

# Repeater User Guide

The repeaters are club resources that are maintained for everyone's enjoyment. They also provide important resources for community service. The basic function of a repeater is to receive a signal's audio modulation on one frequency and to simultaneously retransmit that modulation on another frequency. The complexities that arise from this process have a huge scope and only the more important aspects of repeater use are covered in this guide. The legal responsibility, the expected operator courtesy and the proper problem feedback mechanisms are the areas of greatest interest. Some technical stuff is thrown in to help understand the "what and why."

## Legal Responsibility

When a user transmits a signal on an amateur radio frequency the user is required to identify the call sign that authorizes that signal. This must be done at least once every ten minutes and at the end of a communication session. The repeaters identify with the club call sign once every eight minutes whenever the repeater is in use. If a user talks "over" the voice ID from the repeater's controller the controller switches to a CW audio ID. The repeater ID does not replace the user's responsibility. It only does the required ID for the repeater itself.

Users should never purposely interfere with other's transmissions or with the repeater's transmissions. Finally, users are responsible for keeping their own equipment in good repair and adjustment, including periodic checks on antenna, SWR, frequency accuracy and power output.

Nothing should need to be said about the transmission of music, bad language, false or coded messages.

In practice, each one of us should be responsible for gently reminding our peers of poor operator behavior when necessary.

## Expected Operator Courtesy

Listen before you transmit. It's all too common for operators to turn on the rig and announce their presence immediately. This risks doubling with someone else's response in an ongoing QSO or disturbing the flow of communications during an emergency or organized drill.

Although it isn't required, it's considered good practice for the operator to give a proper ID on the initial transmission of a session on a repeater. It's just like giving your name when someone answers your phone call even if you think your voice is distinctive enough otherwise. It's also polite to wait a bit before switching frequencies to another repeater. It often takes a few seconds to stop a scanning transceiver or even just get to the

mic on a mobile rig. Don't waste other people's time by not giving them a chance to respond.

It's OK to insert yourself into a QSO to get a question answered by one of the parties. However, operators should always get permission for this by at least announcing the intention before going ahead. No one likes to feel ignored, and this happens to others when we don't follow this simple courtesy.

All other cases of joining an ongoing QSO should observe the practice of passing the repeater to the next person in order, either by name or call sign. A new member of the roundtable only needs to remember the name or call sign of one other member. That's the member he turns it over to at the end of his turn transmitting. The only trick to this is knowing who got the pass before you were invited in to the QSO. This is another good reason for listening before you transmit. However, when you invite someone into a QSO, tell that person whom you passed it over to in the rotation so that he or she knows. And then replace him or her as your "pass to." The same sort of thing happens in reverse when someone leaves the QSO. The person that passed it to the person leaving just adopts the person it gets passed to as his or her own "pass to."

Yield the repeater to organized emergency practice nets and public service nets. If there is an actual emergency declared use established procedures to join the net and be a good listener while there's traffic on the air.

It is bad practice to announce opinions about interference or other problems to the world. As Hams, we should be aware that we have legal privileges to use radio as a hobby. We also have a responsibility to respect others in our quest to enjoy what we do. Good operators help the Technical Committee diagnose problems and refrain from passing judgments. If it has to do with the repeaters, let the Club's Board and Trustee handle the legal side of complaints and remedies. Accusing other organizations or individuals is a sure way to sully your own reputation as well as the reputation of Amateur Radio in general.

## **Proper Feedback Mechanisms**

It's vital to have good feedback from operators for maintaining and diagnosing the repeater's functions. Regardless of how many listening stations there, if there isn't any information about problems getting to the Technical Committee, nothing is going to get done to rectify problems. It's helpful if operators give reports that have some technical basis. So here's that technical stuff.

Heterodynes are caused by two nearly equal weak signals arriving at the repeaters input together. This effect is heard by everyone listening to the repeater and only happens on weak signals. If either signal is strong enough the repeater will "capture that signal and ignore the weak signal. The audible effect sounds like a buzzing background signal and rarely provides demodulated audio from both weak signals. Simply stated, heterodynes

are caused by something producing a signal on the repeaters input frequency. A listener might hear this offending signal if it is closer than the other party using the repeater. During periods where this kind of thing is happening, it helps if users listen in on the repeaters input frequency to see if they can hear the interfering carrier. With enough affirmative reports, a map of the offender's location can be estimated.

Hacker's are stations that purposely interfere with the repeater on its input frequency. The same kind of mapping applies to them as to other kinds of heterodyne interference.

So program a channel on your rig for the repeater's input frequency without PL and be prepared to listen when there are active heterodynes or hackers. Without feedback there's not much hope of getting anything done in these cases. Just record or remember where you were and when you heard the interference and report it back to the Technical Committee. Just remember to avoid transmitting on this channel on your rig or you'll become a source of interference.

Intermodulation Distortion is often hard to diagnose. Reporting occurrences of intermod by Time, Date and Duration may help the Technical Committee identify an illegitimate signal source and may help pin down the culprit. Here's a simple explanation of what it is.

In a perfectly linear system two separate frequencies can coexist on the same wire without any side effect. They can leave the wire as radiated energy or be absorbed into a load and will remain simply two separate frequencies. However nothing is ever perfect and when two separate frequencies exist together in a non-linear system they beat with one another and produce both sum and difference frequencies. The non-linear system could be in the repeater equipment, in some external conductors, or even in the users own equipment. One of the frequencies of interest here is the repeater's transmit frequency. The other is the offending signal's frequency. If either the sum or the difference of the two frequencies exactly equals the repeaters input frequency the repeater will suffer interference. The problem is compounded by the possibility that there are more than two strong signals involved. It's one of the most difficult repeater problems to diagnose.

One other common error that mistakenly gets reported as a problem from time to time is too tight a setting on the user's squelch control. This over squelch condition cuts the first syllable of the Repeaters ID or the first syllable of another user's transmission.

This last request is for the sake of the Technical Committee. There is no value in stating that there's something wrong with the repeater over the air. The repeaters are monitored and checked for performance often enough to be confident that they're working well unless they fail completely. It is more important to let us know when you hear a potential problem, where you were when you heard it, and what you heard.

**Have Fun and be a Positive Force!**