**Repeaters and How They Work (**Basics)

**What is a repeater?**

It is a radio transceiver not unlike your own radio, however; it has a few unique features. It receives, or listens, on a specific frequency and sends your transmission back out on a different frequency, instantaneously. It repeats what you say, thus, “Repeater”.

**Why Repeaters?**

A repeater is normally on a high location, (tall building or mountain peak), and is easier to talk to than another radio at ground level. (Better “Line of Sight”). Repeaters have more power than handheld or mobile radios, so it can reach further. The result is that a low power radio can be heard at greater distances. Further is better.

**Repeater terms:**

**A. Output Frequency:**

This is the frequency that we listen to from the repeater. This is also the frequency you will program into your radio. For example: The repeater frequency for Scottsdale Airpark for the (ARA),Arizona Repeater Association is 146.760. This is the frequency you will see on your radio screen and hear on your radio.

**B. Input Frequency:**

This is the frequency that you use to transmit into the repeater. The frequency for transmitting into the Scottsdale Airpark for the Arizona Repeater Association is 146.160. So, you listen on 146.760 and transmit on 146.**1**60. And that brings us to “Offset”.

**C. Offset:**

Repeaters are not designed to receive and transmit on the same frequency, so an Offset is needed. For VHF (2 meter), the offset is always .600 kHz as used at Scottsdale Airpark. UHF (70 cm) is always a 5 MHz offset. Example: The Bishop’s Storehouse UHF repeater transmits on 449.375 and receives on 44**4**.375. And that brings us to “Shift”.

**D. Shift:**

Shift is the direction of the Offset. It can be Minus or Plus. In the two examples above you can see that the Shift was Minus. Minus means that you would subtract. Plus means that you would add. At Scottsdale Airpark is was minus .600 kHz and the Bishop’s Storehouse was minus 5 MHz. (146.760 - .600 = 146.160. The opposite is a positive shift is required. (443.275 + 5.0 = 448.275). As you can see the “Shift” is quite important if you wish to use a repeater and be heard. Now. CTCSS.

**E. CTCSS (PL Tone):**

CTCSS (Continuous Tone Coded Squelch System), or the more common term, PL Tone, (the Motorola term for “Private Line”), is one more thing that a repeater may or may not use. It is often used in busy areas, but may not be needed in rural areas. The PL Tone is an inaudible tone, transmitted by a radio to tell the repeater to recognize your transmission. Similar to a password.

Note: When programming your radio, it most likely will use the term CTCSS, so watch for it.

**CTCSS extra little note:** Most repeaters with a PL Tone of 100.0 are normally open for everyone to use. Some repeaters have different PL Tones and are private or club repeaters. Membership is highly recommended, except in emergencies of course. ARA is one such club. They have many great repeaters and several are linked together for even greater coverage.

**Linked Repeaters:** There repeater systems that will electronically “link” two or more repeaters together. ARA has multiple linked repeaters like *MetroLink, RimLink and NorthLink*. You can talk into one repeater and it will simulcast through other repeaters. Example: You can transmit on the ARA *MetroLink* Mt. Ord repeater and it will re-transmit through five additional repeaters simultaneously. (See attachment)

**Hang Time:** Most repeater's transmitter remains keyed anywhere between 1/2 second and 5 seconds,  
in other words it's transmitter ***<hangs>*** on before it ***<drops out>***, this is what's known as the *hang time* or *drop out delay*.  
Some repeaters insert a beep or other type of tone or multiple tones during the hang time.   
This tone or tones can be a "courtesy tone" or it can be telemetry signaling that certain links or other devices are connected.

**Talk Around:** It simply means= ***Simplex***[operation](http://www.dapcom.com/talkaround.htm) on the ***output*** frequency of a repeater….. No Offset.  
It's also commonly known as "***Direct***". You should ***NEVER*** operate simplex on the ***input***frequency of a repeater.

**Recap:** When someone gives you repeater information for you to program it may look like this; 146.750**-** 100.0. You would then program in: Output Frequency 146.750 with a minus offset and a PL tone of 100.0. Many radios will automatically set the Offset and shift direction once you type in the frequency, but that is usually set up prior to programming.

**Read your radio’s owner’s manual**.

Several reasons to read your manual. There many features on your radio that you should be aware of. Like how to scan, how to make pre-sets and how to manually program your radio. It is very easy to use your computer to program your radio, especially with programs from RT Systems but, there are times when you are out and about and will needed to program your radio manually. Know how before you need to.

Eastern Arizona; EAARS Network: All EAARS network repeaters operate with PL tone 141.3

146.860 + and (440.700 + Hub) Heliograph Peak   
147.280 + Guthrie Peak - Greenlee County   
145.210 - Jacks Peak New Mexico. Between Lordsburg & Silver City   
145.410 - Pinal Peak Near Globe AZ   
147.160 + Mt Lemmon Near Tucson   
146.700 - Greens Peak Near Springerville   
145.270 - South Mtn. Near Alpine, AZ   
147.080 + Mule Mtn. Near Bisbee in Cochise County   
147.060 + Lil Florida Mtn. Near Deming, New Mexico   
145.470 - Caballo Mtn. Near Truth or Consequences, New Mexico   
145.350 - West Peak. West of Heliograph 12 miles

White Mountains area (Kachina Amateur Radio Club)

145.230 – 110.9 Pinedale

145.270 – 141.3 Alpine

145.310 – 110.9 Greens Peak

145.170 – 162.2 Heber/Overgaard

146.620 – 162.2 Greens Peak

146.680 – No PL Holbrook

146.760 – 162.2 Porter Mtn. (Pinetop)

146.800 – 162.2 Heber/Overgaard

146.800 – 159.8 Forest Lakes

146.840 – No PL Winslow

147.380 + 91.5 Winslow

446.550 – 162.2 Heber/Overgaard

446.600 – 100.0 Heber/Overgaard

448.375 – 100.0 Greens Peak

448.850 – 110.9 Greens Peak

449.050 – 110.9 Porter Mtn. (Pinetop)

449.150 – 110.9 Showlow

449.350 – 100.0 Greens Peak