

# How the Microlab SMART Coupler Works

Is your public safety, emergency responder radio communications system (ERRCS) DAS ready to serve first responders during in-building emergencies, which are fraught with unpredictability? Once commissioned through an initial proof-of-performance grid test, proper public safety DAS operation is typically validated on an annual basis, and the lengthy interval between tests heightens the risk of unnoticed faults in DAS cabling, RF components, and antennas. Authorities having jurisdiction (AHJ), building owners, and system integrators can now monitor critical DAS infrastructure in real time by using the Microlab SMART Passives System, comprised of a SMART Gateway and network of SMART Couplers. This article will take a closer look at just one of the two components that enable the SMART Passives System to provide high-integrity, life-safety communications – the SMART Coupler.

The SMART Coupler, available in 6, 10, 15, and 20 dB coupled port values, serves as a direct replacement for the required passive DAS tappers and couplers in public safety networks. It combines both a passive (i.e. tapper) and active solution by merging a specially designed, broadband passive coupler from 130-960 MHz with an active, Industrial Internet of Things (IIoT) circuit board to facilitate DAS diagnostics and communications. The SMART Gateway, located at the head-end of a DAS with a bidirectional amplifier (BDA) or a building's dedicated radio repeater, communicates to the network of SMART Couplers within a building (Figure 1).

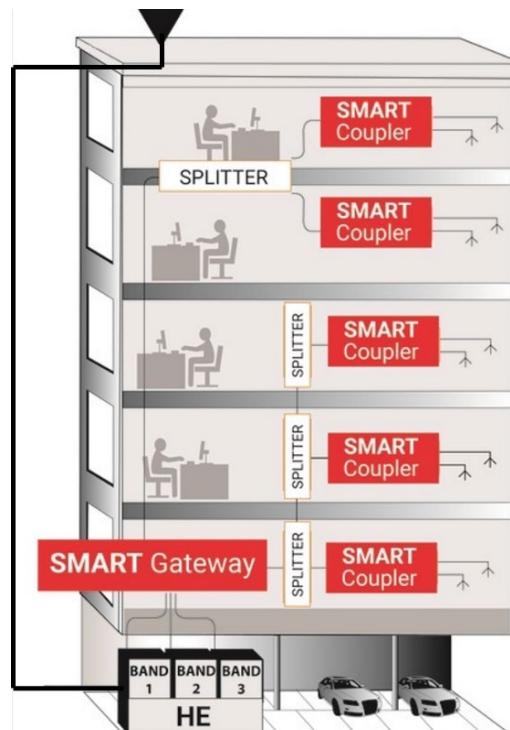


Figure 1: A network of SMART Couplers, complemented by the SMART Gateway, provides real-time monitoring of a building's public safety ERRCS DAS.

Within the SMART Passives System, the SMART Couplers monitor and compare the voltage standing wave ratio (VSWR) at coupled and through ports over time, and these readings are both time- and date-stamped by the SMART Gateway. The VSWR measurement is based on a calibrated, SMART Gateway-generated, continuous wave (CW), 0 dBm = 1 mW tone. The received signal strength of the CW tone or carrier is also reported back to the SMART Gateway by each SMART Coupler throughout the DAS.

SMART Couplers may be pinged by the SMART Gateway at set time intervals to determine transmission line and antenna integrity. If a SMART Coupler's real-time VSWR monitoring detects an abnormal measurement, it will indicate a catastrophic DAS failure has occurred, such as an open or short circuit. In the event of a failure, the SMART Gateway will send an alarm via email or SMS through SNMP traps. The alert message will contain the failure's location since it is based on the detecting SMART Coupler's MAC address, which is tied to a physical location in the building. A SMART Coupler's MAC address may be recorded on as-built drawings and RF designs. Additionally, an alert may be sent through the SMART Gateway's normally closed, dry contact alarm terminal that connects to a building's fire alarm panel. Users can readily view all diagnostics and alarms via the SMART Gateway's convenient graphical user interface (GUI).

The active portion of the SMART Coupler is powered via the SMART Gateway, which injects DC power into the passive DAS RF coaxial cabling. Similarly, the CW tone, as well as all diagnostics and communications between the SMART Couplers and SMART Gateway take place over the DAS coaxial cabling as well, within the industrial, scientific, and medical (ISM) band between 902-928 MHz, which is outside the active public safety spectrum. SMART Couplers do not require local AC/DC power or Ethernet connections during installation.

The SMART Coupler's flow of radio traffic is demonstrated in Figure 2 below, which includes communications to and from each coupler, ISM band diagnostics, and DC power over the RF coaxial cabling.

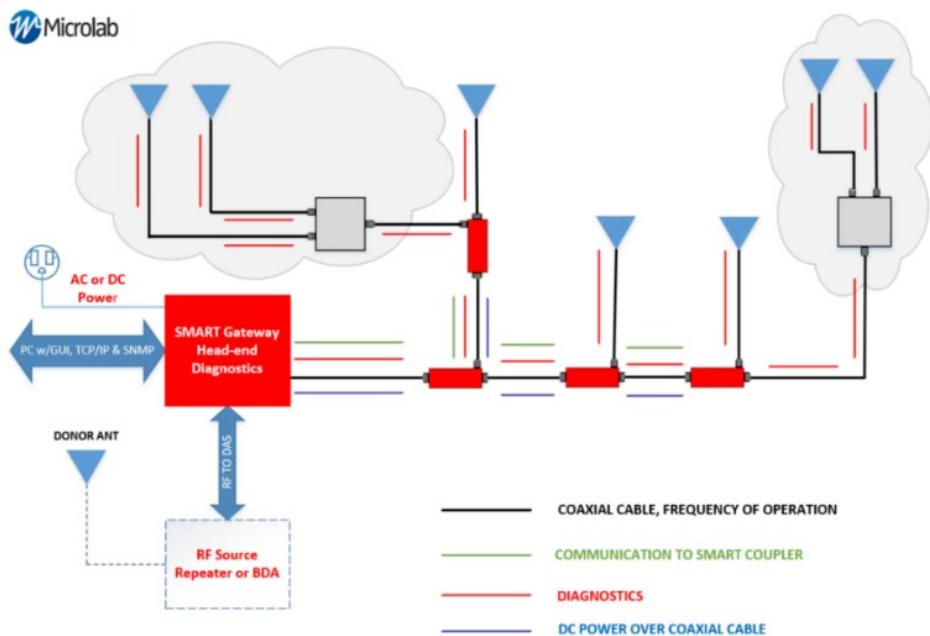


Figure 2: Microlab SMART Couplers' flow of radio traffic.

Since emergencies can arise anywhere at any time within a building, the Microlab SMART Passives System provides essential real-time performance monitoring of mission-critical DAS infrastructure. SMART Couplers support these real-time monitoring capabilities through its hybrid active and passive IIoT-based architecture. Complemented by the SMART Gateway, the SMART Passives System enables AHJ, building owners, and system integrators the ability to actively monitor the operation of their critical communications networks, ensuring high-quality radio communications for first responders. To learn more about public safety DAS solutions from Microlab, please visit <https://microlabtech.com/lmr-public-safety>.