

## POINT-TO-MULTIPOINT

### PRODUCT DESCRIPTION

#### 1.0 Overview

P-COM, Inc., an ISO-9001 certified company, develops, manufactures and markets millimeter-wave radio systems and wireless solutions for wideband and broadband services for the worldwide telecommunications industry. These systems provide a high quality, cost-effective digital transmission solution for short-haul applications and for a variety of wireless services. These systems have been developed to meet all relevant industry standards.

P-COM's Point-to-Multipoint (PMP) system meets the crucial requirements of minimizing the user's cost of ownership. The design philosophy that governs all P-COM product development decisions is one which results in a product that is high in reliability, cost-effectiveness and simple to install and maintain. Given the competitive nature of the telecommunications service industry, these attributes play a key role in the successful and profitable operations of users wireless networks.

The system provides wideband and broadband services for business customers. These services include telephony, data, LAN, and video. The system also provides solutions for Fixed Wireless Access (FWA), Wireless Local Loop (WLL), Local Multi-Point Communications Services (LMCS) and Local Multi-Point Distribution Services (LMDS).

Employing an integrated star topology, the Point-to-Multipoint (PMP) system uses digital wireless cell-based transmission to carry both wideband telephone services and broadband multimedia services to customers. Minimal delay is provided for voice traffic and very low Bit Error Rates are achieved to support data services.

The unique architecture of the PMP system has the following benefits:

- Flexibility
- Scalability
- Bandwidth management
- Integrated Network Management
- Software Distribution
- Wide variety of User Interfaces
- Wide range of frequency bands available: 10 - 40 GHz

## 2.0 System Architecture

The wireless Point-to-Multipoint system addresses the requirements for alternative access to local circuit, packet and cell switching facilities within metropolitan areas. It interfaces with existing PABX, host computers, LANs, Multiplexers, Routers/Bridges, etc. and provides transport to local switching centers via a highly reliable, wireless communications link.

The PMP network is composed of one or more Base Stations that are strategically located within the desired coverage area (i.e., city). Each Base Station supports Line-of-Sight connections to Customer Premise Terminals (CPT). The Base Station multiplexes all traffic onto one or more continuous carriers that are transmitted to the CPTs. These carriers are typically transmitted at slightly different frequencies to avoid interference. On the upstream direction the CPTs use Frequency Division Multiple Access (FDMA) method to transmit information to the Base Station. The CPTs each communicate on separate carriers with demodulators at the Base Station.

The system is designed for rapid fault isolation and repair in the field. All active elements are contained on front-loaded cards with front-mounted LEDs indicating status.

The system makes extensive use of cell transport over the wireless link between the Base Station and the CPTs. It efficiently supports traffic such as T1, Fractional T1, ISDN, analog voice, Frame Relay and Nx64 Kbps data.

### 2.1 Base Station

The Base Station is composed of an independent set of sectors each providing up to 90° coverage within the 360° area around the Base Station. Each Base Station also interfaces to the Public Switched Network (PSN) through concentrated access links. Each Base Station can support multiple sectors. Sectors are composed of one or more Indoor Units (IDUs) and an integrated RF/Antenna Outdoor Unit (ODU). The RF/Antenna ODU contains lensed-horn antennas. Each sector antenna contains a transmit and a receive horn. The IDU is a standard rack-mount chassis with redundant power supplies, and space for plug-in cards.

#### 2.1.1 Sector

The Sector supports FDMA CPTs and provides complete connectivity to the backbone for transport to the service node and/or PSN. A sector consists of up to four sector subsystems connected to a Hub IF Combiner that combines the IF signals from each of the sector subsystem onto a single IF cable connected to the ODU. Each Sector consists of the following components:

- One Outdoor Unit (ODU) containing the RF components and the antenna
- One Hub IF Combiner

- Up to four Indoor Units (IDU) each containing Modulators, Demodulators, Sector Controllers, and T1-Network Interface Cards
- An Inter-facility Link (IFL) consisting of one coaxial cables connecting the Hub IF Combiner to the ODU

### 2.1.2 Hub IF Combiner

The Hub IF Combiner is a rack-mount unit that connects up to four IDUs to a single ODU. The IDUs are connected to the Hub IF Combiner with a single coaxial. The Hub IF Combiner combines all four IF signals onto a single coaxial cable to the ODU. The Hub IF Combiner also multiplexes 10 MHz reference and DC power for the ODU on this cable.

### 2.1.3 Sector Outdoor Unit

The Sector Outdoor Unit (ODU) is a single integrated enclosure containing all RF components mounted directly to a receive horn antenna and a transmit horn antenna.

The ODU transmits modulated RF signals to the CPTs and receives RF signals from the CPTs via line-of-sight wireless communication links.

### 2.1.4 Sector Indoor Unit

The Sector IDU is located indoors at the Base Station site and is connected to the Sector ODU via IFL cables.

The Sector IDU is comprised of the following components:

- Rack mount Chassis with Power Supplies
- Modulators
- Demodulators
- Sector Controller
- T1 Network Interface Cards (NICs)

The Base Station Chassis provides space for Modulators, Demodulators, Sector Controllers, and T1-NICs.

### 2.1.5 Interconnecting Cable

A single coaxial cable is used to connect the Sector ODU to the Hub IF Combiner. This carries the transmit IF signal, receive IF signal, telemetry and DC Power between the ODU and Hub IF Combiner. The ODU and Hub IF Combiner contain "N" type connectors for interconnection of the coaxial cable.

Double screened LMR400 coaxial cable is recommended to provide good EMC performance.

## 2.2 Customer Premise Terminal

The Customer Premise Terminal (CPT) provides the interface to network services at the customer premise. The CPT consists of an integrated RF/Antenna ODU and an IDU. The ODU consists of a RF electronic subsystem connected to a one foot high-gain parabolic

antenna. The IDU is a chassis supporting a power supply, modem, Remote Controller and T1 User Interface Module cards. The IDU can be connected to an external multiplexer which can provide POTS, ISDN and data interfaces.

The CPT consists of the following components:

- An Outdoor Unit (ODU) containing the RF electronics and the antenna
- An Indoor Unit (IDU) containing a Modem, Controller and User Interface Cards
- An Interfacility Link (IFL) consisting of a single coaxial cable connecting the indoor unit to the Outdoor Unit.

### 2.2.1 Outdoor Unit

The Outdoor Unit is an integrated RF/Antenna configuration and includes the following components:

- Reflector
- Feed
- Radome
- ODU Enclosure
- RF Electronics
- Mount

The antenna is a one foot parabolic and can be directly mounted to a 1.75 - 4.5 inch pipe. The mount will support adjustments of  $\pm 180$  degrees of elevation and  $\pm 180$  degrees of azimuth.

### 2.2.2 Indoor Unit

The Indoor Unit (IDU) is located inside the customer's facility at the CPT site and is connected to the ODU via a coaxial cable.

The IDU contains a continuous demodulator, a continuous modulator, T1 User Interface Cards, and a power supply. The carrier back to the hub is a dedicated FDMA carrier capable of carrying up to 16 T1s of traffic.

The IDU may be connected to an external multiplexer via the T1 interfaces. The multiplexer is capable of handling various types of traffic. This allows the CPT to be configured for a mixed POTS, ISDN, and a data environment. This is the typical situation for business customers. In the POTS application, standard telephony and group III fax services are supported.

### 2.2.3 Interconnecting Cable

A single coaxial cable is used to connect the CPT ODU to the CPT IDU. This carries the transmit IF signal, receive IF signal, telemetry and DC Power between the IDU and ODU. The IDU and ODU contain "N" type connectors for interconnection of the coaxial cable.

### **3.0 Network Management**

Network Management is provided through the use of a PC based software configuration tool: Local Site Manager (LSM). The LSM is a Windows 95 application that connects via a serial port to a Remote Terminal, or Base Station Sector Controller. The LSM provides local configuration, control and monitoring of the Indoor Unit (IDU) and Outdoor Unit (ODU). The LSM is usually run upon a laptop computer to provide ease of mobility for testing and configuration.

The LSM has the following hardware requirements:

- IBM PC Compatible with a Pentium or later processor
- 8 MB of memory
- 250 MB hard drive
- Serial port capable of 38400 baud transfers

The LSM has the following software requirements:

- Windows 95 operating system

The main window of the LSM is the Chassis Window. The Chassis Window displays the current settings for the configuration parameters, as well as allowing the operator to change the parameters and save the changed parameters for later use. The Chassis Window is divided into two sections, designated as 'panes', which are separated by a splitter bar. The left pane enables the selection of a configuration section or configuration table within a configuration section. The right pane displays the items that reside within the configuration section or tables within a configuration section selected on the left pane. The following operations may be performed:

1. GET: Getting the values of configuration items.
2. SET: Setting the values of configuration items.
3. GET ALL: Getting the values of all items within a configuration section or table within a configuration section.
4. SET ALL: Setting the values of all items within a configuration section or table within a configuration section.