

**HAMS
HELPING
HAMS**



ARRL
MENTOR PROGRAM

The New Ham's Guide to Repeaters



What Is A Repeater?



What Is A Repeater?

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



- 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.

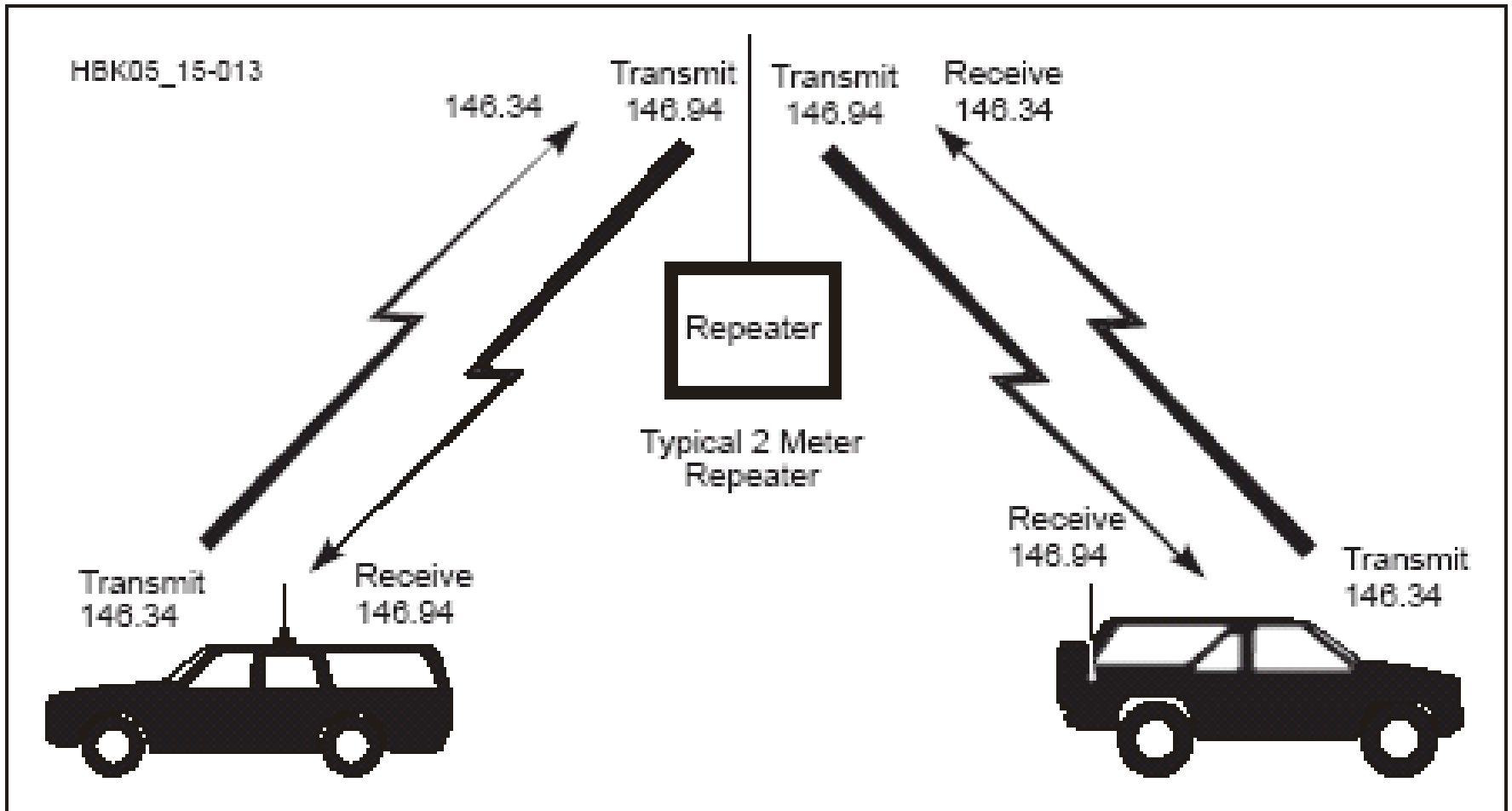


Fig 15.13 — Typical 2-m repeater, showing mobile-to-mobile communication through a repeater station. Usually located on a hill or tall building, the repeater amplifies and retransmits the received signal on a different frequency.



Location, Location, Location

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

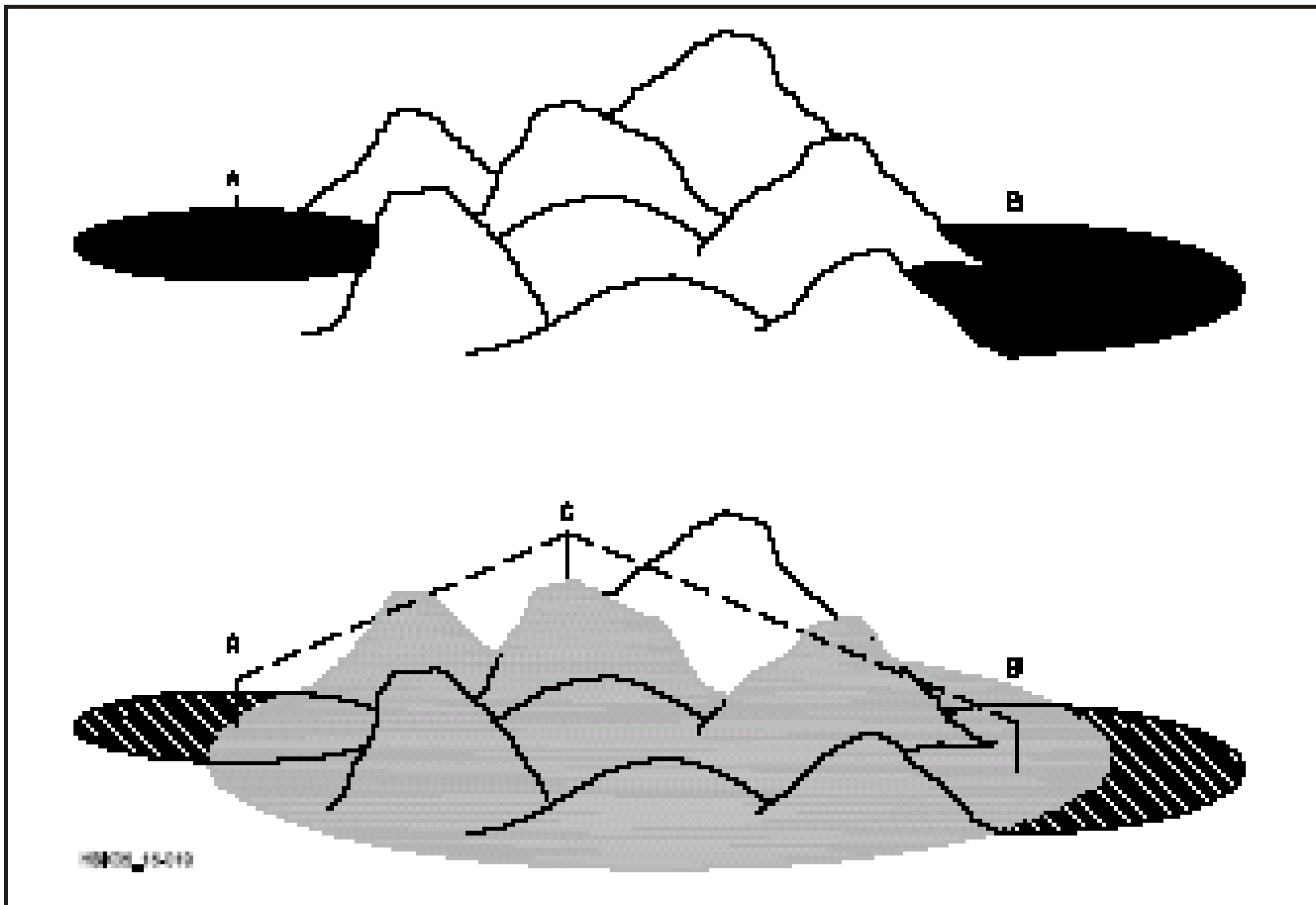


Fig 15.19 — In the upper diagram, stations A and B cannot communicate because their mutual coverage is limited by the mountains between them. In the lower diagram, stations A and B can communicate because the coverage of each station falls within the coverage of repeater C, which is on a mountaintop.



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

<u>Band</u>	<u>Offset</u>
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 +/-.**



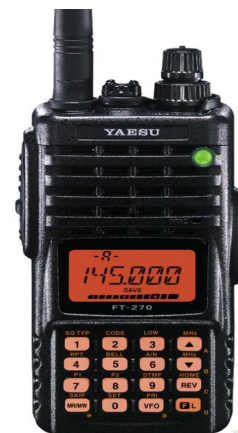
Directory

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



W8IRA

<http://www.w8ira.org>



IRA Repeater System

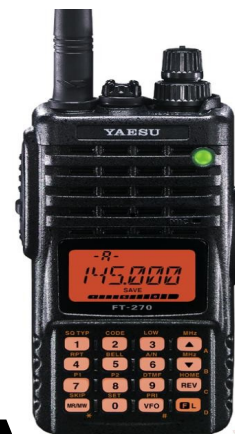
(Grand Rapids Link)

- **147.160 MHZ Repeater Output
(HT Listening Freq)**
- **Offset +600 Khz**
- **147.760 Mhz Repeater Input
(HT Transmitting Freq)**
- **PI 94.8 Hz**



W8DC

<http://www.w8dc.org>



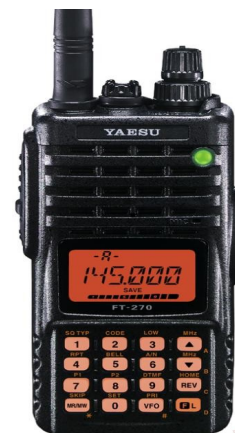
Grand Rapids GRARA

- **147.260 MHZ Repeater Output
(HT Listening Freq)**
- **Offset +600 Khz**
- **147.860 Mhz Repeater Input
(HT Transmitting Freq)**
- **PI 94.8 Hz**



W8USA

<http://www.w8usa.org>

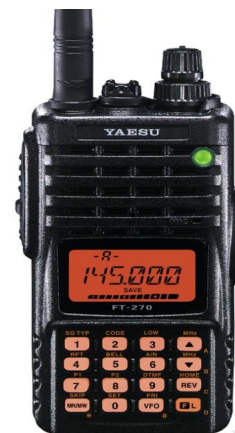


Grand Rapids MARA

- **145.230 MHZ Repeater Output
(HT Listening Freq)**
- **Offset -600 Khz**
- **144.630 Mhz Repeater Input
(HT Transmitting Freq)**
- **PI 94.8 Hz**



W8LRC
<http://www.w8lrc.org>



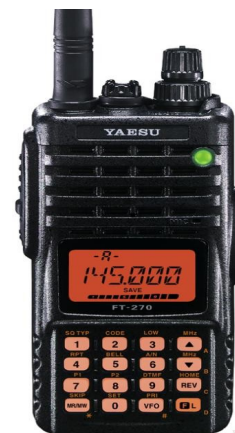
Lowell LARA

- **145.270 MHZ Repeater Output
(HT Listening Freq)**
- **Offset -600 Khz**
- **144.670 Mhz Repeater Input
(HT Transmitting Freq)**
- **PI 94.8 Hz**



K8DAA

<http://www.hollandarc.org>

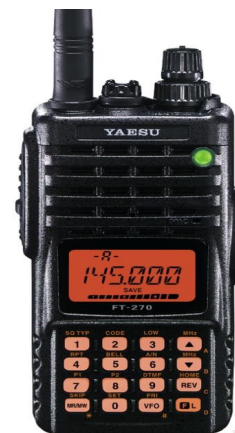


Holland HARA

- **147.060 MHZ Repeater Output
(HT Listening Freq)**
- **Offset +600 Khz**
- **147.660 Mhz Repeater Input
(HT Transmitting Freq)**
- **PI 94.8 Hz**



<http://www.miarc.com>



More Information:

Michigan Area Repeater Council

- The Michigan Area Repeater Council serves as the central coordination body for all amateur radio repeaters in Michigan.
- Kent County Information:
http://www.miarc.com/cnty/kent_rptr.html
- Ottawa County Information:
http://www.miarc.com/cnty/ottawa_rptr.html

What is a PL Tone?

A PL is frequently used to preclude interference in high RF environments and lessen what is called kerchunking (unnecessary keying of the repeater).

Some repeaters may also generate a PL tone on the repeater output so that repeater users who are equipped with a radio capable of decoding PL will not hear other interference sources on the channel that would otherwise open the squelch on the

Time Out Timer

Most radios have a Time out Timer (TOT)

This will save your radio from burning up.

If your mic gets stuck on. (open mic)

The radio will stop transmitting after the timer
Times out.

Set it for 2 or 3 mins.



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.**



Contact

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