ROSE CITY AMATEUR RADIO CLUB CAMROSE

A Beginners Guide to Repeaters

We present this guide with the hope that it will make using repeaters easier to understand and it will answer your questions without dwelling on the many technical details.

What is a repeater?

A repeater is a receiver/transmitter that listens for your transmission and re-transmits it. Repeaters usually enjoy the advantage of height and power to extend the range of your transmission. Repeaters listen on one frequency and transmit on another. The separation between these two frequencies is referred to as the offset.

What is offset?
In order to listen and transmit at the same time, repeaters use two different frequencies. On the 2-meter ham band these frequencies are 600 kilohertz apart. As a general rule, if the output frequency (transmit) of the repeater is below 147 MHz then the input frequency (listening) is 600 kilohertz lower. This is referred to as a minus, (-) offset. If the output is above 147 MHz then the input is 600 kilohertz above. This is referred to as a plus, (+) offset. Virtually all radios sold today set the offset once you have chosen the (- or +). As an example the Camrose repeater output is 146.760 MHz. The input or the frequency it listens on is 146.160 MHz (600 Kilohertz below). If you have your radio tuned to 146.760 MHz and have entered the "-" offset, when you push the push to talk (PTT) switch, it automatically transmits on 146.160 MHz. When you release the PTT to listen, the radio reverts back to 146.760 MHz to listen on the repeater's output frequency.
Note: There are exceptions to the rule so check local repeater listings.

Why do repeaters use an offset?
Most repeater installations use the same antenna for transmit and receive. Without having an offset of 600 KHz the repeater would simply hear itself when it was transmitting on the same frequency it was listening on. Even with the offset, the two frequencies are close enough that some isolation is required. Isolation is achieved by placing a device referred to as a duplexer, cavities, or cans into the coax lines. This is designed to pass a very narrow range of frequencies and reject others. The input duplexers are adjusted to pass only the input frequency and reject or "notch" others out. The output duplexers are adjusted to pass only the output frequency. There is some loss to the system because the duplexers contain many parts such as adjusting rods, short coax lengths and connectors. However, the advantage of being able to use a single antenna outweighs the drawbacks.

How do you call someone on a repeater?
First, listen to make sure that the repeater is not already in use. When you are satisfied that the repeater is not in use, begin with the call sign of the station you are trying to contact followed by your call sign. Example: "VE6UU this is VE6RCA". If you don't establish contact with the station you are looking for, wait a minute or two and try again.
If you are just announcing your presence on the repeater it is helpful to others that may be listening if you identify the repeater you are using. Example: "This

is VE6UU listening on 145.23". This allows people that are listening on radios that scan several repeaters to identify which repeater you are using.
If the repeater you are using is a busy repeater you may consider moving to a simplex frequency (transmit and receive on the same frequency), once you have made contact with the station you were calling. Repeaters are designed to facilitate communications between stations that normally wouldn't be able to communicate because of terrain or power limitations. If you can maintain your conversation without using the repeater, going "simplex" will leave the repeater free for other stations to use.

Repeater etiquette
The first and most important rule is LISTEN FIRST. Nothing is more annoying then someone that "keys up" in the middle of another conversation without first checking to make sure the repeater is free. If the repeater is in use, wait for a pause in the conversation and simply announce your call sign and wait for one of the other stations to acknowledge your call.

When you are using the repeater leave a couple of seconds between exchanges to allow other stations to join in or make a quick call. Most repeaters have a "Courtesy Beep" that will help in determining how long to pause. The courtesy beep serves two purposes, a repeater timeout function and it allows other to join in or make a call. Repeaters have a time out function that will shut down the transmitter if the repeater is held on for a preset length of time (normally three minutes). This ensures that if someone's transmitter is stuck on for any reason, it won't hold the repeater's transmitter on indefinitely.

When a ham is talking and releases the PTT switch on their radio, the controller in the repeater detects the loss of carrier and resets the time-out timer. When the timer is reset, the repeater sends out the courtesy beep. If you wait until you hear this beep (normally a couple of seconds), before you respond, you can be sure that you pause a suitable length of time. After you hear the beep, the Repeater's transmitter will stay on for a few more seconds before turning off. This is referred to as the "hang time". The length of hang time will vary from repeater to repeater but the average is about 2 or 3 seconds. You don't have to wait for the "hang time" to drop before keying up again, but you should make sure that you hear the courtesy beep before going ahead.

Note: If you don't wait for the beep and allow the time-out timer to reset, or run on longer than the timer is set for, you will time-out the repeater. The repeater will not function till you allow the timer to reset.
If you are wondering if you can access a repeater, key your radio and give "Your Call, Testing".

Basic repeater traffic priorities:
1. Emergency and Priority traffic
2. Public service such as Search & Rescue
3. System testing and maintenance
4. Mobile and Portable stations
5. Fixed stations

Remember, nothing is private on a repeater. If you have something of a private nature to talk about, both parties need to use the phone. There are laws controlling disseminating information you heard on a scanner.

In cases of emergency, hams should use the words "Break for an emergency" between exchanges if the repeater is being used. By using the words above, you should be heard by the people using the repeater.

This is a great hobby and everybody who uses the repeaters are human and should be treated the way you would like to be treated.

What is doubling?
When two stations try to talk at the same time the signals mix in the repeater's receiver and results in a buzzing sound or loud squawk. When you are involved in a roundtable discussion with several other stations it is always best to pass off to a specific person rather than leave it up in the air. Example: "VE6UU to take it, this is VE6RCA" or "Do you have any comments Joe? VE6UU". Failing to do so is an invitation to chaos and confusion.

Signal reports
If you request a signal report from someone on a repeater remember that all you will get is an indication of how well you are "getting into the repeater". The signal report you receive will be a report of the repeater's performance, not yours!

I have actually heard stations say, "You're full scale here", when asked for a signal report. You're not full scale, the repeater is! If you are testing with different radios or antenna systems you would be better off finding a station to work simplex (direct contact on a single frequency). Then any changes you make while you are testing will be reflected in the signal report relative to that station.

What is full quieting?
When you hear a station tell another station that their signal is full quieting it means that they are getting into the repeater with no noise on their signal. You will notice that weaker signals will have what is often described as "bacon frying" sounds in the background. If your signal is strong enough to fully quiet the repeater's receiver when there is no audio (your voice) then you are full quieting.

Inversion or Ducting
From time to time, particularly in the summer, VHF signals are transmitted far beyond their normal range. This is caused by changes in temperature and humidity at different levels of the atmosphere and this phenomenon is called Sporadic E. Without going into a lot of technical reasons, the signal effectively gets trapped between these layers much like air is trapped in a heating duct. When the signal escapes it can be many hundreds of miles away. This presents an interesting problem for repeaters. Many repeaters share the same pair of operating frequencies, but because they are so far away from each other, they don't normally interfere with each other. When there is an inversion (or ducting) all bets are off. It is not uncommon for a station to "bring up" several repeaters hundreds of miles apart with one transmission. The resulting confusion can make for some interesting long distance contacts.

Sub audible tones (CTCSS, tone squelch, and PL tone)
You will often hear hams refer to a certain repeater that has tone on it. What they mean is that the repeater has to detect a sub audible tone, transmitted by your radio, before you can use the repeater. Check with the sponsor of the repeater to see what tone they use. Most repeater groups require that you belong to their group before revealing the tone frequencies.

Tone squelch on your receiver is a very valuable feature if you are in an area plagued with a lot of interference, sometimes referred too as "intermod". By programming the code for tone squelch into your radio receiver (check your operating manual) you can eliminate all the interference. Your radio's receiver

will only open up for the repeater it is set for and no others. Again check with the repeater sponsor to see if this feature is offered.

Ham lingo

When listening to the local repeater the new ham will be greeted with all sorts of strange terms. Probably the most common will be the use of "73" when stations are signing off. "73" is a holdover from the days of landline telegraph and is generally accepted as "Best Regards".

You will also hear the use of Q-codes. Q-codes were meant to speed up Morse code transmissions by using abbreviations for the phrases most frequently sent by hams. Some feel there is no place on 2-meters for Q-codes while others feel that if both stations understand and it shortens the exchange, so much the better. Over the years Q-codes have become acceptable on phone along with CW.

Q-Codes

QTH - What is your location? Or my location is.
QSL - I understand or can you acknowledge receipt?
QSY - I'm changing frequency to, or can you change frequency to?
QRZ - Who is calling me?
QRT - I am finished transmitting or please stop transmitting.
QSO - Can you communicate? Or I can communicate.
QRM - I am experiencing interference (man made).
QRN - I am experiencing interference (natural).

A complete set of Q-signals can be found at:
www.arrl.org/FandES/field/forms/fsd218.html

It is also recommended that new hams brush up on the phonetic alphabet. (Alpha, Bravo, Charlie...etc.). When working a weak station and trying to pass information it goes a lot easier if you are both using the standard phonetic alphabet. Many hams still use a mish-mash of made up phonetics and it only causes more confusion. That's not to say that you can't have some fun with call signs and phonetics when conditions aren't a factor.

Standard Phonetic Alphabet

Alpha, Bravo, Charlie, Delta, Echo, Fox-trot, Golf, Hotel, India, Juliet, Kilo, Lima, Mike, November, Oscar, Papa (pah pah), Quebec, Romeo, Sierra, Tango, Uniform, Victor, Whiskey, X-ray, Yankee, Zulu.

Amateur Radio Terms

APRS - Automatic Position Reporting System
Auto Patch - A device that allows repeater users to make phone calls through the repeater
CTCSS - Continuous Tone Coded Squelch System
DTMF - Dual Tone Multi-Frequency - Touchtone
Multimode Transceiver - A Transceiver capable of SSB, CW, and FM operation
OM - Old Man - referring to a male
Packet cluster - A network of automated packet radio stations
Vertical Antenna - An omni-directional antenna
XYL - Ex Young Lady - refers to a married female
Yagi - A beam or directional antenna, usually rotatable and has multi elements
YL - Young Lady - refers to a Young Lady

Final notes

Like most things in life, a little common sense goes a long way. When using a repeater, be mindful of the fact that many others may be listening. Don't say anything on the air that you may regret later. If in doubt, don't say it! Keep

your conversations brief. No one likes to have someone monopolize a repeater for hours on end.

Make sure your equipment is working properly. Check all your connections and your antenna system frequently to make sure that you are not causing interference or irritating noises on the repeaters. If you are using a power supply, make sure it has the proper filtering for radio use. A power supply with inferior filtering can generate a very annoying AC hum.

Ignore those that cause interference as they usually do this to get attention. And last but not least, it takes many hours of dedication and expertise to maintain an effective repeater. If you find you are using a repeater frequently, offer to help support those that own/maintain the repeater or take out a membership with the club that sponsors the repeater.

Hope you find this information helpful.