



Exhibit 12 – Operational Description

Customer Premises Equipment Roof Unit 2.0

FCC ID: NNSRTU2000-00

Model Number : RTU2000-28-3

Information Provided in this Exhibit:

Operational description of CPE Roof Unit

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The SpectraPoint® LMDS system is designed to transport a variety of broadband wireless services to customers. This LMDS system is capable of delivering up to 360 MHz of contiguous bandwidth of data services to customers in an area of up to 5 Km radius from a central base station. The same frequency spectrum may be reused in similar sectors throughout a given metropolitan area.

The two basic parts that make up the SpectraPoint® LMDS system are the Base Station and Subscriber Terminal equipment. The block diagram in Figure 1 shows the relationship of the Customer Premises Equipment (CPE) Roof Unit to the total system. In the diagram, the downstream direction is defined from the RF Transmitter to the Roof Unit. The reverse signal direction is defined as upstream. In operation, the DS3 data interface to the Channel Group is processed and then Quadrature Phase Shift Key (QPSK) modulated onto an L-Band Intermediate Frequency (IF) carrier. The IF is input to the RF Transmitter where it is upconverted to the 27.50 – 27.86 GHz within the authorized LMDS frequency band. The RF is transmitted downstream through one of 4 orthogonal sectors. Each sector reuses the same frequency spectrum analogous to a cellular phone system that has no moving components.

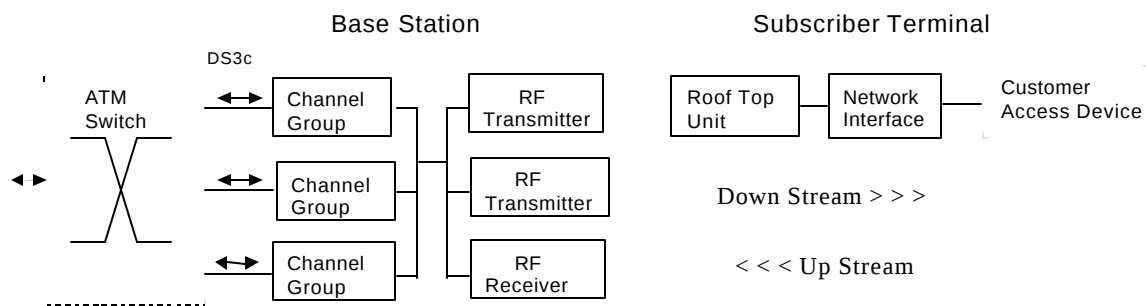


Figure 1: LMDS Block Diagram

The CPE roof unit serves as a transceiver at the customer premises location for the subscriber terminal equipment. The CPE roof unit receives a downstream carrier and down converts the RF signal from 27.50 – 27.86 GHz back to L-Band IF in the 1100 to 1460 MHz range. The L-Band QPSK modulated carrier is input to the Network Interface Unit (NIU) where it is demodulated into data streams to interface with customer T1, 10BaseT LAN, and digital video data equipment.

In the upstream direction, the customer interface to the Network Interface Unit (NIU) is made up of T1 data lines, 10BaseT local area network data, or digital video data. The NIU combines the data into a single data stream and QPSK modulates the data on to an

L-Band IF carrier between 1590 – 1950 MHz. This IF carrier is then input to the transmit side of the CPE Roof Unit Transceiver. The CPE Roof Unit upconverts the L-Band signal to the 27.99 – 28.35 GHz within the authorized LMDS frequency band for transmission upstream to the RF Receiver. The RF Receiver then down converts the RF to the L-band frequency in a reverse of the Base Station downstream process. Finally data is reassembled into a DS3 ATM format for interfacing with the a network switch.

Frequency stability of the CPE roof unit is maintained through high stability crystal based internal oscillator. Power to the CPE roof unit is supplied through the RF coaxial cable interface to the receiver IF connector. The CPE operates from 12 VDC nominal at a maximum current of 2.4 amps. A transmitter enable voltage of +5 VDC is supplied through the RF coaxial cable interface to the transmitter IF connector.

The Roof Unit transmitter operates in a power control mode with power levels controlled through a closed loop with the Base Station. This loop senses signal strength variations due to changes in path parameters and adjusts power levels of the CPE roof unit transmitter. In case of total loss of the link, or oscillator not ready condition, the transmitter portion of the CPE Roof Unit will be disabled.