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TECHNICAL GUIDE

DX Base Station Antenna Placement

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This technical guide presents a brief description of the key elements that should be considered when installing a DX Base Station. Careful thought, before and during the installation of the base, will guarantee the best possible performance for your application and in your particular venue.

Things to consider before and during installation:

- The base should be located so you maximize line-of-sight operation even if this requires operating through a glass window. This assumes the window does not have a metalized film applied for glare protection.
- Minimize the number of walls between the base station antennas and area where the wireless beltpacks will be operating.
- If necessary, the base station can always be moved closer to the area of the highest concentration of wireless beltpack usage for more thorough coverage.
- Always do a walk test before making the decision where to place the base station.

Differences and Considerations for 2.4 GHz

The DX Series Systems use the license free 2.4 GHz Industrial, Scientific and Medical (ISM) frequency band for operation. The frequency range is 2.4 to 2.4835 GHz. At this frequency, there are operational differences when compared to lower frequency band systems. At 2.4 GHz, the radiated wave behaves more like a light beam from a flashlight. Metal equipment will block or cause reduced range because of reflected signals off their surfaces. The signal will bend around sharp edges but not as much in comparison to lower frequency units. The signal will have more loss when penetrating walls. Concrete or masonry walls are worse than standard wallboard. Large non-glare windows will actually allow the signal to pass through with little attenuation. Additionally, the human body will tend to block and absorb the signal when at maximum range.

The DX Series Systems transmit at 100 mW of power (base stations and wireless beltpacks). This power level is used to account for the higher signal losses at this frequency and to accommodate the extremely wide bandwidth signal which tends to lower the receive sensitivity. This power level is typically higher than a wireless network access point such as 802.11.

How to Get the Best Range and Coverage from the DX

A typical theatrical application is set up as shown in Figure 1. From the Audio Booth, the DX base will easily reach all line-of-sight locations in the Main Theater and Stage. Depending on the thickness and material of the wall behind the Audio Booth, the signal in the Lobby will be attenuated to some degree. If communication is required outside and in front of the theater, the signal will be further attenuated due to the additional wall and distance. For the DX to operate in the workshops, the signal must pass through the backstage wall at a significant distance. If it is determined during the walk test that there is no coverage in the workshops but this coverage is necessary, an adjustment to the radiation coverage will be necessary.

Several approaches may be entertained:

- If acceptable to give up coverage in front of the theater (4) then it may be possible to get the desired coverage in the workshops by mounting one or both of the antennas with low-loss 50 ohm coaxial cable to spots closer to the back of the theater (1).
- If it is not necessary to keep the base station in the audio booth, it can be moved closer to the stage (2).
- If coverage is required in both the workshop areas and in front of the theatre, a third approach may require one antenna to be remoted toward the workshops (3) and the other to be remoted in the Lobby (3).

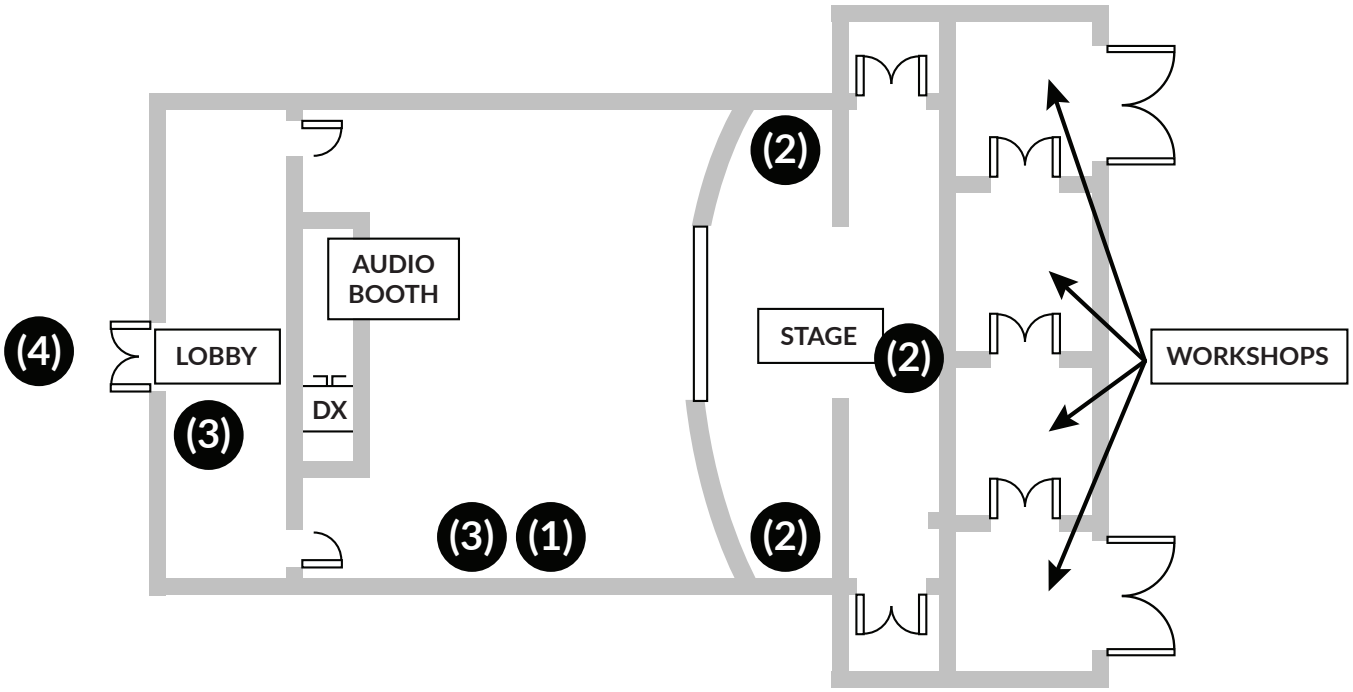


Figure 1: Typical Theater Application

Using the Remote Antenna Kit to Increase Coverage or Fill a Dead Spot

The remote antenna kit consists of a bracket, coax cable and screws. The cable can be screwed onto one base antenna connection and the antenna screwed onto the far end of the cable. The cable is routed to the desired coverage area and the bracket mounted to hold the antenna and cable in position. The coax cable is a special low loss type designed for the DX frequency range.

The DX base station uses two antennas. The base electronics switches between these antennas to obtain the best signal quality. Both antennas act as transmitter and receiver. One antenna could be removed and the system would still operate. The purpose of using two antennas is to overcome multipath dropouts. If one antenna is remoted using the cable, the base will still select the antenna that gives the best signal to a particular wireless beltpack.

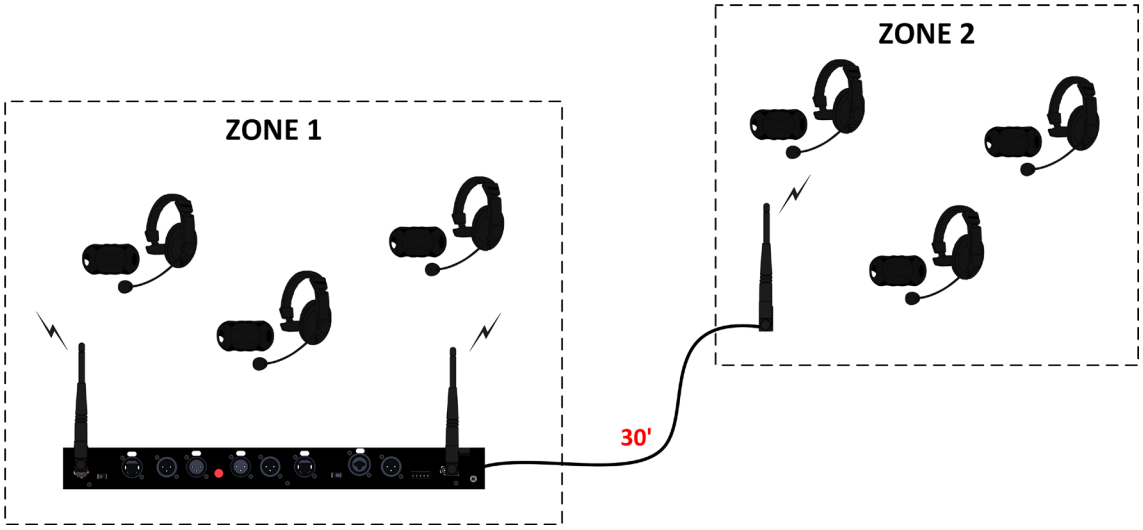


Diagram 1: Two RF zones with two antennas

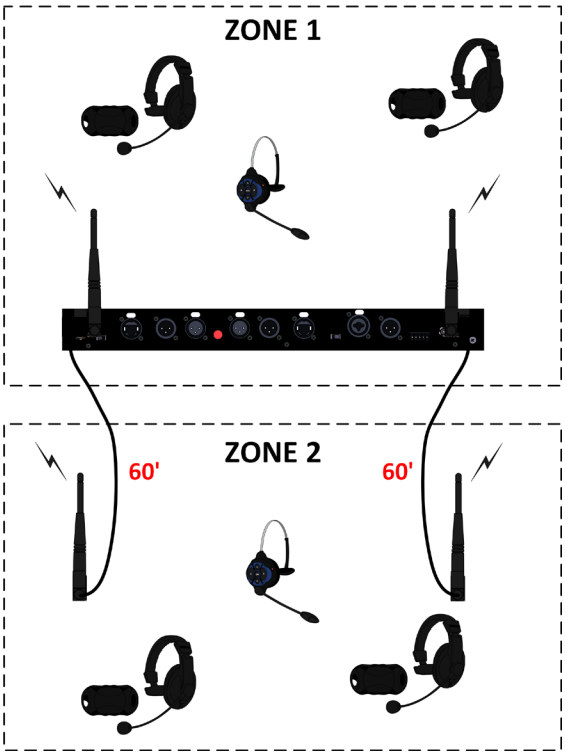


Diagram 2: Two RF zones, one with a single antenna

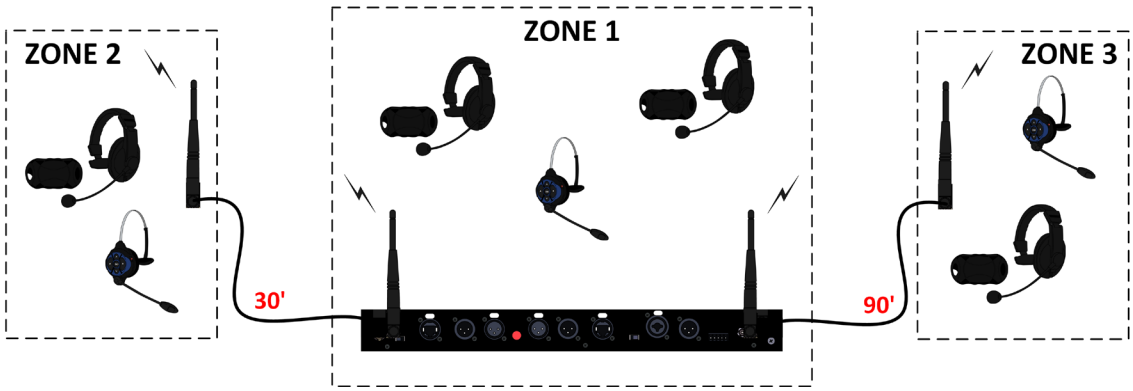


Diagram 3: Three RF zones, two with single antennas

Adding an extension cable to the antenna connection will reduce line-of-sight range to that antenna due to cable signal loss. But in some cases, it may be necessary to fill in a bad coverage area. The cable connectors are built so the cables can be screwed together to create longer runs. However, we don't recommend doing this as the signal strength trade off eventually defeats the purpose.

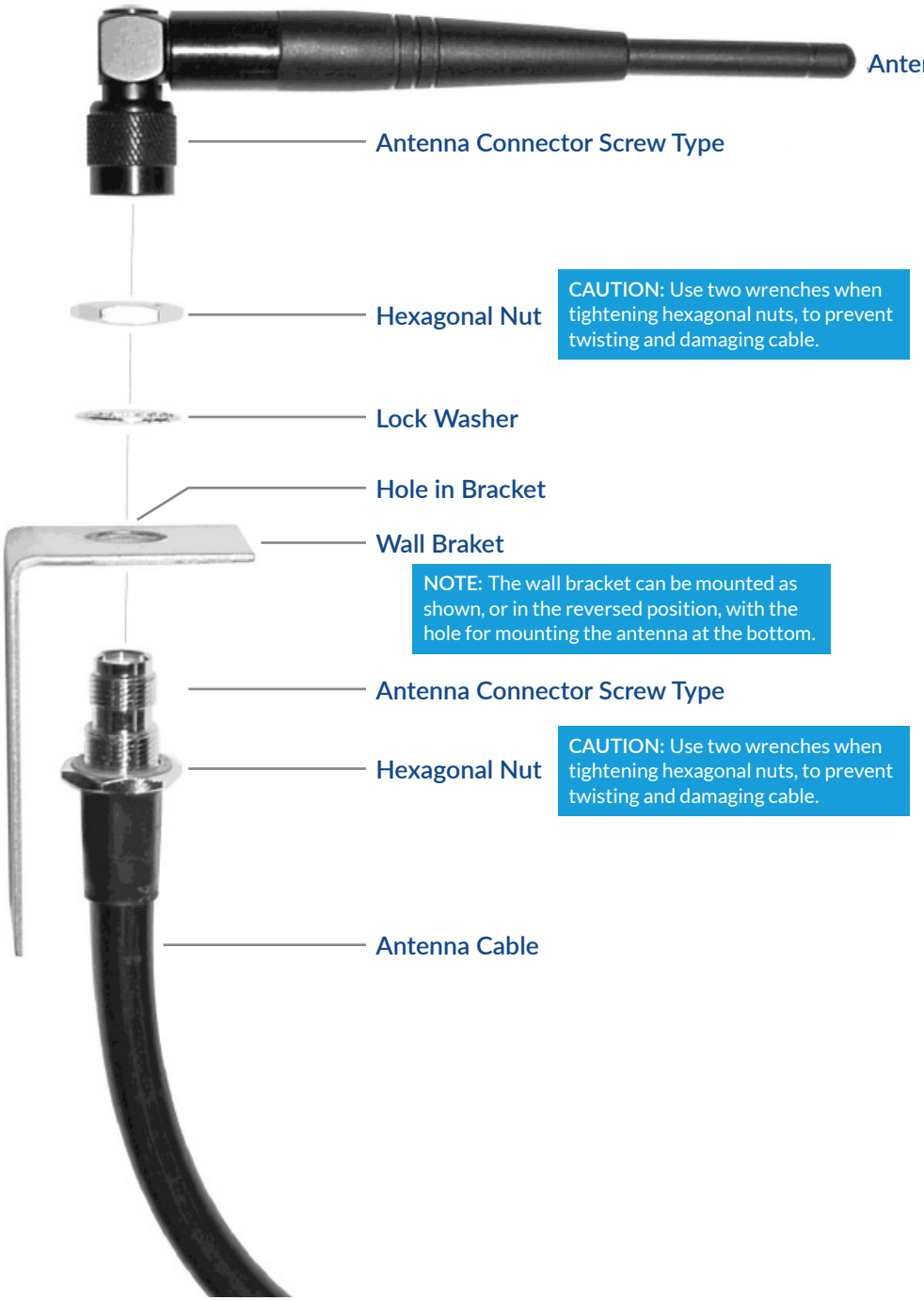
Table 1: Antenna Kit Cable Loss

Number of Cables	dB Loss	Percent Loss	Power at Far End @ 100mw Input in (mw)
1, 30ft	2.5	44	56*
2, 60ft	5.0	68	32*
3, 90ft	7.5	82	18*

*The standard DX base antenna is only 2 dB.
You can compensate for the power loss by getting a higher rated antenna, as long as you don't exceed 250 mw US and 100 mw globally.

In Table 1 above, note that the use of two 30 foot cables (60 feet) is roughly equal to 6dB. This would cut down on the radiated range by approximately ½ of its non-attenuated distance. Therefore, in a situation where the line of sight range is typically 1000 feet, the addition of 60 feet of low loss cable would reduce the range to approximately 500 feet. This may be perfectly acceptable if it fills in an area where the signal is lost and would be a good trade-off. You should always walk test your antenna solutions before making them permanent.

Figure 2: Antenna mounting on wall bracket



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