Crossband Repeater

A crossband repeater is different from a regular repeater in two important ways:

- Where as a regular repeater uses the same band with a small offset between the tx and rx frequencies (600 kHz for VHF and 5 MHz for UHF), a crossband repeater uses two frequencies on different bands (one on VHF and the other on UHF for example).
- Where as a regular repeater always listens to the same frequency (the input of the repeater) and always transmits on the other (the output), a crossband repeater transmits on one frequency whatever it hears on the other, whichever it hears first.

Many higher end dualband radios are capable of doing cross-band repeat (Icom's ID-5100 or Kenwood's TM-D710G are two examples). Below are different uses for a crossband repeater.

Adhoc Repeater

Supposing you are in a remote location with no repeater and you have a few people who need to communicate with handheld radios. You could park your car with a crossband repeater up a hill and use two simplex frequencies as follows:

- Both handhelds are set to listen to 446.100 and transmit on 145.565 so that when Unit A transmits on 145.565,
- The crossband repeater hears the 145.565 signal and re-transmits it on 446.100
- Which Unit B hears, and vice versa.

In practice, it might be tricky to setup the handhelds to receive on one band and transmit on the other. With Baofeng radios, I found it was easier to have receiver A set to the Tx frequency and receiver B to the Rx frequency.

Adhoc Repeater Variation

There's a simpler variation of the above scheme but it only works for two handhelds:

- Here, each handheld uses a different band so there is no need for fancy dual band tx/rx.
- The problem is that you can't add more handhelds (unless they can already hear the others in simplex).

Repeater Extender

This is a scheme I use often at home with my base station in crossband mode: I tune one receiver to our local repeater, and the other to a simplex UHF frequency. I can then use my handheld around the house and the yard with the “power” of my base station and antenna to get into the repeater.

- Unit A transmits and receives on 446.100 (with a tone).
- The crossband repeater hears 446.100 (with a tone squelch) and re-transmits it on 147.**8**20 (the input of the repeater).
- The repeater hears 147.**8**20 and repeaters it on 147.**2**20 (its output)
- Unit B receives 147.**2**20 and replies on 147.**8**20, which
- The repeater re-transmits on 147.**2**20
- The crossband repeater hears 147.**2**20 and re-transmits it on 446.100.

All that is needed to “program” the crossband repeater is to tune it to the regular repeater frequency (with its proper offset and tone), and select a UHF simplex frequency for crossband repeating. I add a tone and tone squelch to the UHF frequency to limit interference being sent to the repeater from other operators who could join the UHF frequency not realizing it's in use.

One thing to keep in mind with crossband repeat is that the radio doing the repeating is transmitting every time someone transmits. Using this scheme to listen to an hour long net means that the radio would transmit at close to 100% duty cycle, which it may or may not be designed to do. It would be best to use the lowest power setting and/or keep the use to a minimum.

Repeater Extender Variation

The following is a variation I use when I can hear the repeater with my handheld, but can't transmit to it because of the handheld's low power. In this configuration, the crossband repeater only transmit when **I** am transmitting, not when the others are transmitting, which is much much easier on the radio.

The crossband repeater is set up with the input frequency of the repeater without the offset. The tone is set to the repeater tone, but the tone squelch is set to something else (I'll explain in a minute). So:

- Unit A transmits on 446.100 and receives the repeater's output on 147.**2**20.
- The crossband repeater hears 446.100 and re-transmits it on 147.**8**20 (the input of the repeater).
- The repeater hears 147.**8**20 and repeats it on 147.**2**20 (its output)
- Unit B receives 147.**2**20 and replies on 147.**8**20
- Then, two things happen:
  - The repeater hears the signal on 147.**8**20 and re-transmits it on 147.**2**20 but,
  - The crossband repeater does NOT hear the signal from the repeater's output frequency because it's tuned to its input. It also doesn't hear the input of Unit B (in case it's close enough to), because it has a different tone squelch than the repeater's tone.
  - So the crossband repeater stays silent.
- Unit A hears the output of the regular repeater, not the crossband repeater.

In this configuration, the crossband repeater only re-transmits Unit A, and not everyone else on the net, keeping the duty cycle low.

Repeater Link

A crossband repeater can be used to link a VHF and UHF repeater simply by dialing both repeater frequencies (with offset and tones) on the crossband repeater.

Here again, high transmit duty cycle can be an issue.

Repeater Link Variation

Supposing a third handheld (Unit C) is close to the crossband repeater but can't hear either repeaters. Unit C can still communicate with Unit B by “impersonating” the UHF repeater: note the difference between Unit A and Unit C. In this configuration, Unit A and B can still communicate with each other, but Unit C can't reach Unit A.

To reach Unit A, Unit C would need to “impersonate” the VHF repeater and be setup as the “opposite” of Unit B.

KT-8900

It's pretty easy to setup a cross band repeater with two KT-8900 radios.

- The first step is to make an ethernet patch cord with this pin out

|1 (Data Input) |↔ empty |

2 (RPT CTRL)	↔ 5 (PTT)
3 (MIC)	↔ 8 (AF OUT)
4 (MIC GND)	↔ 4 (MIC GND)
5 (PTT)	↔ 2 (RPT CTRL)
6 (GND)	↔ 6 (GND)
7 (+8VDC OUT)	↔ empty
8 (AF OUT)	↔ 3 (MIC)

* The second step is to set the menu option 43: REP-M to something like CTDCS. This will send the output of one radio to the other radio if the tone is detected.