ARES CROSS-BAND REPEATER OPERATION

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1. Background.

Many newer true dual band VHF/UHF radios (that have two RF decks with two frequency displays) will operate in a cross-band repeater mode. This mode is very useful to support field operations, especially handheld radio operations, in remote locations that don't have access to high level repeater systems.

Cross-band repeaters typically are set up as either a portable unit or operated from a mobile vehicle platform. The cross-band repeater simply repeats what it hears on UHF to VHF or visa versa.

UHF signal are highly susceptible to attenuation when passing through a grove of pine trees. Therefore, field operation on UHF into a cross-band repeater may not be the best option in a forest.

2. Theory of Operation.

Cross-band repeaters typically operate in one of two ways.

a. The first method is a simple point-to-point cross-band repeater with one field location accessing the cross-band repeater on VHF and another field location accessing it on UHF. This set up can extend the coverage of individual handhelds and/or mobile working through this cross-band repeater.

b. The second method is to connect a remote field site into an existing high level repeater system using the cross-band repeater. For an existing VHF high level repeater, the field units access the cross-band system on UHF. For an existing UHF high level repeater, the field units access the cross-band repeater on VHF.

3. Cross-band Repeater Set Up.

Caution. Radios used as a cross-band repeater may transmit continuously with heavy traffic levels causing cross-band transceiver overheating and possibly harming the output transistors. When in use, first one side transmits and then the other. Highly recommend low or medium power on both VHF/UHF sides of the cross-band repeater. Use only the minimum power levels required to maintain operations.

Notes.
1. Cross-band capable radios have this capability described in their operating manuals. Follow your specific radio's set up procedures.

2. The *receive sides* of both VHF and UHF on the cross-band should have CTCSS (PL) *tone* ***encode*** set to minimize the chance of false triggering by other signals. This is critical when connecting a cross-band repeater to a busy high level repeater system. You don't want to disrupt its operation with false signals.

3. The transmit Time Out Timer (TOT) on the cross-and repeater should be set to prevent accidental continuous transmissions. 3 minutes is a good target period.

a. **Point-To-Point Cross-band Repeater set up.**

Note. For Point-To-Point operation, the transmit and receive frequencies on the cross-band repeater are the same on the VHF and UHF sides of the radio (both are simplex).

Frequencies for point to point operations are normally selected from existing less used simplex frequencies.

Point to point Cross-band repeater example:

VHF Side—146.420 simplex CTCSS 141.3 Hz encode (receive)
UHF Side—445.975 simplex CTCSS 141.3 Hz encode (receive)

b. **Cross-band Repeater to High level Repeater set up.**

Notes.

1. The high level repeater side of a cross-band repeater is set like a normal radio with the proper transmit offset and any CTCSS (PL) tone encode that is required. As mentioned above, it is highly recommended to use tone **encode** on the receive sides (both VHF and UHF) to limit false triggering of the cross-band and high level repeaters.

2. ***Important***- when accessing a high level repeater via a cross-band repeater, the high level repeater MUST either drop the retransmitted PL tone or totally drop the transmitter (squelch tail drop out) BEFORE the cross-band repeater will un-key. The remote field site cannot activate (transmit into) the cross-band repeater until the high level repeater either drops the retransmitted PL (if this option is used) or the high level repeater transmitter totally drops off (squelch tail burst). Once this happens then the cross-band repeater also drops allowing access from the field.

3. If two field operators are using the cross-band system but are out of line-of-sight between them, approximately a mile or so, both using the simplex side, they won't be able to pass traffic to or hear each other. They are not repeated locally on the cross-band repeater but only back to the high level repeater.

Connecting to a VHF high level repeater.

Example 1. Connecting a cross-band repeater to the 146.940 Lufkin repeater.

Cross-band repeater example:

UHF side-- 445.975 simplex, CTCSS/PL 141.3 Hz, tone encode (receive)
VHF side-- 146.940**-600 KHz offset**, CTCSS/PL 141.3 tone encode and decode (receive and transmit).

Remote in the field transmitter—445.975 simplex CTCSS/PL 141.3 tone encode, (must have the PL tone set to access the cross-band repeater).

Connecting to a UHF high level repeater.

Example 2. Connecting a cross-band repeater to the 444.575 MHz Lufkin U-1 repeater.

VHF side—146.420 MHz simplex CTCSS/PL 141.3 Hz tone encode (receive)
UHF side—444.575**+5 MHz offset**, CTCSS/PL 141.3 tone encode and decode (receive and transmit).

Remote in the field transmitter—146.420 simplex CTCSS/PL tone 141.3 Hz tone encode (transmit).