



## WCS band Radio Module

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# WRM Product Manual 2.6 GHz WCS band Backhaul Radio Module

**FCC ID RAR20007001**

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## About this Document

This document is a product manual for the B2XH068AA-A 2.6 GHz WCS band Backhaul Radio Module 1, FCC ID RAR 20007001. The manual outlines the radio modules limitations on use in BelAir Networks products marketed or offered for sale. An overview of BelAir Networks products is included with information on the module installation in these products. Specifications on approved antennas to be used with the module are provided. This manual provides an outline on the module installation, limitations of use, location of FCC label information, regulatory statements and RF exposure minimum safety requirements.

## Introduction

The B2XH068AA-A (hereafter referred to as “the module”) is a 2.6 GHz WCS band radio module compatible with the IEEE 802.16-2004 standard for WiMAX operation. The module contains a complete 802.16 radio and Medium Access Control protocol engine.

The module is not intended for stand-alone operation. It will only be marketed as a complete product, in conjunction with a package, DC power supply and antenna (hereafter referred to as “the product” or the “final product”).

Since the module has a BelAir networks proprietary digital interface, it cannot be directly connected to any standard telecommunications or computer devices. It can only be used with final products designed and authorized specifically for that purpose.

The WiMAX Radio Module (WRM, RAR20007001) is a BelAir Networks radio module designed to operate in the 2.6 GHz frequency bands (BRS / EBS bands) using the IEEE 802.16-2004 (Wireless MAN-OFDM physical layer) (WiMAX) industry standard.

The module will operate under FCC part 27 covering a portion of the frequencies in the UBS band segment under part 27.5, specifically BRS channels E1 to G3 post transition frequency assignments.

The WRM provides WiMAX backhaul support for the BelAir200 and BelAir100 wireless mesh nodes with the capacity to deliver up to 40 Mbps of dedicated data throughput. The WRM supports point-to-point topologies (fixed applications) and is ideal for creating dedicated connections to other BelAir wireless mesh nodes in a network.

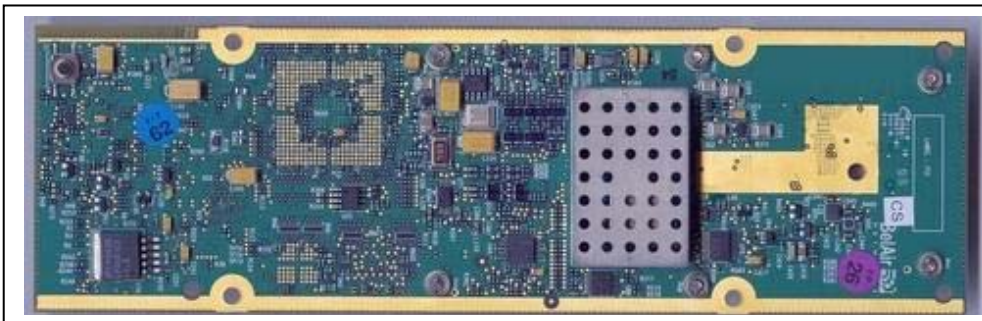
An ideal deployment for the WRM is to configure it with BelAir200 nodes and/or BelAir100 nodes

to provide last mile access for cellular backhaul applications. The WRM operates in the licensed 2.6 GHz frequency bands, and the added capacity that WiMAX (IEEE 802.16d) delivers to the network is ideal for critical applications such as voice traffic.

## Picture of the B2XH068AA-A 2.6 GHz WCS band Backhaul Radio

Module is shown below for reference, notice that the connector interfaces only allow integration of the module into BelAir Networks products .

Top and bottom views;



## General Conditions of Use

This manual is intended to supplement training provided by BelAir Networks or authorized parties. The module B2XH068AA-A is only intended for use in BelAir Networks products and is not for sale to the general public as a stand-alone module. Please read this entire document, including the Regulatory Statements section before attempting to install or operate the module.

**Warning:** Any use of B2XH068AA-A in any manner which is not expressly specified within this manual or specifically approved by BelAir Networks or its authorized agents will void the user's right to operate this module, and is expressly forbidden by BelAir Networks. This includes any modification of the module, installation of the module in a configuration or used with an antenna which is not expressly listed in this document or approved by BelAir Networks.

### Installation into a Product

The module shall only be installed by a technician trained by BelAir Networks or its authorized agents. It should only be installed into an approved product following all manufacturing and service procedures for that product. Refer to the following sections outlining specific installation in BelAir Networks products.

### Module Service

The module is not intended as a field-serviceable unit. It contains no field-replaceable or field-serviceable parts, or any external adjustable mechanisms. The module should only be serviced in a manufacturing or service depot site approved by BelAir Networks or its authorized agents.

### Country of Use

B2XH068AA-A is certified for use as an Intentional Radiator in the United States as device: FCC ID: RAR20007001. Please read all regulatory statements at the end of this document before any attempt to install or operate this module.

The module is only certified for operation in the United States. Before attempting to install and operate this module in any other country, contact BelAir Networks for approval.

## Overview of B2XH068AA-A module installation into BelAir Networks products

### List of Approved Final Products

The B2XH068AA-A module is only approved for use in the following BelAir Networks products:

- BelAir200. See BelAir200 documentation for complete manufacturing instructions.
- BelAir100. See BelAir documentation for complete manufacturing instructions.

Operation of the module within the products expressly listed above is required to ensure compliance to all FCC regulations. Any modification of the module, or its use in any configuration not expressly listed above may void the user's right to operate this module.

The radio module is part of a multi radio system in which the B2XH068AA-A is used for Backhaul applications, for example backhauling cellular signals. The concept is as shown in figure 1.

A typical block diagram of a two radio configuration using one module ( B2XH068AA-A) incorporated into a BelAir Networks product is shown in figure 2. BelAir Networks products incorporate other functional blocks as shown, such as Line and Power interface, battery back up and power conditioning as well as an Access Radio.

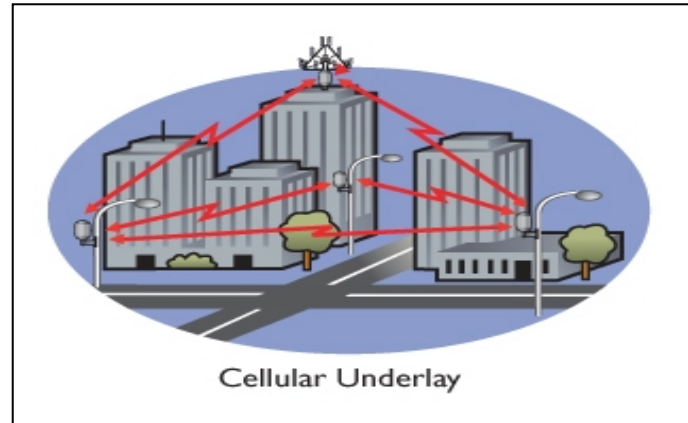


Fig. 1  
Cellular backhaul using the B2XH068AA-A (RAR20007001 ) radio module in BelAir Networks products.

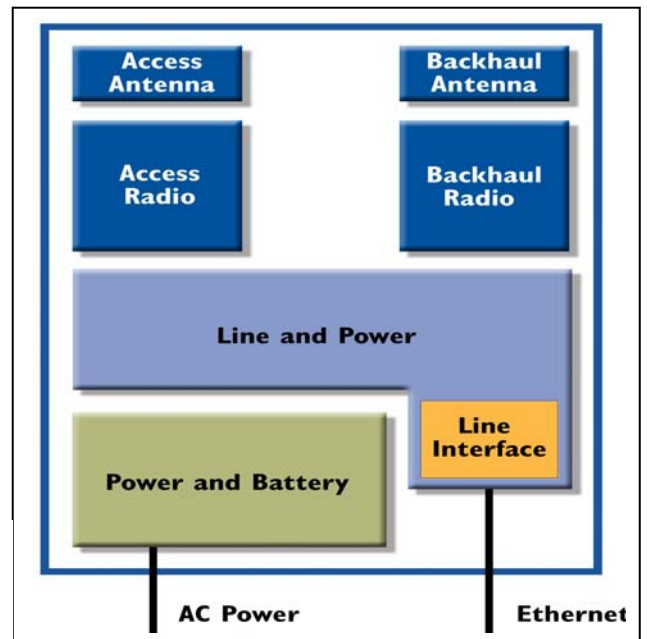


Fig. 2  
Block diagram of a two radio configuration with the backhaul module ( B2XH068AA-A) incorporated into a BelAir Networks product is shown.

Fig.2

## B2XH068AA-A module installation into BA100 product

The module can be installed into three variants of the BA100 product, namely the BA100, BA100C and BA100S. The BA100 product is capable of incorporating two radio modules, options include two B2XH068AA-A (FCC ID :RAR20007001) modules or one B2CH043AA-C (FCC ID :RAR20000003) module as well one B2XH068AA-A module.

BA100 and BA100C incorporating variants in available antennas and the BA100S is a strand mount variant.

BA100 and BA100S variants pictures are shown in figure3 and figure 4, both are typically mounted outside on hydro and light poles or hanging on a support wire in a strand mount application.



Fig 3.  
Typical mount of BA100 with B2XH068AA-A module and MTI panel antenna



Fig 4.  
BA100S, strand mount version with B2XH068AA-A module and MTI patch antennas

## Module installation in a BA100 clam shell

The assembly is made up of two bolted clamshells. The modules are installed in the bottom clamshell. Figure 5 outlines how boards are installed. Refer to document RAR20007001\_BelAir WRM Label Information.pdf for FCC label location details for the module.

Two B2XH068AA-A ( FCC ID :RAR20007001) modules or one B2CH043AA-C ( FCC ID : RAR20000003) module

LPM digital board

Bottom clamshell

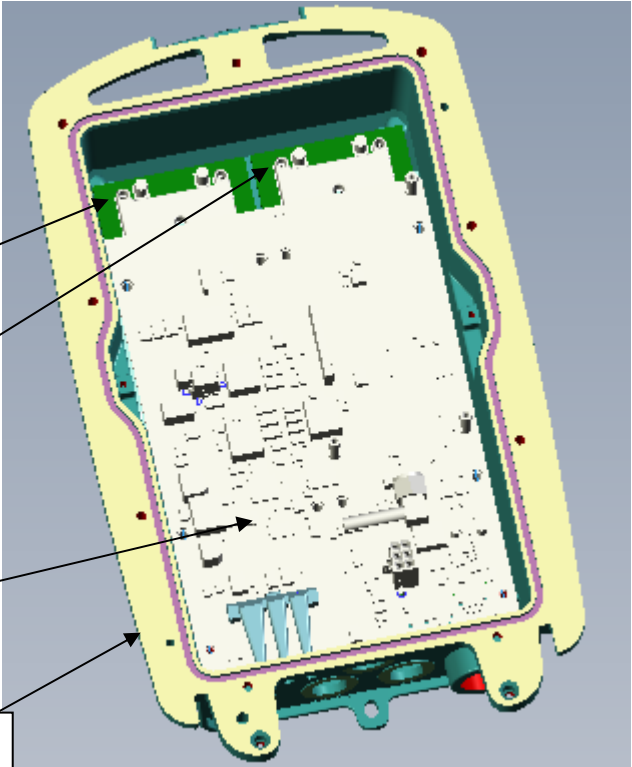


Fig. 5 BA100 “X” board installation into bottom clamshell

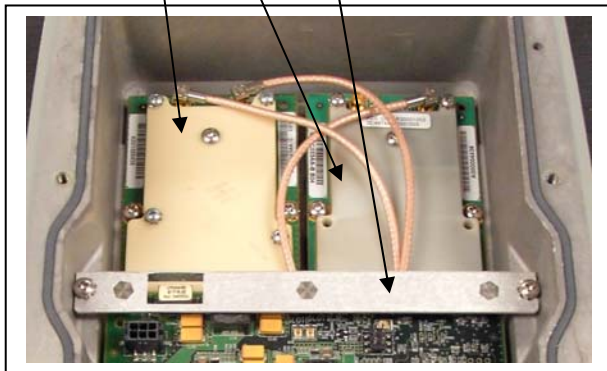


Fig. 6 BA100 picture of board installed into bottom clamshell



## BA100 Unit FCC Labeling

One or more labels are applied to the product during manufacture, including a label which identifies the FCC identification numbers. Refer to figures 7 through 10 for label location on BA100 product. Do not attempt to remove any labels from the module.

The following permanent label, or one containing equivalent information, must be affixed in a conspicuous location on the exterior of every product containing this module:

**FCC ID: RAR20007001**

BA100 location of unit FCC labels;



Fig. 7



Fig. 8

Location of FCC labels for BA100 located on top and bottom clamshells. The labels outline the modules contained in the unit.

## BA 100S Unit FCC Labeling



Fig. 9

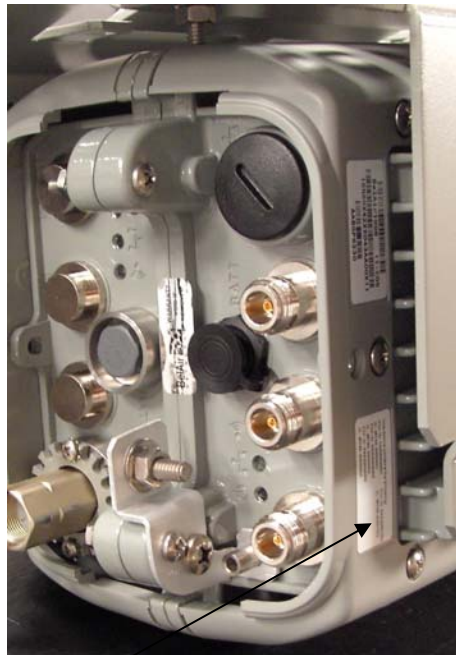


Fig. 10

Location of FCC labels for BA100S located on top and bottom clamshells outlining the radio modules contained in the unit.

## B2XH068AA-A module installation into BA200 product

The module can be installed in a BA200 product. The BA200 can accommodate up to two four radios. Four B2XH068AA-A (FCC ID :RAR20007001) modules or one B2CH043AA-C (FCC ID :RAR20000003) module as well three B2XH068AA-A modules are the possible variants. Figures 11 and 12 outline the BA200 unit, as well as a view of a version with two MTI 16 dBi patch antennas connected to two B2XH068AA-A modules as well omni antennas connected to one B2CH043AA-C Access

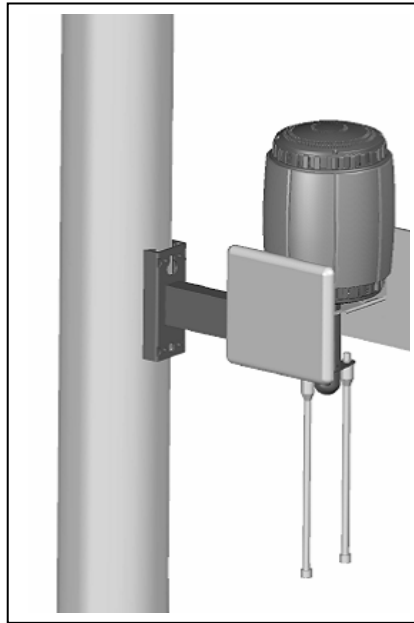


Fig. 11



Fig. 12

Fig. 11 and 12  
BA200 unit pictorial of typical mounting on a pole and close up view.

A typical block diagram of the BA200 is shown in figure 13. The BA 200 is a multiple radio product incorporates up to four B2XH068AA-A modules. The unit incorporates power line conditioning, battery back up and charging, Ethernet interfaces, and switch and control circuitry.

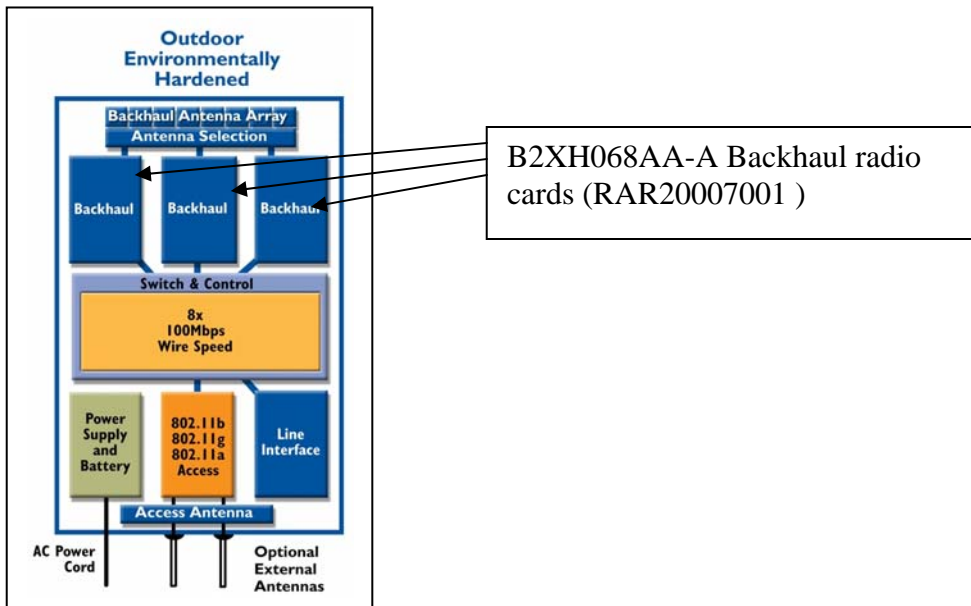


Fig. 13  
Typical configuration for a  
BA200

## Module Installation into a BA200 unit

The core of the BA200 unit is made up of two clam shells as shown in figure 14. The three B2XH068AA-A modules are installed below the SCM digital board.

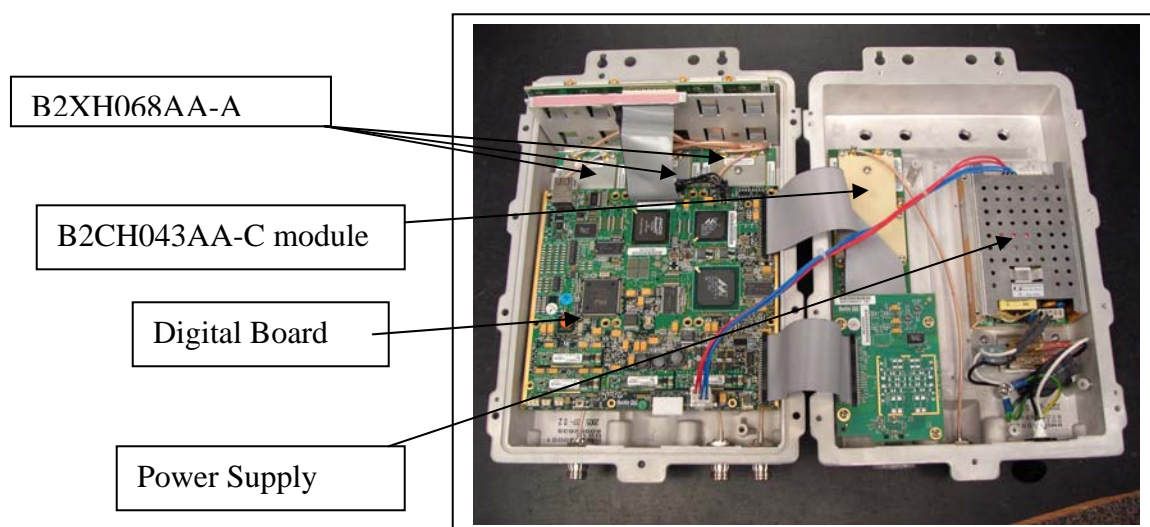


Fig. 14  
BA200 internal boards locations

## BA200 Unit FCC Labeling

One or more labels are applied to the during manufacture, including a label which identifies the FCC identification numbers. Refer to figure 15 for label location on BA200 product. Do not attempt to remove any labels from the module.

The following permanent label, or one containing equivalent information, must be affixed in a conspicuous location on the exterior of every product containing this module:

**FCC ID: RAR20007001**

BA200 FCC label  
Located on bottom of unit

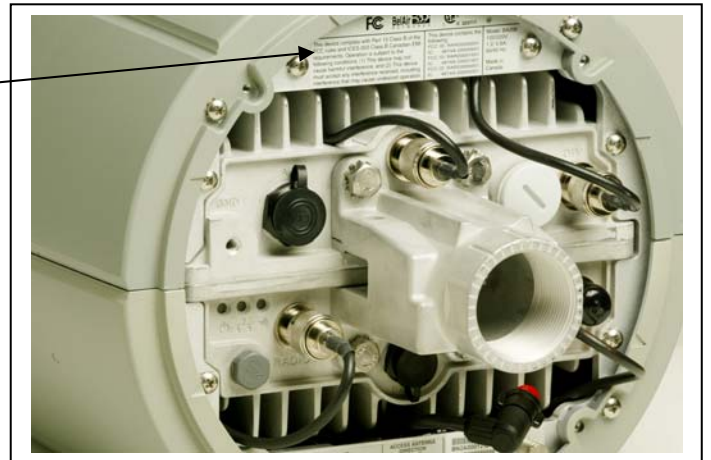


Fig. 15

## Antenna Usage and Module Transmit Power

B2XH068AA-A module shall only be used in conjunction with the following antenna types:

- MTI Wireless Edge MT-36012/SV 10 dBi patch antenna
- MTI Wireless Edge MT-36013/SV 10 dBi patch antenna
- MTI Wireless Edge MT-364002/A 16 dBi panel antenna

In order to comply with the FCC rules in the USA, the module is limited to the maximum transmit power limits as follows for each of the antenna types.

### Antenna Models and Maximum Allowable Power Setting

Table 1

Antenna Model	Manufacturer	Antenna Type	Maximum Transmit Power Setting
MT-36012/SV	MTI Wireless Edge	10 dBi patch antenna	+20 dBm (module maximum power)
MT-36013/SV	MTI Wireless Edge	10 dBi patch antenna	+20 dBm (module maximum power)
MT-364002/A	MTI Wireless Edge	16 dBi panel	+20 dBm (module maximum power)

**Warning:** Use of this module in conjunction with any antenna not expressly listed above will void authority to install or operate this equipment.

## **Installation**

Products which contain B2XH068AA-A shall only be installed by professional installers trained by BelAir Networks or its authorized agents. In addition to normal installation procedures and good installation practice, professional installers are responsible to ensure that:

1. Only an approved antenna (see above) is connected to the module, and,
2. The antenna is mounted in such a manner and in such a location that access to the antenna by the general population is minimized. Access during normal operation to the antenna by the general population should be limited to distances as outlined in the Table 2 in the section on RF Exposure Statement.

Adherence to these rules by the professional installer is mandatory. See full installation procedures for the particular product for details.



## Regulatory Statements

The following regulatory notes apply to the product which contains module B2XH068AA-A (FCC ID: RAR20007001).

The following sections or equivalent information shall appear in the user-manual of the final product.

### Regulatory Information and Disclaimers

Installation and use of this device must be in strict accordance with the instructions included in the user documentation provided with the product. Any changes or modifications to this product not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

The manufacturer is not responsible for any interference to radio or television equipment caused by unauthorized modification of this device, or attachment of any antennas or equipment other than those specified by the manufacturer. The manufacturer or its authorized resellers or distributors will assume no liability for any damage or violation of government regulations arising from failing to comply with these guidelines.

### Manufacturer's FCC Conformity Statement

This device complies with Part 27 of the FCC Rules. This equipment has been tested and found to comply with the limits for a Class B digital device.

## RF Exposure Statement

This Wireless radio device has been evaluated under FCC Bulletin OET 65C and found to be compliant to the requirements set forth in CFR 47 Sections 2.1091, 2.1093, and part 27.52 addressing RF exposure from radio frequency devices.

This device complies with FCC RF radiation exposure limits for an uncontrolled environment. The radiated output power of this Wireless device is below the FCC radio frequency exposure limits. However, this device should still be installed and used in such a manner that the potential for human contact during normal operation is minimized. In order to comply with RF exposure limits, this equipment should be installed and operated at a minimum distance as per the following table between the radiator and a human body. Refer to Appendix A for detail information on approved antennas for the B2XH068AA-A (RAR20007001) module.

Table 2

<b>Minimum Safety Distance cm (inches)</b>		
<b>Node</b>	<b>16 dBi antenna or 10 dBi antenna</b>	<b>Radios</b>
BelAir100 BelAir100S BelAir100C	26 (10.5 inches)	2 x RAR20007001 or 1 RAR20000003 and 1 RAR20007001
BelAir200	36 (14.5 inches)	4 x RAR20007001 or 1 RAR20000003 and 3x RAR20007001

## Appendix A – Information on approved module antennas

Specification for antenna MT-362012/SV for mounting in a BA200 unit:

MTI PART NUMBER	MT –362012/SV	
REGULATORY COMPLIANCE	RoHS CE 0682	
<b>1. ELECTRICAL</b>		
FREQUENCY RANGE	2.5 – 2.7 GHz	
PEAK GAIN	9.5 dBi (min)	
GAIN @ ± 45°	6.5 dBi (min)	
PEAK GAIN VARIATION @ FREQUENCY BAND BETWEEN FOUR ANTENNAS	1.5 dB (max) ± 0.3 dB (max)	
VSWR	2.0 : 1 (max)	
3 dB BEAMWIDTH	AZIMUTH	75° ± 7°
	ELEVATION	40° ± 5°
ANTENNA ISOLATION	50 dB (min)	
POLARIZATION	Linear Vertical	
ELEVATION SIDELOBES LEVEL	- 17 dB (max)	@ - 90° to -45°
	- 13 dB (max)	@ + 45° to +90°
CROSS POLARIZATION	- 18 dB (max)	
F/B RATIO	- 17 dB (max)	
INPUT IMPEDANCE	50 Ohms	
INPUT POWER	2 Watts	

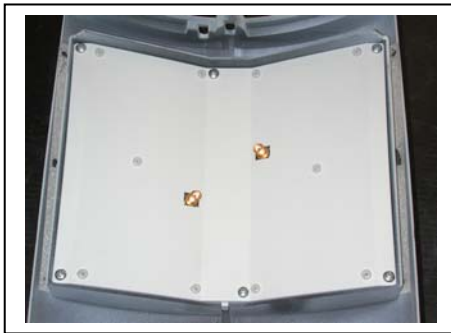


Photo of MTI patch antenna type MT-362012/SV mounted in one plastic external sector of the BA200 unit.

Specification for antenna MT-364002/A for mounting on a BA200/ BA100 unit:

<b>Specifications</b>	
<b>MTI PART NUMBER</b>	<b>MT – 364002/A</b>
<b>ELECTRICAL</b>	
FREQUENCY RANGE	2.5-2.7 GHz
GAIN	16 dBi
VSWR	1.5 : 1 (max)
3 dB BEAMWIDTH	20° (typ)
POLARIZATION	Linear (Vertical or Horizontal)
SIDELobe LEVEL	-13 dB (max)
CROSS POLARIZATION	-20 dB
F/B RATIO	-28 dB
INPUT IMPEDANCE	50 (ohm)
INPUT POWER	6W (max)
LIGHTNING PROTECTION	DC Grounded
<b>MECHANICAL</b>	
DIMENSIONS (LxWxD)	305x305X25mm (max)
WEIGHT	1.5 Kg (max)



Photo of MTI panel antenna type MT-364002/A

Specification for antenna MT-362013/SV for mounting outside a BA100 unit:

MTI PART NUMBER	MT –362013/SV	
REGULATORY COMPLIANCE	RoHS CE 0682	
<b>1. ELECTRICAL</b>		
FREQUENCY RANGE	2.5 – 2.7 GHz	
PEAK GAIN	10 dBi (min)	
GAIN @ ± 45°	6.5 dBi (min)	
PEAK GAIN VARIATION @ FREQUENCY BAND	1.5 dB (max)	
VSWR	2.0 : 1 (max) *	
3 dB BEAMWIDTH	AZIMUTH	80° ± 5°
	ELEVATION	40° ± 5°
POLARIZATION	Linear Vertical	
ELEVATION SIDELOBES LEVEL	- 17 dB (max)	@ - 90° to - 45°
	- 13 dB (max)	@ + 45° to +90°
CROSS POLARIZATION	- 18 dB (max)	
F/B RATIO	- 18 dB (max)	
INPUT IMPEDANCE	50 Ohms	
INPUT POWER	2 Watts	



Photo of MTI patch antenna type MT-362013/SV

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