1.2 General Description

The FiberDAS Fiberoptic Distributed Antenna System provides extended coverage of wireless networks throughout buildings and campus environments. The Hub Shelf is a 3U (5.25 inch) high, 19-inch wide rack-mounted chassis. The Hub Shelf holds up to 8 Hub Transceiver Plug-Ins. The Hub Shelf is located in a communications equipment room in the building and is connected to the wireless base station or repeater via hardline connection. The Hub Shelf may also be connected to the radios of a wireless PBX. Each Hub Shelf is configured with up to eight Hub Transceiver plug-in cards. Each card is connected to up to two Remote Transceivers via two pairs of singlemode fiberoptic lines. The Remote Transceiver Units are distributed throughout the building as necessary to provide coverage. The Remote Transceivers are mounted, generally, above the suspended ceiling but may be mounted near the ceiling inside the room if need be. The aesthetic and low-profile design of the Remote Transceiver makes it relatively unobtrusive. The plastic cover may even be removed and/or painted to match the décor. Each Remote Transceiver is connected to Hub Shelf via two singlemode optical fibers. Each Remote Transceiver has one RF port which is connected to a user-supplied indoor coverage antenna. This port may also be routed through an N-way RF splitter to provide coverage from a number N antennas for the one Remote Transceiver. The choice depends on the results of the engineering design for that particular structure as to the most cost-effective way to provide uniform coverage. The Remote Transceiver is DC-powered, usually by the Remec Central DC Power Supply. This is distributed from the power supply at the Hub location using the conductor pairs in a composite fiber/conductor cable or by a separate two-wire cable pulled along with the fiberoptic cable. The DC connector utilized at the Remote Transceiver can accommodate up to 14 AWG wire.

The FiberDAS design is very versatile but certain options are available that target specific signal types and applications. In addition to the single band versions from iDEN through UMTS, there are dual band versions such as 800 MHz/1900 MHz and GSM900/GSM1800.

FiberDAS installation and setup is very simple. First, standard telcom grade singlemode fiberoptic cable that is most suitable for the site is installed. The cable installer can terminate the cable on site easily with the SC/UPC optical connectors. The Plug-Ins and Remote Transceivers of a given type are completely interchangeable. The SC/UPC plugs directly into the Remote Transceiver at one end. The other end plugs into an optical patch panel or directly into the Hub Shelf via an SC/UPC-to-SC/UPC adapter. If the patch panel is used, SC/UPC-to-SC/UPC jumpers must be used to connect the Hub Shelf to the patch panel. Built-in optical loss compensation automatically equalizes the gain in both the transmit and receive paths so the transmit RF power is known for a given input RF power and the receive path sensitivity is optimized. The only adjustment available is a manual setting for the static transmit power at the Remote Transceiver which may be used to optimize coverage, if necessary. This is a one time adjustment during set up.

1.2.1 Basic Principles

The FiberDAS operation is based on an analog RF fiberoptic link. The principles are illustrated in Figure 1. Input RF signals are converted to light by direct intensity modulation of a semiconductor laser. This modulated light is transmitted over optical fiber and detected by a semiconductor PIN photodiode. The photodiode converts optical power to electrical current. This current is AC coupled and passed through a load to recover the RF signal.

The basic RF loss in this link is determined by the inefficiencies of the conversions of RF to optical and back. The fiber also contributes an RF loss equal to twice the optical loss. This is because the photodiode converts optical *power* to electrical *current* and RF power is proportional to the square of the current. So, for 1 km of fiber with a loss of 0.4 dB/km (this is typical at 1310 nm wavelength) the optical loss is 0.4 dB