

SUBELEMENT T8

Modulation Modes

[4 Exam Questions]



PREPPERNET

T8A01

WHICH OF THE FOLLOWING IS A FORM OF AMPLITUDE MODULATION?

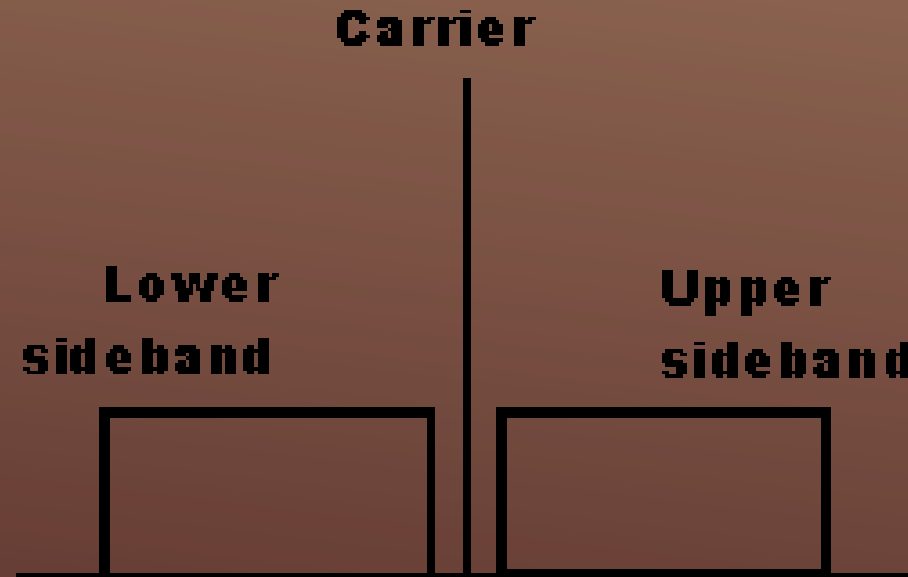
- A. Spread spectrum
- B. Packet radio
- C. *Single sideband***
- D. Phase shift keying (PSK)



PREPPERNET

Single Sideband is a modulation mode commonly used with HF operation and can be essentially described as a variant of amplitude modulation (AM) that only uses half of the signal and no carrier.

Because of this, it is easier to use over a long distance where the reduced bandwidth usage results in less interference and the lack of carrier makes it more likely that the signal will be copyable despite any interference.



PREPPERNET

T8A02

WHAT TYPE OF MODULATION IS MOST COMMONLY USED FOR VHF PACKET RADIO TRANSMISSIONS?

A. FM

B. SSB

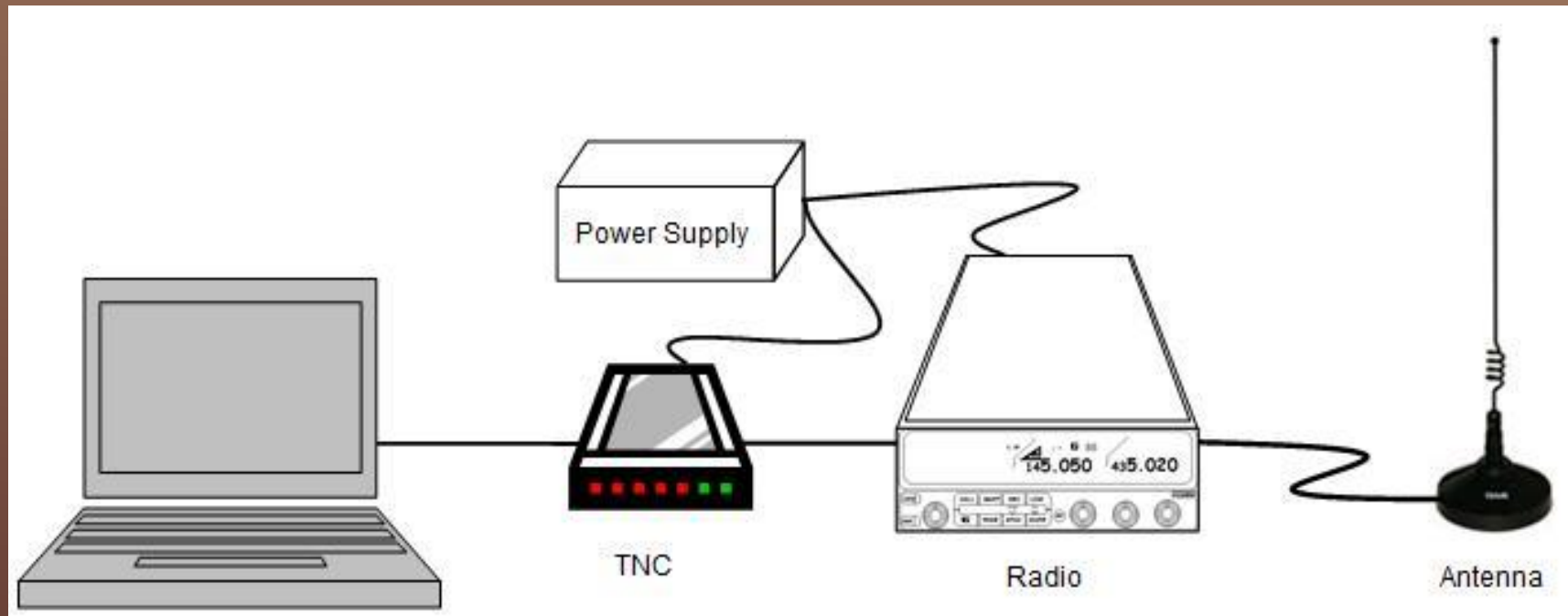
C. AM

D. PSK



PREPPERNET

Since packet radio benefits from good bandwidth and minimal audio amplitude variations, both of which are advantages of FM; and because FM is an allowed modulation method on VHF, FM is the most commonly used modulation for packet.



PREPPERNET

Because packet radio passes traffic from one node to the next, the radio does not require long-distance capabilities...just enough capability to reach the next node which passes the traffic along other nodes to it's intended destination.

Because of this, a VHF transceiver is adequate to accomplish the task of packet radio!



T8A03

WHICH TYPE OF VOICE MODE IS MOST OFTEN USED FOR LONG-DISTANCE (WEAK SIGNAL) CONTACTS ON THE VHF AND UHF BANDS?

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



PREPPERNET

The listed choices are: Frequency Modulation (FM), Single Side-Band (SSB), DRM, and Phase Modulation (PM).

Single Side-Band is unique in that it does not transmit a carrier and requires approximately half of the bandwidth of an FM signal; these two characteristics make it ideal for long-distance and weak signal contacts in nearly any band because less of the signal needs to make it through for the receiver to correctly copy the transmission.

For comparison, consider your AM/FM car radio; when you are too far from the tower, the signal begins to fuzz making it uncopiable.

With SSB the signal would fade but you would have less "white noise" in the faded signal and more of it would be just the voice part that you are interested in.

The downside to this mode is that without a carrier, even when the signal is strong it may not be as clear as an AM or FM signal.



PREPPERNET

T8A04

WHICH TYPE OF MODULATION IS MOST COMMONLY USED FOR VHF AND UHF VOICE REPEATERS?

A. AM

B. SSB

C. PSK

D. FM



PREPPERNET

FM (Frequency Modulation) is the same modulation used by the FM radio in your car, which makes it easier to remember.

Note that regular FM radio broadcast stations (music, talk radio, etc) use what is commonly known as Wide FM, whereas ham radio generally uses Narrow FM which uses less bandwidth (about 5-15kHz).



PREPPERNET

T8A05

WHICH OF THE FOLLOWING TYPES OF EMISSION HAS THE NARROWEST BANDWIDTH?

A. FM voice

B. SSB voice

C. CW

D. Slow-scan TV



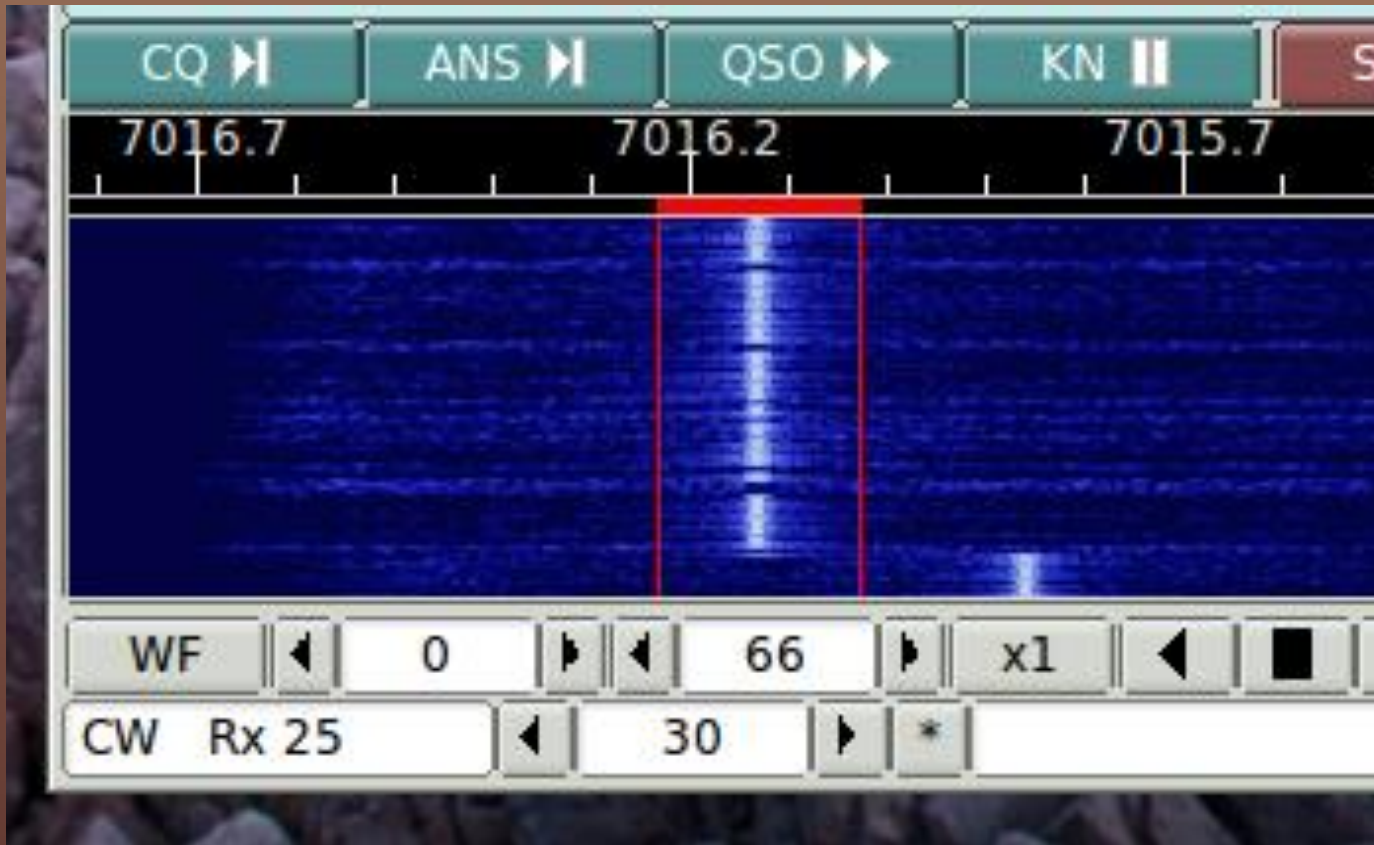
PREPPERNET

CW or "Continuous Wave" is also known as "Morse Code".

This consists of turning the RF carrier "on" and "off".

Since the signal only has to be strong enough to detect if the transmitter is on or not, it requires very little bandwidth.





Looking on a waterfall in FLDIGI, it is quite easy to distinguish CW signals by how narrow the signal looks....



PREPPERNET

CW is the preferred mode for QRP (low-power) communications because so little power is needed to transmit a quality signal.



PREPPERNET

T8A06

WHICH SIDEBAND IS NORMALLY USED FOR 10 METER HF, VHF, AND UHF SINGLE-SIDEBAND COMMUNICATIONS?

A. Upper sideband

B. Lower sideband

C. Suppressed sideband

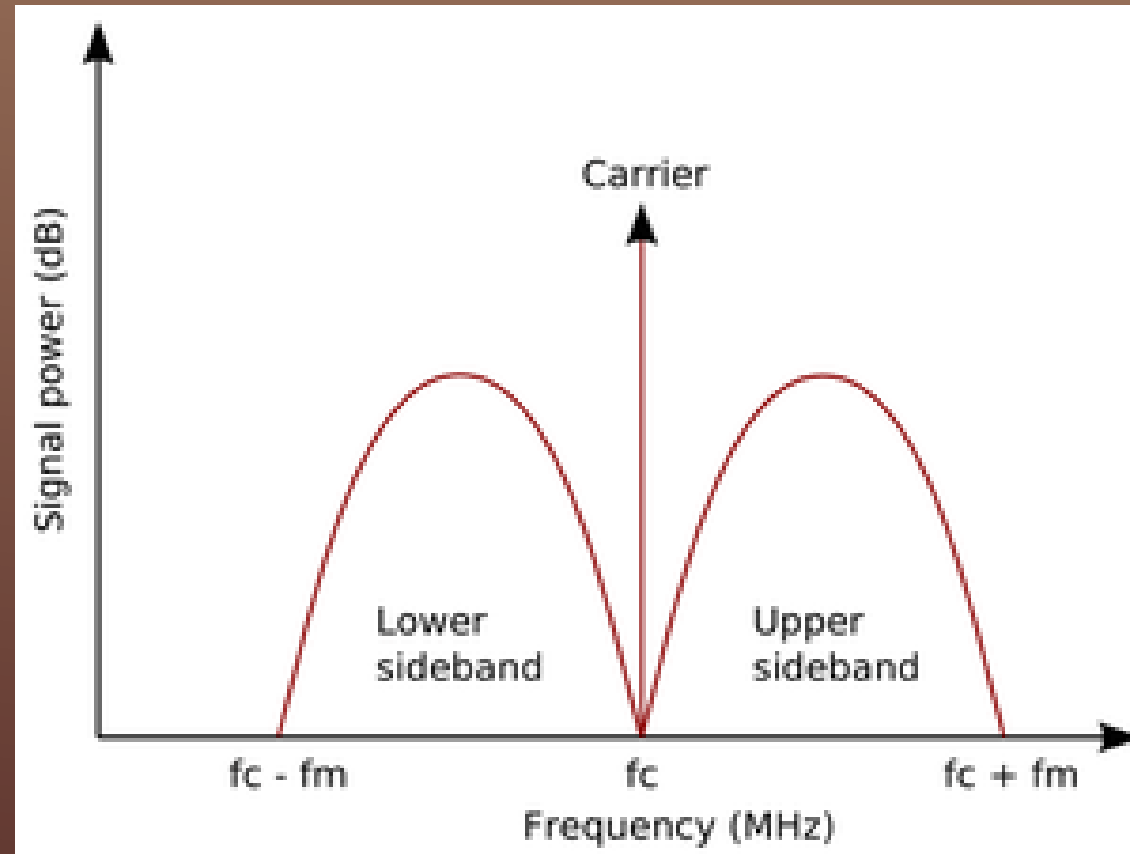
D. Inverted sideband



PREPPERNET

As a convention agreed upon, the Upper Sideband is used for SSB on 10M HF, VHF and UHF bands.

You will need to just remember upper sideband for the upper frequency bands.



PREPPERNET

T8A07

WHAT IS AN ADVANTAGE OF SINGLE SIDEBAND (SSB) OVER FM FOR VOICE TRANSMISSIONS?

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

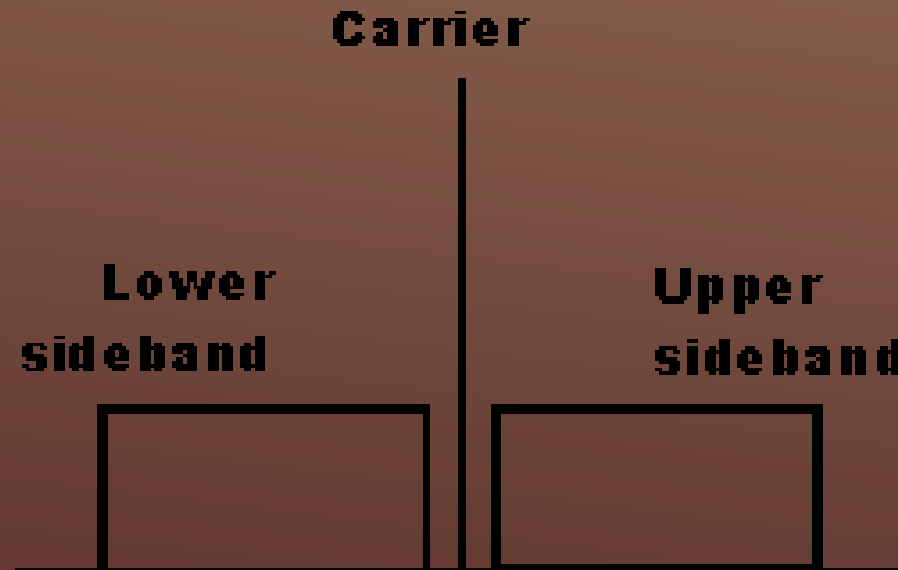


PREPPERNET

A rough way of understanding single sideband is to consider that AM voice transmissions have two sidebands -- upper and lower, with each sideband being approximately half of the bandwidth of the signal.

With Single Sideband there is no carrier and only one of the sidebands is used, either Upper or Lower, and as a result SSB has a much narrower bandwidth.

It is true that SSB signals are more likely to be heard than FM signals when the signal is weak, but this does not imply that they are less susceptible to interference or that they are easier to tune -- they are simply still copyable if a smaller portion of the signal makes it through.



T8A08

WHAT IS THE APPROXIMATE BANDWIDTH OF A SINGLE SIDEBAND (SSB) VOICE SIGNAL?

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



PREPPERNET

Single Sideband is a form of modified Amplitude Modulation (AM). Whereas AM normally uses twice the bandwidth of the original carrier, Single Sideband avoids that issue and also does not waste power on a carrier.

The bandwidth used by a single sideband voice signal varies between 300 and 3400 Hz, or .3 to 3.4 kHz. The approximate bandwidth, therefore, is the rough maximum used, which is approximately 3kHz.



PREPPER.NET

T8A09

WHAT IS THE APPROXIMATE BANDWIDTH OF A VHF REPEATER FM PHONE SIGNAL?

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



PREPPERNET

This can be demonstrated on a 2 meter handheld radio if you have an interest to see it; if you transmit on 146.520MHz and listen on 146.525MHz you will likely still be able to hear the signal. If you can't (or barely can) then the bandwidth is closer to 5kHz (standard for FRS radios, for example) and if you can hear it strongly it may be closer to 10 or 15kHz. The further away you get the wider the bandwidth would need to be for you to still be able to hear it.

Remember that if the bandwidth is 5kHz you will only hear them at the transmit frequency +/- 2.5Khz, because the transmit frequency is the middle so half will be above and half below. Most handheld radios seem to use 10kHz, but some support "half deviation" mode which uses 5kHz.



PREPPERNET

T8A10

WHAT IS THE TYPICAL BANDWIDTH OF ANALOG FAST-SCAN TV TRANSMISSIONS ON THE 70 CENTIMETER BAND?

A. More than 10 MHz

B. About 6 MHz

C. About 3 MHz

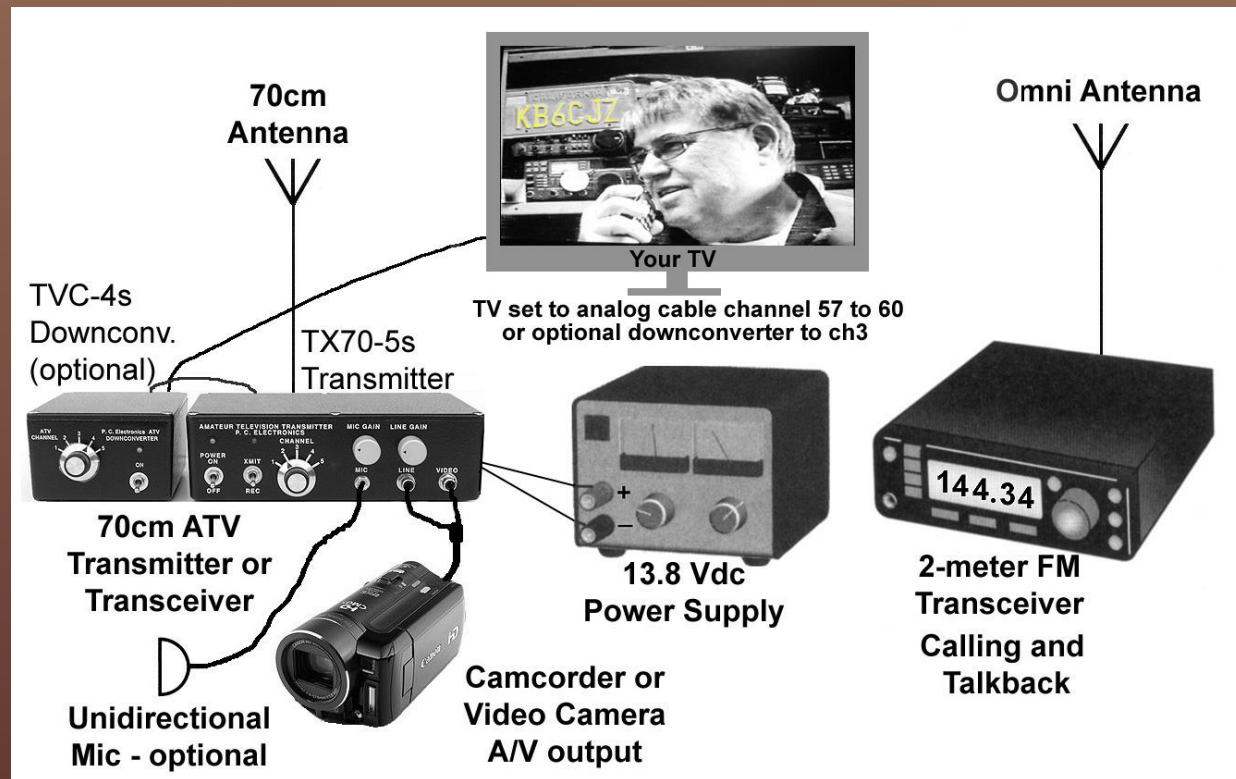
D. About 1 MHz



PREPPERNET

Analog fast-scan TV transmissions use a lot of bandwidth compared to voice and other modes because of how much information is attached to the minorities that need to be transmitted.

The approximate bandwidth is about 6 MHz.



PREPPERNET

T8A11

WHAT IS THE APPROXIMATE MAXIMUM BANDWIDTH REQUIRED TO TRANSMIT A CW SIGNAL?

A. 2.4 kHz

B. 150 Hz

C. 1000 Hz

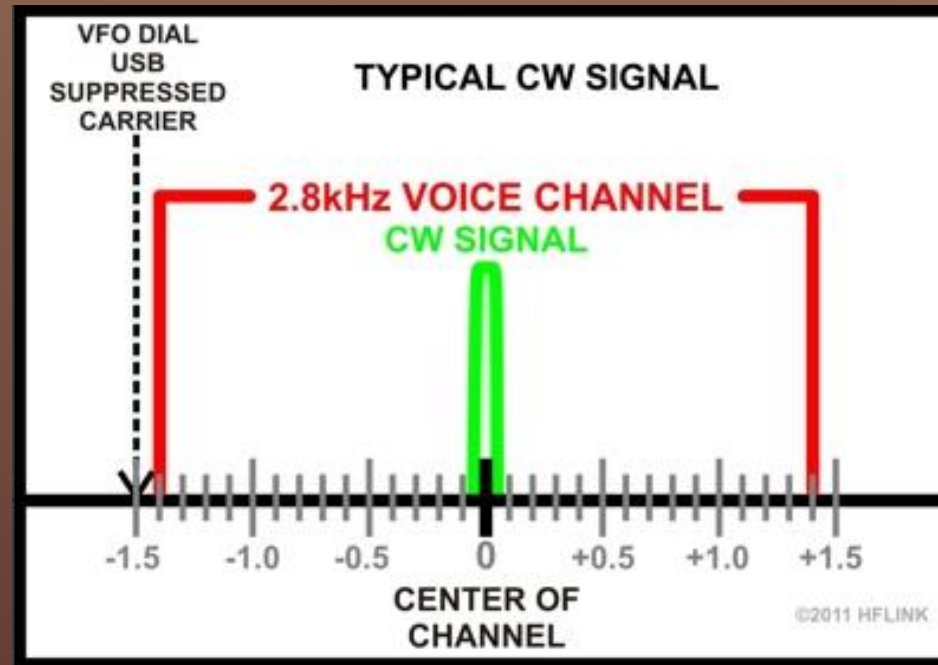
D. 15 kHz



PREPPERNET

CW uses the least bandwidth of all commonly used modes; all you really need to get across clearly is a single tone so that the receiving station can hear when it is "on" or "off".

A good rule of thumb for CW (Continuous Wave, Morse Code) is that when it asks about bandwidth it's probably the smallest value listed.



PREPPERNET

T8B01

WHAT TELEMETRY INFORMATION IS TYPICALLY TRANSMITTED BY SATELLITE BEACONS?

- A. The signal strength of received signals
- B. Time of day accurate to plus or minus 1/10 second
- C. *Health and status of the satellite***
- D. All of these choices are correct



PREPPERNET

Health and status of the satellite is telemetry information typically transmitted by satellite beacons.

Some satellites may transmit other information, but the key word here is "typical".



PREPPERNET

T8B02

WHAT IS THE IMPACT OF USING TOO MUCH EFFECTIVE RADIATED POWER ON A SATELLITE UPLINK?

A. Possibility of commanding the satellite to an improper mode

B. Blocking access by other users

C. Overloading the satellite batteries

D. Possibility of rebooting the satellite control computer



PREPPERNET

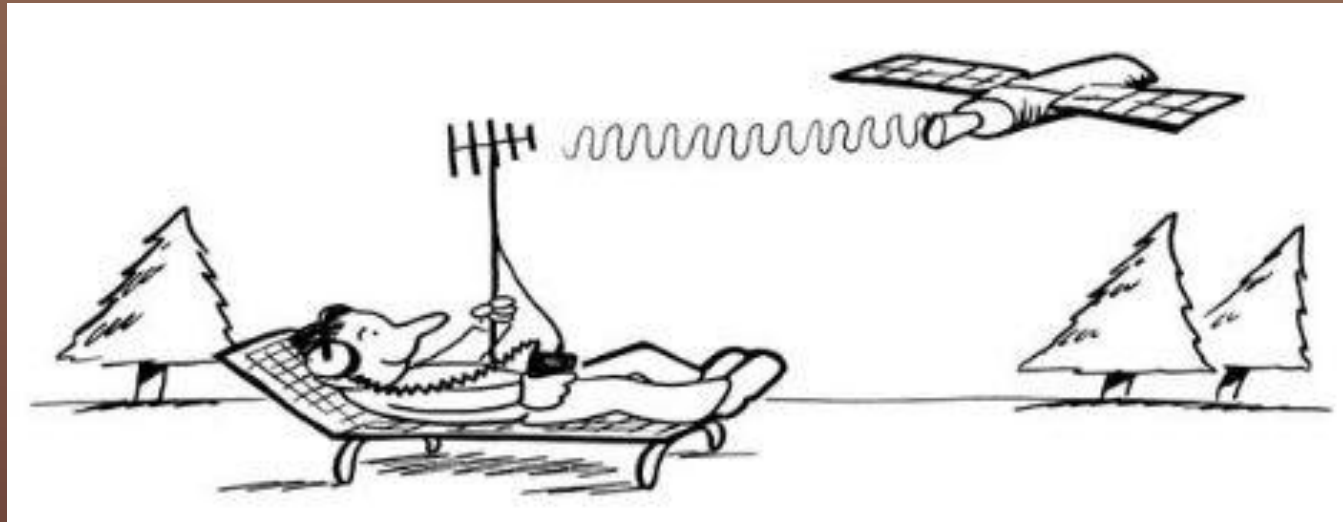
Most analog satellites have what are called linear transponders which retransmit signals in a relatively large "band" often 50-100kHz wide (the passband). What this means, in effect, is that multiple simultaneous signals can be retransmitted (repeated) at the same time.

The trouble is, if one of the signals is significantly more powerful than the other signals it can effectively "blank out" the other signals -- somewhat like how you might be able to see three separate dim flashlights on a distant hill, but if one of them is a powerful flood light you would likely be blinded by that light and unable to see the other two dimmer lights.



PREPPERNET

Thus, you should never use more power than you need when using a repeater because doing so may "blind" the linear transponder to the other signals and block access by other users



PREPPERNET

T8B03

WHICH OF THE FOLLOWING ARE PROVIDED BY SATELLITE TRACKING PROGRAMS?

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



PREPPERNET

Satellite tracking programs tell you where a satellite is at a given time, including its altitude and where it will be at the start and end of a pass, relative to your location.

The tracking programs even tell you how much to change your transmitter's and receiver's frequency to compensate for the Doppler shift you get when the satellite is coming toward you or moving away from you.

So all of these answers are correct.

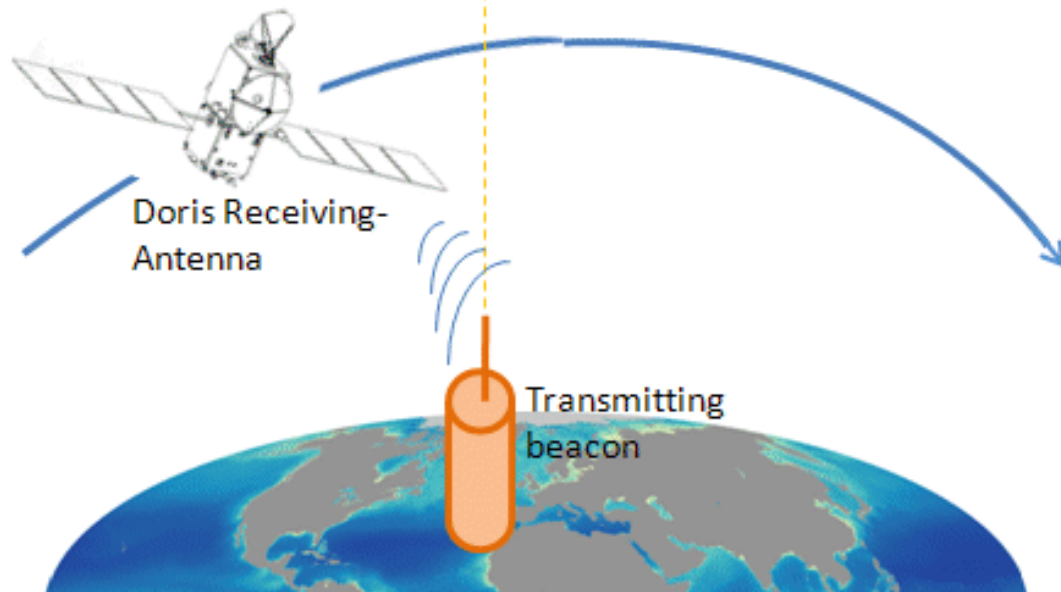


PREPPERNET

The satellite is **upright** the beacon, it's the TCA point (*Time of Closest Approach*).
The frequency of the received signal is **equal** to the frequency of the transmitted signal.

The satellite is **approaching** the beacon :
The frequency of the received signal is **greater** than the frequency of the transmitted signal.

The satellite is **moving away** the beacon :
The frequency of the received signal is **lower** than the frequency of the transmitted signal.



The Doppler Shift is the shift in frequency as a satellite moves toward you vs. when it is moving away from you...



PREPPERNET

T8B04

WHAT MODE OF TRANSMISSION IS COMMONLY USED BY AMATEUR RADIO SATELLITES?

A. SSB

B. FM

C. CW/data

D. All of these choices are correct



PREPPERNET

Some of the things that you can get from the CW beacon is the mode the satellite will be in at which phase counts, keplerian data and other general announcements. The RTTY bulletins contain the same data as the CW plus satellite status telemetry. Packet (AX.25) is also used for telemetry.



PREPPER.NET

T8B05
WHAT IS A SATELLITE BEACON?

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

A beacon provides us with a gauge to determine how much power we should use. If you transmit your signal and compare it to the beacon strength, you can then adjust your power up or down to match the beacon. That would be the optimum transmitting power for your station.

The next thing that the beacons provide us with is a schedule of the satellite's activity. It might tell you that it is on during a particular time period and off during others.

The beacon can also help us tune our radio to compensate for doppler shift. Since we know the beacon is supposed to be on a certain frequency, we can calculate where our signal will be based on the current reception of the beacon



PREPPERNET

T8B06

WHICH OF THE FOLLOWING ARE INPUTS TO A SATELLITE TRACKING PROGRAM?

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



PREPPERNET

Keplerian elements are the parameters that define the orbit of a satellite. From these elements, the program can compute the time and bearing of a satellite pass, relative to your position on the earth.

The weight of the satellite enters into the equation, but it's the Keplerian data that the tracking program uses.

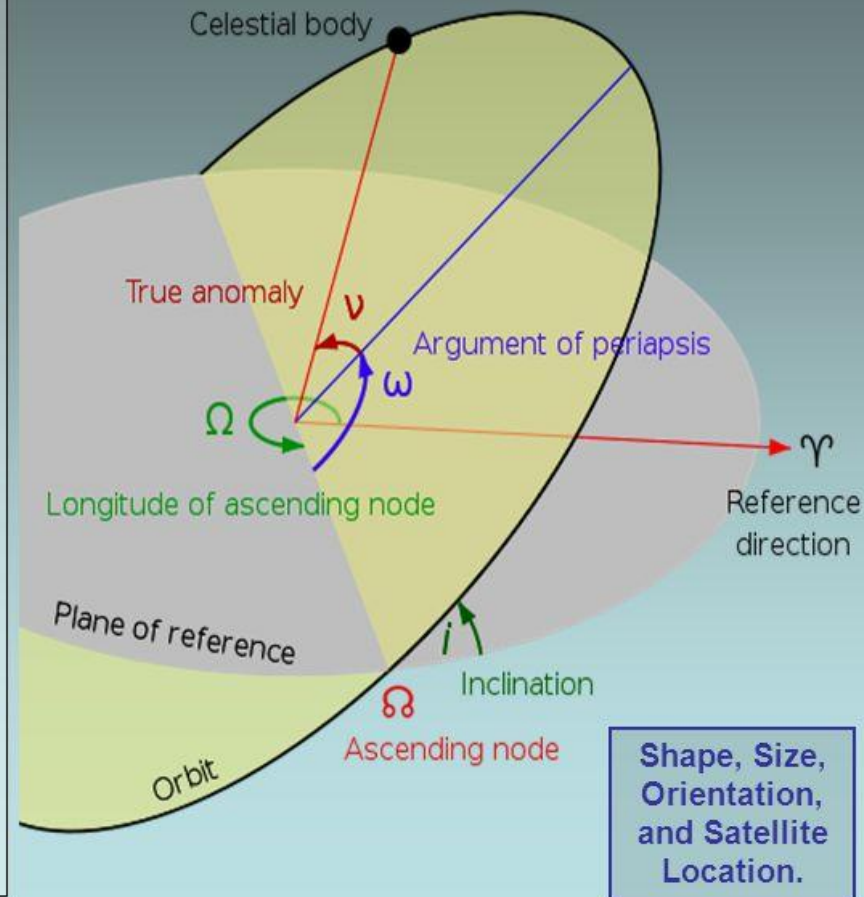
The last observed time of zero Doppler shift would be the time that the satellite was moving neither toward you nor away from you (like when it was overhead, for example). While this might be interesting data, it isn't enough to predict where it will be coming from or going to on its next pass, or at what altitudes.



PREPPERNET

The Six Keplerian Elements

- a** = **Semi-major axis** (usually in kilometers or nautical miles)
- e** = **Eccentricity** (of the elliptical orbit)
- v** = **True anomaly** The angle between perigee and satellite in the orbital plane at a specific time
- i** = **Inclination** The angle between the orbital and equatorial planes
- Ω** = **Right Ascension (longitude) of the ascending node** The angle from the Vernal Equinox vector to the ascending node on the equatorial plane
- ω** = **Argument of perigee** The angle measured between the ascending node and perigee



T8B07

WITH REGARD TO SATELLITE COMMUNICATIONS, WHAT IS DOPPLER SHIFT?

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



PREPPERNET

The most common references to the doppler effect (or doppler shift) refer to sound; one of the most common examples used in high school science classes involves a fire engine (or other vehicle with a siren) whose siren seems to drop in pitch drastically when the vehicle passes you.

The producer of the sound does not actually change frequency, but the relative speed of the vehicle producing the sound to the object (you) receiving the sound makes it seem to you that it does.

The same principle applies to a radio frequency signal; the relative motion between a satellite and the earth station can cause a shift in the frequency at which you can receive the signal depending on what its position and momentum are relative to the receiving station.



PREPPER.NET

T8B08

WHAT IS MEANT BY THE STATEMENT THAT A SATELLITE IS OPERATING IN MODE U/V?

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



PREPPERNET

"mode U/V" is short for "mode UHF/VHF" -- meaning that the uplink is UHF, meaning 70 cm, and the downlink is VHF, meaning 2 meters. There are of course other UHF bands besides 70cm and other VHF bands besides 2m, but they are not commonly used by amateur radio operators and so the term is understood to mean the standard UHF/VHF bands.



PREPPERNET

T8B09

WHAT CAUSES SPIN FADING OF SATELLITE SIGNALS?

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



PREPPERNET

Satellites are not stationary in space; they are constantly moving, and generally they are rotating as well. As they turn, the antennas on the satellite change position relative to your location. The signal may fade if the antennas are directional, or even if omnidirectional, if they are obscured by the rest of the satellite.

This is referred to as "spin fading" because the fading is caused by the satellite spinning around.



PREPPER.NET

T8B10

WHAT DO THE INITIALS LEO TELL YOU ABOUT AN AMATEUR SATELLITE?

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



PREPPERNET

Just remember that we are talking about a satellite; this question could be a bit tricky if you haven't seen it before, but LEO refers to the position, not to any operation.

It is, as the answer indicates, Low Earth Orbit.



PREPPERNET

T8B11

WHO MAY RECEIVE TELEMETRY FROM A SPACE STATION?

- A. *Anyone who can receive the telemetry signal***
- B. A licensed radio amateur with a transmitter equipped for interrogating the satellite
- C. A licensed radio amateur who has been certified by the protocol developer
- D. A licensed radio amateur who has registered for an access code from AMSAT



PREPPERNET

Yep, anyone who can receive the telemetry signal is allowed to receive telemetry from a space station but not allowed to transmit to one without a license.

With the availability of inexpensive RTL-SDR USB dongles, many people are trying their hand at receiving telemetry from space stations even if they don't have a license. For some of us, this sort of thing is what got us interested in amateur radio to begin with.



T8B12

WHICH OF THE FOLLOWING IS A GOOD WAY TO JUDGE WHETHER YOUR UPLINK POWER IS
NEITHER TOO LOW NOR TOO HIGH?

- A. Check your signal strength report in the telemetry data
- B. Listen for distortion on your downlink signal
- C. *Your signal strength on the downlink should be about the same as the beacon***
- D. All of these choices are correct



PREPPERNET

The term uplink suggests that the question was written with amateur radio satellites in mind; most amateur radio satellites have what is called a linear transponder, which listens to a relatively large passband (perhaps 50-100kHz wide, where a normal SSB signal uses 3kHz or less) and retransmits it on another frequency (the downlink). In this way, multiple signals can be carried simultaneously by the satellite.

If your uplink power is too low, your signal coming back may not be strong enough to be heard; on the other hand, if your power is too high you could "blind" the satellite to other signals, blocking them from using it.

The satellite will constantly transmit a Morse Code (CW) beacon on the downlink; you can use that and compare it to your signal strength when it comes down. If your signal is stronger than the beacon then you are likely overloading the receiver and potentially blocking other users; if your signal is weaker than the beacon then the receiver isn't hearing you as strongly as it could. Adjust your power until the your signal strength on the downlink is the same as the beacon and you're in the "just right" zone =]



PREPPERNET

T8C01

WHICH OF THE FOLLOWING METHODS IS USED TO LOCATE SOURCES OF NOISE
INTERFERENCE OR JAMMING?

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



PREPPERNET

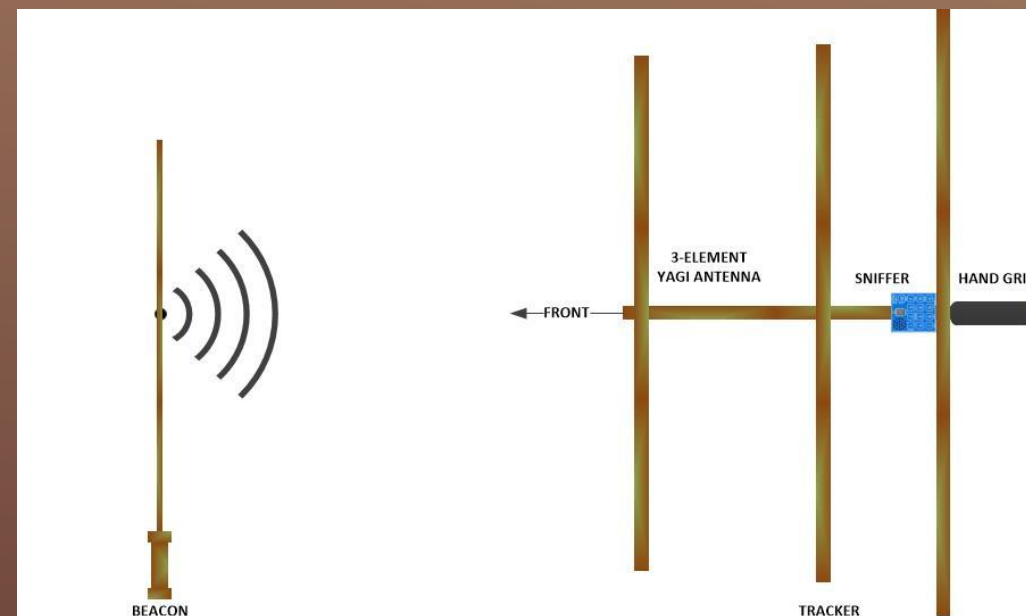
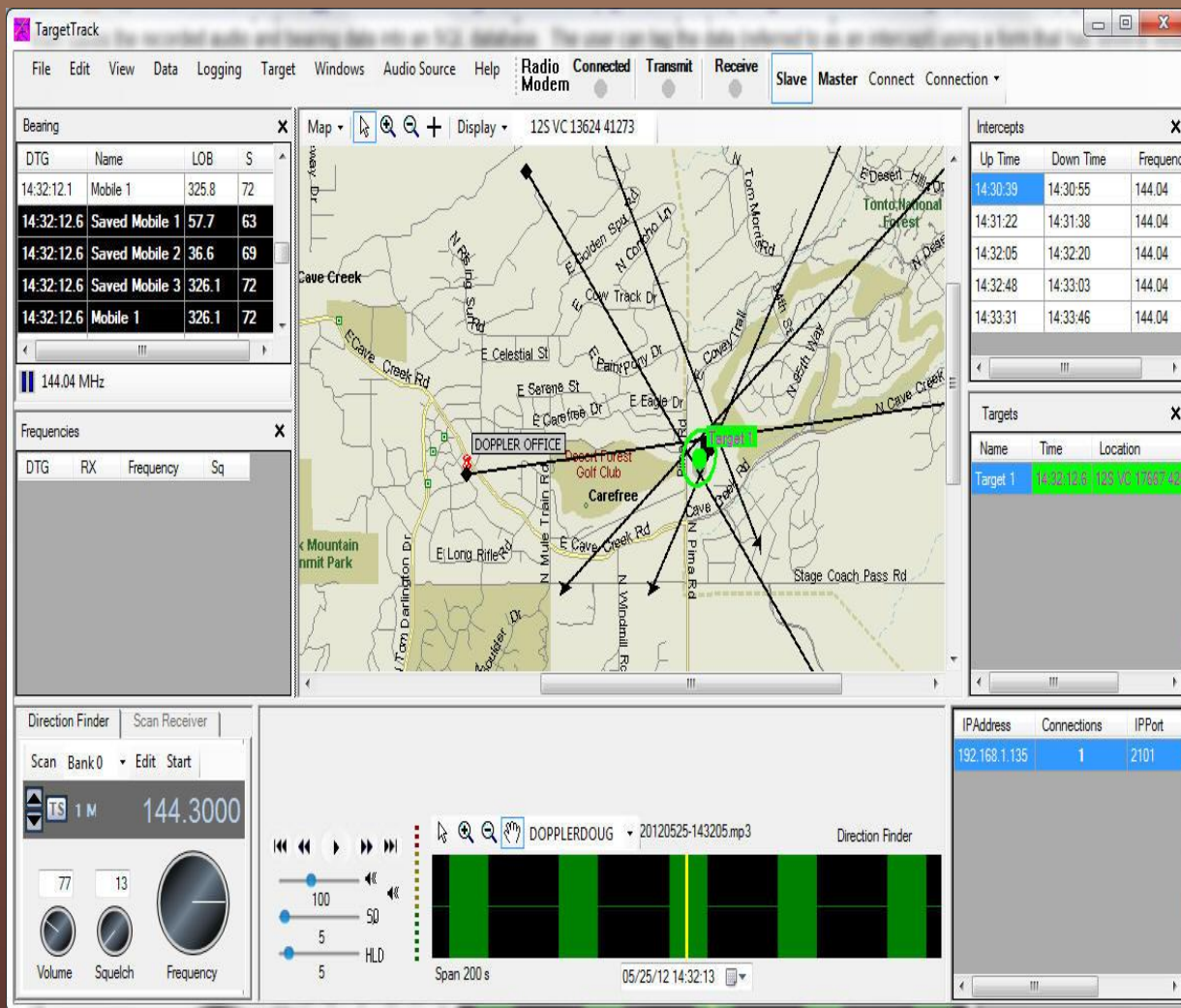
When there is radio interference, whether intentional or unintentional, you can use radio direction finding to track down the interfering noise source.

This can be a directional antenna or some other means of determining where the offender is located.

After you have a direction from two locations you can pinpoint where to go to find your culprit.



PREPPERNET



T8C02

WHICH OF THESE ITEMS WOULD BE USEFUL FOR A HIDDEN TRANSMITTER HUNT?

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



PREPPERNET

A hidden transmitter hunt, also known as a "Fox Hunt", involves having a hidden transmitter (the "fox") that transmits periodically while other operators attempt to find it. The simplest way to do this is to watch the signal strength meter on your radio while rotating a directional antenna to find out from which direction the signal is strongest.

A calibrated SWR meter might be helpful for tuning your antenna, but for a fox hunt you may actually want an out of tune antenna -- since it wouldn't receive as well, it would be easier to see where the signal is coming from.



PREPPERNET



PREPPERNET

T8C03

WHAT OPERATING ACTIVITY INVOLVES CONTACTING AS MANY STATIONS AS POSSIBLE
DURING A SPECIFIED PERIOD?

A. Contesting

B. Net operations

C. Public service events

D. Simulated emergency exercises



PREPPERNET

Contests are a very popular and fun use of HF.

During a contest, all operators participating keep a log of what stations they have contacted and rather than having a conversation with them will exchange the minimum information required to confirm the contact and for the contest rules with as many stations as possible for the duration of the contest.

The goal is to make as many verifiable contacts as possible within a certain time frame and/or bands.



PREPPERNET

T8C04

WHICH OF THE FOLLOWING IS GOOD PROCEDURE WHEN CONTACTING ANOTHER STATION IN A RADIO CONTEST?

- A. Sign only the last two letters of your call if there are many other stations calling
- B. Contact the station twice to be sure that you are in his log
- C. *Send only the minimum information needed for proper identification and the contest exchange***
- D. All of these choices are correct



PREPPERNET

Since the purpose of a radio contest is to see how many stations you can contact during the duration of a contest, the most important things are to make sure that both stations have accurately recorded the identification of the stations (so you should certainly not use only two letters of your call) and that you don't take more of their time than necessary, thus slowing them down (and so you shouldn't work the station more than once).

Always be brief, but also be concise and complete.

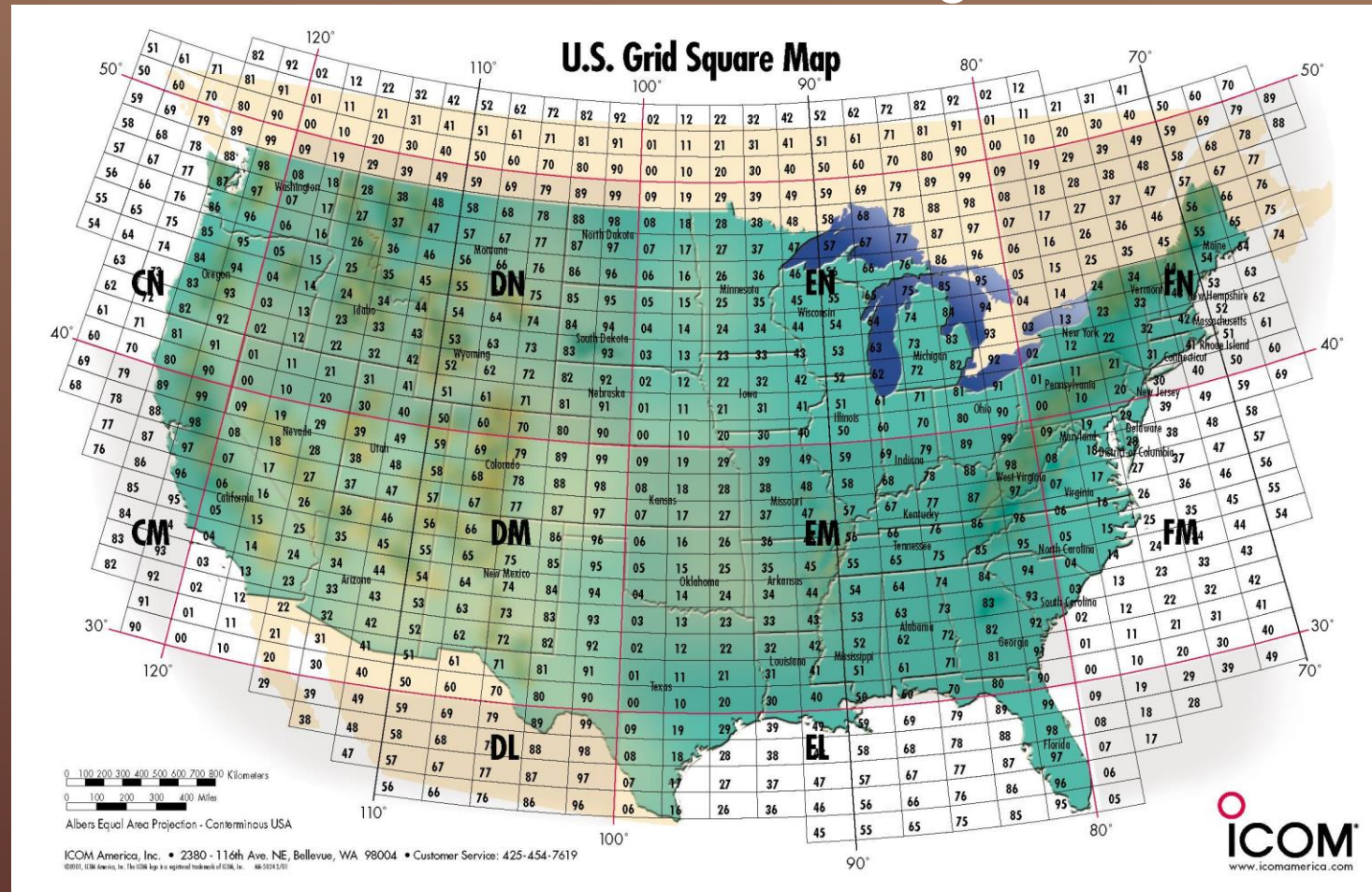


PREPPERNET

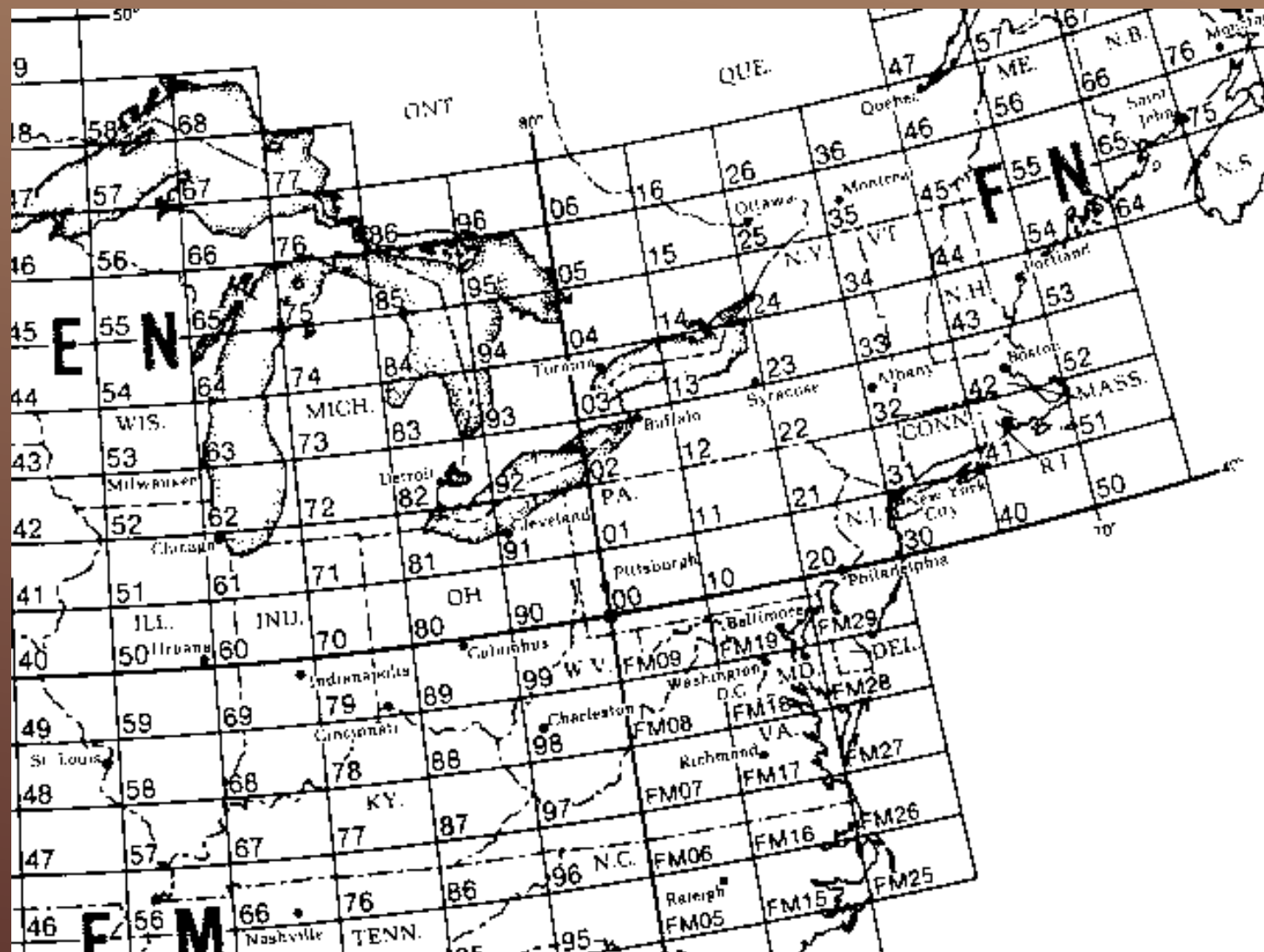
T8C05
WHAT IS A GRID LOCATOR?

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

A Grid Locator, also known as a Grid Square, is basically a shorthand of location based on latitude and longitude.



PREPPER.NET



PREPPER**NET**

T8C06

HOW IS ACCESS TO SOME IRLP NODES ACCOMPLISHED?

A. By obtaining a password that is sent via voice to the node

B. By using DTMF signals

C. By entering the proper internet password

D. By using CTCSS tone codes



PREPPERNET

IRLP: Internet Radio Linking Project

DTMF: Dual Tone - Multi Frequency

DTMF is the generic term for Touch-Tone, which is a registered trademark of ATT. Your touch-tone phone is technically a DTMF generator that produces DTMF tones as you press the buttons.

Communicating with an IRLP node requires the keying of DTMF signals, sent manually by key pad or automatically.

A repeater could require CTCSS (Continuous Tone-Coded Squelch System) or DCS (Digital Code Squelch) to communicate with it, regardless of IRLP, but IRLP itself does not depend on CTCSS or DCS tones.

Also, some repeaters require a special password that you send along with the DTMF signals, but the IRLP access is still accomplished by using DTMF signals.



PREPPER.NET

T8C07

WHAT IS MEANT BY VOICE OVER INTERNET PROTOCOL (VOIP) AS USED IN AMATEUR RADIO?

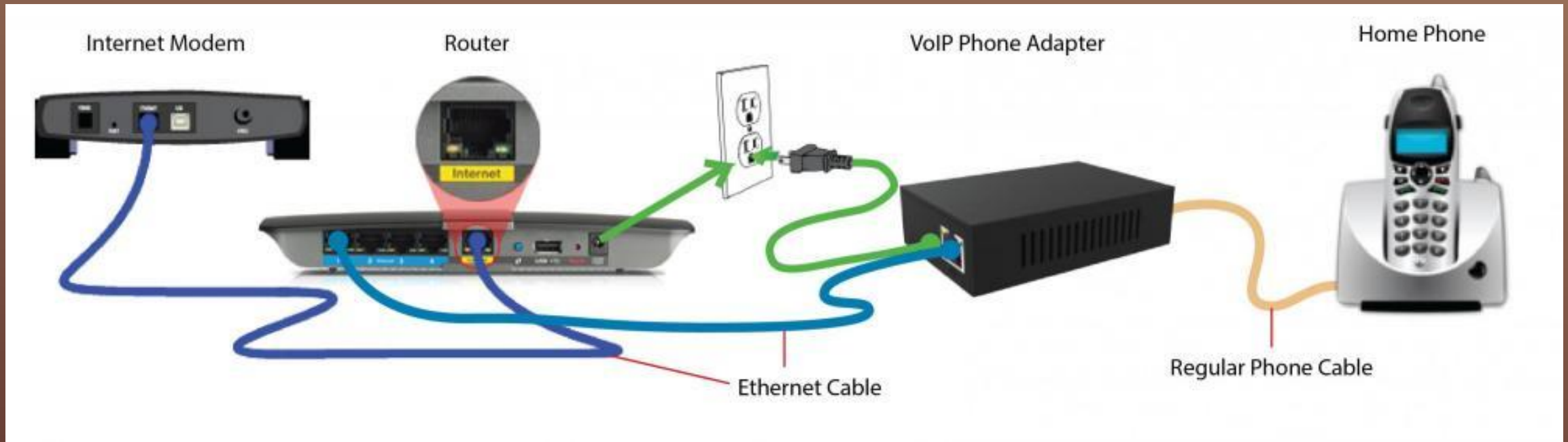
- A. A set of rules specifying how to identify your station when linked over the internet to another station
- B. A set of guidelines for contacting DX stations during contests using internet access
- C. A technique for measuring the modulation quality of a transmitter using remote sites monitored via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

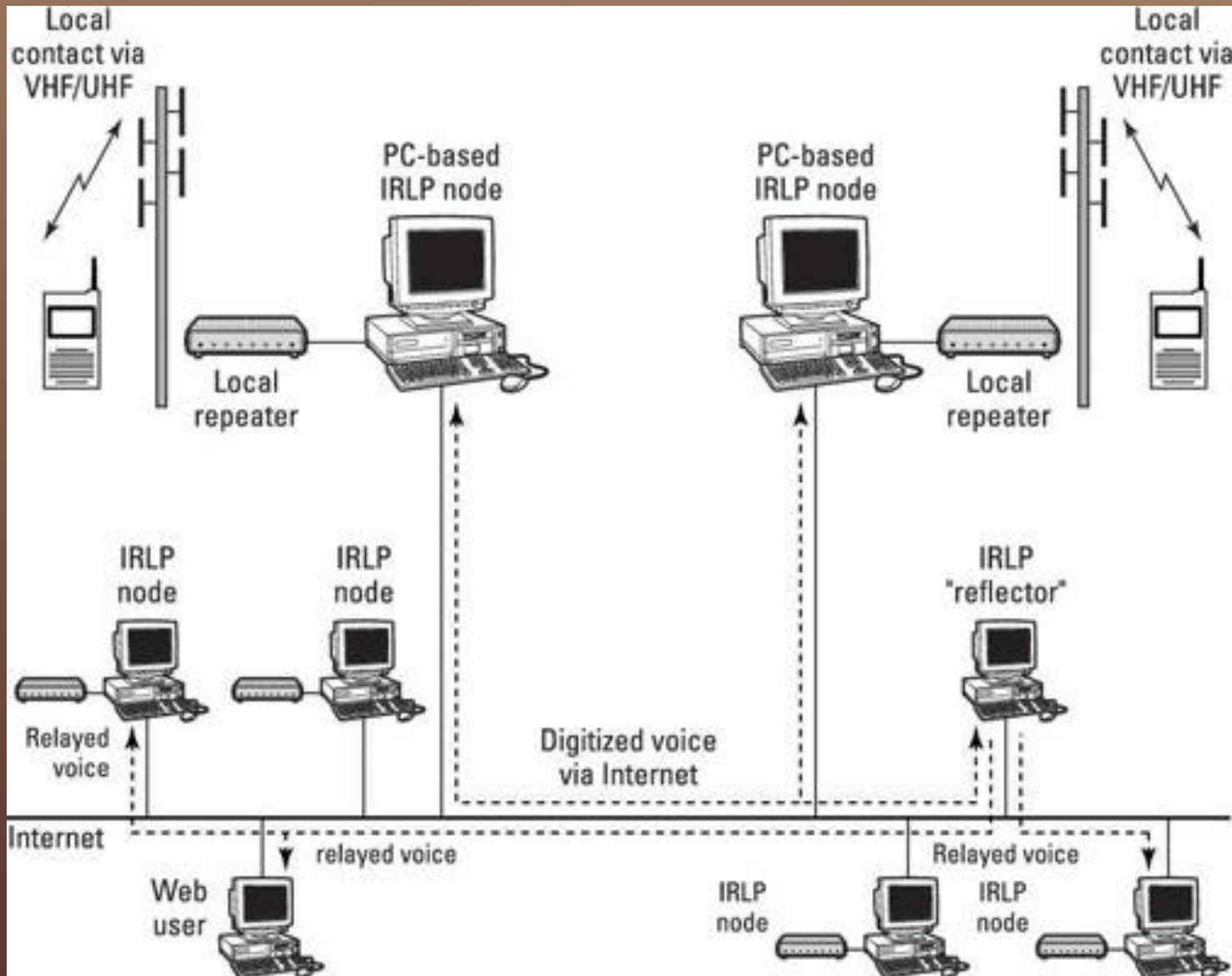


PREPPERNET

Think of Voice Over Internet Protocol (VoIP) as Vonage or Skype.

You're using the Internet to send the audio signal (voice) from a receiver (or a computer) to another radio or another computer for transmission through a radio.





Some examples of VoIP in terms of how Amateur Radio uses it?

Echolink

DMR

D-Star

T8C08

WHAT IS THE INTERNET RADIO LINKING PROJECT (IRLP)?

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



PREPPERNET

IRLP is one of several projects used for linking repeaters and other systems across the internet.

Amateurs use DTMF tones (phone keypad) on a radio to send control codes to the repeater to link or unlink with another repeater or node.

Similar technologies include **EchoLink**, **DMR**, and Icom's **D-Star** network.



T8C09

HOW MIGHT YOU OBTAIN A LIST OF ACTIVE NODES THAT USE VOIP?

- A. By subscribing to an on line service
- B. From on line repeater lists maintained by the local repeater frequency coordinator
- C. From a repeater directory
- D. All of these choices are correct***

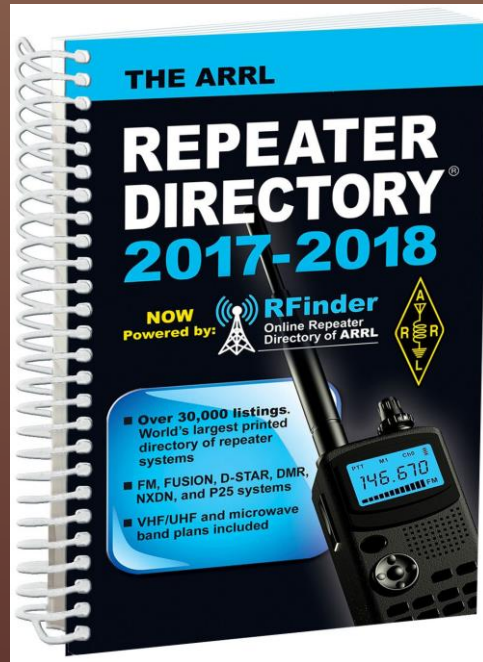


PREPPERNET

The best place to find information such as a list of active nodes that use VoIP is from an actively maintained repeater directory.

A Repeater Directory is a list that someone (company, club, community, etc) maintains of repeaters that has information such as what features are on the repeater, who owns it, callsign, etc.

There are many repeater directories, both on paper and on the internet



T8C10

WHAT MUST BE DONE BEFORE YOU MAY USE THE ECHOLINK SYSTEM TO COMMUNICATE USING A REPEATER?

- A. You must complete the required EchoLink training
- B. You must have purchased a license to use the EchoLink software
- C. You must be sponsored by a current EchoLink user
- D. You must register your call sign and provide proof of license***



PREPPERNET

Echolink is a system of Internet-connected repeaters that can be connected to with client software and used to receive and transmit on amateur radio bands (VHF and UHF). It is essentially a method of remotely controlling a station, so when using it you are the control operator of whichever station you are using.

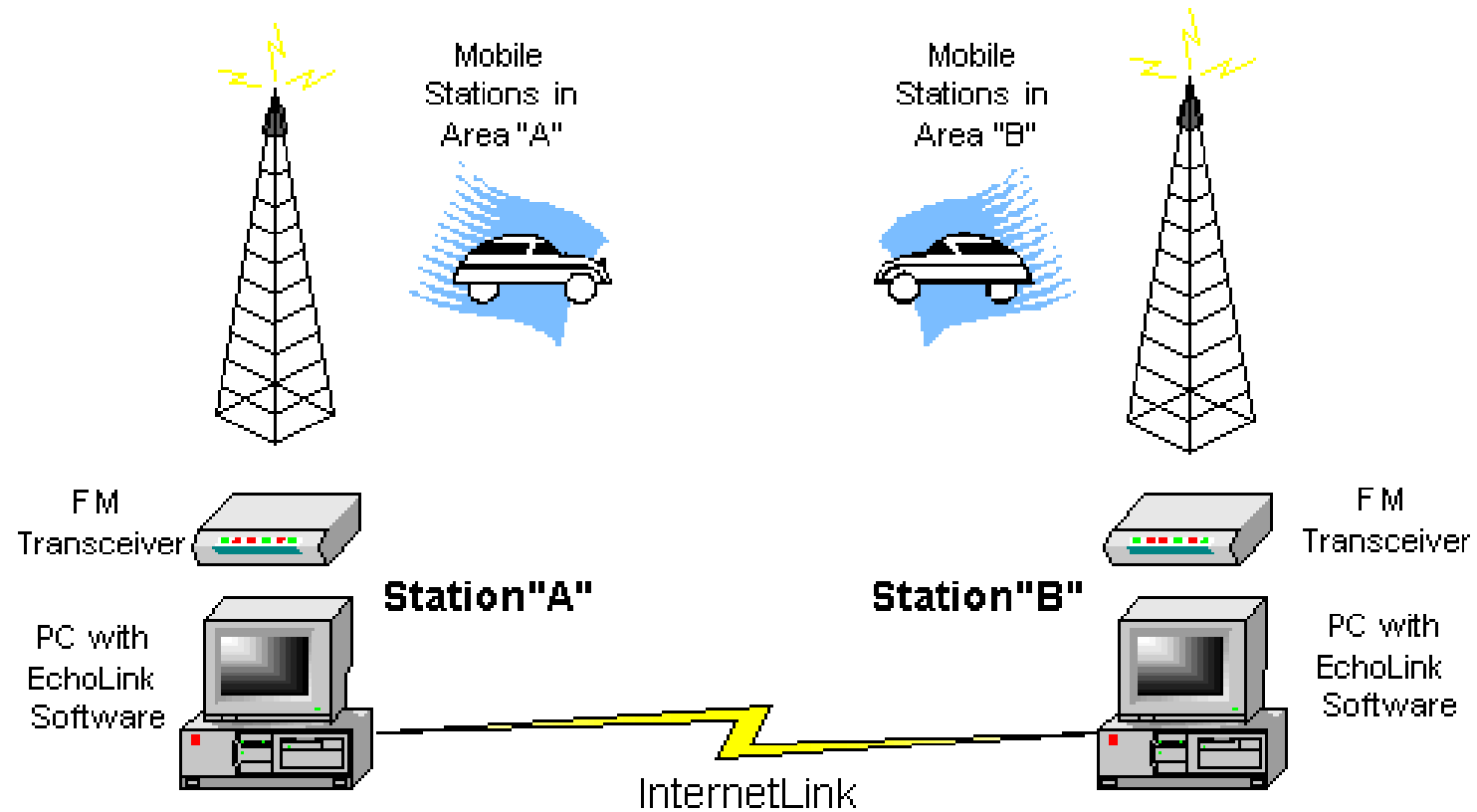
Since you can't legally be a control operator of an amateur station without a license, whether control is remote or local, you must register your call sign and provide proof of license to use the network.

Echolink clients are available for desktop/laptop operating systems, and less sophisticated clients are available for use on mobile devices.



PREPPERNET

Linking Example



PREPPERNET

T8C11

WHAT NAME IS GIVEN TO AN AMATEUR RADIO STATION THAT IS USED TO CONNECT OTHER AMATEUR STATIONS TO THE INTERNET?

A. A gateway

B. A repeater

C. A digipeater

D. A beacon



PREPPERNET

In computer terms a gateway is the name of a device that connects two different networks together; a router is a type of gateway.

Thus, a station that connects a packet radio network to the Internet is also a gateway.

A digipeater is a station that receives packets and then retransmits them; it's the only distractor that would make any sense, but it has nothing to do with the Internet, though it is possible for a digipeter to also be a gateway.

Repeaters simultaneously retransmit signals on another frequency and are used for voice operation; beacons transmit some form of information periodically. Neither has anything to do with packet radio.



PREPPER.NET

T8D01

WHICH OF THE FOLLOWING IS A DIGITAL COMMUNICATIONS MODE?

A. Packet radio

B. IEEE 802.11

C. JT65

D. All of these choices are correct



PREPPERNET

Digital communications methods are methods that send digital information (encoded in bits, 0 or 1) instead of sending an analog signal, such as voice or video.

The methods listed here are all digital modes:

Packet Radio is probably the best known digital mode which can be thought of as using a modem over a radio to allow computers to exchange data

PSK31 is short for Phase Shift Keying, 31 Baud and is more of system for chat over radio; it allows real-time keyboard to keyboard informal chat between operators.

MFSK is short for Multiple frequency-shift keying and is a variation of FSK, a method used by some packet radio systems.

IEEE 802.11 is a set of specifications for implementing wireless local area network (WLAN) computer communication in the 900 MHz and 2.4, 3.6, 5, and 60 GHz frequency bands.



PREPPERNET

T8D02

WHAT DOES THE TERM “APRS” MEAN?

A. Automatic Packet Reporting System

B. Associated Public Radio Station

C. Auto Planning Radio Set-up

D. Advanced Polar Radio System



PREPPERNET

APRS, Automatic Packet Reporting System, is a standard utilizing packet radio and a GPS to send beacons with the location of the unit.

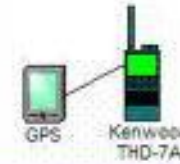
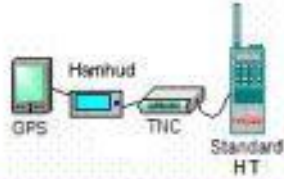
There are many things you can do with APRS, but many use it on bicycles to track their progress, on their vehicle to track where it is, etc.

There have even been reports of APRS-equipped vehicles being stolen and then quickly tracked down thanks to the APRS unit.



PREPPERNET

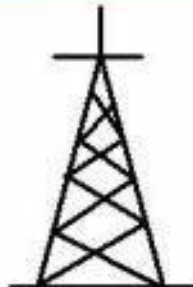
APRS



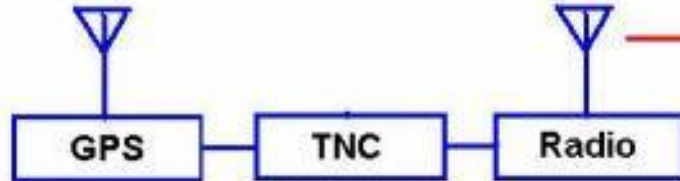
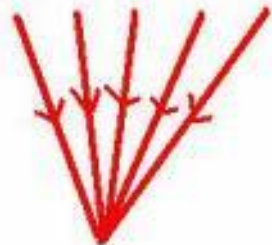
GPS Satellite



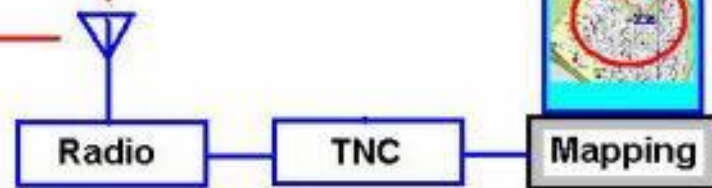
PCSat Satellite



Digipeater



Radio Signal goes
via satellite or
Digipeater radio
tower



*Simply put...
APRS stations
periodically send
packets with
information about
their position or
other status. Those
packets are
(hopefully) heard by
digipeaters, which
repeat the packets
to get them heard
over a wider
geographic range.*



PREPPERNET

APRS proves especially useful:

- *in Search and Rescue operations when the Emergency Coordinator must be able to track each rescue's location in real-time.*
- *Packet Radio when getting traffic to it's final destination via the path of least resistance is necessary.*
- *Allowing amateur radio operators to know where other operators are located in relation to themselves.*
- *Race Coordinators to know where each competitor is located for accountability.*
- *Shipping companies can track the location of their fleet & freight.*



PREPPER.NET

T8D03

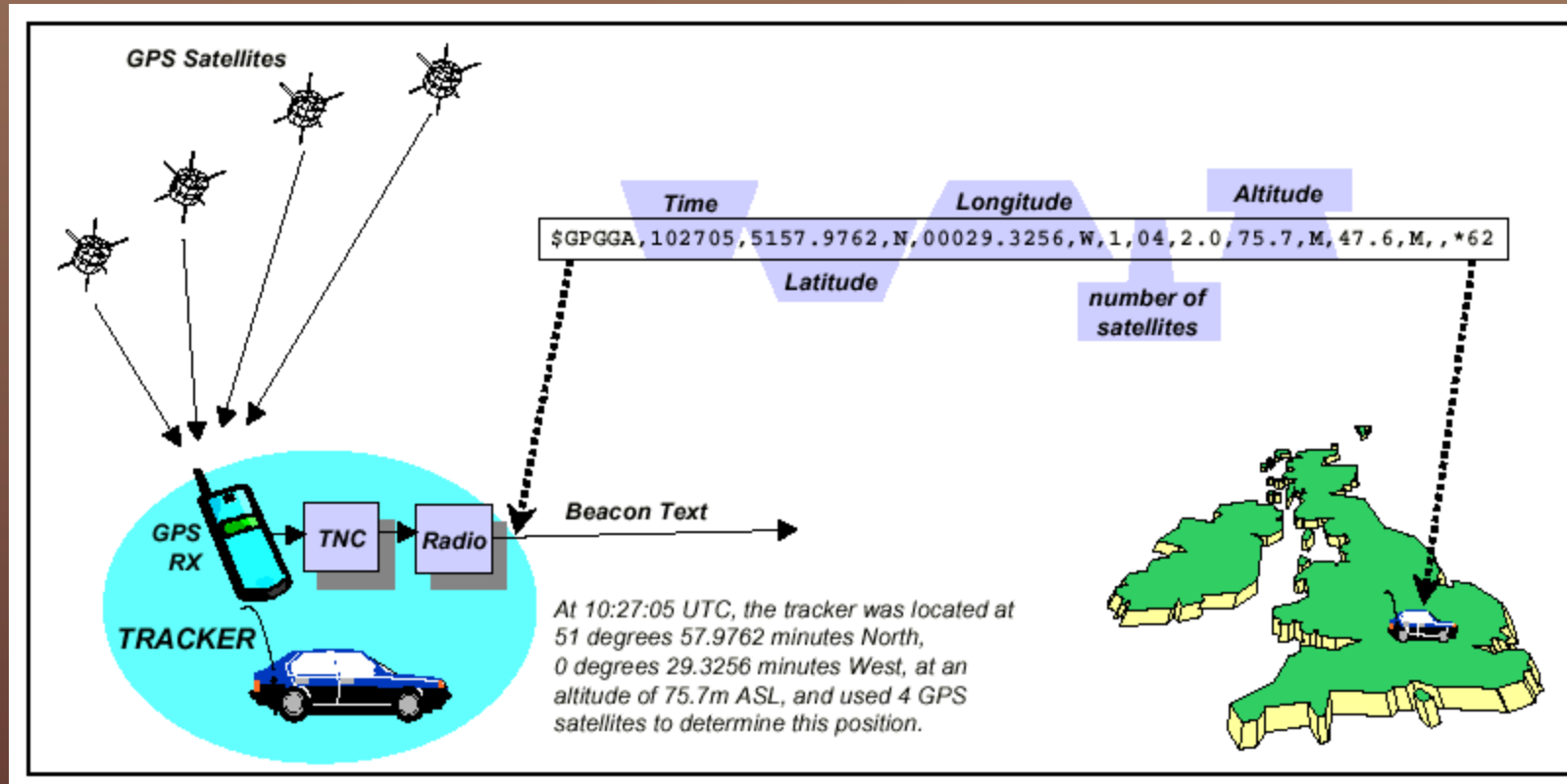
WHICH OF THE FOLLOWING DEVICES IS USED TO PROVIDE DATA TO THE TRANSMITTER
WHEN SENDING AUTOMATIC POSITION REPORTS FROM A MOBILE AMATEUR RADIO
STATION?

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



PREPPERNET

Automatic location reports need to know the location to automatically report; thus, they use a GPS just like anything else would.



PREPPERNET

T8D04

WHAT TYPE OF TRANSMISSION IS INDICATED BY THE TERM "NTSC?"

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



PREPPERNET

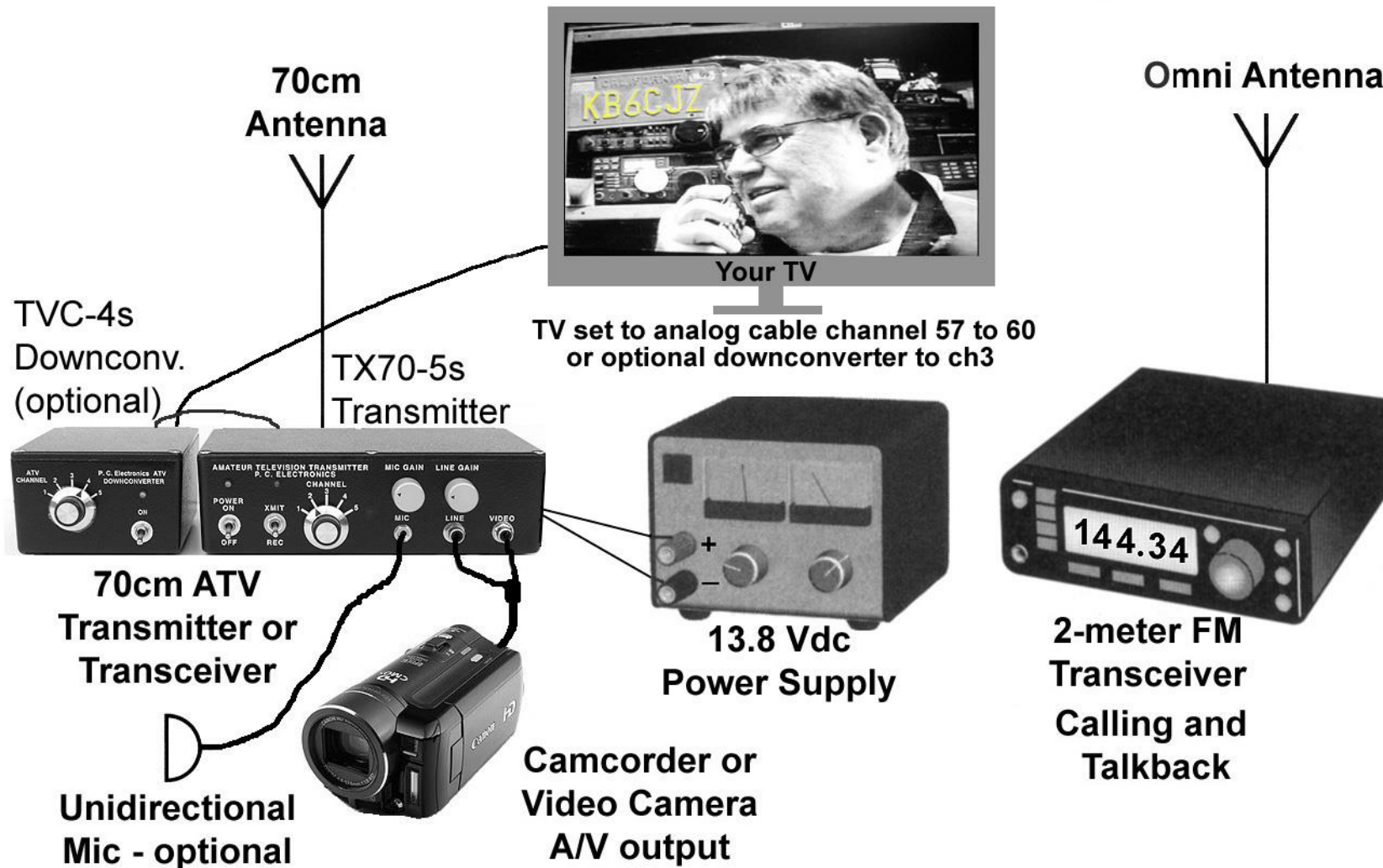
If you ask a broadcast engineer, NTSC stands for Never The Same Color, because his job is to keep all the cameras looking the same.

Now that TV is in the Digital Age the only people you see using the NTSC broadcast standard are Amateur Radio Operators.

Actually, NTSC stands for National Television Systems Committee. They created the rules that governed what the broadcast signal would be electronically so every TV would be able to display the correct picture. And what all this has to do with analog fast scan color TV signals, no one really knows.



PREPPERNET



With a simple \$99 down-converter box, fast-scan color TV can be broadcasted over amateur ham bands...



PREPPERNET

T8D05

WHICH OF THE FOLLOWING IS AN APPLICATION OF APRS (AUTOMATIC PACKET REPORTING SYSTEM)?

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



PREPPERNET

It helps to know what APRS is and does. It transmits a station's GPS coordinates, so other stations can locate it.

The components are a GPS receiver, a ham radio transmitter, and some logic to connect the two...so the transmitter sends out the GPS coordinates.

It just provides real time communications that gives your location. In conjunction with a map, it shows your location to the stations that receive your GPS coordinates via the APRS system.

It has nothing to do with counting packets, It doesn't require voice over Internet, and It doesn't count stations connected to a repeater.



PREPPERNET

T8D06

WHAT DOES THE ABBREVIATION "PSK" MEAN?

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



PREPPERNET

Phase Shift Keying is a method for digitally transmitting data (with a computer of some sort) by varying (keying) the phase of the signal.

Phase refers to where you are in the cycle (the peaks and valleys of the sine wave)



PREPPERNET

T8D07

WHICH OF THE FOLLOWING BEST DESCRIBES DMR (DIGITAL MOBILE RADIO)?

- A. A technique for time-multiplexing two digital voice signals on a single 12.5 kHz repeater channel***
- B. An automatic position tracking mode for FM mobiles communicating through repeaters
- C. An automatic computer logging technique for hands-off logging when communicating while operating a vehicle
- D. A digital technique for transmitting on two repeater inputs simultaneously for automatic error correction



PREPPERNET

DMR is one of several digital modes. It's the only one that uses 'time-multiplexing' to allow two digital voice signals to be repeated through the same repeater, using the same 12.5 kHz repeater channel.

It's not a position tracking system.

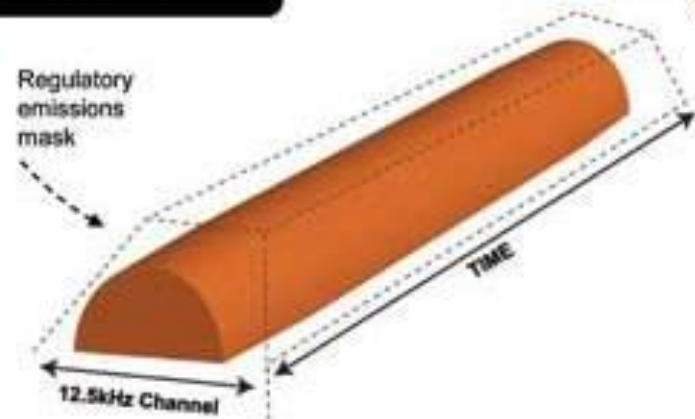
It's not a logging technique.

The third distractor is tempting, because it talks about two simultaneous repeater inputs, but the part about time-multiplexing is unique to DMR, so the best answer.



PREPPERNET

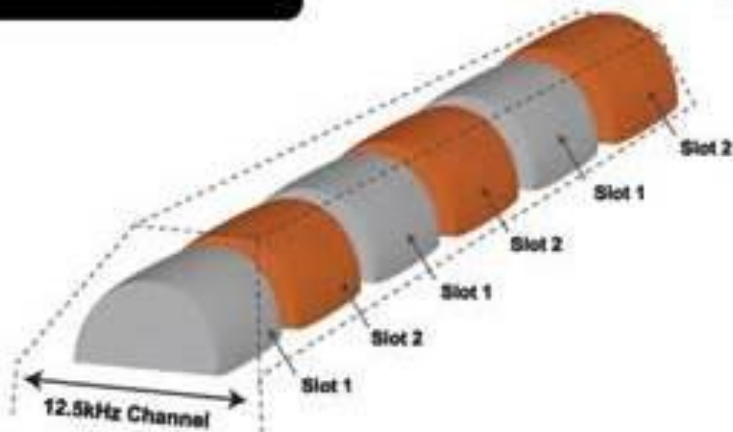
ANALOG



12.5 kHz

- 1 voice for each 12.5 kHz channel
- 1 repeater for each channel

TDMA



12.5 kHz TDMA

- 1 channel divided into 2 time slots
- 50% reduction in repeater costs
- 40% increased battery life
- Reduced need for combining equipment



PREPPERNET

T8D08

WHICH OF THE FOLLOWING MAY BE INCLUDED IN PACKET TRANSMISSIONS?

- A. A check sum that permits error detection
- B. A header that 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***



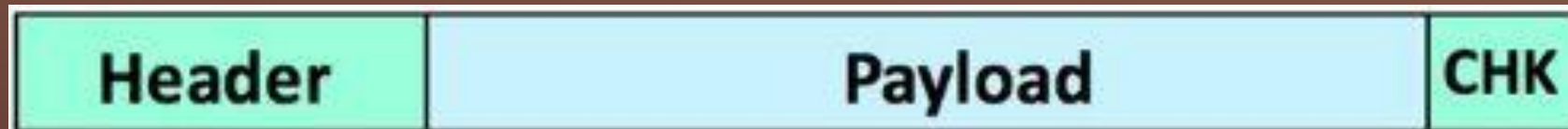
PREPPERNET

A checksum is an error detection method used by many data transmission types including packet radio.

Basically all bytes in the message are added (summed) up and sent as a "checksum". The receiving station repeats this process and "checks" the result against the checksum it received from the sending station.

If the checksum fails (the sums don't match) then an automatic repeat request is sent.

Since packet radio is a form of amateur radio communications the destination station is generally identified at least by call sign, so that information is often included in the header as well.



PREPPERNET

T8D09

WHAT CODE IS USED WHEN SENDING CW IN THE AMATEUR BANDS?

- A. Baudot
- B. Hamming
- C. *International Morse***
- D. All of these choices are correct



PREPPERNET

CW stands for "Continuous Wave", which is a sine wave: an electromagnetic wave of constant amplitude and frequency.

This wave can be interrupted, creating an "off" state. The on and off states can be used to transmit Morse code.

The original version of Morse code developed by Samuel Morse is often referred to as Railroad Morse code or American Morse code—American because the rest of the world adopted International Morse. Eventually International Morse also replaced Railroad Morse in America, and this is what we use today.

The term CW comes up a lot; whether you remember what CW stands for or not, every amateur radio operator should know that CW means Morse code.



PREPPERNET

A ● ■■■
 B ■■■ ● ● ●
 C ■■■ ● ■■■ ●
 D ■■■ ● ●
 E ●
 F ● ● ■■■ ●
 G ■■■ ■■■ ●
 H ● ● ● ●
 I ● ●
 J ● ■■■ ■■■ ■■■
 K ■■■ ● ■■■
 L ● ■■■ ● ●
 M ■■■ ■■■
 N ■■■ ●
 O ■■■ ■■■ ■■■
 P ● ■■■ ■■■ ●
 Q ■■■ ■■■ ● ■■■
 R ● ■■■ ●
 S ● ● ●
 T ■■■

U ● ● ■■■
 V ● ● ● ■■■
 W ● ■■■ ■■■
 X ■■■ ● ● ■■■
 Y ■■■ ● ■■■ ■■■
 Z ■■■ ■■■ ● ●

1 ● ■■■ ■■■ ■■■ ■■■
 2 ● ● ■■■ ■■■ ■■■
 3 ● ● ● ■■■ ■■■
 4 ● ● ● ● ■■■
 5 ● ● ● ● ●
 6 ■■■ ● ● ● ●
 7 ■■■ ■■■ ● ● ●
 8 ■■■ ■■■ ■■■ ● ●
 9 ■■■ ■■■ ■■■ ■■■ ●
 0 ■■■ ■■■ ■■■ ■■■ ■■■



PREPPERNET

T8D10

WHICH OF THE FOLLOWING OPERATING ACTIVITIES IS SUPPORTED BY DIGITAL MODE SOFTWARE IN THE WSJT SUITE?

- A. Moonbounce or Earth-Moon-Earth
- B. Weak-signal propagation beacons
- C. Meteor scatter
- D. All of these choices are correct***



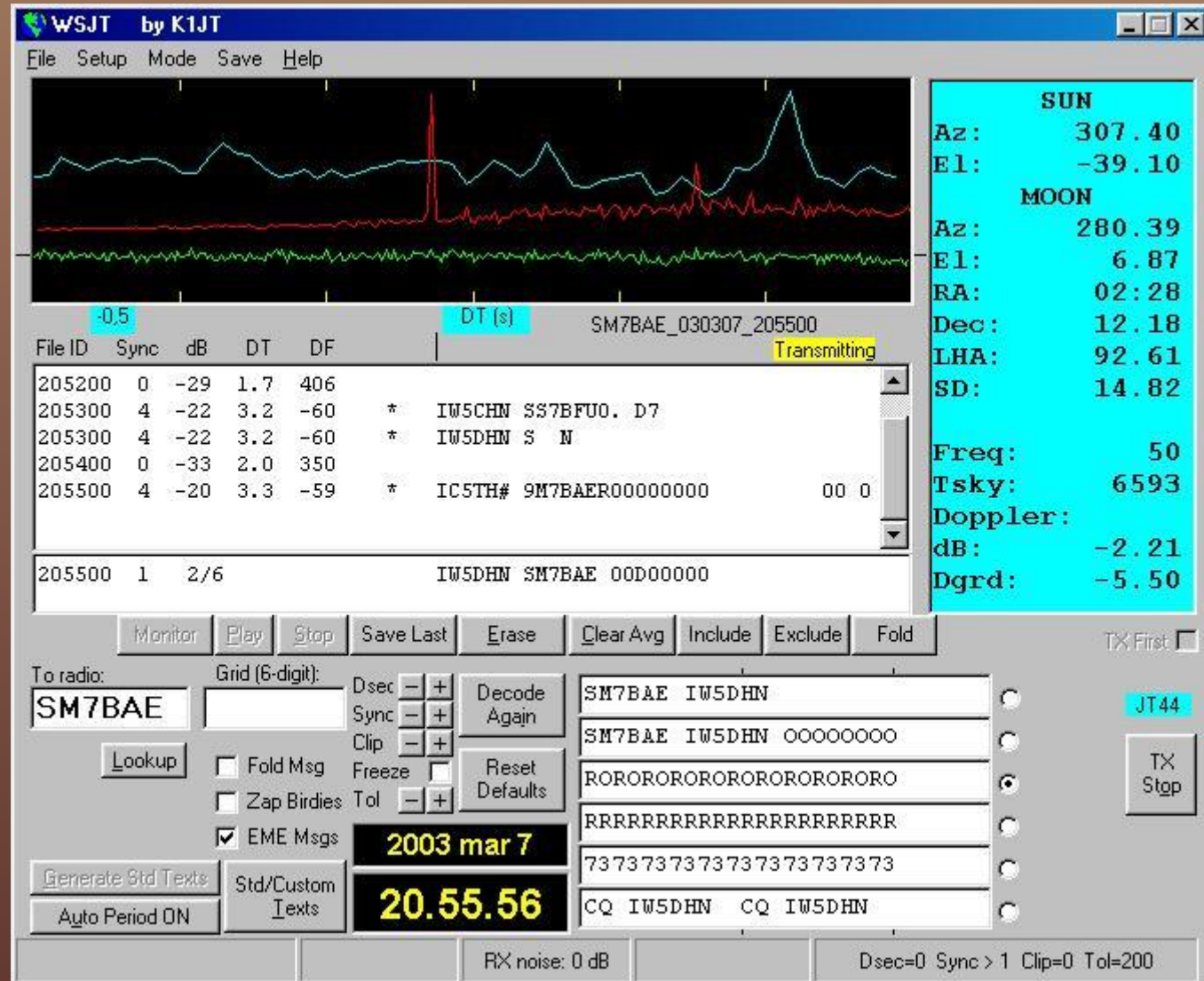
PREPPERNET

WSJT is software that facilitates short, quick digital transmissions and is very useful for weak signals.

As such, it's great for moon bounce (Earth-Moon-Earth), weak signal beacons and meteor scatter, all of which result in very little of the transmitted signal reaching anyone's receiver.



PREPPERNET



SUN
Az: 307.40
El: -39.10
MOON
Az: 280.39
El: 6.87
RA: 02:28
Dec: 12.18
LHA: 92.61
SD: 14.82
Freq: 50
Tsky: 6593
Doppler:
dB: -2.21
Dgrd: -5.50



PREPPER.NET

T8D11

WHAT IS AN ARQ TRANSMISSION SYSTEM?

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



PREPPERNET

ARQ stands for Automatic Repeat reQuest

When the receiving station detects an error, it automatically sends a repeat request to the sending station.

It has nothing to do with encryption (which would be illegal except for sending commands to a satellite), or video signals, or data compression.

Indeed, it takes a long time to have the receiving station send a repeat request and to then re-transmit the message, or portion of the message.



PREPPERNET

T8D12

WHICH OF THE FOLLOWING BEST DESCRIBES BROADBAND-HAMNET(TM), ALSO REFERRED TO AS A HIGH-SPEED MULTI-MEDIA NETWORK?

- A. An amateur-radio-based data network using commercial Wi-Fi gear with modified firmware***
- B. A wide-bandwidth digital voice mode employing DRM protocols
- C. A satellite communications network using modified commercial satellite TV hardware
- D. An internet linking protocol used to network repeaters



PREPPERNET

Broadband-Hamnet was at one time called HSMM-Mesh™ and is one of a couple of different projects which are basically intended to create a peer to peer wireless network on ham radio frequencies.

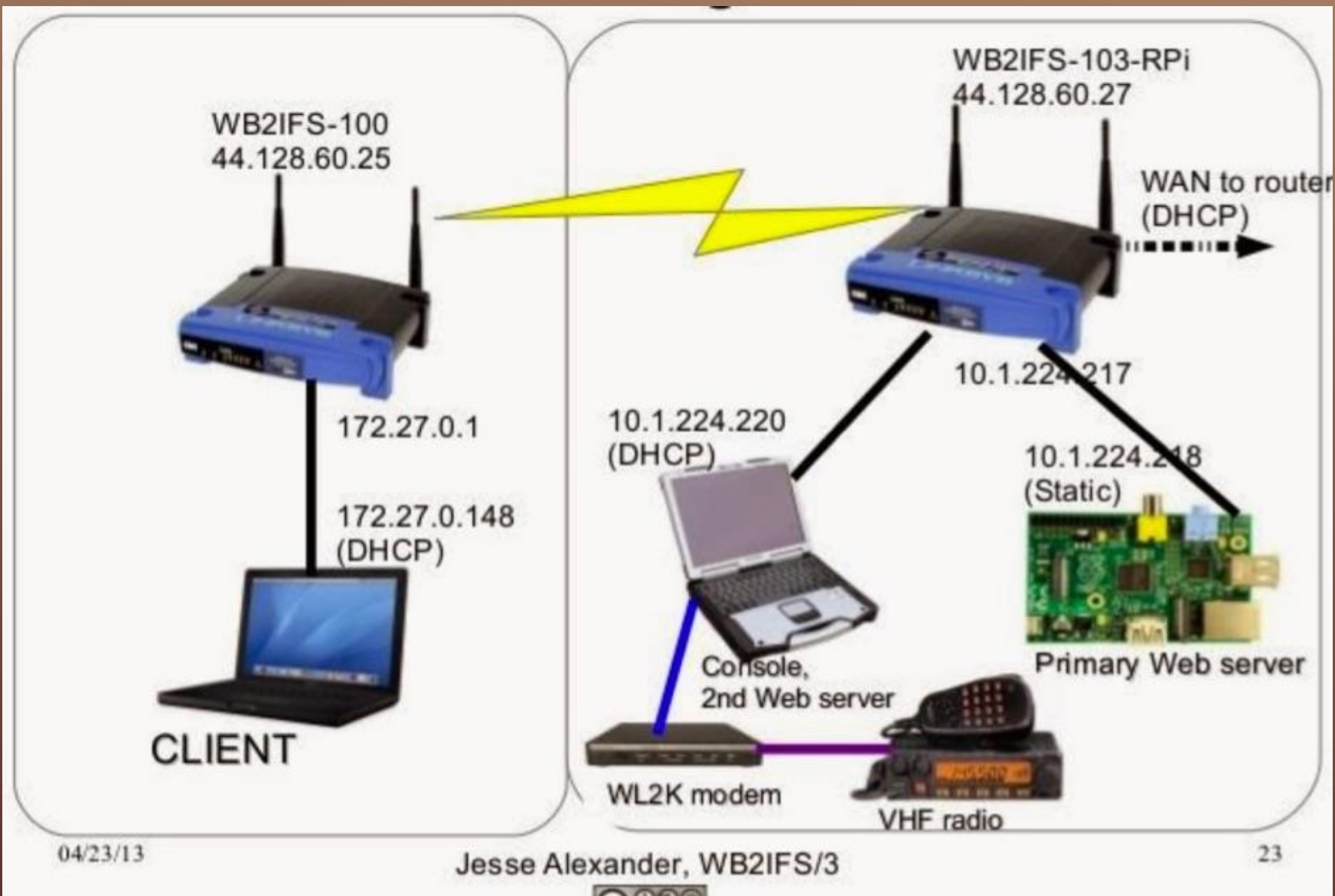
The first iteration of this involved using the Linksys WRT-54G -- a highly modifiable consumer access point -- with custom firmware on 2.4ghz channel 1, which is actually part of the ham radio allotted spectrum.

The idea is that "mesh nodes" can connect to each other automatically and route traffic between each other, thus providing a wireless network which covers a city (or larger) by creating interlinking nodes.

In practice this is more difficult than you might expect, due to congestion on 2.4ghz frequencies, but the project has expanded to include support for other access points and bands as well.



PREPPERNET



PREPPER.NET

Broadband-Hamnet in a box



PREPPERNET

T8D13 WHAT IS FT8?

- A. A wideband FM voice mode
- B. A digital mode capable of operating in low signal-to-noise conditions that transmits on 15-second intervals***
- C. An eight channel multiplex mode for FM repeaters
- D. A digital slow scan TV mode with forward error correction and automatic color compensation

FT8 is a relatively new digital mode which became popular in 2017; it very quickly largely replaced JT65 because it's much faster.

FT8 is usually used on HF bands and it can achieve very long distances because it is extremely tolerant of noise and interference.

It requires that both transmitter and receivers synchronize their computer time with the same time source (which is easy with the internet).

When you transmit, you transmit for 15 seconds and send only a very short (75 bit) message with a 12 bit checksum.



PREPPERNET

T8D14
WHAT IS AN ELECTRONIC KEYS?

- A. A device for switching antennas from transmit to receive
- B. A device for voice activated switching from receive to transmit
- C. A device that assists in manual sending of Morse code**
- D. An interlock to prevent unauthorized use of a radio

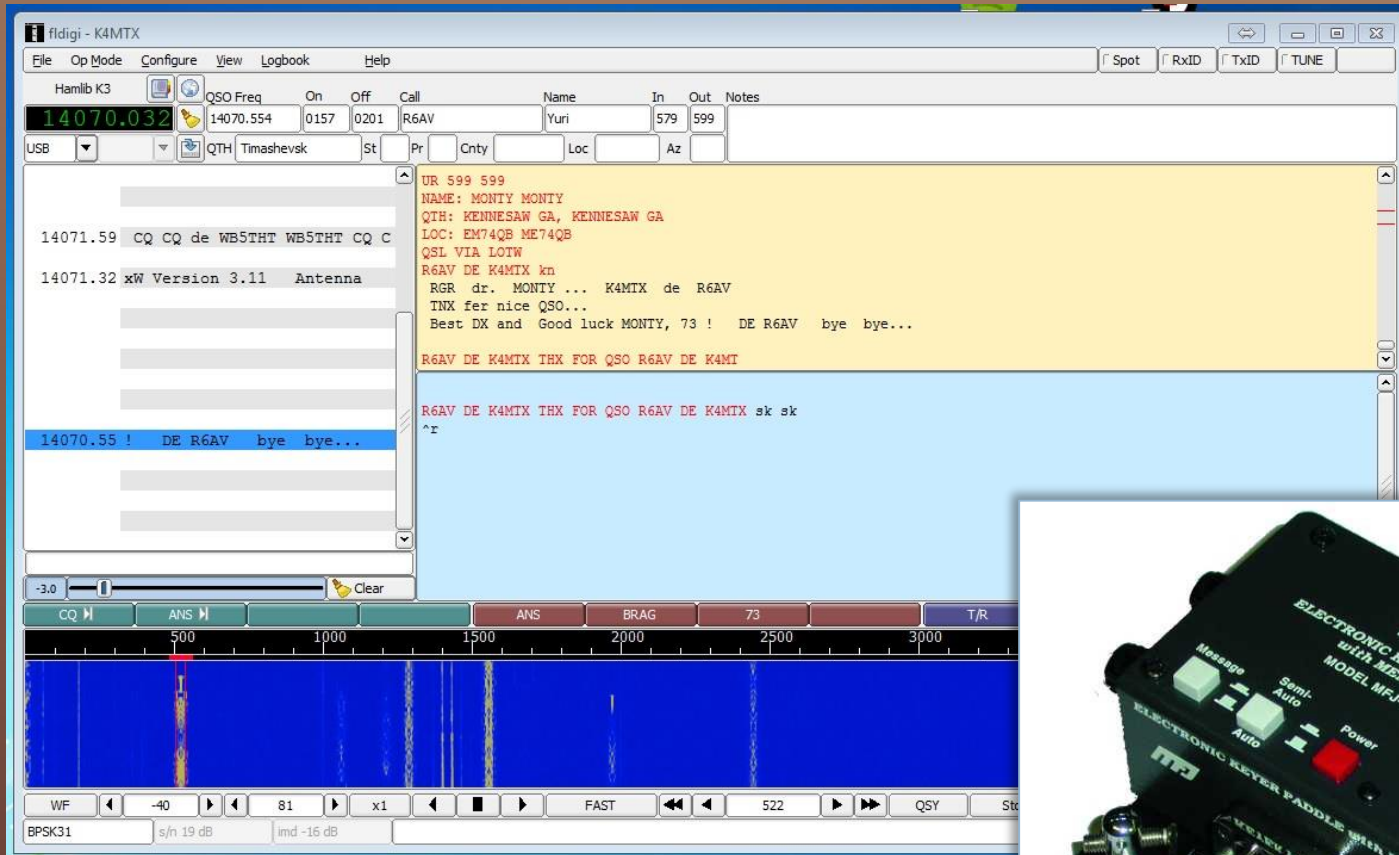
An **Electronic keyer** is the modern fancy replacement for the traditional telegraph key, or in other words a device that assists in manual sending of Morse code.

An **Electronic keyer** can have a variety of functions including:

- Separate keys for sending dots and dashes at a specified rate.
- The ability to set a limited transmission rate (in WPM) while allowing the operator to "get ahead" of the current transmission by buffering up additional code or word spaces to be sent in sequence after previously entered code is sent.
- The ability to continually send dots or dashes by holding down a key so that fewer hand movements are required to transmit a series of dots or dashes.
- The ability to combine some functions with the use of a traditional key that is plugged into the electronic keyer.



PREPPERNET



Often they are hardware devices but they can also be computer or smartphone software applications that provide these and other functions.



PREPPERNET

END OF SUBELEMENT T8



PREPPERNET



PREPPERNET