



Cisco Access Points with Smart Antenna Connectors

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Application question:

Can you refer me to technical documentation that discusses the Smart "DART" antenna connector and the maximum distance the secondary antenna can be placed from 2800/3800 "E" series?

Application answer:

I would recommend that customers keep all antenna cables as short as possible.

Let's examine how the RF system works on the models with external antenna connectors known as the "E" series.

Figure 1: XOR radio is defaulted to 2.4 GHz until detection of a smart antenna



If a Smart connector is not used, the "E" Series Access Point operates much like an AP-2700e / 3700e in conventional 2.4 and 5 GHz mode.



Note Dual 5 GHz is not supported until the XOR radio detects the insertion of a Smart antenna or Smart antenna to RP-TNC adapter.

Figure 2: Smart antenna connector "DART" and DART to RP-TNC adapter



Operation of the Smart antenna connector can enable the XOR radio to function in either band known as SRE or "single radiating Element mode" enabling single band antennas to be used with the XOR radio. If the XOR is not servicing clients but rather in a monitor mode, it will serially scanning 2.4 and 5 GHz and a DRE "dual radiating element" (orange label antenna) should be used.



Note If monitor mode, the XOR radio cannot service clients and only the 5 GHz primary radio on the TOP of the AP will be active for client use.

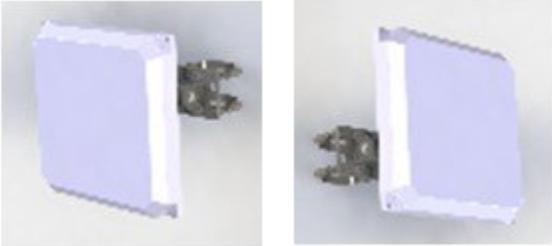
Figure 3: Understanding radio roles DRE and SRE



When using the Smart antenna connector, in dual 5 GHz mode, you should avoid co-locating them next to each other if at all possible.

Let's talk a bit about directional and omni-Directional antennas.

Figure 4: Directionals are often used in warehouse and stadium deployments



In the case of dual Directional, face the energy away from each other - If the antenna has sufficient null behind the antenna you may be able to place them "back to back".

Avoid using dual Omni antennas unless you are using the XOR in 2.4 GHz.

Figure 5: Using 5 GHz Omni (dipoles) indoors and mounting 2.4 GHz Omni Outdoors



If dual 5 GHz were used, again directional are best or you could use Omni antennas if you were to run the XOR in very low power (creating a Micro cell) while the AP antennas (ideally also remoted away) in Macro cell mode.



Note Most Cisco external antennas have a cable length of 3 Ft so it is possible using external antennas to get approximately 7-8 Ft of separation as there is some additional cable length in the smart antenna adapter.

Avoid extending the antenna cables it at all possible.

If you choose to use longer cables, be aware there is significant loss (attenuation) in cable and different types of cable has different loss ratings. This loss affects both the ability to receive (decode) the signal as well as reducing the transmitter power as well.

Additional cable and RF connectors also introduce potential points of failure and reduce overall MTBF. So use additional cable only when needed. Consider relocating the device closer to the user or antenna source.

Figure 6: Cables come in different sizes and have different loss characteristics



Antenna Cables – LMR Series

LMR ® Flexible Communications Cable	
LMR-100A	1/8"
LMR-195	3/16"
LMR-200	3/16"
LMR-240	1/4"
LMR-300	5/16"
LMR-400	3/8"
LMR-500	1/2"
LMR-600	1/2"
LMR-900	5/8"
LMR-1200	7/8"
LMR-1700	1 1/4"

This is a chart depicting different types of Microwave LMR Series coaxial cable.

Cisco uses Times Microwave cable and has standardized on two types:
[Cisco Low Loss \(LMR-400\)](#)
[Ultra Low Loss \(LMR-600\)](#)

LMR-600 is recommended when longer cable distances are required

Larger cables can be used but connectors are difficult to find and larger cable is harder to install

Trivia: LMR Stands for “Land Mobile Radio”

Try to keep cable lengths to 15 Ft or less when possible. If further distance is needed and relocating the AP is not possible then look at LMR-600 or better as it has less attenuation.

Figure 7: Popular coaxial cable properties

Antenna Cable Characteristics

LMR[®]-400 TIMES MICROWAVE SYSTEMS Flexible Low Loss Communications Coax

Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	5800
Attenuation dB/100 ft	0.7	0.9	1.5	1.9	2.7	3.9	5.1	5.7	6.0	6.8	10.8
Attenuation dB/100 m	2.2	2.9	5.0	6.1	8.9	12.8	16.8	18.6	19.6	22.2	35.5
Avg. Power kW	3.33	2.57	1.47	1.20	0.83	0.58	0.44	0.40	0.37	0.33	0.21

LMR[®]-600 Flexible Low Loss Communications Coax

Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	5800
Attenuation dB/100 ft	0.4	0.5	1.0	1.2	1.7	2.5	3.3	3.7	3.9	4.4	7.3
Attenuation dB/100 m	1.4	1.8	3.2	3.9	5.6	8.2	10.9	12.1	12.8	14.5	23.8
Avg. Power kW	5.51	4.24	2.41	1.97	1.35	0.93	0.70	0.63	0.59	0.52	0.32



Foil shield and braid
LMR-400 3/8 inch
LMR-600 1/2 inch



Cisco P/N for cable
(breakdown)

[AIR-CAB-050-LL-R](#)

AIR - Aironet

CAB - Cable

050 - Length

LL - Low Loss

(LL=LMR-400, ULL=LMR-600)

R - RP-TNC

(connector type "R" and "N")



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