
St. Louis & Suburban Radio Club
70th ANNIVERSARY
1947 - 2017

# Amateur Radio Repeaters

- What are they?
- Why are they needed?
- How do they work?
- How do I use them?
- Are there rules, etc?

# What is a Repeater?

It’s a two-way radio system that receives on one frequency, then retransmits what it receives on another frequency at exactly the same time, and also amplifies the signal.

# What is a Repeater?

It's a two-way radio system that **receives on one frequency,** then retransmits what it receives on another frequency at exactly the same time, and also amplifies the signal.

# What is a Repeater?

It’s a two-way radio system that receives on one frequency, then **retransmits what it receives on another frequency at exactly the same time**, and also amplifies the signal.

# What is a Repeater?

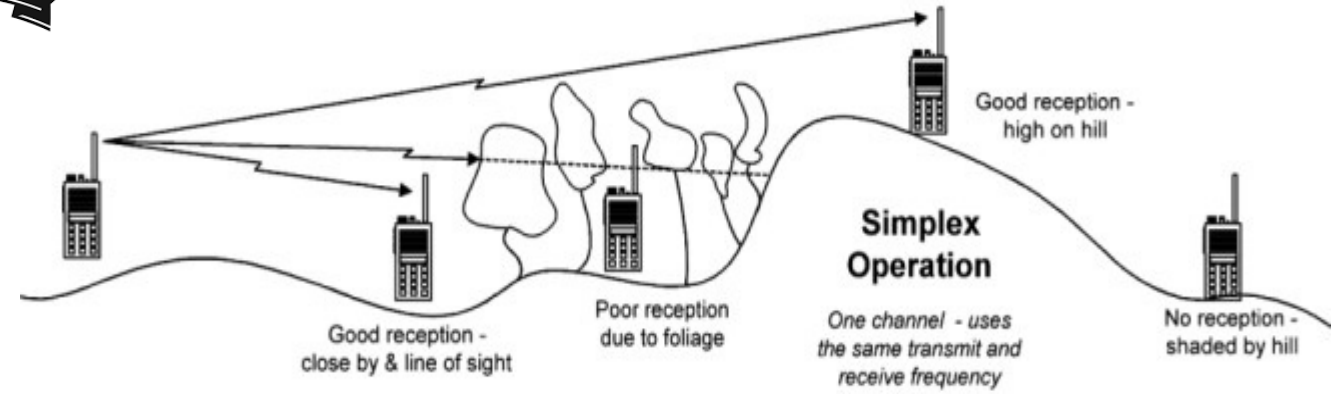
It's a two-way radio system that receives on one frequency, then retransmits what it receives on another frequency at exactly the same time, and **also amplifies the signal**.

# Why are they needed?

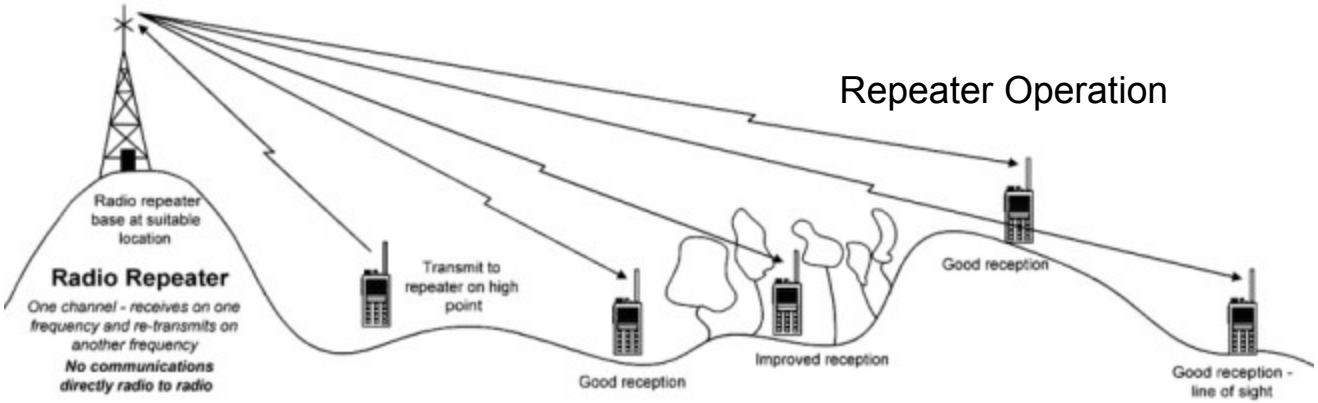
They are used to “repeat” your transmitted and received signals to much higher strength using high gain antennas, low loss feed-lines and a transmitter and receiver that is rated for heavy duty use. (Antenna is high on a building, water tower, mountain top, etc.)

A repeater “gets out” your signal and receives the station you are talking to with a far greater range and coverage area.

# Simplex vs. Repeater Communication




Repeater Operation



St. Louis & Suburban Radio Club
70th ANNIVERSARY
1947 - 2017

# Basic Repeater Components

## Antenna

- Most use only one antenna
  - High gain, heavy duty, mounted very high

# Basic Repeater Components

## Feedline (Coax)

- Hardline (Ideal, but $$$$)

# Basic Repeater Components
# Feedline (Coax)

- LMR400 - RG8 Type Equivalent- probably most common on local repeaters.

St. Louis & Suburban Radio Club
70th ANNIVERSARY
1947 - 2017

# Basic Repeater Components
# Duplexer

- Separates and isolates the incoming signal from the outgoing signal.
- It prevents the receiver and transmitter from hearing one another by the isolation it provides.
- It helps reject very strong nearby signal from getting into the repeater system.

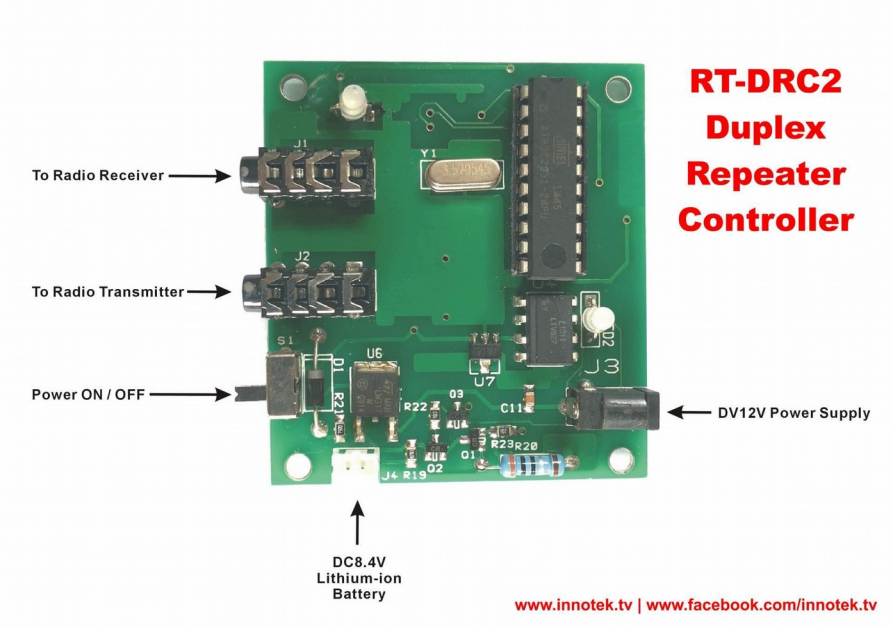
# Basic Repeater Components
# Duplexer

# Basic Repeater Components
# Receiver and Transmitter

- **Receiver** “receives the incoming signal”
  - Tuned to the receive frequency
- **Transmitter**- transmits the signal
  - Tuned to the transmit frequency

# Basic Repeater Components Controller

- The “brains” of the repeater
  - Handles the station ID
  - Performs other functions that are programmed (announcements, etc)




St. Louis & Suburban Radio Club
70th ANNIVERSARY
1947 - 2017

# Transmit and Receive Frequency

- 2 meter repeater
  - + or - 600 Hz offset

*Remember...It's a two-way radio system that **receives on one frequency**, then **retransmits what it receives on another frequency** at exactly the same time, and also amplifies the signal.*

*The duplexer separates and isolates the incoming signal from the outgoing signal.*

St. Louis & Suburban Radio Club
70th ANNIVERSARY
1947 - 2017

# *Repeater Input/Output Offsets*

| Band | Channel spacing | Offset |
|---|---|---|
| 10 meters | 20 KHz | 0.1 MHz |
| 6 meters | 20 KHz | 1.7 MHz |
| **2 meters** | **20 KHz** | **600 kHz** |
| 1.25 meters | 20 KHz | 1.6 MHz |
| **70 cm** | **25 KHz** | **5 MHz** |
| 33 cm | 25 KHz | 12 MHz |
| 23 cm | 25 KHz | 20 MHz |

**2 Meter and 70 cm are the most popular repeater band.**

Amateur repeaters use standardized input and output pairs. Many modern radios know the **Bandplan** and will handle this automatically

Locally determined by the Frequency Coordinator.

# Transmit and Receive Frequency Explained

- Your radio will transmit on the input frequency of the repeater.
  - Example- 146.940/146.340 (-600Hz offset)
  - You transmit at 146.340
  - Repeater receives at 146.340
  - Repeater transmits at 146.940
  - Your radio receives the signal at 146.940

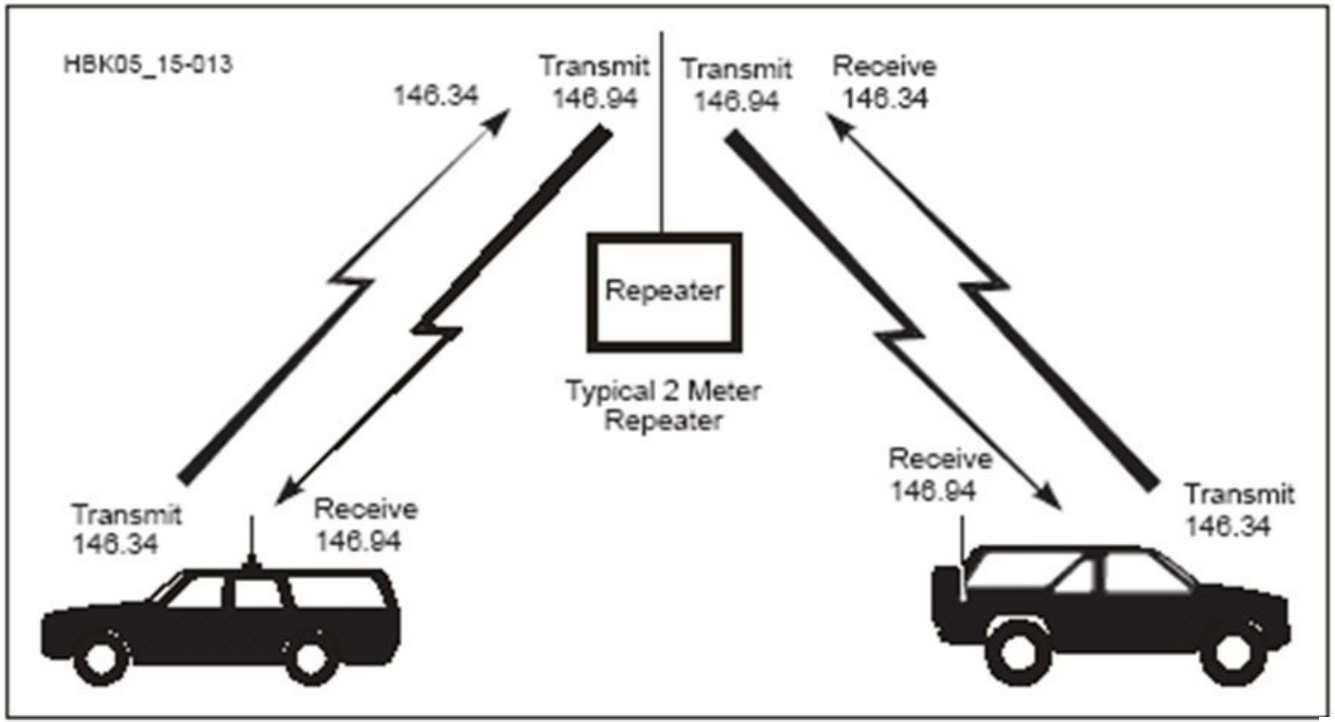



**Fig 15.13 — Typical 2-m repeater, showing mobile-to-mobile communication through a repeater station. Usually located on a hill or tall building, the repeater amplifies and retransmits the received signal on a different frequency.**

St. Louis & Suburban Radio Club
70th ANNIVERSARY
1947 - 2017

# CTCSS or PL tone

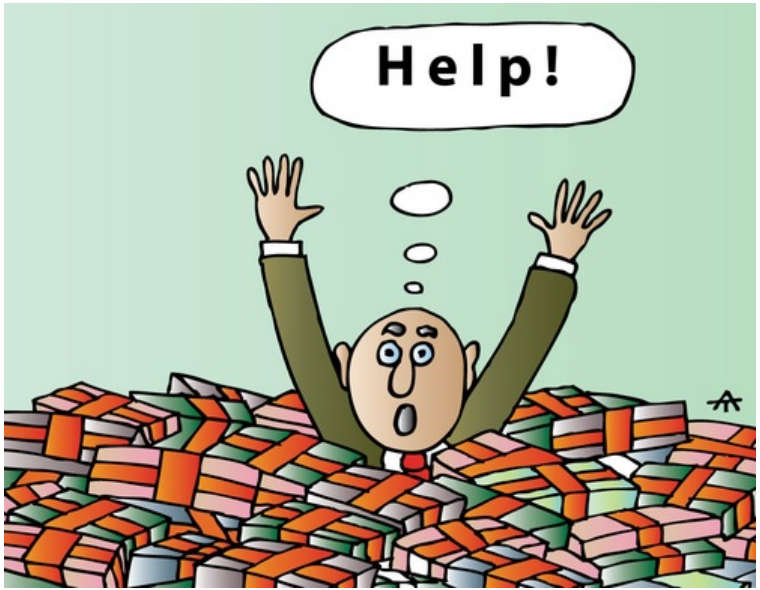
- **C**ontinuous **T**one **C**oded **S**quelch **S**ystem
- **P**rivate **L**ine (Motorola’s proprietary name)

# CTCSS or PL tone

- It is used to prevent a repeater from responding to unwanted signals or interference.
- Your radio must have the same tone programed as the repeater in order for the repeater to “hear” your signal and retransmit it.
- All SLSRC repeaters have a 141.3 MHz tone

| CTCSS TONE FREQUENCY (Hz) | | | | | |
|---|---|---|---|---|---|
| 67.0 | 69.3 | 71.9 | 74.4 | 77.0 | 79.7 |
| 82.5 | 85.4 | 88.5 | 91.5 | 94.8 | 97.4 |
| 100.0 | 103.5 | 107.2 | 110.9 | 114.8 | 118.8 |
| 123.0 | 127.3 | 131.8 | 136.5 | 141.3 | 146.2 |
| 151.4 | 156.7 | 159.8 | 162.2 | 165.5 | 167.9 |
| 171.3 | 173.8 | 177.3 | 179.9 | 183.5 | 186.2 |
| 189.9 | 192.8 | 196.6 | 199.5 | 203.5 | 206.5 |
| 210.7 | 218.1 | 225.7 | 229.1 | 233.6 | 241.8 |
| 250.3 | 254.1 | – | – | – | – |

OK...I have the frequency programmed in the radio….the PL tone is also programmed and I am ready to talk on a repeater……..




St. Louis & Suburban Radio Club
70th ANNIVERSARY
1947 - 2017

# What do you say when you “key” the mic on your radio?

- KCØSDV mobile/listening (Indicates I am on the air and monitoring the frequency)
- KØAZV…..KCØSDV (I am calling Max)
- KCØSDV this is KØAZV…(Max responds to my call)

# What do you say when you “key” the mic on your radio?

- **KCØSDV mobile/listening** **(Indicates I am on the air and monitoring the frequency)**
- KØAZV…..KCØSDV (I am calling Max)
- KCØSDV this is KØAZV…(Max responds to my call)

# What do you say when you “key” the mic on your radio?

- KCØSDV mobile/listening (Indicates I am on the air and monitoring the frequency)
- **KØAZV…..KCØSDV (I am calling Max)**
- KCØSDV this is KØAZV…(Max responds to my call)

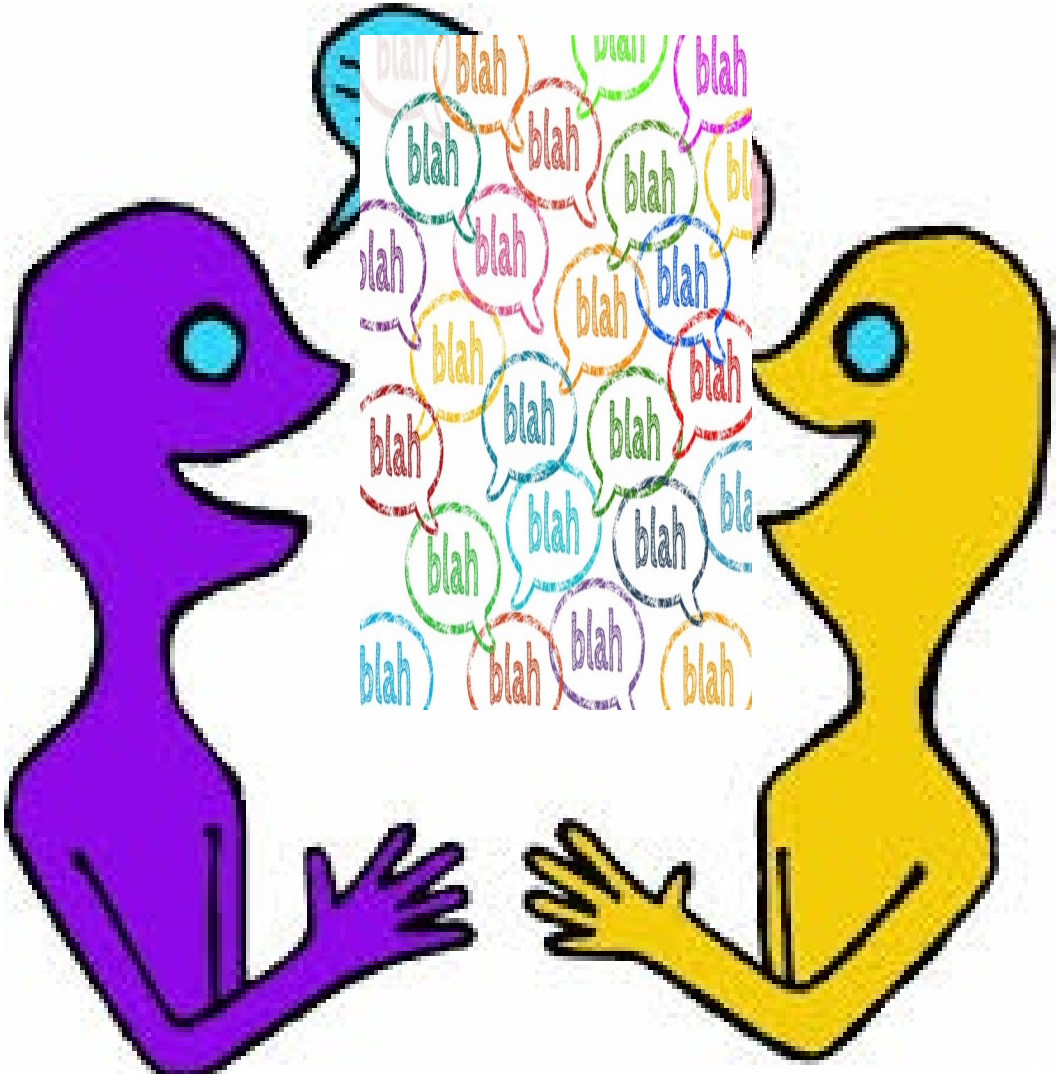
# What do you say when you “key” the mic on your radio?

- KCØSDV mobile/listening (Indicates I am on the air and monitoring the frequency)
- KØAZV…..KCØSDV (I am calling Max)
- **KCØSDV this is KØAZV…(Max responds to my call)**

# What do you say when you “key” the mic on your radio?

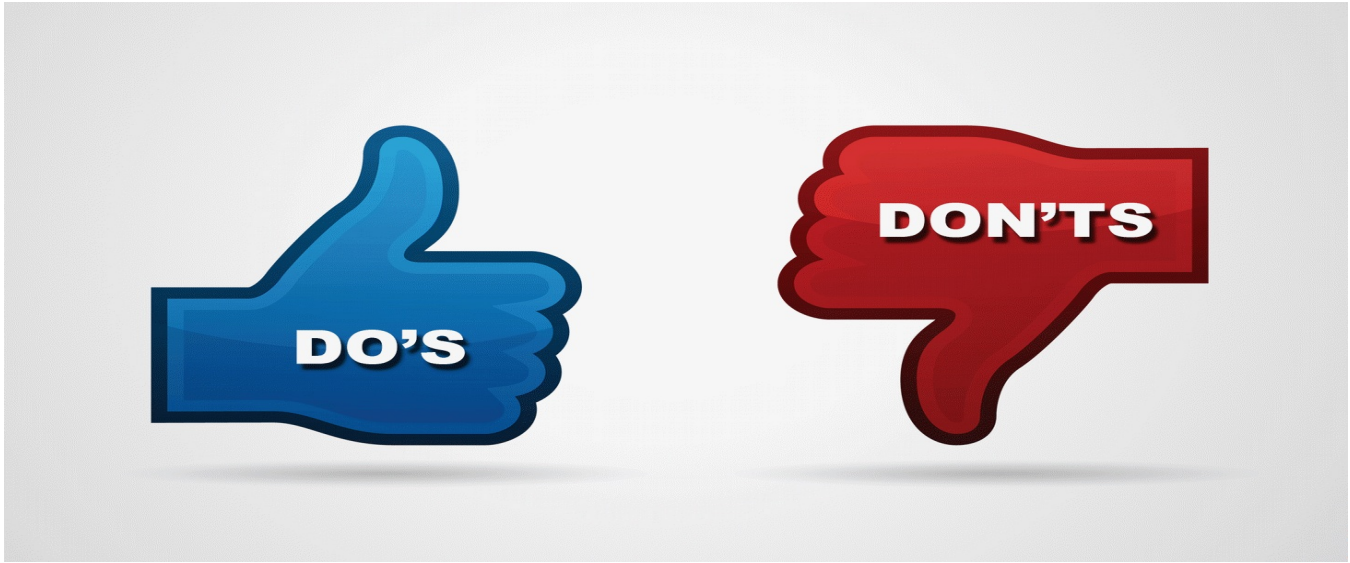
- KCØSDV mobile/listening (Indicates I am on the air and monitoring the frequency)
- KØAZV…..KCØSDV (I am calling Max)
- KCØSDV this is KØAZV…(Max responds to my call)

**What happens next ????**


blah

St. Louis & Suburban Radio Club
70th ANNIVERSARY
1947 - 2017

# Repeater Etiquette, etc



- LISTEN FIRST before you talk.
  - If the repeater is in use, wait for a pause before saying your callsign.

## Use Plain Language

Pause before transmitting as there might be someone else wanting to join the conversation. Don’t “fast key”

Keep transmissions as short as possible so other people can join in. Most, if not all, repeaters “time out” at 3 minutes. During a “net” the repeater is in “net mode” so it will not time out.

Identify every 10 minutes and when you sign off.


Say “Break Break” to enter a conversation…..this should be used only in the case of an emergency


Say “CQ CQ”. That is used in HF but not on repeaters. Simply say your call sign and then “listening” , “monitoring”, “mobile” etc. It indicates you are on the frequency a
available to talk to someone.


Make up your own phonetic alphabet...Use the standard one that all hams will understand.

| | | |
|---|---|---|
| *A – Alpha* | *J – Juliet* | *S – Sierra* |
| *B – Bravo* | *K – Kilo* | *T – Tango* |
| *C – Charlie* | *L – Lima* | *U – Uniform* |
| *D – Delta* | *M – Mike* | *V – Victor* |
| *E – Echo* | *N – November* | *W – Whiskey* |
| *F – Foxtrot* | *O – Oscar* | *X – X-Ray* |
| *G – Golf* | *P – Papa* | *Y – Yankee* |
| *H – Hotel* | *Q – Quebec* | *Z – Zulu* |
| *I – India* | *R – Romeo* | |

The International Telecommunications Union
Standard Phonetic Alphabet


Do yourself a favor….

- Don't discuss religion or politics on the radio.
- It is *not* illegal, but it won't win friends and influence people


DON'TS


!@&*#!*

# Some “lingo” or “slang” you might hear

| CODE | MEANING | USAGE |
|---|---|---|
| CQ | Seek You – Calling all stations | CQ, CQ ,CQ |
| Hi | Laughter | Very funny, Hi Hi |
| 73 | Best Regards | 73, Joe |
| 88 | Love and kisses | 88 from Julie |
| YL | Young Lady | Nice to hear a YL on the band |
| OM | Old Man | See you later OM |
| DX | Long distance | I’m looking for a DX contact |
| CW | Continuous Wave (Morse code) mode | I’m going to send you CW now |
| WX | Weather | The WX is getting bad here |
| Phone | Voice communication mode | Switching to phone mode now |
| 80,40,20 etc | Wavelength of the amateur band | I will be operating on 40 |
| 7100 | 7.100 kilohertz | Change frequency to 7100 |
| Roger | Yes, OK | Roger Joe |
| Negative | No | Negative copy Julie |
| Over | Back to you | I’m finished talking, over |
| Copy | Heard and understood | I did not copy that |
| Rig | Radio Transceiver | I just switched on my rig |
| Eyeball | Face to face meeting | Let’s have an eyeball |
| Doubled | Two stations transmitting at the same time | Julie, you just doubled with Joe. Go again please. |
| Ragchew | A long rambling contact | You have been ragchewing for hours |
| Zulu | The time in UTC | It is 2359 zulu here |
| PAN | Urgency call – Emergency situation | PAN PAN PAN … engine failure, taking on water… |
| MAYDAY | Distress call – Life and death situation | MAYDAY MAYDAY MAYDAY … ship sinking… |

# Checking into “nets”

Nets are run in many ways. Some nets are formal; others are more like extended roundtable QSOs**.** The key is to listen and follow the directions. The behavior of other net members is your guide.

When Net control station (NCS) calls for check-ins**, say your call sign and location or status with the NCS.** Be sure that you can hear the NCS **clearly and that you can understand his or her instructions.**

# Don’t develop “Mic Fright”

If a net follows standard operating rules, it's called a *directed net*. Nearly all directed nets have a similar basic structure. A net control station (NCS) initiates the net operations, maintains order, directs the net activities, and then terminates net operations in an orderly way.

Stations that want to participate in the net check in at the direction of the NCS. A net manager defines net policy and focus, and works with the NCS stations to keep the net meeting on a regular basis.

Hearing none, here's the order of check-ins for tonight's net: I'll first call for short-time check-ins, followed by stations with announcements, then all regular check-ins. Following the regular check-ins, we'll open the net for comments, answers to the question of the week, and swap-net items for the regular check-ins, and we'll conclude the net with the Amateur Radio Newsline report.

We will now begin taking check-ins. Please check in with your call-sign using standard phonetics and your first name.

First, calling for all short-time stations. Short-timers, please call WØSRC.

We are now calling for stations with SLSRC-related announcements or announcements of general interest to the net, please call WØSRC.

# Area Amateur Radio Club Nets.

| Monday | Frequency | Notes |
|---|---|---|
| 20:00 | 147.075 | Jefferson County ARC |
| 20:00 | 147.24 | Franklin County ARES |
| 20:00 | 145.23 | Lewis and Clark ARC |

| Tuesday | Frequency | Notes | | |
|---|---|---|---|---|
| 19:00 | 147.12 | St, Clair Amateur Radio Club | | |
| 19:00 | 145.33 | SCARC Weekly net | | |
| 19:30 | 146.85 | SLSRC Weekly net | | |
| 20:00 | 147.24 | Franklin County ARES | Digital Net 1st Tuesday | |
| 20:00 | 147.405 | Franklin County ARES | Simplex net 4th Tuesday | 145.100 alternate |
| 20:00 | 146.805 | Sullivan Amateur Radio Club | | |
| 20:00 | 146.76 | Egyptian Radio Club | | |

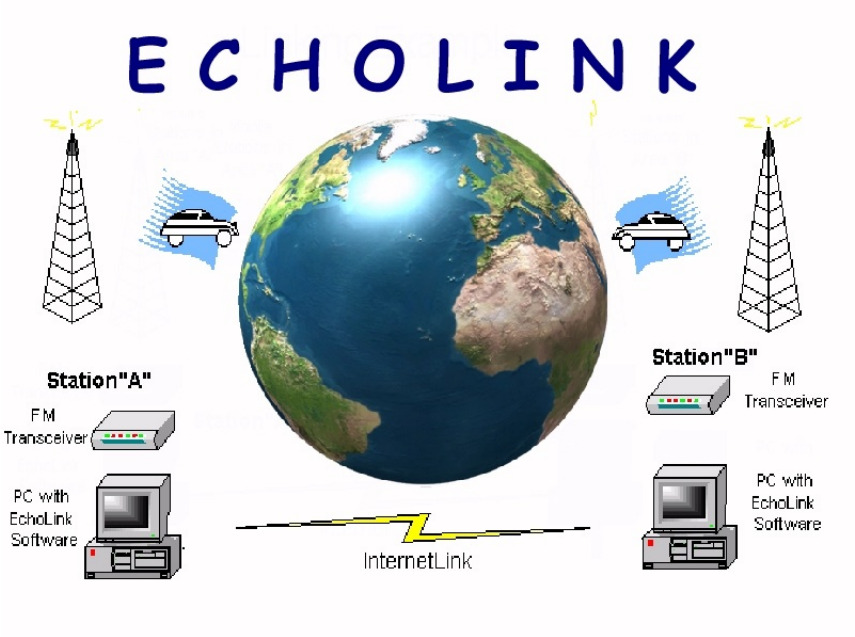
Sent

| Wednesday | Frequency | Notes | |
|---|---|---|---|
| 19:30 | 146.85 | Metro St. Louis ARES | |
| 20:00 | 146.85 | Metro St. Louis ARES | Traffic handling net |

| Thursday | Frequency | Notes | |
|---|---|---|---|
| 18:30 | 145.33 | St. Charles County RRT | |
| 19:00 | 147.36 | St. Louis County Skywarn | 1st Thursday of Month |

Copies available at front table

# EchoLink is a computer-based Amateur Radio system distributed free of charge that allows radio amateurs to communicate with other amateur radio operators using Voice over IP technology on the Internet for at least part of the path between them.




www.echolink.org

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.

IRLP operates a worldwide network of dedicated servers and nodes offering very stable worldwide voice communications between hundreds of towns and cities. All this with unsurpassed uptimes and the full dynamic range of telephone quality audio.

www.irlp.net/

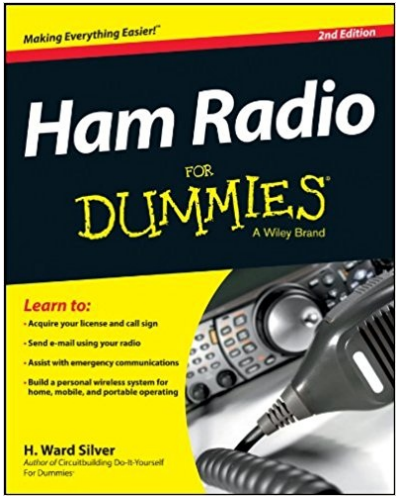
# Additional information

www.slsrc.org

www.youtube.com

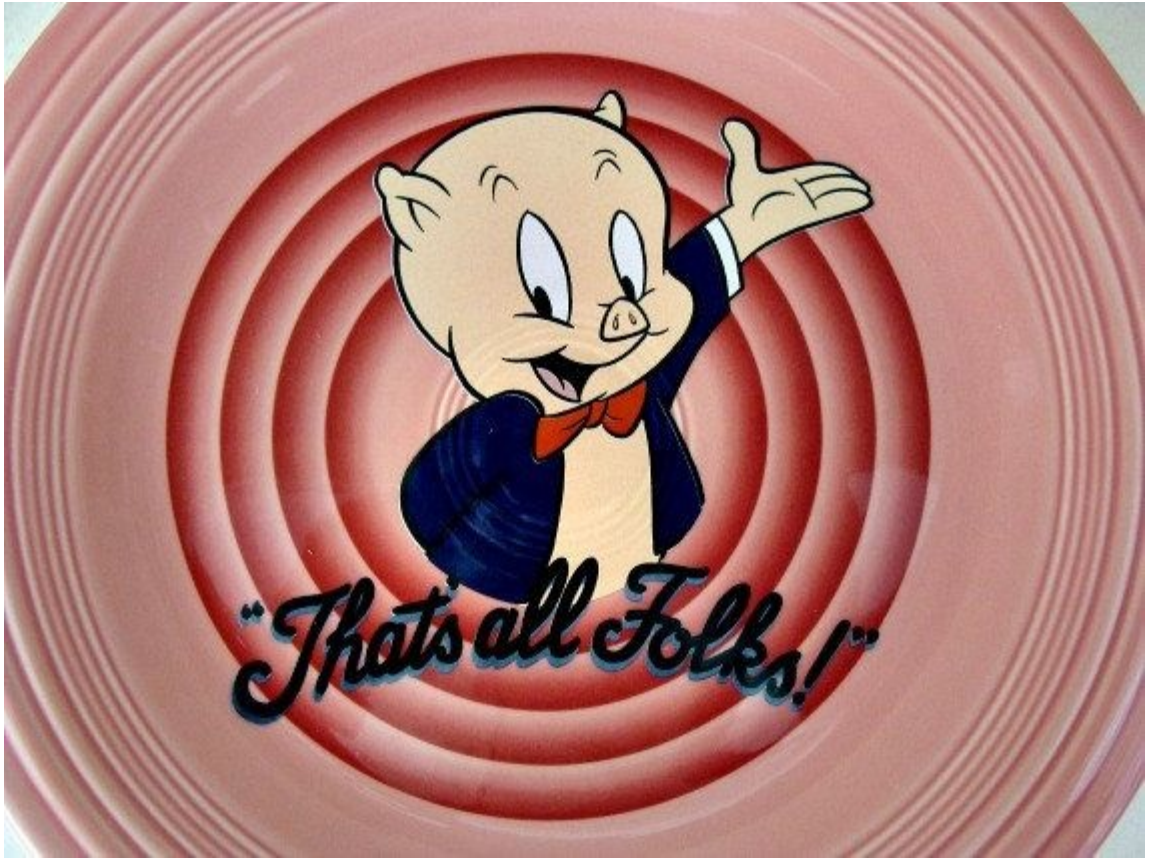
www.arrl.org

Google is your friend



# Repeaterisms

The Repeaterisms were engineered and recorded at Musicol Recording Studios in Columbus, Ohio by owner John Hull W8RRJ back in the early 70's.
They were written for the 146.76 Columbus, Ohio repeater which went on the air in 1970.


"Thats all Folks!"