Crossband Couplers

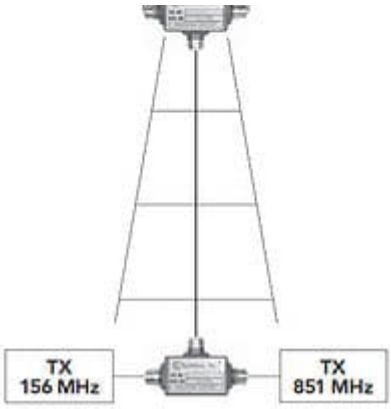
A crossband coupler is a three-port network that allows transmitters and receivers of different frequency bands to share a single feedline to an antenna. It does this by using low-pass, high-pass, or band-pass filters to isolate the desired signals from each other, with very low loss in both paths to the antenna.

Because it is a passive, reciprocal device, the crossband coupler can be used either as a divider or as a combiner. When used as a divider, it can split incoming signals from a common port into two paths (or channels), dependent on frequency. For example, when fed from a multiband antenna or feedline, a crossband coupler can divide the incoming signal into appropriate bands for two different receivers.

When used as a combiner, the crossband coupler takes inputs at two different frequencies and sends a combined signal through the common port. One example of power combining might be two antennas at different frequencies that both feed the same multiband radio receiver. Another example could be two transmitters at different frequencies connected to the same antenna. Multiple crossband couplers can be used to combine additional antennas, receivers, or transmitters.

A common configuration for a shared feedline has two different transmitters (in the graphic below, one at 156 MHz and another at 851 MHz) that feed their signals to a crossband coupler which then combines the signal to a single tower feed line. That common line routes to the input of a second crossband coupler atop the mast, which divides the signal back into two frequencies, sending each to the appropriate antenna.

This could also work the opposite way with receivers instead of transmitters. The signal from two different antennas (at 156 MHz and 851 MHz for example) are input to a crossband coupler atop the mast which combines the signals to a common feed line. That one line then becomes the input to a second crossband coupler that divides the signal back into the two frequencies, sending each to the appropriate receiver on the ground.



One of the benefits of crossband couplers over other approaches to combining signals is that crossband couplers offer higher isolation between the two signals, and therefore less band to band interaction. Other benefits include simplified installation and reduction of tower wind loading.

When choosing a crossband coupler, some of the important considerations include:

- Frequency ranges for the two signals: typically separated by greater than 2:1
- Frequency isolation: Telewave's line of TS-XX (/products/couplers-and-junctions/) Couplers provide up to 30 dB
- Insertion loss: tenths of a dB at UHF frequencies
- Voltage standing wave ratio (VSWR) at each port (band-specific): 1.5:1 typical
- Power handling: hundreds in watts

Note that a crossband coupler is not the same as a duplexer, although they are both three-port networks that permit a transmitter and receiver to use the same antenna.