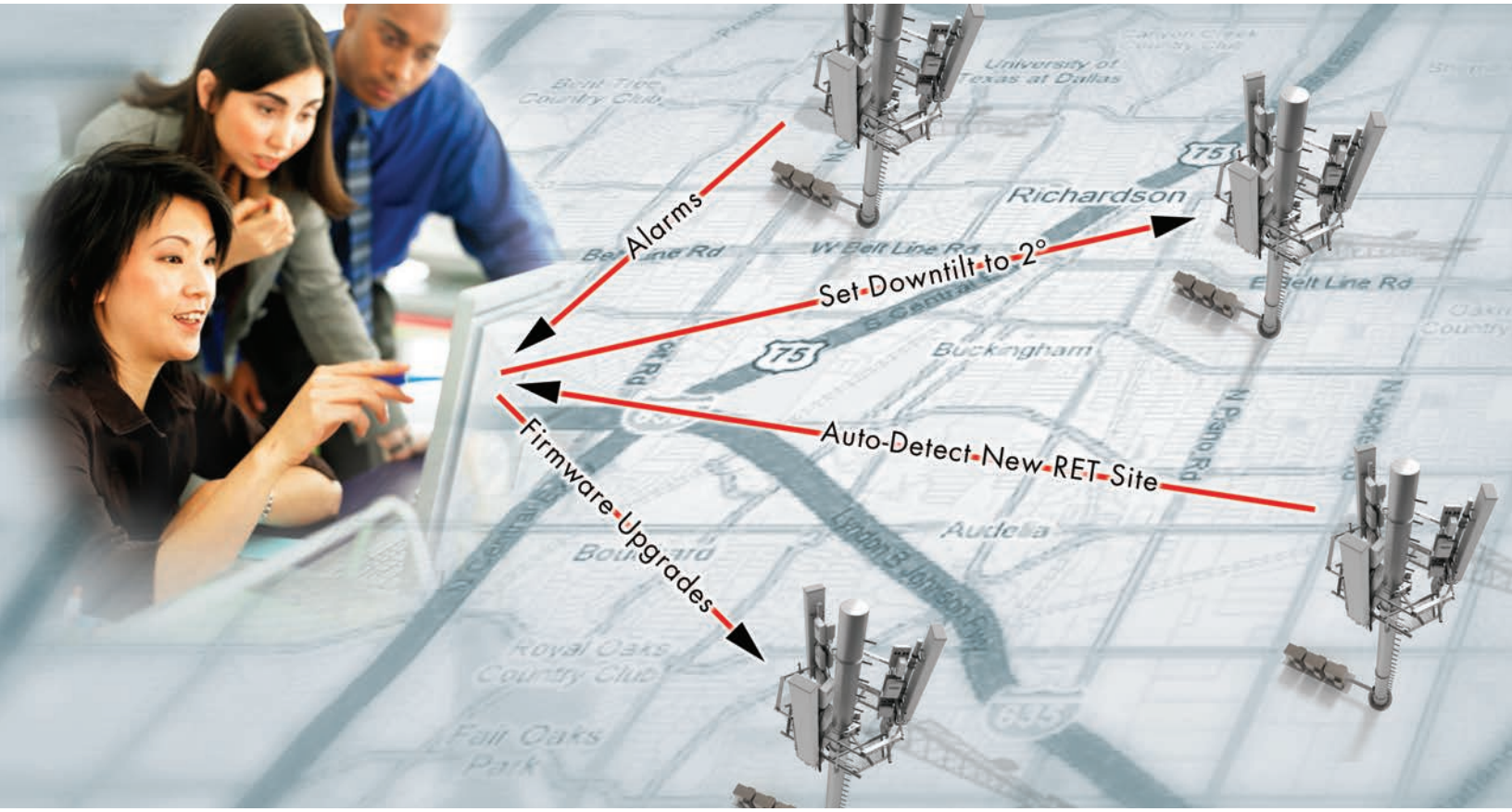
COMMSCOPE®

Capacity Solutions




# Remote Electrical Downtilt Systems

Optimize capacity with better antenna beam management

# What's your position on perfection?

As a wireless network manager, you feel the constant pressure to increase the capacity and improve the quality of service in your network. Sure, LTE can be a powerful tool, but it is also limited by capacity-crippling noise and interference. So you take a hard look at your network antennas—a major source of noise and interference.

As long as the antenna's beam is precisely and accurately positioned, the amount of potential interference can be managed. **But, if the alignment shifts or a change in the sector requires the beam to be repositioned, can you afford the cost and time of repeated tower climbs? Is there a better way to keep your antennas and network optimized?**


**Absolutely.**

## Remote electrical downtilt systems from CommScope

CommScope's highly precise, yet flexible, remote electrical tilt (RET) solutions enable you to optimize, control and maintain the perfect antenna beam position from anywhere—without costly site visits, tower climbs or network downtime.

- Respond quickly to changing traffic needs
- Prevent pattern blooming, common with mechanical tilt
- Reduce human error with computer-controlled accuracy
- Ideal for all sites, including isolated or difficult-to-access sites


More importantly, the ability to control and maintain precise beam tilt leads to less intersector interference and noise and allows you to maximize the capacity and call quality of your LTE services.

# Don't just respond to change—control it

When it comes to your antenna beam position, there is no "set it and forget it." The RF environment and demands are constantly in flux. Every site has a lifecycle: pre-installation to deployment to maturity. As traffic patterns change, your radiation patterns have to adapt. You need instant and complete control over the positioning of every array in every antenna—regardless of where it is. That's the value of CommScope's RET solutions.


In the last two years, CommScope shipped over **450K** antennas equipped with **internal RET**

CommScope is a driving force within the Antenna Interface Standards Group. AISG is a global standards body defining the control interface for antenna line devices such as RETs. CommScope products are designed and developed to be fully compliant to AISG standards.

## CommScope's RET portfolio keeps you optimized and in control

Since introducing the world's first RET solution in 1995, CommScope has gone on to develop one of the most comprehensive portfolios of RET components and systems in the industry. Our external solutions enable you to easily retrofit existing antennas with RET capabilities and avoid costly CapEx investments.

**CommScope is also an industry leader in the design, integration and application of internal tilt solutions with over 1M internal RETs in use globally today.** RET functionality is integrated into the antenna's architecture, as is independent beamtilt for each array. The result is high-accuracy beam position and remote control capabilities all under one radome.

Using the newly added **diagnostic** capabilities of our RET Master controller, operators are able to proactively monitor and optimize key beamtilt variables—actuator functioning, power levels, connector connectivity, etc.—to better manage their network coverage remotely and in real time. And we have recently added variable-gain, tower-mounted amplifiers to our interference reduction portfolio.

Together, the quality, depth and breadth of our RET solutions are enabling wireless operators to optimize their network's performance while holding the line on OpEx and CapEx costs.

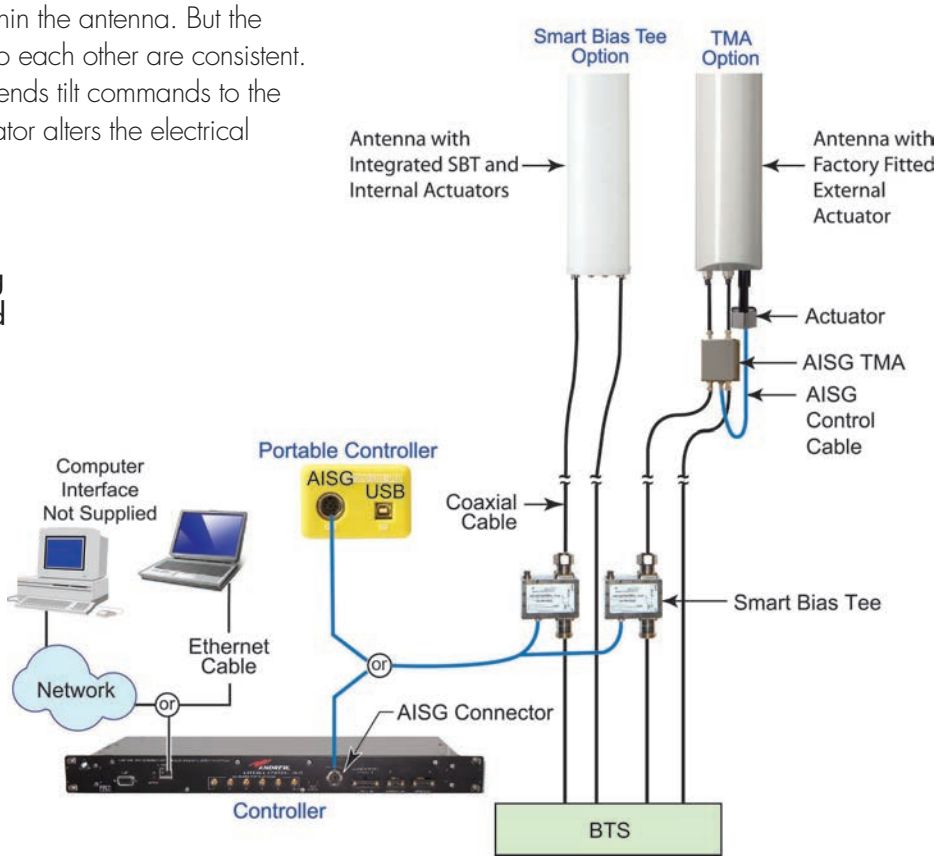
# Basic design of CommScope's RET system

CommScope's RET systems feature significant design flexibility that starts with the RET architecture within the antenna. But the basic elements and their relationship to each other are consistent. In a typical RET system the controller sends tilt commands to the motorized antenna actuator. The actuator alters the electrical downtilt by adjusting the phase shifter.

Various RET system devices, including the antenna's actuators,are connected to the controller using control cables.

Multiple actuators can be joined together either by daisy-chaining control cables or by using junction boxes.

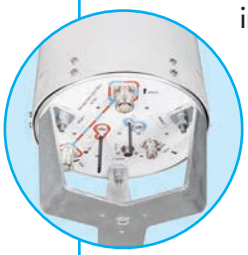
The base station connects to the RET system either through a single home run control cable or over the RF transmission line equipped with smart bias tees that inject the AISG signal into the existing RF cable.




## Pushing the boundaries of RET design to take you further

At CommScope, we know a thing or two about remote electrical tilt (RET). After all, we invented the technology and still hold the patent on it. We are constantly working to develop new and innovative applications that will allow you to maximize the value of your network going forward. For example:

Our work in metro cell network design suggests that the same principles used to manage interference in macro cells can help control interference in urban metro cells. By incorporating internal RET technology into our existing and new metro cell antennas, we help operators use pattern shaping, a common macro cell technique. By doing this, third-party testing shows, multinetwork operators can increase overall network capacity 40 to 50 percent while decreasing CapEx and OpEx 25 to 35 percent.



We've also embedded our internal RET technology into our newest multiband, multiport twin-beam antennas. Not only does this innovative solution help operators overcome the restrictions on the number of onsite antennas, it enables them to take advantage of opportunities for cost-efficient site sharing and capacity-generating MIMO deployments. With each sub-band array under independent RET control, operators can tailor the dimensions of each sector based on the demands on the specific area.

# Inside CommScope's RET portfolio

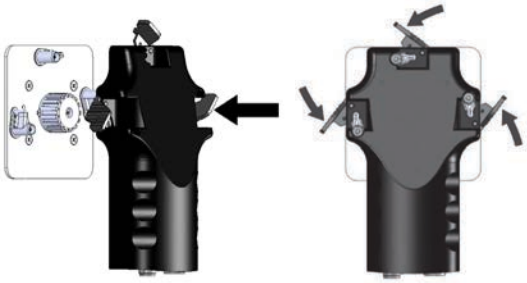
CommScope's RET portfolio provides all the product solutions, technical expertise and system support to maximize your antennas' performance and your network's value. All system components support AISG 1.1 and 2.0. And, because CommScope can provide a complete turnkey solution, you have one trusted partner for all your RET and antenna needs.

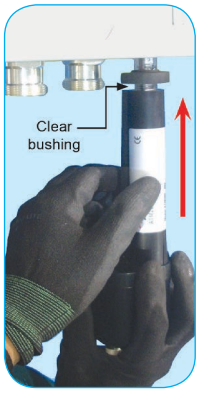
## Actuators

Actuators perform the actual electrical downtilt of the antenna beam. CommScope offers an extensive portfolio of antennas with integrated internal actuators for reduced wind load and increased aesthetic appeal. Or upgrade your existing RET compatible antennas with our external actuators that install easily in just minutes—no tools required. Many CommScope RET compatible antenna designs are also available with factory-fitted external actuators that include a protective shroud.

Network multiple actuators by daisy-chaining control cables, to support up to 32 antenna line devices.

## Easily retrofit antennas with RET—no tools needed




## Ongoing reliability testing validates performance meets or exceeds specification

- CommScope actuators carry an overall success rate of 99.99%.
- Every actuator— internal and external—undergoes operational testing under load during assembly.
- Random samples from each actuator production lot must pass hot and cold operating tests, under load, before the lot is approved.
- On-going random reliability testing is performed to ensure failure-free life cycle operation.

## Controllers

RET controllers are the brains of the system—and CommScope's controllers are as smart, flexible and capable as they come. There are three different models for all the ways you need to work.

*RET Master Portable Diagnostic Controller*


Our **portable controllers** are popularly used for initial RET site setup, enabling you to check actuator operation prior to installing the antennas.

The portable **RET Master** provides remote control for any RET device, plus remote diagnostics and testing during setup and subsequent revisits.

Technicians can run small dither tests on actuators, check current and voltage measurements, and perform continuity testing on all control cable connector PINs. Taking advantage of its built-in Wi-Fi hot spot and free downloadable iOS-based app, technicians can test and diagnose from their iPhone or iPad, or even charge their phones and tablets using the built-in USB power port.

The **rack mount controller** allows remote access from a central office and provides alarm monitoring and optional remote firmware update for actuators, AISG TMAs, and controllers.


*Rack Mount Controller*

## Smart Bias Tees

CommScope's AISG smart bias tees inject the power and control signals into an existing RF cable—eliminating the need for a long AISG cable run from the base to the top of the tower. Supporting 694–2690 MHz bands, they feature female-female, female-male, and male-female connector options for both top and bottom smart bias tees.


## Junction Boxes

Junction boxes divide and direct data and power from the RET control unit to the actuators and/or additional junction boxes. With 4- and 7-way models available, you can connect up to 32 AISG antenna line devices to a single controller. Each junction box features one male input port and four or seven female output ports and easily mounts to a pole or a flat surface using the provided brackets. Select from a wide variety of configurations to reduce the number of RET control cables needed.

## Control Cables

Our AISG control cables feed data and power from the controller to the RET components. Available in lengths from 0.50 meters to 100 meters, each cable is terminated with male and female connectors to meet your specified length. Right-angle AISG male connector options are available in a 0.50-meter length with 6- and 9-o'clock key positions.


## Lightning Protection Unit and Grounding Kits

Able to withstand a lightning surge of 10 strikes at 600 Amps, 10/350 waveform and equipped with a grounding stud, CommScope's lightning protection unit safeguards your RET controller and antenna line devices in the worst of storms. The lightning protection unit easily mounts to a pole or flat surface and is AISG and RoHS compliant. CommScope provides RET grounding kits for grounding control cables at connection without the need to cut and splice, as well as those used to ground RET components.

# The only thing more relentless than the pressure is our commitment to help you deal with it

Unfortunately, the pressure to increase your data capacity while reducing your total cost of ownership won't let up anytime soon. Even as new and promising capacity-generating technologies like LTE emerge, noise and interference will always threaten the gains you've fought so hard to achieve. Success requires a new way of thinking—about interference management, about beam control, and about how to squeeze more performance from your wireless network.

Fortunately, however, you're not alone. With our technical expertise, worldwide presence and comprehensive portfolio of RET components and systems, CommScope is at your side. We can provide the solutions and guidance needed to put today's most advanced RET technology to work, with pattern shaping, sector sculpting, metro cell integration, noise filtering and more—all from the company that started it all.

**CommScope** (NASDAQ: COMM) helps companies around the world design, build and manage their wired and wireless networks. Our network infrastructure solutions help customers increase bandwidth; maximize existing capacity; improve network performance and availability; increase energy efficiency; and simplify technology migration. You will find our solutions in the largest buildings, venues and outdoor spaces; in data centers and buildings of all shapes, sizes and complexity; at wireless cell sites and in cable headends; and in airports, trains, and tunnels. Vital networks around the world run on CommScope solutions.

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