Manuals+ — User Manuals Simplified.

ONDAS NETWORKS Mercury 450 Radio User Guide

ONDAS NETWORKS Mercury 450 Radio User Guide

Warning: Never power on a Mercury 450 radio without a load on the RF connector.

Contents

FCC Compliance

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Ondas Networks could void the user's authority to operate the equipment.

This equipment is authorized for use only under the conditions as specified in the FCC Waiver reference DA 21-58. The full details of the waiver can be found at the following link:

https://docs.fcc.gov/public/attachments/DA-21-58A1.pdf

FCC Exposure Statement

This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must be at least 20 centimeters from the user and must not be co-located or operating in conjunction with any other antenna or transmitter.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Ondas Networks may void the user's authority to operate the equipment.

System Overview

The Mercury 450 platform employs Ondas Networks' FullMAX technology

FullMAX is a multi-cell, Point-to-Multipoint (PtMP) broadband wireless system based on the IEEE 802.16 standard with modifications to enable its operation in a wide range of frequencies and a wide range of channel sizes. The system is used to establish a private, broadband wireless service for mission critical industries. It supports both fixed and mobile applications.

The main characteristics of the FullMAX System include the following:

FullMAX employs HD-FDD or TDD framing to provide greater flexibility and to maximize spectrum utilization.

FullMAX is capable of operating in any frequency band between 40 MHz and 6 GHz and in any channel size between 12.5 kHz and 5 MHz. FullMAX can be configured to operate in a downlink to uplink ratio tosupport symmetrical, asymmetrical and reverse asymmetrical applications.

The FullMAX system offersthe private system operator wide area coverage by leveraging the following:

- High transmit power from both the Base Station and Remote Stations
- Exceptional receiver sensitivity
- Superior propagation due to the operation in narrower channel sizes and low band frequencies.

The FullMAX system offers excellent frequency utilization through the following capabilities:

- Adaptive Modulation and Coding per link in both the downlink and uplink
- Optimization of the downlink and uplink ratio for the user's main applications. For example, in the case of SCADA applications, the FullMAX frame is configured as reverse asymmetrical, i.e., more bandwidth is allocated to the uplink than to the downlink.
- Modifications to the standard air interface protocol to minimize MAC layer overhead.
- Employ Band-AMC subcarrier allocation scheme in both uplink and downlink direction to maximize the percentage of data transport subcarriers.
- Packet Header Suppression (PHS) with the following characteristics:
  - Compressible header field values are learned automatically with no need for manual configurations.
  - Support for multiple compressible values for the same header fields. As a result, PHS can be used even when the header fields are not constant.

FullMAX includes a versatile set of Quality of Service (QoS) tools that can optimize traffic performance for each application and prioritize access to the available bandwidth according to the operator's requirements. QoS tools include various scheduling methods (e.g., Best Efforts and Unsolicited Grant Service), service flows with various QoS parameters such as priority level, minimum and maximum traffic rates, guaranteed delay, Litter, etc.

FullMAX provides secure connections with strong encryption (AES-128 or AES-256), strong authentication (EAP after RSA with X.509 certificates) and advanced key management protocol (PKMv2).

FullMAX supports various frequency reuse methods including:

- Traditional full channel based frequency reuse
- OFDMA based Band-AMC sub-channel reuse with up to 12 sub-channels in both uplink and downlink. Any combination of sub-channels can be used in each sector in both downlink and uplink.

FullMAX Remote Stations support a pre-configured channel acquisition plan, i.e., a preconfigured list of channel alternatives, characterized by center frequency, bandwidth, sub channels and other parameters. During channel acquisition, the Remote Station goes through the list and evaluates the best alternative.

FullMAX has an advanced remote management system that enables the system operator to monitor, configure, manage, detect failures and diagnose problems. The FullMAX system configuration and FullMAX system provisioning support centralized management profiles.

The FullMAX system architecture consists of Base Stations, Fixed Remote Stations and Mobile Stations. Backhaul networking equipment connectsthe Base Stations to the customer's Network Operations Center (NOC)

and the FullMAX Network Management System (NMS). FullMAX Base Stations are typically installed in the existing Private Land Mobile Radio (PLMR) towers serving their respective cells.

The FullMAX Base Station is designed as a single sector device. Any number of sectors can be designed per tower, however the most common configuration is a three sector design with one Base Station unit per sector.

The sector configuration dictates the type of antenna thatshould be used. Typically a router is used at the tower to connect all Base Stations to the NOC via backhaul facilities. FullMAX Fixed Remote and Mobile Stations are deployed throughout the tower's serving area.

Physical Installation

Introduction

A Mercury 450 radio is comprised of software and hardware which is packaged in a lightweight carbon fiber enclosure.

Mercury 450 Enclosure

Specifications

Enclosure Material	Carbon Fiber
Dimensions (W x D x H)	5.25" x 4.5" x 1.0" (133mm x 115mm x 25mm)
Operating Temperature	-40° F to 140° F (-40° C to 60° C)
DC Input Power Range	10.2 to 13.8 VDC
Power Consumption	< 10 Watts

Product Overview
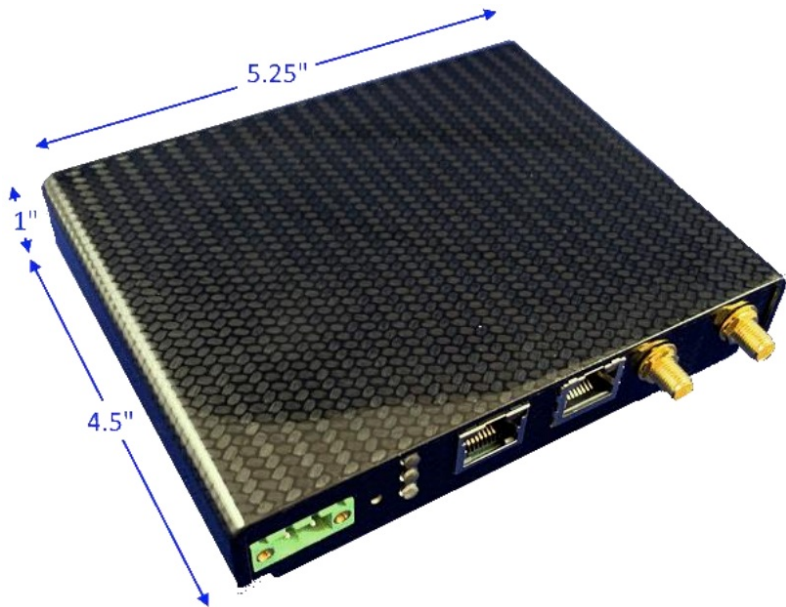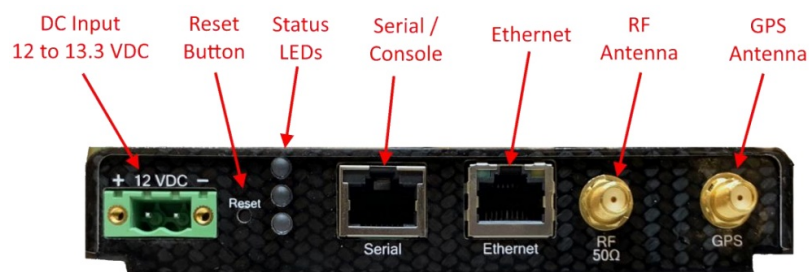
Connection Descriptions

Connector	Application
GPS Antenna	SMA female connector for optional GPS antenna.
RF Out	50Ω SMA female connector for RF input
DC Input	DC power input 12 to 13.3 volts. Warning: Ensure Correct Polarity
Ethernet	RJ45 8-pin connector for Ethernet 10/100 Base-T interface
Console / Serial Data	RJ45 8-pin connector wired using the Cisco interface specification for serial access and console access via an adapter cable

System Operation

A Mercury 450 radio automatically starts operation when the DC power is connected.
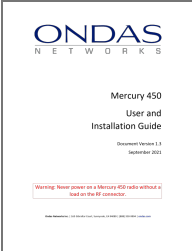
Basic connectivity with the network can be verified using the Command Line Interface (CLI) via the console connection as shown below.

- operator@mercury-$ show ms measurement report
- show ms measurement report
- Instantaneous DL CINR : 23 (dB)
- Mean DL CINR : 24 (dB)
- Mean DL CINR Min : 24 (dB)
- Mean DL CINR Max : 25 (dB)
- Rx Gain : 11 (dB)
- FreqErr : 119 (Hz)
- DL Preamble RSSI : -65 (dBm)
- Mean DL RSSI : -65 (dBm)
- DL RPD : -54 (dBm)
- DL Path loss : 85 (dB)
- MS Tx Power : 0 (dBm)
- DC Offset Real : -2575 (mV)
- DC Offset Imag : 775 (mV)

- Avg DC Offset Real : -343
- Avg DC Offset Imag : -230
- Tx iTrim : 47
- Tx qTrim : 44
- Current UL FEC Code : 1
- Current DL FEC Code : 0
- Power Control mode : Closed loop power control mode

Documents / Resources

	ONDAS NETWORKS Mercury 450 Radio [pdf] User Guide HG450-1, HG4501, X27-HG450-1, X27HG4501, Mercury 450, Radio, Mercury 450 Radio