

Description

In multiple channel applications, it is often desirable to use one antenna for multiple transmitters. This can be helpful since many locations do not have the room to place multiple antennas, especially considering each antenna needs to be a wavelength apart for optimum performance. This would be 13.4 feet (4.08m) for 72 MHz systems, and 4.5 feet (1.38m) for 216MHz systems. For most applications, placing multiple antennas at these distances apart is not preferred or cosmetically appealing. Combining antenna outputs into one coaxial cable run to one antenna can be much simpler for the architect, contractor and installer. Combining multiple RF signals into one coaxial cable to one antenna can be done successfully with the proper knowledge and installation of the equipment. It is important to remember that there are a maximum number of channels or transmissions that is limited by the bandwidth at each frequency band. The maximum numbers of channels are:

- 72 MHz: Six channels
- 216 MHz: Three channels

The main disadvantage of combining signals is the loss of power and range. For every two signals that are combined, generally half of the power is lost (3db). This can equal a loss in transmission range between 25 and 50%, depending on the antenna type (directional, omni-directional). The following table shows the typical loss for different frequencies and number of channels:

Frequency Band	Number of Channels Combined				
	2	3	4	5	6
72 MHz Loss	3.5db	6.8db	6.8db	8.9db	8.9db
216 MHz Loss	3.8db	7db	NA	NA	NA

If this loss in range is acceptable for the application at hand, combining multiple signals for the use of one antenna is an option. There are still some important things to remember that will ensure that the combined system will work efficiently as possible without any inter-modulation problems or other undesired results. The following points should be kept in mind:

- 1 Make sure that all the transmitters are on the same RF power level setting. This power level setting is on the rear of the transmitter. If the power for one channel is greater than another, you are more likely to hear inter-modulation products and two transmissions on the same channel.
- 2 Make sure that the coaxial cable from each transmitter to the combiner is kept equal in length. This is needed so the RF power level is the same for each input to the combiner.
- 3 If you will be combining an odd number of transmitters, it will be necessary to terminate the unused combiner input. A 50 ohm terminating resistor is included with the 4 and 6 way combiners for this purpose.
- 4 Choose channels that are spaced evenly apart in the frequency band and at least 300 kHz apart from one another. This should be done whether a combiner is being used or not. 72 MHz and 216 MHz frequency charts are available on Listen's website for your reference at www.listentech.com.

It is important to determine how many transmitter outputs you desire to combine prior to ordering. Use a combiner that is appropriate for the amount of transmitters you will have. If you were to use a 6 way combiner but only have 2 transmitter inputs to the combiner, the loss would be equivalent to combining 6 transmitters.

Antenna Combining Tech Note

Combiners are available from Listen Technologies that will work for both 72 MHz and 216 MHz. The available combiners are:

- 2 way combiner: LA-80 MSRP: \$150.00
- 4 way combiner: LA-81 MSRP: \$180.00
- 6 way combiner: LA-82 (72 MHz only) MSRP: \$299.00



LA-80
2-Way RF Antenna Combiner



LA-81
4-Way RF Antenna Combiner



LA-82
6-Way RF Antenna Combiner

Coaxial cable is also available from Listen for connecting your transmitters to the combiner. This coaxial cable can be purchased at any length specified, but make sure that they are kept the same length. If you order the LA-391 preassembled cable, Listen will terminate the ends with BNC connectors.

Should you have any further questions, need help in determining the best solution for your application, or are having problems with your installed system, please contact Listen Technologies technical support staff for additional assistance at 800.330.0891 or support@listentech.com.