Application Note: Fiber Optic Donor Link Expands Wilson Repeater Applications

The Wilson repeater product line has made improved cellular coverage readily available to commercial and residential property owners. Compact, cost-effective, adaptable and easy to deploy, these kits install easily for robust, FCC-compliant coverage.

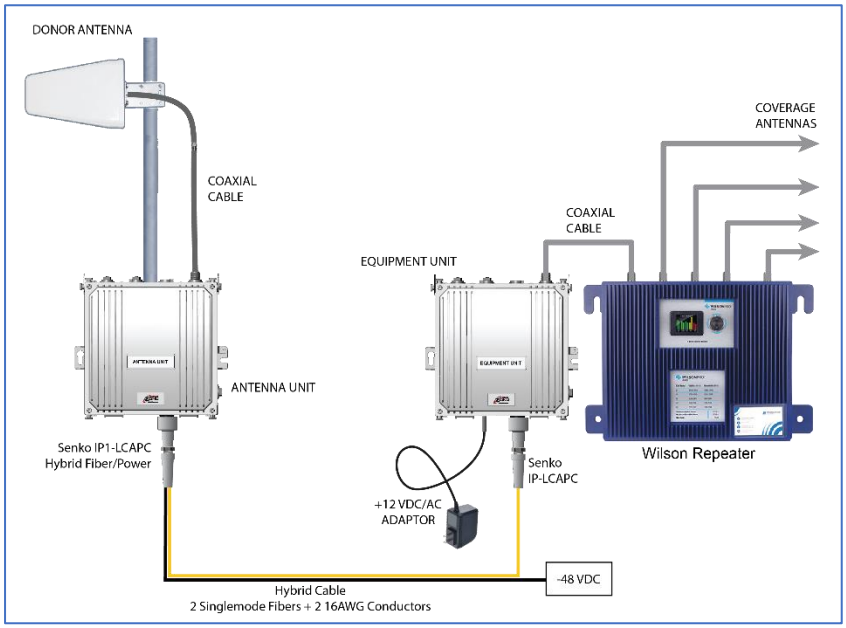
In some cases, a coaxial cable connection between the donor antenna and the repeater is not practical or possible to provide the coverage needed. In these cases, Optical Zonu's Antenna Extender provides a drop-in solution.

There are three cases where the Antenna Extender is needed to complete the system:

1. The donor antenna location is too far for coaxial cable.
2. The repeater is used as the temporary connection to an active DAS.
3. A single donor antenna must feed multiple repeaters.

Optical Zonu Antenna Extender

The Optical Zonu Antenna Extender is an RF-Over-Fiber coaxial cable replacement between the donor antenna and the repeater. It is filtered to pass only the RF bands of interest thus preventing transmitting or receiving any interference. It connects directly to the Wilson repeater and no adjustments are needed. The Antenna Unit connects to the donor and can be powered locally or remotely. The -48 VDC power supply can support a voltage drop up to 12 VDC (5100 ft for 20 AWG wire). The Equipment Unit connects directly to the Wilson repeater.

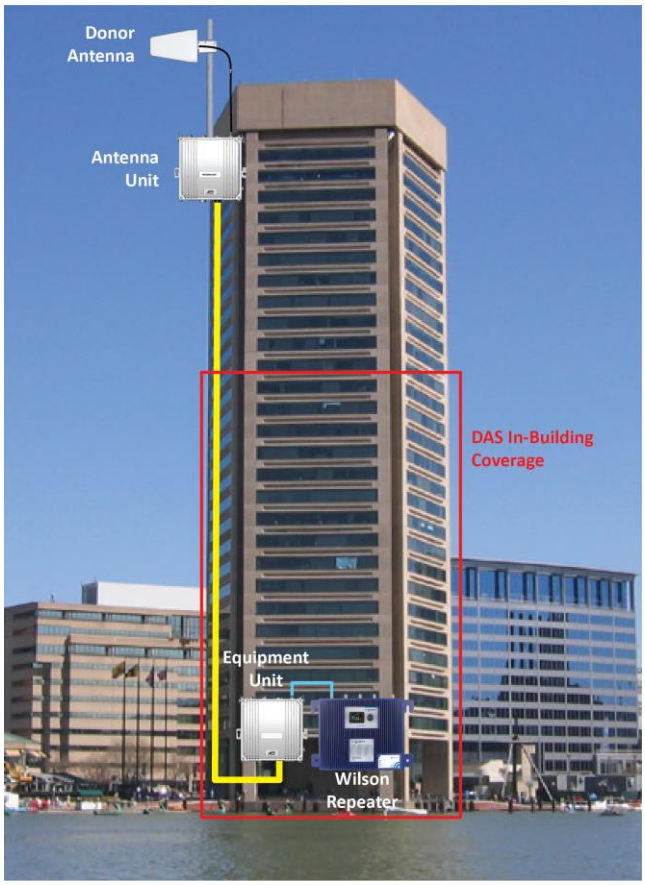


The Optical Zonu Antenna Extender provides an RF connection between the donor antenna and repeater when coaxial cable is not practical.

Case 1: Donor Antenna Location Too Far Away for a Coaxial Cable Connection

The maximum usable RF loss between the donor antenna and the Wilson repeater is approximately 7 dB. For the standard LMR400 cable supplied, this is 100 ft (at 2300 MHz). With a larger diameter cable, this distance can be extended to over 200 ft. However, long cable runs with large, heavy coaxial cable become major construction projects that are no longer practical. In these cases, the Antenna Extender simplifies the installation with its lightweight, flexible fiber optic cable.

In general, the Wilson repeater should be installed close to the distributed antennas to maximize the coverage. When the area needing coverage is in the lower floors of a high rise or in a facility where the outdoor signal is blocked by tall buildings or geography, the required donor antenna location could be 100s of feet away or more. In these situations, the Antenna Extender is the only solution.



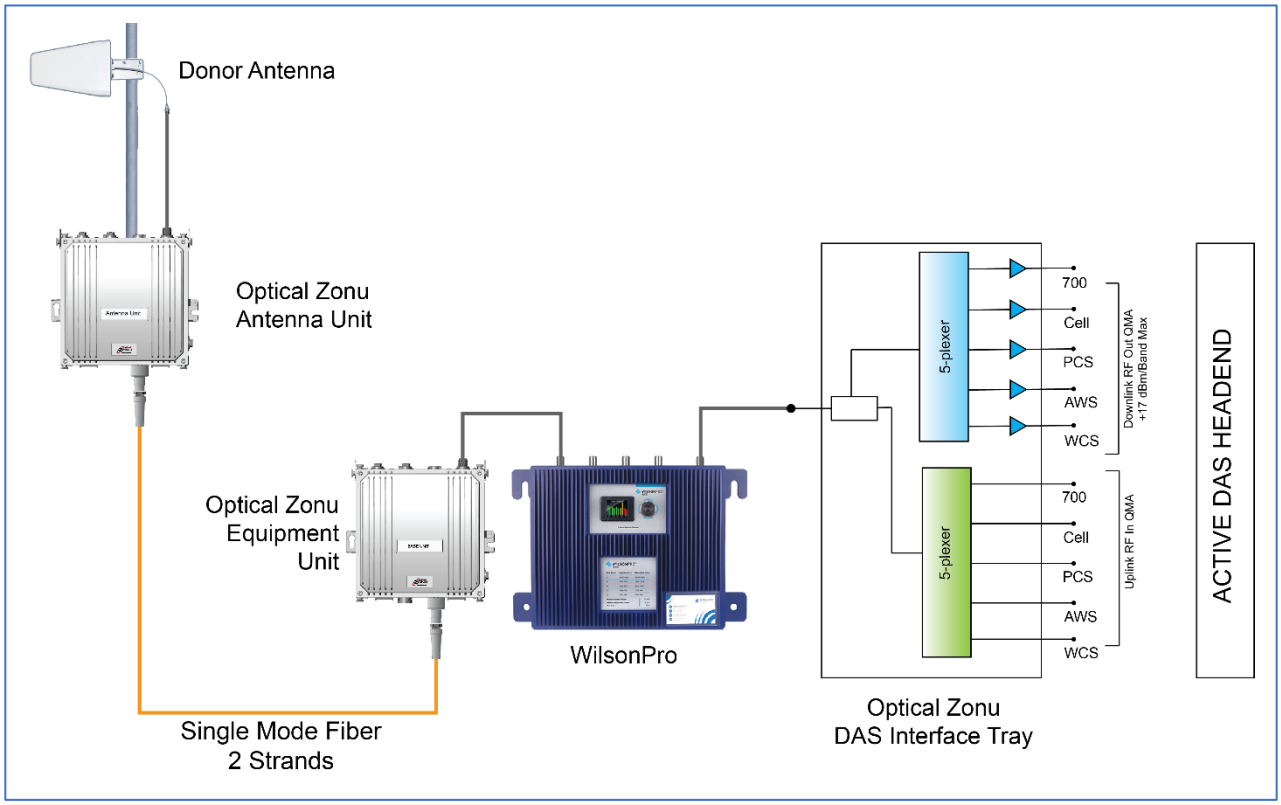
Case 1. Example of In-Building coverage for the lower floors of a high-rise. The repeater must be with the DAS on the lower floors but the donor antenna must be far away on the roof.

Case 2: Temporary Off-Air Connection to an Active DAS

More and more commercial building owners are realizing that robust indoor mobile wireless coverage is an essential requirement for prospective tenants. While the wireless carriers may pay for the deployment of a coverage system for large venues with high data and voice traffic, they will generally not pay for such a system for small and medium size commercial structures. However, they will usually provide the necessary base station equipment and backhaul to drive a properly designed in-building coverage system paid for by the building owner. The problem is that, while a skilled engineering services company can design and deploy an in-building DAS quickly, one may have to wait over a year to get the base station and backhaul from the carrier.

To get coverage quickly, the building owner can opt to have the engineering services company connect wireless services to the DAS via an off-air connection. This connection uses a roof-mounted donor antenna to pick off the cellular signal from a nearby macro site (with the permission of the carrier). This signal is amplified by the WilsonPro repeater at the DAS headend. If the DAS deployed is an active (fiber optic) DAS, the combined signal is split into the separate bands with an Optical Zonu DAS Interface Tray

and provides separate uplink and downlink connections for the DAS headend. As in case 1 above, if the DAS headend is far from the donor antenna site, the Optical Zonu Antenna Extender can be used to make the connection.

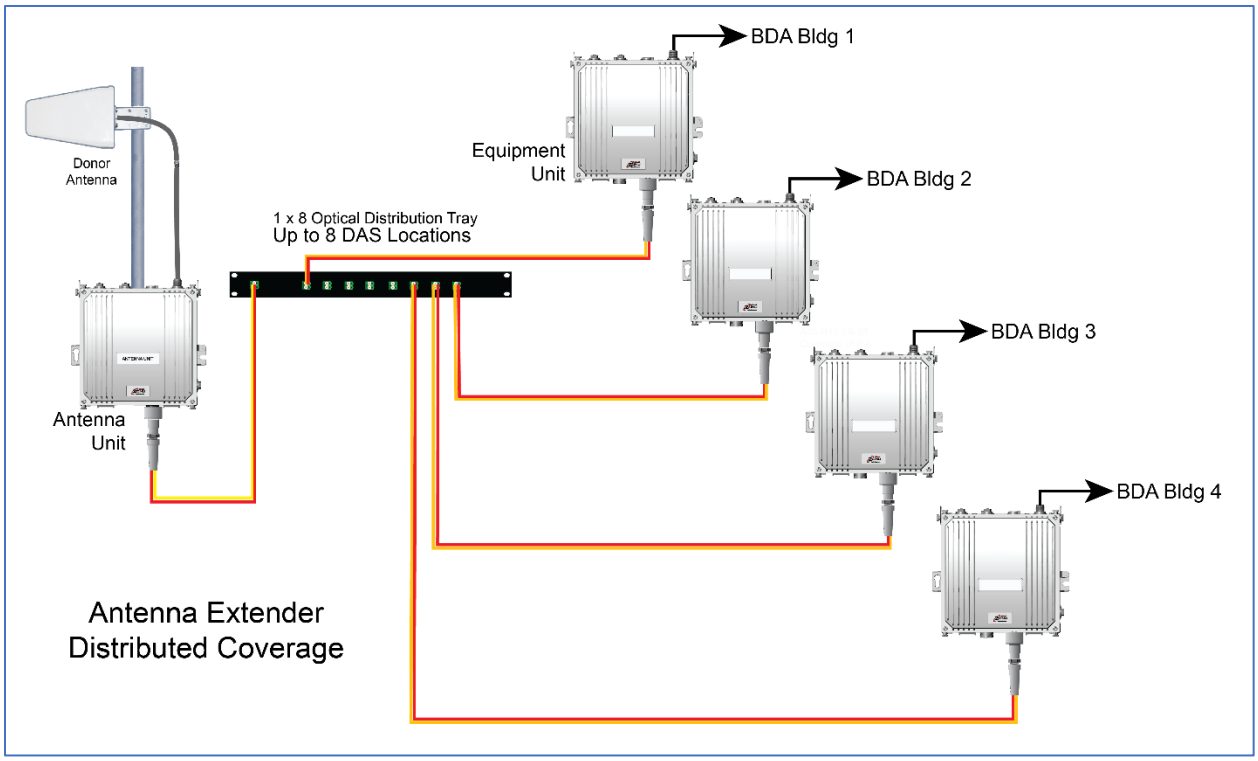


Case 2. Off-air connection to an active DAS. If the donor antenna is relatively close, the Antenna Extender would not be needed. The DAS Interface Tray splits the composite off-air signal from the WilsonPro into simplex, band-specification connections to the fiber DAS headend.

Case 3: Off-Air Donor Simulcast to Multiple WilsonPro Repeaters

In this scenario, a multi-building facility is far from network macro coverage or is in a shadow zone where coverage is blocked by other structures or geography. If the facility wireless traffic is expected to be low or moderate, an off-air connection to a DAS in each building may provide sufficient service. If the usage is expected to be high, an off-air connection be useful in providing some coverage while waiting for the carriers to approve and deploy dedicated base stations and backhaul (which is often over a year).

In this case, the Optical Zonu Antenna Extender is available in a configuration that can distribute the donor signal for up to eight locations. The downlink signal is split eight ways by an optical splitter. The Equipment Units are modified with additional downlink gain to compensate for the additional losses. For the uplink, the laser in each Equipment Unit is set to a different CWDM (coarse wave division multiplex) wavelength so that, when combined they do not interfere with one another. Each Equipment Unit then connects to a WilsonPro repeater that drives the DAS in that building.



Case 3. Optical Zonu Distributed Antenna Extender. This configuration permits simulcasting of the off-air mobile wireless signals for up to 8 WilsonPro repeaters each driving a DAS in different buildings.

Conclusion

The Wilson repeater kits greatly simplify the problem of bringing usable mobile wireless coverage into small and medium size businesses and residences. However, there are scenarios where the Wilson repeater would be the perfect solution except the required site for the donor antenna is too far for a coaxial cable connection. This problem is solved by the Optical Zonu Antenna Extender.

About Optical Zonu: Founded in 2001, Optical Zonu manufacturers a range of digital and analog RF-Over-Fiber products for commercial and government wired and wireless networks, satellite and telemetry/tracking earth stations, broadcast and Public Safety networks. The company's fast track product development ensures on time delivery of reliable, cost-effective standard product as well as custom solutions for our customers' most pressing needs. We provide full design and bid support along with on-site deployment services. For more information on Optical Zonu's capabilities, please visit our web site at www.opticalzonu.com or call us at 818-780-9701.

About Wilson Electronics, LLC: Wilson Electronics, LLC, home of WilsonPro and weBoost, is a market leader in cellular signal booster technology, dedicated to delivering wireless network coverage to everyone, everywhere. Each booster is FCC approved to amplify signal from all major carriers for all cellular devices; significantly improving cellular coverage in homes, vehicles and commercial buildings. The company has developed and manufactured cell phone signal boosters, antennas, and related components for more than 20 years—establishing an extensive portfolio of intellectual property surrounding mobile phone repeater and booster architectures along the way. All Wilson Electronics products are designed, assembled, and tested in the USA. For more information, visit https://www.wilsonelectronics.com/.