The New Ham's Guide to Repeaters

What Is A Repeater?

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A repeater is a device which will receive a signal on one frequency and simultaneously transmit it on another frequency.

All Repeaters Are not Voice Repeaters

Types of Repeaters

- FM Voice – Very common.
- ATV – Amateur Television.
- AM and SSB - Not very common.
- Digipeaters – Primarily used for packet communications.
- Multi-channel (wideband) – Amateur satellites.

- Most hams are familiar with FM voice repeaters.
- They are the most popular repeater used in Amateur Radio.
- These repeaters are commonly found on 29, 144, 222 or 440 MHz bands.
- Though not as popular, there are FM repeaters on the 6m amateur band.

When we use the term *repeater* we are almost always talking about transmitters and receivers on VHF or higher bands, where radio-wave propagation is normally line of sight.

Why Do We Use Repeaters?

Greater Range

A repeater's expanded coverage greatly enhances the ability to communicate with mobile stations and hams using hand held transceivers.

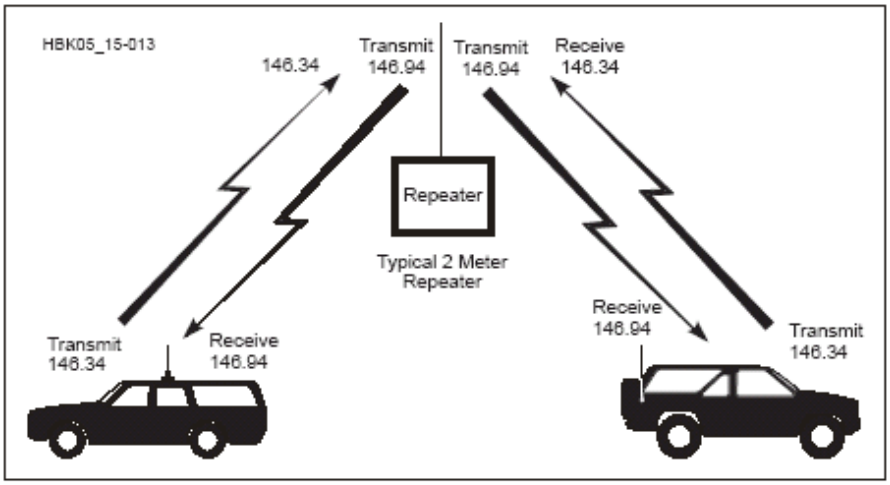


Fig 15.13 — Typical 2-m repeater, showing mobile-to-mobile communication through a repeater station. Usually located on a hill or tall building, the repeater amplifies and retransmits the received signal on a different frequency.

Location, Location, Location

Repeaters are often located on high ground or tall towers that offer greater coverage than that offered by *simplex* operation.

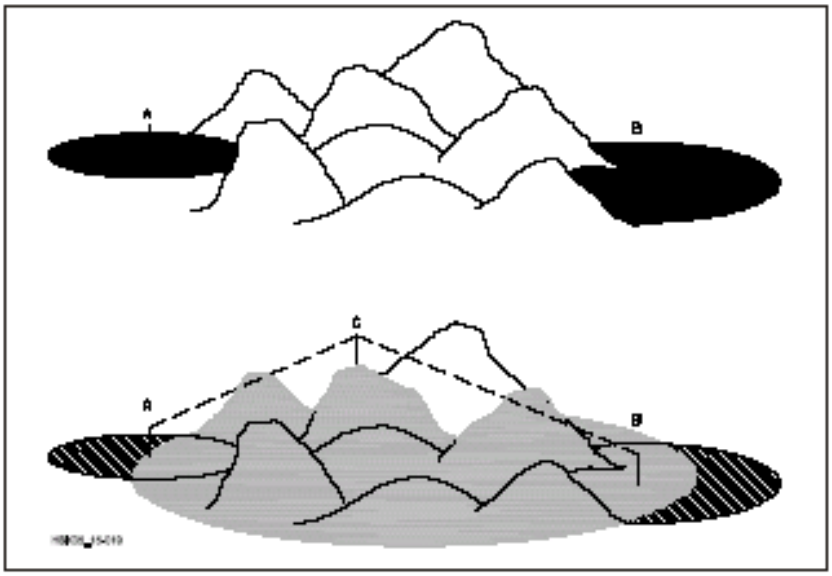


Fig 15.19 — In the upper diagram, stations A and B cannot communicate because their mutual coverage is limited by the mountains between them. In the lower diagram, stations A and B can communicate because the coverage of each station falls within the coverage of repeater C, which is on a mountaintop.

Using A Repeater

Using a repeater is not much different than making any other two way contact.

Simplex and Duplex

When two stations contact each other using the same frequency for both transmit and receive, they are said to be operating *simplex*.

Simplex and Duplex

Duplex **operation is where one station transmits on frequency A and receives on frequency B and the other station transmits on frequency B and receives on frequency A.**

Simplex and Duplex

- **Full duplex is when both stations can transmit and receive signals simultaneously.**
- **A repeater operates in full duplex mode.**

Simplex and Duplex

- **Because users of a repeater cannot transmit and receive simultaneously, the stations are actually operating in *half duplex* mode.**

When making a contact through a repeater it is important to make sure that you are on the correct pair of frequencies.

Input and Output

- The frequency that a repeater receives is the *input* frequency.

- This is the frequency that your station will be transmitting on.

Input and Output

- **The frequency that a repeater transmits on is the *output* frequency.**

- **This is the frequency that your station will be receiving.**

Input and Output

- **Repeaters are commonly referred to by their transmit frequency. This is the receive frequency displayed on your radio.**

Input and Output

- **Your radio should display *your receive frequency* (the repeater's transmit frequency) when monitoring the repeater.**

Offset

The difference between the repeater's output frequency and input frequency is known as the *offset*.

Offset

Most repeaters use a standard offset.

Standard Frequency Offsets for Repeaters

Band	Offset
29 MHz	100 kHz
52 MHz	1 MHz
144 MHz	600 kHz
222 MHz	1.6 MHz
440 MHz	5 MHz
902 MHz	12 MHz
1240 MHz	12 MHz

Plus or Minus

- **The offset frequency can either be above or below the repeater's transmit frequency.**
- **The band plan has taken the guess work out of +/-.**

Directory

- **The ARRL Repeater Directory list thousands of repeaters on the Amateur bands.**
- **Think of it as a phone book for repeaters.**

Directory

- **Among the information listed for each repeater are the callsign, location, TX/RX frequencies and PL tones, if any.**

Directory

- **Travel Plus For Repeaters is a CD-ROM version of the Repeater Directory.**
- **The electronic format allows more information and a lot more features than a book can.**

Directory

- **Travel Plus For Repeaters allows you to find repeaters along a planned route.**

Directory

- **Travel Plus For Repeaters also works with most radio programming software to program your radio's memories with the proper repeater information.**

Making Contact

- **Listen first.**
- **Then listen again**
- **If the repeater is not busy then make your call.**

Making Contact

- **If you want to call a particular station then press your mic button and say the station's call and then your call**

"W1ABC this is K2XYZ"

Making Contact

- When you release your mic button you should hear the repeater signal for a second or two often followed by a tone or beep.
- This is called the “squelch tail”, “courtesy tone” and “hang time.”

Making Contact

- The courtesy tone tells you that the repeater has reset its timer and it is ok to transmit.

Making Contact

- **If you want put out a general call to any station then press your mic button and announce your call.**

“This is W1ABC listening.”

or

“This is W1ABC monitoring.”

Making Contact

- **If you want to enter a conversation in progress do so when one station ends transmission and before the other station begins transmitting.**

Making Contact

- **Simply key your mic and announce your call during the pause in the ongoing conversation.**

Making Contact

Do not use the word *BREAK*

This is usually reserved for emergencies.

Making Contact

It is proper etiquette to only enter a conversation if you have something constructive to add.

Making Contact

(Or Not)

If the other operators do not recognize your call or if people are not responding to you make sure that all of your settings are correct.

Making Contact

(Or Not)

Especially check your offset and PL tones.

Making Contact

(Or Not)

Before making a rash assumption that the other operators are rude and are ignoring you, have someone else go over your settings with you.

Etiquette

Listen, Listen, Listen and then Listen some more.

Etiquette

Do not KERCHUNK the repeater

- **This is simply keying the repeater and not saying anything.**
- **Not only is it annoying but it puts undue wear and tear on the equipment.**

Etiquette

If you do want to test your equipment and see if all of your settings are correct and you are “getting into the machine” …

Etiquette

… Then give your call and say “testing”

It is good practice not to make a habit of this.

Etiquette

Don’t time it out

- Keep your transmissions brief.
- Most repeaters have a 3 minute timer to prevent long winded transmissions and to protect the equipment.

Etiquette

Don’t time it out

- Wait for the courtesy tone before transmitting. This tells you that the timer has reset itself.
- You don’t have to wait for the repeater to “drop” after the courtesy tone.

Etiquette

Jargon

- Speak normally when using a repeater.
- As with any voice mode it is not proper to use Q signals or lingo.

Have Fun

- Repeaters are a great way to stay in touch with local hams and club members.

The Serious Side

- Repeaters play a big role during emergencies.
- When used for emergencies keep the repeater open for priority communications.

The Serious Side

- Repeaters are also used for public service events that you may wish to volunteer to help with.

The Serious Side

- **Make sure that you have registered with the event coordinator before joining in any type of net or organized communications for an event.**

Support

- **Repeaters are built and maintained at the expense of a club, an individual or a small group of hams.**

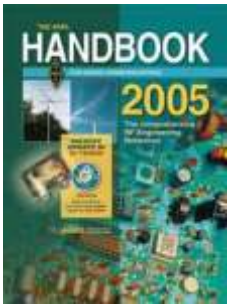
Support

- **While not required, it is a nice gesture to support the sponsor of a repeater that you frequently use by joining the club or making a donation.**

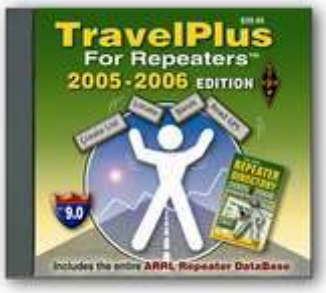
Publications

ARRL Handbook

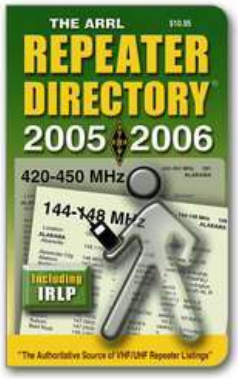
http://www.arrl.org/catalog/?item=9280



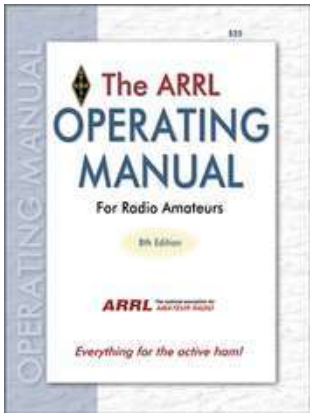
TravelPlus for Repeaters CD-ROM -- 2005/2006 Edition. Version 9.0



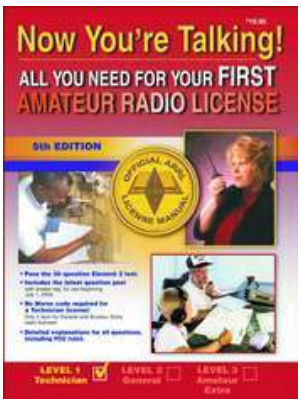
The ARRL Repeater Directory -- 2005-2006 Edition



The ARRL Operating Manual for Radio Amateurs
-- *Everything for the active ham!*



Now You're Talking!--5th Edition
-- All You Need For Your FIRST Amateur Radio License



Contact

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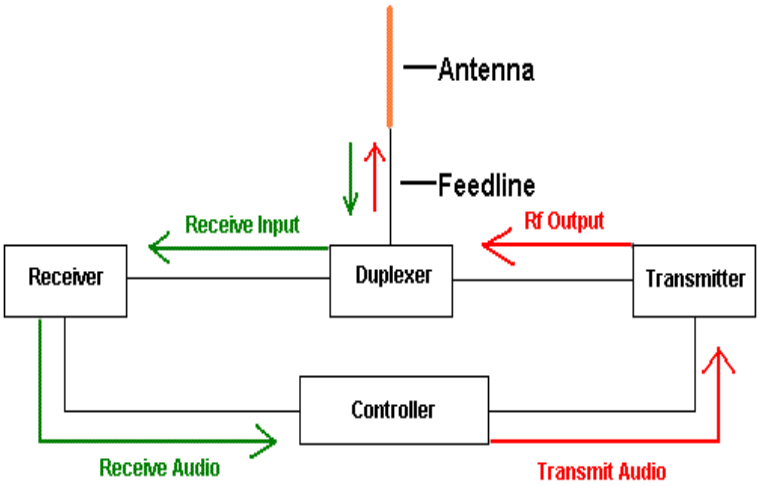


BASIC REPEATER BLOCK DIAGRAM N4UJW

Antenna

- Most repeaters use a single antenna for transmit & receive
- The antenna is usually “robust” and high-gain
- The antenna is usually mounted as high as possible on the tower structure

Feed Line

- Most repeaters do NOT use standard coaxial cable
- Standard coax has too much loss!
- Repeaters use “hard line” which is much more efficient and more durable than standard coax

Duplexer

- Allows single-antenna operation for transmit & receive
- Also known as “Cans” or “Cavities”
- Most duplexers are a pass & notch filter – on the Tx side they pass the Tx frequency while notching the Rx frequency – on the Rx side they pass the Rx frequency while notching the Tx frequency

Receiver

- Receives the incoming signal
- Must be very sensitive
- Must be very selective
- May have CTCSS (or PL) tone decoding
- Provides receive audio
- Provides COS (Carrier Operated Switch) or Squelch signal

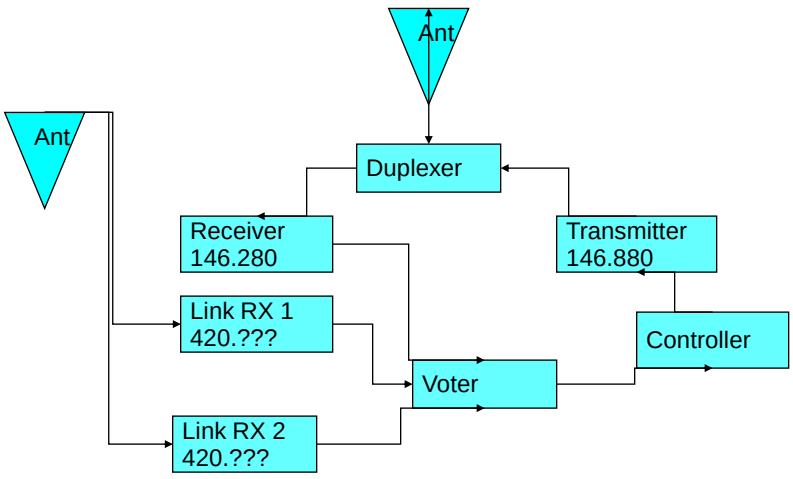
Transmitter

- Transmits on desired output frequency
- Must be “robust” – continuous duty cycle
- Accepts PTT signal
- Accepts Transmit Audio

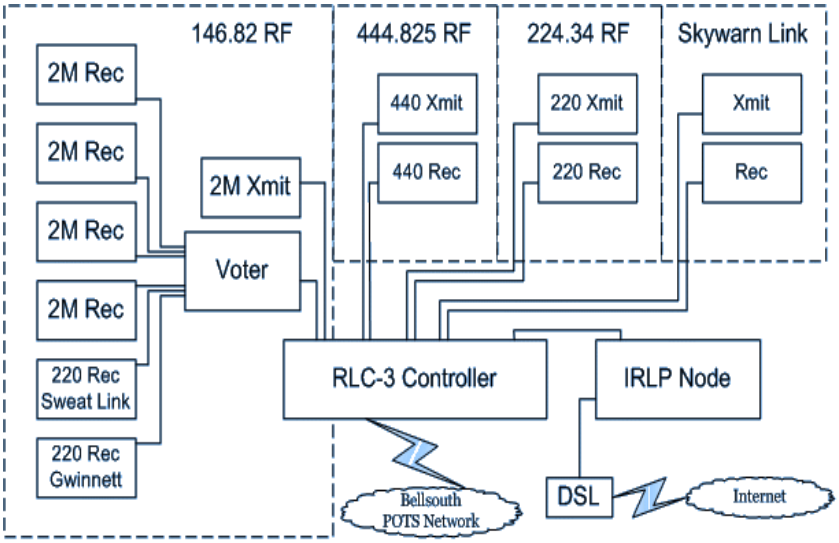
Controller

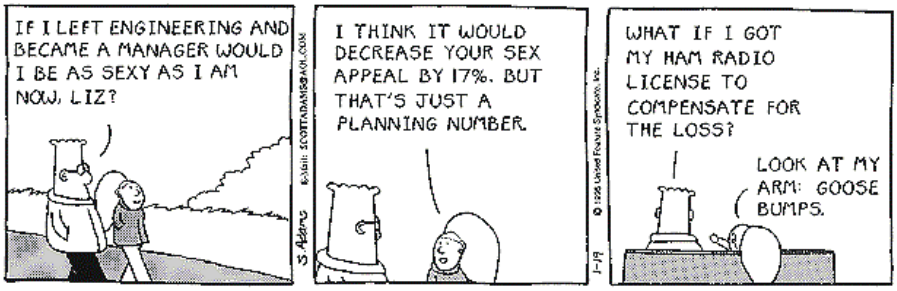
- The “Brains” of the repeater
- Identifies the repeater (CW or Voice)
- Provides courtesy (go ahead) tones
- Provides timers for transmit & receive
- Provides phone patch (interconnect)
- Provides linking capability to other radios & repeaters

Example of a Repeater with Multiple Receive Sites



Example of a Linked Repeater System





QUESTIONS?

Thank You!