PREPPERNET



PREPPERNET

T4A07
HOW IS A COMPUTER'S SOUND CARD USED WHEN CONDUCTING DIGITAL COMMUNICATIONS?

A. The sound card communicates between the computer CPU and the video display

B. The sound card records the audio frequency for video display

C. The sound card provides audio to the radio's microphone input and converts received audio to digital form

D. All of these choices are correct

PREPPERNET

You can connect the audio out of the computer to your radio's microphone input and the receive audio from the radio into the “Line In” or microphone port on your computer; The computer then listens to the audio and converts it to digital form and when it needs to transmit the sound card generates the tones that the TNC (similar to a modem) would have produced.

PREPPERNET

T4A08
WHICH OF THE FOLLOWING CONDUCTORS PROVIDES THE LOWEST IMPEDANCE TO RF SIGNALS?

A. Round stranded wire

B. Round copper-clad steel wire

C. Twisted-pair cable

D. Flat strap

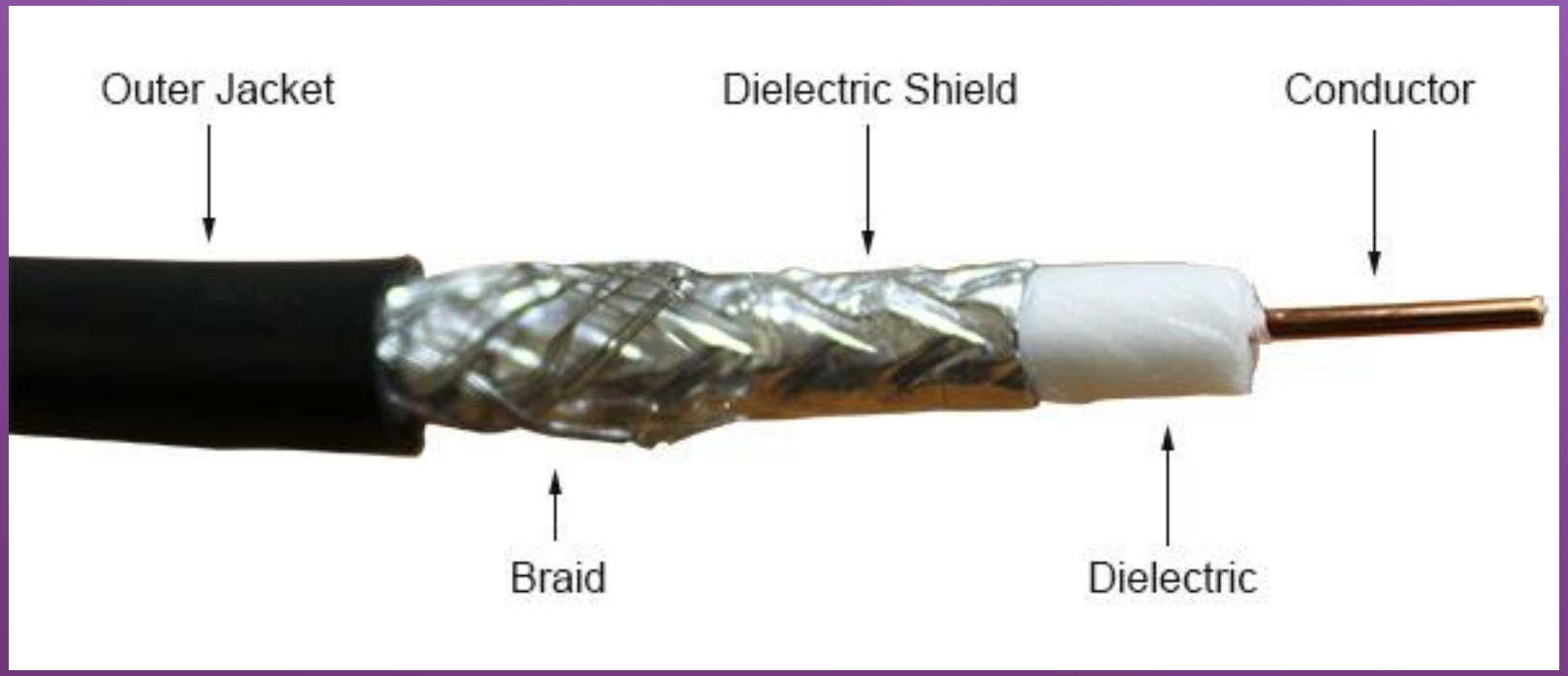
A good RF ground conductor to go from your radio gear to an Earth ground is a Flat strap.

The width of the flat strap contains more surface area than round wire.

It reduces inductance in the conductor and thus is a good ground conductor.

PREPPERNET

While flat strap can be bought online, you can simply remove the outer plastic and the inner conductor & dieletric to make your own flat strap.



PREPPERNET

T4A09

WHICH OF THE FOLLOWING COULD YOU USE TO CURE DISTORTED AUDIO CAUSED BY RF CURRENT ON THE SHIELD OF A MICROPHONE CABLE?

A. Band-pass filter

B. Low-pass filter

C. Preamplifier

D. Ferrite choke

PREPPERNET

A Ferrite Choke can be placed on a cable to reduce current flow conducted on the shield of audio (and power) cables.

The grey tubes or clamp on ferrite devices add inductance to the cable to block the common mode RF energy that may leak from the radio onto the cables attached to the radio.

PREPPERNET

T4A10
WHAT IS THE SOURCE OF A HIGH-PITCHED WHINE THAT VARIES WITH ENGINE SPEED IN A MOBILE TRANSCEIVER'S RECEIVE AUDIO?

A. The ignition system

B. The alternator

C. The electric fuel pump

D. Anti-lock braking system controllers

PREPPERNET

The alternator in your vehicle is an AC generator that is then rectified to produce the DC voltage to charge the battery and run the vehicle's electrical system. It generates a rather high frequency AC signal that can have audio frequency components that can get into the radio's audio amplifier. Sometimes this is because of a weak battery or the design of the electrical system.

Fortunately you can filter out this whine with a 12 Volt power line filter.

PREPPERNET

T4A11
WHERE SHOULD THE NEGATIVE RETURN CONNECTION OF A MOBILE TRANSCEIVER'S POWER CABLE BE CONNECTED?

A. At the battery or engine block ground strap

B. At the antenna mount

C. To any metal part of the vehicle

D. Through the transceiver's mounting bracket

PREPPERNET

A mobile transceiver can draw many Amperes of current when transmitting. That current needs to come directly from the battery.

Using another electrical path could reduce the current available and hinder the transceiver's performance.

Do NOT assume that every wire under your dash produces +12V of current. Underpowering a device creates heat and heat destroys the sensitive components in a radio…

PREPPERNET

T4B01
WHAT MAY HAPPEN IF A TRANSMITTER IS OPERATED WITH THE MICROPHONE GAIN SET TOO HIGH?

A. The output power might be too high

B. The output signal might become distorted

C. The frequency might vary

D. The SWR might increase

PREPPERNET

Some microphones have an adjustable gain control. Some radios have an internal gain control to trim the audio gain of the microphone.

If the gain is set too high it can exceed the range that circuitry can handle and will cause the audio signal to be distorted

The rule of thumb is holding the mic a fist distance from your mouth and speak in a normal "indoor" voice unless the listener asks for you to speak louder!

PREPPERNET

T4B02

WHICH OF THE FOLLOWING CAN BE USED TO ENTER THE OPERATING FREQUENCY ON A MODERN TRANSCEIVER?

A. The keypad or VFO knob

B. The CTCSS or DTMF encoder

C. The Automatic Frequency Control

D. All of these choices are correct

PREPPERNET

On HF radios, the VFO knob is almost always going to be the biggest knob on the faceplate. Almost all HF radios have a keypad to directly enter a frequency.

PREPPERNET

On VHF/UHF radios, the VFO knob is usually the same size as the other buttons…except the VFO knob typically 'clicks' as you turn it.

Many handheld VHF/UHF radios have a keypad on the face of them that allows direct entry of your desired frequency…many mobile VHF/UHF radios have the keypad on the microphone.

PREPPERNET

T4B03

WHAT IS THE PURPOSE OF THE SQUELCH CONTROL ON A TRANSCEIVER?

A. To set the highest level of volume desired

B. To set the transmitter power level

C. To adjust the automatic gain control

D. To mute receiver output noise when no signal is being received

PREPPERNET

The squelch control on a transceiver will "squelch" or mute the noise when no signal is received.

The receiver portion of the transceiver is very sensitive and has variable amplification to give gain to weak signals. When there is no signal to receive, this gain is at maximum which makes the noise received as loud as a normal signal. Fortunately we do not have to listen to that noise because we can adjust the squelch control to mute or turn off signals that are not stronger than the setting we choose.

Typically VHF/UHF radios have the squelch as a menu setting. You will rarely ever have to worry about squelch on VHF/UHF radios.

PREPPERNET

T4B04
WHAT IS A WAY TO ENABLE QUICK ACCESS TO A FAVORITE FREQUENCY ON YOUR TRANSCEIVER?

A. Enable the CTCSS tones

B. Store the frequency in a memory channel

C. Disable the CTCSS tones

D. Use the scan mode to select the desired frequency

PREPPERNET

The ability of most radios to store/program and recall our favorite frequencies gives us quick access to them. These memories can be programmed with more than just the frequency that is needed.

For example, to reach a repeater we need the correct frequency, input offset frequency and CTCSS tone. These are better stored together as a channel in memory.

The key words here are frequency, which is found in the question and correct answer.

PREPPERNET

T4B05

WHICH OF THE FOLLOWING WOULD REDUCE IGNITION INTERFERENCE TO A RECEIVER?

A. Change frequency slightly

B. Decrease the squelch setting

C. Turn on the noise blanker

D. Use the RIT control

PREPPERNET

Ignition interference is interference that comes from the ignition of a vehicle engine. Newer vehicles seem to have this problem less than older ones did, but it is still not uncommon to have an engine that produces enough noise (particularly if your power or feed lines are poorly shielded) to cause your radio's squelch to open when there is no real signal or even to make it more difficult to hear a weak signal.

A noise blanker is a device that is designed to filter out some of this interference. They work in different ways, and some work better than others.

Note that with ignition interference changing the frequency (which is also what an RIT control would do) is not going to help; increasing the squelch setting might help you ignore the problem, if the noise is slight, but decreasing it would certainly not help...

PREPPERNET

T4B06

WHICH OF THE FOLLOWING CONTROLS COULD BE USED IF THE VOICE PITCH OF A SINGLE-SIDEBAND SIGNAL SEEMS TOO HIGH OR LOW?

A. The AGC or limiter

B. The bandwidth selection

C. The tone squelch

D. The receiver RIT or clarifier

PREPPERNET

RIT stands for Receiver Incremental Tuning. It is a fine tuning control to adjust the receiver frequency without adjusting the transmitter frequency.

While SSB is a very efficient transmission mode, everyone ends up sounding somewhat like Donald Duck. This is due to the fact that the transmit carrier frequency is missing. RIT recreates the signal's missing carrier transmit frequency.

When the RIT adjustment is misadjusted, the result can be a voice which is too high or too low sounding. Adjust the RIT until the voice sounds correct.

Keep in mind some people have naturally higher voices than others.

PREPPERNET

T4B07
WHAT DOES THE TERM “RIT” MEAN?

A. Receiver Input Tone

B. Receiver Incremental Tuning

C. Rectifier Inverter Test

D. Remote Input Transmitter

PREPPERNET

Sometimes you may have a signal coming in that is slightly distorted due to the transmitting station being slightly off frequency OR because of an issue within your radio where the frequency tolerances are slightly off (radio need a tune up??) OR maybe just atmospheric conditions, etc....

So maybe you are on frequency 14.150 MHz but you are unable to hear the other station clearly. In this case use the RIT knob (or buttons) to swing up or down a bit to dial in (tune in) the signal and hear it more clearly.

Your transmit signal would remain as 14.150 MHz but your receive might now be tuned to 14.152 MHz (for example) to compensate for the difference.

PREPPERNET

T4B08
WHAT IS THE ADVANTAGE OF HAVING MULTIPLE RECEIVE BANDWIDTH CHOICES ON A MULTIMODE TRANSCEIVER?

A. Permits monitoring several modes at once

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

C. Increases the number of frequencies that can be stored in memory

D. Increases the amount of offset between receive and transmit frequencies

PREPPERNET

Different modes use different amounts of bandwidth; if you are using a narrow receive bandwidth and the mode is wide FM, you will only "hear" a portion of the signal.

On the other hand if you're using a wide FM receive bandwidth and the mode is narrow FM, you may not be able to make out the signal at all and there could be interference from other stations on nearby frequencies.

The best signal will be experienced when the receiver is expecting the same amount of bandwidth that the transmitter is transmitting.

PREPPERNET

T4B09

WHICH OF THE FOLLOWING IS AN APPROPRIATE RECEIVE FILTER BANDWIDTH FOR MINIMIZING NOISE AND INTERFERENCE FOR SSB RECEPTION?

A. 500 Hz

B. 1000 Hz

C. 2400 Hz

D. 5000 Hz

PREPPERNET

The information contained in the average human voice needed to understand the voice is contained within about the first 3000hz of the human hearing range.

Because of this, a 2400Hz filter will generally leave enough of the voice characteristics to be understandable but filter out much of the noise.

PREPPERNET

T4B10
WHICH OF THE FOLLOWING IS AN APPROPRIATE RECEIVE FILTER BANDWIDTH FOR MINIMIZING NOISE AND INTERFERENCE FOR CW RECEPTION?

A. 500 Hz

B. 1000 Hz

C. 2400 Hz

D. 5000 Hz

Morse code (or CW, Continuous Wave) communications use far less bandwidth than voice modes; because you only need to be able to definitely discern whether or not the carrier is there (so you can hear the 'dit' and 'dah' of Morse Code) you need very little bandwidth and so your receive filter can be very small.

As a point to remember, any time you see a question regarding CW and bandwidth, CW will pretty much be the smallest number there.

PREPPERNET

T4B11
WHAT IS THE FUNCTION OF AUTOMATIC GAIN CONTROL, OR AGC?

A. To keep received audio relatively constant

B. To protect an antenna from lightning

C. To eliminate RF on the station cabling

D. An asymmetric goniometer control used for antenna matching

PREPPERNET

Automatic Gain Control (AGC) used to control the gain, automatically, so that when AM signals get stronger, they don't suddenly get louder.

It smooths out the changes in audio level when the signal strength goes up and down, something that happens a lot on low bands with SSB signals (SSB is a type of AM).

You can guess that an AGC has nothing to do with protecting from lightning or eliminating RF from the station cabling.

A goniometer is an instrument that either measures an angle or allows an object to be rotated to a precise angular position. The term goniometry is derived from two Greek words, gōnia, meaning angle, and metron, meaning measure. Nothing at all to do with an AGC. An asymmetric goniometer? I can only imagine!

PREPPERNET

T4B12
WHICH OF THE FOLLOWING COULD BE USED TO REMOVE POWER LINE NOISE OR IGNITION NOISE?

A. Squelch

B. Noise blanker

C. Notch filter

D. All of these choices are correct

PREPPERNET

A Noise Blanker reduces impulse noise without significantly reducing the strength of non-impulse noise. We use it to 'tame' undesirable signals.

Squelch would remove too much, not just the power line or ignition noise - it might remove the signal you're trying to hear.

A notch filter removes a signal at a specific frequency, but power line and ignition noise are typically heard on a range of frequencies, so a notch filter wouldn't remove that noise.

Since two of the distractors are wrong, it can't be All, so that leaves the Noise blanker, the right answer.

PREPPERNET

T4B13

WHICH OF THE FOLLOWING IS A USE FOR THE SCANNING FUNCTION OF AN FM TRANSCEIVER?

A. To check incoming signal deviation

B. To prevent interference to nearby repeaters

C. To scan through a range of frequencies to check for activity

D. To check for messages left on a digital bulletin board

PREPPERNET

A scanning function is useful for scanning through a range of frequencies to check for activity.

None of the other options have anything to do with scanning.

The scanning feature on a radio will rapidly switch receive frequencies automatically, pausing on each frequency for only a fraction of a second to see if a carrier signal is present indicating that someone is actively transmitting on that frequency. If no carrier is present on a frequency it continues to the next one.

As you can imagine, this can be very useful for finding other operators to communicate with when you have no idea what frequency they might be transmitting on.

PREPPERNET