Technician License Preparation Class

Fun On Repeaters (p. 88)

T5C01 (B)

What is one purpose of a repeater?

- A. To cut your power bill by using someone else's higher power system
- B. To extend the usable range of mobile and low-power stations
- C. To transmit signals for observing propagation and reception
- D. To communicate with stations in services other than amateur

Most hams never see the “insides” of a repeater. This one runs on solar power!

T3C02 (D)

What is considered to be proper repeater operating practice?

- A. Monitor before transmitting and keep transmissions short
- B. Identify legally
- C. Use the minimum amount of transmitter power necessary
- D. All of these answers are correct

T5C04 (C)

Why should you pause briefly between transmissions when using a repeater?

- A. To let your radio cool off
- B. To reach for pencil and paper so you can take notes
- C. To listen for anyone wanting to break in
- D. To dial up the repeater's autopatch

T5C02 (B)

What is a courtesy tone?

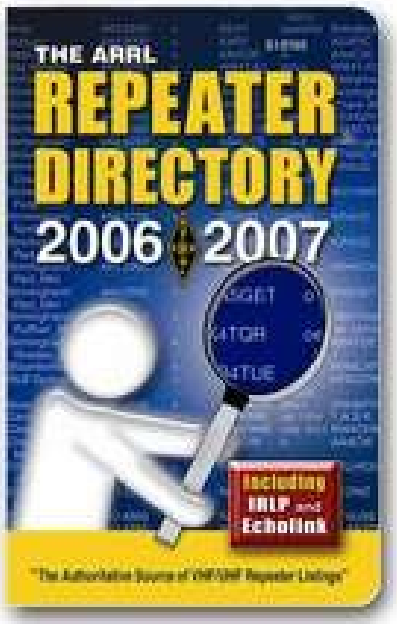
- A. A tone used to identify the repeater
- B. A tone used to indicate when a transmission is complete
- C. A tone used to indicate that a message is waiting for someone
- D. A tone used to activate a receiver in case of severe weather

BUT…wait a second before you talk!

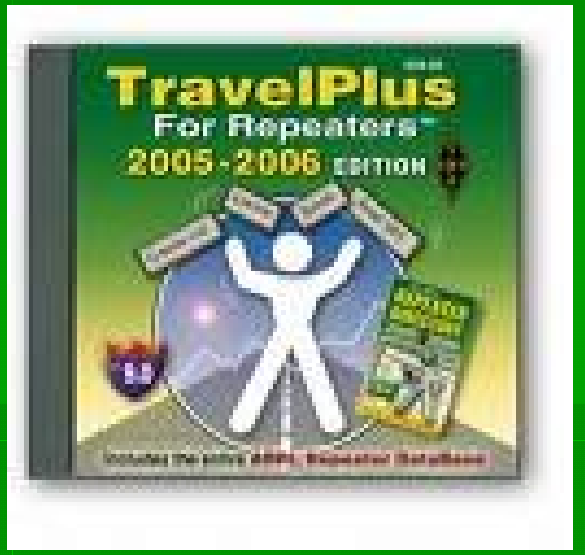
T5C03 (A)

Which of the following is the most important information to know before using a repeater?

- A. The repeater input and output frequencies
- B. The repeater call sign
- C. The repeater power level
- D. Whether or not the repeater has an autopatch



These repeater directories list repeaters from all over the USA, making them handy for travelers.



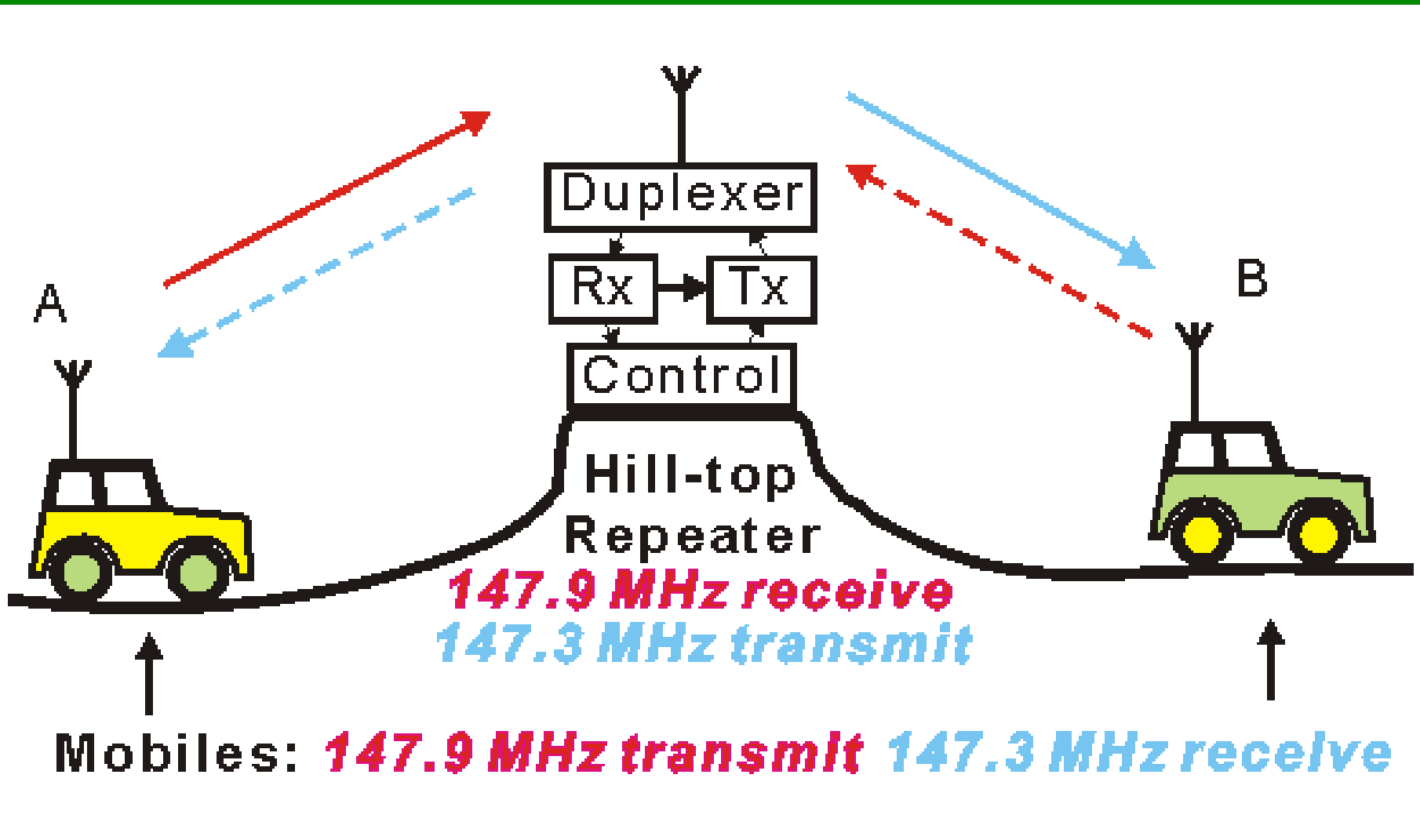
Input and output frequencies & other settings are listed

T5C07 (A)

What is meant by the terms input and output frequency when referring to repeater operations?

- A. The repeater receives on one frequency and transmits on another
- B. The repeater offers a choice of operating frequencies
- C. One frequency is used to control the repeater and another is used to retransmit received signals
- D. The repeater must receive an access code on one frequency before it will begin transmitting

The repeater receives on one frequency and transmits on another



T5C05 (A)

What is the most common input/output frequency offset for repeaters in the 2-meter band?

- A. 0.6 MHz
- B. 1.0 MHz
- C. 1.6 MHz
- D. 5.0 MHz

Most modern handhelds have automatic 2 meter repeater shifts programmed into them, so you rarely have to set the offset. .6 MHz = 600 KHz

T5C06 (D)

What is the most common input/output frequency offset for repeaters in the 70-centimeter band?

- A. 600 kHz
- B. 1.0 MHz
- C. 1.6 MHz
- D. 5.0 MHz

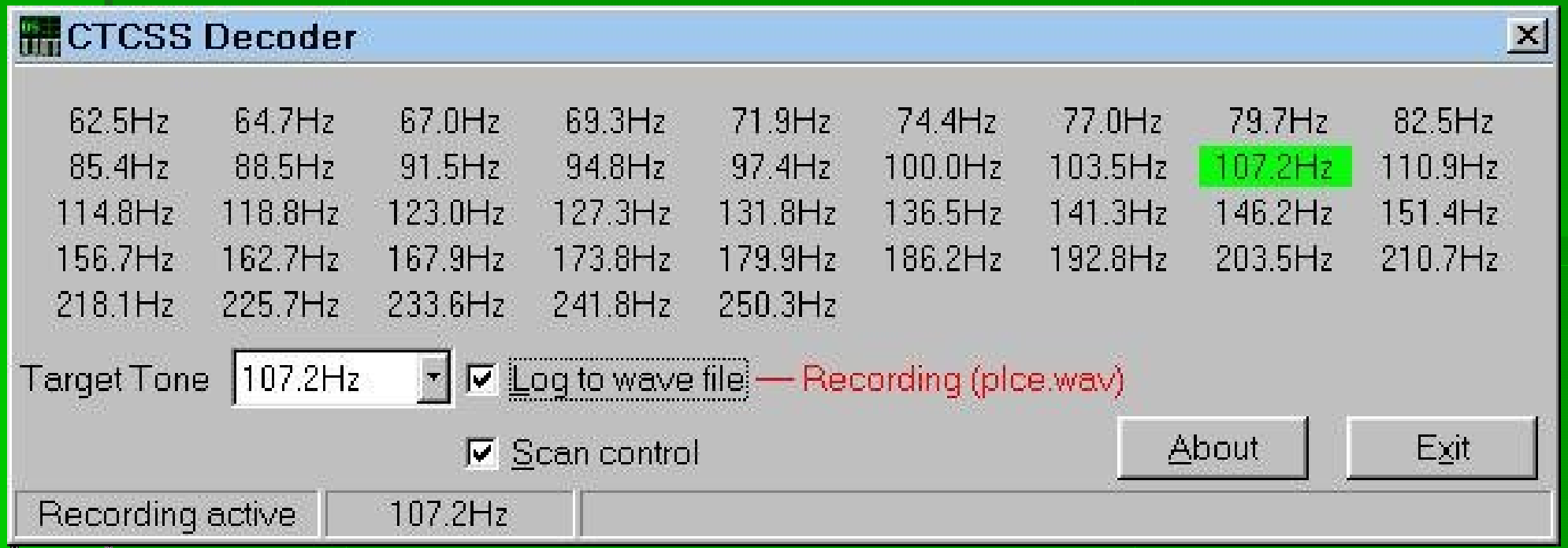
Most modern handhelds have automatic 70 cm (440 MHz) repeater shifts programmed into them, so you rarely have to set the offset.

T3A02 (B)

How do you call another station on a repeater if you know the station's call sign?

- A. Say "break, break" then say the station's call sign
- B. Say the station's call sign then identify your own station
- C. Say "CQ" three times then the other station's call sign
- D. Wait for the station to call "CQ" then answer it

Some repeaters configured to respond only to subaudible signals containing a specific tone. They will only respond to user signals and will ignore other signals. This is known as the "Continuous Tone Coded Squelch System" or CTCSS. Most hams call these "PL" which means "private line". There are over 40 tone frequencies, and they are already programmed into modern radios.



T9B07 (C)

What is a good thing to remember when using your hand-held VHF or UHF radio to reach a distant repeater?

- A. Speak as loudly as possible to help your signal go farther
- B. Keep your transmissions short to conserve battery power
- C. Keep the antenna as close to vertical as you can
- D. Turn off the CTCSS tone

Hold your radio as vertical as possible to get the best signal!

T9B09 (B)

What might be a way to reach a distant repeater if buildings or obstructions are blocking the direct line of sight path?

- A. Change from vertical to horizontal polarization
- B. Try using a directional antenna to find a path that reflects signals to the repeater
- C. Ask the repeater owners to repair their receiver
- D. Transmit on the repeater output frequency

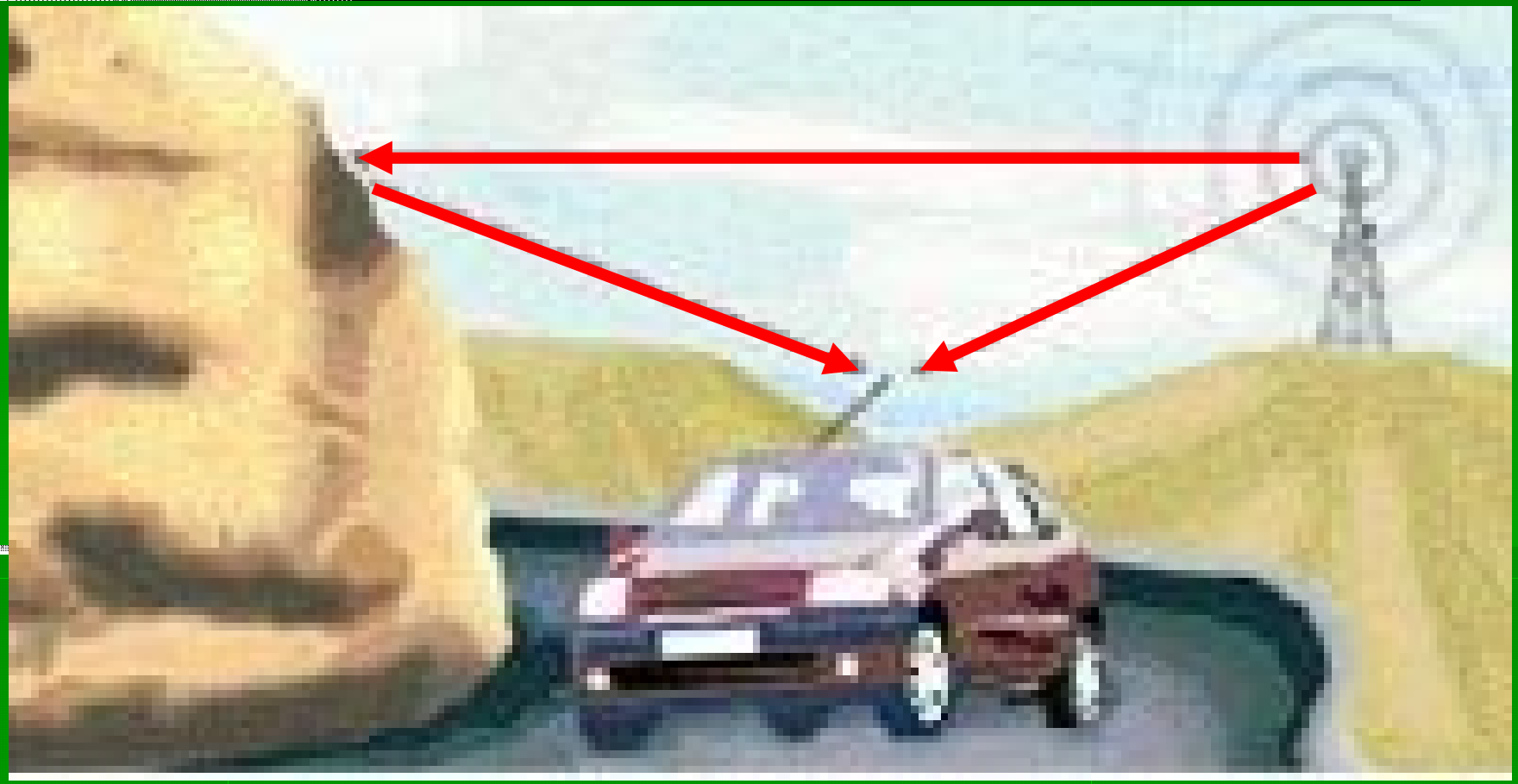
Directional Beam Antenna

Ten element 2 meter Yagi

T9B05 (D)

- What should you do if a station reports that your signals were strong just a moment ago, but now they are weak or distorted?
- A. Change the batteries in your radio to a different type
- B. Speak more slowly so he can understand your better
- C. Ask the other operator to adjust his squelch control
- D. Try moving a few feet, random reflections may be causing multi-path distortion.

Multipath distortion is caused by signals bouncing off of nearby structures



T5D12 (D)

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

- 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 answers are correct

T6C09 (D)

What is a practical reason for being able to copy CW when using repeaters?

- A. To send and receive messages others cannot overhear
- B. To conform with FCC licensing requirements
- C. To decode packet radio transmissions
- D. To recognize a repeater ID sent in Morse code

T2B04 (D) [97.119(b)]

What is an acceptable method of transmitting a repeater station identification?

- A. By phone using the English language
- B. By video image conforming to applicable standards
- C. By Morse code at a speed not to exceed 20 words per minute
- D. All of these answers are correct.

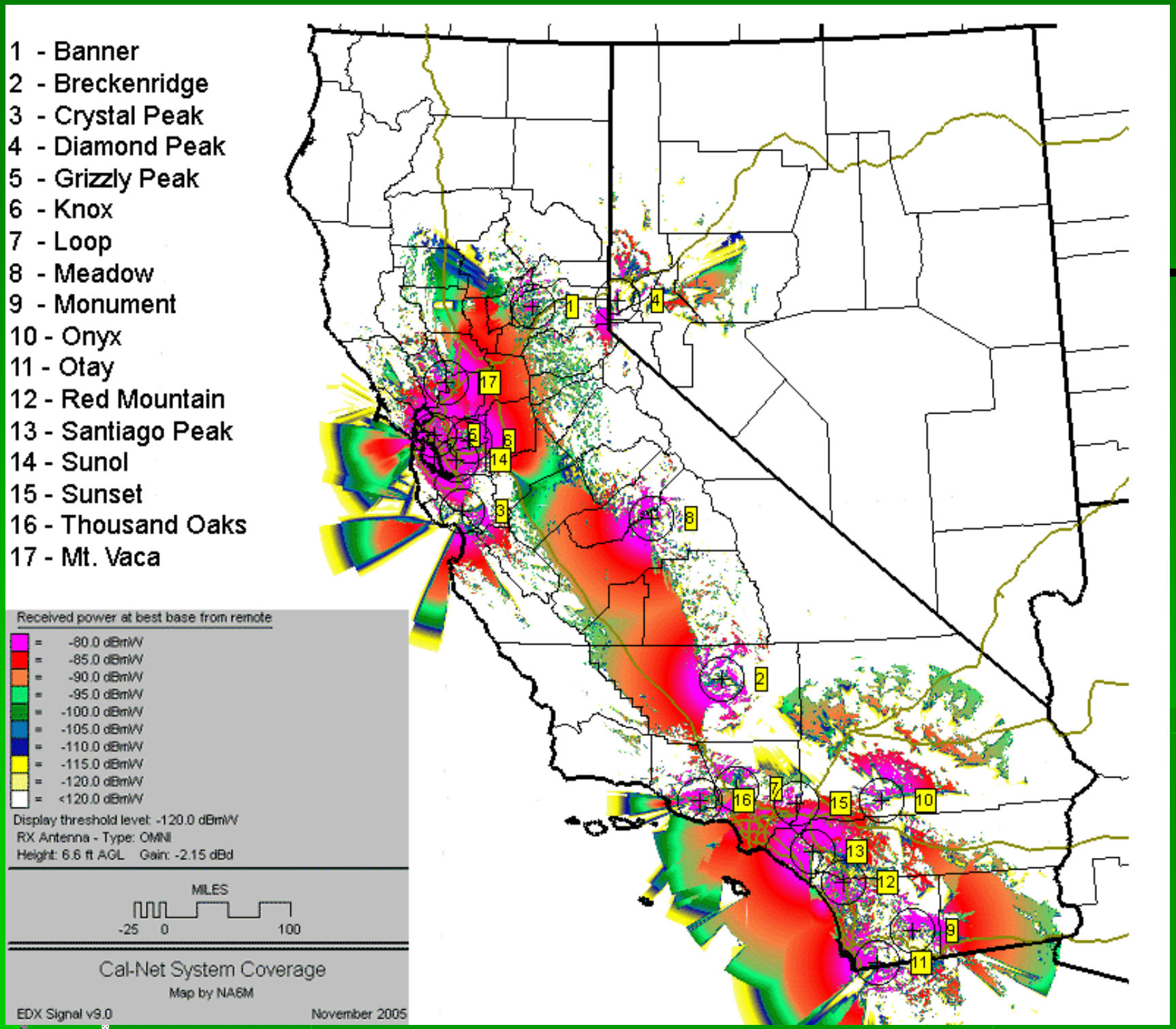
T5C11 (C)

What is the term for a series of repeaters that can be connected to one another to provide users with a wider coverage?

- A. Open repeater system
- B. Closed repeater system
- C. Linked repeater system
- D. Locked repeater system

Calnet is a multi repeater amateur radio system serving most of California and parts of Nevada. The Calnet system consists of numerous fulltime linked 440 MHz repeaters connecting San Diego to San Francisco and Lake Tahoe. We have 440 MHz coverage in the areas of Los Angeles, Orange, San Bernardino, Imperial, Riverside, San Diego, Kern, Ventura, Fresno, San Joaquin, Alameda, San Mateo, Santa Cruz , Santa Clara, Placer, El Dorado, Washoe, Carson City and Douglas Counties.

1 - Banner
2 - Breckenridge
3 - Crystal Peak
4 - Diamond Peak
5 - Grizzly Peak
6 - Knox
7 - Loop
8 - Meadow
9 - Monument
10 - Onyx
11 - Otay
12 - Red Mountain
13 - Santiago Peak
14 - Sunol
15 - Sunset
16 - Thousand Oaks
17 - Mt. Vaca



C A L N E T

T5C13 (B)

Which of the following statements regarding use of repeaters is true?

- A. All amateur radio operators have the right to use any repeater at any time
- B. Access to any repeater may be limited by the repeater owner
- C. Closed repeaters must be opened at the request of any amateur wishing to use it
- D. Open repeaters are required to use CTCSS tones for access

Some repeaters are “closed” to the public and are accessible by dues paying members. The dues is used to maintain the repeater itself. There are several 440 MHz closed repeaters.[27]

T5C14 (D)

What term is used to describe a repeater when use is restricted to the members of a club or group?

- A. A beacon station
- B. An open repeater
- C. A auxiliary station
- D. A closed repeater

T3B05 (A)

- What is the main purpose of repeater coordination?
- A. To reduce interference and promote proper use of spectrum
- B. To coordinate as many repeaters as possible in a small area
- C. To coordinate all possible frequencies available for repeater use
- D. To promote and encourage use of simplex frequencies

T3B04 (C)

- Who is in charge of the repeater frequency band plan in your local area?
- A. The local FCC field office
- B. RACES and FEMA
- C. The recognized frequency coordination body
- D. Repeater Council of America

SCRRBA
(REGIONAL FREQUENCY COORDINATOR)

Club Name: SCRRBA (REGIONAL FREQUENCY COORDINATOR)
ARRL Section: Los Angeles
Contact Person
Name: Michael P Penrose
Call Sign: W6AP **Address:** PO Box 5967
City: Pasadena
State: CA
ZIP Code: 91117-0967
E-mail: admin@scrrba.org

T5C12 (A)

- What is the main reason repeaters should be approved by the local frequency coordinator before being installed?
- A. Coordination minimizes interference between repeaters and makes the most efficient use of available frequencies
- B. Coordination is required by the FCC
- C. Repeater manufacturers have exclusive territories and you could be fined for using the wrong equipment
- D. Only coordinated systems will be approved by the officers of the local radio club

There are three repeaters in Southern California that have the same output on 145.280 MHz, but they have been <u>coordinated</u> to use different PL inputs

Covina Repeater = 145.280 MHz

negative offset

PL 141.3 MHz

Table Mtn Repeater = 145.280 MHz

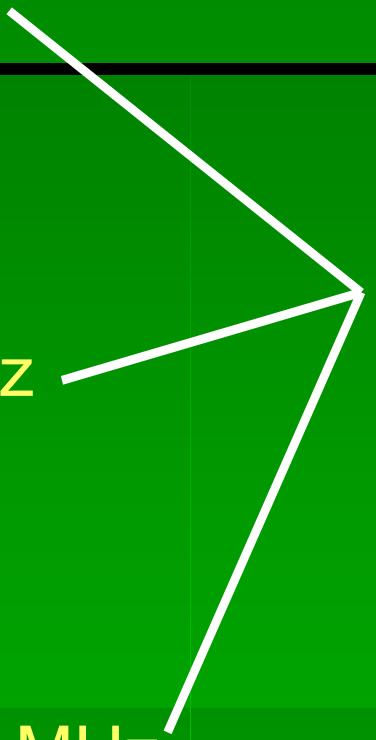
negative offset

PL 131.7 MHz

Santa Monica Repeater = 145.280 MHz

negative offset

PL 127.3 MHz



T3B06 (C) [97.205(g)]

Who is accountable if a repeater station inadvertently retransmits communications that violate FCC rules?

- A. The repeater trustee
- B. The repeater control operator
- C. The transmitting station
- D. All of these answers are correct

Relax! Rarely will the F.C.C. get involved !

T2C03 (B) [97.205(a)]

What minimum class of amateur license must you hold to be a control operator of a repeater station?

- A. Technician Plus
- B. Technician
- C. General
- D. Amateur Extra

Unfortunately in southern California there is virtually no room for new repeaters!

T2C07 (C) [97.109(d)]

What type of amateur station does not require a control operator to be at the control point?

- A. A locally controlled station
- B. A remotely controlled station
- C. An automatically controlled station

Repeater owners don't have to camp out at their stations 24/7 to be legal if they can control their station automatically.

T2C09 (C) [97.3(a)]

What type of control is being used on a repeater when the control operator is not present?

- A. Local control
- B. Remote control
- C. Automatic control
- D. Uncontrolled

T3B02 (C)

- Which of the following statements is true of band plans?
- A. They are mandated by the FCC to regulate spectrum use
- B. They are mandated by the ITU
- C. They are voluntary guidelines for efficient use of the radio spectrum
- D. They are mandatory only in the US

Band plans are determined by the ham community, not the FCC!

T3B03 (C)

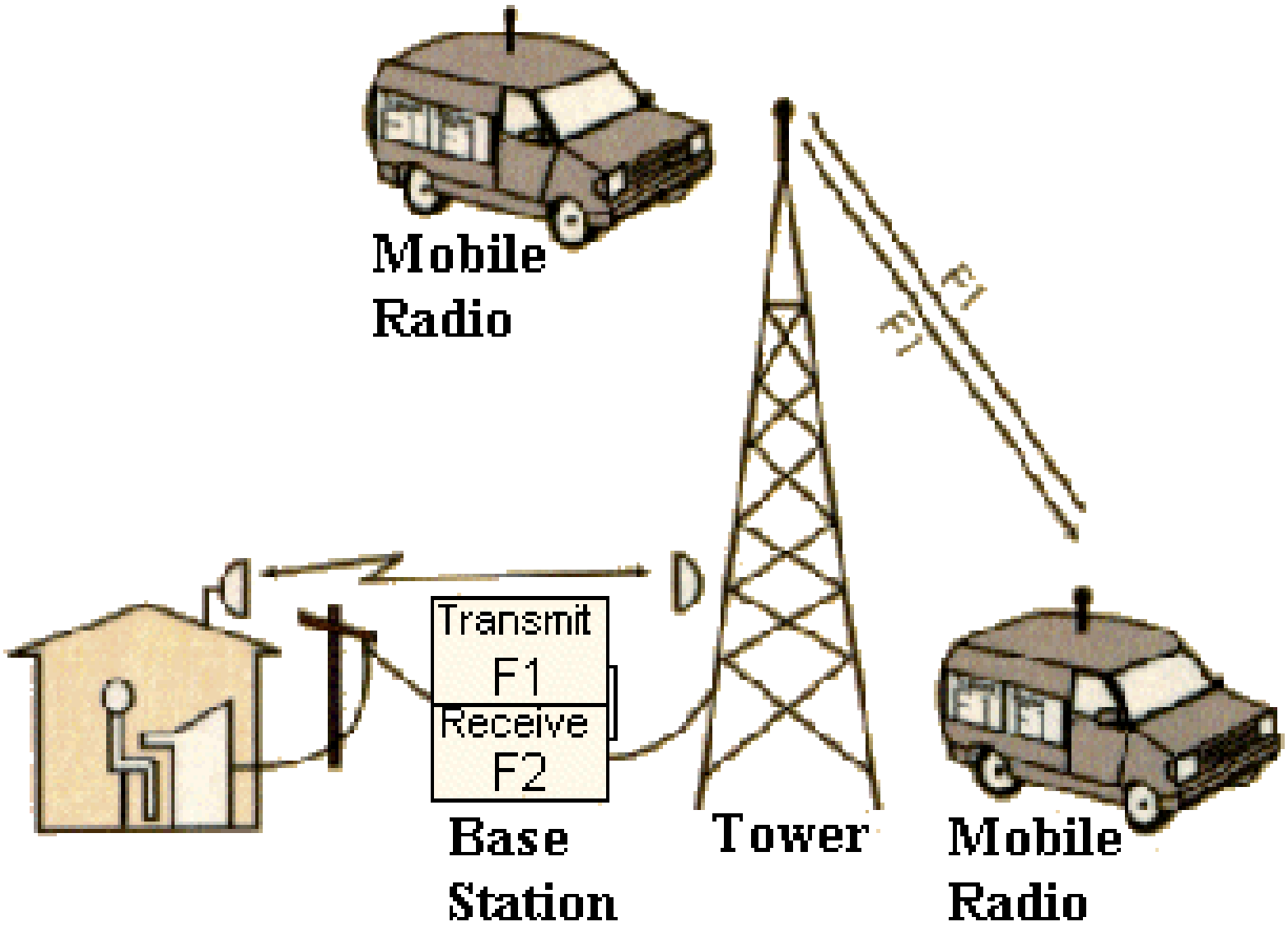
- Who developed the band plans used by amateur radio operators?
- A. The US Congress
- B. The FCC
- C. The amateur community
- D. The Interstate Commerce Commission

T5C08 (A)

What is the meaning of the term simplex operation?

- A. Transmitting and receiving on the same frequency
- B. Transmitting and receiving over a wide area
- C. Transmitting on one frequency and receiving on another
- D. Transmitting one-way communications

Figure 1
Simplex Radio



T5C09 (B)

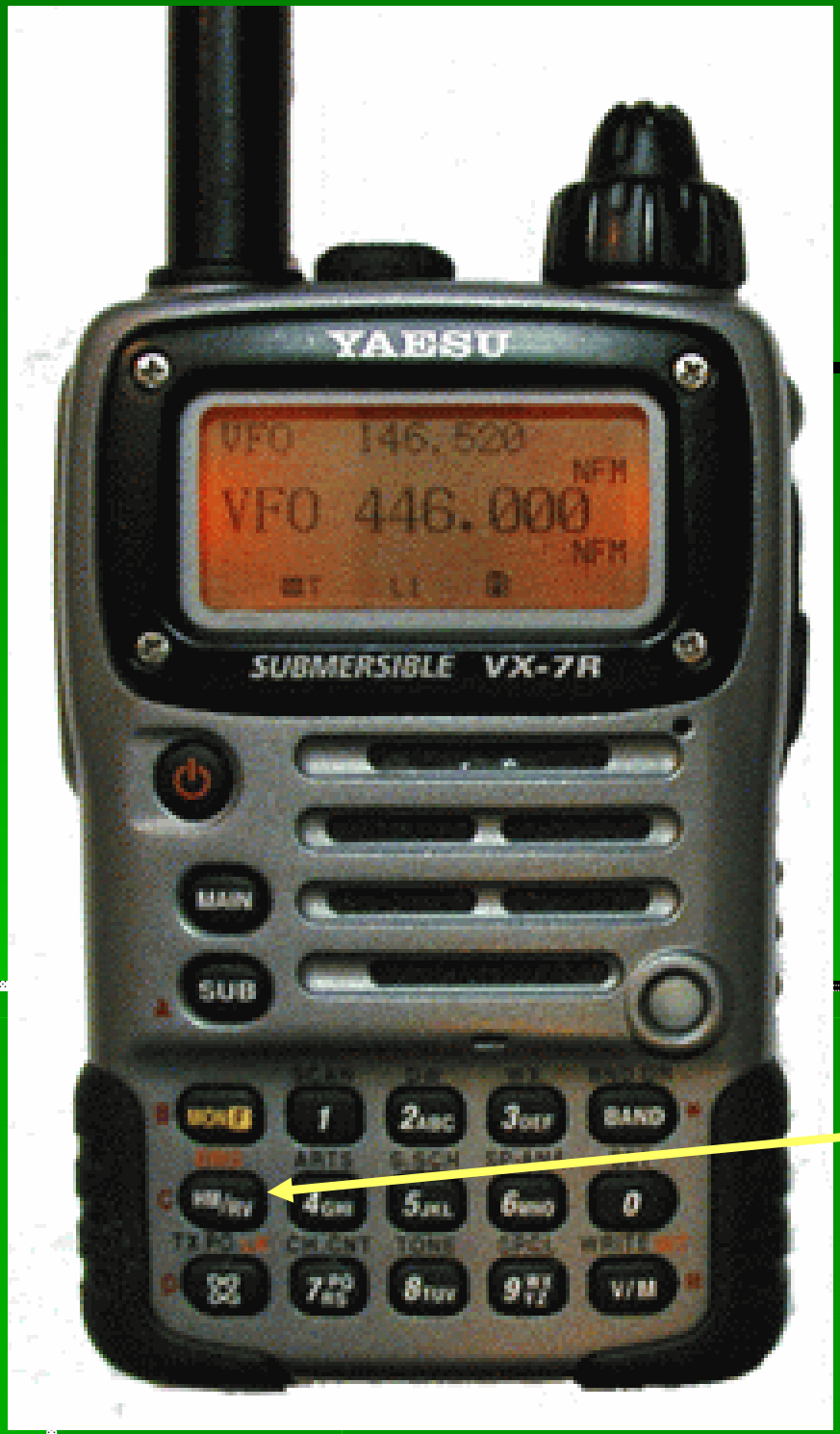
What is a reason to use simplex instead of a repeater?

- A. When the most reliable communications are needed
- B. To avoid tying up the repeater when direct contact is possible
- C. When an emergency telephone call is needed
- D. When you are traveling and need some local information

T5C10 (A)

How might you find out if you could communicate with a station using simplex instead of a repeater?

- A. Check the repeater input frequency to see if you can hear the other station
- B. Check to see if you can hear the other station on a different frequency band
- C. Check to see if you can hear a more distant repeater
- D. Check to see if a third station can hear both of you



The “reverse “ key is used to check the input frequency momentarily. On the Yaesu VX-7R it is labeled “RV”

Emergency! (p. 102)

T8C01 (A)

- Which type of traffic has the highest priority?
- A. Emergency traffic
- B. Priority traffic
- C. Health and welfare traffic
- D. Routine traffic

T8A11 (B) [97.101(c)]

What type of communications has priority at all times in the Amateur Radio Service?

- A. Repeater communications
- B. Emergency communications
- C. Simplex communications
- D. Third-party communications

T8A12 (D) [97.101(c)]

When must priority be given to stations providing emergency communications?

A. Only when operating under RACES
B. Only when an emergency has been declared
C. Any time a net control station is on the air
D. At all times and on all frequencies

T8A09 (D)

What is an appropriate way to initiate an emergency call on amateur radio?

- A. Yell as loudly as you can into the microphone
- B. Ask if the frequency is in use and wait for someone to give you permission to go ahead before proceeding
- C. Declare a communications emergency
- D. Say "Mayday, Mayday, Mayday" followed by "any station come in please" and identify your station

T8B02 (C) [97.403]

- When may you use your amateur station to transmit a "SOS" or "MAYDAY" signal?
- A. Only when you are transmitting from a ship at sea
- B. Only at 15 and 30 minutes after the hour
- C. When there is immediate threat to human life or property
- D. When the National Weather Service has announced a weather warning

T8B08 (B) [97.403, 97.405(a),(b)]

When can you use non-amateur frequencies or equipment to call for help in a situation involving immediate danger to life or property?

- A. Never; your license only allows you to use the frequencies authorized to your class of license
- B. In a genuine emergency you may use any means at your disposal to call for help on any frequency
- C. When you have permission from the owner of the set
- D. When you have permission from a police officer on the scene

Try not to call on police or fire frequencies. You may later be in a lot of trouble!

T8A10 (D)

What are the penalties for making a false emergency call?

- A. You could have your license revoked
- B. You could be fined a large sum of money
- C. You could be sent to prison
- D. All of these answers are correct

T8A08 (B)

What should you do if you hear someone reporting an emergency?

- A. Report the station to the FCC immediately
- B. Assume the emergency is real and act accordingly
- C. Ask the other station to move to a different frequency
- D. Tell the station to call the police on the telephone

T8A03 (D)

What should you do if you are in contact with another station and an emergency call is heard?

- A. Tell the calling station that the frequency is in use
- B. Direct the calling station to the nearest emergency net frequency
- C. Disregard the call and continue with your contact
- D. Stop your contact immediately and take the emergency call

T8C07 (B)

What should the net control station do if someone breaks in with emergency traffic?

- A. Ask them to wait until the roll has been called
- B. Stop all net activity until the emergency has been handled
- C. Ask the station to call the local police and then resume normal net activities
- D. Ask them to move off your net frequency immediately

T8C08 (C)

What should you do if a large scale emergency has just occurred and no net control station is available?

- A. Wait until the assigned net control station comes on the air and pass your traffic when called
- B. Transmit a call for help and hope someone will hear you
- C. Open the emergency net immediately and ask for check-ins
- D. Listen to the local NOAA weather broadcast to find out how long the emergency will last

T8C03 (C)

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

- A. Whenever the net frequency is quiet, announce your call sign and location
- B. Move 5 kHz away from the net's frequency and use high power to ask other hams to keep clear of the net frequency
- C. Do not transmit on the net frequency until asked to do so by the net control station
- D. Wait until the net frequency is quiet, then ask for any emergency traffic for your area

T8A02 (B) [97.113(a)(3)]

Under what conditions are amateur stations allowed to communicate with stations operating in other radio services?

- A. When communicating with the space shuttle
- B. When specially authorized by the FCC, or in an actual emergency
- C. When communicating with stations in the Citizens Radio Service
- D. When a commercial broadcast station is reporting news during a natural disaster

T8A06 (A) [97.401(b)]

What is legally required to restrict a frequency to emergency-only communication?

- A. An FCC declaration of a communications emergency
- B. Determination by the designated net manager for an emergency net
- C. Authorization by an ARES/RACES emergency coordinator
- D. A Congressional declaration of intent

T8A04 (C)

What are the restrictions on amateur radio communications after the FCC has declared a communications emergency?

- A. The emergency declaration prohibits all communications
- B. There are no restrictions if you have a special emergency certification
- C. You must avoid those frequencies dedicated to supporting the emergency unless you are participating in the relief effort
- D. Only military stations are allowed to use the amateur radio frequencies during an emergency

T8A01 (C) [97.401(b)]

What information is included in an FCC declaration of a temporary state of communication emergency?

- A. A list of organizations authorized to use radio communications in the affected area
- B. A list of amateur frequency bands to be used in the affected area
- C. Any special conditions and rules to be observed during the emergency
- D. An operating schedule for authorized amateur emergency stations

T8A07 (D)

Who has the exclusive use of a frequency if the FCC has not declared a communication emergency?

- A. Any net station that has traffic
- B. The station first occupying the frequency
- C. Individuals passing health and welfare communications
- D. No station has exclusive use in this circumstance

But good operators stand clear for emergency net operation.

T8A05 (B)

What is one reason for using tactical call signs such as "command post" or "weather center" during an emergency?

- A. They help to keep the general public informed
- B. They are more efficient and help coordinate public-service communications
- C. They are required by the FCC
- D. They increase goodwill and sound professional

T8B11 (C) [97.403, 97.405(a),(b)]

When can you use a modified amateur radio transceiver to transmit on the local fire department frequency?

- A. When you are helping the Fire Department raise money
- B. Only when the Fire Department is short of regular equipment
- C. In a genuine emergency you may use any means at your disposal to call for help on any frequency
- D. When the local Fire Chief has given written permission

T3D09 (C) [97.103(a)]

What rules apply to your station when using amateur radio at the request of public service officials or at the scene of an emergency?

- A. RACES
- B. ARES
- C. FCC
- D. FEMA

T8C04 (B)

What is one thing that must be included when passing emergency messages?

- A. The call signs of all the stations passing the message
- B. The name of the person originating the message
- C. A status report
- D. The message title

T8C09 (D)

What is the preamble of a message?

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

T8C05 (A)

What is one way to reduce the chances of casual listeners overhearing sensitive emergency traffic?

- A. Pass messages using a non-voice mode such as packet radio or Morse code
- B. Speak as rapidly as possible to reduce your on-air time
- C. Spell out every word using phonetics
- D. Restrict transmission of messages to the hours between midnight and 4:00 AM

T2D05 (A) [97.3(a)46]

What is the definition of third-party communications?

- A. A message sent between two amateur stations for someone else
- B. Public service communications for a political party
- C. Any messages sent by amateur stations
- D. A three-minute transmission to another amateur

T8C02 (B)

What type of messages should not be transmitted over amateur radio frequencies during emergencies?

- A. Requests for supplies
- B. Personal information concerning victims
- C. A schedule of relief operators
- D. Estimates of how much longer the emergency will last

T8C10 (A)

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

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

T8C11 (B)

What is the recommended guideline for the maximum number of words to be included in the text of an emergency message?

- A. 10 words
- B. 25 words
- C. 50 words
- D. 75 words

T8B03 (A)

What is the primary function of RACES in relation to emergency activities?

- A. RACES organizations are restricted to serving local, state, and federal government emergency management agencies
- B. RACES supports agencies like the Red Cross, Salvation Army, and National Weather Service
- C. RACES supports the National Traffic System
- D. RACES is a part of the National Emergency Warning System

Radio Amateur Civilian Emergency Service logos

T8B05 (C) [97.407(a)]

What organization must you register with before you can participate in RACES activities?

- A. A local amateur radio club
- B. A local racing organization
- C. The responsible civil defense organization
- D. The Federal Communications Commission

T8B06 (B)

What is necessary before you can join an ARES group?

- A. You are required to join the ARRL
- B. You must have an amateur radio license
- C. You must have an amateur radio license and have Red Cross CPR training
- D. You must register with a civil defense organization

Are you interested in volunteering for ARES?

The Amateur Radio Emergency Service (ARES) consists of licensed amateurs who have voluntarily registered their qualifications and equipment for communications duty in the public service when disaster strikes. Every licensed amateur, regardless of membership in ARRL or any other local or national organization, is eligible for membership in the ARES. The only qualification, other than possession of an Amateur Radio license, is a sincere desire to serve.

T8B04 (B)

What is the primary function of ARES in relation to emergency activities?

- A. ARES organizations are restricted to serving local, state, and federal government emergency management agencies
- B. ARES supports agencies like the Red Cross, Salvation Army, and National Weather Service
- C. ARES groups work only with local school districts
- D. ARES supports local National Guard units

T3D10 (D)

What do RACES and ARES have in common?

- A. They represent the two largest ham clubs in the United States
- B. One handles road traffic, the other weather traffic
- C. Neither may handle emergency traffic
- D. Both organizations provide communications during emergencies

T8B01 (D)

What can you do to be prepared for an emergency situation where your assistance might be needed?

- A. Check at least twice a year to make sure you have all of your emergency response equipment and know where it is
- B. Make sure you have a way to run your equipment if there is a power failure in your area
- C. Participate in drills that test your ability to set up and operate in the field
- D. All of these answers are correct

T8B07 (D)

What could be used as an alternate source of power to operate radio equipment during emergencies?

- A. The battery in a car or truck
- B. A bicycle generator
- C. A portable solar panel
- D. All of these answers are correct

T7A02 (B)

Which of these items would probably not be very useful to include in an emergency response kit?

- A. An external antenna and several feet of connecting cable
- B. A 1500 watt output linear amplifier
- C. A cable and clips for connecting your transceiver to an external battery
- D. A listing of repeater frequencies and nets in your area

You probably won't find the power to run this !

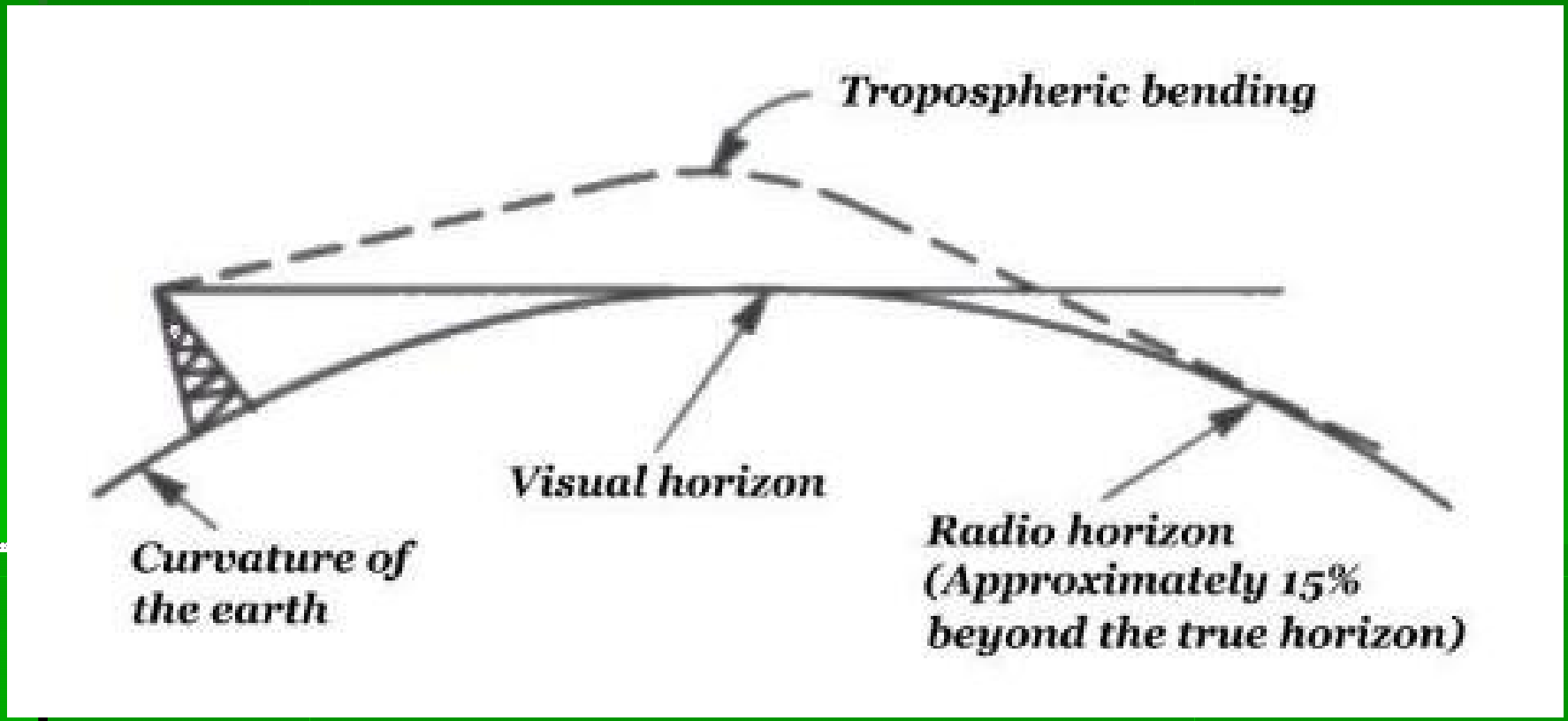
Weak Signals (p.115)

T9B04 (A)

What is the radio horizon?

- A. The point where radio signals between two points are blocked by the curvature of the Earth
- B. The distance from the ground to a horizontally mounted antenna
- C. The farthest point you can see when standing at the base of your antenna tower
- D. The shortest distance between two points on the Earth's surface

Radio Horizon



The Radio Horizon is the point where the curvature of the earth blocks radio signals.

T9B11 (C)

Why do VHF and UHF Radio signals usually travel about a third farther than the visual line of sight distance between 2 stations?

- A. Radio signals move somewhat faster than the speed of light and
- travel farther in the same amount of time
- B. Radio waves are not blocked by dust particles
- C. The Earth seems less curved to radio waves than to light
- D. Radio waves are blocked by dust particles

T9B06 (B)

Why do UHF signals often work better inside of buildings than VHF signals?

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

Now a word about those unlicensed FRS "Family Radios" that are very inexpensive. They do have a definite benefit in urban search & rescue since they transmit on the the UHF band! Keep a pair on hand!

FRS Radios do not require licensing!

T9B10 (B)

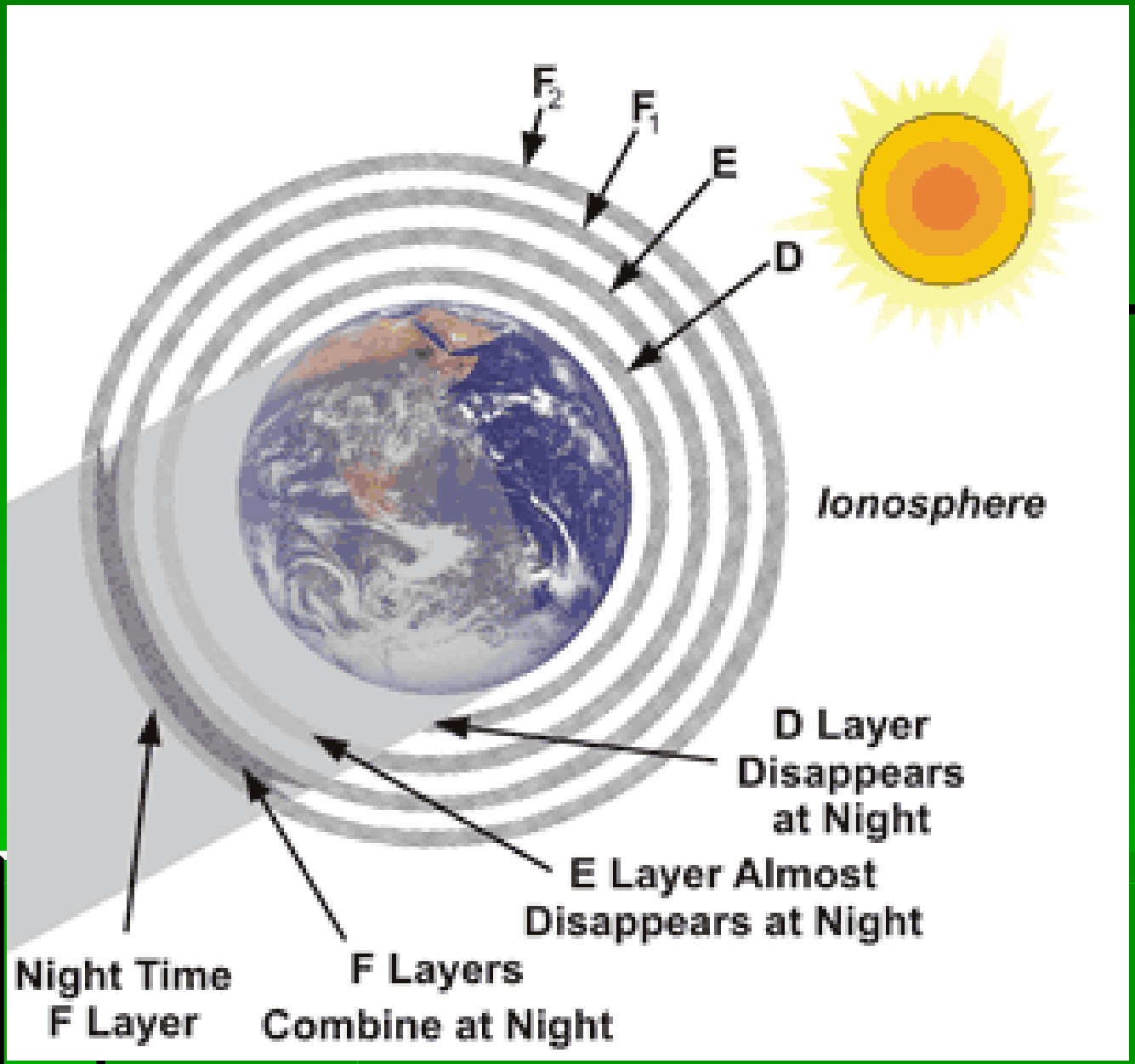
What term is commonly used to describe the rapid fluttering sound sometimes heard from mobile stations that are moving while transmitting?

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

T9B02 (D)

What might be happening when we hear a VHF signal from long distances?

- A. Signals are being reflected from outer space
- B. Someone is playing a recording to us
- C. Signals are being reflected by lightning storms in our area
- D. A possible cause is sporadic E reflection from a layer in the ionosphere



"Sporadic" E

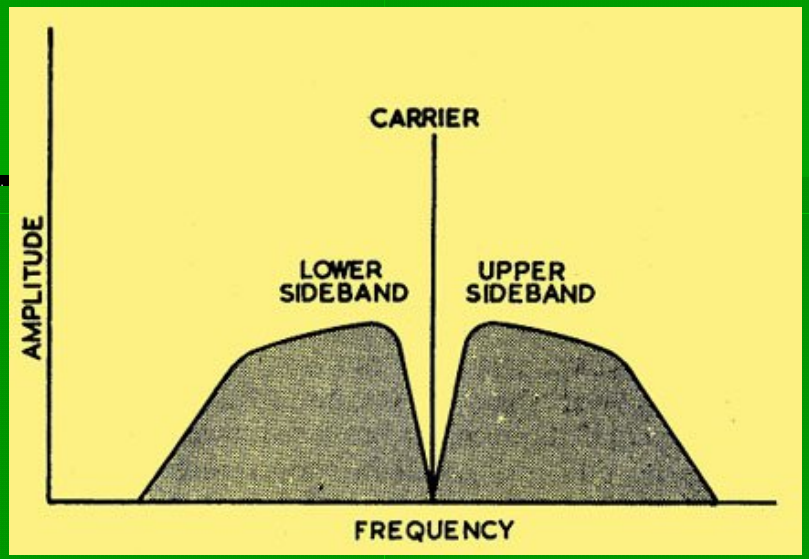
Radio waves may bounce off the E layer of ionized particles and travel a long distance!

T6A04 (C)

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

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

SSB is "Single Side Band"



T6A07 (A)

Which sideband is normally used for VHF and UHF SSB communications?

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

T5D11 (C)

What may be the problem if another operator reports that your SSB signal is very garbled and breaks up?

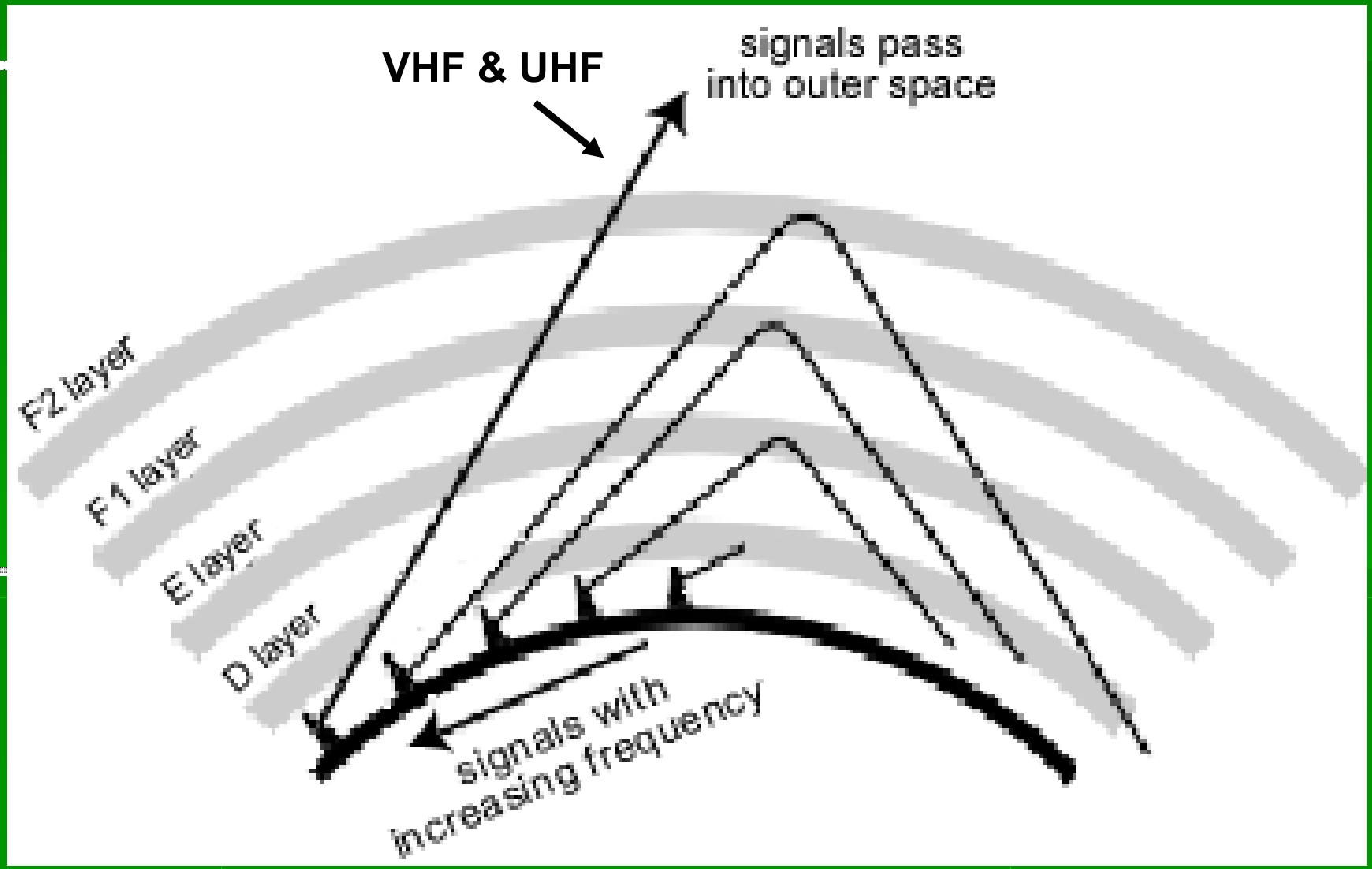
- A. You have the noise limiter turned on
- B. The transmitter is too hot and needs to cool off
- C. RF energy may be getting into the microphone circuit and causing feedback
- D. You are operating on lower sideband

T9B01 (C)

Why are VHF/UHF signals not normally heard over long distances?

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

VHF & UHF signals go right out into space!



T1C09 (C) [97.303]

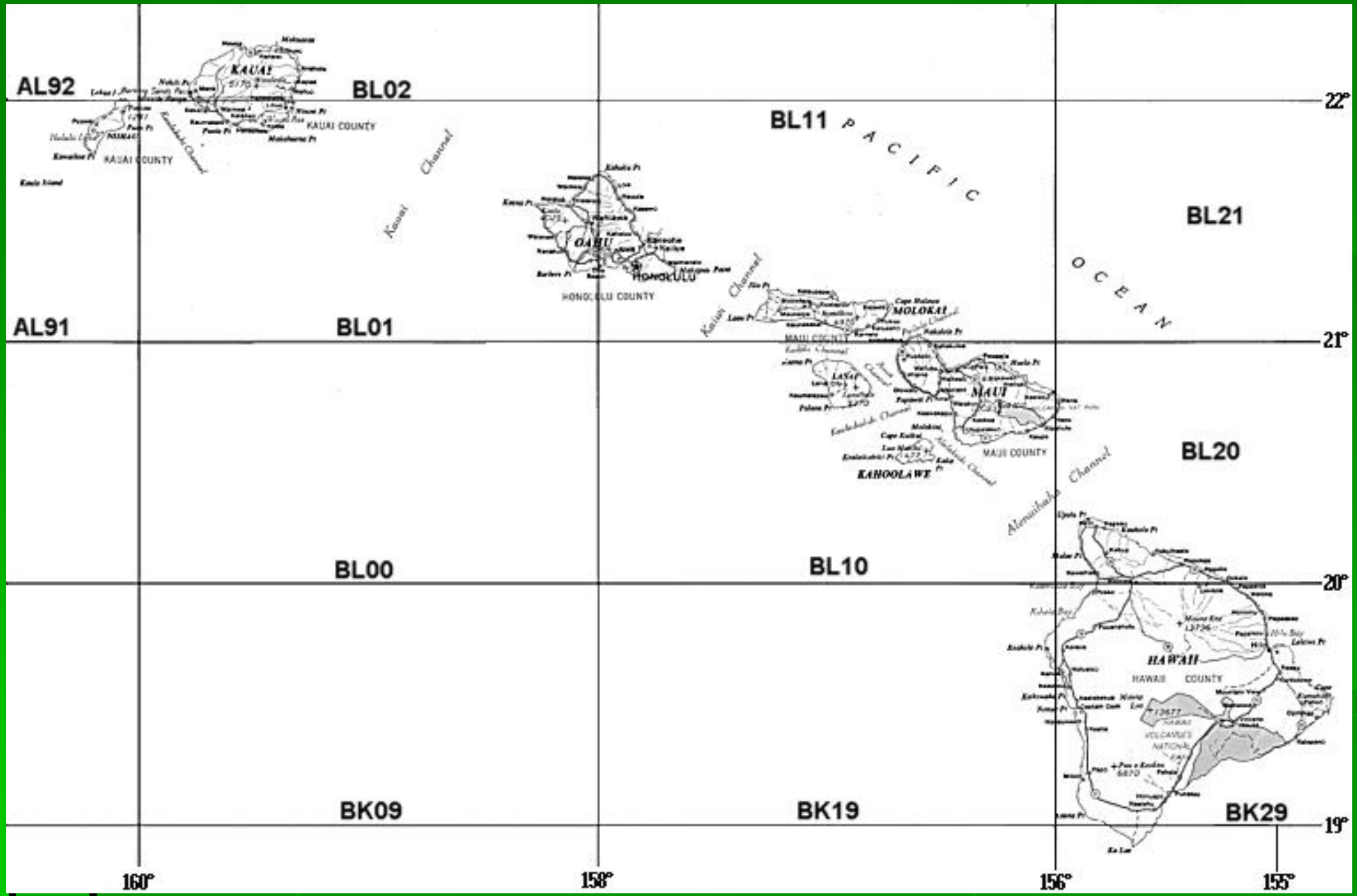
What do the FCC rules mean when an amateur frequency band is said to be available on a secondary basis?

- A. Secondary users of a frequency have equal rights to operate
- B. Amateurs are only allowed to use the frequency at night
- C. Amateurs may not cause harmful interference to primary users
- D. Secondary users are not allowed on amateur bands

T7A09 (A)

What is a grid locator?

- A. A letter-number designator assigned to a geographic location
- B. Your azimuth and elevation
- C. Your UTC location
- D. The 4 digits that follow your ZIP code



Grid Locators for Hawaii

T7A11 (B) [97.215(c)]

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

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

T7A12 (C) [97.215(a)]

What is the station identification requirement when sending commands to a radio control model using amateur frequencies?

- A. Voice identification must be transmitted every 10 minutes
- B. Morse code ID must be sent once per hour
- C. A label indicating the licensee's call sign and address must be affixed to the transmitter
- D. There is no station identification requirement for this service

Digital & Space (p. 122)

T6A03 (A)

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 station

T6B04 (A)

What technology do Echolink and IRLP have in common?

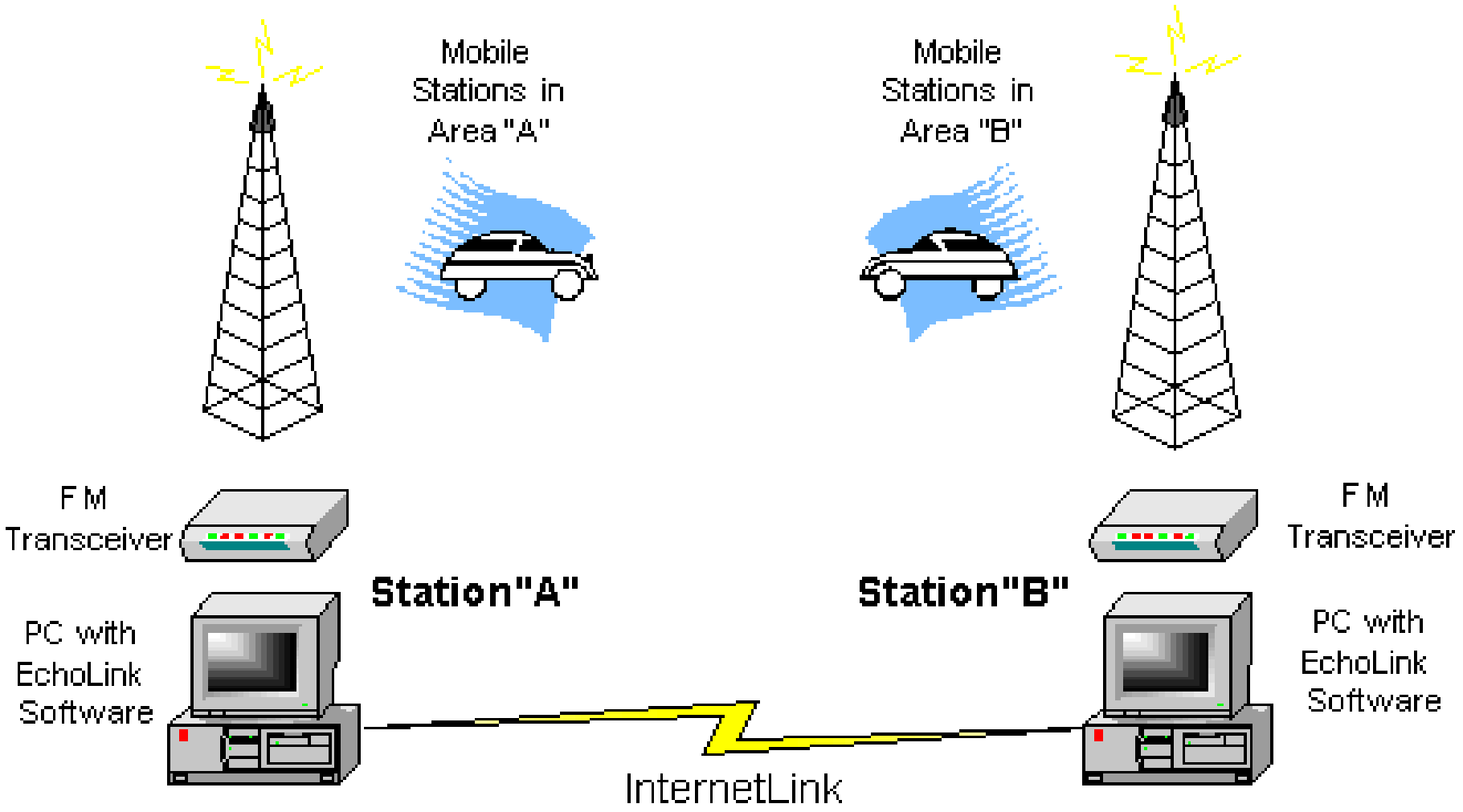
- A. Voice over Internet protocol
- B. Ionospheric propagation
- C. AC power lines
- D. PSK31

EchoLink and IRLP

EchoLink® software allows licensed Amateur Radio stations to communicate with one another over the Internet, using voice-over-IP (VoIP) technology. The program allows worldwide connections to be made between stations, or from computer to station, greatly enhancing Amateur Radio's communications capabilities. There are more than 170,000 registered users in 158 nations worldwide!

The IRLP uses Voice-Over-IP (VoIP) custom software and hardware. Coupled with the power of the Internet, IRLP will link your repeater site or simplex station to the world in a simple and cost effective way.

Linking Example



T6B06 (B)

What does the term IRLP describe?

- A. A method of encrypting data
- B. A method of linking between two or more amateur stations using the Internet
- C. A low powered radio using infra-red frequencies
- D. An international logging program.

Internet Radio Linking Project allows you to access the internet through your radio!

T6B02 (A)

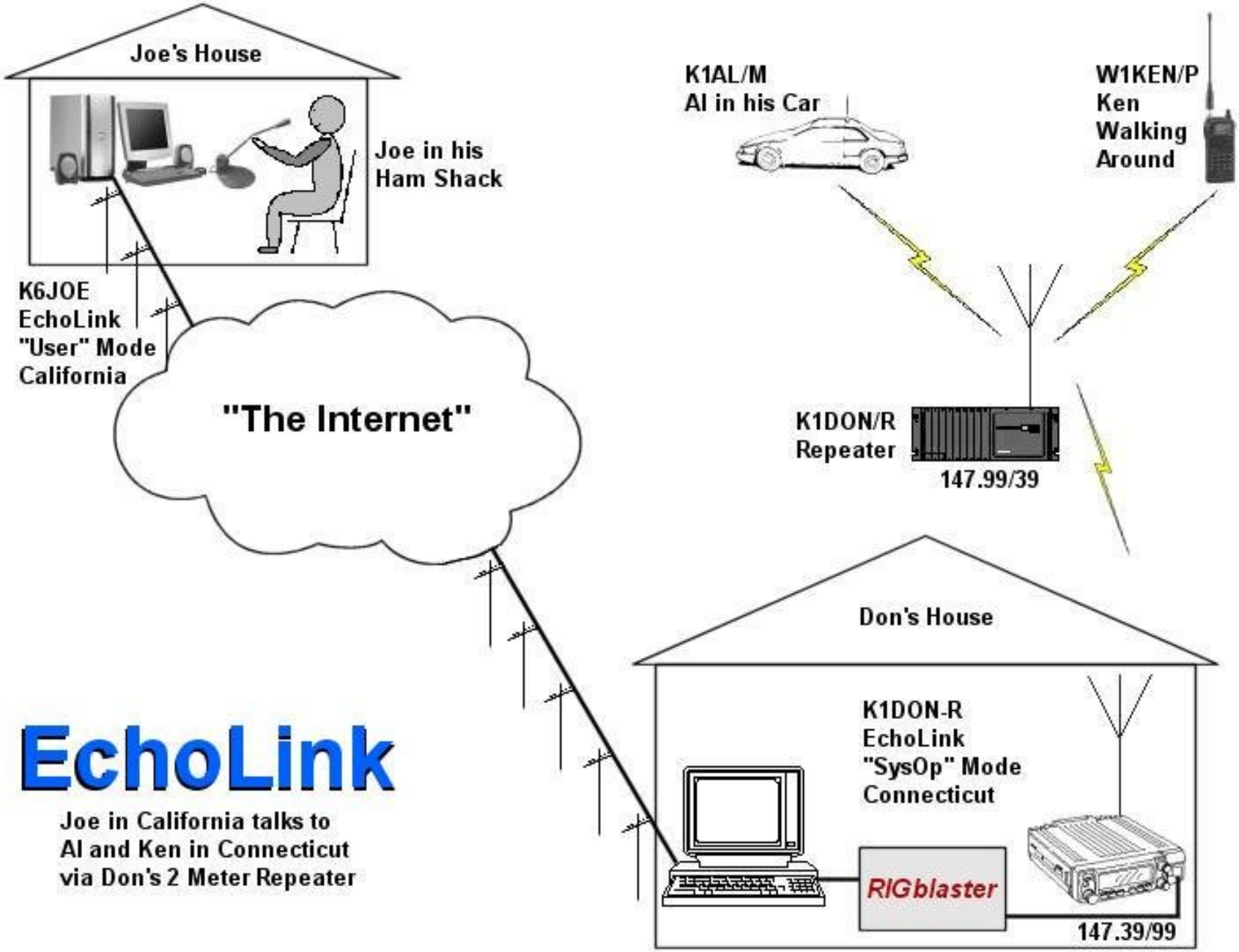
What does the abbreviation IRLP mean?

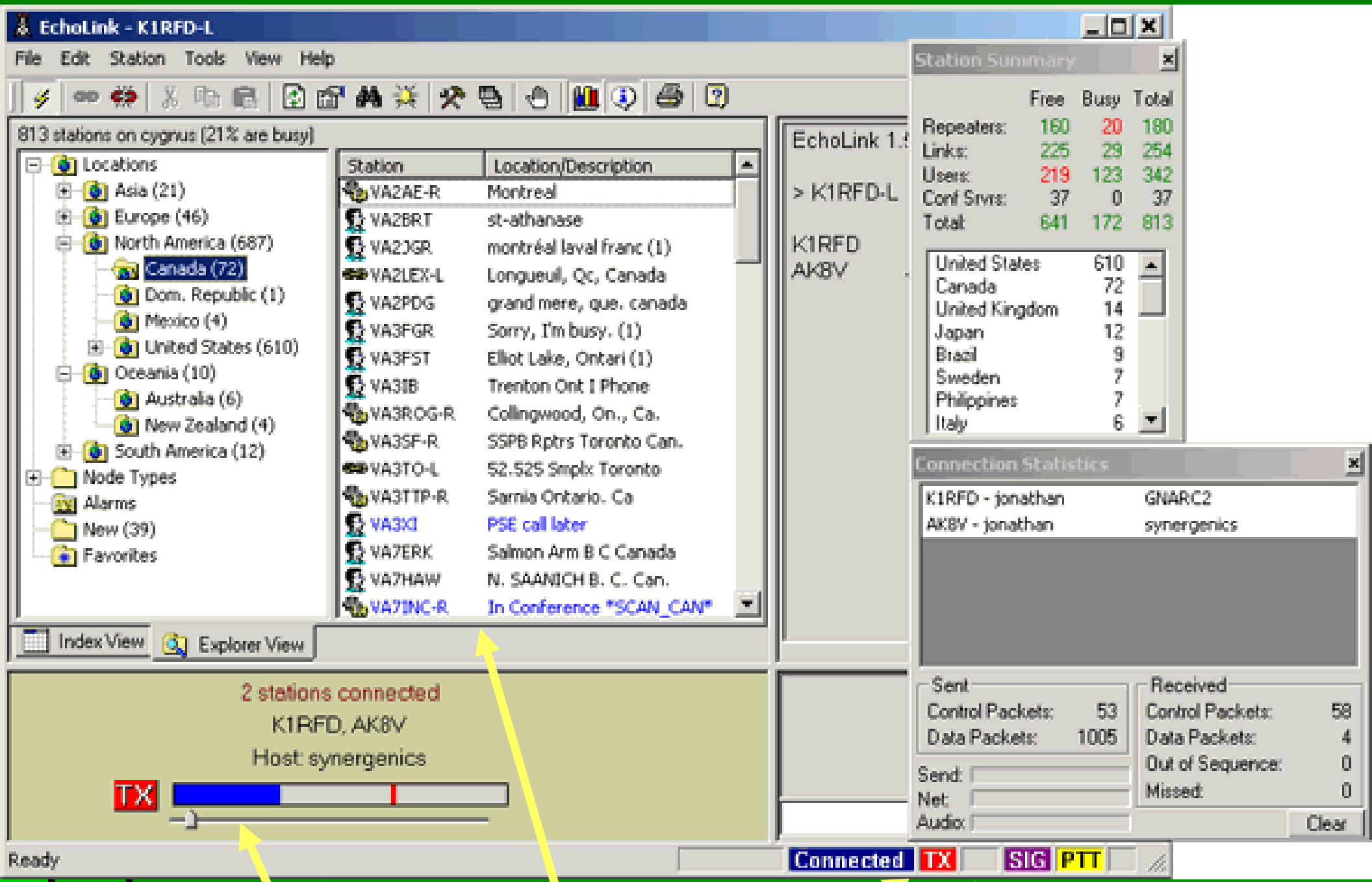
- A. Internet Radio Linking Project
- B. Internet Relay Language Protocol
- C. International Repeater Linking Project
- D. International Radio Linking Project

T6B05 (C)

What method is used to transfer data by IRLP?

- A. VHF Packet radio
- B. PSK31
- C. Voice over Internet protocol
- D. None of these answers are correct

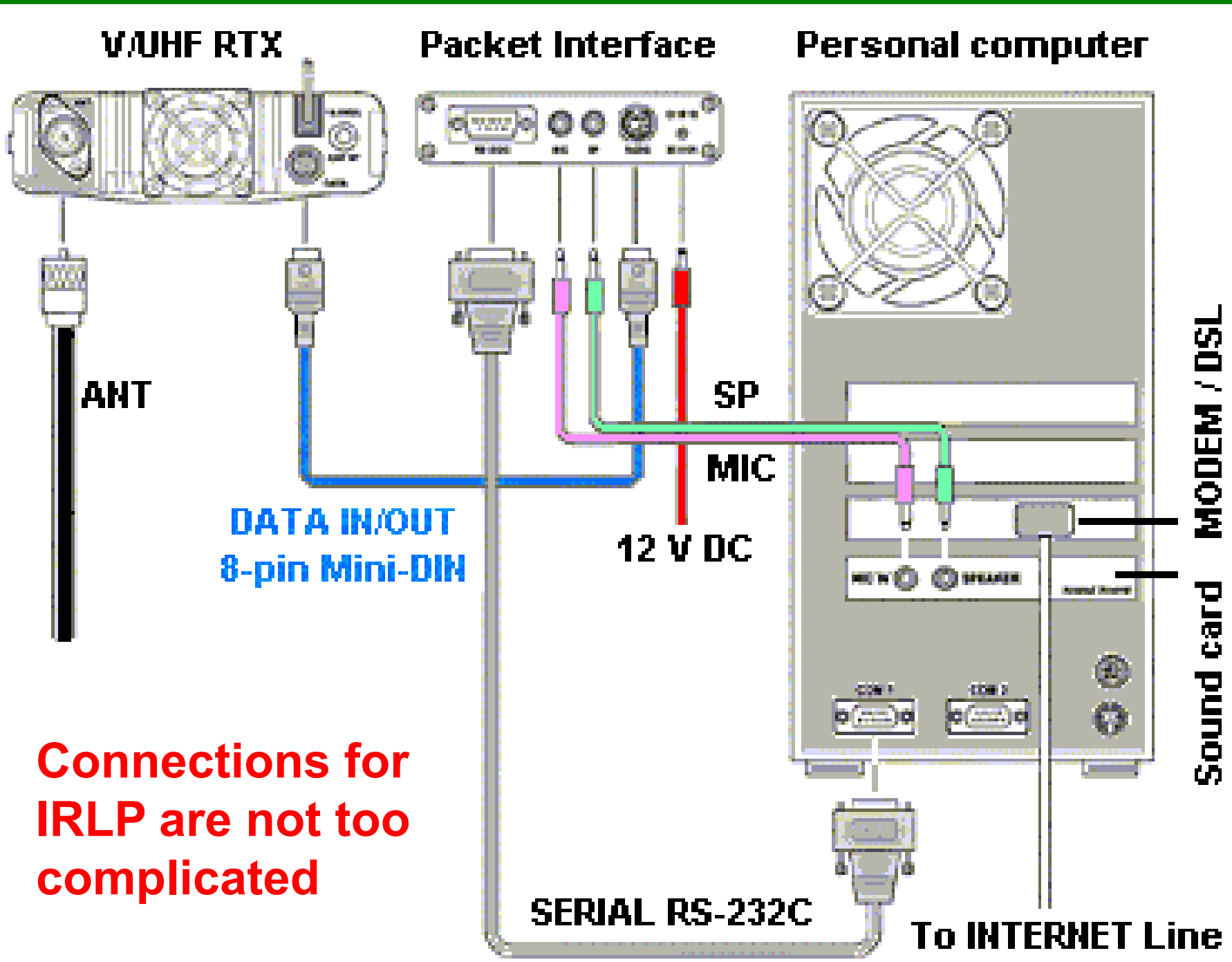

Joe's House
Joe in his
Ham Shack
K6JOE
EchoLink
"User" Mode
California
"The Internet"
K1AL/M
Al in his Car
W1KEN/P
Ken
Walking
Around
K1DON/R
Repeater
147.99/39
Don's House
K1DON-R
EchoLink
"SysOp" Mode
Connecticut
RIGblaster
147.39/99
EchoLink
Joe in California talks to
Al and Ken in Connecticut
via Don's 2 Meter Repeater
NODE



Audio Level

Station List World Wide

Annunciators



Connections for IRLP are not too complicated

T6B11 (D)

When using a portable transceiver how do you select a specific IRLP node?

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

EchoLink Nodes Are Easy To Find

GLENDORA, CA
I found these nodes within 25 miles from my Zip Code: 91740

Node	Call	State	Freq.	PL/DCS	Miles
3558	NZ6L	CA	223.7200	100	2.24
3448	KJ6KB	CA	145.7250	250.30	4.69
3480	WA6LA	CA	145.3800	100.00	4.69
3460	WA6LA	CA	223.7800	100.00	4.69
3609	K6GTZ	CA	51.5000	100.00	11.78
3884	N6EW	CA	445.3200		14.57
3114	W6VLD	CA	445.5800	94.80	15.48
3745	KE6HRV	CA	144.4800	88.50	17.16
3125	K6CBS	CA	224.5600	77Hz	20.23
3030	KB6THO	CA	224.4800	110.90	24.05
3339	W6DVI	CA	147.5250	114.8	24.65

T6B10 (C)

Where might you find a list of active nodes using VoIP?

- A. The FCC Rulebook
- B. From your local emergency coordinator
- C. A repeater directory or the Internet
- D. The local repeater frequency coordinator

T6B07 (B)

Which one of the following allows computer-to-radio linking for voice transmission?

- A. Grid modulation
- B. EchoLink
- C. AMTOR
- D. Multiplex

T6B03 (B)

Who may operate on the Echolink system?

- A. Only club stations
- B. Any licensed amateur radio operator
- C. Technician class licensed amateur radio operators only
- D. Any person, licensed or not, who is registered with the Echolink system

T6B01 (C)

How is information transmitted between stations using Echolink?

- A. APRS
- B. PSK31
- C. Internet
- D. Atmospheric ducting

T6B08 (C)

What are you listening to if you hear a brief tone and then a station from Russia calling CQ on a 2-meter repeater?

- A. An ionospheric band opening on VHF
- B. A prohibited transmission
- C. An Internet-linked DX station
- D. None of these answers are correct

T6C01 (D)

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

- A. Single sideband voice
- B. Amateur television
- C. FM voice
- D. Packet radio

T6C01 (D)

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

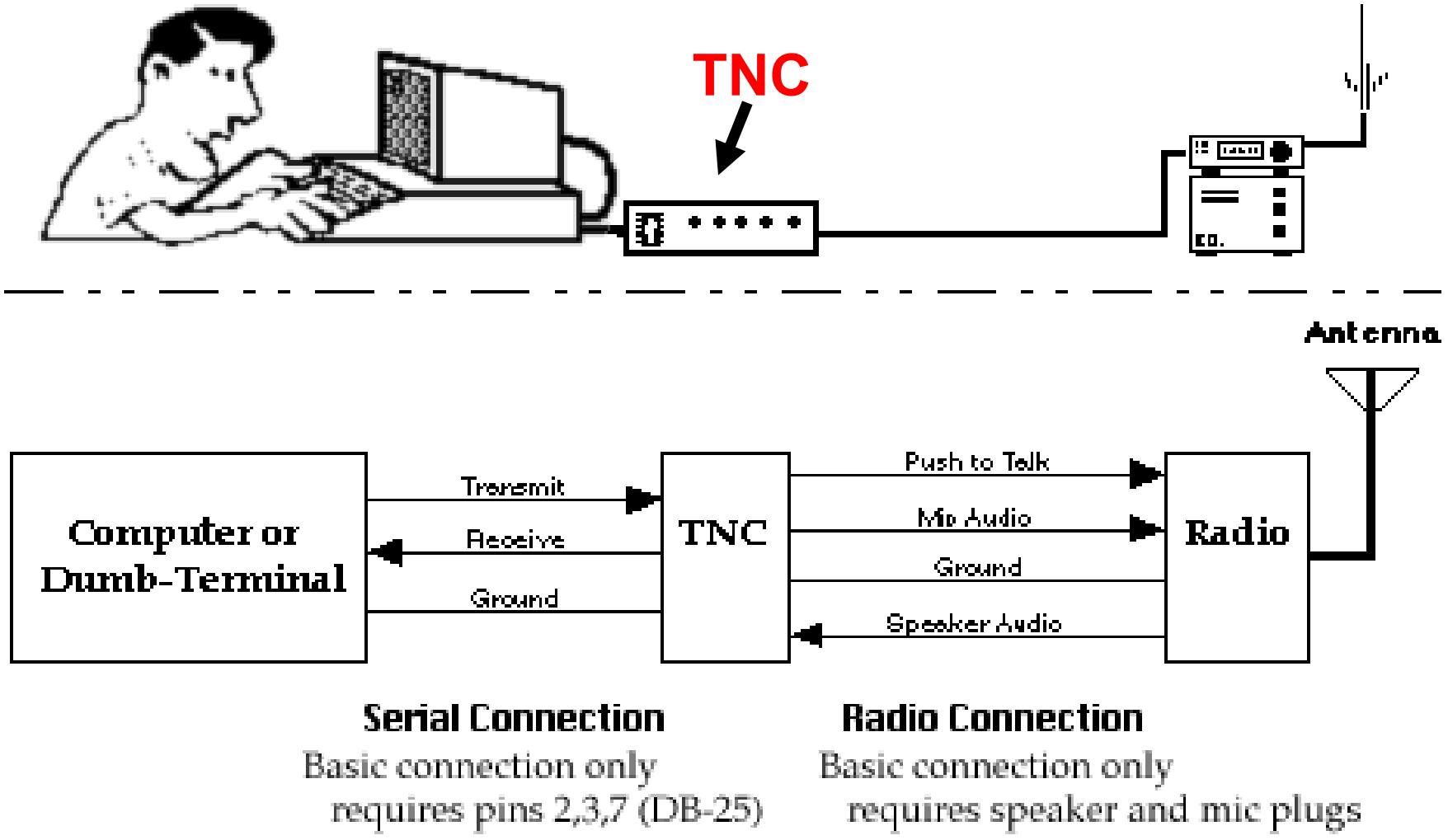
- A. Single sideband voice
- B. Amateur television
- C. FM voice
- D. Packet radio

T5A08 (C)

What is connected between the transceiver and computer terminal in a packet radio station?

- A. Transmatch
- B. Mixer
- C. Terminal Node Controller
- D. Antenna

Figure 1 –Packet Radio Station



Packet radio is great for emergency communications because the transfer of information is almost automatic

Portable Packet Station

TNC

T5A09 (D)

Which of these items is not required for a packet radio station?

- A. Antenna
- B. Transceiver
- C. Power source
- D. Microphone

T5A10 (B)

What can be used to connect a radio with a computer for data transmission?

- A. Balun
- B. Sound Card
- C. Impedance matcher
- D. Autopatch

T5D13 (B)

What is one of the reasons to use digital signals instead of analog signals to communicate with another station?

- A. Digital systems are less expensive than analog systems
- B. Many digital systems can automatically correct errors caused by noise and interference
- C. Digital modulation circuits are much less complicated than any other types
- D. All digital signals allow higher transmit power levels

T6C07 (D)

What is PSK31?

- A. A high-rate data transmission mode used to transmit files
- B. A method of reducing noise interference to FM signals
- C. A type of television signal
- D. A low-rate data transmission mode that works well in noisy conditions

T6C06 (B)

What does the abbreviation PSK mean?

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

T6C06 (B)

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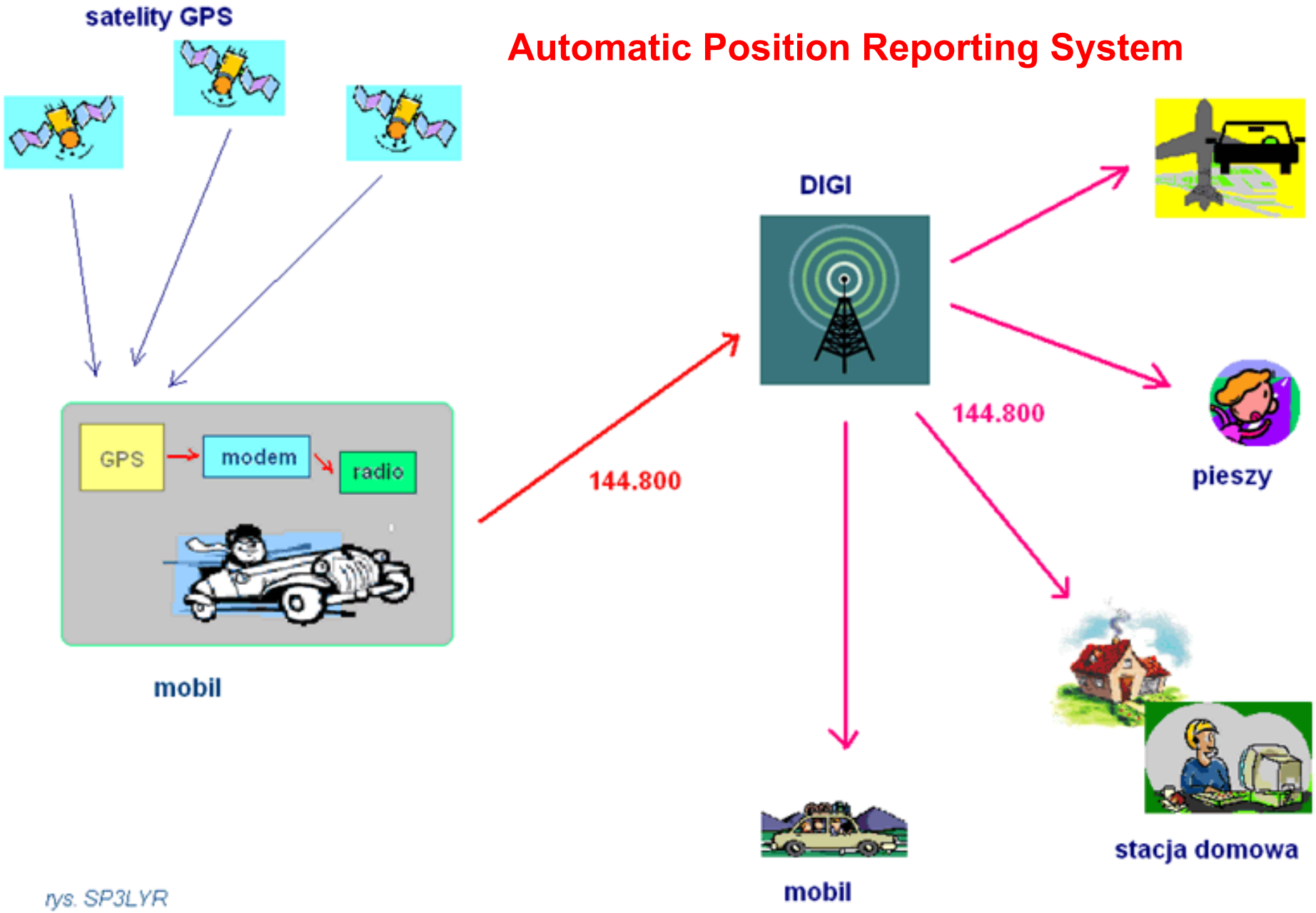
T6C02 (A)

What does the term APRS mean?

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

Automatic Position Reporting System



rys. SP3LYR

T6C03 (D)

What item is required along with your normal radio for sending automatic location reports?

- A. A connection to the vehicle speedometer
- B. A connection to a WWV receiver
- C. A connection to a broadcast FM sub-carrier receiver
- D. A global positioning system receiver

“GPS”

Tranceivers

GPS Unit

T7B08 (C)

What is the name of the group that coordinates the building and/or launch of the largest number of amateur radio satellites?

- A. NSA
- B. USOC
- C. **AMSAT**
- D. FCC

T7B05 (D)

What is a satellite beacon?

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

T7B05 (D)

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Satellite Beacon & Data Frequencies

This mode requires a 70 cm SSB/CW transmitter and a 2 meter SSB/CW receiver and supports CW and voice. Some satellites also support RTTY and SSTV in this mode.

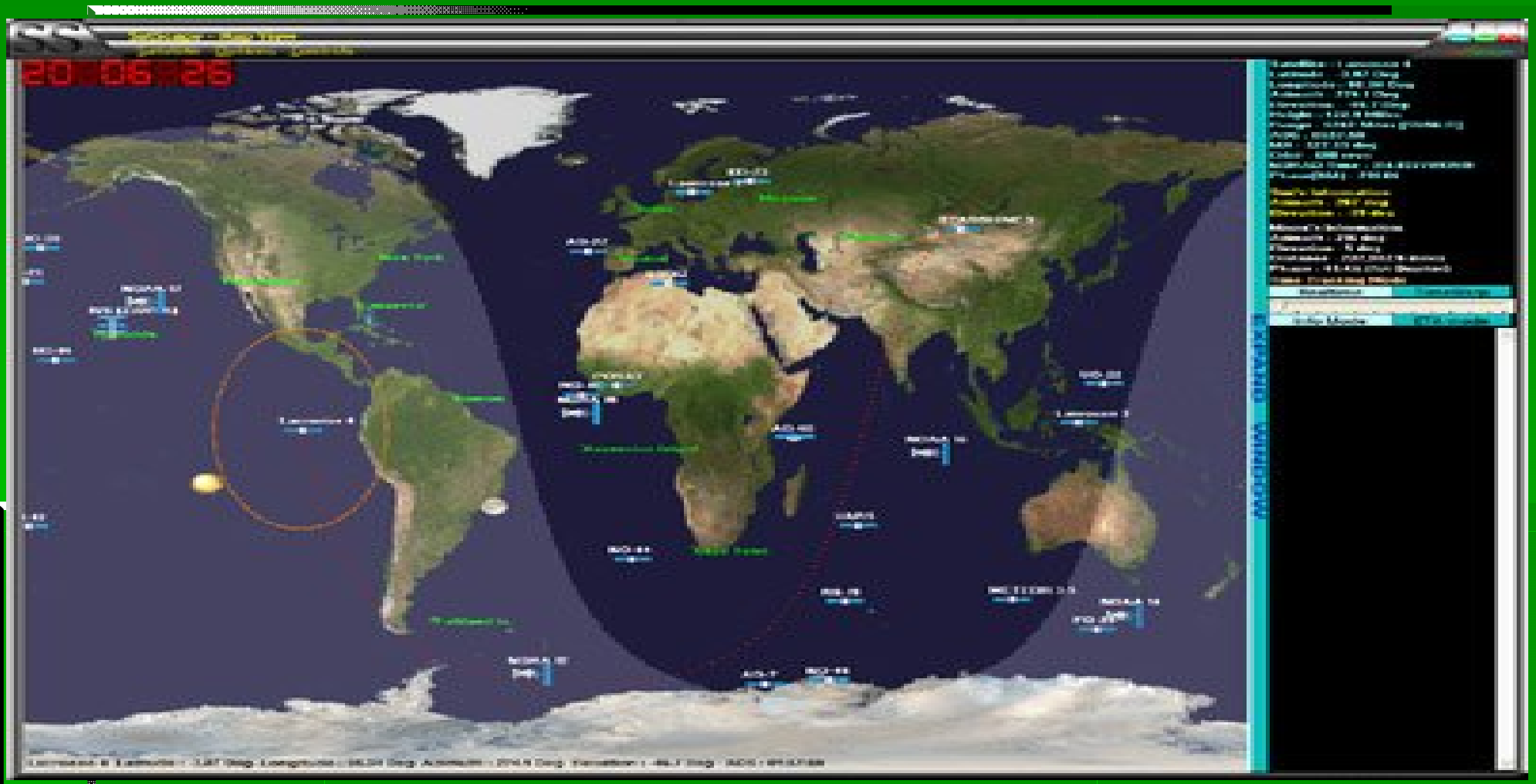
Designation	Frequencies	Transponder / Beacon
AO - 10	Downlink 145.810	B
	Downlink 145.825- .975	T
	Downlink 145.987	B
	Uplink 435.027- .179	T

T7B06 (D)

What should you use to determine when you can access an amateur satellite?

- A. A GPS receiver
- B. A field strength meter
- C. A telescope
- D. A satellite tracking program

Today's Satellite Tracking software is very colorful!



T7B01 (D)

What class of license is required to use amateur satellites?

- A. Only Extra class licensees can use amateur radio satellites
- B. General or higher class licensees who have a satellite operator certification
- C. Only persons who are AMSAT members and who have paid their dues
- D. Any amateur whose license allows them to transmit on the satellite uplink frequency

T7B02 (B)

How much power should you use to transmit when using an amateur satellite?

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

T7B03 (D)

What is something you can do when using an amateur radio satellite?

- A. Listen to the Space Shuttle
- B. Get global positioning information
- C. Make autopatch calls
- D. Talk to amateur radio operators in other countries

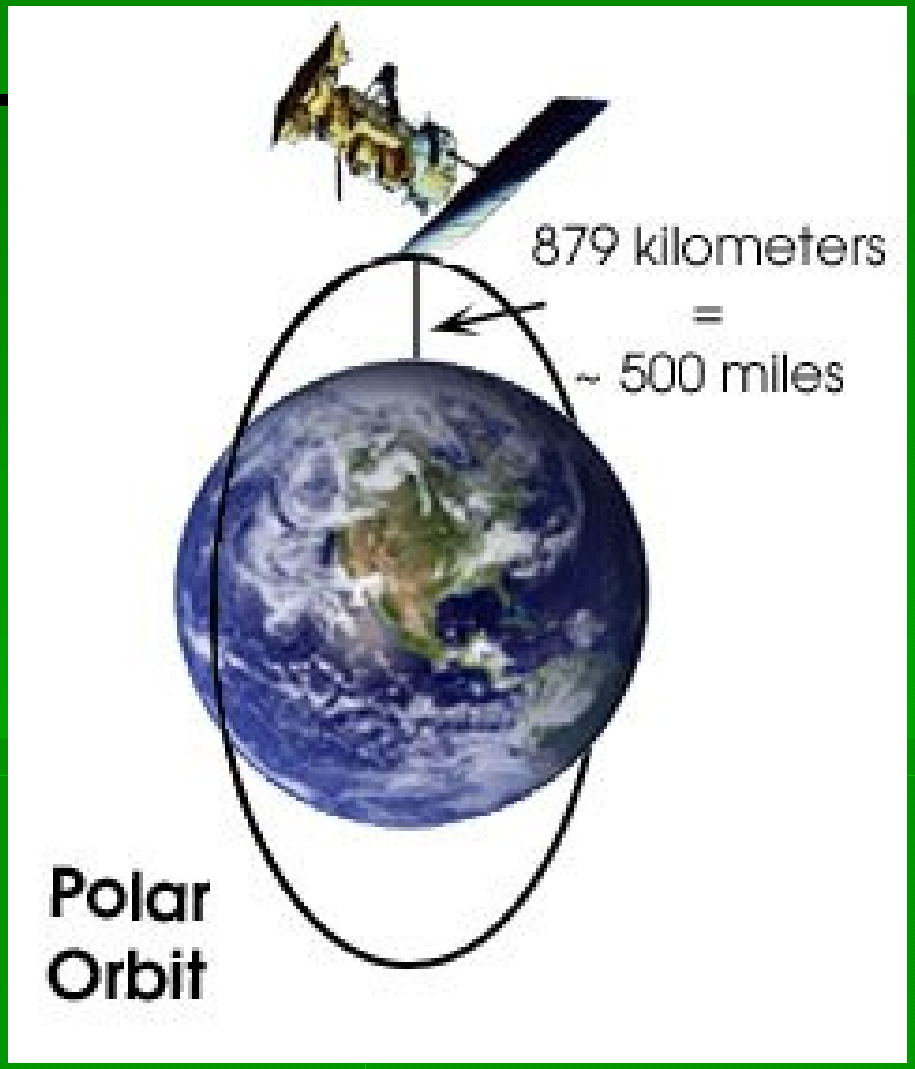
T7B11 (C)

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

Low Earth Orbiting Satellites

Polar orbiting satellites travel in a circular orbit moving from pole to pole. These satellites collect data in a swath beneath them as the earth rotates on its axis. In this way, a polar orbiting satellite can "see" the entire planet twice in a 24 hour period.



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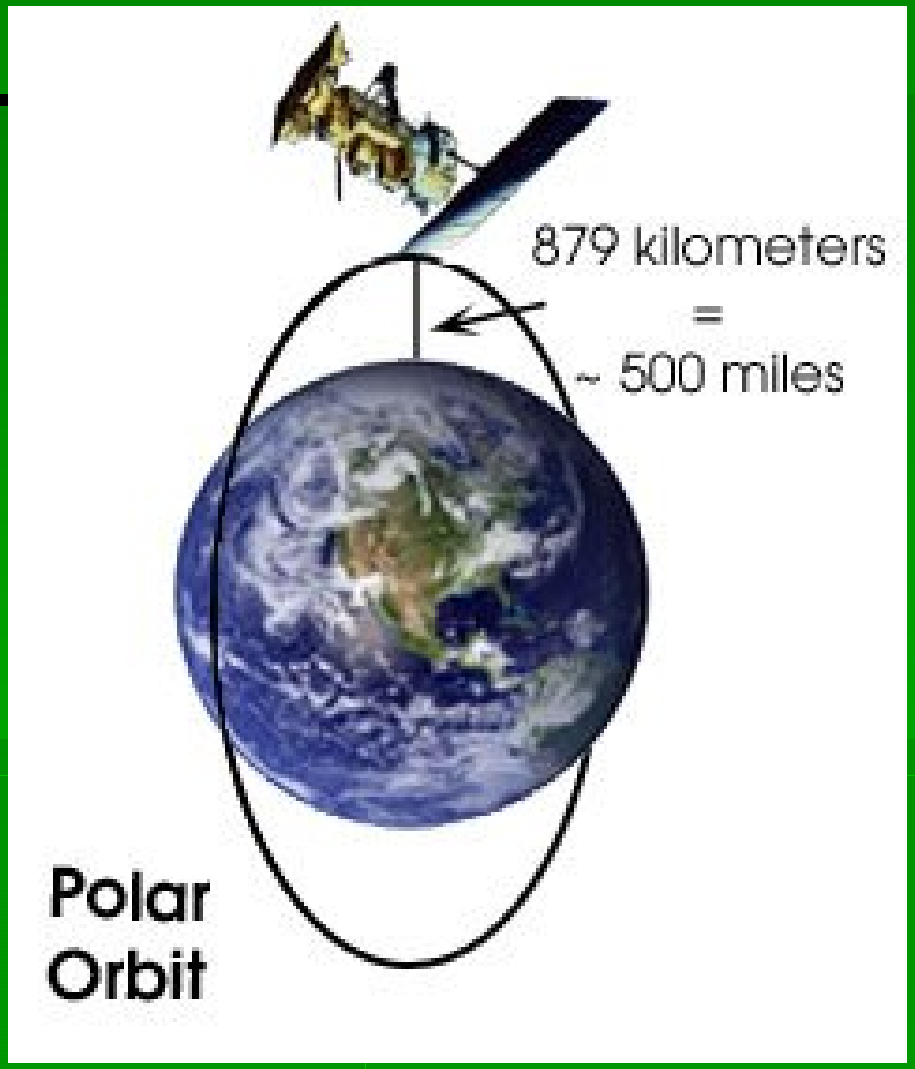
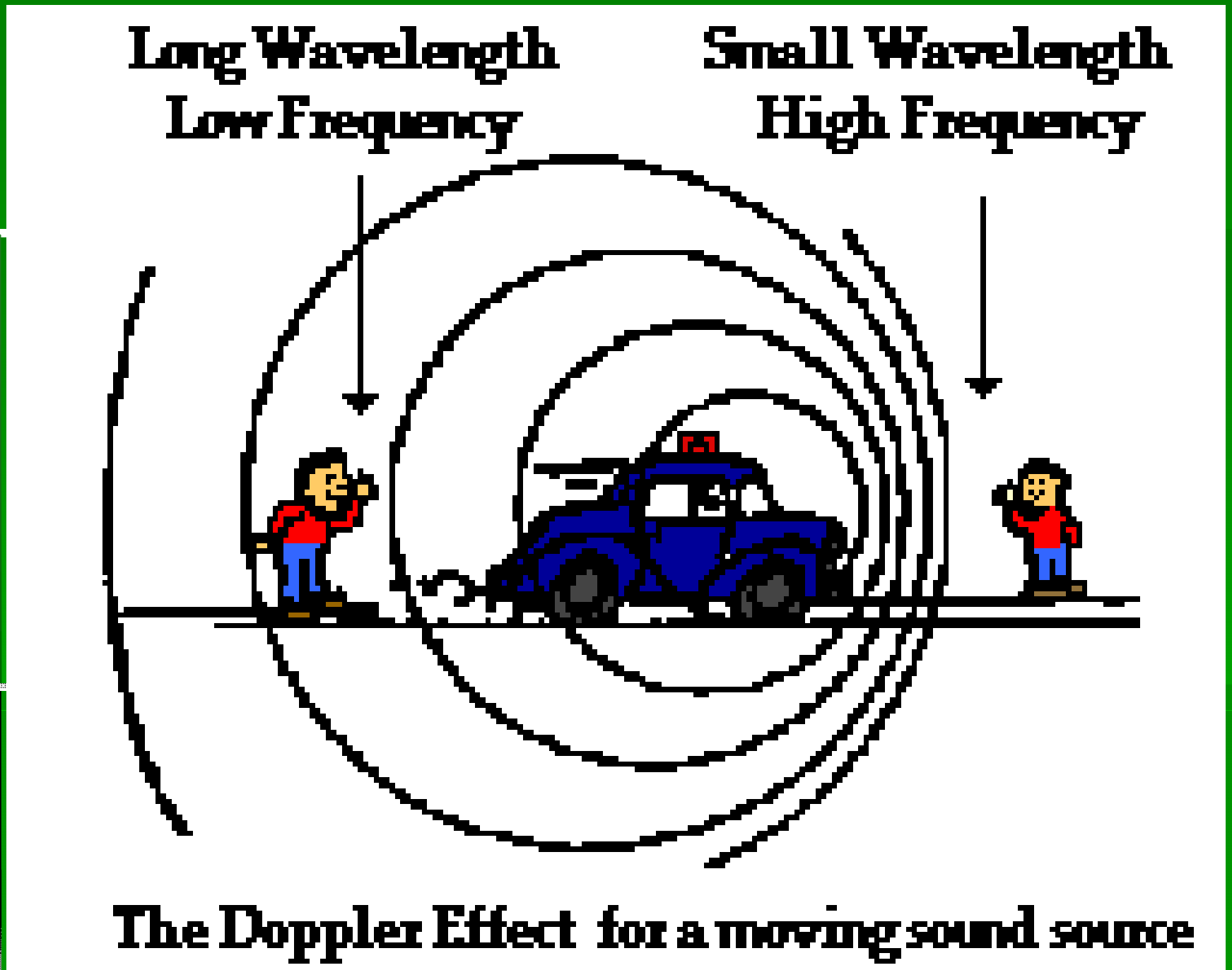


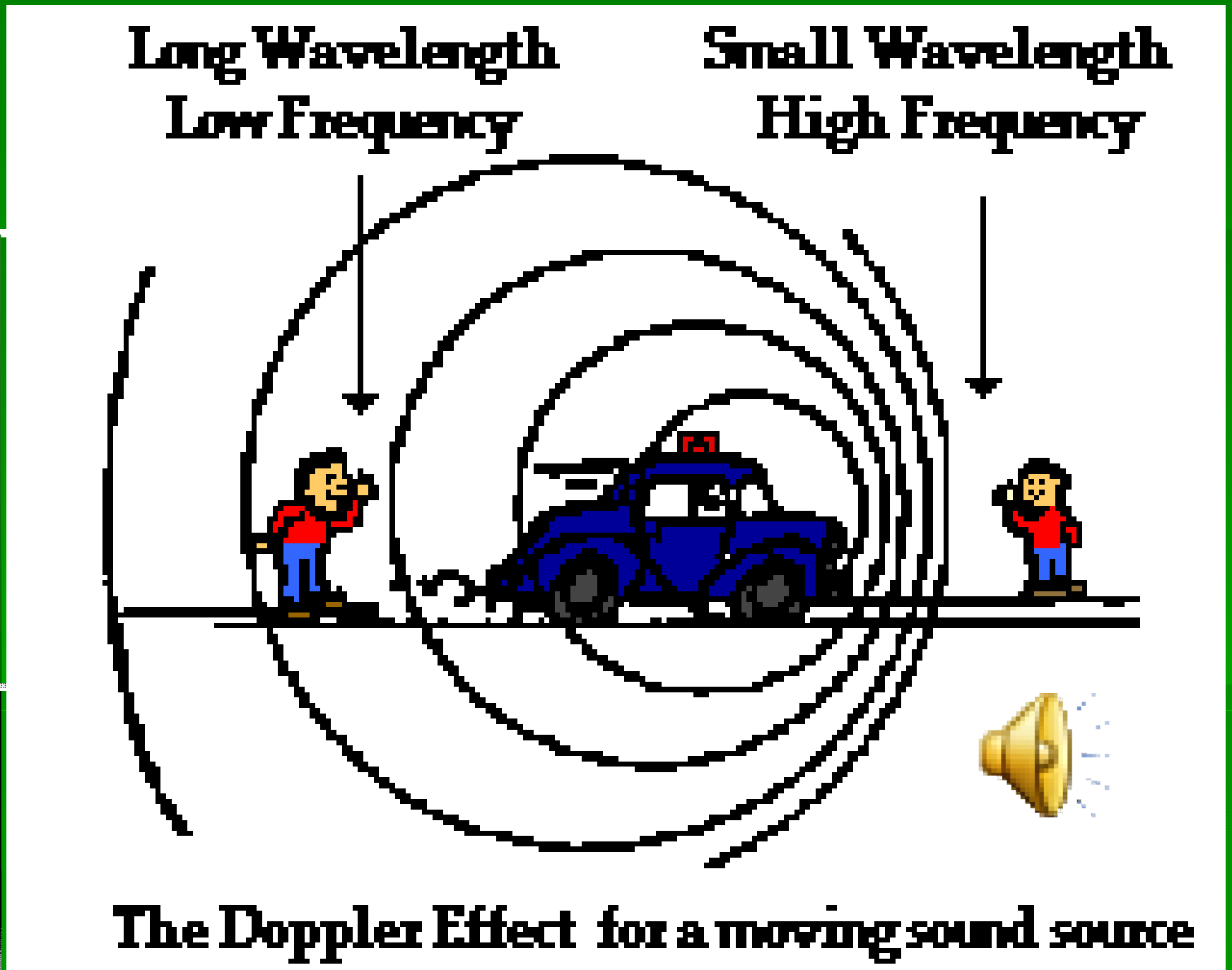
T7B07 (C)

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. A change in signal frequency caused by motion through space
- D. A special digital communications mode for some satellites



The Doppler Effect for a moving sound source



The Doppler Effect for a moving sound source

T7B09 (C)

What is a satellite sub-band?

- A. A special frequency for talking to submarines
- B. A frequency range limited to Extra Class licensees
- C. A portion of a band where satellite operations are permitted
- D. An obsolete term that has no meaning

T7B10 (B)

What is the satellite sub-band on 70-CM?

- A. 420 to 450 MHz
- B. 435 to 438 MHz
- C. 440 to 450 MHz
- D. 432 to 433 MHz

T7B04 (B)

Who may make contact with an astronaut on the International Space Station using amateur radio frequencies?

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

YOU will be able to talk to Astronauts!

ARISS Astronauts Talk With Hams On Earth

Mike Fincke, KE5AIT

Michael Foale, KB5UAC

John Phillips, KE5DRY

Bandwidth & Interference (p. 132)

T6A06 (C)

Which emission type has the narrowest bandwidth?

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

T6A01 (C)

What are phone transmissions?

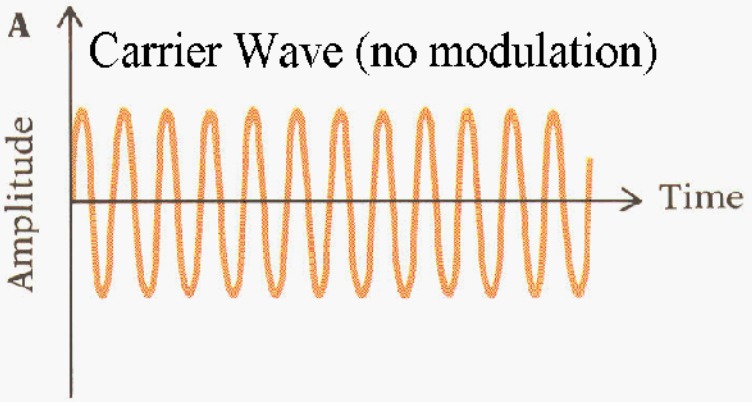
- A. The use of telephones to set up an amateur radio contact
- B. A phone patch between amateur radio and the telephone system
- C. Voice transmissions by radio
- D. Placing the telephone handset near a radio transceiver's microphone and speaker to relay a telephone call

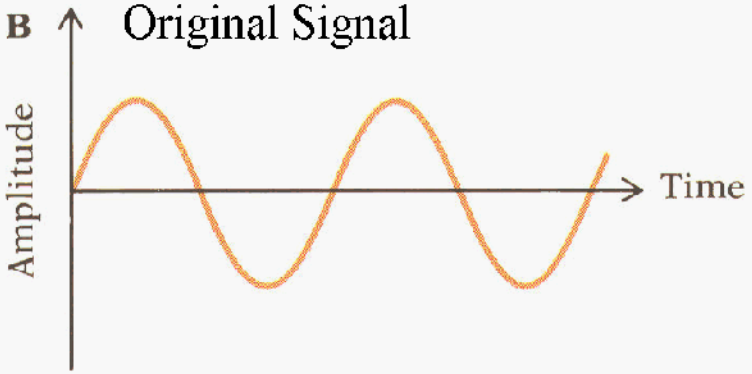
T6A05 (D)

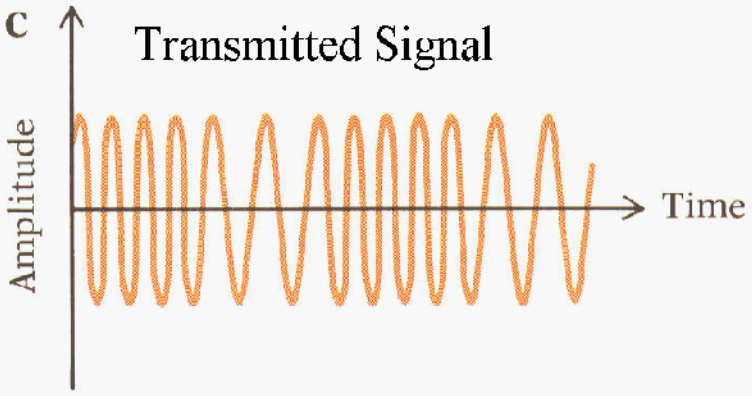
Which type of modulation is most commonly used for VHF and UHF voice repeaters?

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

Frequency Modulation gives the best sound quality just like commercial FM broadcast radio







The need for Modulation

If modulation techniques were not used, it would not be possible to have more than one radio station operating in the same area. This is because there would be no way of distinguishing between them at the receiver.

Frequency Modulated Signal

T6A10 (C)

What is the approximate bandwidth of a frequency-modulated voice signal?

- A. Less than 500 Hz
- B. About 150 kHz
- C. Between 5 and 15 kHz
- D. More than 30 kHz

T6A11 (B)

What is the normal bandwidth required for a conventional fast-scan TV transmission using combined video and audio on the 70-centimeter band?

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

AMATEUR TELEVISON REPEATERS IN SOUTHERN CALIFORNIA

T6C04 (C)

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. A standard fast scan color television signal
- D. A frame compression scheme for TV signal

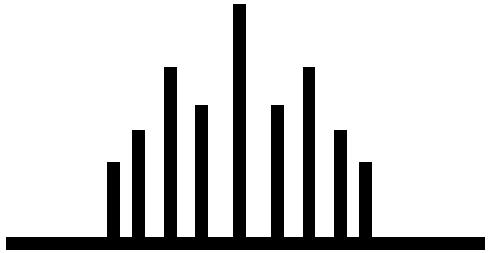
T6A02 (C)

Which of the following is a form of amplitude modulation?

- A. Frequency modulation
- B. Phase modulation
- C. Single sideband
- D. Phase shift keying

(SSB) AM radio communication technique in which the transmitter suppresses one sideband and therefore transmits only a single sideband.

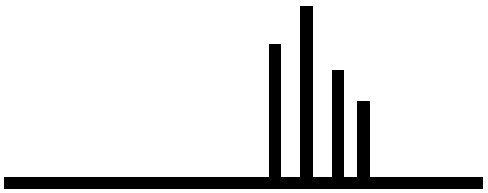
Double Side-band or Amplitude Modulation.



LSB USB

Centre Line is the carrier wave.

Full transmission



No carrier wave, No Lower side band.

Only the Upper Side Band is being used.

T6A09 (D)

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

- A. 1 kHz
- B. 2 kHz
- C. Between 3 and 6 kHz
- D. Between 2 and 3 kHz

T6A08 (C)

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

- A. SSB signals are easier to tune in than FM signals
- B. SSB signals are less likely to be bothered by noise interference than FM signals.
- C. SSB signals use much less bandwidth than FM signals
- D. SSB signals have no advantages at all in comparison to other modes.

T3D07 (C)

What effect might a break in a cable television transmission line have on amateur communications?

- A. A break cannot affect amateur communications
- B. Harmonic radiation from the TV may cause the amateur transmitter to transmit off-frequency
- C. TV interference may result when the amateur station is transmitting, or interference may occur to the amateur receiver
- D. The broken cable may pick up very high voltages when the amateur station is transmitting

This may happen on the 2 meter band

T5D08 (C)

- What is the proper course of action to take when a neighbor reports that your radio signals are interfering with something in his home?
- A. You are not required to do anything
- B. Contact the FCC to see if other interference reports have been filed
- C. Check your station and make sure it meets the standards of good amateur practice
- D. Change your antenna polarization from vertical to horizontal

T5D05 (A)

- What should you do first if someone tells you that your transmissions are interfering with their TV reception?
- A. Make sure that your station is operating properly and that it does not cause interference to your own television
- B. Immediately turn off your transmitter and contact the nearest FCC office for assistance
- C. Tell them that your license gives you the right to transmit and nothing can be done to reduce the interference
- D. Continue operating normally because your equipment cannot possibly cause any interference

T3D02 (D)

Who is responsible for taking care of the interference if signals from your transmitter are causing front end overload in your neighbor's television receiver?

- A. You alone are responsible, since your transmitter is causing the problem
- B. Both you and the owner of the television receiver share the responsibility
- C. The FCC must decide if you or the owner of the television receiver is responsible
- D. The owner of the television receiver is responsible

But good hams will try to work with the owner to resolve the problem.

T5D09 (D)

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 answers are correct

T5A07 (D)

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?

- A. Low-pass filter
- B. High-pass filter
- C. Band pass filter
- D. Notch filter

NEVER put Notch filters on Satellite or cable TV coax!

T3D03 (C)

What is the major cause of telephone interference?

- A. The telephone wiring is inadequate
- B. Tropospheric ducting at UHF frequencies
- C. The telephone was not equipped with adequate interference protection when manufactured.
- D. Improper location of the telephone in the home

Telephone Choke Filters

The real problem is that manufacturers of inexpensive telephones often leave out choke filters

T5D03 (B)

What is the most likely cause of telephone interference from a nearby transmitter?

- A. Harmonics from the transmitter
- B. The transmitter's signals are causing the telephone to act like a radio receiver
- C. Poor station grounding
- D. Improper transmitter adjustment

T5D04 (C)

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

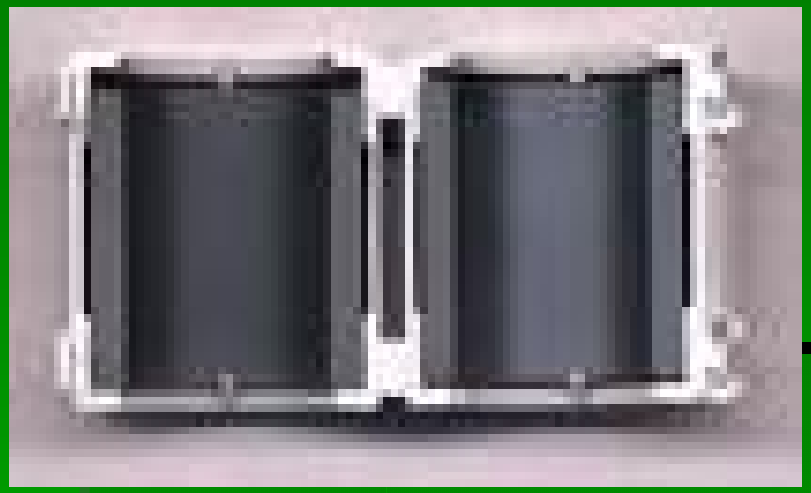
- A. Install a low-pass filter at the transmitter
- B. Install a high-pass filter at the transmitter
- C. Install an RF filter at the telephone
- D. Improve station grounding

T5D07 (D)

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. Notch and band-pass filters
- D. All of these answers are correct

FILTERS



T5D02 (B)

Which of the following is NOT a cause of radio frequency interference?

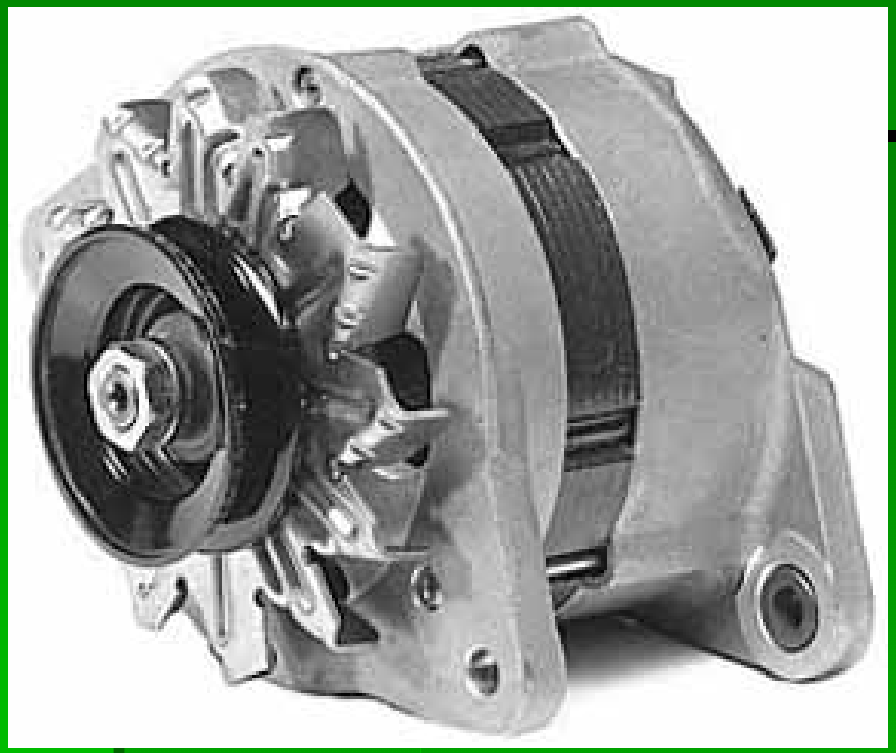
- A. Fundamental overload
- B. Doppler shift
- C. Spurious emissions
- D. Harmonics

T5D10 (D)

What could be happening if another operator tells you he is hearing a variable high-pitched whine on the signals from your mobile transmitter?

- A. Your microphone is picking up noise from an open window
- B. You have the volume on your receiver set too high
- C. You need to adjust your squelch control
- D. The power wiring for your radio is picking up noise from the vehicle's electrical system

Problem: Alternator Whine



Solution: Alternator Noise Supressor

T9B03 (B)

- What is the most likely cause of sudden bursts of tones or fragments of different conversations that interfere with VHF or UHF signals?
- A. The batteries in your transceiver are failing
- B. Strong signals are overloading the receiver and causing undesired signals to be heard
- C. The receiver is picking up low orbit satellites
- D. A nearby broadcast station is having transmitter problems

This usually only happens in the city where there are lots of radio operators!

T3D11 (C)

What is meant by receiver front-end overload?

- A. Too much voltage from the power supply
- B. Too much current from the power supply
- C. Interference caused by strong signals from a nearby source
- D. Interference caused by turning the volume up too high

T5D01 (C)

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

- A. Too much voltage from the power supply
- B. Too much current from the power supply
- C. Interference caused by very strong signals from a nearby source
- D. Interference caused by turning the volume up too high

T3D01 (D)

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

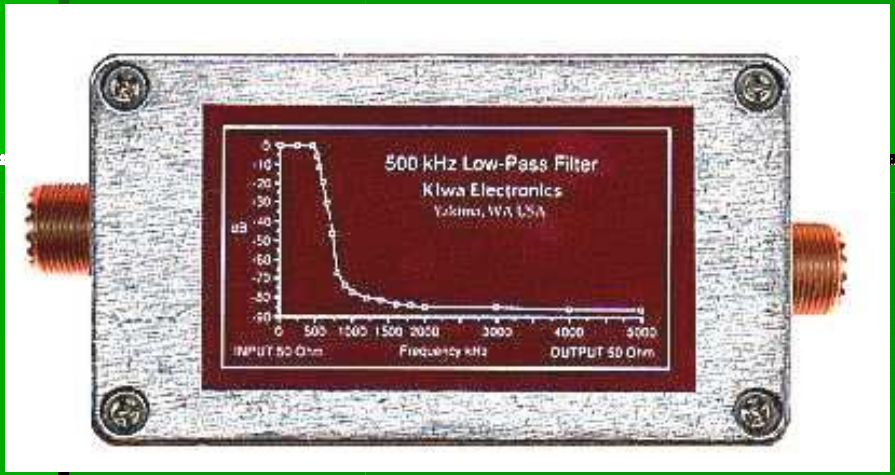
- A. Increase transmit power
- B. Change mode of transmission
- C. Report the interference to the equipment manufacturer
- D. Check transmitter for off frequency operation or spurious emissions

T5A06 (A)

Where must a filter be installed to reduce spurious emissions?

- A. At the transmitter
- B. At the receiver
- C. At the station power supply
- D. At the microphone

Low Pass, High Pass, and Band Pass Filters are used to reduce spurious emissions

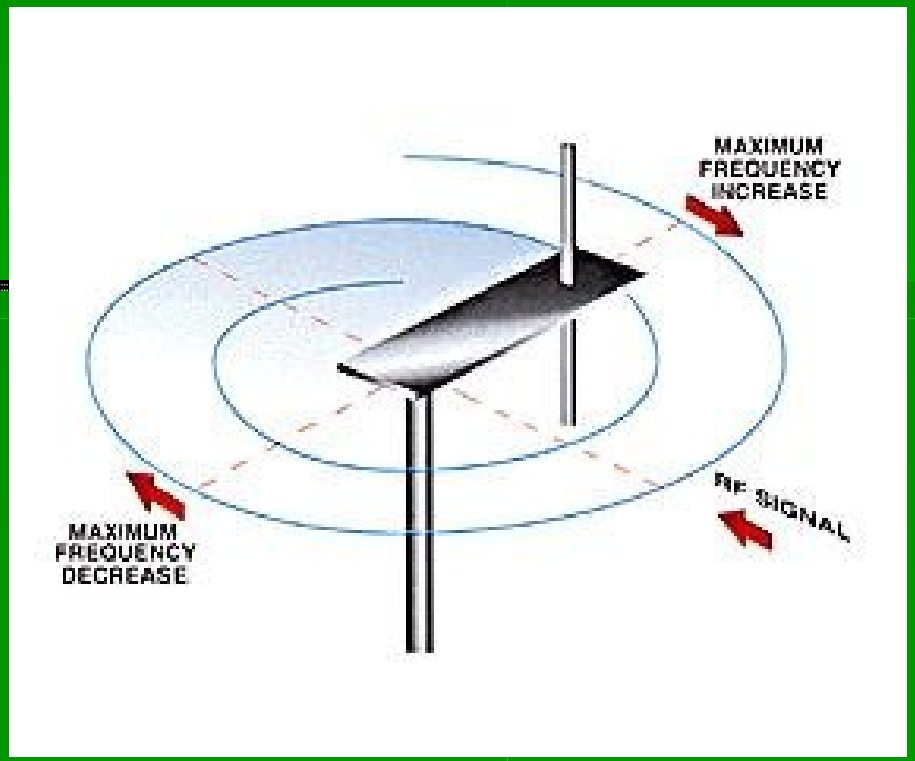


T7A05 (C)

What is a method used to locate sources of noise interference or jamming?

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

Equipment used to locate radio jammers



Volts & Amps (p. 142)

T4A13 (B)

What instrument is used to measure Electromotive Force (EMF) between two points such as the poles of a battery?

- A. Magnetometer
- B. Voltmeter
- C. Ammeter
- D. Ohmmeter

T4A06 (A)

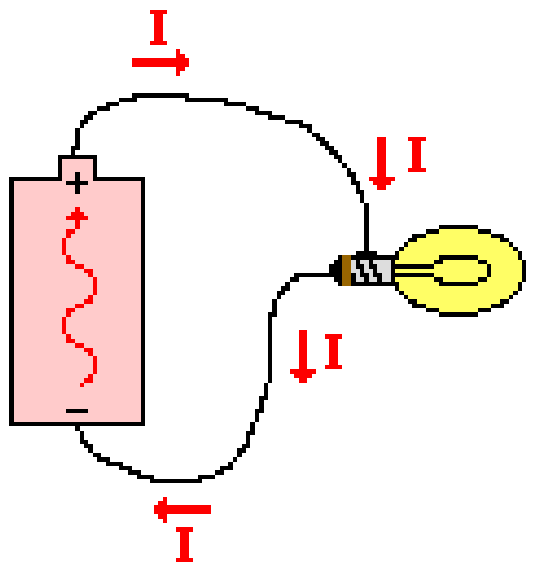
How much voltage does an automobile battery usually supply?

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

T4A03 (D)

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

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

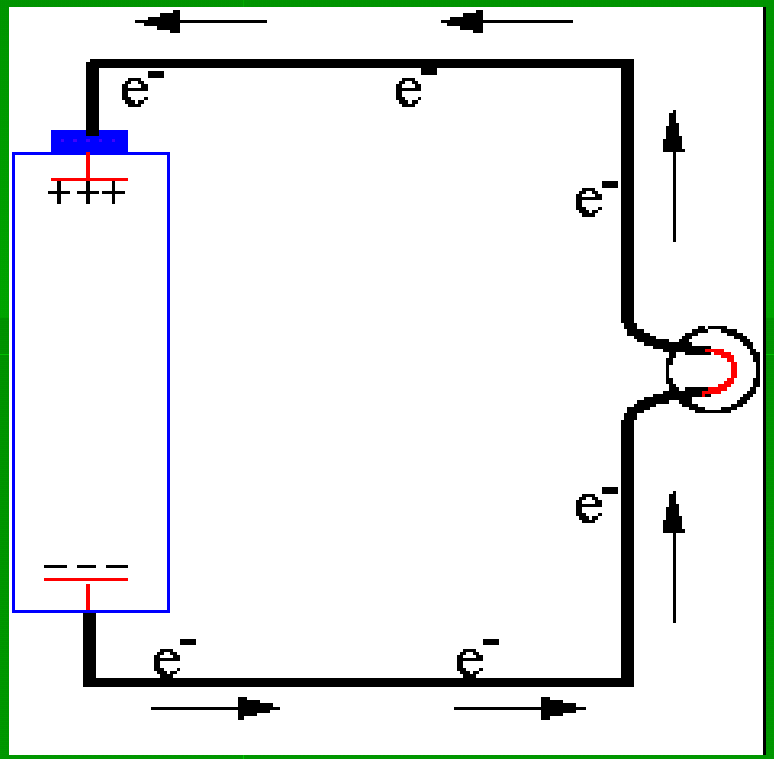


Electric current in the external circuit is directed from the positive to the negative terminal.

T4A04 (B)

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

- A. An alternating current
- B. A direct current
- C. A normal current
- D. A smooth current



T4A01 (D)

Electrical current is measured in which of the following units?

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

T4A12 (C)

What instrument is used to measure the flow of current in an electrical circuit?

- A. Frequency meter
- B. SWR meter
- C. Ammeter
- D. Voltmeter

T4A09 (C)

Which of the following is a good electrical conductor?

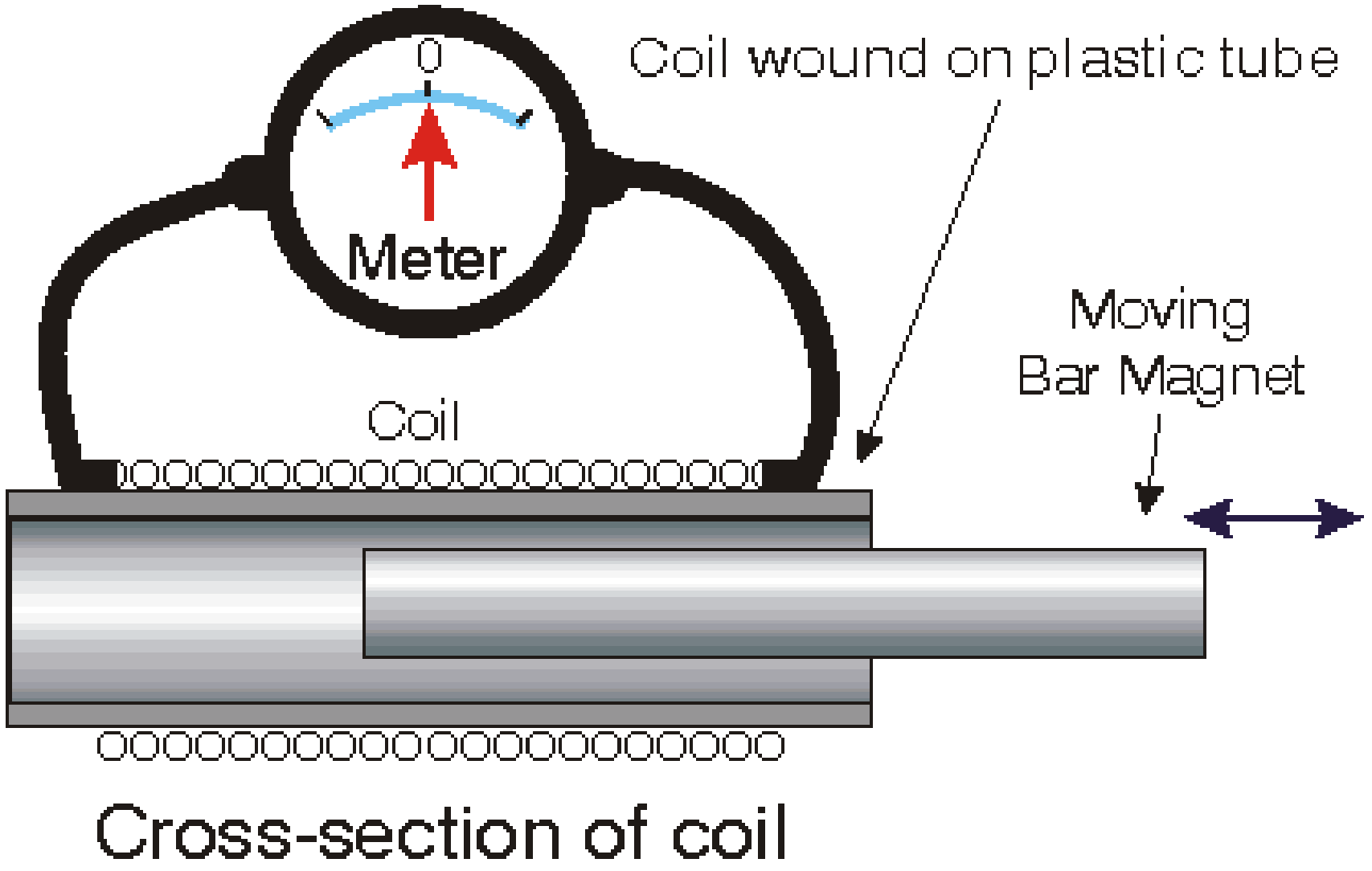
- A. Glass
- B. Wood
- C. Copper
- D. Rubber

T4A08 (A)

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

- A. An alternating current
- B. A direct current
- C. A circular current
- D. A vertical current

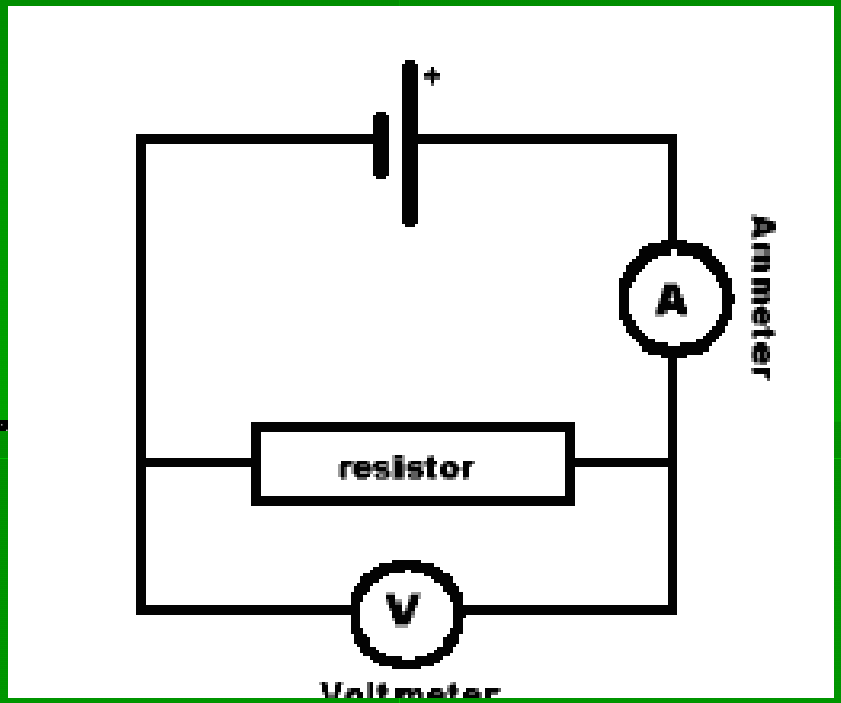
Alternating Current



T4A11 (B)

What is the term used to describe opposition to current flow in ordinary conductors such as wires?

- A. Inductance
- B. Resistance
- C. Counter EMF
- D. Magnetism

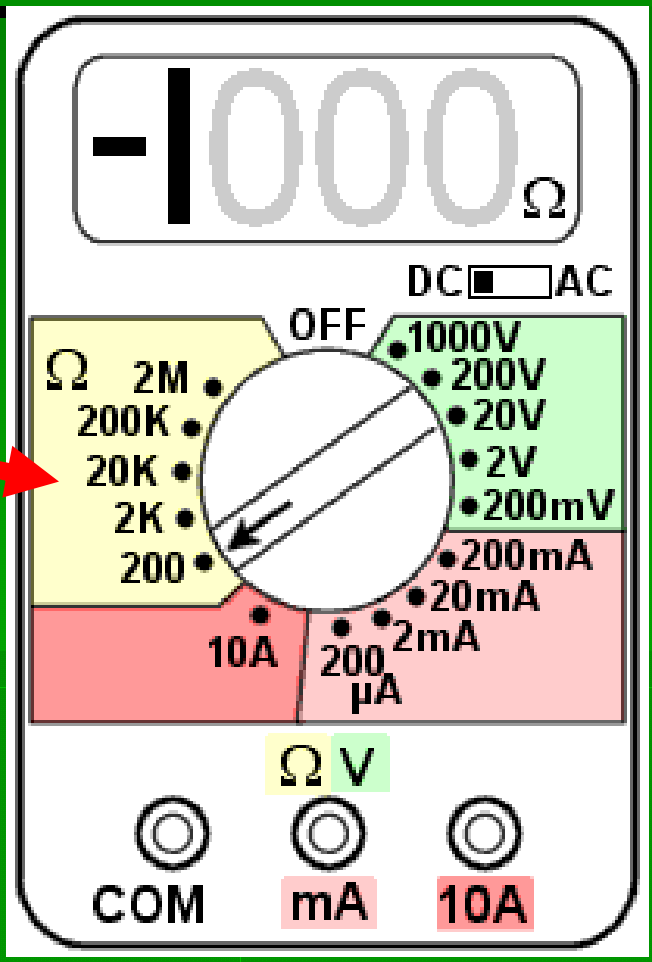


T4A07 (D)

What is the basic unit of resistance?

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

Georg Ohm



T4A10 (B)

Which of the following is a good electrical insulator?

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

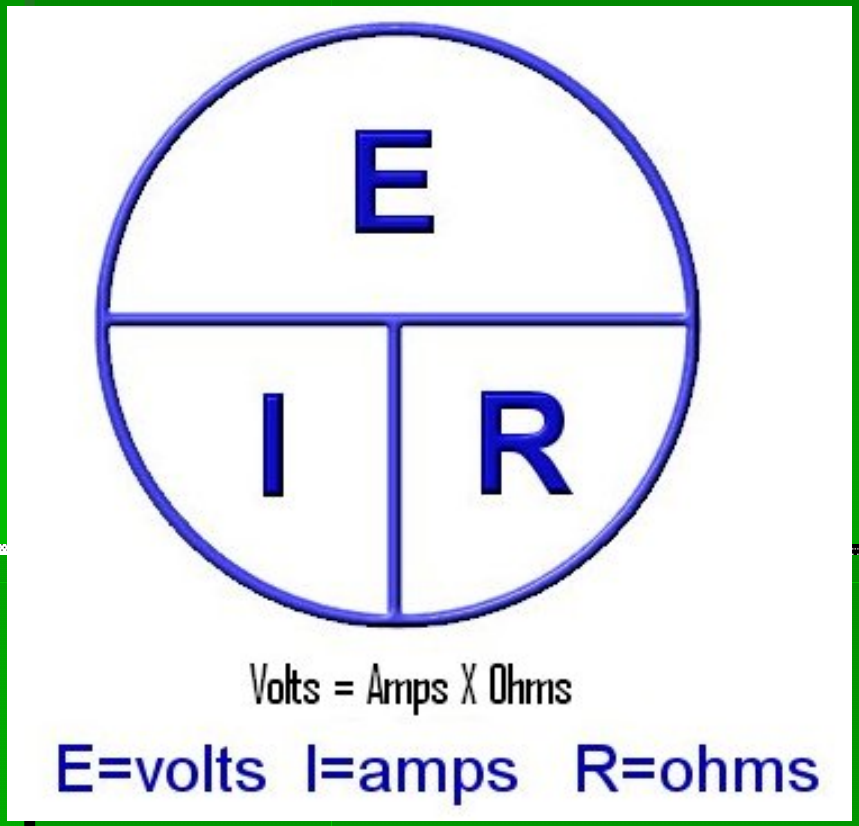
T4D02 (A)

What formula is used to calculate voltage in a circuit?

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

Voltage = Current X Resistance

Volts = Amps X Ohms

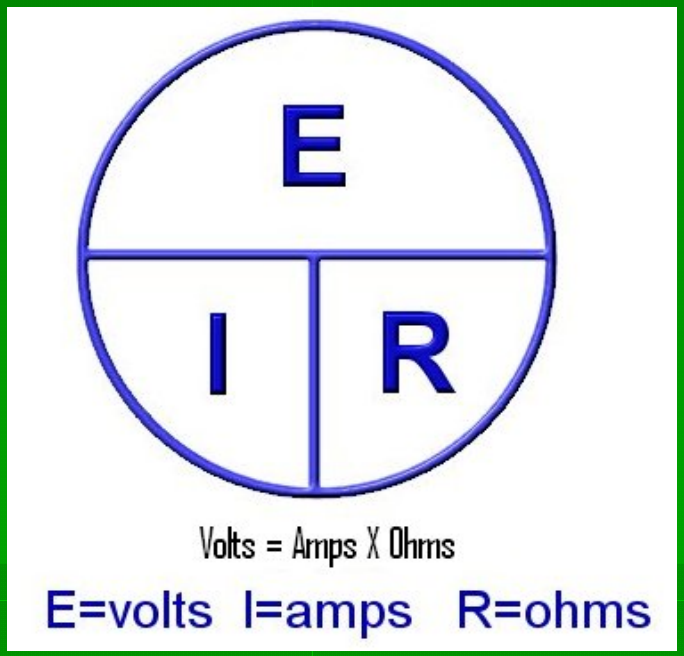


Use this magic circle on all of your Ohm's Law problems!

T4D07 (A)

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

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



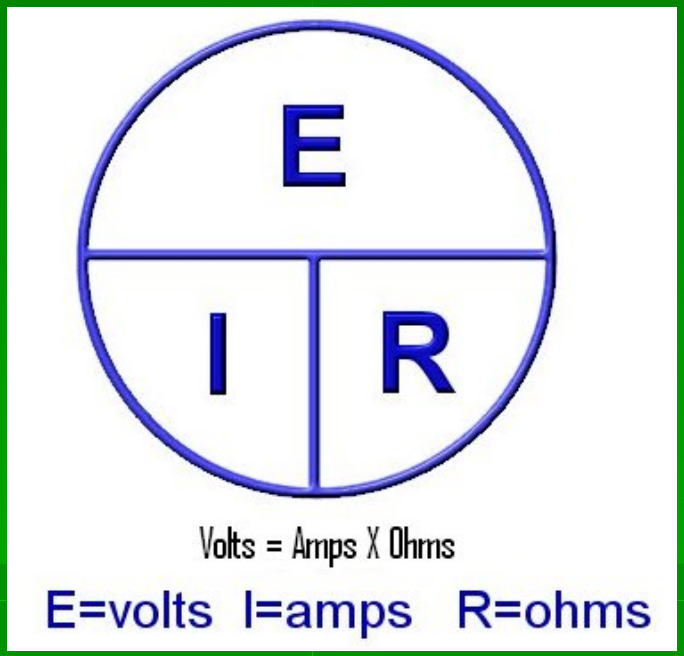
Use the Magic Circle

Volts = 0.5 amps X 2 ohms = 1 volt

T4D08 (A)

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

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

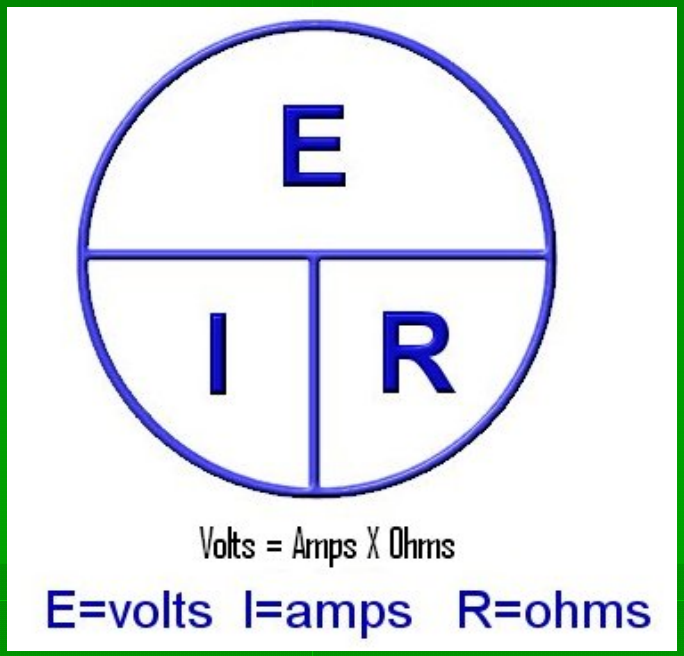


Use the Magic Circle
Volts = 1 amp X 10 ohms = 10 volts

T4D09 (A)

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

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

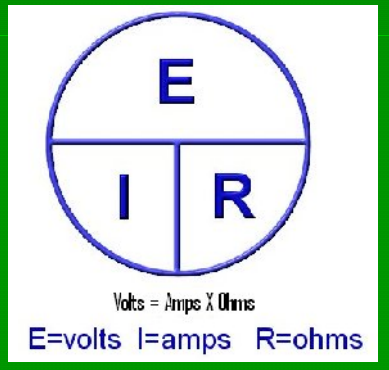


Use the Magic Circle
Volts = 2 amps X 10 ohms = 20 volts

T4D01 (B)

What formula is used to calculate current in a circuit?

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

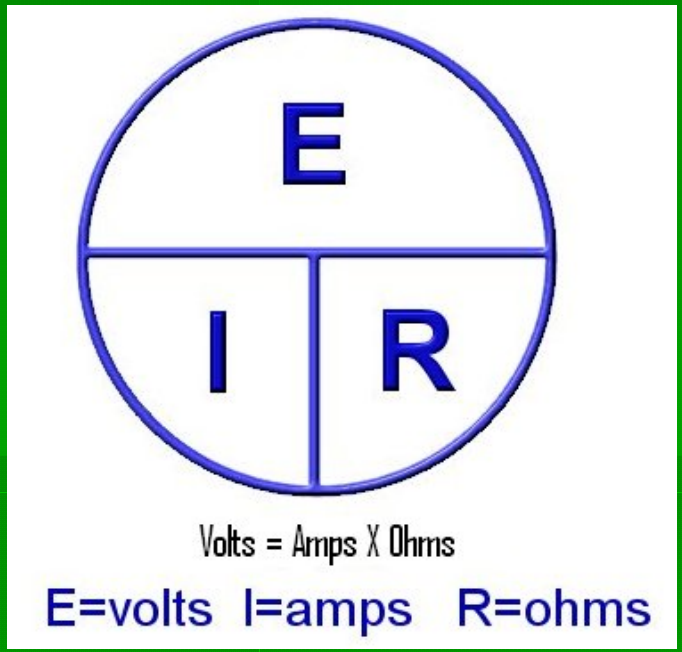


I = E ÷ R

T4D06 (D)

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

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

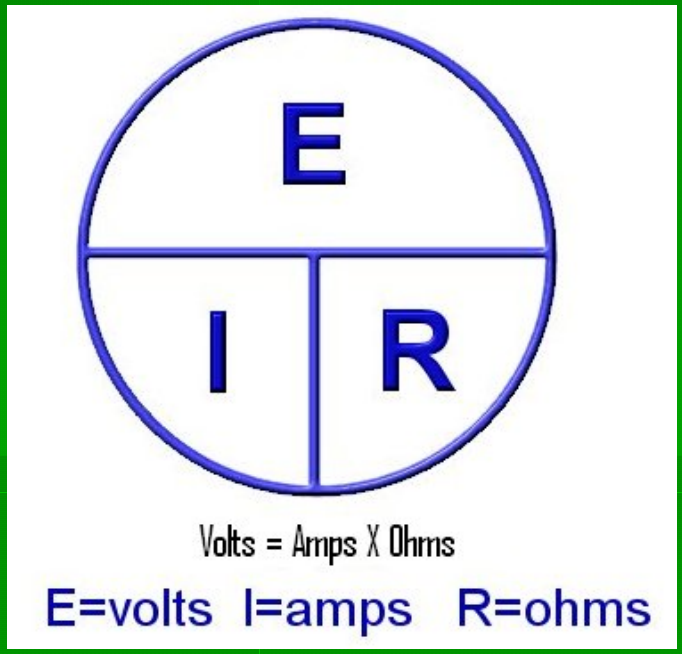


Amps = 120 volts ÷ 80 ohms = 1.5 amps

T4D10 (C)

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

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

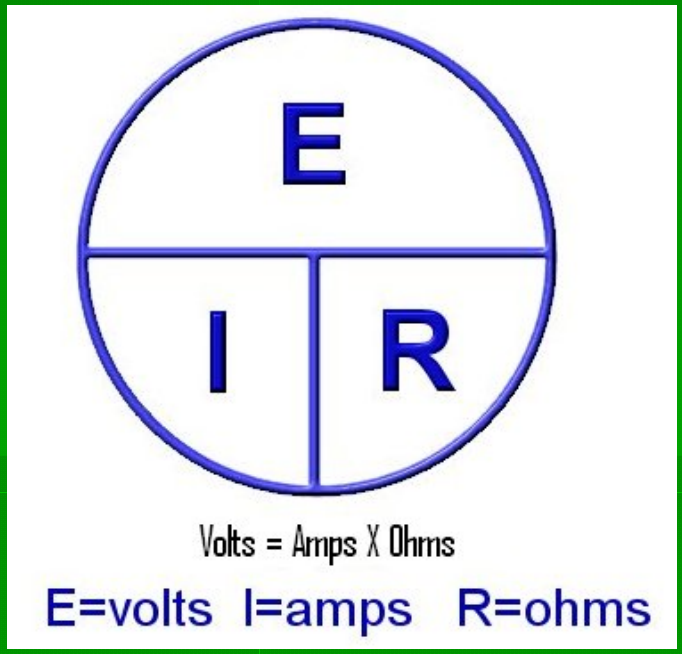


Amps = 200 volts ÷ 100 ohms = 2 amps

T4D11 (C)

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

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



Amps = 240 volts ÷ 24 ohms = 10 amps

T4D03 (B)

What formula is used to calculate resistance in a circuit?

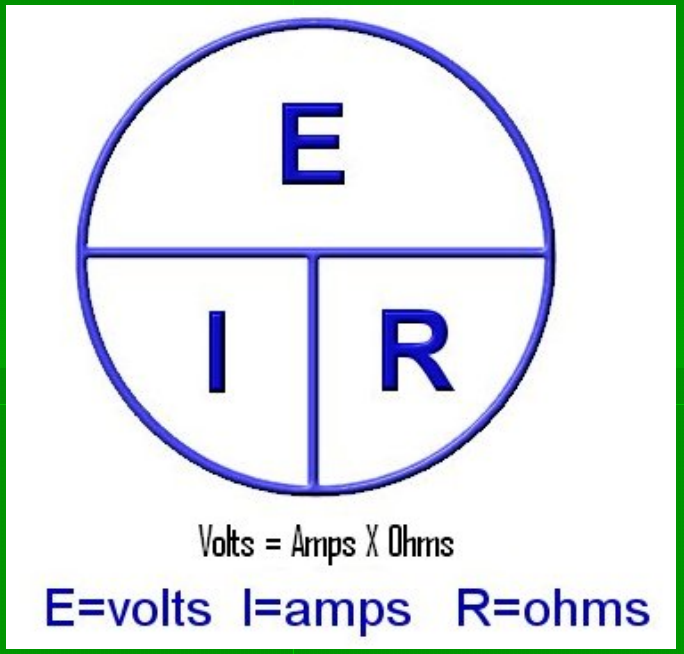
- A. Resistance (R) equals voltage (E) multiplied by current (I)
- B. Resistance (R) equals voltage (E) divided by current (I)
- C. Resistance (R) equals voltage (E) added to current (I)
- D. Resistance (R) equals voltage (E) minus current (I)

R = E ÷ I

T4D04 (B)

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

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

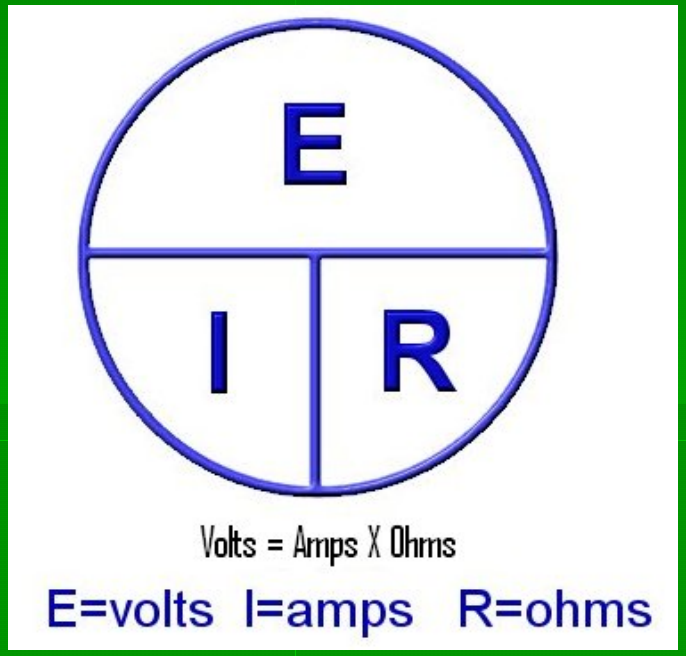


Ohms = 90 volts ÷ 3 amps = 30

T4D05 (C)

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

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

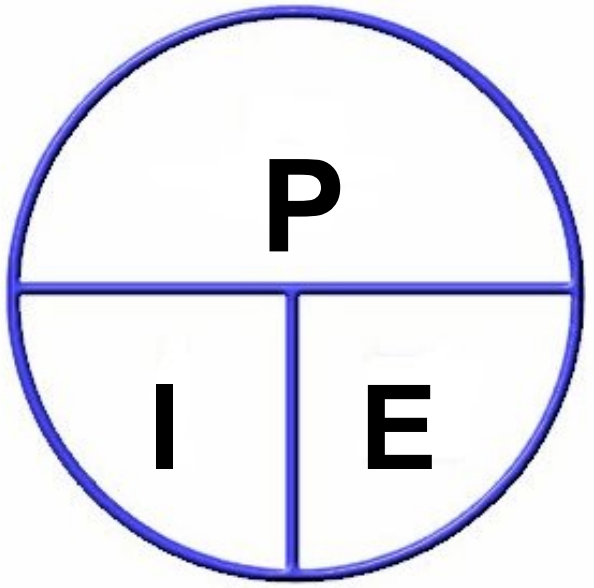


Ohms = 12 volts ÷ 1.5 amps = 8

T4A02 (B)

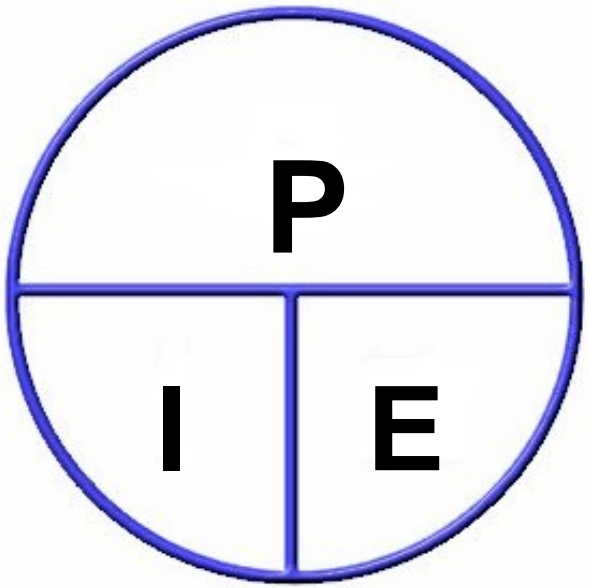
Electrical Power is measured in which of the following units?

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



P = watts, I = amps,
E = Volts

- T4E01 (D)
- What unit is used to describe electrical power?
- A. Ohm
- B. Farad
- C. Volt
- D. Watt



P = watts, I =amps,
E = Volts

The Power Circle

T4E02 (A)

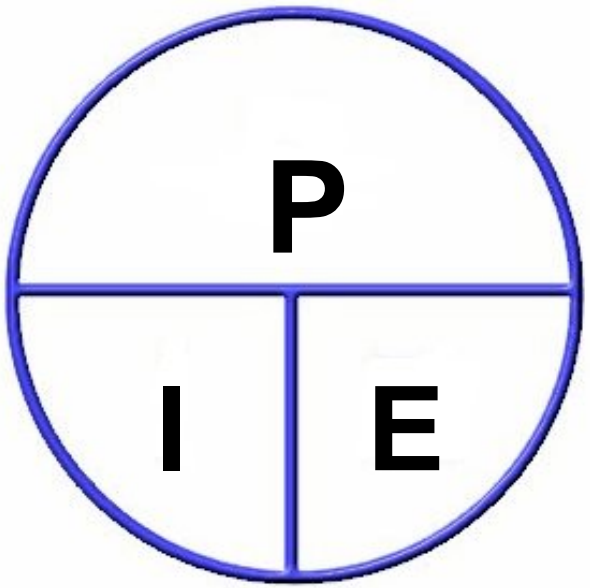
What is the formula used to calculate electrical power in a DC circuit?

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

T4E03 (A)

How much power is represented by a voltage of 13.8 volts DC and a current of 10 amperes?

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



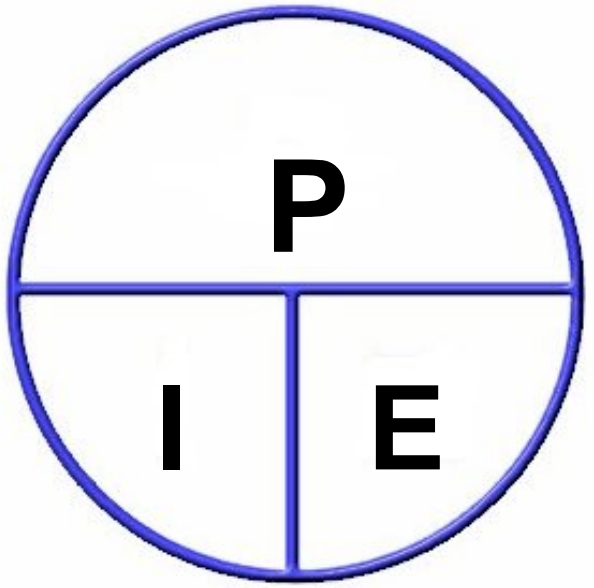
P = watts, I =amps,
E = Volts

Watts = 10 amps X 13.8 volts = 138

T4E04 (B)

How much power is being used in a circuit when the voltage is 120 volts DC and the current is 2.5 amperes?

- A. 1440 watts
- B. 300 watts
- C. 48 watts
- D. 30 watts



P = watts, I =amps,
E = Volts

Watts = 2.5 amps X 120 volts = 300

T4E05 (D)

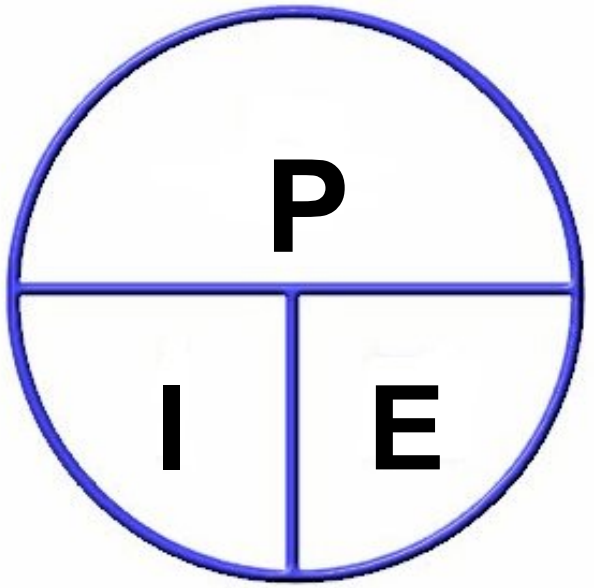
How can you determine how many watts are being drawn by your transceiver when you are transmitting?

- A. Measure the DC voltage and divide it by 60 Hz
- B. Check the fuse in the power leads to see what size it is
- C. Look in the Radio Amateur's Handbook
- D. Measure the DC voltage at the transceiver and multiply by the current drawn when you transmit

T4E06 (B)

How many amperes are flowing in a circuit when the applied voltage is 120 volts DC and the load is 1200 watts?

- A. 20 amperes
- B. 10 amperes
- C. 120 amperes
- D. 5 amperes



P = watts, I =amps,
E = Volts

Amps = 1200 watts ÷ 120 volts = 10

T4C04 (C)

What device is used to convert the alternating current from a wall outlet into low-voltage direct current?

- A. Inverter
- B. Compressor
- C. Power Supply
- D. Demodulator

Hayden's Universal Rule

Conversion of Units of Measurement

Multiply when changing from a larger unit of measurement into a smaller unit of measurement, and

Divide when changing a smaller unit of measurement into a larger unit of measurement.

T4E07 (C)

How many milliamperes is the same as 1.5 amperes?

- A. 15 milliamperes
- B. 150 milliamperes
- C. 1500 milliamperes
- D. 15000 milliamperes

“milli” means 1000, so 1.5 x 1000 = 1500

T4E10 (A)

How many volts are equal to one microvolt?

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

“micro” means one-millionth

T4E09 (C)

How many volts are equal to one kilovolt?

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

“Kilo” means 1000, one thousand

T4E11 (B)

How many watts does a hand-held transceiver put out if the output power is 500 milliwatts?

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

500 ÷ 1000 = .5 watts

Antennas (p. 150)

T9A04 (A)

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

- A. It does not transmit or receive as effectively as a full sized antenna
- B. It is much more expensive than a standard antenna
- C. If the rubber end cap is lost it will unravel very quickly
- D. It transmits a circular polarized signal

T9A10 (A)

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

- A. Signals can be 10 to 20 times weaker than when you are outside of the vehicle
- B. RF energy trapped inside the vehicle can distort your signal
- C. You might cause a fire in the vehicle upholstery
- D. The SWR might increase

T7A03 (B)

How can you make the signal from a hand-held radio stronger when operating in the field?

- A. Switch to VFO mode
- B. Use an external antenna instead of the rubber-duck antenna
- C. Stand so there is a metal building between you and other
- stations
- D. Speak as loudly as you can

T9A02 (C)

What is an antenna that consists of a single element mounted perpendicular to the Earth's surface?

- A. A conical monopole
- B. A horizontal antenna
- C. A vertical antenna
- D. A traveling wave antenna

T9B08 (B)

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

- A. The modulation sidebands might become inverted
- B. Signals could be as much as 100 times weaker
- C. Signals have an echo effect on voices
- D. Nothing significant will happen

T9A09 (D)

What is one type of antenna that offers good efficiency when operating mobile and can be easily installed or removed?

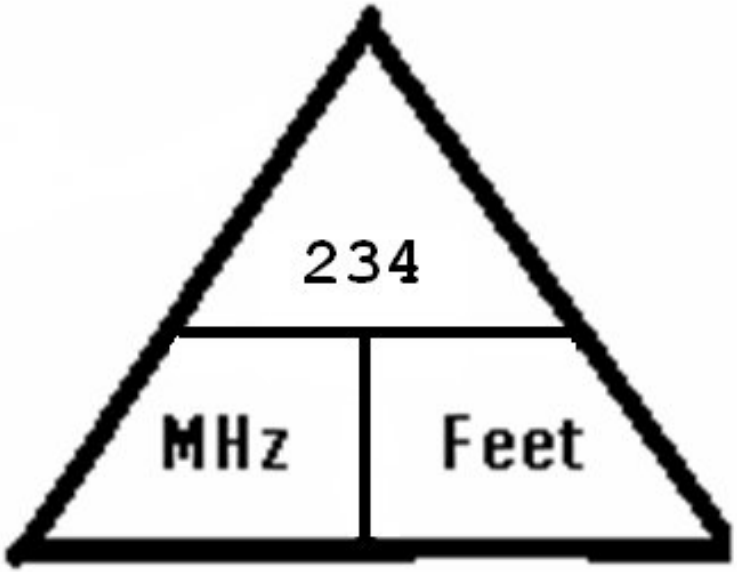
- A. A microwave antenna
- B. A quad antenna
- C. A traveling wave antenna
- D. A magnet mount vertical antenna

T9A11 (C)

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

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

How to Calculate the Length of a 1/4 Wave Dipole Antenna



Use N7YLA's
Quarter Wave
Triangle

Quarter Wave Dipole Calculator: 234 ÷ MHz = Feet

234 ÷ 146 MHz = 1.6 ft

1.6 ft x 12 inches per foot = 19.2 inches

T9A06 (B)

What is the advantage of 5/8 wavelength over 1/4 wavelength vertical antennas?

- A. They are easier to match to the feed line than other types
- B. Their radiation pattern concentrates energy at lower angles
- C. They pick up less noise
- D. Their radiation pattern concentrates energy at higher angles

T9A03 (B)

What type of antenna is a simple dipole mounted so the elements are parallel to the Earth's surface?

- A. A ground wave antenna
- B. A horizontal antenna
- C. A rhombic antenna
- D. A vertical antenna

T9A05 (C)

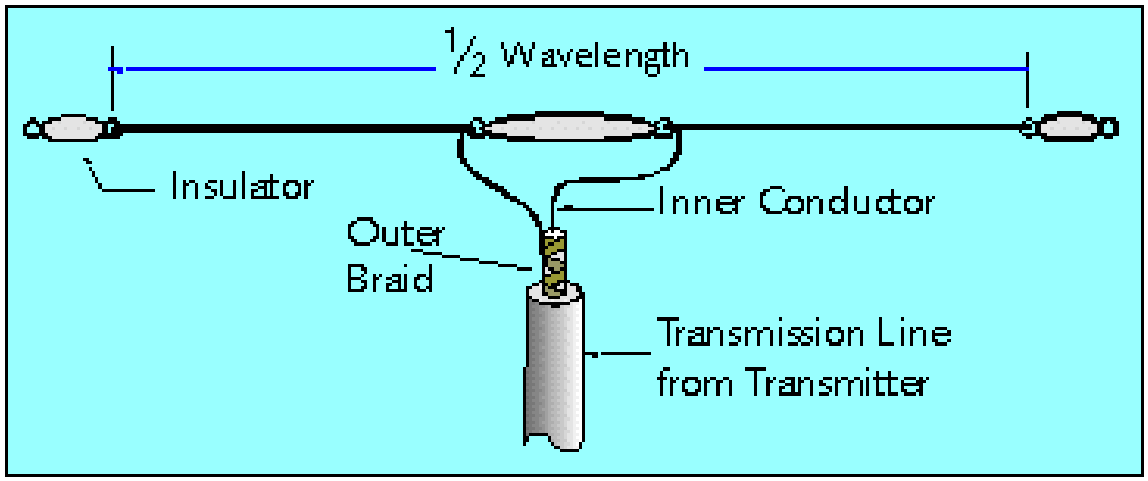
How does the physical size of half-wave dipole antenna change with operating frequency?

- A. It becomes longer as the frequency increases
- B. It must be made larger because it has to handle more power
- C. It becomes shorter as the frequency increases
- D. It becomes shorter as the frequency deceases

T9A12 (C)

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

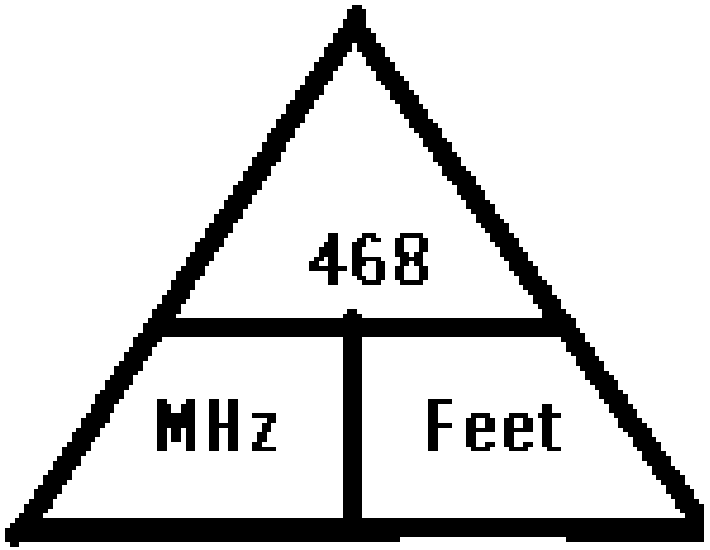
- A. 6 inches
- B. 50 inches
- C. 112 inches
- D. 236 inches



dipole antenna

How to Calculate the Length of a ½ Wave Dipole Antenna

6 meters is the **50** MHz band



Use N7YLA's ***Half Wave***

Triangle

Half Wave Dipole Calculator: 468 ÷ MHz = Feet

468 ÷ 50 MHz = 9.36 Ft

9.36 x 12 = 112 inches

T9A08 (C)

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

- A. Antennas invented after 1985
- B. Loop antennas
- C. Directional or beam antennas
- D. Antennas that are not permitted for amateur radio stations

T9A01 (C)

What is a beam antenna?

- A. An antenna built from metal I-beams
- B. An antenna that transmits and receives equally well in all
- directions
- C. An antenna that concentrates signals in one direction
- D. An antenna that reverses the phase of received signals

T0B05 (A) [97.15(A)]

What must be considered when erecting an antenna near an airport?

- A. The maximum allowed height with regard to nearby airports
- B. The possibility of interference to aircraft radios
- C. The radiation angle of the signals it produces
- D. The polarization of signal to be radiated

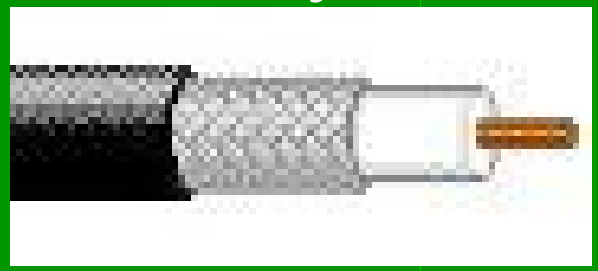
Keep your antenna below 200 feet!

T9C12 (A)

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

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

RG-8x coax



T9C11 (B)

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

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

Did you know that smashing coax can affect its impedance?

T9C10 (D)

Why is the outer sheath of most coaxial cables black in color?

- A. It is the cheapest color to use
- B. To see nicks and cracks in the cable
- C. Black cables have less loss
- D. Black provides protection against ultraviolet damage

Did you know this?

T9C09 (C)

What can happen to older coaxial cables that are exposed to weather and sunlight for several years?

- A. Nothing, weather and sunlight do not affect coaxial cable
- B. The cable can shrink and break
- C. Losses can increase dramatically
- D. It will short-circuit

Any crack in the outside jacket will cause signal loss!

T9C05 (C)

What happens to the power lost in a feed line?

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

T9C07 (A)

What is the most common reason for failure of coaxial cables?

- A. Moisture contamination
- B. Gamma rays
- C. End of service life
- D. Overloading

Seal all connections exposed to the elements!

PL 259 UHF connectors are very popular!

T9C01 (A)

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

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

Cross-Needle SWR meter

This equipment becomes important when you build your own antennas!

Antenna Analyzer

T9C08 (B)

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

- A. To reduce television interference
- B. To allow the efficient transfer of power and reduce losses
- C. To prolong antenna life
- D. To keep your signal from changing polarization

T9C02 (C)

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

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

A 1 to 1 SWR is sometimes very dfficult to achieve, so try for a 1.5 to 1 SWR

SWR is the **Standing Wave Ratio** measurement of your radio's antenna system. Radio systems with too high of an SWR will not function properly, perhaps even ruining some of the components if the condition is not corrected.

T9C04 (A)

What is the SWR value where the protection circuits in most solid-state transmitters begin to reduce transmitter power?

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

Be careful about transmitting from your HT through an external antenna! Poor SWR may cause your radio to get too hot!

T9C06 (D)

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

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

T9C03 (B)

What might be indicated by erratic changes in SWR readings?

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

T9A07 (A)

What is the primary purpose of a dummy load?

- A. It does not radiate interfering signals when making tests
- B. It will prevent over-modulation of your transmitter
- C. It keeps you from making mistakes while on the air
- D. It is used for close in work to prevent overloads

- T3D08 (C)
- What is the best way to reduce on the air interference when testing your transmitter?
- A. Use a short indoor antenna when testing
- B. Use upper side band when testing
- C. Use a dummy load when testing
- D. Use a simplex frequency instead of a repeater frequency

Your Safety (p.160)

T0A01 (B)

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

- A. 12 volts
- B. 30 volts
- C. 120 volts
- D. 300 volts

T0A10 (D)

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

- A. It contains dangerous acid that can spill and cause injury
- B. Short circuits can damage wiring and possibly cause a fire
- C. Explosive gas can collect if not properly vented
- D. All of these answers are correct

Battery Hazards Summary

- Short circuits cause a great reduction in battery capacity.
- To prevent short circuits in a battery, overcharging and overdischarging should be avoided at all costs.
- The adverse effect of gassing is that if gassing occurs and the gases are allowed to collect, an explosive mixture of hydrogen and oxygen can be readily produced.

- To reduce the amount of gassing, charging voltages above 2.30 volts per cell should be minimized.
- Whenever the battery is charged, the current flowing through the battery will cause heat to be generated by the electrolysis of water and by l2 V power generation.
- Higher temperatures will give some additional capacity, but they will eventually reduce the life of the battery.

- Very high temperatures, 125°F and higher, can actually do damage to the battery and cause early failure.

WARNING: BATTERIES CAN BE DANGEROUS!

T0A11 (A)

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

- A. The battery could overheat and give off dangerous gas or explode
- B. The terminal voltage will oscillate rapidly
- C. The warranty will be voided
- D. The voltage will be reversed

T0A06 (D)

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

- A. Use 3-wire cords and plugs for all AC powered equipment
- B. Connect all AC powered station equipment to a common ground
- C. Use a ground-fault interrupter at each electrical outlet
- D. All of these answers are correct

T0A03 (C)

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

- A. Neutral
- B. Hot
- C. **Ground**
- D. The white wire

T0A02 (B)

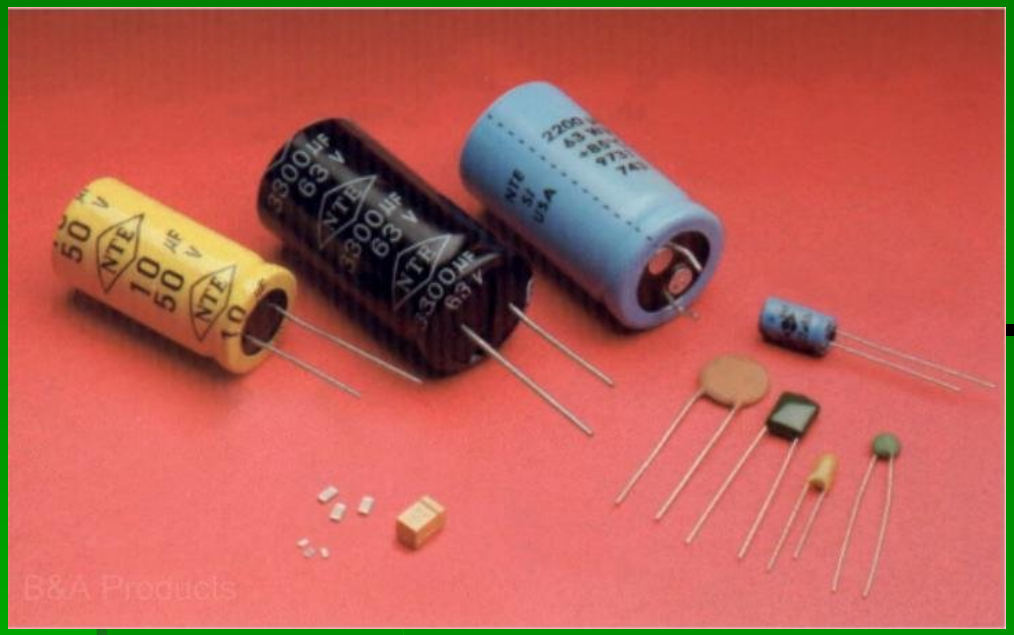
What is the lowest amount of electrical current flowing through the human body that is likely to cause death?

- A. 10 microamperes
- B. 100 milliamperes
- C. 10 amperes
- D. 100 amperes

T0A13 (D)

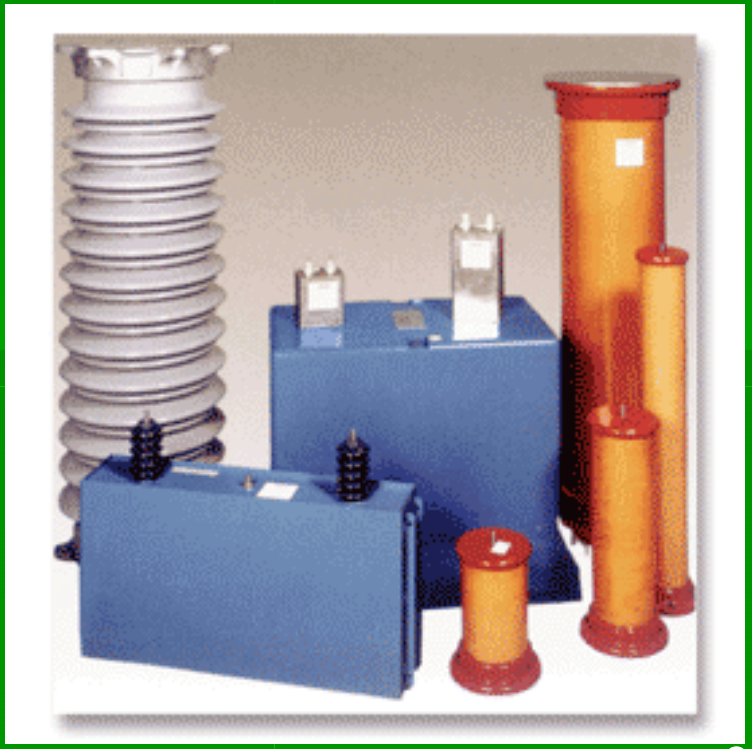
What kind of hazard might exist in a power supply when it is turned off and disconnected?

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



Beware of capacitor shock . Keep your fingers away!

Touching these babies could ruin your day!



T0A07 (C)

What is the most important thing to consider when installing an emergency disconnect switch at your station?

- A. It must always be as near to the operator as possible
- B. It must always be as far away from the operator as possible
- C. Everyone should know where it is and how to use it
- D. It should be installed in a metal box to prevent tampering

T0A04 (B)

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

- A. To make sure enough power reaches the circuit
- B. To interrupt power in case of overload
- C. To prevent television interference
- D. To prevent shocks

FUSES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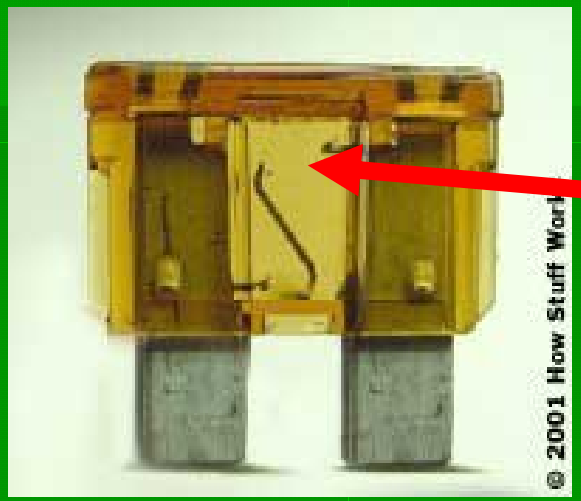

© 2001 How Stuff Work

B L O W N

T0A05 (C)

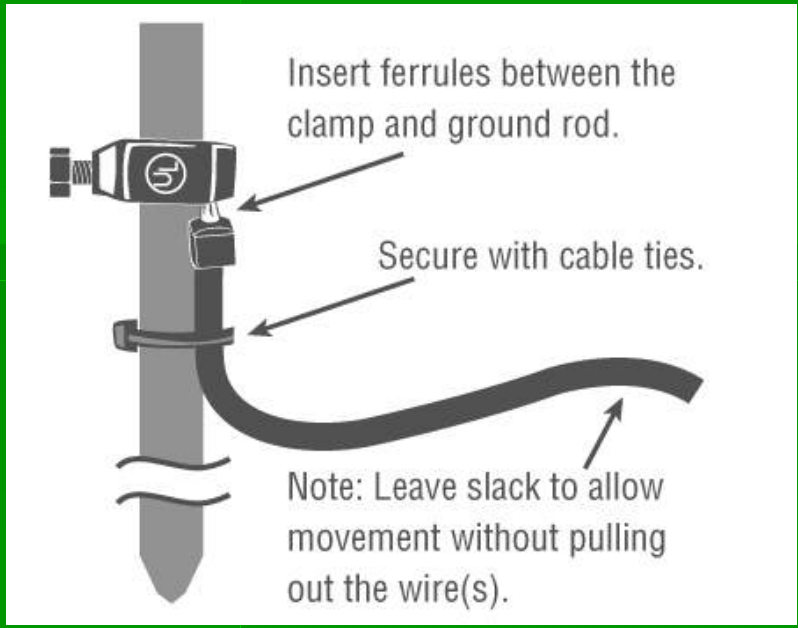
What might happen if you install a 20-ampere fuse in your transceiver in the place of a 5-ampere fuse?

- A. The larger fuse would better protect your transceiver from
- using too much current
- B. The transceiver will run cooler
- C. Excessive current could cause a fire
- D. The transceiver would not be able to produce as much RF output

T0A12 (C)

What is the most important reason to have a lightning protection system for your amateur radio station?

- A. Lower insurance rates
- B. Improved reception
- C. Fire prevention
- D. Noise reduction



T0A08 (D)

What precautions should be taken when a lightning storm is expected?

- A. Disconnect the antenna cables from your station and move them away from your radio equipment
- B. Unplug all power cords from AC outlets
- C. Stop using your radio equipment and move to another room until the storm passes
- D. All of these answers are correct

T0B04 (B)

What is an important consideration when putting up an antenna?

- A. Carefully tune it for a low SWR
- B. Make sure people cannot accidentally come into contact with it
- C. Make sure you discard all packing material in a safe place
- D. Make sure birds can see it so they don’t fly into it

T0B06 (D)

What is the most important safety precaution to observe when putting up an antenna tower?

- A. Install steps on the tower for safe climbing
- B. Insulate the base of the tower to avoid lightning strikes
- C. Ground the base of the tower to prevent lightning strikes
- D. Look for and stay clear of any overhead electrical wires

T0B08 (D)

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

- A. Half the width of your property unless the wires are at least 23 feet high
- B. 12.5 feet in most metropolitan areas
- C. 36 meters plus 1/2 wavelength at the operating frequency
- D. **So that if the antenna falls unexpectedly, no part of it can come closer than 10 feet to the power wires**

T0B11 (C)

What is considered to be an adequate ground for a tower?

- A. A single 4 foot ground rod, driven into the earth no more than 12 inches from the base
- B. A screen of 120 radial wires
- C. Separate 8 foot long ground rods for each tower leg, bonded to the tower and each other
- D. A connection between the tower base and a cold water pipe

T0B10 (C)

Why is stainless steel hardware used on many antennas instead of other metals?

- A. Stainless steel is a better electrical conductor
- B. Stainless steel weighs less than other metals
- C. Stainless steel parts are much less likely to corrode
- D. Stainless steel costs less than other metals

T0B07 (D)

How should the guy wires for an antenna tower be installed?

- A. So each guy wire anchor point has an even number of wires
- B. So that no guy wire is more than 25 feet long
- C. Each guy wire must be pulled as tight as possible
- D. In accordance with the tower manufacturer's instructions

T0B01 (C)

Why should you wear a hard hat and safety glasses if you are on the ground helping someone work on an antenna tower?

- A. It is required by FCC rules
- B. To keep RF energy away from your head during antenna testing
- C. **To protect your head and eyes in case something accidentally falls from the tower**
- D. It is required by the electrical code

T0B03 (D)

What should you do before you climb a tower?

- A. Arrange for a helper or observer
- B. Inspect the tower for damage or loose hardware
- C. Make sure there are no electrical storms nearby
- D. **All of these answers are correct**

T0B02 (C)

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

- A. Turn on all radio transmitters
- B. Remove all tower grounding connections
- C. **Put on your safety belt and safety glasses**
- D. Inform the FAA and the FCC that you are working on a tower

T0B09 (D)

What is the most important safety rule to remember when using a crank-up tower?

- A. This type of tower must never be painted
- B. Crank up towers must be raised and lowered frequently to keep them properly lubricated
- C. Winch cables must be specially rated for use on this type of tower
- D. **A crank-up tower should never be climbed unless it is in the fully lowered position**

T0C02 (B)

When can radio waves cause injury to the human body?

- A. Only when the frequency is below 30 MHz
- B. Only if the combination of signal strength and frequency cause excessive power to be absorbed
- C. Only when the frequency is greater than 30 MHz
- D. Only when transmitter power exceeds 50 watts

T0C07 (B)

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

A. Touching the antenna could cause television interference

B. They might receive a painful RF burn injury

C. They would be able to hear what you are saying

D. Nothing

T0C01 (D)

What type of radiation are VHF and UHF radio signals?

- A. Gamma radiation
- B. Ionizing radiation
- C. Alpha radiation
- D. **Non-ionizing radiation**

T0C04 (D)

What factors affect the RF exposure of people near an amateur transmitter?

- 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 answers are correct**

T0C03 (C) [97.13(C)(1)]

What is the maximum power level that an amateur radio station may use at frequencies above 30 MHz before an RF exposure evaluation is required?

- A. 1500 watts PEP transmitter output
- B. 1 watt forward power
- C. **50 watts PEP at the antenna**
- D. 50 watts PEP reflected power

This includes the Technician operated VHF equipment

T0C06 (D) [97.13(c)(1)]

How can you 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

T0C11 (A)

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

- A. **It takes into account the amount of time the transmitter is operating**
- B. It takes into account the transmitter power supply rating
- C. It takes into account the antenna feed line loss
- D. It takes into account the thermal effects of the final amplifier

T0C05 (D)

Why must the frequency of an RF source be considered when evaluating RF radiation exposure?

- A. Lower frequency RF fields have more energy than higher frequency fields
- B. Lower frequency RF fields do not penetrate the human body
- C. Higher frequency RF fields are transient in nature and do not affect the human body
- D. **The human body absorbs more RF energy at some frequencies than others**

T0C10 (A)

Which of the following units of measurement is used to measure RF radiation exposure?

- A. **Milliwatts per square centimeter**
- B. Megohms per square meter
- C. Microfarads per foot
- D. Megahertz per second

T0C09 (B)

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

- A. Compliance is not necessary
- B. **By re-evaluating the station whenever an item of equipment is changed**
- C. By making sure your antennas have a low SWR
- D. By installing a low pass filter

T0C08 (D)

What action might amateur operators take to prevent exposure to RF radiation in excess of FCC supplied limits?

- A. Alter antenna patterns
- B. Relocate antennas
- C. Change station parameters such as frequency or power
- D. **All of these answers are correct**

CONGRATULATIONS !

You have made it through the Question Pool!

We will see you here on March 25, 6-9 pm for the ARRL exam!

Bring $14.00 per test.

Driver's License or other photo ID

And one other form of ID

Pencil and Calculator

73's