



Using advanced RF conditioning components to simplify and optimize RF design

Shaping the always-on networks of tomorrow

COMMSCOPE®

Cut through the complexity with CommScope

Competition across the wireless landscape is intensifying. For network operators, reducing time to market is critical, but so is the need to modernize their existing sites and bring new ones on line. How do you achieve both?

Today's RF path—base station to antenna—is highly complex and growing more so every day. Most feature multiport antennas, tower-mounted amplifiers (TMAs), combiners, and other RF components. The question for operators? How do they analyze, develop and implement a truly effective RF design that doesn't compromise their aggressive rollout schedule? In a word, CommScope.

With experienced RF engineering teams and an end-to-end portfolio of RF conditioning components, we help you analyze and simplify your RF design to reduce cost and clutter. The result is a more efficient, less costly RF path that deploys faster with the future in mind.

Traditional installations growing overly complex

The most common challenges in any network modernization project are due to the proliferation of RF-based components, both at the base and top of the tower.

- As tower loads and leasing costs increase, operators opt to install radio heads on the ground—especially where towers are shared among several carriers.
- The complexity in the RF path and quantity of diverse components to be installed in the field frequently create delays due to installation errors, troubleshooting and rework.
- Most multiband combiners are “dc-pass”, allowing direct current (dc) to pass through to all ports. To block the unwanted transmission, external “dc-stop” devices must be installed, adding complexity and time to the installation.
- Most networks now support up to five different frequency bands, yet traditional TMAs are singleband. Therefore, operators must deploy multiple TMAs, increasing tower loading and RF complexity.

CommScope's engineering experts help streamline and improve RF path designs



40+ years

RF design
experience

With 40+ years of experience in the field, CommScope engineering teams are able to analyze and propose actionable and sound alternatives to simplify the RF design. Customers look to us to help them improve RF performance, decrease total cost, and reduce time to market. We respond by helping them:

- Improve logistics by reducing the amount and variety of materials in the RF path
- Decrease complexity to reduce possible errors and rework
- Reduce installation time
- Improve overall RF performance.

Example: streamlining a typical three-sector/four-band site

Site description:

Sectorization: Three-sector site

Antenna: One 10-port antenna per sector

Frequency bands: Two low bands: one for 3G and one for 4G LTE; two high bands for 4G LTE, each with 4x4 MIMO.

RF conditioning components, per sector:

- Tower top: Four singleband twin TMAs, two dc-pass twin diplexers, four external dc-stop devices, and eight jumpers.
- Tower base: Three dc-pass twin diplexers and four external dc-stop devices. 7/8-in. feeders linked the base to the top.

Solution description

The recommended solution (“Optimized RF Path Design” in Figure 1 below), involved changes at the base of the tower as well as at the top.

On top of the tower, CommScope engineers recommended installing two twin-dualband TMAs; each combines diplexers, amplifiers and bias-Ts in a single unit (see Appendix 1). Additionally, it eliminates the need for dc-stop devices and the external jumpers required to link these devices.

At the base of the tower, two existing dc-pass diplexers and external dc-stop devices were replaced with two dc-sense diplexers. The dc-sense diplexer automatically allows the AISG signal or direct current to pass through to the ports where it is needed and blocks the other ports.

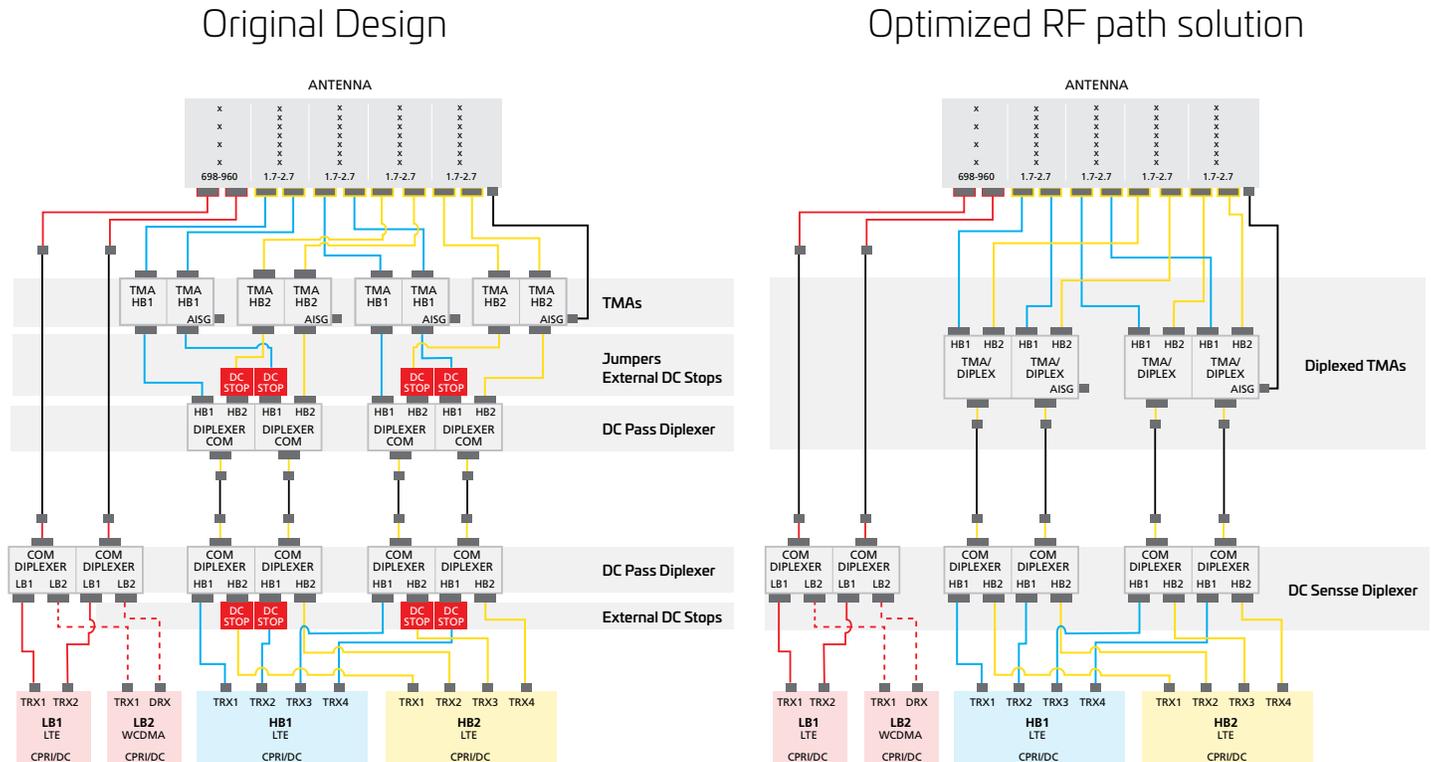


Figure 1: Plumbing diagram of a traditional and an optimized site

Solution results

Adopting the recommended changes significantly reduced the total number of RF conditioning elements. The 54 total elements at the top of the tower (six twin diplexers, 12 twin TMAs, 24 jumpers, and 12 dc-stop devices) were replaced with just six multiband TMAs. At the bottom of the tower, the six dc-sense diplexers eliminated 12 dc-stop devices.

By dramatically simplifying the RF design, CommScope engineers were able to create the following hard and soft cost savings.

- Reduced installation time of the RF conditioning hardware for the three-sector site by an estimated 70 percent—from approximately five hours to about 90 minutes.
- Reduced the purchase cost of RF conditioning hardware by approximately 45 percent.
- Considerably reduced the risk and cost of installation errors, future troubleshooting and rework.

The following illustrates other comparative benefits of the CommScope solution as shown in Figure 1.

	Existing traditional RF design	Revised design with multiband TMAs
Procurement and delivery	Usually involves several vendors for TMA, diplexers, jumpers and dc-stop devices	One vendor for RF conditioning hardware with no additional products required
Logistics on warehouse	Transportation and scheduling involves getting multiple products delivered to site <ul style="list-style-type: none"> • Diplexers with dc-pass • TMAs • Jumpers • Dc-stop devices 	Transportation and scheduling involves two SKUs and one vendor <ul style="list-style-type: none"> • Diplexers for bottom with dc sense • Multiband TMA
On-site unpacking and acceptance of bill of materials (BOM)	Each item must be unpacked from a separate box or bag, then inventoried and checked against BOM	70 percent fewer items to unpack, inventory and compare against BOM
Field installation	Requires several connections on top of the tower, including jumpers and dc-stop devices, in addition to TMAs and diplexers Dc-stop devices must be installed at the bottom of the tower	At the top of the tower, jumpers are not needed to connect diplexer with TMAs, and far fewer hardware connections are required overall No dc-stop devices required at the bottom

Using fewer components streamlines distribution logistics, reducing the time and costs associated with warehousing, packaging and transportation.

On-site labor is simplified and reduced, minimizing installation errors and rework.

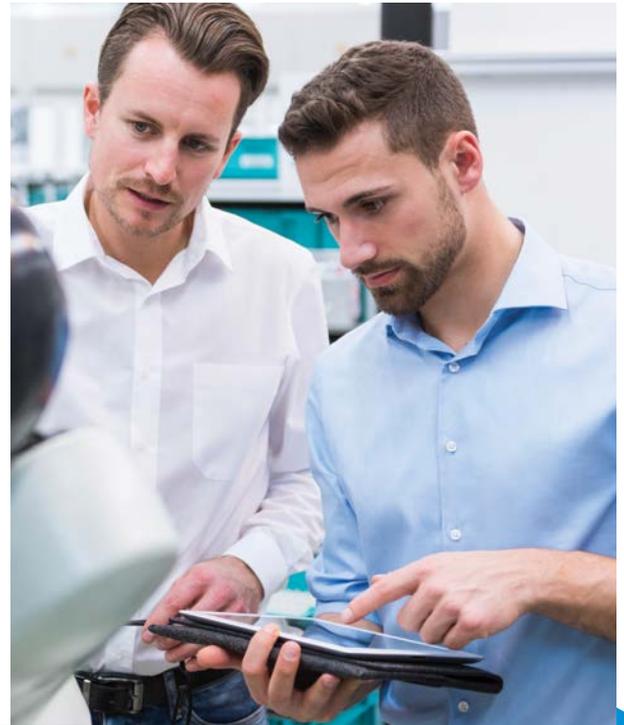
Summary

At CommScope, we are always looking for a better way, and provide customers with optimized products and solutions that allow them to stay ahead of the game. Helping you cut through the clutter and cost of traditional RF designs is just one way we do that.

Constantly questioning the status quo led us to pioneer the development of the multiband TMA. It enables operators to combine and amplify multiple frequencies and integrate the function of a bias-T. More importantly, it drives greater efficiency—in time, cost and performance—through their networks.

With experienced engineers and proven RF conditioning products like multiband TMAs, network operators and installers trust CommScope to help them streamline their RF designs, reduce cost and accelerate their time to market.

To learn more about how multiband TMAs and our other RF conditioning products can dramatically improve your RF design, contact your CommScope representative or visit us at www.commscope.com. Let's build the future together.



CommScope helps companies around the world design, build, and manage their wired and wireless networks. As demands for connectivity grow, our vast portfolio of network infrastructure helps our partners meet their customers' demands.

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Integrated manufacturing and supply chain approach which delivers product quality, capacity and inventory management excellence



Recycle to the greatest possible extent, produce off-peak for enhanced energy efficiency and ISO14001 certification

Appendix 1: Diagram A

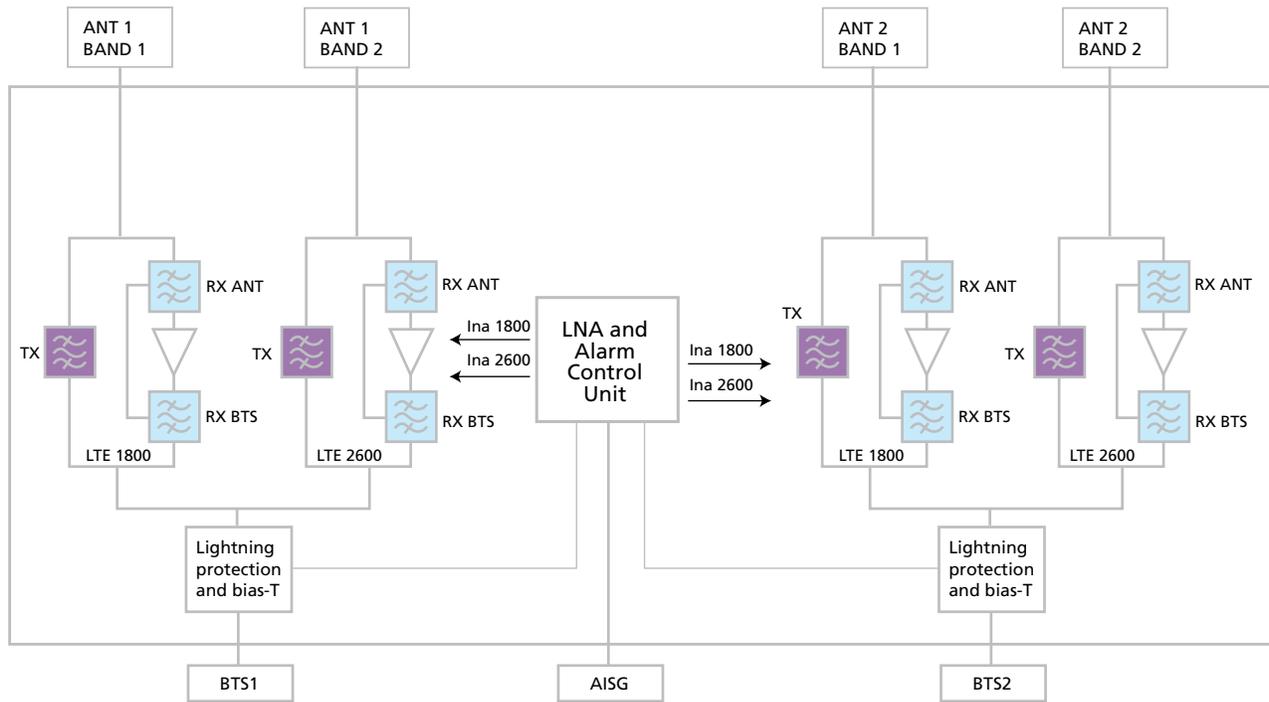


Diagram A: Internal block diagram of twin diplexed TMA with two BTS ports, four antenna ports, and one AISG out port—twin module

Appendix 2: Terminology

2G, 3G, and 4G: Mobile technology standards, as they are evolving. G Stands for generation, being 2G digital communication, mostly voice and low speed data. 3G offers faster data connections and voice, and 4G, also known as LTE (Long term evolution), is the current technology deployed in most of the countries worldwide with offer about 10x more capacity than 3G.

LTE: Long term evolution. A mobile telecommunications defined by 3GPP (Third Generation Partnership Project), commonly known as 4G

WCDMA: A mobile telecommunications defined by 3GPP (Third Generation Partnership Project), commonly known as 3G

RF: Radio Frequency

TMA: Tower Mount Amplifier. A device that amplifies the signal coming from the user equipment to the Radio base Station installed on top of the tower, near the antennas. Also known as TTA (Tower Top Amplifier) or MHA (Mast Head Amplifier)

Diplexer: a system made of RF filters that combines two different RF bands

Diplexed TMAs: a system that do both functions: combines and amplifies two RF bands

Twin TMA, Twin Diplexer, and so on: A pack containing two identical elements

RF conditioning hardware: equipment installed in the RF path between the radio and the antenna (excluding cables). Examples of those are combiners, TMA's and filters, among others.

DC pass: a feature that allows DC (Direct Current) or low frequencies to pass through one port to another in a device.

DC Stop: a device that blocks DC in a connector to avoid the current to pass through a system.

DC sense: a system that detects DC presence in a port of a combiner and allows it to past through the input/output ports while blocking DC in the other ports

Bias-T: a device that separates or mixes one low frequency signal or DC current, and a high frequency RF signal.

BOM: Build of Material: a detailed list of materials to be used in an installation.

Radio heads or Remote Radio Heads or Remote Radio Units: a component of a site intended to amplify an RF signal and transmit it to the antenna and is split from the site main controller. It also receives and amplifies the RF signal coming from mobile user devices

7/8" feeders: coaxial cable used to transmit RF signal, with an external diameter of 7/8"

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