

StarMAX™ 4100 Series Base Station

Installation Manual

Version 1.0



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Abbreviations & Definitions

Abbreviation	Description
ACB	ATCA carrier board
BS	Base Station
CLI	Command Line Interface
DC	Direct Current
GND	Ground
GPS	Global Positioning System
IDU	Indoor Unit
IF	Intermediate Frequency
IPMI	Intelligent Platform Management Interface
LED	Light Emitting Diode
LVDS	Low Voltage Data Signal
MPU	Main Processor Unit
NMS	Network Management System
ODU	Outdoor Unit
PLL	Phase Locked Loop
PMP	Point To Multipoint
PPS	Pulses Per Second
PS	Power Supply
RF	Radio Frequency
SELV	Safety Extra Low Voltage
SFP	Small Form-factor Pluggable
SNMP	Simple Network Management Protocol
SoC	System on Chip
SS	Subscriber Station
STC/MRC	Space Time Coding / Max. Ratio Combining
TDM	Time Division Multiplexing
TTL	Transistor-Transistor Logic
VEE	Virtual End-to-End

1 Preface

This book serves as the Installation Guide for the StarMAX™ 4100 Base Station, providing basic system overview, information about the installation procedure and safety guidelines.

Audience

This book will be useful for all professionals dealing with the installation of the StarMAX™ 4100 Series Base Stations.

Related Information

For more information, refer to the following:
StarMax™ 4110 User's Guide.

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1.1 Conventions

The following conventions are used in the document to help you identify special terms.

Convention	Usage	Example
Bold	Book titles and emphasis	Purpose
<i>Italic</i>	Description of figures and tables	<i>Product Codes</i>
<u>Bold-Underlined</u>	Emphasis	<u>Important!</u>
➤	Individual steps in the procedure	<ul style="list-style-type: none"> ➤ Attach the ODU assembly to the antenna mast ➤ Use the indicated bolts and washers/split washers
•	List of components	<ul style="list-style-type: none"> • IDU-ODU cable • Antenna • RF cable

2 Purpose

This manual provides basic information for installing the Telsima StarMAX™ 4100 Series Base Stations. It has been designed for qualified personnel responsible for installation of the StarMAX™ system. The installation requires that the qualified personnel holds appropriate technical training and experience and is aware of the potential hazards involved in the installation process.

3 General

3.1 Introducing StarMAX™ 4100 Series Base Station

StarMAX™ 4100 Series Base Station is a compact, 1U rack mount WiMAX Base Station. It is suitable for a whole range of deployments, for use in low density rural areas on one end and in highly populated urban areas on the other. The StarMAX™ 4100 Series Base Stations have a modular split indoor/outdoor (IDU/ODU) design for flexible, WiMAX compliant implementations in the licensed bands. StarMAX™ 4100 Series comprise the following products:

Product	Description
StarMAX 4110-3.3G	WiMAX Base Station, Single Sector, TDD, 3.3GHz, includes IDU & ODU
StarMAX 4120-3.3G	WiMAX Base Station, Dual Sector or Single Sector STC/MRC, TDD, 3.3GHz, includes IDU & ODU,
StarMAX 4110-3.5G	WiMAX Base Station, Single Sector, TDD, 3.5GHz, includes IDU & ODU, slot for GPS option card
StarMAX 4120-3.5G	WiMAX Base Station, Dual Sector or Single Sector STC/MRC, TDD, 3.5GHz, includes IDU & ODU
StarMAX 4110-2.6G	WiMAX Base Station, Single Sector, TDD, 2.6GHz, includes IDU & ODU
StarMAX 4120-2.6G	WiMAX Base Station, Dual Sector or Single Sector STC/MRC, TDD, 2.6GHz, includes IDU & ODU

Table 1: Product Codes

StarMAX™ 4100 Series modular hardware design is built around processor blade with 2 daughter boards, which support single WiMAX sector each or two of them together single sector STC/MRC. Daughter boards provide WiMAX functionality, while the processor subsystem provides features, which are not included in the WiMAX standard, such as advanced functionality of layer 2 and layer 3. The chassis is designed for installation in 19" and 21" rack. Alternatively, the chassis is also suitable for desktop operation.

3.2 Equipment Identification

Equipment of the StarMAX™ 4100 Series consists of the following elements:

- Indoor Unit IDU is the main processing unit. This unit contains an advanced network processor that implements the various control and networking protocols, required for the operation of the StarMAX™ 4100 Series system. The IDU has two slots that can be populated by Point-to-Multipoint (PMP) module. The PMP module contains a WiMAX System-on-a-Chip (SoC) that implements the 802.16-2004 standard based functionality. One PMP module supports one sector. Use of two PMP modules in one IDU provides either two sectors of WiMAX operation or one sector using advanced STC/MRC technology.
- Outdoor Unit ODU is a part of StarMAX™ 4100 Series system and takes care of converting the intermediate frequency (IF) signal from the Indoor Unit IDU to the desired transmit/receive frequencies, bandwidths and power levels. The StarMAX™ ODU is enclosed in a lightweight, rugged, weatherproof enclosure that allows peak performance in unprotected, extreme conditions. They are typically mounted in close proximity to the antennas.
- Antennas; sectorized high gain antennas, mounting kit and RF jumper coax cable for connectivity between the ODU and the antenna.
- IDU – ODU coax cable
- GPS device for synchronization purpose



Figure 1: Indoor Unit IDU StarMAX™ 4120 Dual Sector Base Station

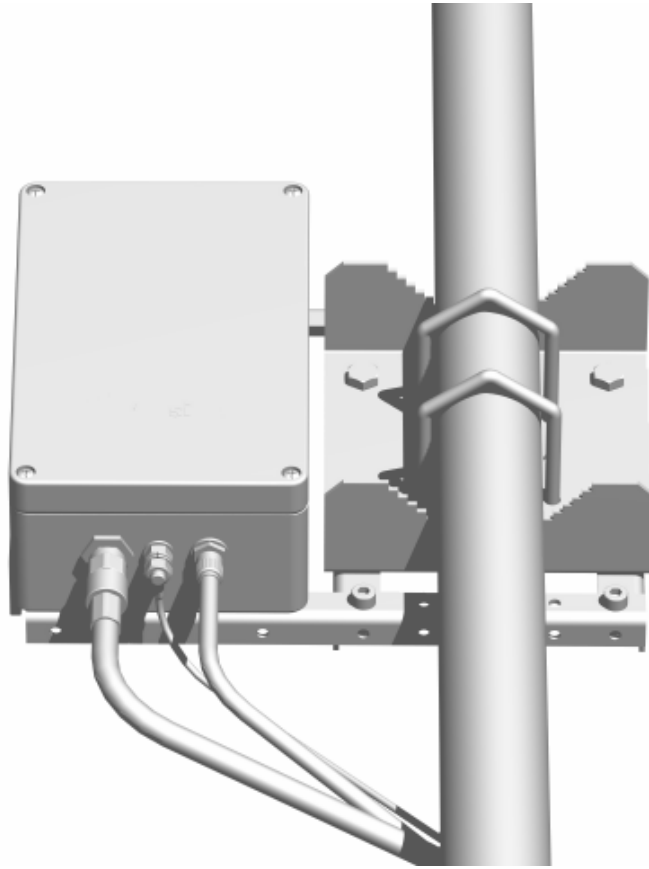


Figure 2: Outdoor Unit ODU for StarMAX™ 4100 Series BS

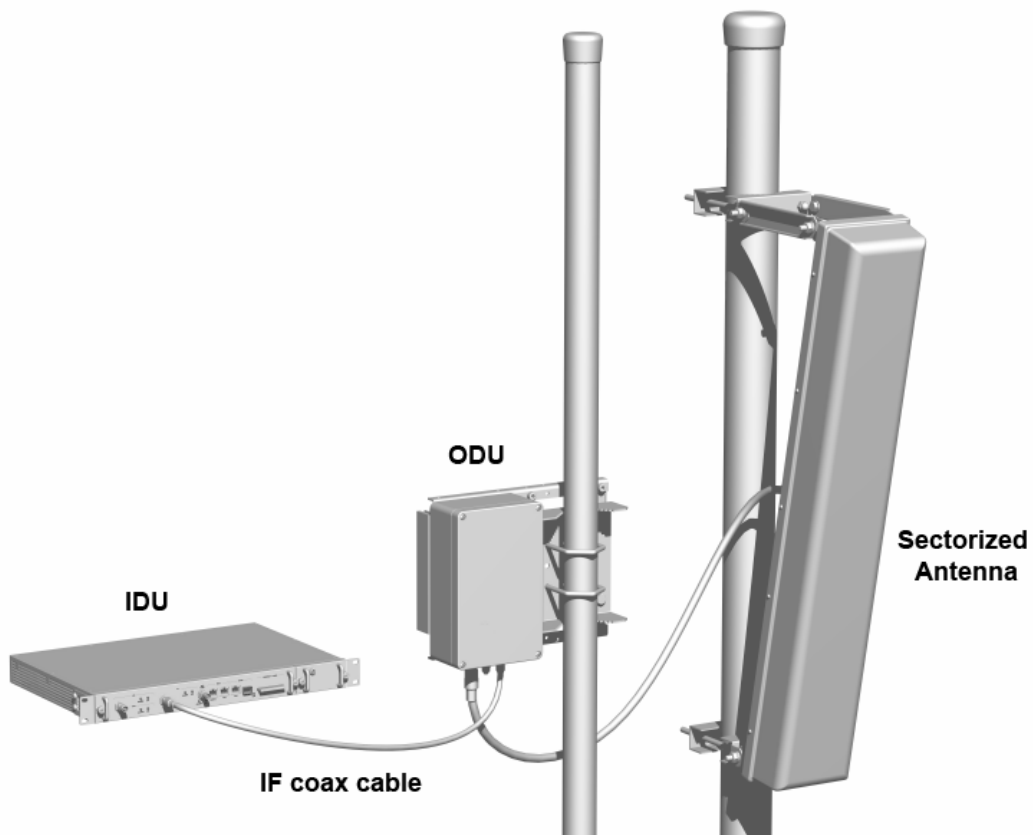


Figure 3: Basic connections between Base Station system elements

3.3 Unpacking

Each element is delivered in a package identified by a label with model type and serial number.

- **1 IDU package** contains Indoor Unit with Flash Memory Card, multiple serial access board, short Ethernet cable, serial cable for connecting computer to the serial port of the IDU.
- **1 ODU package** contains ODU with pole/mast mounting kit including two types of clamps: small ODU mounting clamp is suitable for antenna masts of 4-8 cm in diameter, large ODU mounting clamp is suitable for antenna masts of 9-12 cm in diameter.

3.4 Mechanical, Environmental and Electrical Specifications

	StarMAX 4110 & 4120 (IDU)	StarMAX 8100 (ODU)
Dimensions (H x W x D) [mm]	45 x 480 x 340	300 x 345 x 140
Weight [kg]	5,2	8,3

Table 2: Mechanical Specifications

	StarMAX 4110 & 4120 (IDU)	StarMAX 8100 (ODU)
Operating Temperature Range	-5°C ÷ +45°C	-50°C ÷ +55°C
Operating Humidity Range	5% ÷ 95%	5% ÷ 100%
EN 300 019 reference:	class 3.2	extended class 4.1E
Storage Temperature Range	-45°C ÷ +45°C	
Storage Humidity Range	8% ÷ 100%	
EN 300 019 reference:	class 1.3E	
Transportation:	EN 300 019 class 2.3	

Table 3: Environmental Specifications

	StarMAX 4110 & 4120 (IDU)	StarMAX 8100 (ODU)
Power Supply Voltage	-48V ÷ -60V	-
Power Supply Voltage Tolerance	+20% / -20%	-
Power Consumption, max.	StarMax 4110 – 47W StarMax 4120 – 61W	41W

Table 4: Electrical Specifications

3.5 Safety measures

3.5.1 General

3.5.1.1 Indoor unit

Wireless equipment for indoor use must be installed by properly trained and qualified personnel and must always adhere to local and national codes for grounding of electrical equipment and other safety measures. The Indoor equipment must be connected to a -48V DC SELV (Safety Extra Low Voltage).

3.5.1.2 Outdoor unit(s)

Wireless equipment for outdoor use (Outdoor Units and antennas) must be installed by experienced installation personnel, familiar with the local building and safety regulations and, if applicable, licensed by the appropriate governmental regulatory agencies.

Any deviation from the requirements mentioned above may result in voiding of the StarMAX™ Series product warranty and may expose the end user or Service Provider to legal and financial liabilities. Neither Telsima nor its partners will be held liable for injury, damage or regulation violations, associated with improper use or installation of StarMAX™ Series equipment.

3.5.2 Special safety measures

- Prior to installation, users must read this StarMAX™ 4100 Series Base Station Installation Guide and familiarize themselves with proper installation procedures. To ensure proper installation, all operating and safety instructions should be followed as mentioned in the paragraph 3.5.1.
- The Indoor Unit should be installed in temperature controlled locations, although partly temperature controlled locations can be used too. Avoid placing the equipment near heat radiating elements, close to the openings to the open-air climate, to locations where water droplets can fall on the housing and in close proximity of the dust sources.
- The Indoor Unit must be placed on a stable horizontal surface or mounted in a 19" or 21" rack.
- The Outdoor Units must not be located near power lines or other electrical power circuits.
- The Outdoor Unit must be properly grounded to be protected against power surges and accumulated static electricity. User should always install this device in accordance with the local electrical safety codes. Correct installation procedures should be implemented for grounding the Outdoor Unit.

- The antenna must be free of all fixed or moving obstacles within the antenna's vertical and horizontal radiating pattern. The support infrastructure must be sturdy to withstand harsh weather conditions such as wind, frost, etc..
- Installation of the antenna and Outdoor Unit must be performed by qualified personnel.

3.5.3 Lightning Protection

Outdoor microwave equipment is susceptible to electrostatic discharges, such as indirect lightning strike. In spite of the fact that the ODU has quality internal over-voltage protection, it is recommended to install external lightning protection when the ODU is installed in locations with high probability of lightning. In order to minimize equipment damage, service outages and serious injuries, it is essential to install the lightning protection and grounding according to the local and national electrical safety codes.

Electrostatic discharge induced damage may occur due to:

- Improper grounding of towers/antenna/cables masts.
- Absence of or improper installation of the lightning protection systems.

When the Base Station equipment is to be installed in locations with high probability of lightning, we recommend the following safety measures:

- Outdoor unit and the lightning arrestor (optional) must be grounded directly to the same grounding point at the tower.
- IDU-ODU cable must be properly installed and grounded.
- IDU-ODU cable must be grounded at the point where the cable leaves the tower or at any other location away from the main tower construction where the cable is sharply bent.
- Install lightning arrestor on the IDU-ODU cable at the entry point to the building (on the external side). The building cable entry point must be properly grounded to the common ground system of the building and the antenna tower.
- The ground connection on the back side of the IDU must be properly connected to the common electrical grounding terminal of the building.

4 Installation Procedure

4.1 General Installation Guidelines

Ensure that Outdoor Units, antennas and supporting structures are properly installed to eliminate any physical hazard to either people or property. Make sure that the installation of the Outdoor Unit, antenna and cables is performed in accordance with all relevant national and local building and safety codes. Even where grounding is not mandatory according to applicable regulation and national codes, it is highly recommended to ensure that the Outdoor Unit and the antenna mast are grounded and suitable lightning protection devices are used so as to provide protection against the voltage surges and static charges.

4.2 IDU installation

This section presents the installation of the StarMAX™ 4100 Series Base Station IDU. Indoor unit installation comprises mounting of the IDU, grounding of the IDU, connecting of the IF cable and connecting of the power (GPS if applicable). The indoor equipment should be installed as close as possible to the location where IF cable(s) enters the building. The location of the indoor equipment should take into account its connection to the power source(s) and to the Base Station networking equipment.

4.2.1 IDU Structure

IDU unit consists of:

- IDU Chassis
- MPU (ATCA form factor)
- 19" or 21" rack
- One or Two PMP units
- Fan Tray

IDU chassis is designed for installation in 19" or 21" rack. Alternatively the chassis is also suitable for desktop operation. Base Station IDU is designed for indoor installation with controlled climate. The chassis has two independent external DC power sources. The power consumption of the fully loaded IDU does not exceed 61W. StarMAX™ 4100 Series chassis has redundant cooling fans and a removable fan tray. The fan tray is hot swappable. The Base Station may operate without the fan tray for a period of time (depends on the current load and ambient temperature, typically for 5 minutes), sufficient for the fan tray replacement.

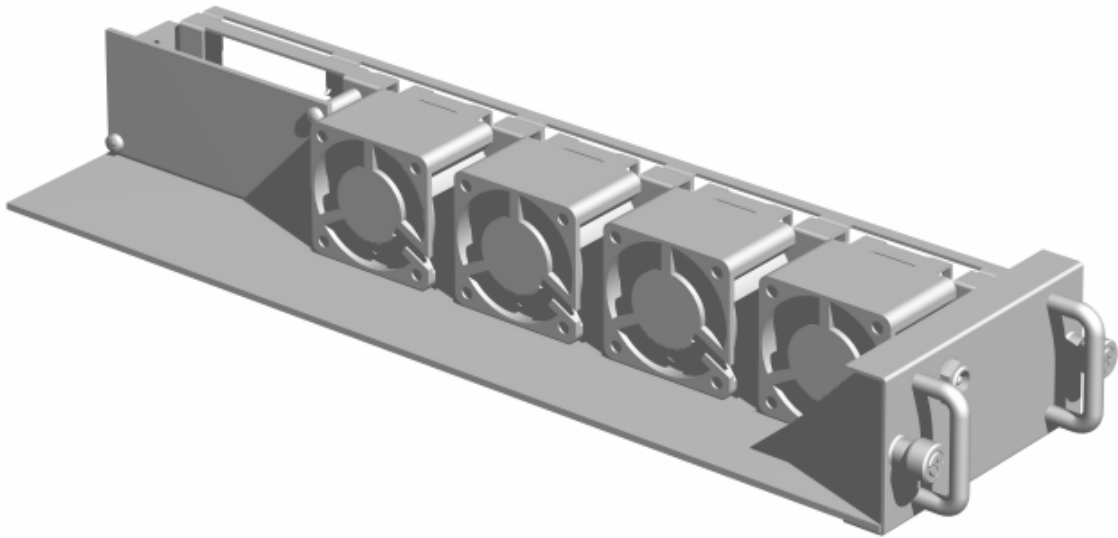


Figure 4: Fan Tray Unit

4.2.2 IDU Connections and Settings

4.2.2.1 External interfaces

StarMAX™ 4100 IDU external interfaces are provided on the front and on the back side of the IDU enclosure.

On the **front side** there are (see **Figure 5**, interfaces from the left to the right):

- Two IF interfaces (TNC) for connection with the StarMAX™ 8100 Series ODU (point to multipoint ODU)
- One GPS interface (BNC) for connecting GPS receivers, which may be used to provide clocking for the Base Station or cluster of Base Stations and PPS synchronization
- Two management interfaces (RJ-45) - one 10/100 Base T Ethernet for NMS and one serial port for the local management).
- Two network interfaces, optical Gigabit Ethernet interface (with optional pluggable SFP transceiver) and 10/100 Base T interface (RJ 45).
- Compact FLASH

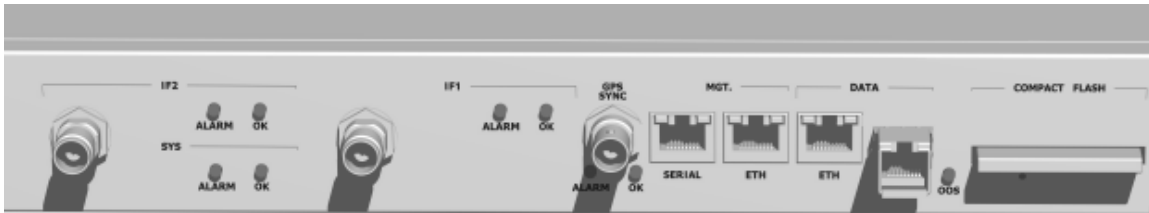


Figure 5: IDU front side interfaces

On the **back side** there are (see **Figure 6** from the left to the right):

- Grounding terminal for grounding of the chassis
- Power supply terminals, which allow connection of two independent DC sources
- Two 10/100 Base T Ethernet connectors (RJ-45) – reserved.
- Synchronization interface for internal clock supply (Base Station clustering).
- Removable panel for connecting 8xE1/T1 signals (DSUB-37), which may be used for legacy applications (transport of TDM traffic over IP and vice versa).



Figure 6: IDU back side interfaces

4.2.2.1.1 Serial Console interface

There is one serial console interface available on a single RJ-45 connector on the front panel of the IDU. Via serial console interface various functions of the IDU can be controlled by the CLI (Command Line Interface).

4.2.2.1.2 Ethernet interfaces

There are two fast Ethernet interfaces available on the front panel of the IDU designed for connection of the IDU to the network. In case of “out-of-band operation” one Fast Ethernet port is used for Management traffic and another one for Data traffic. In case of “in-band operation” “data port” is used for both – Management and Data traffic. All Ethernet interfaces support auto crossover. LED diodes on the Ethernet connectors are indicating physical activity.

LED	Function
yellow	On: 100 Mbs
	Off: 10 Mbs
green	On: Link
	Blinking: Activity

Table 5: Ethernet interface LED signaling

On the front panel there is also one Gigabit Ethernet interface, provided through SFP module. Desired physical interface can be chosen through dedicated SFP module (electrical or optical). User shall be aware that 1000BaseT SFP module can operate just with GBE speed. Connection to the equipment with 100BaseT is not possible.

4.2.2.1.3 Synchronization interfaces

On the front panel of the IDU there is a BNC connector designed for connecting an external 1PPS synchronization source. This could be dedicated synchronization equipment or simple GPS receiver with 1PPS output. When simple GPS receiver is used it could be powered from 12V power supply, available on the Fan Tray front. Input signal level shall be TTL compliant.

On the back side of the IDU there is a synchronization interface which provides synchronization with other stacked IDUs. There are two bidirectional synchronization LVDS pairs, 1Hz (1PPS) reference signal for the Base Station synchronization and 8.192 MHz reference signal for TDM synchronization.

4.2.2.1.4 E1/T1 interface (optional)

All eight E1/T1 interfaces are available on a single DSUB-37 connector on the back side of the IDU enclosure.

4.2.3 Power Requirements

Unit	Details
Power Source	-48V to -60V DC +20% / -10%
IDU consumption	61W max, not including ODU
ODU consumption	41W max, one ODU

Table 6: Power Requirements, Base Station Equipment

Note!

In order to protect the system the following fuses should be used:

- main power supply A: fuses LITTLEFUSE 154 004T (for -48V) and LITTLEFUSE 154 005T (for +48V GND);
- main power supply B: fuses LITTLEFUSE 154 004T (for -48V) and LITTLEFUSE 154 005T (for +48V GND);
- early power supply: fuses LITTLEFUSE 154 004T (for -48V and +48V GND).

4.2.4 IDU Mounting

The StarMAX™ 4100 Series Base Station IDU is suitable for 19" or 21" rack mounting. For this purpose special mounting tabs are supplied with the IDU unit as a part of the IDU installation kit. Alternatively IDU can be placed on the shelf inside a 19" or 21" cabinet. Ventilation openings on the right hand side of the IDU should not be covered i.e. airflow should not be obstructed in any way.

Steps:

- insert 4 captive nuts in the correct position on the rack or cabinet
- insert the chassis into the rack or cabinet
- with 4 M6x16 screws tighten the IDU

4.2.5 Connecting the Cables

4.2.5.1 Grounding

The StarMAX™ 4100 Base Station IDU should be properly grounded. For this purpose, a special grounding terminal is provided at the back of the unit. Grounding of the IDU should be compliant with the local and national safety codes for connecting of the electrical equipment. To properly ground the IDU, attach the grounding cable with the grounding screw to the grounding terminal on one side and to the rack or building ground on the other side.

4.2.5.2 DC Power connection

The StarMAX™ 4100 Series Base Station IDU is equipped with dual DC power feeds. One DC power source is sufficient to provide the powering of the entire unit, the other power feed is provided for redundancy purposes.

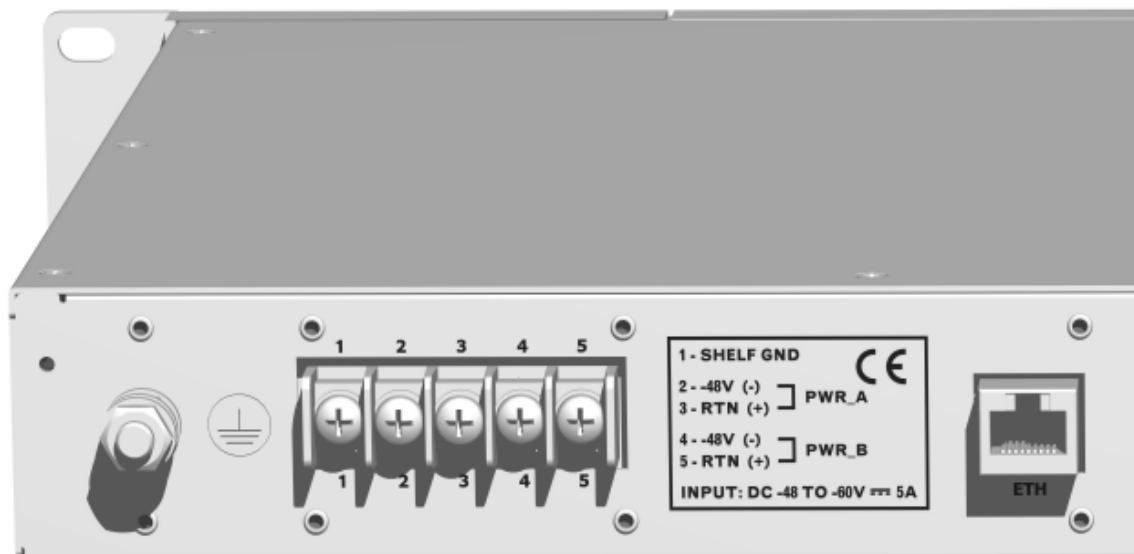


Figure 7: Back panel DC power connections

	Label	Description
1	SHELF GND	DC power cable shield (or DC cable 3rd wire connected to the power supply grounding point)
2	VEE 48A	primary power supply input, input A; -48V (negative)
3	VRTNA GND	primary power supply input, input A; 0V
4	VEE 48B	secondary power supply input, input B; -48V (negative)
5	VRTNB GND	secondary power supply input, input B; 0V

Table 7: DC Power input pinout

In case of only one DC power supply, input A as a primary DC power input should be used.

4.2.5.3 Connecting of the Management System

StarMAX™ 4100 Series have one port assigned to Management Port. On that port remote configuration can be performed using telnet access, ftp server capabilities for software upgrade, SNMP. Connect that port to a network element as per Network setup plan.

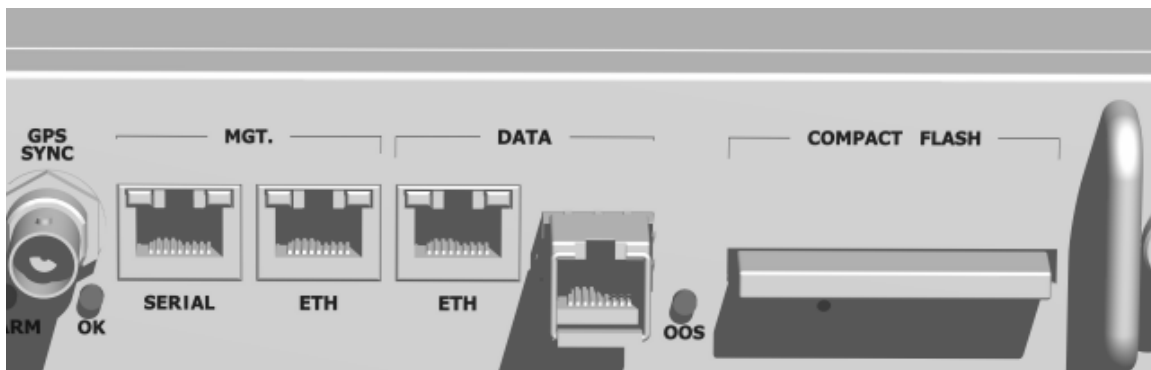


Figure 8: GPS, Management Ports, Data Ports, Compact Flash Memory Card

4.2.5.4 Connecting of the PC Console to the Serial Port

StarMAX™ 4100 Series have one port assigned to Serial Access Port. On that port local configuration can be performed using RS-232 protocol via console.

IDU package comprises also a multiple serial access board, short Ethernet cable and a serial cable for connecting the computer to the Serial Port of the IDU or multiple serial board. With multiple serial access it is possible to connect to the main board command line console, IPMI and both Point-to-Multipoint units (only one at a time, switchable on the main board command line console).

Please refer to the StarMAX™ Base Station User's Guide for further details.

4.2.5.5 Connecting of the Data Port

StarMAX™ 4100 Series have two ports assigned to Data Ports. One is electrical 100Mbps Ethernet port and the other is Optical 1Giga Ethernet (see **Figure 7**). Connect one of those ports to a network element as per Network setup plan.

4.2.5.6 Connecting of the IDU-ODU cables to the IF Interface Ports

The IDU-ODU cable has to be terminated by TNC male connector on both ends. It is recommended that IDU side connector is the right-angle version. At the IDU, connect one IF cable to the Point-to-Multipoint port 1, marked as IF1 i.e. interface 1 (see **Figure 8**), and the other IF cable to the Point-to-Multipoint port 2, marked as IF2 i.e. interface 2 (see **Figure 8**).

In case of only one ODU (one sector) on site only one IF cable can be connected to the PMP interface.

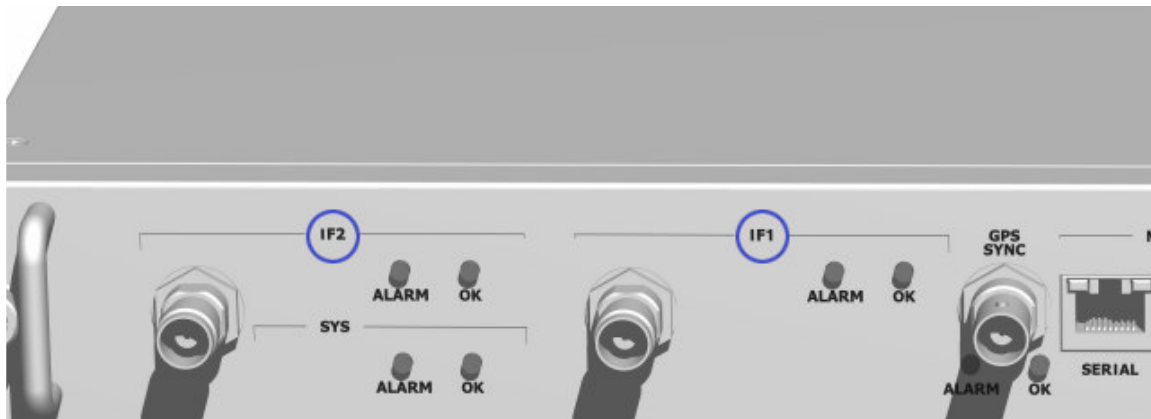


Figure 9: PMP interfaces (IF2, IF1)

4.2.5.7 Inserting a Compact Flash Memory Card

StarMAX™ 4100 Series has one slot assigned to an external memory compact flash card. This card has to be present at the IDU in case that IDU is configured to boot and load from the compact flash card. On the compact flash card configuration data, current software version and old software versions for the software rollback are stored.

Before powering up the StarMAX™ system, card has to be inserted into the empty slot (see **Figure 7**).

4.3 ODU Installation

This section presents the installation of the StarMAX™ 8100 Series Base Station Outdoor Unit. ODU installation comprises mounting of the ODU, grounding of the ODU, connecting of the IDU-ODU and RF cables and installing of the optional lightning arrester.

ODU installation consists of the following tasks:

- ODU mechanical mounting
- Connection of the ODU and the antenna
- Installation of the IF lightning arrestors (optional)
- Connection of the IDU-ODU cable to the ODU

4.3.1 ODU Packing List

Any of the following:

- StarMAX™ 8100-3.3G, StarMAX™ 8100-3.5G, StarMAX™ 8100-2.6G
- Pole mounting Kit

4.3.2 Additional Installation Requirements

The following items are also required for ODU installation:

- IDU-ODU cable
- Antenna
- RF cable for connecting the antenna to the ODU
- Grounding cable with the appropriate termination

4.3.3 Guidelines for positioning of the ODU

- The ODU can be pole mounted.
- It should be easily accessible for installation
- Higher placement of the antenna enables better link quality.
- Antenna should be installed in such a way that it provides coverage to all of the Subscriber Units within its service area.

4.3.4 ODU mechanical mounting

The ODU is suitable for pole/mast mounting. ODU mounting clamps support two diameters of antenna masts:

- ODU mounting clamp type 1 is suitable for antenna masts with diameters 4-8 cm.
- ODU mounting clamp type 2 is suitable for antenna masts with diameters 9-12 cm.
- ODU mechanical parts are preassembled for mounting with the clamp type 1

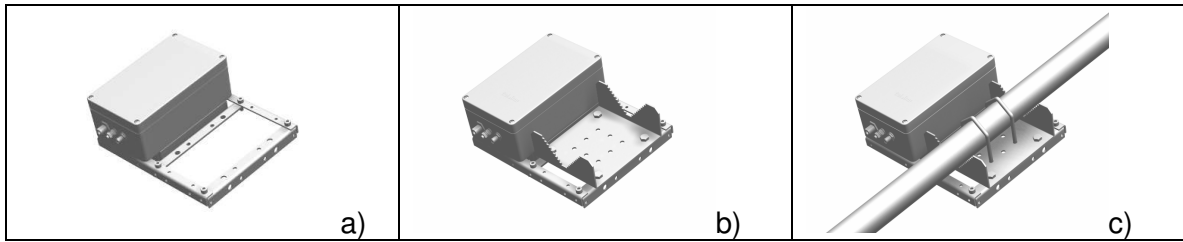


Figure 10: ODU mounting (clamp type 1)

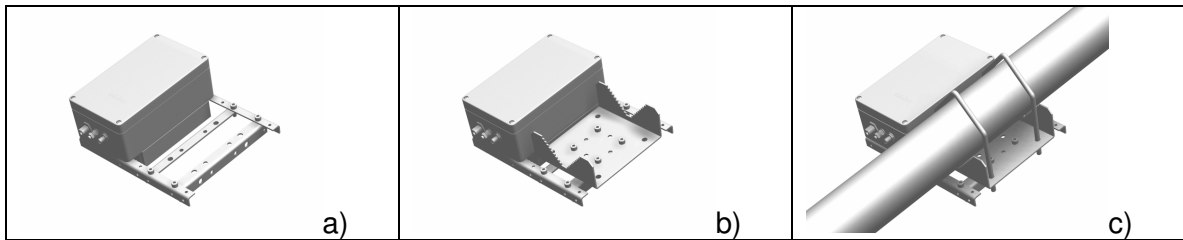


Figure 11: ODU mounting (clamp type 2)

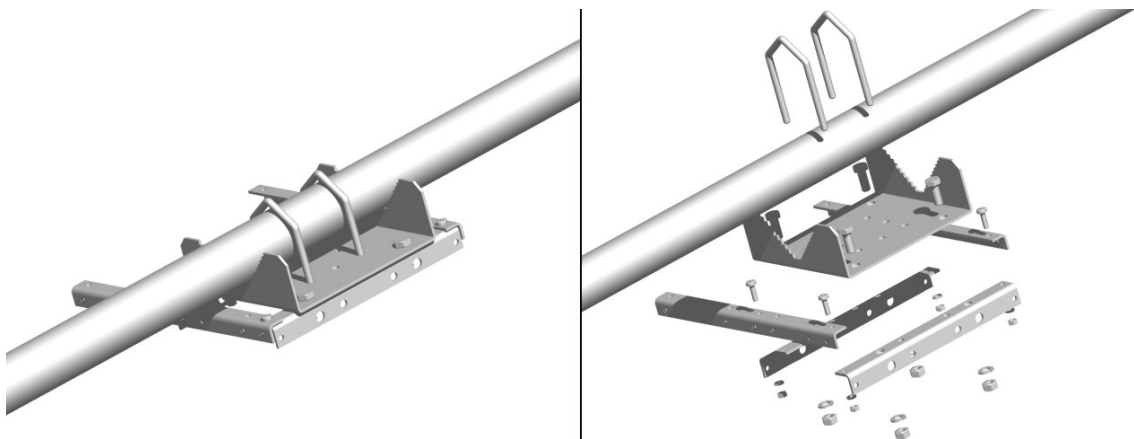


Figure 12: Mounting the ODU on the pole using the clamps

4.3.4.1 Mounting Procedure:

- Attach the ODU assembly to the antenna mast.
- Use all of the indicated bolts and washers/split washers.
- Insert two U type clamps to the ODU assembly to hold the pole, tighten all 4 nuts so that the ODU cannot be moved in any direction. The position of the ODU is correct, when both connectors are facing downwards. The position of the cooling body of the ODU can be oriented in any direction.

- Place the ODU near the antenna connector, in order to ease the installation make the clamp bolts easily accessible.
- Protective solar shield can be mounted on the top of the ODU to protect the unit from the solar radiation (optional).

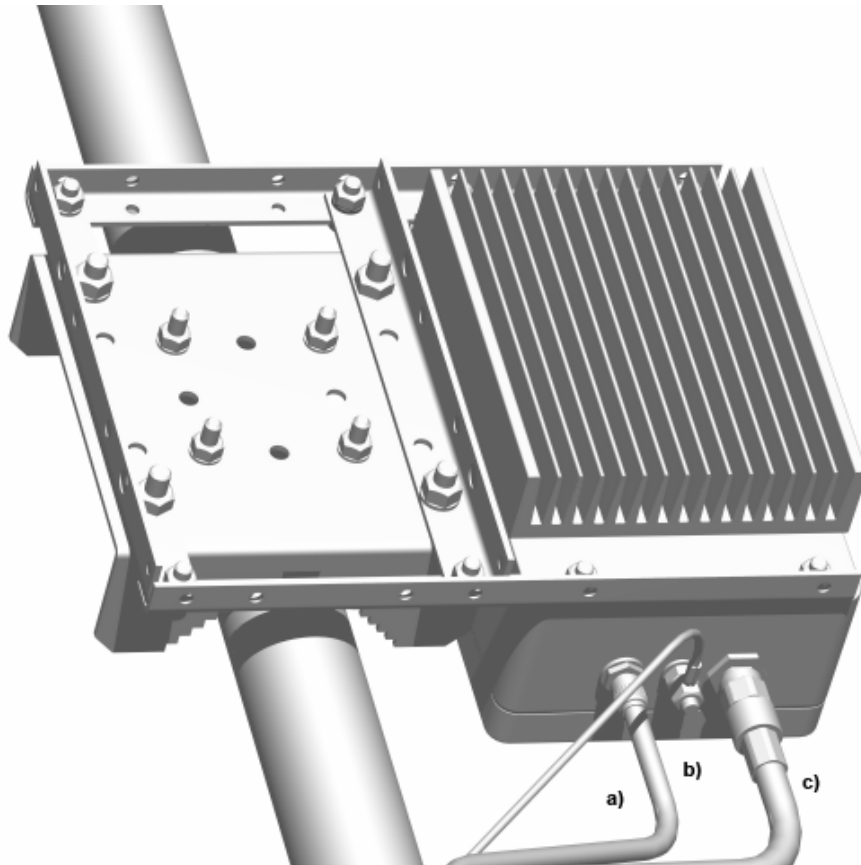


Figure 13: Back view of the ODU:
a) antenna cable, b) grounding cable, c) IDU cable

4.3.5 Connecting the Cables

- Connect the RF cable between the ODU assembly and the Base Station antenna. RF cable uses N type male connectors on both ends.
- Perform correct ODU grounding. Use at least 16 mm² grounding cable and connect one end point to the ODU grounding screw, and the other end to the nearest grounding point.
- Connect the IDU-ODU cable to the ODU. The StarMAX™ 4100 Series Base Station uses TNC type male connectors on both sides.



- Properly weatherproof all connections which are subjected to the environmental influences. We recommend the use of the sealing tapes, designed for an outdoor use. Qualified personnel may also use their own weatherproofing procedures and materials. Silicon-based sealants must not be used, because they are difficult to remove.
- The coaxial IDU-ODU cable shield should be grounded at the entry point of the building. The coaxial shield should also be grounded to the tower ground terminal at the base of the mast/tower. Never do a bonding on the cable curves or on a point where the cable bends. Appropriate grounding kits should be used for grounding of the coaxial shield to the grounding point.
- Only the shield of the IF cable should be grounded. There is DC current flowing in the central conductor and any connection to the central conductor will interfere with the DC current and cause equipment malfunction.

IDU-ODU cable may be ordered separately. Maximum permitted attenuation, introduced by the cable is 15 dB at 500 MHz; this table limits the length of the IF cable. The cable should be well shielded, ensuring isolation of more than 80 dB at 500 MHz. Telsima recommends the use of the following cables:

Manufacturer	Cable type	Cable loss (dB/100 m @450 MHz)	Maximal cable length (m)
Belden	RG 214	13.5	100
TMS	LMR 400	8	150
Belden	RG8	Type dependent	Type dependent

Table 8: Recommended Cables

Important!

- It is very important to ensure that all connectors are correctly tightened and weatherproofed.
- Direct grounding connection should be provided from the lightning protector and the StarMAX™ ODU to the grounding point on the tower.
- All the grounding connections should provide low impedance.
- ODU temperature range is -50 °C to + 55 °C .

4.3.6 ODU: Connectors

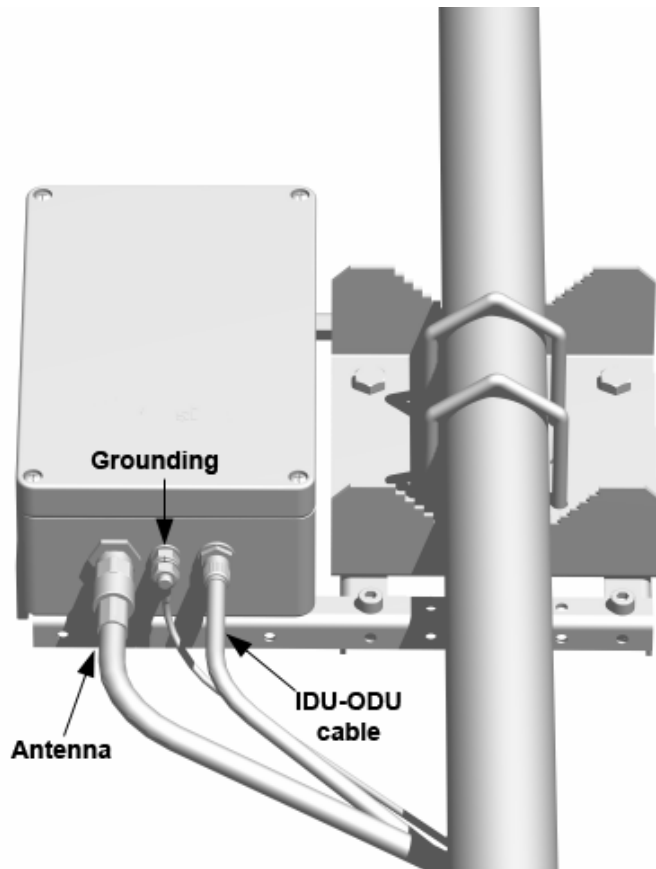


Figure 14: Bottom Panel of the ODU

Name	Description	Functionality
N	Coax connector, type N(f)	Antenna port
TNC	Coax connector, type TNC(f)	IDU/ODU port
GND	Grounding bolt, M 8	Grounding of ODU

Table 9: ODU connectors

4.4 IDU-ODU Connection

ODU is connected to the IDU via IDU-ODU coaxial cable, carrying both signals and power. The maximum permitted attenuation of the IF cable at applicable frequencies, its screening effectiveness and its maximum permitted DC resistance (the sum of DC resistance of the inner and the outer conductors) are provided in the **Table 11**. On both ends of the IDU-ODU cable there must be a TNC male connector installed. It is recommended to use right-angle variant of the TNC connector at the IDU side. At the

ODU endpoint additional weather sealing should be done in order to protect the connector against the water, humidity and dust.

Note!

After the installation of the cable check for short circuit conditions between the inner and the outer conductor.

IF Cable Specifications	
Max. Insertion Loss at 500 MHz	15 dB
Min. Isolation at 500 MHz	80 dB
Min. Return Loss at 500 MHz	18 dB
Max. DC Resistance	5 Ohm

Table 10: IF cable specifications

4.5 Base Station antenna installation

- Unpack the pole mounting antenna kit and follow the instructions given by the manufacturer of the antenna.

Important!

If the RF (Radio Frequency) planner requires mechanical antenna down tilting, make sure that the tilt part of the kit is on the top position of the antenna.
 If antenna up tilt is required, the tilt part should be installed at the bottom position of the antenna.

Proper tilting can be done using special antenna tilt tool.

With sectorized Base Station antennas the radiating direction is important. Make sure that the antenna azimuth is correct (RF planner).

The antenna must be free of all fixed or moving obstacles within the antenna's vertical and horizontal radiating pattern. The supporting infrastructure must be sturdy to withstand harsh weather conditions.



Figure 15: Sectorized antenna mounted on a pole with tilt mounting kit

4.6 GPS unit installation (optional)

GPS unit is required for the synchronization of the TDD radio network. With the Time Division Duplex TDD operation each sector should transmit and receive at the same time, to avoid intra-cell and inter-cell interference.

The GPS unit must be installed outdoors. The receiver's antenna should be installed somewhere on the supporting structure without any obstructions on the way to the open sky.

Procedure:

- Mount the GPS receiver on the top of the building in such a way, that there are no obstructions between the GPS unit and the open sky.
- Connect the cable provided with the GPS receiver to the GPS unit.
- Make sure that the weatherproof cable is in the proper position.
- Guide the cable from the GPS receiver on the top of the building to the Base Station IDU installation point.

- Tighten the cable all the way from the GPS.
- Connect the other end of the GPS cable with the RJ-45 connector to the:
 - a) (versions 010-040) GPS cable adapter (see **Figure 15**)
 - Connect the BNC connector of the cable adapter and the GPS synch port on the front panel of the IDU with a BNC to BNC coaxial cable.
 - Connect the DC power jack cable to the GPS cable adapter and to the connector installed on the front panel of the Fan Tray Unit (GPS Power Supply -12V, see **Figure 16**).
 - b) (versions 050 and higher) RJ-45 connector on the IDU (see **Figure 17**).

RJ-45: pinout:	1	2	3	4	5	6	7	8
Function	Tx	Rx	PPS signal TTL	NC	+12V	NC	GND	GND

Table 11: RJ-45 pinout (versions 050 and higher)

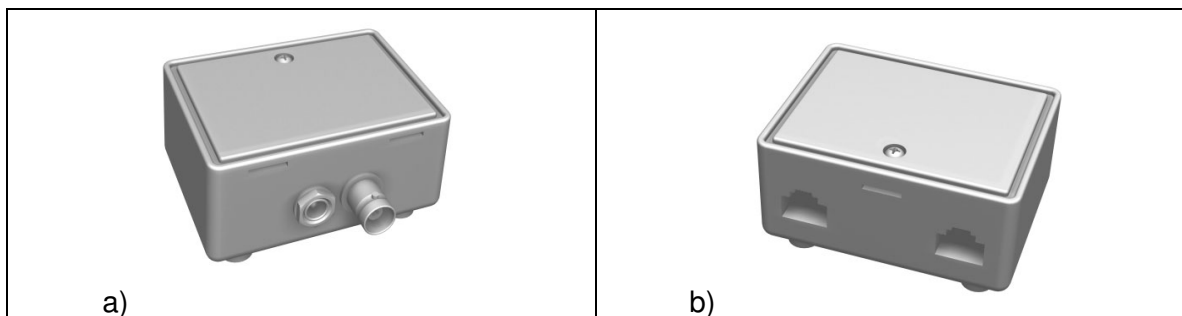


Figure 16: Cable Adapter (a) front, b) back)

In case of GPS use the operator should refer to “User’s Guide” How to configure the synchronization source.

If several IDUs are used simultaneously they can be synchronized by GPS on a “master/slave” principle, where one IDU has a master role and all the other units are “slave units”, controlled by the master unit and connected among themselves with cables in the Synch Ports on the back panels of the IDUs.

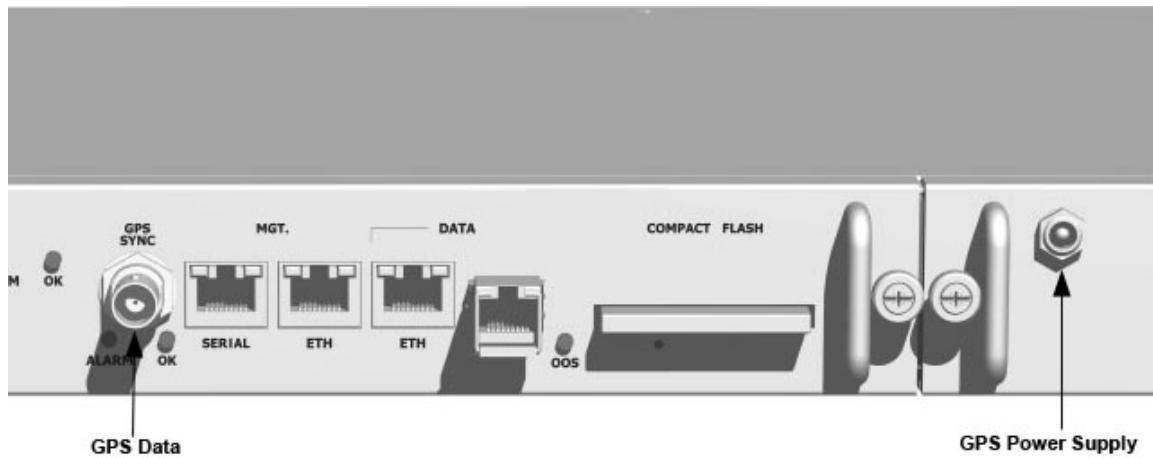


Figure 17: GPS Interface-BNC (versions 010-040)

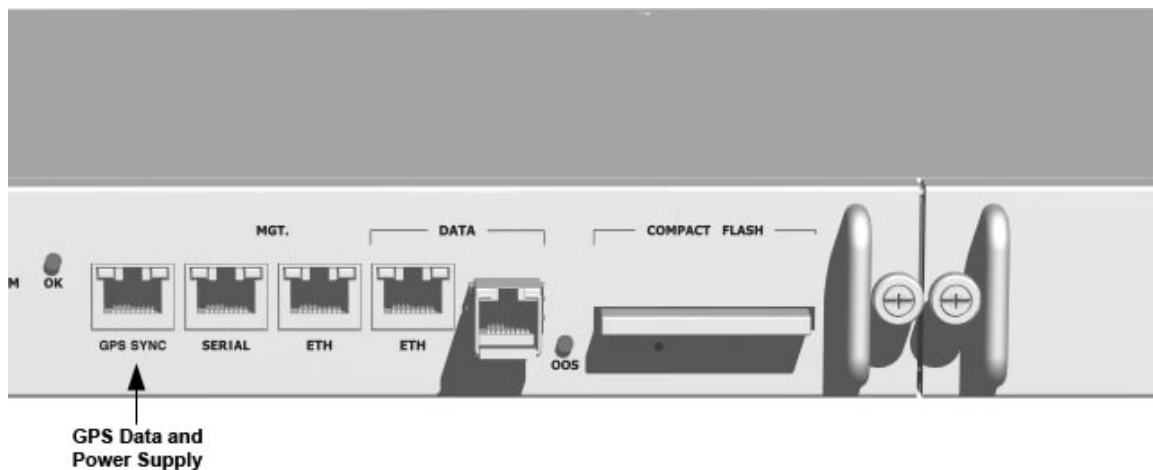


Figure 18: GPS interface-RJ45 (versions 050 and higher)

5 Power-on the Base Station

5.1 Checklist

Before connecting the Base Station to the power source make sure that:

- DC fuse has the proper value (5 Amp fast);
- coaxial cables are connected to the PMP connectors and the ODU units are connected to the coaxial cables;
- RF jumper cable from the ODU to the antenna is connected tightly on both connectors;
- there is no short circuit present at the IDU-ODU coaxial cable (check with the instrument);
- the DC input wires are correctly connected to the IDU (check with the instrument);
- the main board slide unit is fully inside the BS chassis and the bolts are tightened;
- the flash memory card is inserted in the BS.

When powering up the system, most of the LEDs are ON for a few seconds. In case of the system failure, blue LED is ON.

Make sure that the fan tray is operational and the airflow on the left side of the IDU is present.

Note!

Powering up the ODU without antenna connected to the ODU might damage the ODU unit!

6 Maintenance

6.1 Maintenance of the Base Station

Maintenance of the Base Station is limited to cleaning of the dust filter of the Fan Tray Unit (see **Figure 4**) at least once per month. The Unit is hot swappable that means that the Base Station can operate without the Fan Tray Unit for at least 5 minutes without overheating. The best way to clean the filter is to wash it with water or clean it by air flow. In case that the filter is extremely dirty we can provide you with a spare one.

Note!

Dirty filter could diminish cooling capacity of the Fan Tray Unit and cause overheating of the Base Station in particular the PMP board.

Outdoor Unit and antenna don't require any special maintenance.

7 Appendix

The following table describes the meanings of the various LED signals on the front panel of the IDU.

Type	Label	Color	Description
SYS	OOS	BLUE	<ul style="list-style-type: none"> • Illuminates, when 48V is applied to the system and power is not provided to the system side.
SYS	ALARM	RED	<ul style="list-style-type: none"> • Unlighted: The BS is functional • Blinking: The BS has wrong configuration/not configured • Solid: The BS has a permanent fault (broken).
SYS	OK	GREEN	<ul style="list-style-type: none"> • Unlighted: The BS image is not running. • Blinking: The BS is running a self-test. • Solid: The BS is functional
IF	ALARM	RED	<ul style="list-style-type: none"> • Unlighted: The PMP is functional • Blinking: The PMP has wrong configuration/not configured • Solid: The PMP has a permanent fault (broken).
IF	OK	GREEN	<ul style="list-style-type: none"> • Unlighted: The PMP image is not running. • Blinking: The PMP is running a self-test. • Solid: The PMP is functional
SYNC	ALARM	RED	<ul style="list-style-type: none"> • Unlighted: PPS signal present • Lighted: no PPS signal present
SYNC	OK	GREEN	<ul style="list-style-type: none"> • Unlighted: PLL not locked to the PPS • Lighted: PLL locked to the PPS
SERIAL	SERIAL	YELLOW	<ul style="list-style-type: none"> • OFF: uart on PMP-1 is selected • ON: uart on PMP-2 is selected
SERIAL	SERIAL	GREEN	<ul style="list-style-type: none"> • OFF: ODU IMPI uart (on the selected PMP) • ON: Sequans PMP console (on the selected PMP)

Table 12: IDU LEDs