Libra MAX-58 User Guide

Version: 1.0.8
Released: January 2010
Item Number: 5722-0048

This guide is used for the following products;
Libra MAX-HD Chassis Base Station
Libra MAX-LT 5800 – 5.8 GHz ODU Base Station
Libra MAX-RBS 5800 – 5.8 GHz Rapid Backhaul System
Libra MAX-LT-IND 5800 – 5.8 GHz ODU Base Station, India Only Variant
Libra MAX-RBS-IND 5800 – 5.8 GHz Rapid Backhaul System, India Only Variant

Copyright Notice

1.1 Copyright

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Preface

1.2 Regulatory Notice

The specifications and parameters of the Libra MAX-58 devices described in this document are subject to change without notice.

> **There is no guarantee that interference will not occur in any particular installation.**

A Libra MAX-58 system consists of one or more chassis-based base stations and multiple subscriber stations. The Libra MAX-58 allows for a carrier-grade wireless network system that can offer video, voice, and data services.

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. Per FCC 15.19

If this equipment does cause harmful interference to radio or television reception, the user is encouraged to correct the interference by one or more of the following methods:

- reorient or relocate the radio antenna
- move the equipment and receiver farther apart
- connect equipment to an outlet on a circuit different from that to which the receiver is connected

Both the Libra MAX's base station and subscriber station equipment are intended to connect to a 10/100 BaseT network; having the capability of transporting video, voice, and data-based applications.

The base station equipment has the added capability of providing routing, switching, protocol conversion (T1, E1, T3, E3, ATM, Fiber, etc), VoIP Gateways, Bandwidth management, and other services through a wide variety of add-on products.

For more information on regulatory requirements, refer to the following web sites:

- For Canadian regulatory information, refer to the **Industry Canada** web site, www.ic.gc.ca
- For United States of America regulatory information, refer to the **Federal Communications Commission** web site, www.fcc.gov
- For European regulatory information, refer to the **European Telecommunications Standards Institute** web site, www.etsi.org

For those areas not covered by the above listed regulatory bodies, please consult your local regulatory body for more information.

1.3 Other Notices

- Changes or modifications to the equipment not expressly approved by EION,

Inc., could void the user's authority to operate the equipment, per FCC Part 15.21.

- All antenna installation work should be carried out by a professional installer.
- The parts in the Libra MAX-58 are Imperial sizes; i.e; inches and fractions of an inch. Do not attempt to mix Imperial nuts, bolts and screws with similar metric hardware. This will strip the threads.

CERTIFICATION ORIGINAL

CE DECLARATION OF CONFORMITY

Manufacturer Name: **EION Inc.**
Manufacturer Address: 320 March Road, Suite 500, Ottawa, Ontario K2K 2E3, Canada

EION Incorporated declares under our own responsibility, that the following product is in compliance with the harmonized EN standards covering essential requirements under article 3 of the R&TTE Directive (99/5/EC).

Products: Libra MAX-58 and all variants Libra MAX-HD 5800; Libra MAX-RBS 5800; Libra MAX-LT 5800; Libra MAX-SS 5800; Libra MAX-SP 5800; Libra MAX-HD-IND 5800; Libra MAX-RBS-IND 5800; Libra MAX-LT-IND 5800; Libra MAX-SS-IND 5800; Libra MAX-SP-IND 5800

This declaration is based on compliance with the following standards which are considered to give a presumption of conformity with the essential requirements under article 3 of the directive.

Standards Applied:

EMC : ETSI EN 301 489-1 V1.6.1: 2005-09, (EU)
EN55022, (2006, EN 61000 3-2, 3-3, 4-2, 4-3, 4-4, 4-5, 4-6, 4-11), (EU)
FCC Part 15 subpart C 15.207: 2007, (US)
RSS 210, Issue 6: 2005, (Canada)

RF : FCC Part 15 Subpart C, 15.203, 15.207, 15.251: 2007, (US)
RSS 210, Issue 6, (2005), (Canada)
ETSI EN 302 326-2 V1.2.1: 2007 (EU)
ETSI EN 301 489-1 V1.6.1: 2005-09 (EU)
EN50385: 2002, (RF Exposure Limits) (EU)

Safety : UL 60950, Equivalent EN60950 (EU)
Modular approvals (electrical)

CE Mark:

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EION Inc.
Chairman & CEO
Kalai Kalaichelvan Ph. D.
Ottawa. September. 2009

EION Inc. EION Authorized Officer CANADA

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www.eionwireless.com

Figure 0-1 Copy of Libra MAX-58 CE Declaration

1.4 Warranty and Repair

The standard warranty for the Libra MAX-58 is one year from the date of purchase.

EION provides no direct warranty to the end-users of this product. Please contact the party from whom you purchased the Libra MAX-58 system for warranty and repair information.

1.5 Customer Support Contacts

Users of EION equipment who require technical assistance must contact their reseller or distributor. For information on distributors in your area, please visit www.eionwireless.com.

1.5.1 Distributor Technical Support

Distributors may contact EION's Technical Support on EION's products.

When requesting support, please have the following information available:

- configuration of the system, including models of EION equipment, versions, serial numbers, and MAC address
- antenna type and cable lengths
- site information, including possible RF path problems, such as trees, buildings and other RF equipment in the area
- distance of the RF link
- configuration of unit.
- description of the problem

1.5.2 Contacting EION Technical Support

By Telephone	Call: 1-866-346-6555 (NA Toll Free) or +1-613-271-4400
	Hours of operation are 9:00 AM to 5:00 PM (EST)
By e-mail	Send an email message to: techsupport@eion.com
RMA Information	Send an email message to: rma@eion.com

Pre-installation

Before you begin installing your Libra MAX-58 base station and subscriber stations, you need to take certain issues and conditions into consideration, prior to, and throughout, the entire installation process. This chapter defines some of the more common installation concerns.

Start by reviewing the equipment packing lists to ensure that you have all the cables, connectors, surge protection devices, fasteners, antennas, and any other installation material you will require to properly install your equipment. You should also visually check all components for any physical damage.

> **Throughout this guide, the term "ODU" refers to the Base Station "Out Door Unit" portion of the Libra MAX-58 system, this includes the Libra MAX-RBS and the radio portion of the Libra MAX-HD.**

If possible, you should connect all necessary cables and power up the radio equipment to confirm that it has not been damaged during shipping. You can also perform the units' initial configuration before they are sent out to the field. This will ensure your equipment and all interconnecting cables are functioning properly. Refer to chapters 4 and 5 for more information on configuring your Libra MAX-58 equipment for the first time.

> **EION provides this document as a general set of guidelines for installing its Libra MAX-58 equipment. In no way does EION provide any warranties as to the effectiveness of these guidelines. Implementation of these guidelines is solely at your discretion. You must ensure that the equipment is installed and grounded in accordance with the local electrical and building codes and the codes of the country of operation. The Libra MAX-58 equipment must be installed by a certified professional communication installer, familiar with all necessary local regulations.**

1.6 Required Tools

Before you go on-site or out into the field to install your equipment, make certain you have all the necessary tools to perform the installation properly. The following list of tools is a general guideline of the tools you may need. Some installations may require more specialized tools, while others may only need a few of the tools listed here. Each specific installation will dictate your tool requirements.

Basic Hand Tools

- socket set
- crescent wrench
- cable cutters
- pliers
- a variety of screwdriver types and sizes

Power Tools

- electric drill
- drill bits of assorted sizes and lengths
- hole saw

Specialized Tools

- Crimp tools for:
- Ethernet connectors
- RF connectors
- power and grounding compression lugs
- Laptop or PDA

Test Equipment

- spectrum analyzer to check for interference
- site master to check the antennas for proper VSWR

Consumables

- butyl rubber tape or pads
- anti-oxidizing paste
- low temperature tape

Miscellaneous

- ladders
- compass
- GPS
- binoculars

Cables

- DB9 serial cable (male to female) for the base station
- EION proprietary serial cable for the subscriber station
- Ethernet crossover cable

1.7 Site Evaluation

Before you begin the actual installation of you Libra MAX-58 equipment, you need to make certain that your equipment site is acceptable and has been properly prepared. Site preparation will depend on whether you will be installing the MAX-HD chassis base station, MAX-LT ODU, MAX-RBS ODU or a MAX-SS subscriber station.

1.8 Base Station Site Considerations

When you are preparing your site for your Libra MAX-58 base station, you will need to make allowances for both the base station's Indoor Unit (IDU) and one or more Outdoor Units (ODU).

1.8.1 Indoor Unit Site Considerations

Your first step should be to review your network plan and make certain that the chosen site will be able to house all of your network equipment, not just your Libra MAX-58 system. During your site examination, make certain that you have left adequate service access in both front and back of any cabinets or equipment racks you are installing.

The site environment for your base station's IDU should be clean, dust-free, and if possible, climate controlled. If a climate controlled environment is not possible, you need to make certain that the equipment can be operated within its specified environmental limits. Ensuring that there is enough room around your cabinets and racks for proper ventilation will aid in proper operation of the units.

Proximity to the units' power mains and correct cable length are other issues that need to be considered when selecting and preparing your equipment site. The physical location of the base station's IDU in the site should be as close as possible to the AC or DC mains in order to minimize cable length. This connection should be made with appropriate sized cables. The following table provides the appropriate cable lengths for a DC power source.

DC Power Cable Size - 10 amps 5% voltage drop	Maximum Cable length between the equipment and DC distribution (feet/meters)
14 AWG	22.97/7
12 AWG	0
10 AWG	0

The site must also include a properly installed principle ground bar (PGB) that the equipment cabinet or rack will be connected to. The physical location of your IDU should also be influenced by its location to the base station's ODU. It is important that you locate the IDU as close to where the ODU will be mounted to minimize cable lengths.

1.8.2 Outdoor Unit Site Considerations

Conversely, when making your decisions about the ODU's mounting location, you need to consider issues such as its proximity to the base station's IDU if needed, cable lengths between the IDU and the ODU, and so on.

You should first inspect the site to verify that the antenna mounting structure is suitable for both the antenna and ODU. The ODU needs to be positioned in a location that allows for easy maintenance access. You also must review routes that the cables will follow, when connecting the IDU to the ODU.

You should review the proposed cabling entrance/exit points for the site's building; they must be practical. You must be able to easily drill the holes for cable access and the cables should be in a location that allows for easy maintenance.

The MAX ODU has a single shielded CAT5/5e cable to connect the ODU to the IDU sector card or to connect the ODU to the POE inserter. It is important not to exceed the maximum allowed length of 100 meters for this cable. This Ethernet cable provides power to the ODU.

1.8.3 Subscriber Station Site Considerations

Preparing the site for your Libra MAX-58 subscriber station or stations is similar to the site preparation for the base station's ODU. You should first inspect the proposed site to verify that the line-of-site and Fresnel Zone clearances can be met.

You also need to verify that the unit mounting structure is suitable for both the subscriber station, and the subscriber station's antenna, if a separate antenna is used. The subscriber station needs to be positioned in a location that allows for easy maintenance access.

If the subscriber station is to be mounted to a wall, you will need to consider how the wall's material will affect your mounting strategies; the wall is made of cinder-block, wood, concrete, and so on. You will then need to acquire the appropriate mounting fasteners to fit the wall material.

You must also review routes that the cables will follow, when connecting the subscriber station to your terminal equipment. Review the proposed cabling entrance/exit points for the site's building; they must be practical. You must be able to easily drill the holes for cable access and the cables should be in a location that allows for easy maintenance.

The subscriber station's proximity to your terminal equipment must be considered as this will affect the cable lengths between your terminal equipment and the subscriber station unit. Cables must always be connected without exceeding their recommended bend radius.

1.9 Base Station Power Sources

If your equipment uses AC power, make certain that the power is provided from a separate, isolated circuit and that you are using a surge protected power source or a dedicated Uninterruptible Power Supply (UPS). This will aid in protecting your equipment against power surges, spikes and/or possible lightning damage. Providing clean, filtered power will also minimize the possibility of system performance degradation due to RF interference.

If your base station equipment uses DC power, your power should be supplied from the main station DC power panel, through a dedicated fused output. A fuse of 15 Amps should be used.

1.10 Grounding

Grounding your equipment properly is one of the most important operations you will perform during installation. Equipment grounding is required for both safety and effective operation of the installed lightning protection devices.

You must ensure that your system is grounded in accordance with your local electrical codes and safety laws. EION does not provide any warranties as to the effectiveness of the grounding concepts and processes described here, they are for your reference only. EION is not liable for any damage to your equipment or any injuries to you resulting from improper grounding.

1.10.1 ESD Warning

Before you begin to install your base station and its components, you should ensure that your equipment will be protected against electrostatic discharge (ESD). This section lists some guidelines that you should take into account during installation.

- Proper grounding is extremely important. Make certain that you ground yourself before you begin working with your equipment. Also try to ensure that your workspace is static-free and make use of an anti-static wrist or leg straps. If you do not have access to static protection, ground yourself to your environment by first touching your finger to a metal surface before touching your equipment.
- All electrical components should be moved or stored in an anti-static bag. Before you remove a component from its anti-static bag, you should first hold the bag in one hand while touching a metal surface with the other hand, then perform the same action with the component.
- Handle electronic components as little as possible and when you do handle them, hold all parts by their edge.
- Never slide static-sensitive equipment across any type of surface. Friction can cause static build-up.
- Keep any non-conductive material, such as Styrofoam and other plastics, away from your work area

1.10.2 Outdoor Unit Grounding

When you are installing your outdoor units, you need to follow proper grounding practices. The proper grounding of outdoor units helps to minimize lightning damage and dissipate static buildup. In general, grounding is accomplished by installing a single heavy gauge wire, such as a 6 gauge, copper cable, between the outdoor unit's grounding lug and the mounting structure's grounding point.

The following section sets out some grounding guidelines for you to follow during installation.

- It is very important that the grounding system for your outdoor equipment be installed by a fully qualified, professional installer, and that proper safety practices are followed in accordance with your local electrical code.

- Locate your grounding point as close to the outdoor unit as possible. It must be below the unit and must not be inside a building.
- The grounding point can be located on an unpainted section of a metal tower, as section of a building's metal structure or a ground riser per your applicable local electrical code.
- When you run the ground cable to the grounding point, make certain that it follows a direct path and that you avoid sharp bends in the cable.
- Do not drill holes in tower supports or cross braces to provide a grounding point.
- Do not remove any paint on the outdoor unit chassis.
- Do not secure the ground cable in a bundle with other data, power, or RF cables.
- The chassis of the outdoor unit's power supply must be connected to the frame or cabinet via a ground strap.

If you are installing more than one outdoor unit and they will be in close proximity to each other, do not daisy chain the units' grounds to each other. This means that you should not connect the ground of one unit to the ground of another unit and finally to the grounding system, as shown in Figure 0-1 Daisy Chain Configuration.

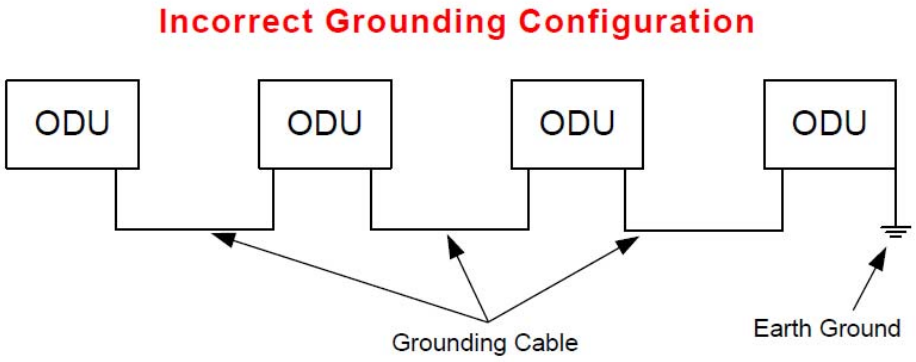


Figure 0-1 Daisy Chain Configuration

Daisy chaining the grounds of your units will cause problems such as ground loops, high resistance paths between units, and reduced ability for dealing with lightning. Instead, you should use a star configuration, as shown in Figure 0-2 Star Configuration. In this configuration, each outdoor unit's grounding lug is connected to a common grounding point that is then connected to the earth ground.

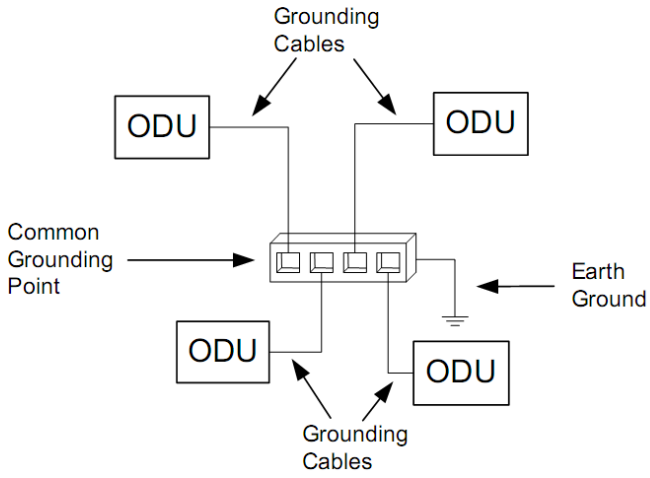


Figure 0-2 Star Configuration

1.10.3 Indoor Unit Chassis Ground

The base station's indoor unit shelf should be grounded to the cabinet or rack through a grounding strap. This strap needs to be connected from the grounding bolt, located at the back of the chassis, to the cabinet's (or rack's) grounding bar. It is not sufficient to rely on the mounting screws to ground the chassis to the cabinet.

You must also run the cable to the grounding point in a direct path and avoid sharp bends.

Do not secure the ground cable in a bundle with other data, power, or radio frequency cables.

1.11 Lightning Protectors

The use of lightning protectors and surge suppressors is extremely important and, although your Libra MAX-58 equipment will operate without them, it is highly recommended that you make use of them. Lightning protectors and surge suppressors are used to aid in the protection of your outdoor units against lightning damage and static discharge.

During installation, it is important to note that all lightning protection devices have a surge (or cable-facing) side and an equipment facing side, as shown in Figure 0-3 Surge Suppressor Sides. The equipment side generally faces the outdoor unit or the indoor power adapter. The surge side faces the other surge suppressor.

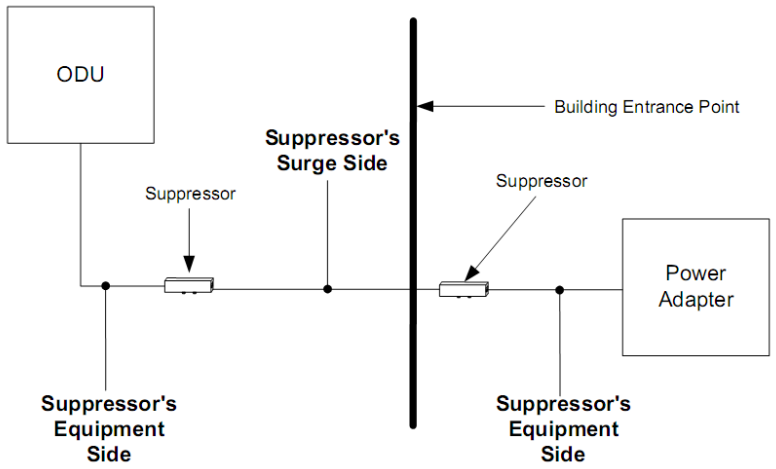


Figure 0-3 Surge Suppressor Sides

1.11.1 Surge Suppression Unit Location

Lightning arrestors and surge protectors should be installed at all input/output points on the Libra MAX-58 equipment. Additionally, they should be properly grounded by connecting the body of the arrestor or protector to the grounding system with a heavy gauge (6 AWG) copper wire. This grounding wire should be as short as possible.

The following figures illustrate the locations where the surge suppressors must be installed, when cabling both the base station and the subscriber station.

Figure 0-4 Libra MAX-58 Base Station Surge Suppressor Diagram, illustrates where the surge suppressors must be installed when cabling the equipment for a Libra MAX-58 sector.

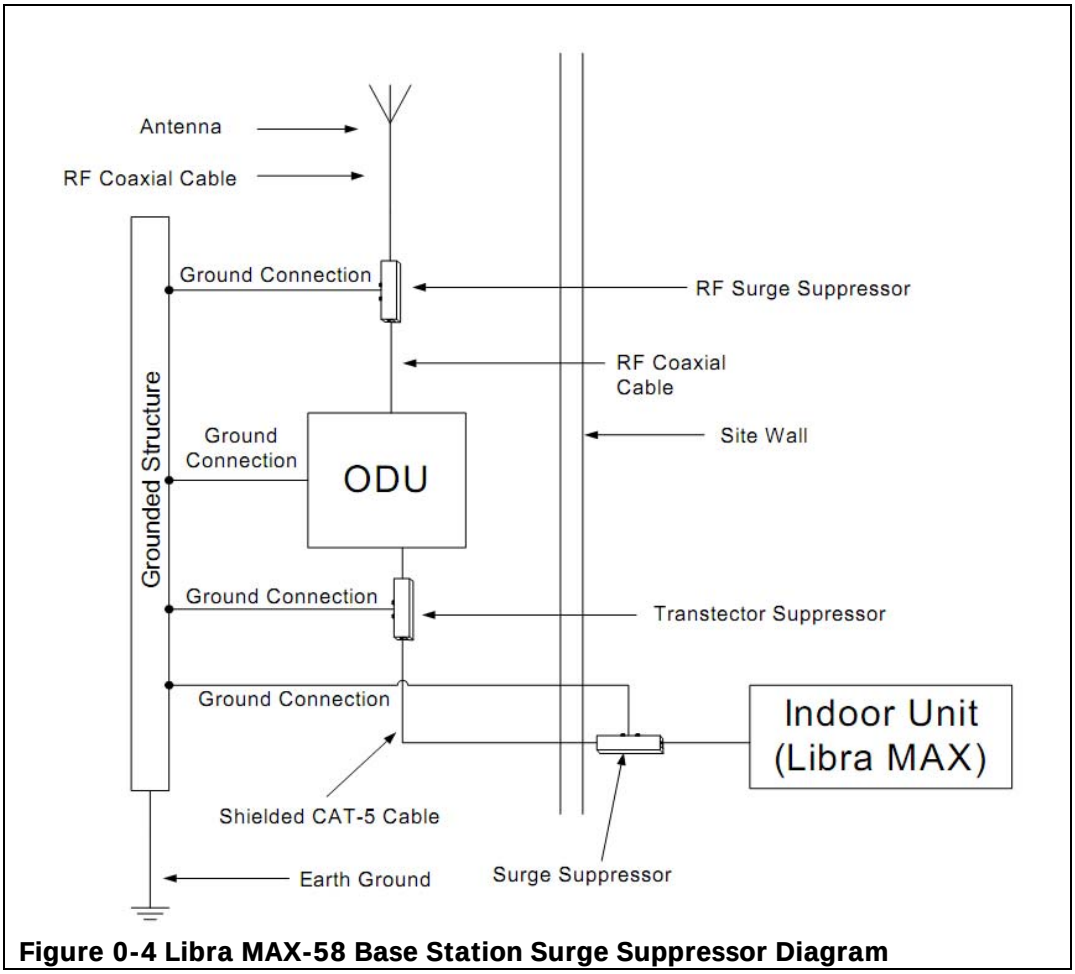


Figure 0-4 Libra MAX-58 Base Station Surge Suppressor Diagram

Figure 0-5 Subscriber Station (MAX-SP) Surge Protector Diagram with Integrated Antenna illustrates where the surge suppressors must be installed when cabling the equipment. This diagram takes the integrated antenna into account.

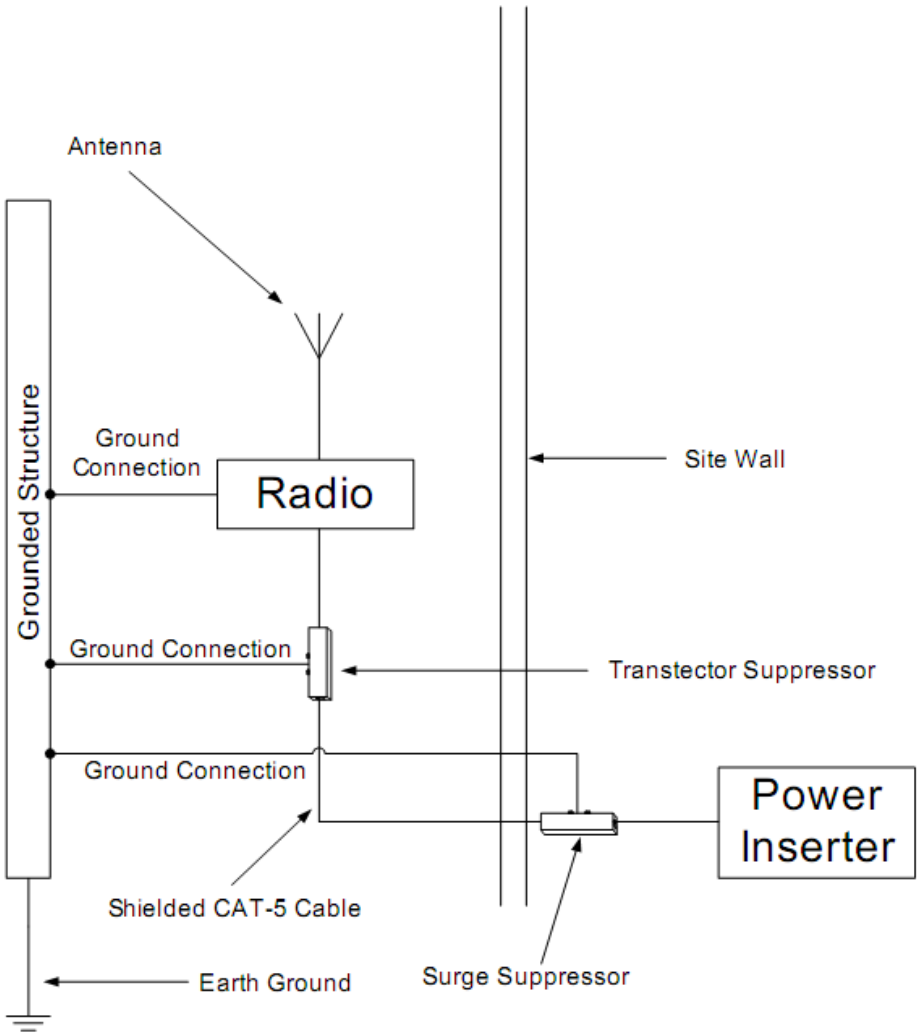


Figure 0-5 Subscriber Station (MAX-SP) Surge Protector Diagram with Integrated Antenna

Figure 0-6 Subscriber Station (MAX-SP) Surge Protector Diagram with External Antenna, illustrates where the surge suppressors must be installed when cabling the equipment.

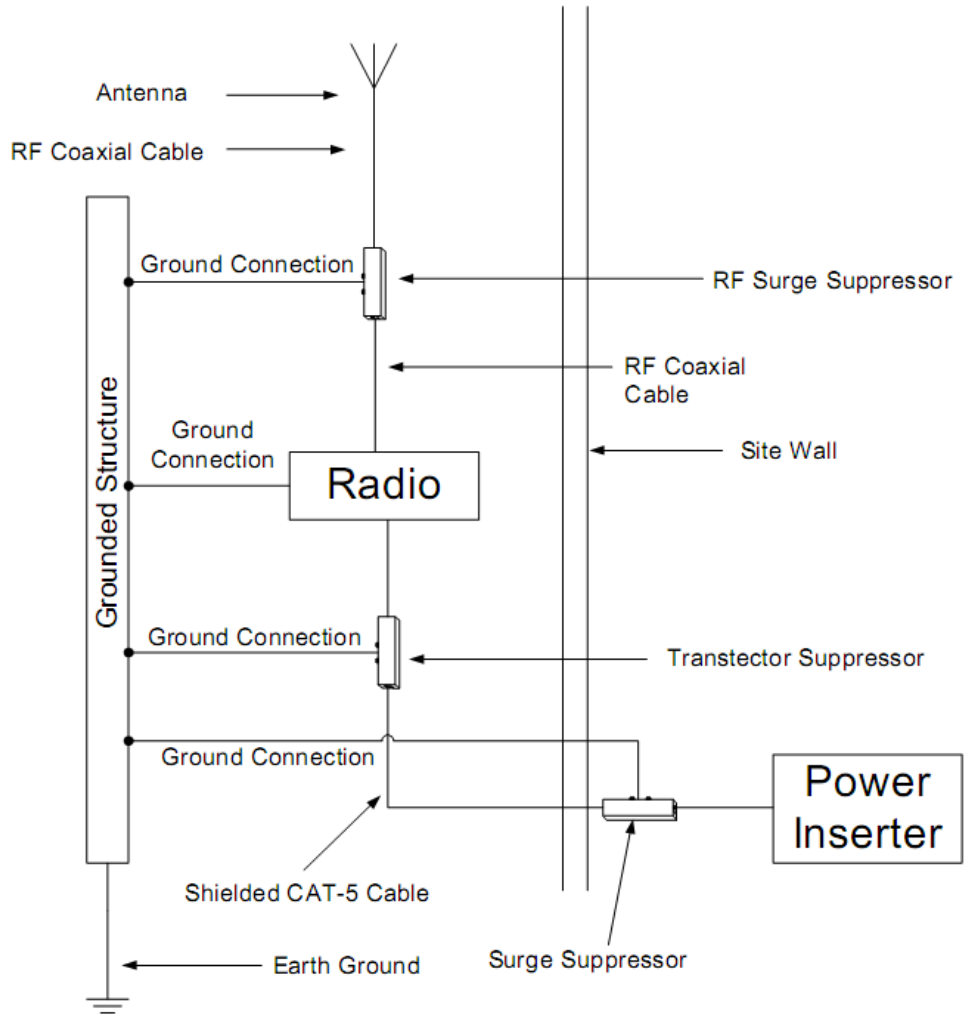


Figure 0-6 Subscriber Station (MAX-SP) Surge Protector Diagram with External Antenna

When installing surge suppressors between your outdoor unit and the antenna, use protectors that provide a DC short such as an L-C circuit or one quarter-wave shorting stub. These protectors should be physically located as close as possible to the ODU, preferably no further than five (5) feet (1.52 metres). Also, a star configuration should be used when grounding your surge suppressors.

1.12 Weatherproofing Connectors

One of the most common installation problems is water intrusion, due to improper weatherproofing. Unfortunately, this activity is often overlooked and can lead to costly repairs and unnecessary expenses if not completed properly or not performed at all. Therefore, it is extremely important to properly weatherproof your connectors.

An additional reason for using tape to weatherproof your cable connections is to prevent the connection loosening, due to environmental conditions.

One method is to apply two layers of high quality rubber tape to the connectors, then apply two layers of high quality vinyl electrical tape, such as:

- Scotch® 130C Linerless Rubber Splicing Tape
- Scotch® Super 88 Premium Vinyl Electrical Tape

Corrosion is another problem that arises if your cabling system is not properly weatherproofed. Corrosion can lead to high impedance at contact points, which can drastically reduce the effectiveness of your lightning protection. To help stop corrosion, you should use an anti-oxidizing paste on all contacts. When using anti-oxidization paste, keep the following guidelines in mind:

- read the instructions and warnings for the selected product
- lock washers should be used since the anti-oxidization paste acts as a lubricant
- use a small amount. A thin film applied to exposed surfaces and on contact points is adequate
- do not apply the anti-oxidization paste to the data cable connections on the outdoor unit. The anti-oxidization paste is conductive and may degrade performance and damage equipment.
- using electrical or rubber tape is not recommended for sealing the grounding connections when anti-oxidization paste is used
- do not use thread-locking compound on the same bolt or screw as anti-oxidization paste is used.

1.13 CAT-5 Ethernet Cable Shielding

Using shielded CAT-5 Ethernet cable is very important when installing your BS or SS ODU, as it will help in reducing data errors caused by nearby interference.

It is also very important that the shield be connected at only one end of the cable, the end that connects to the indoor unit. This is required to eliminate ground loops caused by current flowing between the indoor and outdoor units, due to a possible difference in ground levels. Such currents can damage equipment at either end or introduce noise that will interfere with the user data traffic on the cable.

Base Station Installation

This chapter discusses how to install your Libra MAX-58 base station equipment. There are four general tasks that you will need to perform when you install your Libra MAX-58 base station. They are:

1. base station indoor unit installation
2. base station outdoor unit installation
3. mounting the antenna
4. cabling the base station

Please review the Pre-installation chapter before you begin installing your base station equipment.

1.14 Installing the Indoor Unit

This Step applies to the MAX-HD ONLY. The MAX-RBS and MAX-LT units do not have an indoor unit component.

Your first task is to install the base station's indoor unit. Before you begin, review the material in the Pre-installation chapter of this manual and make certain that you have met all of the conditions laid out there.

Also, when you first receive your Libra MAX-58 indoor unit, the power supply, and fan tray and filter should already be installed in the chassis.

If these two components, or any other components, are not installed, or if you are adding functional components to the chassis, this procedure will instruct you in their installation. If the components are installed from the factory, ignore those steps that deal with component installation.

Visually inspect the chassis' back plane connector pins, in both the front and rear card slots, before you begin to install your indoor unit's chassis. You need to make certain that none of the pins are bent or broken.

To install your base station indoor unit:

1. Install the indoor unit chassis in the rack or cabinet.
   1.1. Make certain that you have allowed enough room in the rack or cabinet for proper ventilation.
   1.2. Install the 19 inch (48.26 cm) to 23 inch (58.42 cm) mounting extenders on your indoor unit chassis, if necessary, as shown in on the next page.
   1.3. Slide the indoor unit chassis into the desired shelf in the appropriate rack or cabinet, as shown in Figure 0-1 Daisy Chain Configuration below.

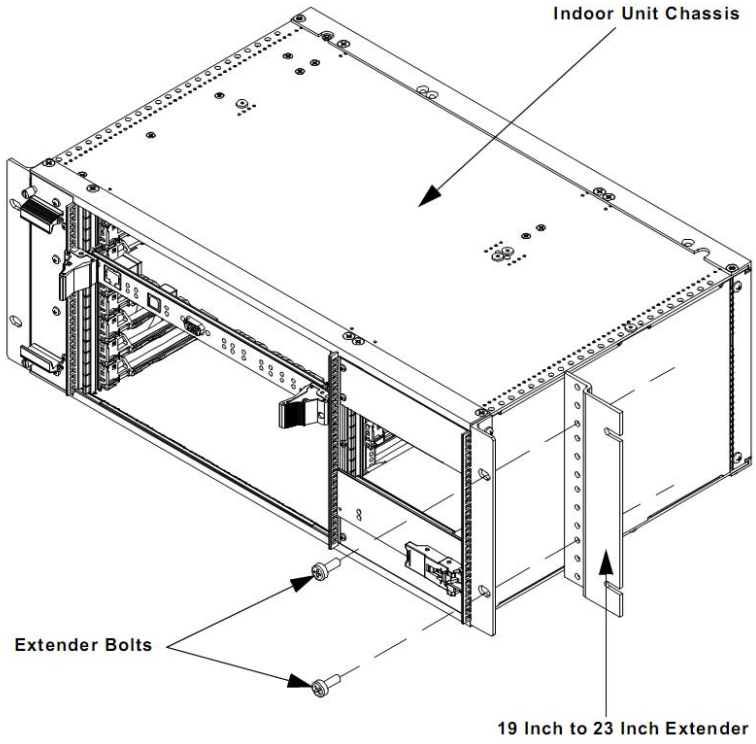


Figure 0-1 Attaching Extender Plate

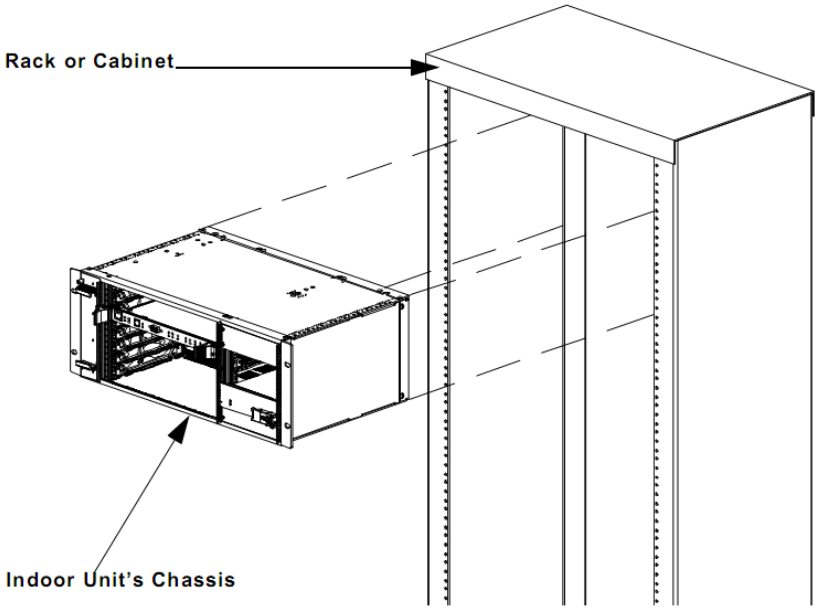


Figure 0-2 Inserting the Indoor Unit Chassis in the Cabinet

1.4. Use the mounting bolt kit that was supplied with your chassis to secure the indoor unit chassis in the rack or cabinet, as shown in Figure 0-3 Installing the Mounting Bolts.

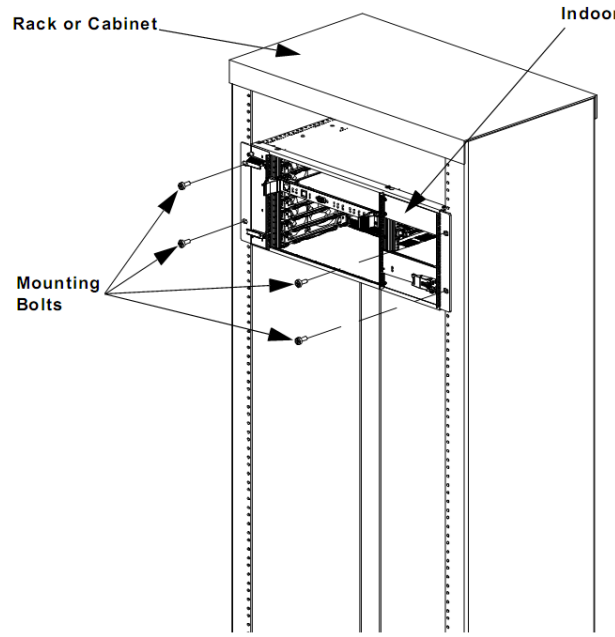


Figure 0-3 Installing the Mounting Bolts

2. Ground the indoor unit's chassis to the rack or cabinet.

   2.1. Remove the nut and lock washer from the grounding pole, located at the rear of the indoor unit's chassis, as shown in Figure 0-4 Indoor Unit Chassis Grounding Lug Location.

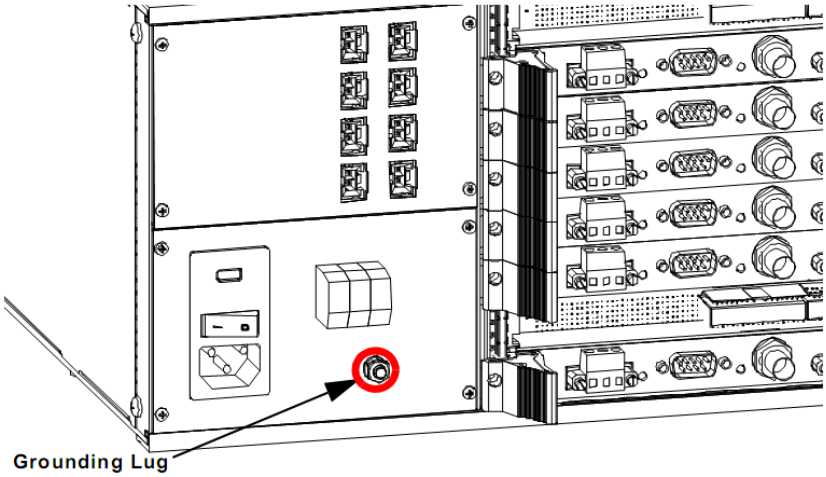


Figure 0-4 Indoor Unit Chassis Grounding Lug Location

   2.2. Connect a grounding strap to the indoor unit's grounding pole, as shown in Figure 0-5 Connecting the Grounding Strap to the Indoor Unit Chassis. Make certain that this grounding strap is a heavy gauge wire (10-12 AWG). You should also have ring terminals at both ends of the strap.

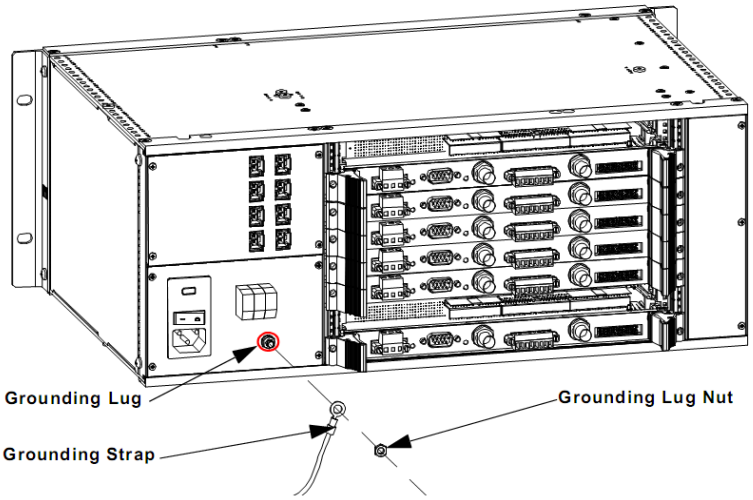


Figure 0-5 Connecting the Grounding Strap to the Indoor Unit Chassis

2.3. Reinstall the lock washer and nut on the grounding pole and tighten them.

2.4. Connect the other end of the grounding strap to the grounding bar of the rack or cabinet.

3. Install the power supply for your indoor unit chassis.

Before you begin to install components in the indoor unit's chassis, make certain that you are using an anti-static wrist strap. For more information static discharge and grounding, refer to the ESD Warning section, in the Pre-installation chapter.

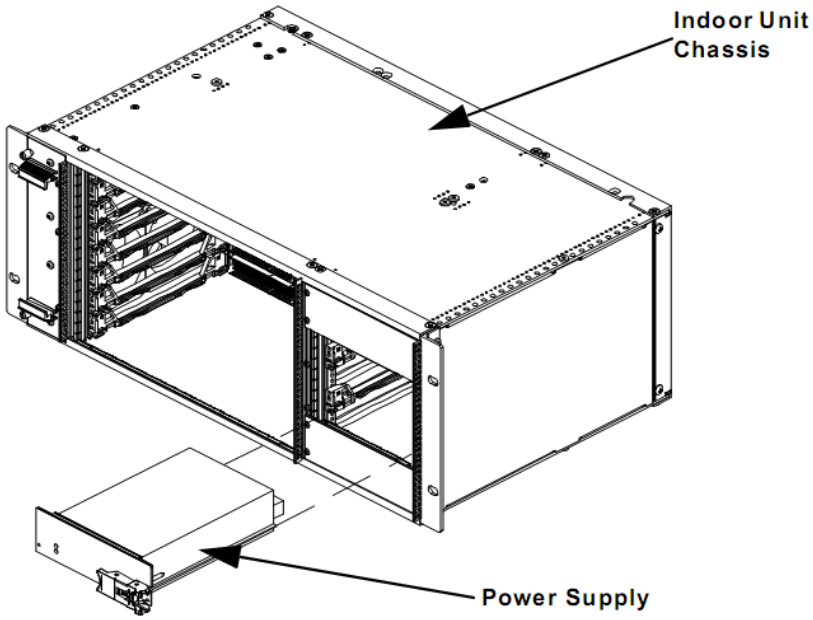


Figure 0-6 Installing the Indoor Unit's Chassis Power Supply

3.1. Slide the power supply into an empty slot on the right side of the chassis, as shown in Figure 0-7 Locking the Power Supply Tab . Make certain that you align the power supply mounting guides on the chassis rails.

3.2. Push the power supply into the chassis until it can go no further.

3.3. Push the locking tab against the face plate of the power supply and tighten the locking screws, as shown in 7 below. This will secure the power supply in the chassis.

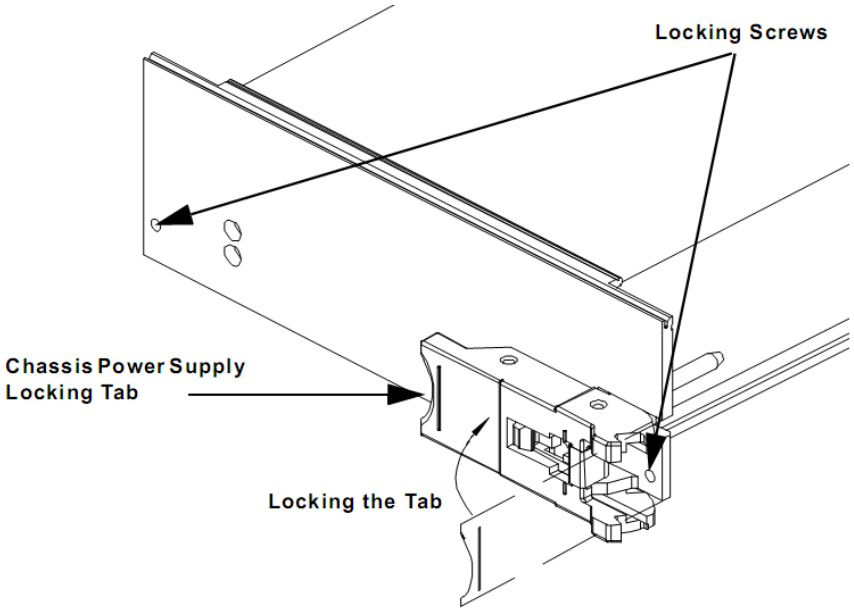


Figure 0-7 Locking the Power Supply Tab

4. Install the PoE card in the indoor unit chassis.

4.1. Slide the PoE card into an empty grey slot in the rear bay of the chassis, as shown below. Make certain that you align the PoE card mounting guides on the chassis rails.

4.2. The PoE card can only be installed in slots 1, 3, 4, 5, 6, and 7.

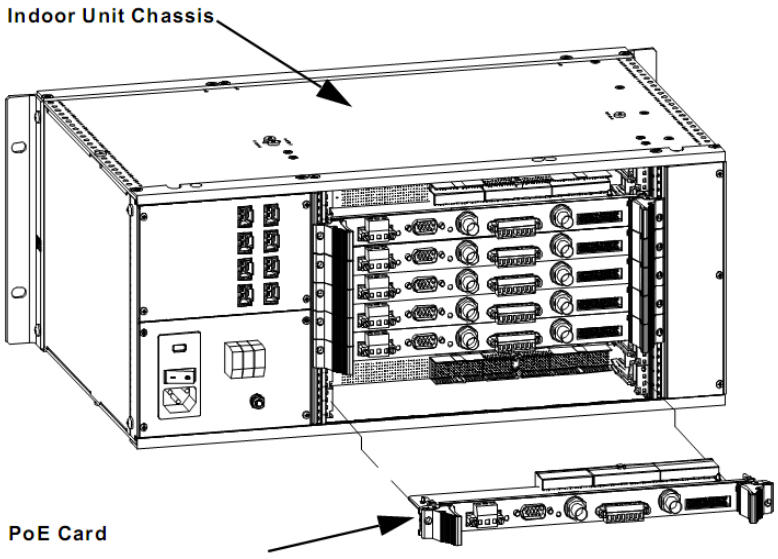


Figure 0-8 Installing the PoE Card

4.3. Gently push the PoE card into the chassis until it can go no further.

4.4. Push the outside of both locking tabs towards the center of the PoE's face plate until they stop, as shown below.

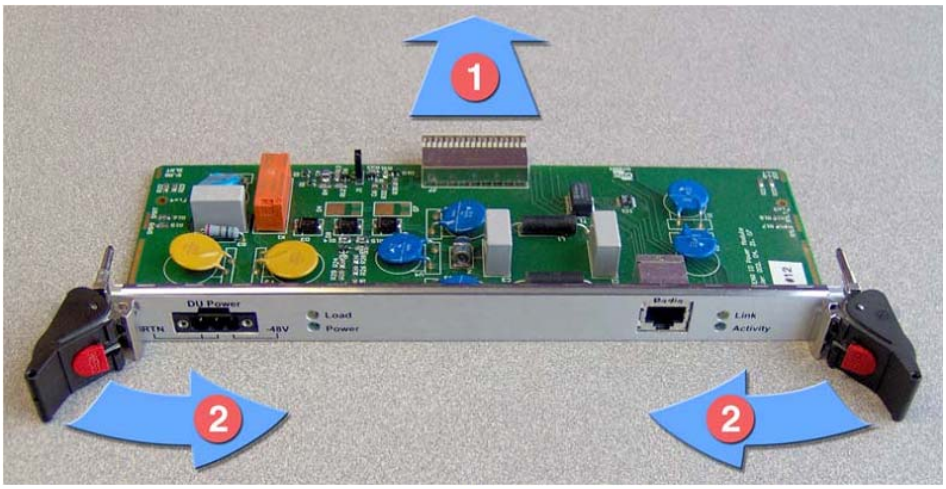


Figure 0-9 Locking the PoE Card Tabs

4.5. Tighten the locking screws; this will secure the PoE card in the chassis.

5. Install the sector card in the base station's chassis.

5.1. Slide the sector card into an empty grey or red coloured slot in the central bay of the chassis, as shown below. Make certain that you align the mounting guides on the chassis rails.

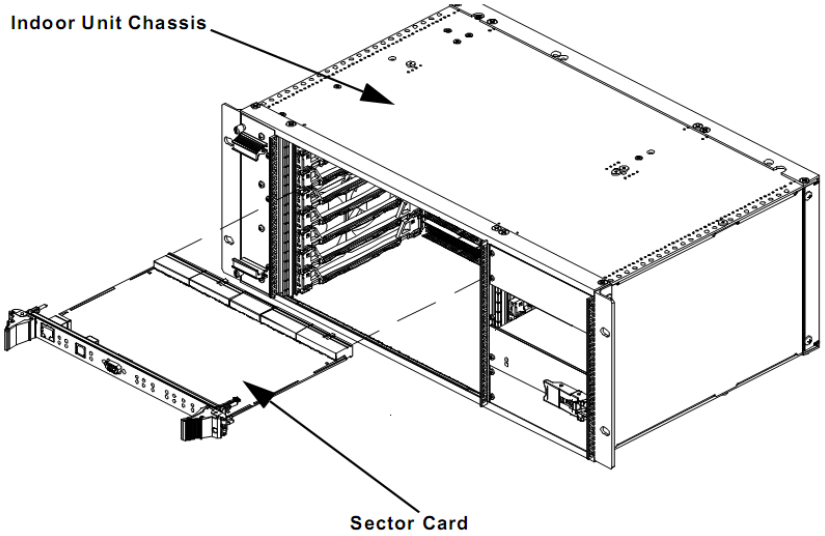


Figure 0-10 Installing the Sector Card in the Chassis

5.2. Gently push the sector card into the chassis until it can go no further.

5.3. Push the outside of both locking tabs towards the center of the sector card's face plate until they stop, as shown in the following drawing.

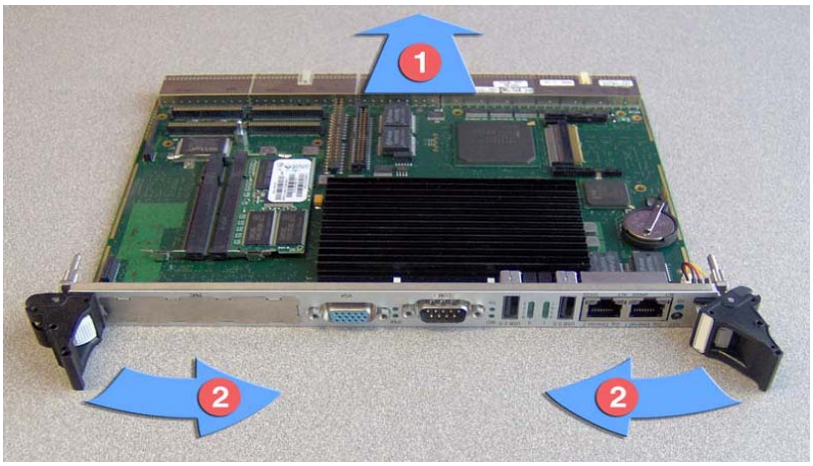


Figure 0-11 Locking the Sector Card Tabs

5.4. Tighten the locking screws. This will secure the controller card in the chassis.

6. Install the Libra MAX-58 switch fabric card. The switch fabric card must go into either slot 1 or slot 7 (yellow slots).

7. Install any necessary third party cards, such as switches and so on. Make certain that you carefully read the installation instructions that come with your card and that you adhere to any conditions, cautions, and warnings.

8. Install filler panels in all of the open slots, for both front and rear card bays, in the indoor unit's chassis.

   8.1. Place the filler panel over the empty slot and secure the screws to the chassis, as shown in the following figure.

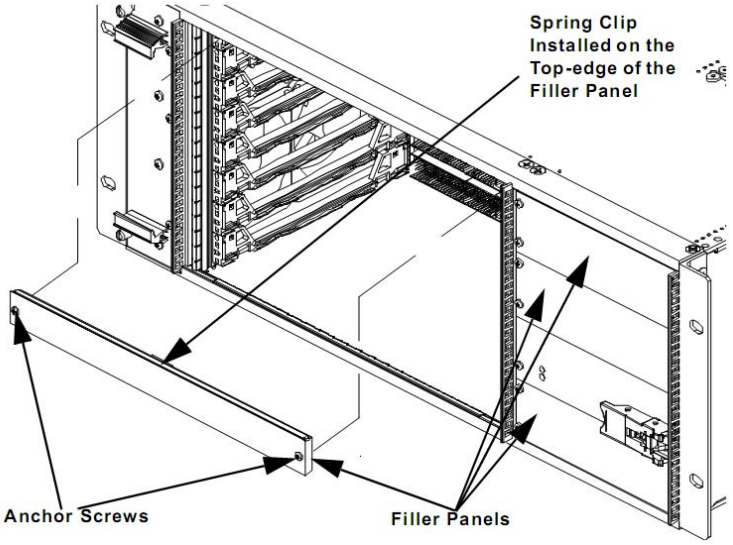


Figure 0-12 Installing Filler Panels on the Indoor Unit's Chassis

9. Install the outdoor unit's -48 volt power supply in the rack or cabinet. This power supply should be installed near the indoor unit. If possible, it should be installed above or below the indoor unit in the same rack or cabinet.

   9.1. Connect the power leads to the DC power connectors, as shown in the following figure, before you install the DC power supply unit in the rack or

cabinet. These leads will be used to connect to the PoE card.

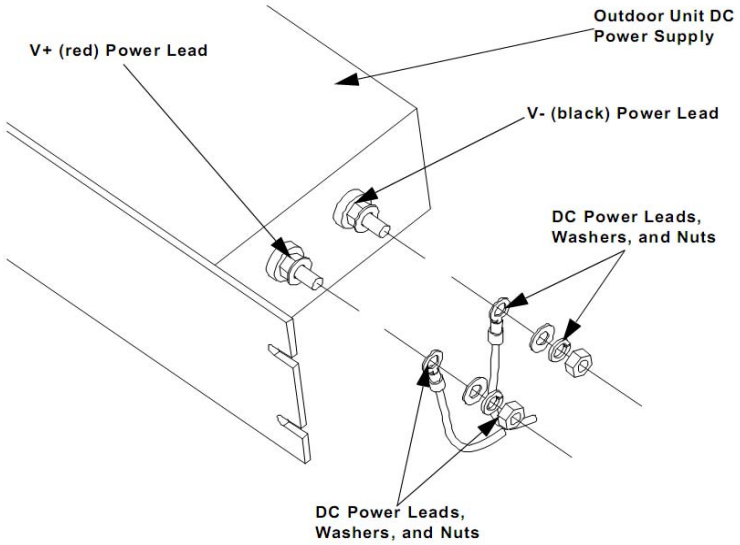


Figure 0-13 Connecting the PoE Card Power Leads

9.2. Install the 19 inch (48.26 cm) to 23 inch (58.42 cm) mounting extenders on your DC power supply, if necessary, as shown in the figure below.

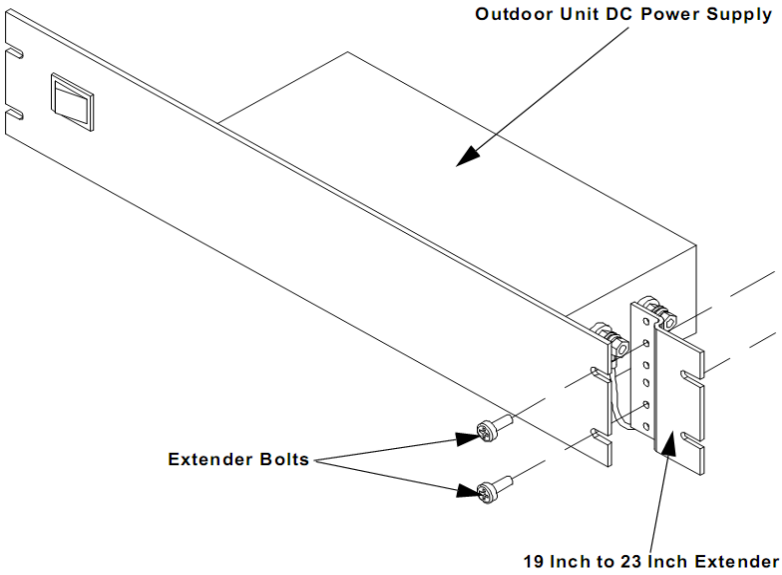


Figure 0-14 Power Supply Housing Extender Installation

9.3. Slide the outdoor unit's DC power supply into the desired position in the appropriate rack or cabinet, as shown in the next figure.

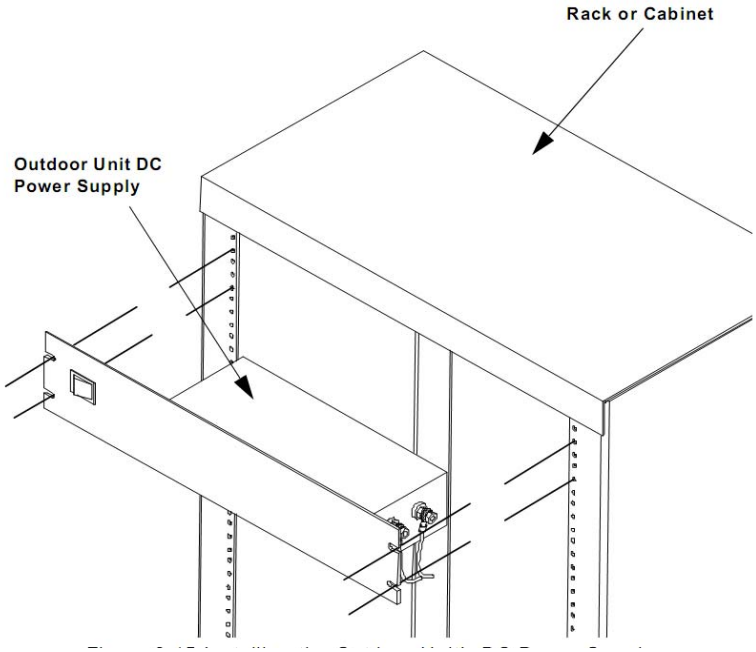


Figure 0-15 Installing the Outdoor Unit's DC Power Supply

9.4. Use the mounting bolts that were supplied with your cabinet or rack to secure the outdoor unit's DC power supply in the rack or cabinet, as shown in the drawing below.

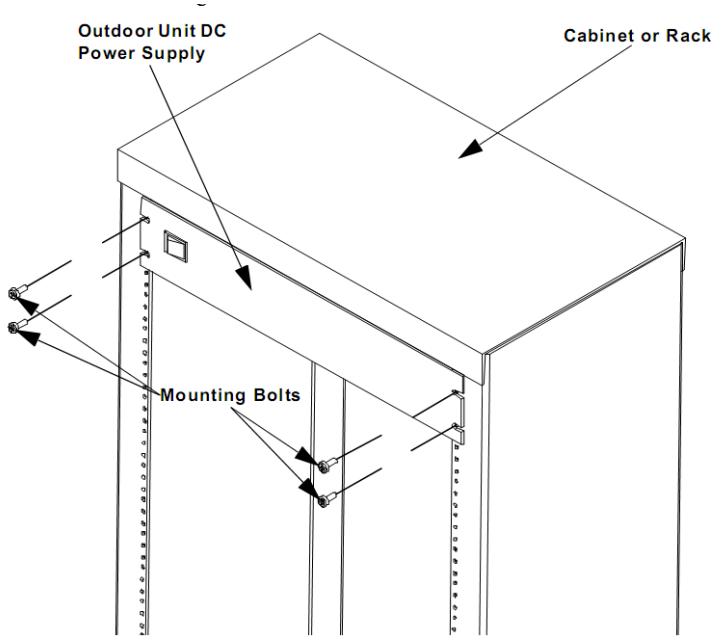


Figure 0-16 Installing the Mounting Bolts

You may now begin cabling the Libra MAX-58 indoor unit. Refer to the Cabling the Base Station section, in the Base Station Installation chapter.

1.15 Installing the BS Outdoor Unit

This chapter discusses how to install your Libra MAX-58 Base Station Outdoor Unit equipment. There are four general tasks that you will need to perform when you install your Libra MAX-58 subscriber station. They are:

1. configuring your outdoor unit equipment
2. installing your outdoor unit equipment
3. mounting the antenna, if the equipment uses a separate antenna
4. cabling the outdoor unit

Please review the Pre-installation chapter before you begin installing your equipment.

1.16 Connecting the Ethernet Cable

Before you mount your outdoor unit, either on a pole or a wall you will need to temporarily connect an Ethernet cable between the unit and your computer's Ethernet port. This is to allow you to configure your outdoor unit.

If connecting the unit directly to a laptop or PC, a crossover Ethernet cable is required.

For information on configuring your outdoor unit for the first time, refer to the chapter Base Station Configuration and Management.

1.17 Mounting Conditions

The two (2) general subscriber station mounting scenarios are:

1. pole mount
2. wall mount

1.18 Pole Mounting

If you are mounting your Base Station Outdoor Unit using an external antenna, you will not have to concern yourself with the polarization of the antenna. In this instance, attach the mounting bracket unit anchor to the side of the unit housing as shown in the figure below.

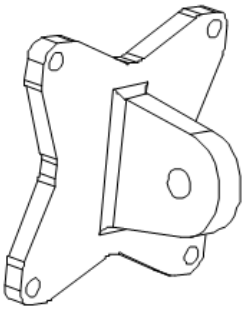


Figure 0-17 Mounting Bracket Unit Anchor

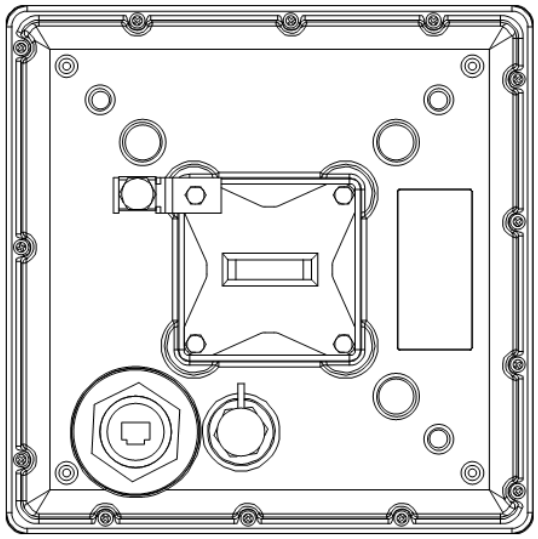


Figure 0-18 Attaching the Mounting Bracket Unit Anchor

1.19 Pole-mounting the Outdoor Unit

Your next task is to install the Base Station outdoor unit. Before you begin, review the material in the Pre-installation chapter of this manual and make certain that you have met all of the conditions laid out there. Also, you should make certain that all of the necessary brackets and bolts are included in the box with your unit.

To mount your outdoor unit on a pole:

1. Mount the outdoor unit on the pole.

    1.1. Mount the bracket clamp to the pole, as shown in the figure below. If the pole is two (2) inches (5.08 cm) in diameter or less, turn the mounting bracket clamp back over so that the angle faces the pole. This will allow you to mount the bracket to a smaller pole.

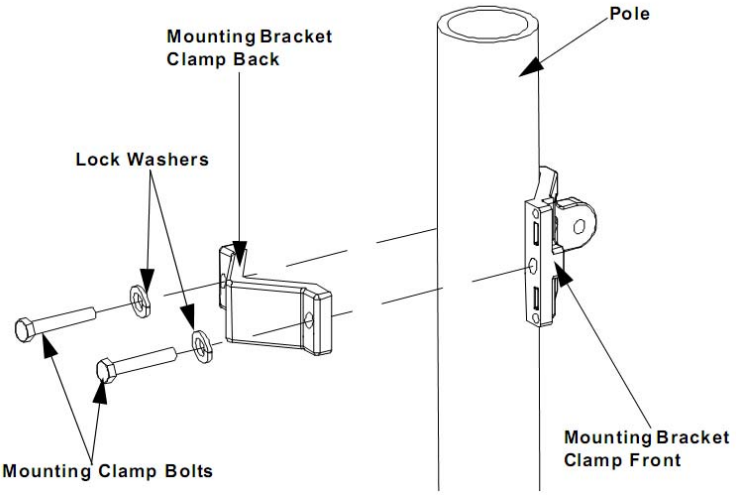


Figure 0-19 Attaching the Bracket to the Pole

    1.2. Tighten the bolts so that the bracket will not move. The recommended maximum torque is 24 N/m (17.7 ft/lbs).

1.3. Bolt the mounting bracket's unit anchor to the Base Station ODU's housing, as shown in the figure below. Tighten the bolts so that they are snug. Do not over tighten the bolts, as they could crack the housing. The recommended maximum torque is 5.7 N/m (17.7 ft/lbs).

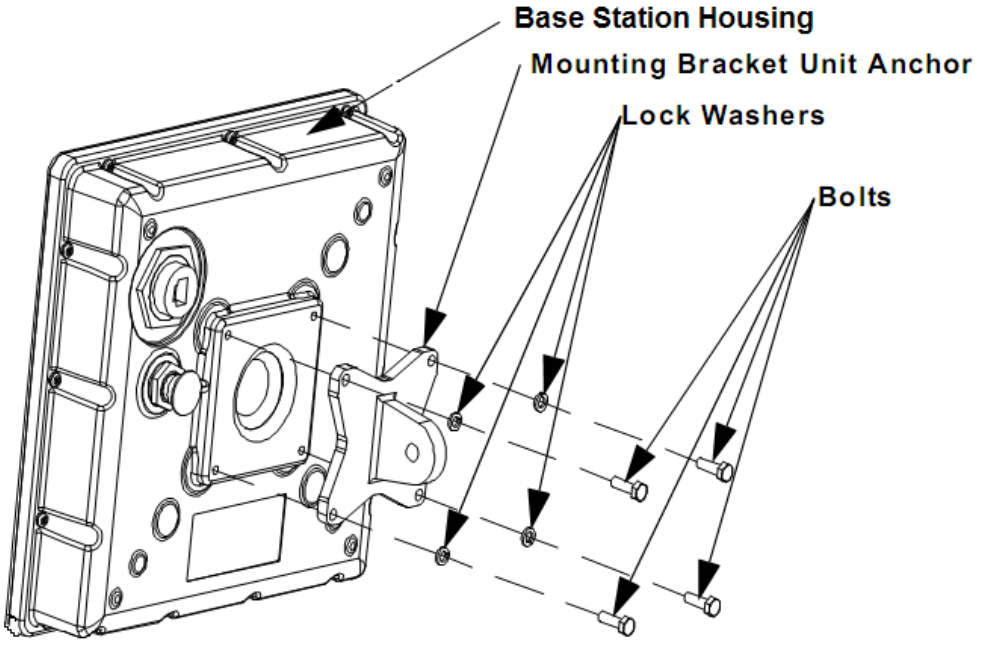


Figure 0-20 Attaching the Bracket to the Outdoor unit

1.4. Secure the unit to the pole, as shown in the figure below.

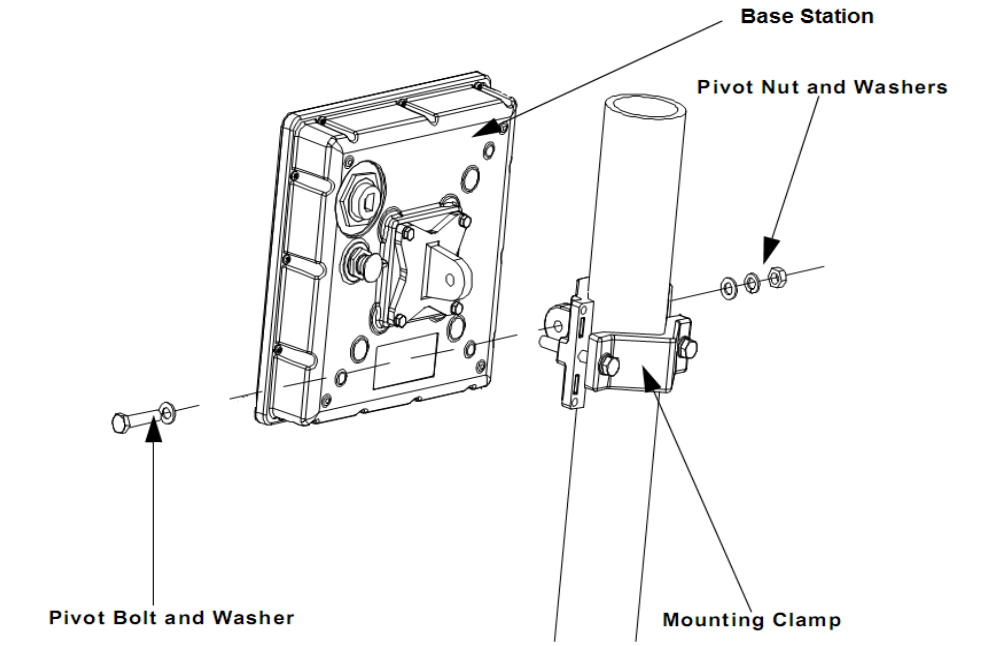


Figure 0-21 Securing the Base Station to the Pole

1.5. Tighten the pivot nut and bolt. The recommended maximum torque is 24 N/m (17.7 ft/lbs). If your subscriber station has an integrated antenna, do

not tighten the pivot nut and bolt until you have aligned your antenna.

1.20 Wall-mounting the Outdoor unit

1. To mount your outdoor unit to a wall:

   1.1. Prepare the wall to hold the mounting bracket. The type of mount you create will depend upon the type of wall surface and material your wall is made of. It may be that you only need to drill holes and insert bolt anchors, or you may have to fabricate a strong mount that will withstand the unit's weight, outside temperature change, or other variables. For this reason, EION requires that you supply your own fastening bolts, lag-screws, or other fastening devices.

   1.2. Place the back of the bracket against the wall mount, as shown below.

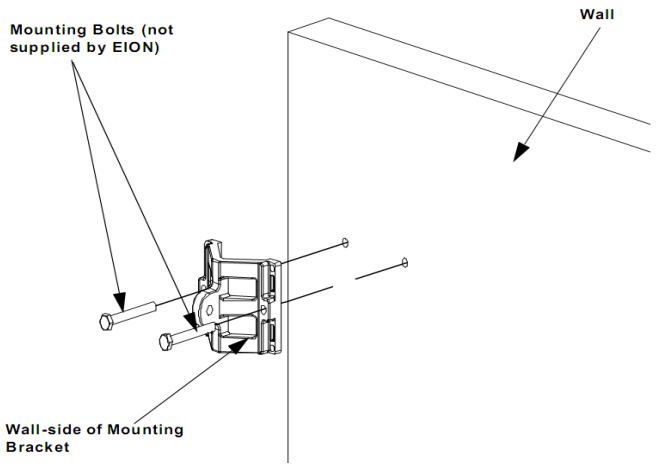


Figure 0-22 Bolting the Wall-side Bracket to the Wall

   1.3. Secure the mounting bracket to the wall, using the necessary bolts.

   1.4. Bolt the bracket's unit anchor to the base station outdoor unit's housing, as shown below.

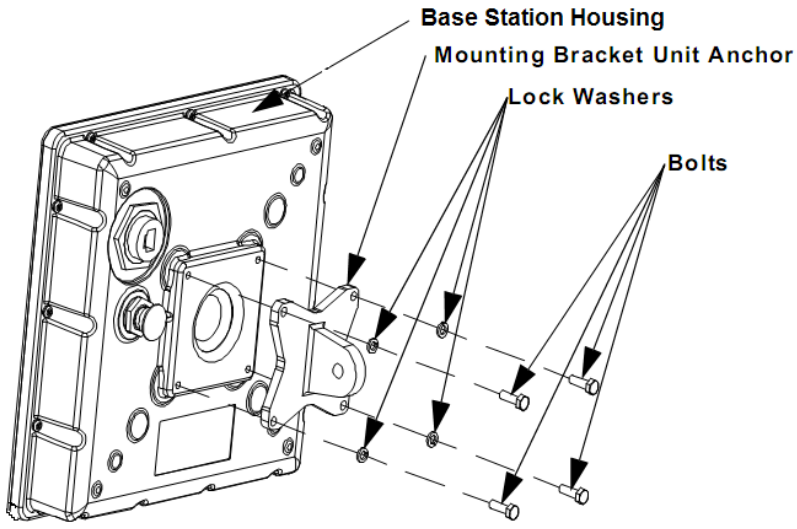


Figure 0-23 Attaching the Bracket to the Base Station

1.5. Tighten the bolts so that they are snug. Do not over tighten the bolts, as they could crack the housing. The recommended maximum torque is 5.7 N/m (4.2 ft/lbs).

1.6. Connect the base station ODU to the mounted wall-side bracket, using the pivot arm, as shown below.

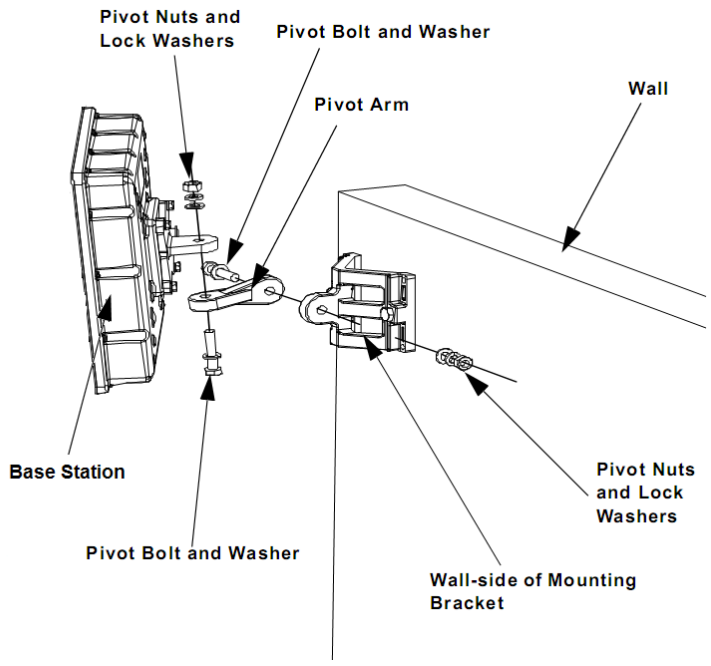


Figure 0-24 Bolting the Subscriber Station to the Wall Bracket

How you connect your grounding cable to a common earth ground will depend on how you have prepared the installation site and where the outdoor unit is installed. For more information on outdoor unit grounding requirements, refer to the Outdoor Unit Grounding section of this manual.

1.21 Antenna Mounting Guidelines

It is essential that you properly install your base station's antenna. This ensures that your system is operating at optimum performance and aids in protecting it against lightning damage.

To correctly install your antenna, it is very important that you follow your antenna manufacturer's installation instructions closely. In addition, keep the following guidelines and practices in mind while performing your installation.

1.21.1 Mounting the Structure

Make certain that the mounting structure (i.e.: pole mount, wall mount, etc.) is perpendicular to the horizontal, as shown below. This is essential, because the antenna's mechanical tilt indicator or indicators rely on using a vertical mounting surface for its reference point. The degree of vertical accuracy should be checked and, if necessary, corrected prior to the installation of the antenna. The mounting surface's vertical angle can be verified using a level or angle indicator.

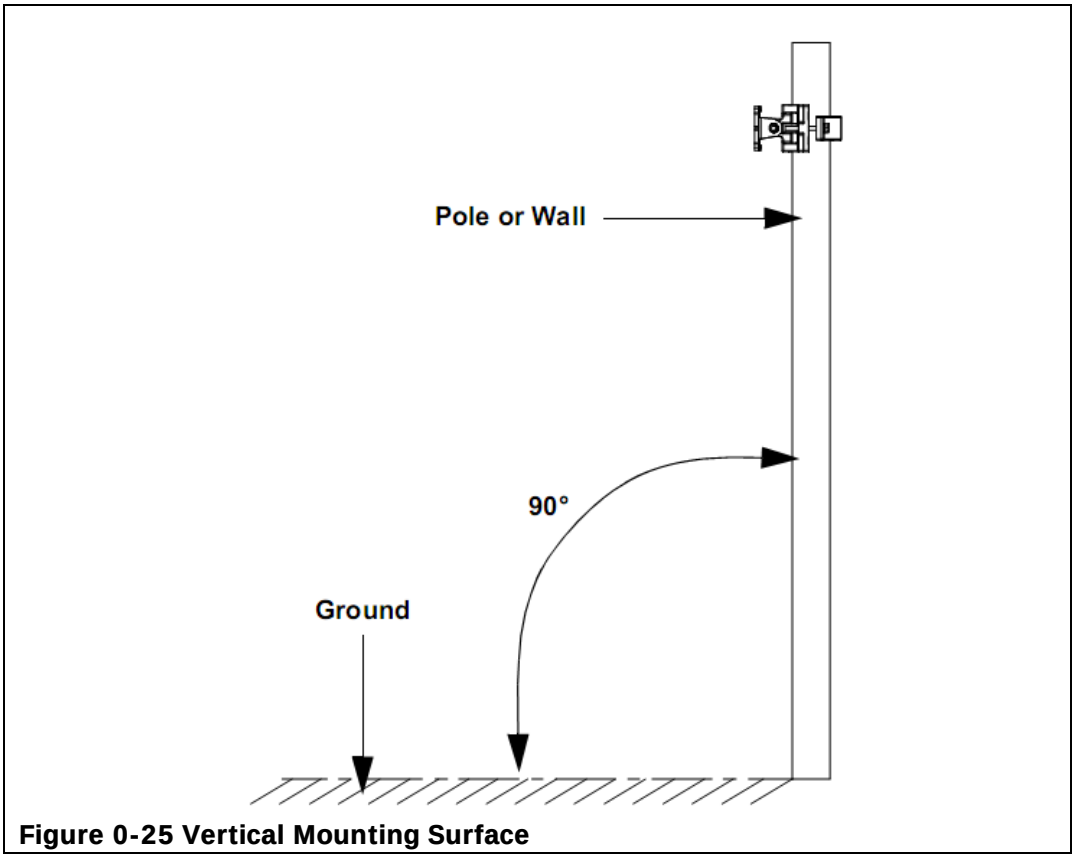


Figure 0-25 Vertical Mounting Surface

1.22 Cabling the Base Station

Once you have installed and mounted all of your Libra MAX-58 base station equipment, you will need to connect all of the cables required to power the units and transmit the data. This will require that you connect all of the power and data cables to the base station's indoor unit, then connect all of the cables between the indoor unit and the outdoor unit, then finally connect the cables between the outdoor unit and the antenna.

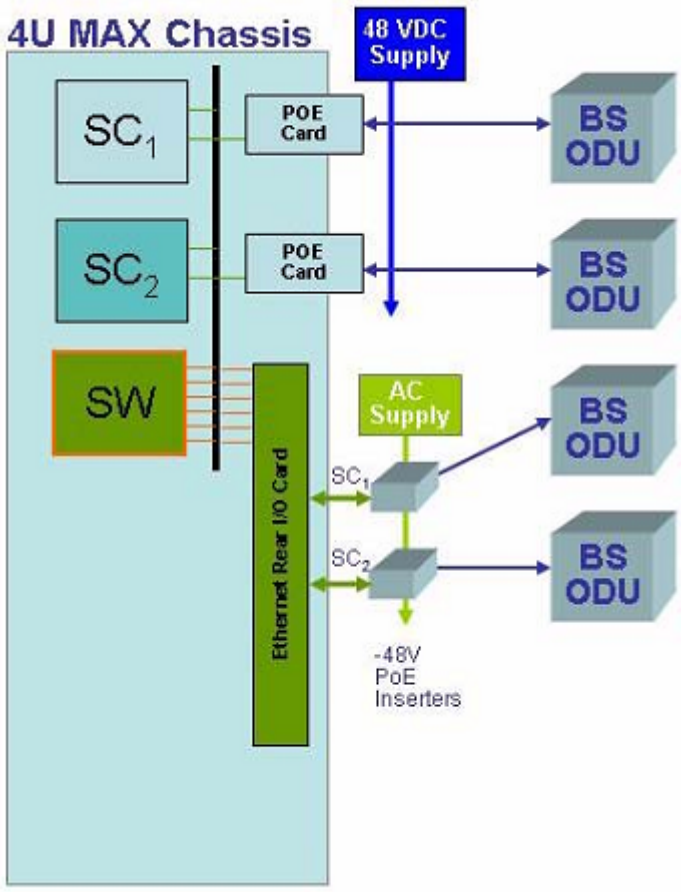


Figure 0-26 Libra MAX-58 Base Station Layout Diagram

A Libra MAX-58 BS ODU can be connected to the Indoor Unit (IDU chassis) in one of two ways. One way is to connect the ODU directly to the chassis using the PoE cards with power provided by the 48V power supply. The other method is to connect the BS ODU to the switch fabric card with power supplied by an External PoE injector. The following layout diagram shows both of these options. The two different cabling options are further explained with lightning and surge protection in the diagrams that follow.

The following sections set out the steps that you should follow in order to install the cables needed by your Libra MAX-58 base station. When you have completed cabling your Libra MAX-58 cable connections should resemble those shown in the following drawing.

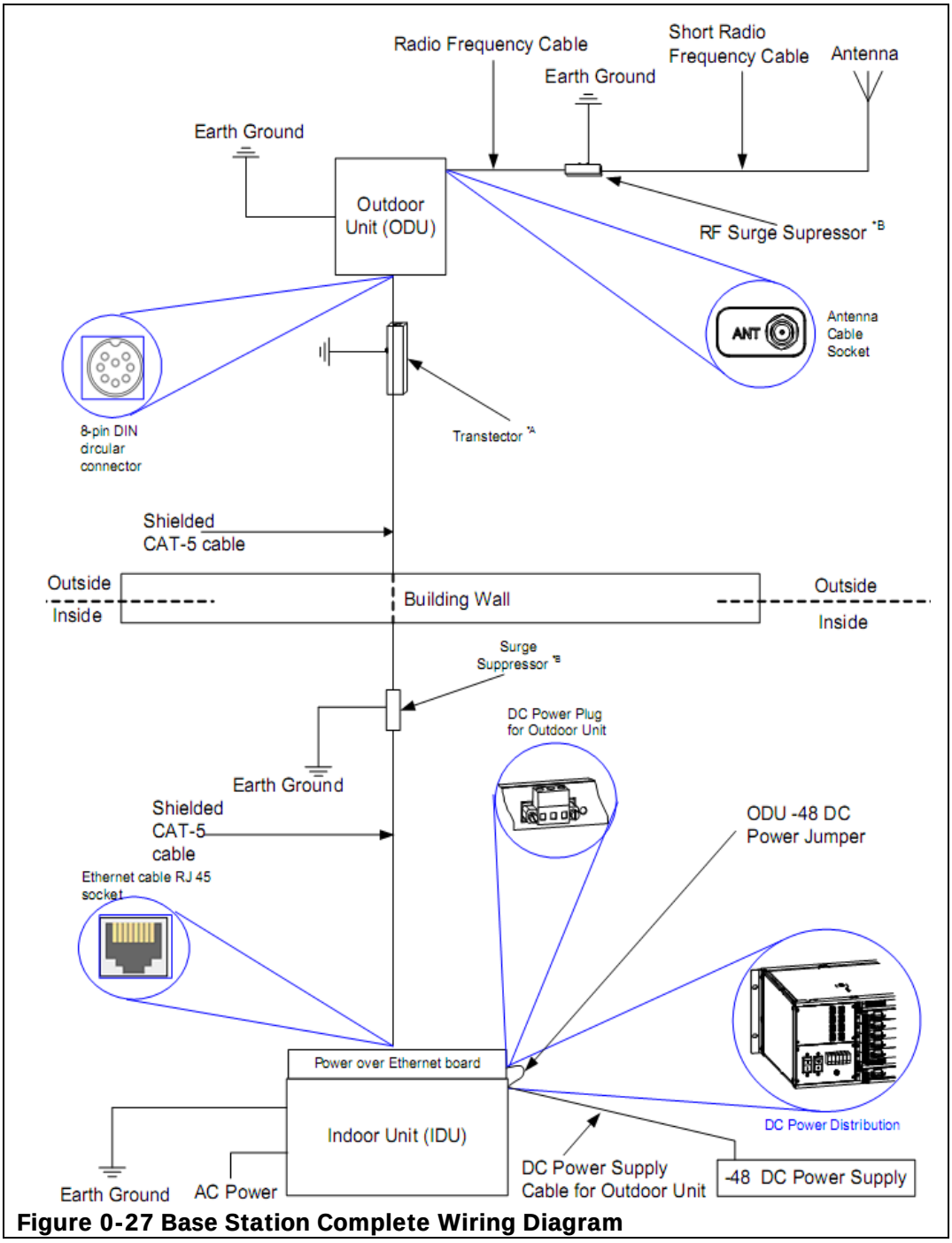


Figure 0-27 Base Station Complete Wiring Diagram

Tag	EION Part Number	Description	Manufacturer
A	1220-0041	Surge Arrester Ethernet Outdoor	Transtector
B		Surge Arrester	Huber and Suhner

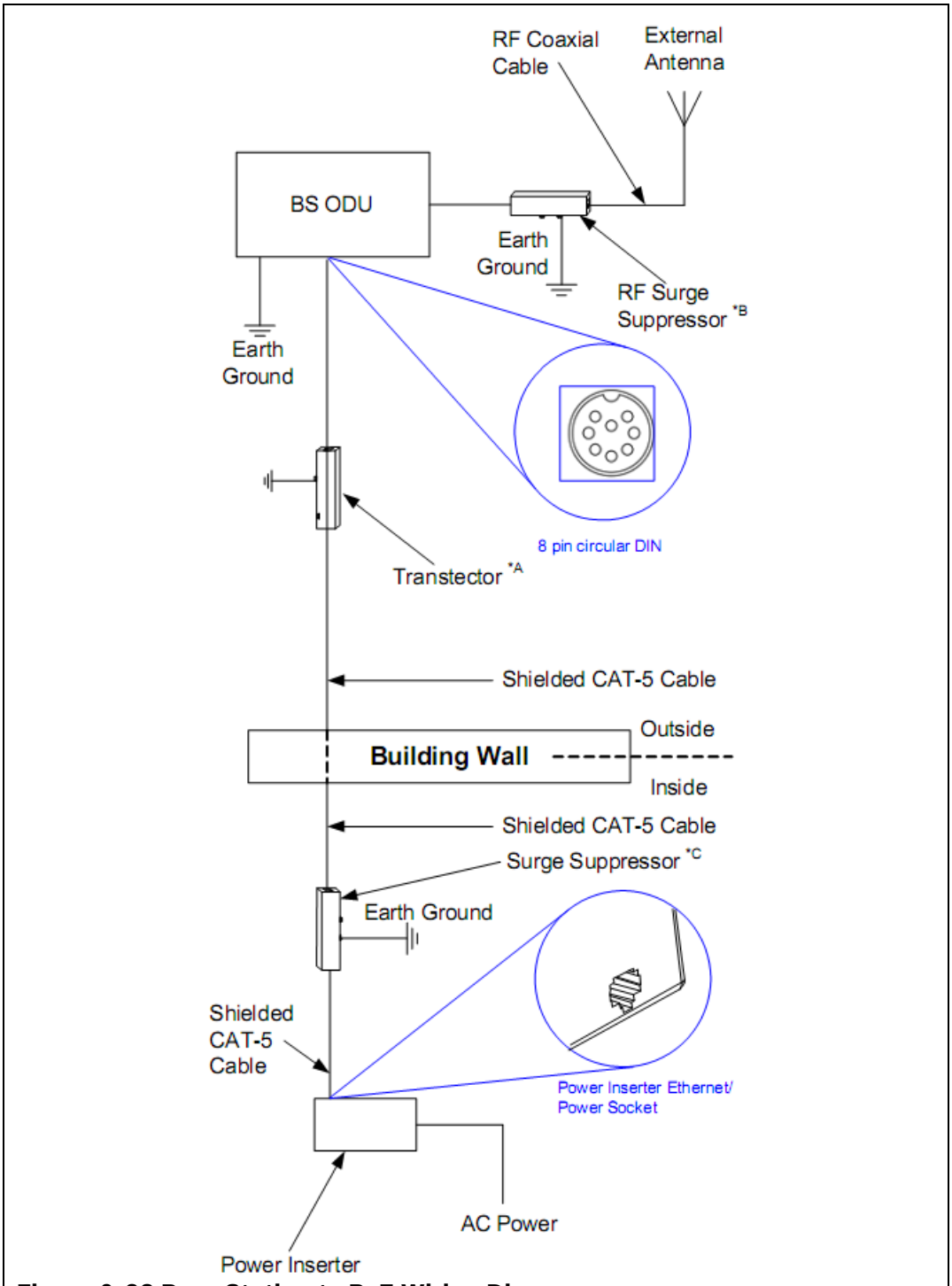


Figure 0-28 Base Station to PoE Wiring Diagram

Tag	EION Part Number	Description	Manufacturer
A	1220-0041	Surge Arrester Ethernet Outdoor	Transtector
B		Surge Arrester	Huber and Suhner
C	1220-0042	10/100Base-T Shield Surge Suppressor	Huber and Suhner

1.23 Weatherproofing Cable Connections

One task that is extremely important is weatherproofing the connections between your cable and an outdoor unit or antenna. Not only does this prevent corrosion and keep water from interfering with the connection, it also aids in keeping the connection tight.

In general, you will weatherproof two types of connection, cable to outdoor unit or antenna and cable to cable.

1.23.1 Cable to Outdoor Unit Connections

Most antenna or outdoor unit problems are caused by coaxial cable connections that loosen due to vibration, allowing moisture to penetrate the connector interface. EION recommends that all outdoor unit to cable connections be weatherproofed using a procedure similar to the one described below.

Fasten connectors securely together, as shown in below. Ensure the connector and cables are free of foreign substances such as oil, water, grease, dirt, etc.

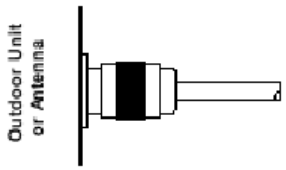


Figure 0-29 Secure Connector

Tightly wrap two (2) layers of rubber splicing tape over the connection extending one (1) inch (2.54 cm) beyond the connectors and overlapping the tape on each turn, as shown below.

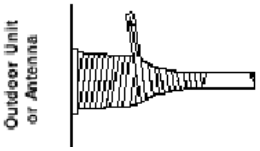


Figure 0-30 Wrap two layers of rubber tape

Tightly wrap two (2) layers of electrical tape over the rubber splicing tape extending one (1) inch (2.54 cm) beyond the rubber splicing tape, as shown below.

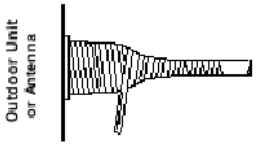


Figure 0-31 Wrap two layers of electrical tape

1.23.2 Cable to Cable Connections

Problems that occur in coaxial cable connections are often due to moisture penetration and corrosion in loose connections, caused by vibration. EION recommends that all cable to cable connections be weatherproofed using a procedure similar to the one described below.

Fasten connectors securely together, as shown below. Ensure the connector and cables

are free of foreign substances such as oil, water, grease, dirt, etc.

Figure 0-32 Secure connection

Tightly wrap two (2) layers of rubber splicing tape over the connection extending one (1) inch (2.54 cm) beyond the connectors and overlapping the tape on each turn, as shown below.

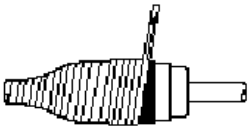


Figure 0-33 Wrap two layers of rubber splicing and electrical tape

Tightly wrap two (2) layers of electrical tape over the rubber splicing tape extending one (1) inch (2.54 cm) beyond the rubber splicing tape, as shown below.

1.24 Installing a Drip Loop

Another preventative measure that you can perform is to install a drip loop, as shown in the figure below. Drip loops should be incorporated into the cable before it is connected to outdoor devices, such as outdoor units, antennas, etc. For example, if you are installing one of the cables that run between the indoor unit and outdoor unit, you may want to install a drip loop in the cable immediately before it enters the building.

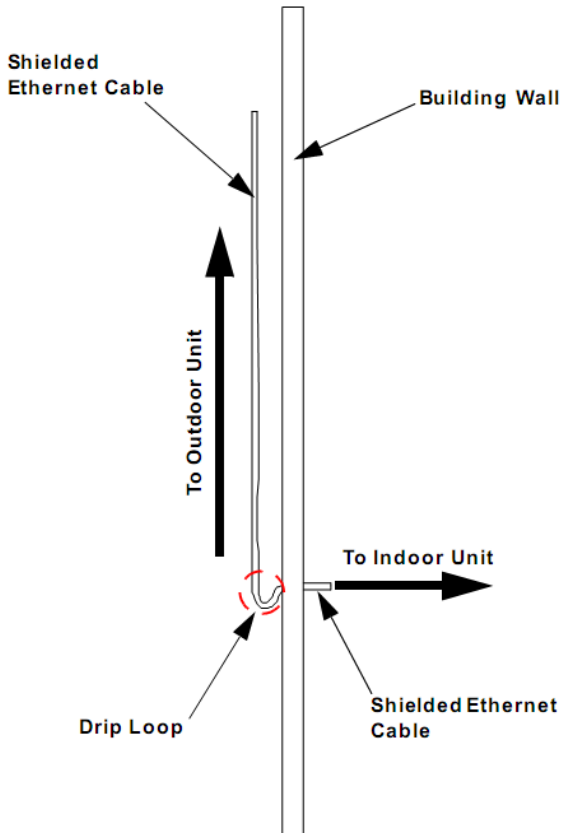


Figure 0-34 Cable Drip Loop

Drip loops should be incorporated into a system's external cabling at any point where a connection is made. Some examples of where a drip loop should be used are:

- cable to outdoor unit connection
- cable to antenna connection
- cable to cable connection
- the junction where a cable enters a building or structure
- a common grounding junction box or bar

1.25 Cabling the Indoor Unit

Your first task in cabling your Libra MAX-58 base station is to connect all of the wires and cables to your indoor unit. To cable your indoor unit:

Connect the PoE translation card's power plug to the DC power supply leads, as shown in the figure on the next page.

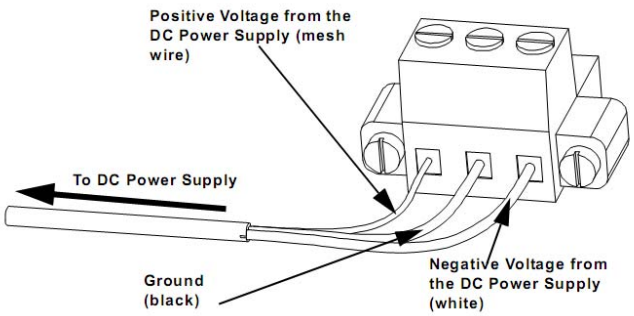


Figure 0-35 Wiring the PoE Card Power Plug

Connect the power plug to the PoE translation card, as shown in the figure below.

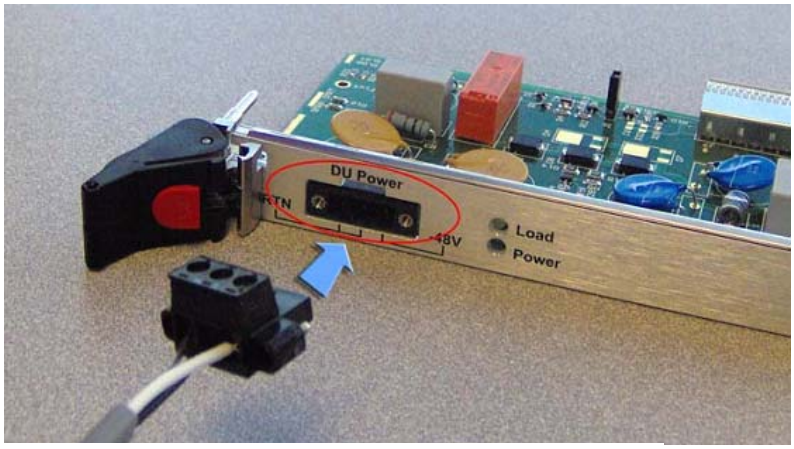


Figure 0-36 Plugging the DC Power Plug Into the PoE Card

Connect the Ethernet cable to the PoE card, as shown in the figure below.

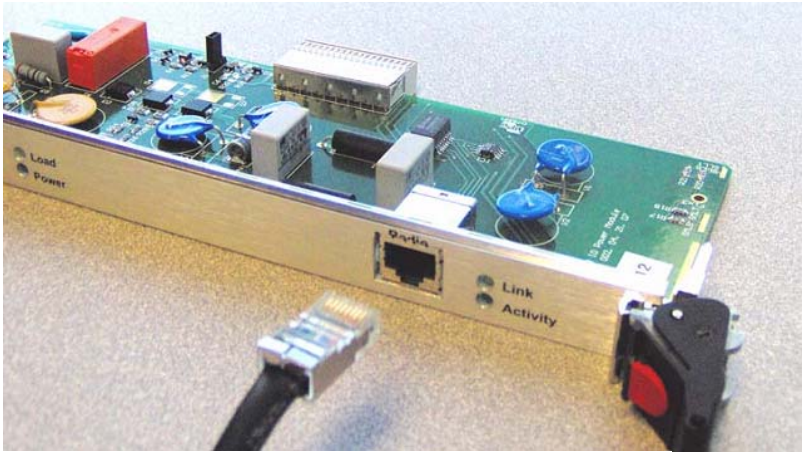


Figure 0-37 Connecting the Ethernet Cable to the PoE Card

Plug the DC power supply's power cord into your power bar or an Uninterruptible Power Supply (UPS).

If using the EION switch fabric card, the power is supplied to the ODU using an external power supply connected to an AC power source.

1.26 Cabling to the Outdoor Unit

Once you have finished cabling your indoor unit, you will need to run your cables and connect them to the outdoor unit. To cable your outdoor unit:

Run the Ethernet cable from the inside of your site, through your building wall opening, to the outside of your building. How the cable will be run will depend on the strategy you used to create the building opening and, as such, cannot be defined here.

Connect the Ethernet cable to the outdoor unit 8-pin DIN female circular connector, as shown in the figure below.

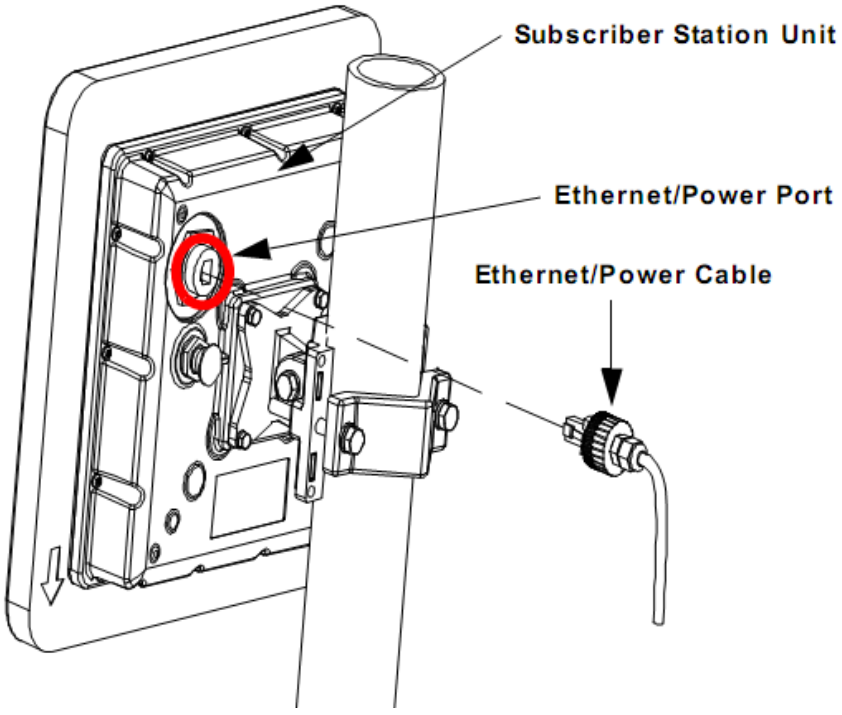


Figure 0-38 Connecting the Ethernet Cable to the ODU

Weatherproof the connection, as described above.

1.27 Cabling to the Antenna

To connect the radio frequency cable between the base station's outdoor unit and the antenna, perform the following steps:

1. Connect the radio frequency cable to the outdoor unit socket labeled ANT.
2. Weatherproof the cable connection, as outlined on page 44 above.
3. Connect the surge suppressor to the cable, per the manufacturer's instructions. Selection of the lightning protector should be of the Non DC Pass as this will also aid in the prevention of static discharge damaging the equipment or degrading performance by introducing noise to the receiver portion of the outdoor unit.
4. Weatherproof the suppressor connection, as outlined on page 44 above.
5. Connect the cable from the surge suppressor to the antenna, per the manufacturer's instructions.
6. Weatherproof the suppressor connection, as outlined on page 44 above.

7. Ground the suppressor to a common earth ground, per the manufacturer's instructions. RF cable sections (before and after the suppressor) should be kept as short as possible.

1.28 Connecting the Ethernet Cable

You will need to connect your base station to your network via Ethernet. Connect an Ethernet cable to your base station to either of the two ports shown shown below. If you are connecting your base station's Ethernet port directly to a computer, you will need to use a cross-over cable for the connection.

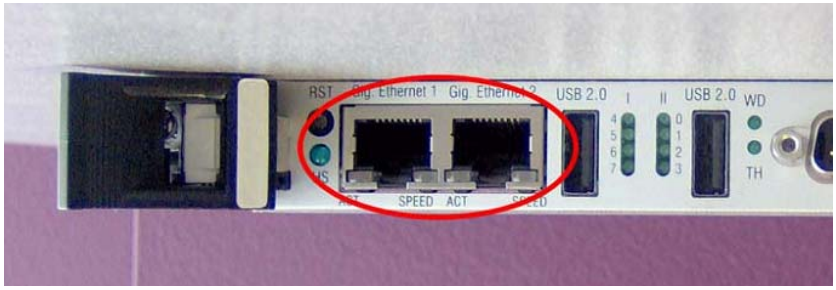


Figure 0-39 Connecting an Ethernet Cable to the Sector Card's Ethernet Port

1.29 Powering on the Base Station

Once all of the equipment has been installed and cabled, you should connect the power to the base station and power it on to check that all components are operating correctly.

You can use either AC or DC power for your base station, depending on your needs and the chassis you choose to use.

1.29.1 AC Power

The AC chassis requires that you use both AC and DC to power the base station chassis and components. AC is used to power the chassis itself and all of the cards installed in it, through the built-in power supplies. The DC is used to provide the -48V power to the outdoor units, through the PoE card or cards.

To plug your base station into an AC mains outlet:

1. Plug the AC power cord into the indoor unit chassis' AC power socket, as shown below.

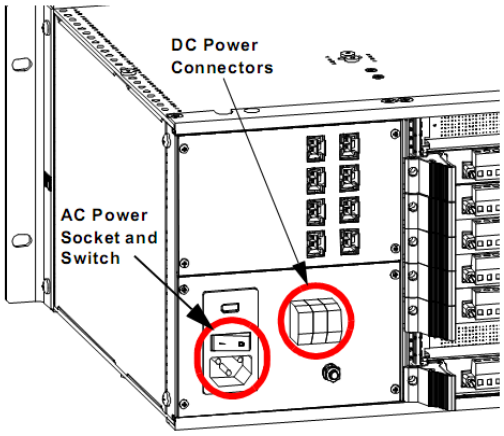


Figure 0-40 AC Power Socket

2. Connect the DC power cord(s) from the DC power supply to the indoor unit chassis' DC Power Connectors, shown in Figure 0-40 AC Power Socket.
3. Plug the AC power cord into your power bar or UPS. Make certain that your power bar or UPS is plugged into the AC wall outlet.
4. Turn on the indoor unit chassis power switch, shown in the above figure. When the base station is first powered up, it takes roughly four (4) minutes for the sector card to boot up. You cannot use the sector card until it has booted up completely.

1.29.2 DC Power

The DC variant of the indoor unit's chassis does not need any AC power to operate, it only uses -48V DC power. You will, however, need to run a power jumper from the DC power distribution panel sockets to the PoE card DC power sockets before you can use the base station.

To plug your base station into a DC mains outlet:

1. Run a patch cord from each one of the DC power distribution panel sockets to one of the PoE card DC power sockets, shown in Figure 0-41 DC Power Sockets below. Make certain that you connect all of the installed PoE cards to the DC power sockets.

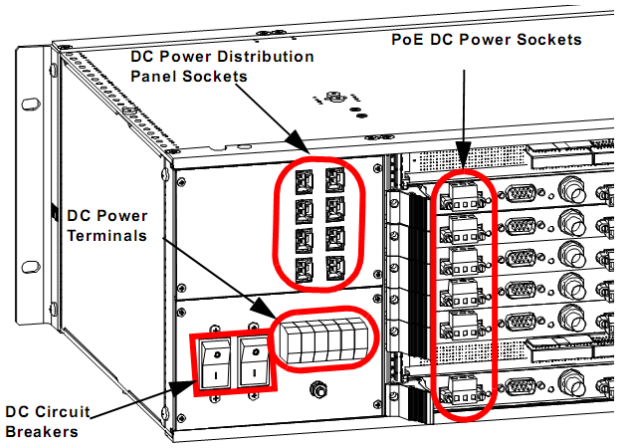


Figure 0-41 DC Power Sockets

2. Connect the DC power cord(s) from the DC power supply to the indoor unit chassis' DC Power Terminals, shown above.
3. Turn on the indoor unit chassis circuit breakers, shown above. When the base station is first powered up, it takes roughly four (4) minutes for the sector card to boot up. You cannot use the sector card until it has booted up completely.

Rapid Backhaul System Installation

This chapter discusses how to install your Libra MAX-58 base station equipment. There are four general tasks that you will need to perform when you install your Libra MAX-58 base station. They are:

1. RBS unit installation
2. mounting the antenna
3. cabling the RBS

Please review the Pre-installation chapter before you begin installing your equipment.

1.30 Installing the RBS Unit

Before you begin, review the material in the Pre-installation chapter of this manual and make certain that you have met all of the conditions laid out there. Also, you should make certain that all of the necessary brackets and bolts are included in the box with your RBS unit.

1.30.1 Pole-mounting the RBS Unit

To mount your RBS on a pole:

1. Mount the bracket on the pole.
   1.1. Place the back of the bracket against the pole, as shown.

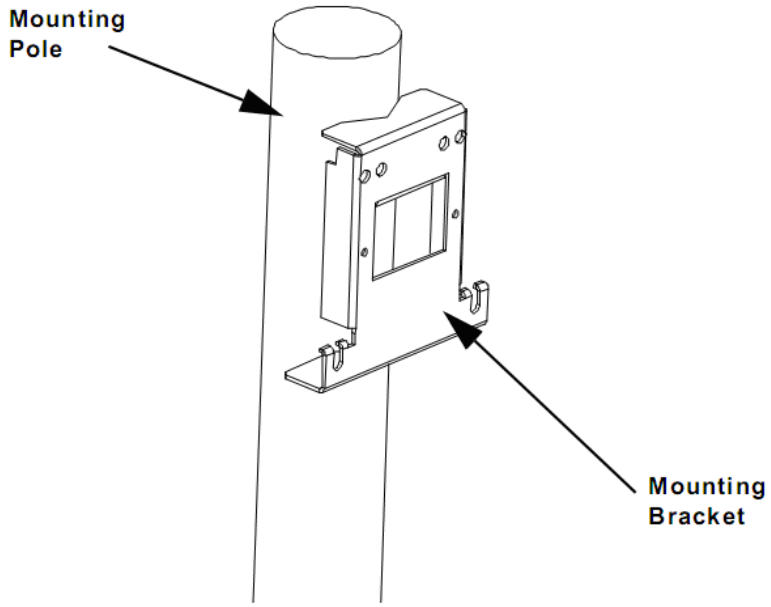


Figure 0-1 The RBS Mounting Bracket Against Pole

1.2. Slide the U-bolt around the pole and fit the threaded ends through the holes in the bracket, as shown below.

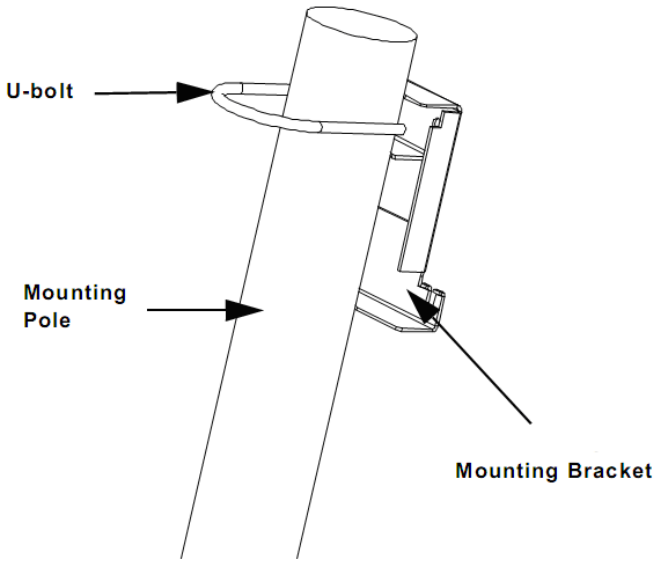


Figure 0-2 Installing the RBS Mounting Bracket U-bolt

1.3. Place the washers on the U-bolt's threaded ends and thread the nuts onto the U-bolt, as shown in the following figure.

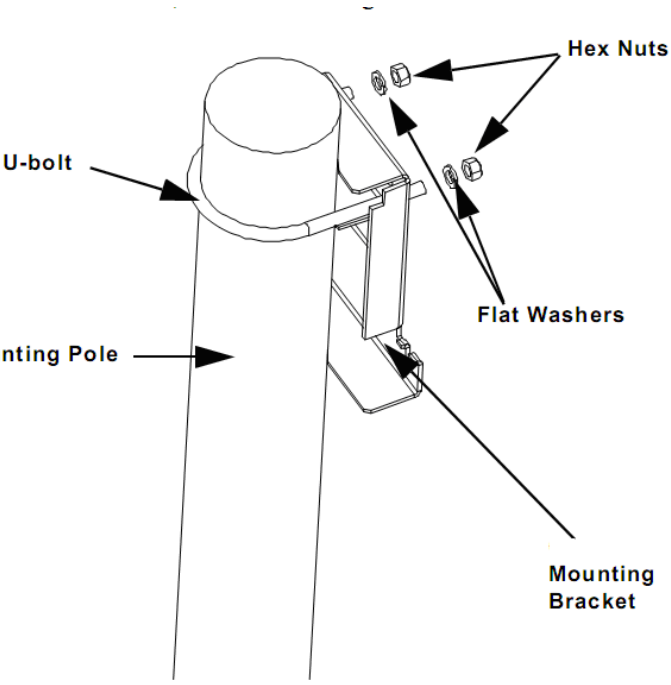


Figure 0-3 Fixing the Hex Nuts to the U-bolt

1.4. Tighten the two nuts against the RBS unit's body. The minimum pole diameter 1 inches and the maximum is 4 inches.

2. Mount the RBS unit to the bracket.

2.1. Hang the RBS unit on the front of the bracket by sliding the installation handle bolted to the back into the opening on the face of the bracket.

Make certain that the two bolts in the middle, on the back of the RBS unit's housing are sitting securely in the bolt slots at the bottom of the bracket.

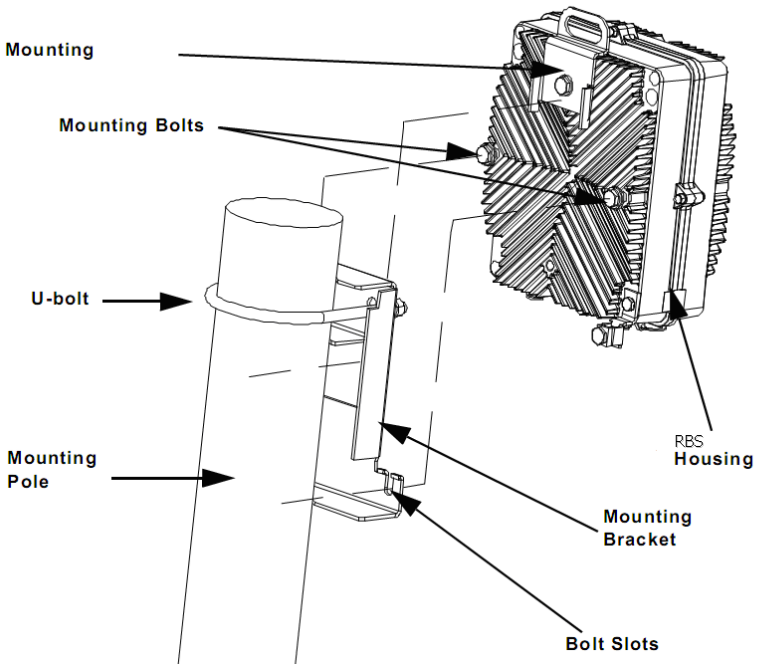


Figure 0-4 Handing the RBS Unit on the Mounting Bracket

2.2. Tighten the two lower bolts.

2.3. Thread the nylon vibration bolt through the back of the bracket and tighten it against the unit's body until it will not tighten any further. Setting this anti-vibration bolt is important to prevent any noise due to wind vibration.

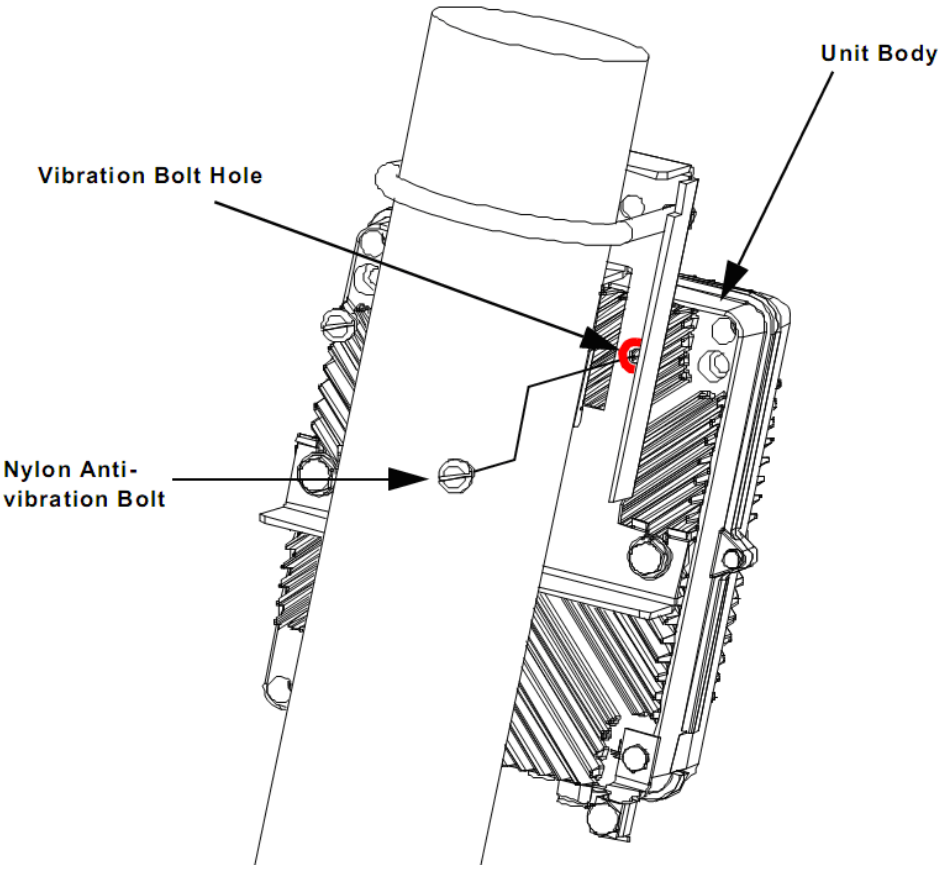


Figure 0-5 Installing the Nylon Anti-vibration Bolt

3. Ground the RBS unit.

   3.1. Strip roughly one (1) inch (2.54 cm) of insulation from one end of your grounding cable. The cable that you use for grounding your RBS unit should be at least a 6 AWG cable.

   3.2. Insert the bare end of the grounding cable in the grounding lug of the RBS unit, as shown.

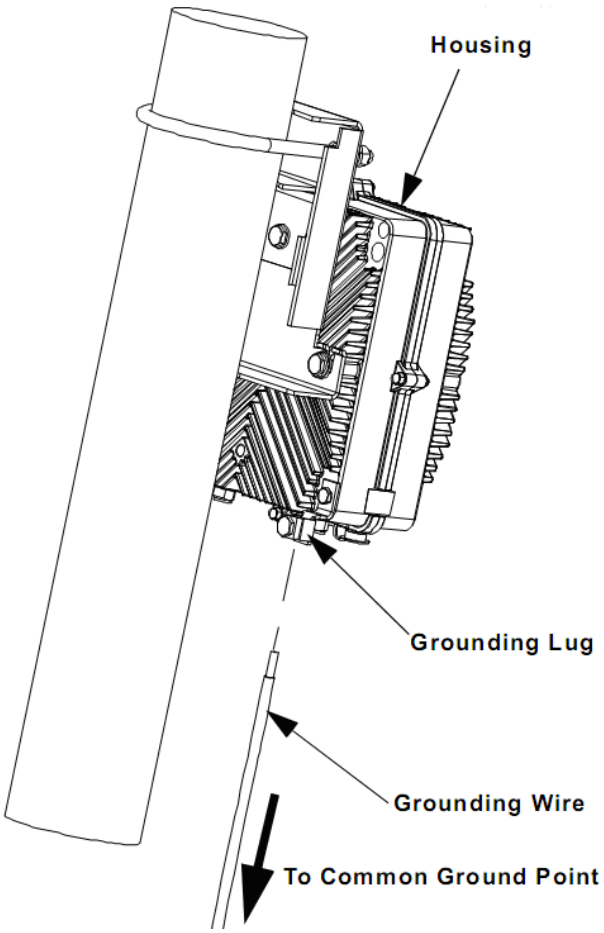


Figure 0-6 Grounding the RBS Unit

3.3. Once you have inserted the grounding cable in the grounding lug, tighten the bolt.

3.4. Connect the other end of the grounding cable to your common earth ground.

How you connect your grounding cable to a common earth ground will depend on how you have prepared the installation site and where the RBS unit is installed. For more information on RBS grounding requirements, refer to the RBS Unit Grounding section of this manual.

1.30.2 Wall-mounting the RBS Unit

To mount your RBS unit to a wall:

2. Prepare the wall to hold the mounting bracket, similar to the wall mount shown below. The type of mount you create will depend upon the type of wall surface and material your wall is made of. It may be that you only need to drill holes and insert bolt anchors, or you may have to fabricate a strong mount that will withstand the RBS's weight, outside temperature change, or other variables.

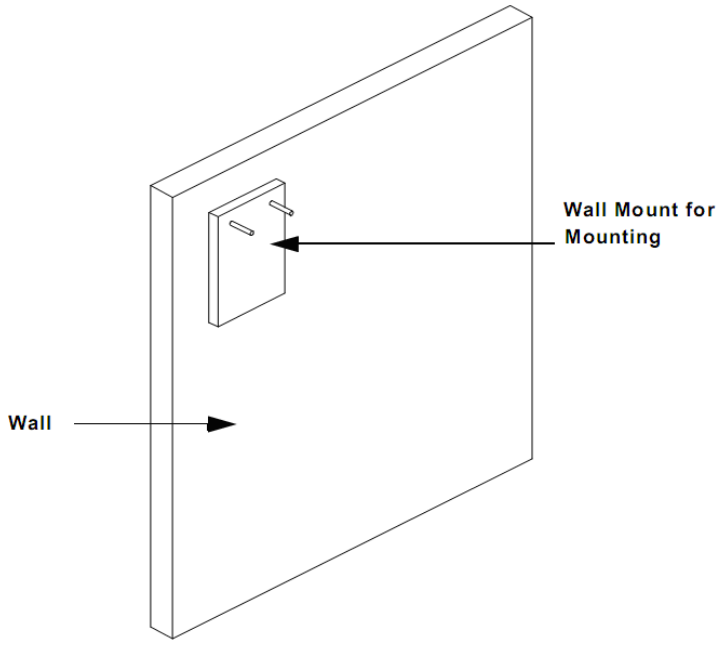


Figure 0-7 Wall Mount to Receive RBS Mounting Bracket

3. Mount the bracket on the wall.

   3.1. Place the back of the bracket against the wall mount.

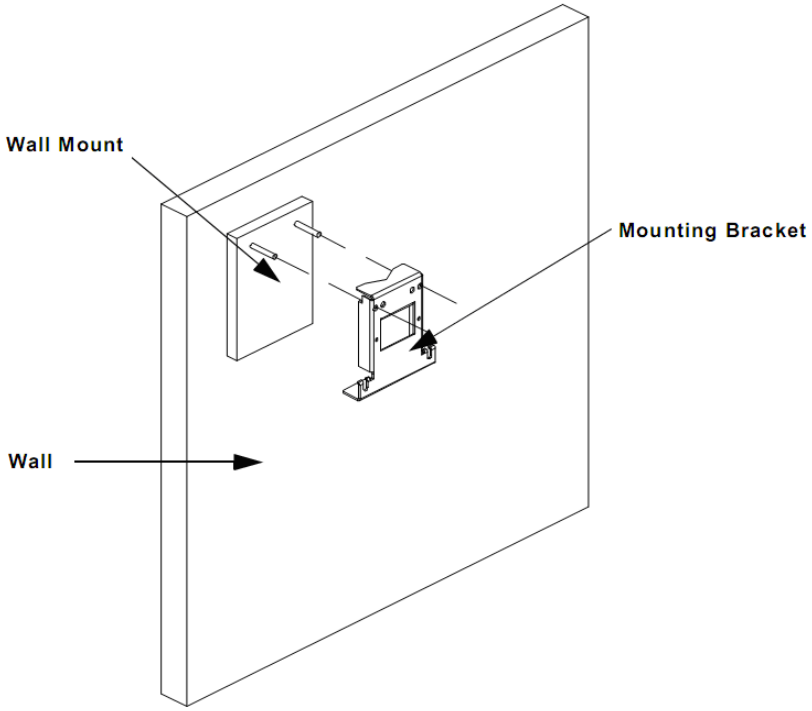


Figure 0-8 RBS Mounting Bracket against Wall

   3.2. Secure the mounting bracket to the wall, using the necessary bolts, nuts, or other fixtures.

4. Mount the RBS to the bracket.

   4.1. Hang the RBS on the front of the bracket by sliding the installation handle

into the opening on the face of the bracket. Make certain that the two bolts in the middle, on the back of the RBS's housing are sitting securely in the bolt slots at the bottom of the bracket.

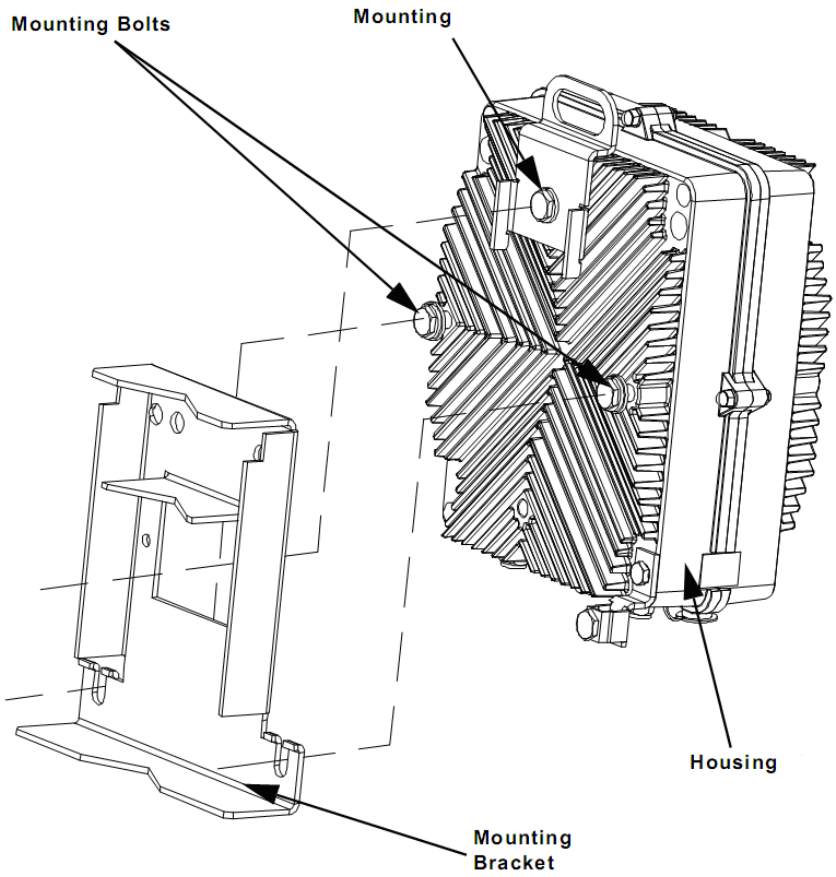


Figure 0-9 Handing the RBS on the Wall Mounting Bracket

4.2. Tighten the two lower bolts.

5. Ground the RBS.

5.1. Strip roughly one (1) inch (2.54 cm) of insulation from one end of your grounding cable. The cable that you use for grounding your RBS should be at least a 6 AWG cable.

5.2. Insert the bare end of the grounding cable in the grounding lug of the RBS, as shown in the next diagram.

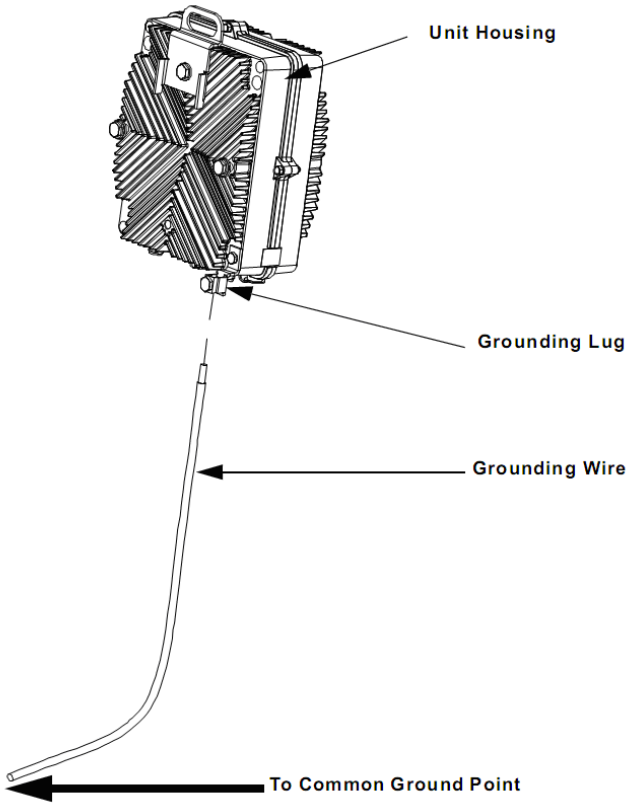


Figure 0-10 Grounding the RBS

5.3. Once you have inserted the grounding cable in the grounding lug, tighten the bolt.

5.4. Connect the other end of the grounding cable to your common earth ground.

How you connect your grounding cable to a common earth ground will depend on how you have prepared the installation site and where the RBS unit is installed. For more information on RBS unit grounding requirements, refer to the RBS Grounding section of this manual.

1.31 Antenna Mounting Guidelines

It is essential that you properly install your RBS's antenna. This ensures that your system is operating at optimum performance and aids in protecting it against lightning damage.

To correctly install your antenna, it is very important that you follow your antenna manufacturer's installation instructions closely. In addition, keep the following guidelines and practices in mind while performing your installation.

1.31.1 Mounting the Structure

Make certain that the mounting structure (i.e.: pole mount, wall mount, etc.) is perpendicular to the horizontal, as shown below. This is essential, because the antenna's mechanical tilt indicator or indicators rely on using a vertical mounting surface for its reference point. The degree of vertical accuracy should be checked and,

if necessary, corrected prior to the installation of the antenna. The mounting surface's vertical angle can be verified using a level or angle indicator.

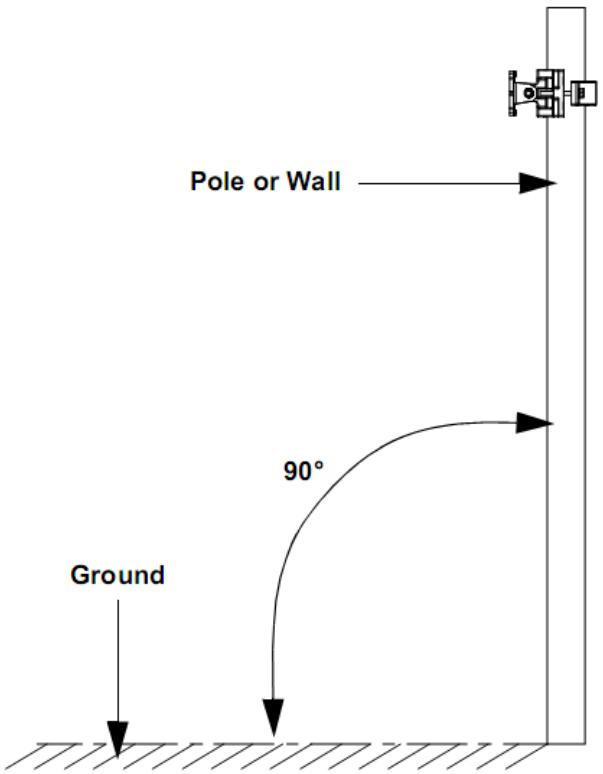


Figure 0-11 Vertical Mounting Surface

1.32 Cabling the RBS

Once you have installed and mounted all of your Libra MAX-58 RBS equipment, you will need to connect all of the cables required to power the units and transmit the data. This will require that you connect all of the power and data cables to the RBS and connect the cables between the RBS and the antenna.

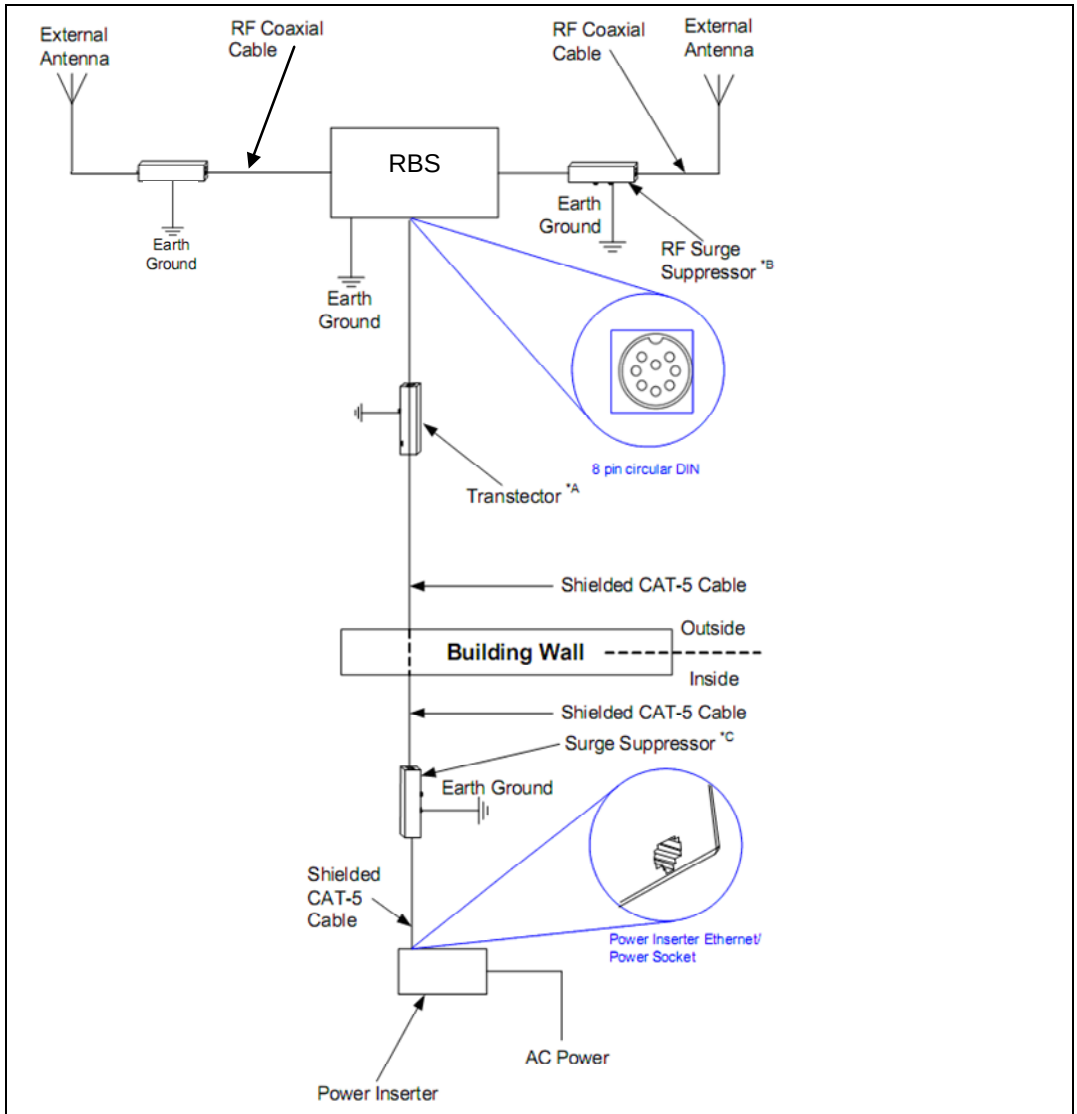


Figure 0-12 RBS to PoE Wiring Diagram

Tag	EION Part Number	Description	Manufacturer
A	1220-0041	Surge Arrester Ethernet Outdoor	Transtector
B		Surge Arrester	Huber and Suhner
C	1220-0042	10/100Base-T Shield Surge Suppressor	Huber and Suhner

1.33 Weatherproofing Cable Connections

One task that is extremely important is weatherproofing the connections between your cable and an RBS or antenna. Not only does this prevent corrosion and keep water from interfering with the connection, it also aids in keeping the connection tight.

In general, you will weatherproof two types of connection, cable to RBS unit or antenna and cable to cable.

1.33.1 Cable to RBS Connections

Most antenna or radio problems are caused by coaxial cable connections that loosen due to vibration, allowing moisture to penetrate the connector interface. EION recommends that all RBS to cable connections be weatherproofed using a procedure similar to the one described below.

Fasten connectors securely together, as shown in below. Ensure the connector and cables are free of foreign substances such as oil, water, grease, dirt, etc.

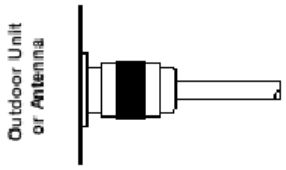


Figure 0-13 Secure Connector

Tightly wrap two (2) layers of rubber splicing tape over the connection extending one (1) inch (2.54 cm) beyond the connectors and overlapping the tape on each turn, as shown below.

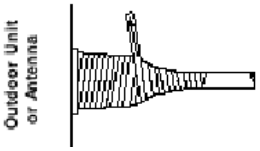


Figure 0-14 Wrap two layers of rubber tape

Tightly wrap two (2) layers of electrical tape over the rubber splicing tape extending one (1) inch (2.54 cm) beyond the rubber splicing tape, as shown below.

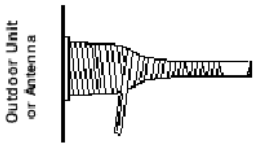


Figure 0-15 Wrap two layers of electrical tape

1.33.2 Cable to Cable Connections

Problems that occur in coaxial cable connections are often due to moisture penetration and corrosion in loose connections, caused by vibration. EION recommends that all cable to cable connections are weatherproofed using a procedure similar to the one described below.

Fasten connectors securely together, as shown below. Ensure the connector and cables are free of foreign substances such as oil, water, grease, dirt, etc.

Figure 0-16 Secure connection

Tightly wrap two (2) layers of rubber splicing tape over the connection extending one (1) inch (2.54 cm) beyond the connectors and overlapping the tape on each turn, as shown below.

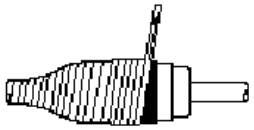


Figure 0-17 Wrap two layers of rubber splicing and electrical tape

Tightly wrap two (2) layers of electrical tape over the rubber splicing tape extending one (1) inch (2.54 cm) beyond the rubber splicing tape, as shown below.

1.34 Installing a Drip Loop

Another preventative measure that you can perform is to install a drip loop, as shown in the figure below. Drip loops should be incorporated into the cable before it is connected to outdoor devices, such as outdoor units, RBS, antennas, etc. For example, if you are installing one of the cables that run indoors from an RBS, you may want to install a drip loop in the cable immediately before it enters the building.

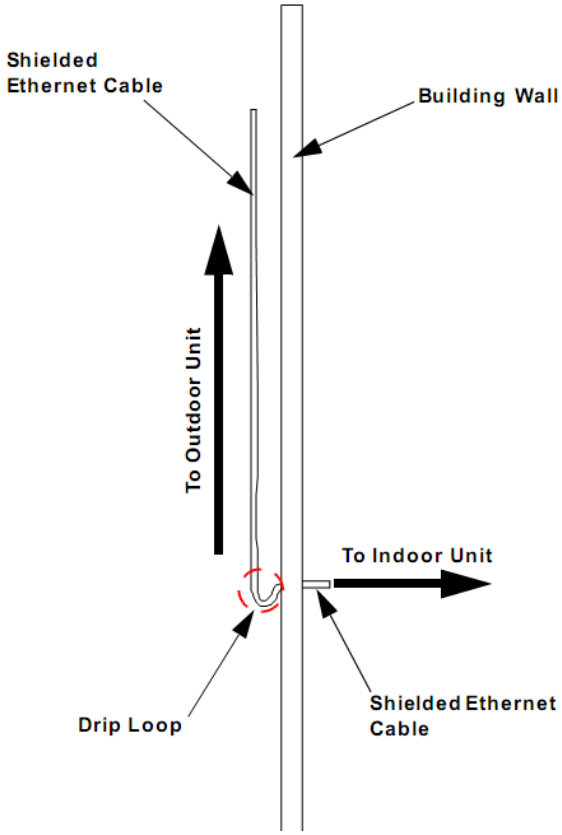


Figure 0-18 Cable Drip Loop

Drip loops should be incorporated into a system's external cabling at any point where a connection is made. Some examples of where a drip loop should be used are:

- cable RBS connection
- cable to antenna connection
- cable to cable connection
- the junction where a cable enters a building or structure

- a common grounding junction box or bar

1.35 Cabling to the RBS

To cable your RBS unit:

Run the Ethernet cable from the inside of your site, through your building wall opening, to the outside of your building. How the cable will be run will depend on the strategy you used to create the building opening and, as such, cannot be defined here.

Connect the Ethernet cable to the RBS unit 8-pin DIN female circular connector, as shown in the figure below.

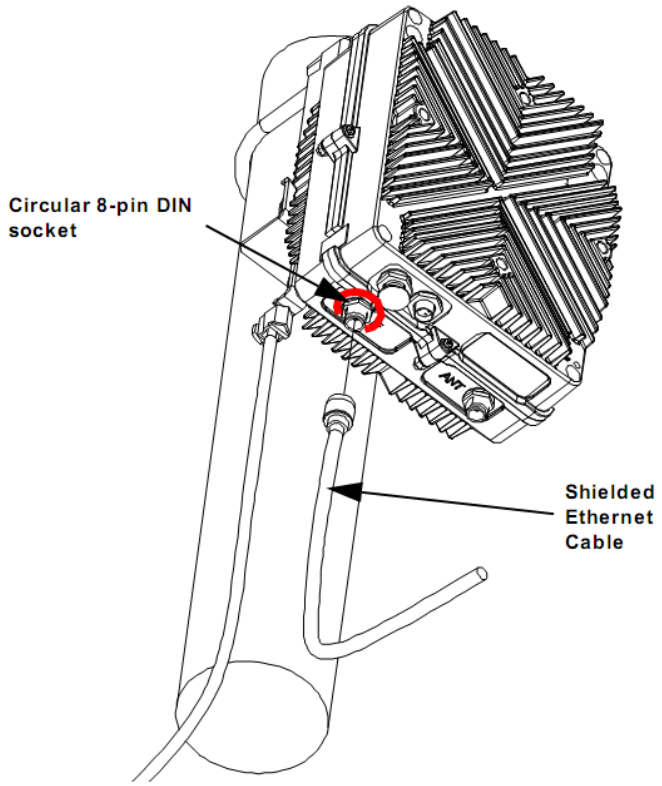


Figure 0-19 Connecting the Ethernet Cable to the RBS

Weatherproof the connection, as described above.

1.36 Cabling to the Antenna

To connect the radio frequency cable between the RBS unit and the antenna, perform the following steps:

8. Connect the RF cable for the antenna that is pointing at a subscriber station to the RBS socket labeled ANT.
9. Connect the RF cable for the antenna that is pointing at a Base Station to the RBS socket labeled IF.
10. Weatherproof the cable connection, as outlined on page 44 above.
11. Connect the surge suppressor to the cable, per the manufacturer's instructions. Selection of the lightning protector should be of the Non DC Pass as this will

also aid in the prevention of static discharge damaging the equipment or degrading performance by introducing noise to the receiver portion of the RBS.

12. Weatherproof the suppressor connection, as outlined on page 44 above.
13. Connect the cable from the surge suppressor to the antenna, per the manufacturer's instructions.
14. Weatherproof the suppressor connection, as outlined on page 44 above.
15. Ground the suppressor to a common earth ground, per the manufacturer's instructions. RF cable sections (before and after the suppressor) should be kept as short as possible.

1.37 Powering on the RBS

Once all of the equipment has been installed and cabled, you should connect the power to the RBS and power it on to check that all components are operating correctly.

Base Station Configuration

1.38 Introduction

Libra MAX-58 Base Station Manager controls the operation and configuration of a Libra MAX-58 Base Station. It is administered over an Ethernet connection using a web-based GUI.

This chapter will cover the basic operation of the **Libra MAX-ODU 5800**, **Libra MAX-LT 5800 and the Base Station Portion of the Libra MAX-RBS 5800**.

1.38.1 Connect to the BS Manager

Requirements:

- PC running Windows
- Web browser (Internet Explorer or Firefox)
- Java

To connect to the Libra MAX-58 BS do the following:

1. Configure a PC in the same subnet as the Libra MAX-58 BS ODU.
2. Open Firefox web browser on the PC.
3. Type the following URL including the port into the address bar:

http://192.168.1.40:28086

Note: The IP Address listed above is the default value.

4. The BS Manager Login Screen (Figure 0-1) will appear. Log in with the following:

Username: root

Password: BS4400

NOTE: In older versions of the firmware the default password is “eionbs”

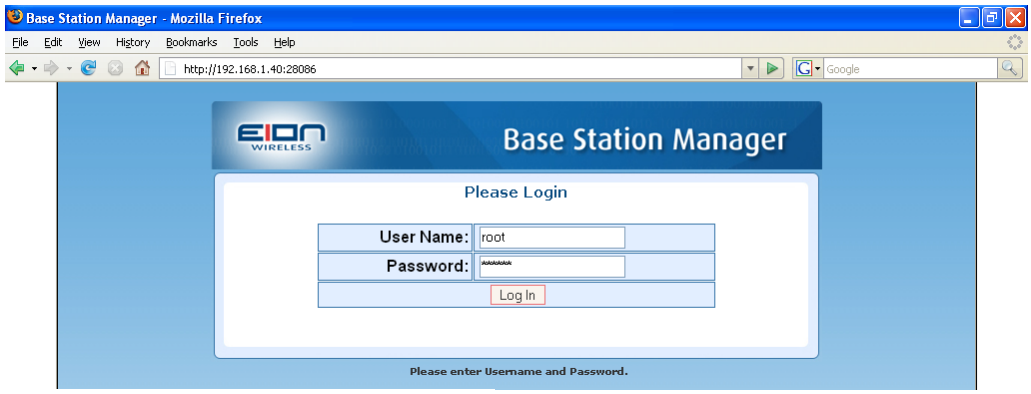


Figure 0-1: BS Manager Login Screen

5. After successful login the Post-login screen (Figure 0-2) appears.

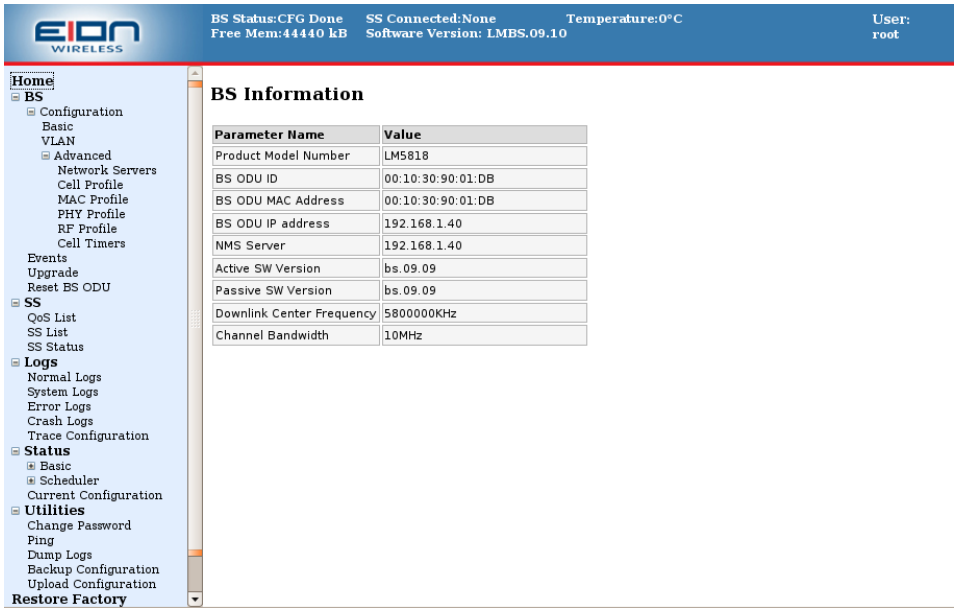


Figure 0-2: Post-login screen

1.38.2 Screen Layout

The NMS GUI is divided into four distinct areas (Figure 0-1 and Figure 0-3).

Left Panel: This area contains a hierarchical view of all the elements in the system. You can expand and collapse the sections by clicking on the '+' and '-' symbols beside each element icon.

Main Menu: Select different functions in the main menu

Main Screen: The main portion of the screen shows configuration settings, topological maps and performance charts.

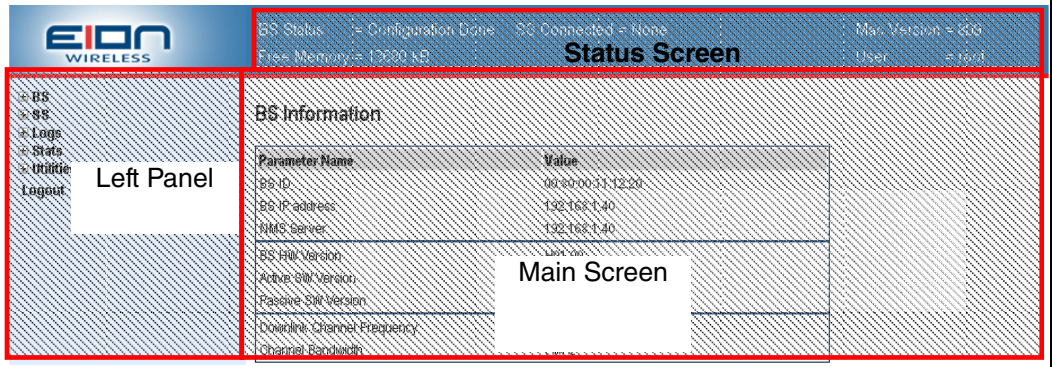


Figure 0-3: BS Manager Layout

Status Screen: Status screen displays the current status of the BS ODU. After successful configuration of the BS ODU, BS Status becomes 'Configuration Done'. This screen also displays other relevant information such as logged in user, current version of firmware and the number of connected subscriber stations if any.

Navigating Groups on Left Panel: Click on the '+' sign to the left of a group icon to expand the group. This will display relevant configuration tree for a group.

1.39 Base Station Configuration (BS)

1.39.1 Basic Configuration

This screen appears after clicking on 'BS', then on 'Configuration' and then on 'Basic'. It allows configuration of the following:

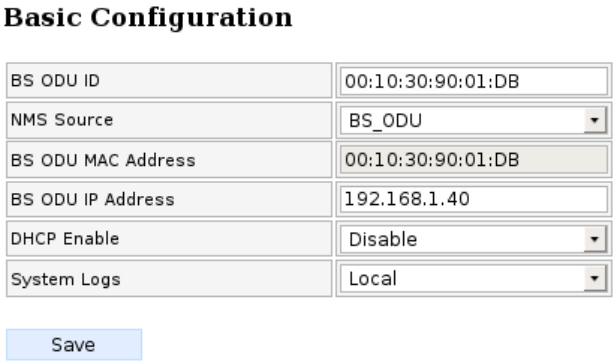


Figure 0-4: Basic Configuration

BS ODU ID – It is a globally unique numeric identifier for the BS ODU and hence the network. It is 6 bytes (48 bits) in length. This identifier has to be entered in the subscriber stations for them to communication with this particular BS. By default this is set as the MAC Address of the BS ODU. The Base Station must be rebooted for changes to the BS ODU ID to take effect.

NMS Source – It configures whether the NMS and AAA server to be used should be loaded from the BS ODU itself or a sector card with standalone NMS/AAA server. This has to be set to BS_ODU for MAX-LT. For MAX-HD it can be set to either BS_ODU or SECTOR_CARD as needed. The Base Station must be rebooted for changes to the NMS Source to take effect.

BS ODU MAC Address – It displays the MAC address of the active port of the BS ODU. This MAC address has to be configured into subscriber stations if you want them to specifically connect to the particular BS ODU of interest. MAC address is not configurable by user.

BS ODU IP Address – It is the IP of the active port of the BS ODU. IP address has to be in the same subnet as the subscriber station. The Base Station must be rebooted for changes to the BS ODU IP Address to take effect. Note that if the IP Address is changed, you will need to login using the newly configured IP address.

NOTE: The default BS ODU IP Address is 192.168.1.40

DHCP Enable – Setting it to 'Enable' activates a DHCP server in BS ODU so that subscriber stations associated with it can receive IP address automatically. It is disabled by default. The Base Station must be rebooted for changes to DHCP to take effect.

Syslogd – It configures where the log files for the BS ODU are stored. Its value is set to 'Local' by default. The Base Station must be rebooted for changes to the Syslogd to take effect.

1.39.2 VLAN Configuration

Currently the VLAN setting allows users to configure a management VLAN. This allows network administrators access to the management GUI over a specified VLAN.

Support of Management VLAN will prevent this and will allow access to the Base Station only from the specified VLAN (Management VLAN). So, the Base Station can be accessed and managed only from a system that is in the specified VLAN either on the Ethernet side of the Base Station or on any of the associated Subscriber Stations network. The following figure depicts this behavior when a Management VLAN is specified in the Base Station.

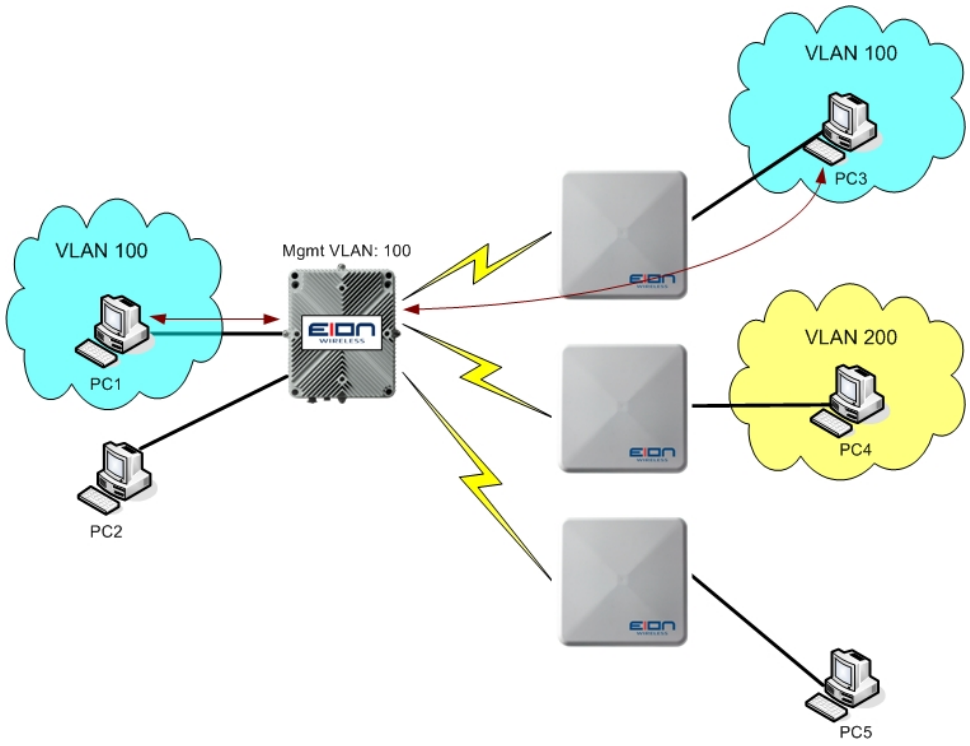


Figure 0-5: Base Station configured with a management VLAN

In the above figure, the Base Station is configured with a Management VLAN ID 100. So, only PC1 and PC3 that are part of VLAN 100 can access the Base Station. The other PCs cannot access the Base Station.

In the VLAN management screen, VLAN Management can be enabled or disabled and a Management VLAN ID can be configured. The default management VLAN ID is '1'. The allowed range of VLAN IDs is from 0 to 4092.

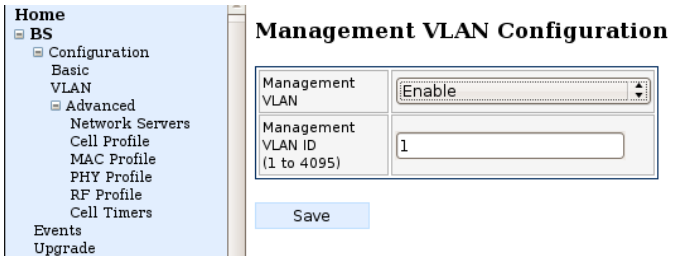


Figure 0-6: Management VLAN Configuration

1.39.3 Firmware Upgrade

The firmware for the Libra MAX Base Station (includes Libra MAX-LT, Libra MAX-HD ODU and the BS side of the Libra MAX-RBS) can be upgraded using the GUI. To access the firmware upgrade page, click on **"Upgrade"** in the **"BS"** menu. The following screen will appear;

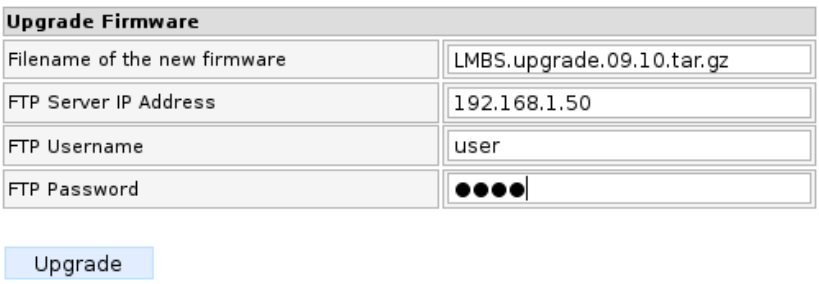


Figure 0-7: Upgrade Firmware Screen

IMPORTANT: In order to upgrade the firmware on the Base Station, the upgrade package must be placed on an FTP server that is accessible by the Base Station and the upgrade package must be in the root directory.

If upgrading from firmware version prior to v09.10.xx, a patch must first be applied for the upgrade procedure to work properly. First apply the patch file *"LMBS.patch.09.10.tar.gz"* using the regular upgrade process. When the upgrade is complete apply the full upgrade patch *"LMBS.upgrade.09.10.tar.gz"*

Upon successful firmware upgrade the base station will automatically reboot.

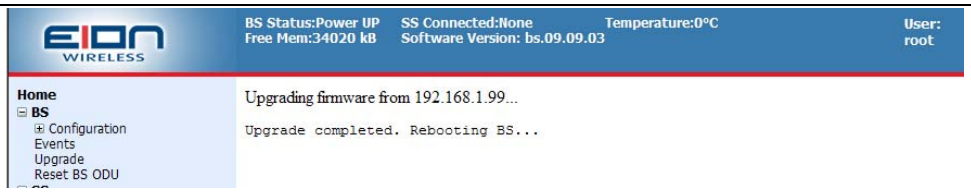


Figure 0-8: Upgrade Success

The upgrade process takes on average a total of three minutes with an average of two minutes of network downtime.

1.39.4 Advanced Configuration

1.39.4.1 Network Servers

More detail network parameters can be set by clicking on 'Advanced' and then on Network Servers'. This page allows configuration of the following:

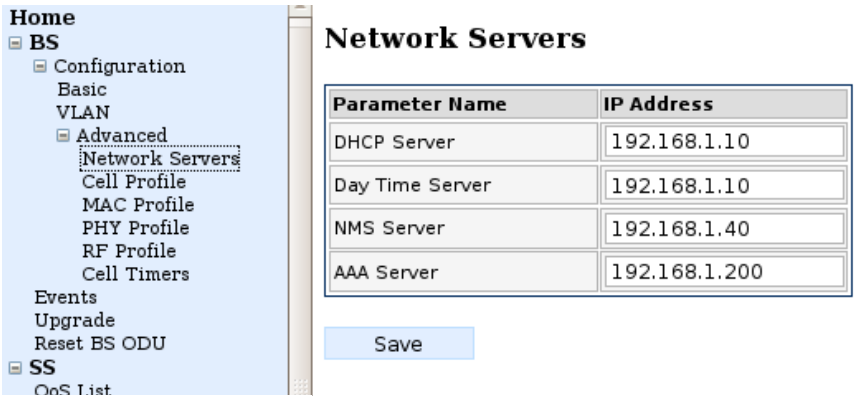


Figure 0-9: Network Servers

DHCP Server IP Address – If enabled in basic configuration, it sets the IP of the DHCP server. The Base Station must be rebooted for changes to the DHCP Server IP Address to take effect.

Day Time Server IP Address – It sets the IP of the day time server and should be set to the same value as set under basic configuration. The Base Station must be rebooted for changes to the Day Time Server IP Address to take effect.

NMS Server – IP address of the NMS server needs to be entered here. If the value of NMS Source is set to 'BS_ODU' then enter the same IP address as that of BS ODU. If NMS Source is set to 'SECTOR_CARD' in the basic configuration, this value will be the same as the IP address of the sector card. The Base Station must be rebooted for changes to the NMS Server IP Address to take effect.

AAA Server – It is the IP address of the machine from which AAA configurations are to be loaded. If NMS Source is set to 'BS_ODU' in the basic configuration, this value will be the same as the IP address of the BS ODU. The Base Station must be rebooted for changes to the AAA Server IP Address to take effect.

1.39.4.2 Cell Profile

Cell Profile screen can be accessed by clicking on 'BS' – 'Configuration' – 'Advanced' – 'Cell Profile'. This page allows configuration of the following:

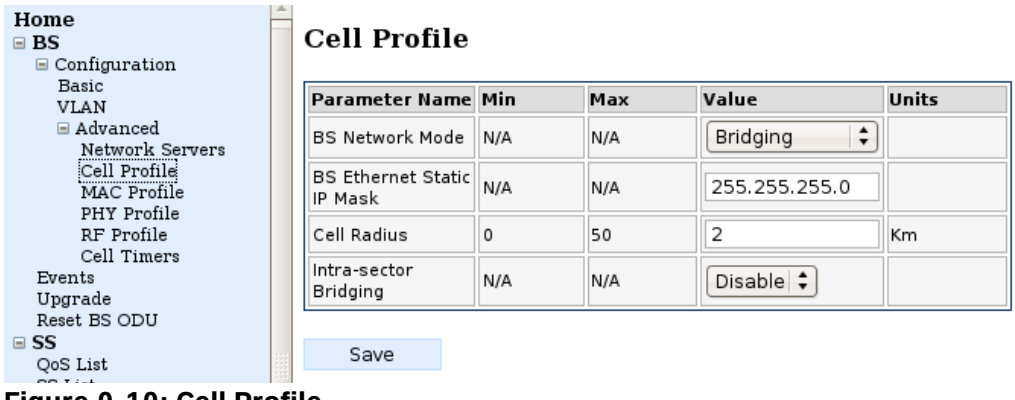


Figure 0-10: Cell Profile

BS Network Mode – It determines whether the BS ODU will operate as a bridge or a router. It is set to bridge mode by default. The Base Station must be rebooted for changes to the BS Network Mode to take effect.

BS Ethernet Static IP Mask – It specifies the subnet mask for the BS ODU. It is used to determine what subnet the IP address of the BS ODU belongs to. The Base Station must be rebooted for changes to the BS Ethernet Static IP Mask to take effect.

Cell Radius – Enter the cell radius in kilometers. This value is used to adjust the timeout value used by the base station.

Intrasector Bridging – Activating the intrasector bridging allows the flow of traffic between the Subscriber Stations in the same sector. Deactivating intra sector bridging will stop the flow of traffic between the Subscriber Stations and will allow flow of traffic only between a Subscriber Station and the Ethernet side of the Base Station to which it is connected and vice-versa.

1.39.4.3 MAC Profile

MAC Profile screen can be accessed by clicking on 'BS' – 'Configuration' – 'Advanced' – 'MAC Profile'. The parameters under this section need not be changed under most operations. This page allows configuration of the following:

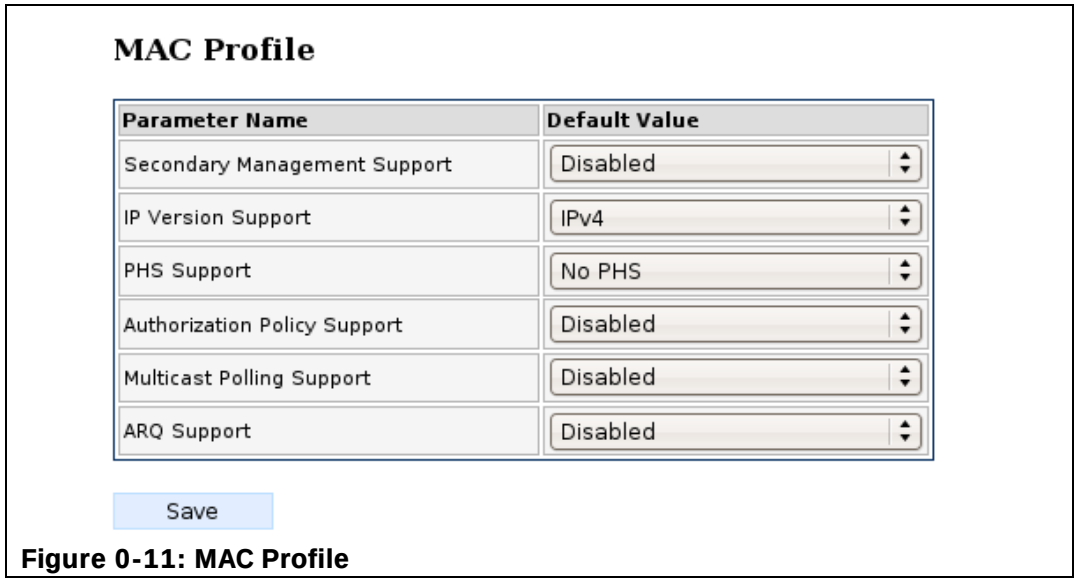


Figure 0-11: MAC Profile

Secondary Management Support – It provides information on whether BS supports the secondary management of SS. Secondary management is used to manage the SS from NMS. The Base Station must be rebooted for changes to the Secondary Management to take effect.

IP Version Support – It sets the IP version for BS ODU. Currently, only IPv4 is supported. The Base Station must be rebooted for changes to the IP Version to take effect.

PHS Support – Payload Header Suppression is the process of removing or blocking the transfer of packet header information. This field indicates the level of PHS support. Currently, PHS support is not present in the current version. The Base Station must be rebooted for changes to the PHS Support to take effect.

Authorization Policy Support – It notifies if the BS supports authorization policy. This is disabled by default. The Base Station must be rebooted for changes to the Authorization Policy Support to take effect.

Multicast Polling Support – It indicates the maximum number of simultaneous Multicast Polling Groups the BS can belong to. It is not supported in the current version. The Base Station must be rebooted for changes to the Multicast Polling to take effect.

ARQ Support - Automatic Repeat Request is used to correct errors not corrected by FEC, by having the information with errors resent. The Base Station must be rebooted for changes to the ARQ Support to take effect.

1.39.4.4 PHY Profile

PHY Profile screen can be accessed by clicking on 'BS' – 'Configuration' – 'Advanced' – 'PHY Profile'. This page allows configuration of the following:

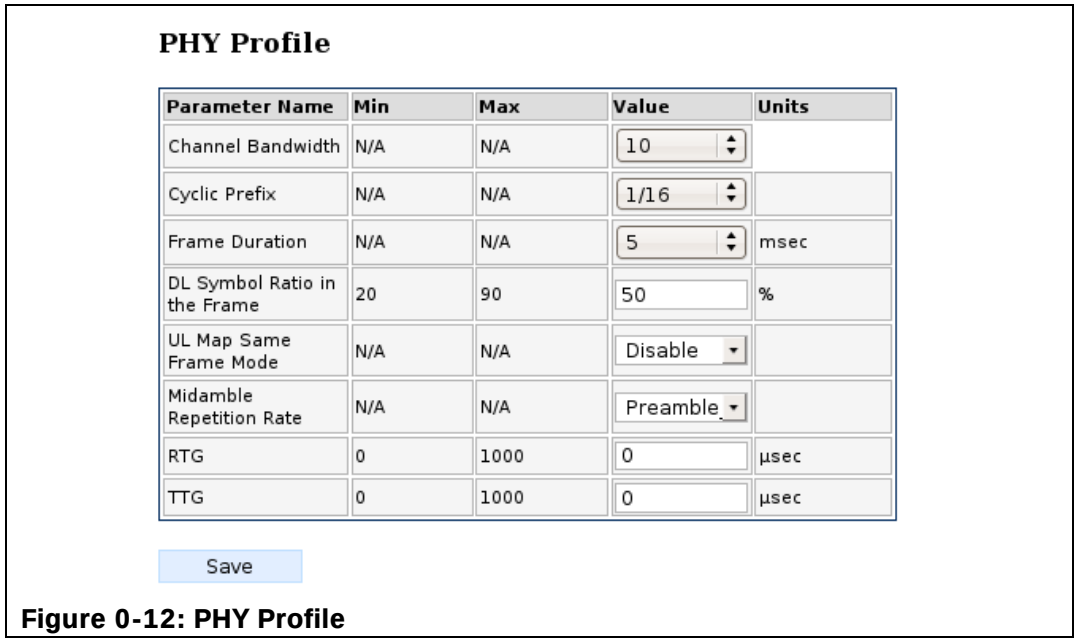


Figure 0-12: PHY Profile

Channel Bandwidth –For Libra MAX-58 5.8 GHz the supported channel bandwidth is 10 MHz. The Base Station must be rebooted for changes to the Channel Bandwidth to take effect.

Cyclic Prefix - It is a repeat of the end of the symbol at the beginning. It allows multi-path to settle before the main data arrives at the receiver. In OFDM, cyclic prefixes are used to combat multi-path by making channel estimation easy. Possible values are 1/4, 1/8, 1/16 and1/32. The Base Station must be rebooted for changes to the Cyclic Prefix to take effect.

Frame Duration - The frame duration code values indicate the specific frame durations that are allowed. The frame duration used can be determined by the periodicity of the frame start preambles. Once specific frame duration has been selected by the BS, it cannot be changed in between. Changing the frame duration forces all subscriber stations to resynchronize to the BS. The Base Station must be rebooted for changes to the Frame Duration to take effect.

Code	Frame Duration (ms)	Frames per second
0	2.5	400
1	4	250
2	5	200
3	8	125
4	10	100
5	12.5	80
6	20	50

DL Symbol Ratio in the Frame – It provides information on how much percentage of the symbols is used for downlink data. This is used to split bandwidth for the UL and DL usage. If the total bandwidth is 20 Mbps and operator selects 70%, then 14 Mbps is the maximum allowable for DL traffic. 6 Mbps will be allocated for UL traffic. This value is set to 50% by default. The Base Station must be rebooted for changes to the UL Map to take effect.

UL Map Same Frame Mode – If Uplink Same frame mode is enabled, MAP-IE grants in the UL-MAP message will be meant for same frame in which UL- AP is received. If it is disabled, MAP-IE grants in the UL-MAP message will be meant for next frame in which ULMAP is received.

Midamble Repetition Rate – Setting this value other than "Preamble only" consumes more bandwidth; but it improves the decoding at receiving end during adverse RF conditions. Available options are:

- Preamble only
- Midamble after every 4 data symbols
- Midamble after every 16 data symbols

Midamble after every 8 data symbols The Base Station must be rebooted for changes to the Midamble Repetition Rate to take effect.

RTG (Receive/Transmit Transition Gap) – It is a gap between the uplink burst and the subsequent downlink burst in a TDD transceiver. During RTG, BS switches from receive to transmit mode and subscriber stations switch from transmit to receive mode. The Base Station must be rebooted for changes to the RTG to take effect.

TTG (Transmit/Receive Transition Gap) – It is a gap between the downlink burst and the subsequent uplink burst in a TDD transceiver. During TTG, BS switches from transmit to receive mode and subscriber stations switch from receive to transmit mode. The Base Station must be rebooted for changes to the TTG to take effect.

Default values are recommended for these parameters.

1.39.4.5 RF Profile

RF Profile screen can be accessed by clicking on 'BS' – 'Configuration' – 'Advanced' – 'RF Profile'. This page allows configuration of the following:

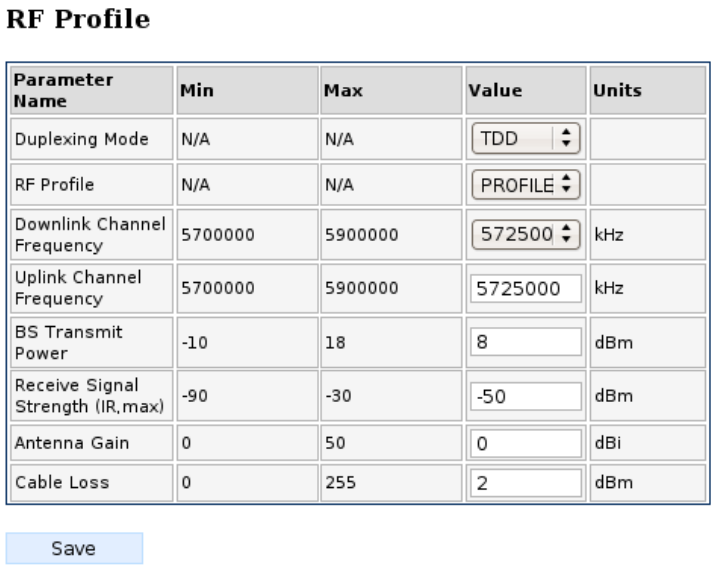


Figure 0-13: RF Profile

Duplexing Mode – Sets the duplexing mode of the BS. Currently, only Time Division Duplex (TDD) is supported. The Base Station must be rebooted for changes to the Duplexing Mode to take effect.

NOTE: Frequency availability is subject to country specific regulatory approval

RF Profile – RF profile is available for 5.8 GHz frequency range only. For such systems, following three profiles are supported as defined by IEEE 802.16-2004 standard. The Base Station must be rebooted for changes to the RF Profile to take effect.

	Frequency	Units
PROFILE_0	5725000, 5730000, 5840000, 5845000, 5850000, 5855000, 5860000 5865000, 5870000, 5875000	kHz
PROFILE_1	5735000, 5745000, 5755000, 5765000, 5775000, 5785000, 5795000, 5805000, 5815000, 5825000, 5835000	kHz
PROFILE_2	5740000, 5750000, 5760000, 5770000, 5780000, 5790000, 5800000, 5810000, 5820000, 5830000	kHz

Downlink Channel Frequency – Sets the center frequency for the BS ODU. All subscriber stations communicating with the same base station need to be on the same frequency. Since the current system only supports TDD which uses the same frequency for both uplink and downlink (but at different time slots), this is the only frequency that needs to be configured. Please note that this value is set in kHz, so 5.8 GHz is entered

as 5800000. The Base Station must be rebooted for changes to the Downlink Channel Frequency to take effect.

Uplink Channel Frequency – Currently, since the system is TDD only, uplink channel frequency is set to the same value as the downlink channel frequency by default. Hence there is no option of configuring this parameter. This parameter is applicable to FDD or H-FDD systems only.

BS Transmit Power – It is the power level (in dBm) at the transmitter of the BS ODU. It is used by subscriber stations to adjust power level. The Base Station must be rebooted for changes to the BS Transmit Power to take effect.

> **NOTE: BS Transmit Power is subject to country specific regulatory approval**

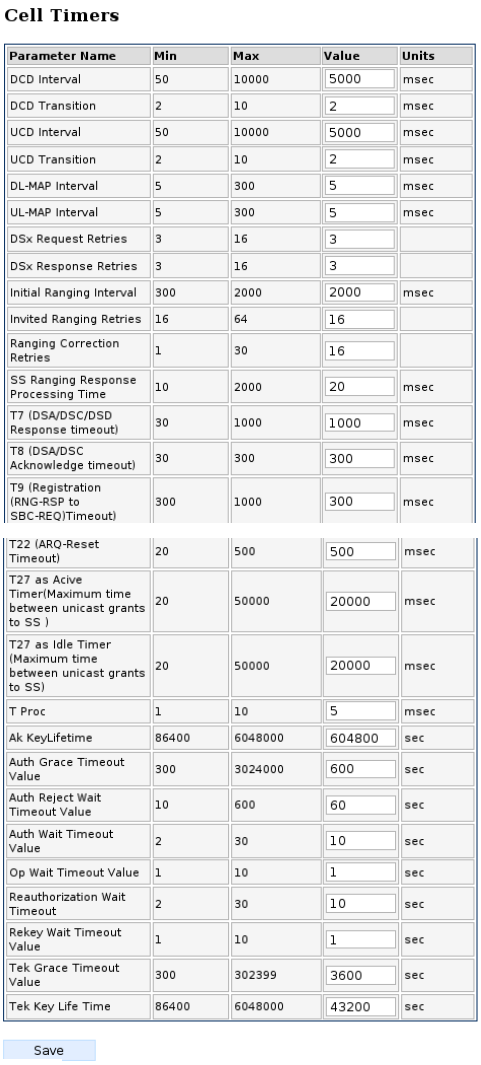
Receive Signal Strength (IR,max) – It is the minimum signal strength (in dBm) that the receiver of the BS expects to establish a reliable connection with subscriber stations. Its recommended values are between -50 to -70 dBm. The Base Station must be rebooted for changes to the Receive Signal Strength to take effect.

Antenna Gain – It is the gain of the antenna connected to the BS ODU. The Base Station must be rebooted for changes to the Antenna Gain to take effect.

Cable Loss – It refers to the RF cable loss between the antenna port at the BS ODU and the antenna. The Base Station must be rebooted for changes to the Cable Loss to take effect.

1.39.4.6 Cell Timers

Cell Timers screen can be accessed by clicking on 'BS' – 'Configuration' – 'Advanced' – 'Cell Timers'. This page allows configuration of the following:



Cell Timers

Parameter Name	Min	Max	Value	Units
DCD Interval	50	10000	5000	msec
DCD Transition	2	10	2	msec
UCD Interval	50	10000	5000	msec
UCD Transition	2	10	2	msec
DL-MAP Interval	5	300	5	msec
UL-MAP Interval	5	300	5	msec
DSx Request Retries	3	16	3	
DSx Response Retries	3	16	3	
Initial Ranging Interval	300	2000	2000	msec
Invited Ranging Retries	16	64	16	
Ranging Correction Retries	1	30	16	
SS Ranging Response Processing Time	10	2000	20	msec
T7 (DSA/DSC/DSD Response timeout)	30	1000	1000	msec
T8 (DSA/DSC Acknowledge timeout)	30	300	300	msec
T9 (Registration (RNG-RSP to SBC-REQ)Timeout)	300	1000	300	msec
T22 (ARQ-Reset Timeout)	20	500	500	msec
T27 as Acive Timer(Maximum time between unicast grants to SS)	20	50000	20000	msec
T27 as Idle Timer (Maximum time between unicast grants to SS)	20	50000	20000	msec
T Proc	1	10	5	msec
Ak KeyLifetime	86400	6048000	604800	sec
Auth Grace Timeout Value	300	3024000	600	sec
Auth Reject Wait Timeout Value	10	600	60	sec
Auth Wait Timeout Value	2	30	10	sec
Op Wait Timeout Value	1	10	1	sec
Reauthorization Wait Timeout	2	30	10	sec
Rekey Wait Timeout Value	1	10	1	sec
Tek Grace Timeout Value	300	302399	3600	sec
Tek Key Life Time	86400	6048000	43200	sec

Save

Figure 0-14: Cell Timers

DCD Interval – It is the time interval between transmissions of Downlink Channel Description messages. DCD message contains parameters that are necessary or that assists it to access the BS in receiving information from the downlink channel. Its default value is 5000 ms. The Base Station must be rebooted for changes to the DCD Interval to take effect.

DCD Transition – It is the time the BS shall wait after repeating a DCD message with an incremented configuration change count before issuing a DL-MAP message referring to Downlink_Burst_Profiles defined in that DCD message. The Base Station must be rebooted for changes to the DCD Transition to take effect.

UCD Interval - Time between transmissions of UCD message. Its default value is 5000 ms. The Base Station must be rebooted for changes to the UCD Interval to take effect.

UCD Transition – It is the time the BS shall wait after repeating a UCD message with an incremented configuration change count before issuing a UL-MAP message referring to Uplink_Burst_Profiles defined in that UCD message. The Base Station must be rebooted for changes to the UCD Transition to take effect.

DL-MAP Interval - Time between transmissions of DL-MAP messages. Its default value is 5 ms. The Base Station must be rebooted for changes to the DL-MAP Interval to take effect.

UL-MAP Interval - Time between transmissions of UL-MAP messages. Its default value is 5 ms. The Base Station must be rebooted for changes to the UL-MAP Interval to take effect.

DSx Request Retries – It is the number of timeout retries on DSA/DSC/DSD Requests. Its default value is 3. The Base Station must be rebooted for changes to the DSx Request Retries to take effect.

DSx Response Retries – It is the number of timeout retries on DSA/DSC/DSD Responses. Its default value is 3. The Base Station must be rebooted for changes to the DSx Response Retries to take effect.

Initial Ranging Interval – It is the time interval between initial ranging regions assigned by the BS. Its default value is 2000 ms. The Base Station must be rebooted for changes to the Initial Ranging Interval to take effect.

Invited Ranging Retries – It is the number of retries on inviting Ranging Requests by SS. Its default value is 16. The Base Station must be rebooted for changes to the Invited Ranging Retries to take effect.

SS Ranging Response Processing Time – It is the time allowed for a subscriber station following receipt of a ranging response before it is expected to reply to an invited ranging request. Its default value is 20 ms. The Base Station must be rebooted for changes to the SS Ranging Response Processing Time to take effect.

T7 (DSA/DSC/DSD Response timeout) – It sets the time to wait for DSA/DSC/DSD response to timeout. Its default value is 1000 ms. The Base Station must be rebooted for changes to T7 to take effect.

T8 (DSA/DSC Acknowledge timeout) – It is the time required for DSA/DSC acknowledgement to timeout. Its default value is 300 ms. The Base Station must be rebooted for changes to T8 to take effect.

T9 (Registration (RNG-RSP to SBC-REQ) Timeout) – It is the time allowed between the BS sending a RNG-RSP (success) to an SS, and receiving a SBC-REQ from that same SS. Its default value is 300 ms. The Base Station must be rebooted for changes to T9 to take effect.

T10 (DSA/DSC/DSD Transaction End timeout) – It is the time to wait for transaction end timeout. Its default value is 3000 ms. The Base Station must be rebooted for changes to T10 to take effect.

T13 (SS REG-RSP to SS TFTP-CPLT timeout) – It is the time allowed for an SS, following receipt of a REG-RSP message to send a TFTP- CPLT message to the BS. Its default value is 15 minutes. The Base Station must be rebooted for changes to T13 to take effect.

T15 (MCA-RSP Timeout) – It is the time needed to wait for MCA-RSP. Its default value is 30 ms. The Base Station must be rebooted for changes to T15 to take effect.

T17 (Time allowed for SS to complete Authorization and Key) – It is the time allowed for SS to complete SS authorization and key exchange. Its default value is 300 ms. The Base Station must be rebooted for changes to the T17 to take effect.

T22 (ARQ-Reset Timeout) – It is the time needed to wait for ARQ-Reset. Its default value is 500 ms. The Base Station must be rebooted for changes to T22 to take effect.

T27 as Active Timer (Maximum time between unicast grants to SS) – It is the maximum time between unicast grants to SS when BS believes SS uplink transmission quality is not good enough. Its minimum value is Ranging Response Processing Time. Its default value is 20000 ms. The Base Station must be rebooted for changes to T27 to take effect.

T27 as Idle Timer (Maximum time between unicast grants to SS) – It is the maximum time between unicast grants to SS when BS believes SS uplink transmission quality is good enough. Its maximum value is SS Ranging Response Processing Time. Its default value is 20000 ms. The Base Station must be rebooted for changes to T27 to take effect.

T Proc – It is the wait time after receiving the ULMAP at SS & SS considering the ULMAP for the grant usage. This parameter is not used in the current version. Its default value is 10 ms. The Base Station must be rebooted for changes to T Proc to take effect.

Ak KeyLifetime – This attribute contains the lifetime, in seconds, of an AK. It is a 32-bit unsigned quantity representing the number of remaining seconds for which the associated key shall be valid. Its default value is 604800 seconds. The Base Station must be rebooted for changes to the Ak Key Lifetime to take effect.

Auth Grace Timeout Value – This value specifies the grace period for reauthorization in seconds. Its default value is 600 seconds. The Base Station must be rebooted for changes to the Auth Grace Timeout Value to take effect.

Auth Reject Wait Timeout Value – This value specifies time in seconds an SS waits in the Authorize Reject Wait state after receiving an Authorization Reject. Its default value is 60 seconds. The Base Station must be rebooted for changes to the Auth Reject Wait Timeout Value to take effect.

Auth Wait Timeout Value – This value specifies retransmission interval, in seconds, of Authorization Request messages from the Authorize Wait state. Its default value is 10 seconds. The Base Station must be rebooted for changes to the Auth Wait Timeout Value to take effect.

Op Wait Timeout Value – This value specifies the retransmission interval, in seconds, of Key Requests from the Operational Wait state. Its default value is 1 second. The Base Station must be rebooted for changes to the Op Wait Timeout Value to take effect.

Reauthorization Wait Timeout – This value specifies the retransmission interval, in seconds, of Reauthorization Wait Timeout. Its default value is 10 seconds. The Base Station must be rebooted for changes to the Reauthorization Wait Timeout to take effect.

Rekey Wait Timeout Value – This value specifies the retransmission interval, in seconds, of Key Requests from the Rekey Wait state. Its default value is 1 second. The Base Station must be rebooted for changes to the Rekey Wait Timeout Value to take effect.

Tek Grace Timeout Value – This value specifies the grace period, in seconds, for rekeying the TEK. Its default value is 3600 seconds. The Base Station must be rebooted for changes to the Tek Grace Timeout Value to take effect.

Tek Key Lifetime – This value contains the lifetime, in seconds, of a TEK. It is a 32-bit unsigned quantity representing the number of remaining seconds for which the associated key shall be valid. Its default value is 43200 seconds. The Base Station must be rebooted for changes to the Tek Key Lifetime to take effect.

1.39.5 Events

It lists the recent activities of a base station. It can be accessed under 'BS' category.

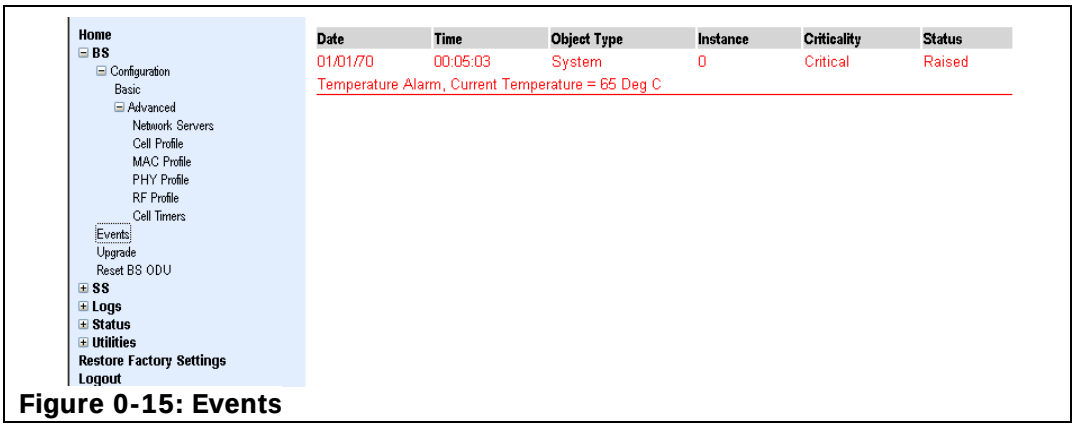


Figure 0-15: Events

1.39.6 Base Station Reboot

BS ODU can be reset by clicking on 'Reset BS ODU' and then on 'Reboot'. Confirmation prompt will appear upon clicking any of the three options. None of these options will alter the existing configuration. 'Restart' is used to reset the BS ODU after changing its IP Address.

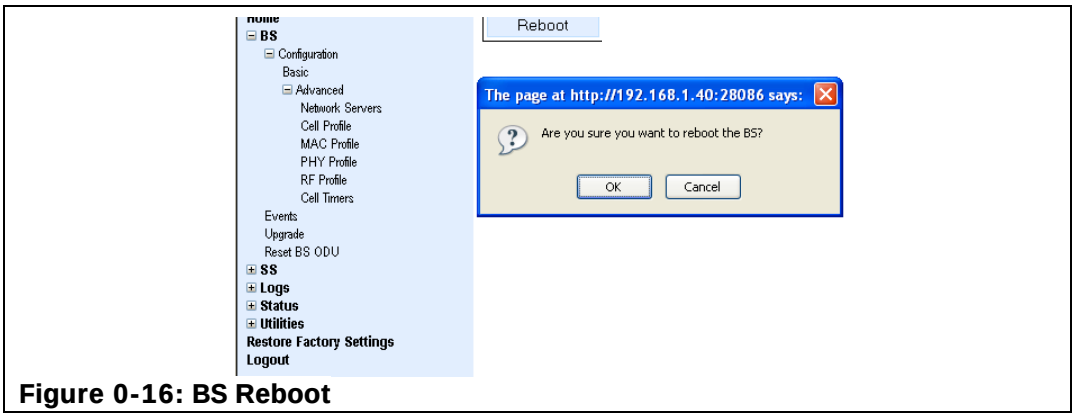


Figure 0-16: BS Reboot

Reboot – Complete reboot of the system will occur upon clicking this button. It is equivalent to plugging off the power and plugging it back again.

Note: Do not use this feature during BS ODU IP configuration. Use Restart instead under such circumstances.

Restart – After making changes in the configuration, click on this button to for the BS to activate the changes. This option will stop and then restart the wireless interface of the BS ODU. Depending on the memory usage and processes running, this action might also result in the reboot of BS ODU.

Note: Always use this feature after BS ODU IP configuration.

1.40 Subscriber Station Association (SS)

This section contains information about the subscriber station(s) associated with the BS. For a SS to associate with BS, MAC address of the SS has to be listed in the BS apart from them being on the same RF frequency. Also, at least one QoS for downlink and uplink has to be defined.

1.40.1 QoS

Quality of Service is a set of service related parameters given by the operator to the subscriber (customer). It defines all parameters that are described in the IEEE 802.16d documentation. This section can be accessed by clicking on 'SS' and then on 'QoS'. Existing QoS can either be edited or deleted.

Upon selecting a different direction, scheduling type or CS specification, the QoS parameters will also be set to default and relevant set of fields are enabled.

Upon deletion of a PCID, the PCID has to be dissociated with each subscriber station manually.

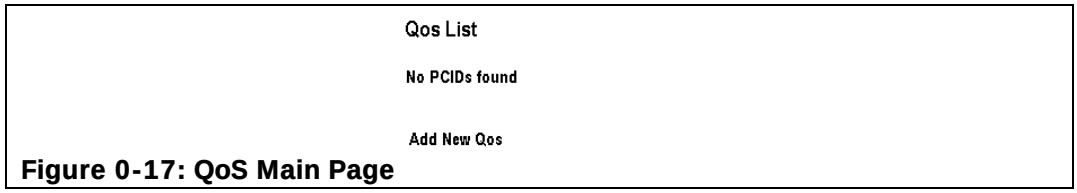


Figure 0-17: QoS Main Page

To add a new QoS, click on the link 'Add New QoS'. The following screen appears. Two sample QoS have been added by default.

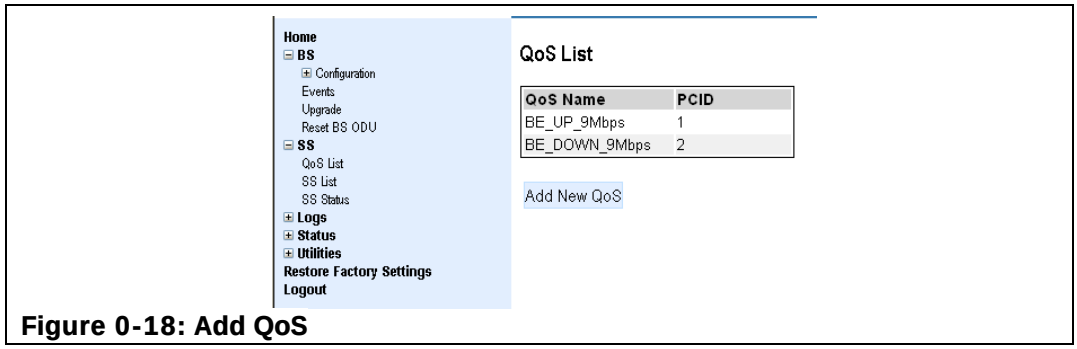


Figure 0-18: Add QoS

Click on 'Add New QoS' and the following screen appears.

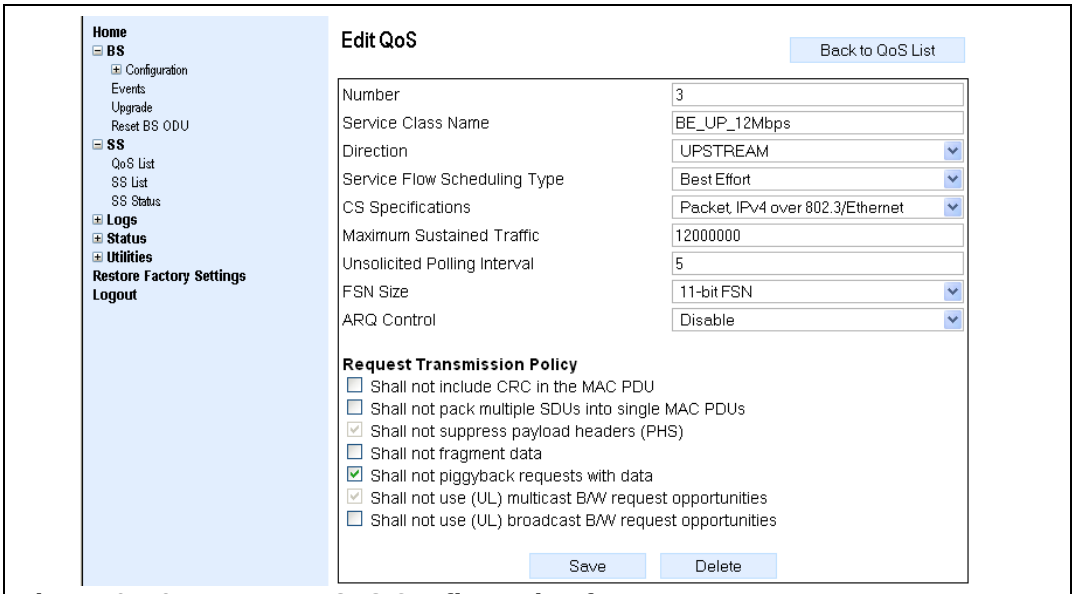


Figure 0-19: Upstream QoS Configuration for BE

After configuring the QoS for downstream, click on 'Back to QoS List' on top and then add another QoS, this time for the downstream.

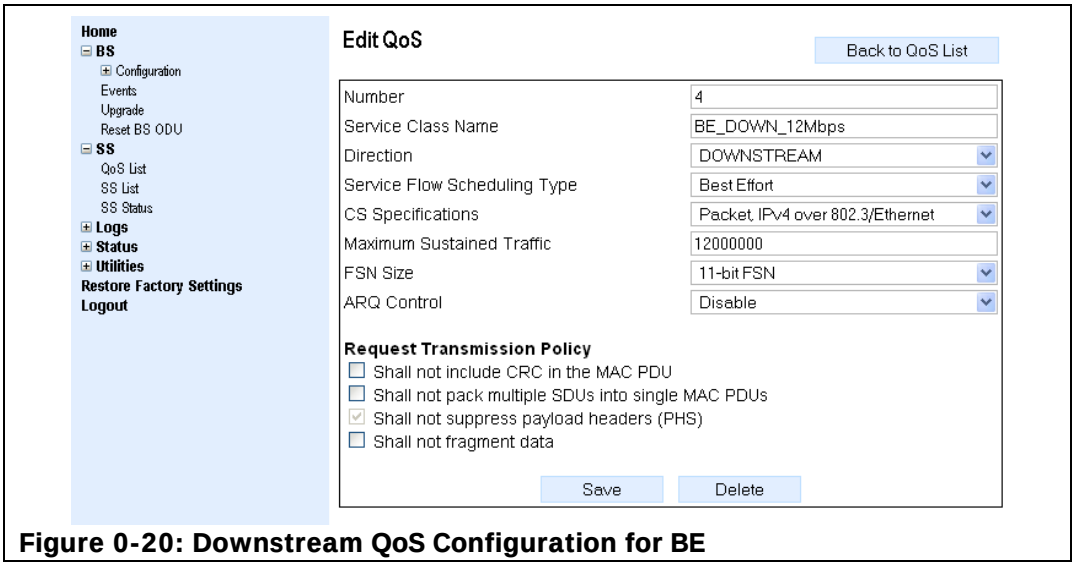


Figure 0-20: Downstream QoS Configuration for BE

At least one uplink and one downlink classifier need to be defined for successful communication between the base and subscriber stations.

Number – This should be a unique identifier given manually by the operator for ease of use.

Service Class Name – A unique class name given to identify the service (DL or UL) & its capabilities (data rates).

Example: SF_<Direction (UL/DL)>_<Data Rate (1024000bps)>

Direction – It provides the direction of the service flow whether in down-link or up-link. Default is set for Request transmission policy. At least one upstream and one downstream classifier have to be assigned to a SS.

Service Flow Scheduling Type – The value of this parameter specifies the scheduling service that shall be enabled for the associated service flow.

CS Specification – Service-specific CS resides on top of the MAC CPS and utilizes, via the MAC SAP (Service Access Point), the services provided by the MAC CPS (Common Part Sub layer). Recommended value is 'Packet, IPv4 over 802.3/Ethernet'.

Traffic Priority – The value of this parameter specifies the priority assigned to a service flow. Given two service flows identical in all QoS parameters besides priority, the higher priority service flow should be given lower delay and higher buffering preference. This field is mandatory for nrtPS. Its default and the minimum value is 0 and the maximum value is 7.

Maximum Sustained Traffic – This parameter defines the peak information rate of the service. The rate is expressed in bits per second and pertains to the SDUs at the input to the system. If this parameter is omitted or set to zero, then there is no explicitly mandated maximum rate. This field specifies only a bound, not a guarantee that the rate is available. This field is mandatory for BE. Its minimum value is 0 and the maximum value is 20480000 bps.

Maximum Traffic Burst – This parameter defines the maximum burst size that shall be accommodated for the service. Since the physical speed of ingress/egress ports, the air interface, and the backhaul will, in general, be greater than the maximum sustained traffic rate parameter for a service, this parameter describes the maximum continuous burst the system should accommodate for the service.

Minimum Reserved Traffic – This parameter specifies the minimum rate reserved for this service flow and is equal to (SDU Size)*8/(Maximum Latency). The rate is expressed in bits per second and specifies the minimum amount of data to be transported on behalf of the service flow when averaged over time. It is disabled by default.

Min Tolerable Traffic – This parameter specifies the minimum tolerable rate in bits per second for this service flow. This value should not be higher than the corresponding Minimum Reserved Traffic Rate value. The difference between these two values reflects SDUs' loss rate. It is disabled by default.

Unsolicited Grant Interval – The value of this parameter specifies the nominal interval in milliseconds between successive data-grant opportunities for this Service Flow. The maximum unsolicited grant interval field specifies only a bound. It is applicable to UGS. It is disabled by default. Its minimum value is 0 and maximum value is 100 ms.

Unsolicited Polling Interval – This parameter defines the maximum nominal interval in milliseconds between successive polling grants opportunities for a DL and UL service flow. If this parameter is set to zero, then there is no explicitly mandated unsolicited grant interval. It is mandatory for Best Effort, nrtPS and rtPS services in Uplink direction only. Its default and minimum value is 0 ms and maximum value is 5000 ms.

FSN Size – This indicates the size of the FSN for the connection that is being setup. A value of 0 indicates that FSN is 3-bit long and a value of 1 indicates that FSN is 11-bit long. It is mandatory for rtPS service. Its default value is set at 11-bit FSN.

Tolerated Jitter – This parameter defines the maximum delay variation (jitter) for the connection. It is disabled by default. It is mandatory for UGS service. Its minimum value is 0 ms and the maximum value is 2048 ms.

Maximum Latency – The value of this parameter specifies the maximum latency between the reception of a packet by the BS or SS on its network interface and the forwarding of the packet to its RF Interface. It is disabled by default but is mandatory for rtPS and UGS services. Its minimum value is 0 ms and the maximum value is 2048 ms.

Request Transmission Policy – The value of this parameter provides the capability to specify certain attributes for the associated service flow. One or more can be chosen in these parameters. Only a few options are enabled depends on the service type.

Shall not Include CRC in the MAC PDU:

If checked, the service flow shall not include CRC in the MAC PDU.

If unchecked, this feature is on and will request bandwidth using CRC in the MAC PDU (if CRC in the MAC PDU groups are created).

Shall not use Packing:

If checked, the service flow shall not pack multiple SDUs (or fragments).

If unchecked, this feature is on and will request bandwidth using packing (if packing groups are created at BS).

Shall not suppress payload headers (PHS):

If checked, the service flow shall not suppress payload headers (CS parameters).

If unchecked, this feature is on and will request bandwidth using suppress payload headers (if PHS groups are created at BS). PHS is disabled by default.

Shall not Use uplink Piggyback requests with data:

It is applicable to Upstream QoS.

If checked, the service flow shall not piggyback requests with data. Please keep this checked.

If unchecked, this feature is on and will request bandwidth using uplink piggyback requests (if Piggyback groups are created at BS)

Default: Piggyback is off.

Shall not Use Fragmentation:

If checked, the service flow shall not fragment data.

If unchecked, the feature is on. The packets can be fragmented and sent to SS on this service. The number of bits in FSN Size is used as the sequence number of the fragmented packet.

Shall not Use UL Broadcast-Bandwidth request opportunities:

It is applicable to Upstream QoS.

If checked, service flow shall not request broadcast bandwidth request opportunities. Please keep this option checked.

If unchecked, the feature is on. This particular service flow will request bandwidth using uplink broadcast request opportunities. Broadcast bandwidth request is done on the contention slot.

Shall not use UL multicast bandwidth request opportunities:

It is applicable to Upstream QoS.

If checked, service flow shall not request bandwidth using multicast connection identifiers.

If unchecked, the feature is switched on. This particular service flow will request bandwidth using multicast connection identifiers.

1.40.2 SS List

Subscriber stations are added in this section.

MAC Address – This parameter provides MAC address of SS. This is unique for a particular SS. This is also used as SS ID to identify as SS. In order for the SS to associate with the BS, correct OFDM MAC address of the SS has to be entered in the SS list. This MAC address is printed on the label of the SS and can also be obtained by logging into a SS. Please refer to 'SS Manager Configuration Guide' for detail information.

SS Name – A unique user name should be given to the SS to identify it.

It can also give the location or the customer name to represent the SS.

PCID – PCID is used to associate a set of QOS parameters to the SS for downlink and uplink service flow that are created with 'Add QoS'. A number of PCIDs can be selected depending on requirements.

Once PCIDs are selected, the user can associate classifiers which each PCID. Classifiers are used to associate a particular traffic data to the Service flow (identified by QOS parameters in BS).

1.40.3 Adding a Subscriber Station

To add a subscriber station, click on 'SS' and then 'SS List' the following screen appears. Sample subscriber station may have been added by default. You can also choose to edit it or start by adding a new one.

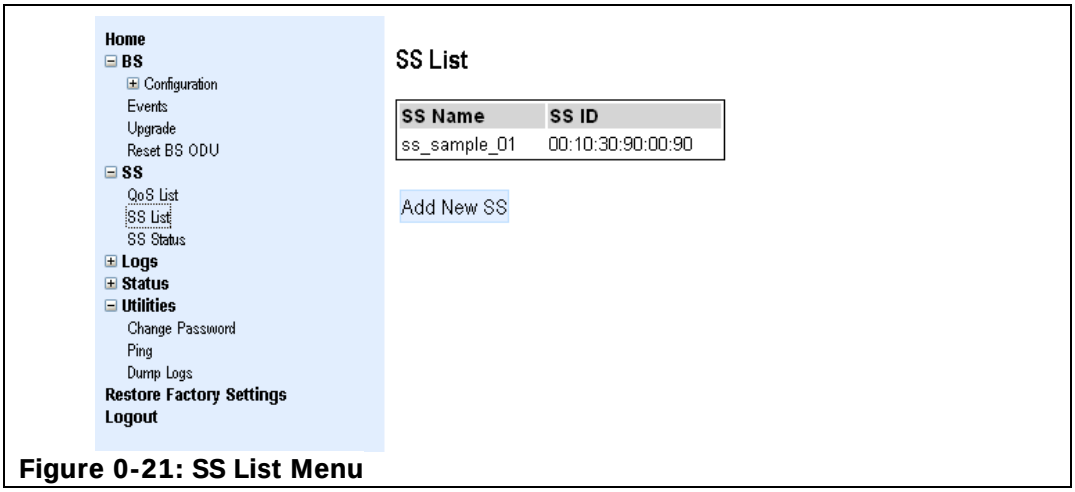


Figure 0-21: SS List Menu

To add a subscriber station, click on 'Add New SS' and it will prompt for name and MAC address of the SS. Provide a unique name for the SS. Enter MAC address of the subscriber you would like the BS to communicate with. Then click on 'Save SS' to save before moving on to adding classifiers.

MAC addresses must be entered using lowercase characters

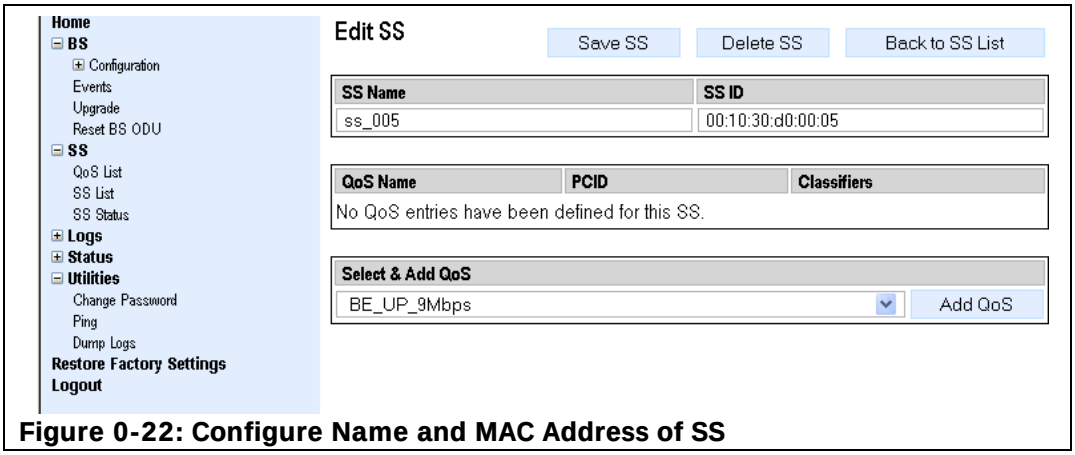


Figure 0-22: Configure Name and MAC Address of SS

After saving the name and MAC address of the subscriber station, the following screen appears.

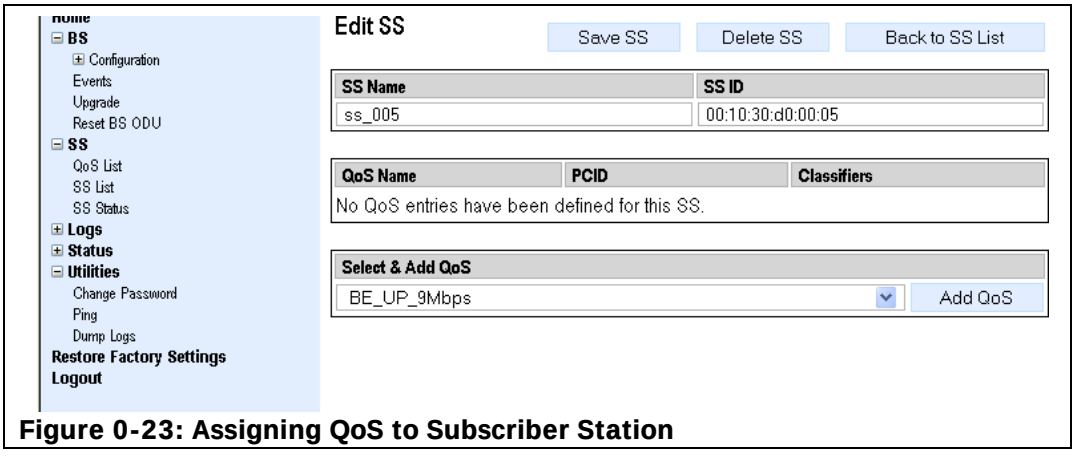


Figure 0-23: Assigning QoS to Subscriber Station

Click on 'Add QoS' to assign QoS to the subscriber station.

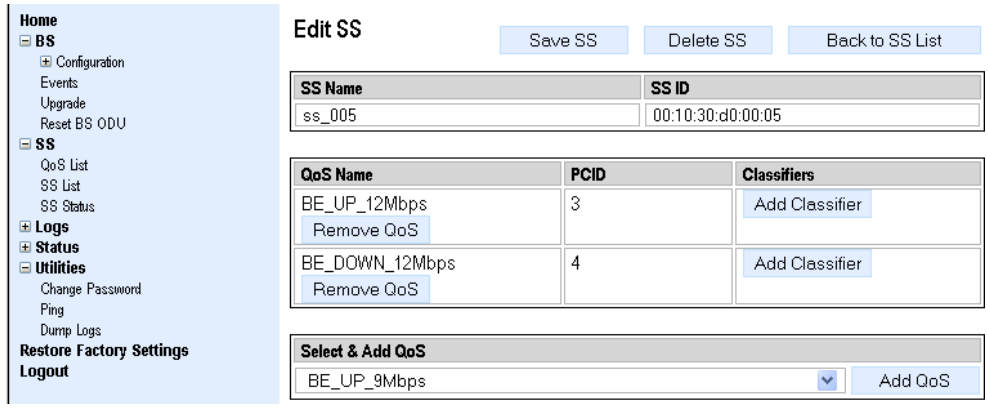


Figure 0-24: Screen after assigning Uplink and Downlink QoS to SS

1.40.4 Classifiers

Classifiers are used for routing of packets to particular SS using IP rules (Classifier maps an IP packet to a particular connection). Its length is 2 bytes (maximum number of classifiers that the SS supports). It is mandatory to have classifiers for each PCID.

Type – There are two types of classifiers.

Static: User has to add the IP address of the system or router on the subscriber station side as a classifier.

Dynamic: If DHCP is enabled at the subscriber station side, it will obtain an IP address dynamically. In this case DHCP must be enabled at PC/Router connected to the subscriber station.

Index – This specifies the priority for the classifier, which is used for determining the order of the classification. Classifiers may have priorities in the range 0–255 with the default value being 0.

Type of Service – The values of this field specify the matching parameters for the IP type of service byte range and mask. An IP packet with IP type of service (ToS) byte value "ip-tos" matches this parameter if tos-low ≤ (ip-tos AND tos-mask) ≤ tos-high. If this field is omitted, then comparison of the IP packet ToS byte for this entry is irrelevant.

Minimum: 0 (for low, high and mask)

Maximum: 65535 (for low, high and mask)

IP Source Address and Mask – This parameter specifies a IP source address (designated "src") and its corresponding address mask (designated "dmask"). An IP packet with IP destination address "ip-dst" matches this parameter if src = (ip-dst AND dmask). If this parameter is omitted, then comparison of the IP packet source address for this entry is irrelevant.

Protocol Source Port Range: The value of the field specifies a range of protocol source port values. Classifier rules with port numbers are protocol specific; i.e., a rule on port numbers without a protocol specification shall not be defined. An IP packet with

protocol port value "src-port" matches this parameter if src-port is greater than or equal to sport low and src-port is less than or equal to sport high. If this parameter is omitted, the protocol source port is irrelevant. This parameter is irrelevant for protocols without port numbers.

Minimum: 0 (low, high and mask)

Maximum: 65535 (low, high and mask)

Protocol Destination Port Range – The value of the field specifies a range of protocol destination port values. Classifier rules with port numbers are protocol specific; i.e., a rule on port numbers without a protocol specification shall not be defined. An IP packet with protocol port value "dst-port" matches this parameter if dst-port is greater than or equal to dport low and dst-port is less than or equal to dport high. If this parameter is omitted the protocol destination port is irrelevant. This parameter is irrelevant for protocols without port numbers.

Minimum: 0 (low, high and mask)

Maximum: 65535 (low, high and mask)

Ethernet Source MAC Address – This parameter specifies a MAC source address (designated "src") and their corresponding address mask (designated "msk"). An IEEE 802.3/Ethernet packet with MAC source address "ethersrc" corresponds to this parameter if src = (ethersrc AND msk). If this parameter is omitted, then comparison of the IEEE 802.3/Ethernet source MAC address for this entry is irrelevant.

Notation: xx:xx:xx:xx:xx:xx

Ethernet Destination MAC Address – This parameter specifies a MAC destination address (designated "dst") and its corresponding address mask (designated "msk"). An IEEE 802.3/Ethernet packet with MAC destination address "etherdst" corresponds to this parameter if dst = (etherdst AND msk). If this parameter is omitted, then comparison of the IEEE 802.3/Ethernet destination MAC address for this entry is irrelevant.

Notation: xx:xx:xx:xx:xx:xx

The format of the Layer 3 protocol ID in the Ethernet packet is indicated by type, eprot1, and eprot2 as follows:

If type = 0, the rule does not use the Layer 3 protocol type as a matching criteria. If type = 0, eprot1, eprot2 are ignored when considering whether a packet matches the current rule.

If type = 1, the rule applies only to SDUs that contain an Ethertype value. Ethertype values are contained in packets using the DEC-Intel-Xerox (DIX) encapsulation or the Sub-Network Access Protocol (SNAP) encapsulation (IEEE 802.2, IETF RFC 1042) format. If type = 1, then eprot1, eprot2 gives the 16 bit value of the Ethertype that the packet shall match in order to match the rule.

If type = 2, the rule applies only to SDUs using the IEEE 802.2 encapsulation format with a Destination Service (DSAP) other than 0xAA (which is reserved for SNAP). If type = 2, the lower 8 bits of the eprot1, eprot2 shall match the DSAP byte of the packet in order to match the rule.

If the Ethernet SDU contains an IEEE 802.1D and IEEE 802.1Q Tag header (i.e., Ethertype 0x8100), this object applies to the embedded Ethertype field within the IEEE 802.1D and IEEE 802.1Q header.

To add a classifier, go to 'SS List' window and click on the subscriber of interest in the list. Then on the screen that appears as shown on Figure 0-24**.** Click on 'Add Classifier' next to 'QoS Name' and the following screen appears.

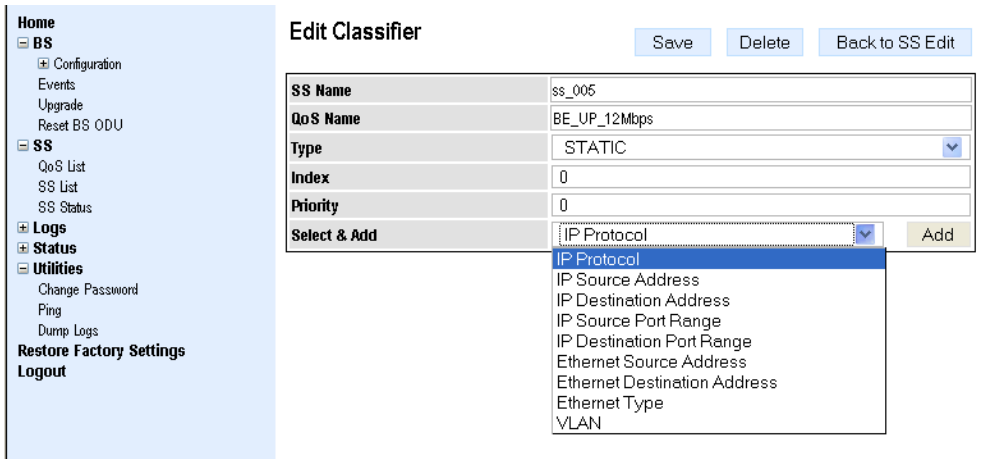


Figure 0-25: Adding Classifier

Next, select the classifier type to be based upon. Ethernet Destination Address is chosen in the following example.

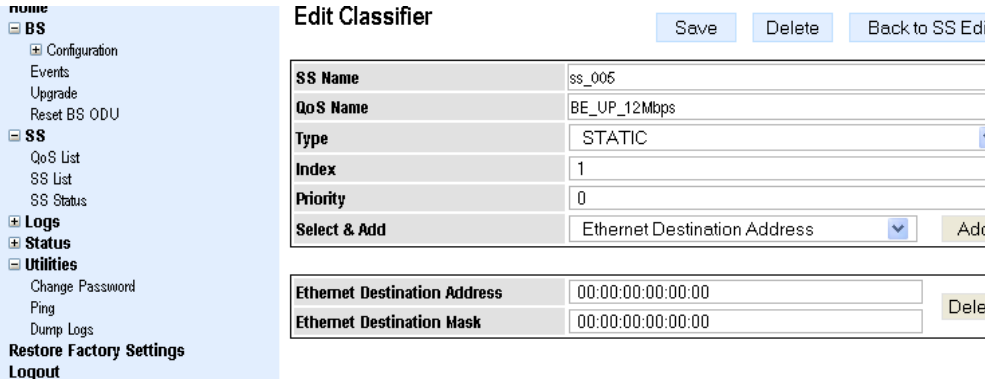


Figure 0-26: Adding Classifier based on Ethernet Destination MAC Address

Next click on 'Save' on top and then click on 'Back to SS Edit' to add another classifier for downlink as shown in figure and then click on 'Save'.

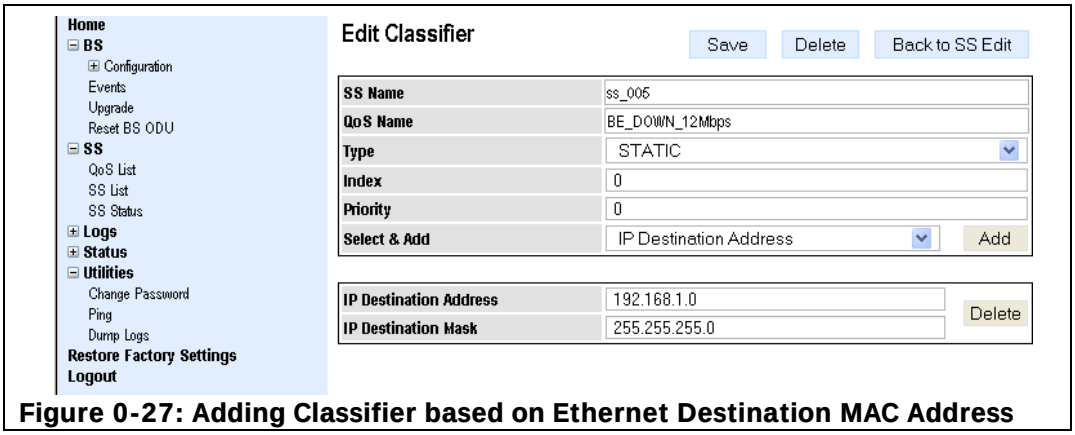


Figure 0-27: Adding Classifier based on Ethernet Destination MAC Address

MAC Address and IP Address are verified real time for their format. If invalid, it will highlight in red color. If such values are highlighted in red despite the correct format, delete the last character and type it again so that it appears in black.

1.40.5 SS Status

List of connected subscriber stations can be viewed by clicking on 'SS Status' under 'SS' menu. If any subscriber station is connected to the BS, a table will display its name, MAC address, RSSI, CINR, uplink and downlink FEC. You can deregister any connected subscriber station by clicking on 'Deregister'. Detail information of the connected subscriber station can be obtained by clicking on the MAC address.

1.41 Logs

This section contains information about the recent system activities and helps troubleshoot system errors.

1.41.1 Normal Logs

Normal logs are generated after any system event. It lists activities such as communication between BS and SS.

1.41.2 Crash Logs

Crash logs are generated if the system crash occurs at any point. It does not include logs regarding system reboot. This is normally empty.

1.41.3 Stats

Statistics provides information about the BS ODU system such as its IP and MAC addresses, uptime and system memory. It also provides statistics on schedulers such as timing, grant timing, IUC mapping and DCD/UCD dumps.

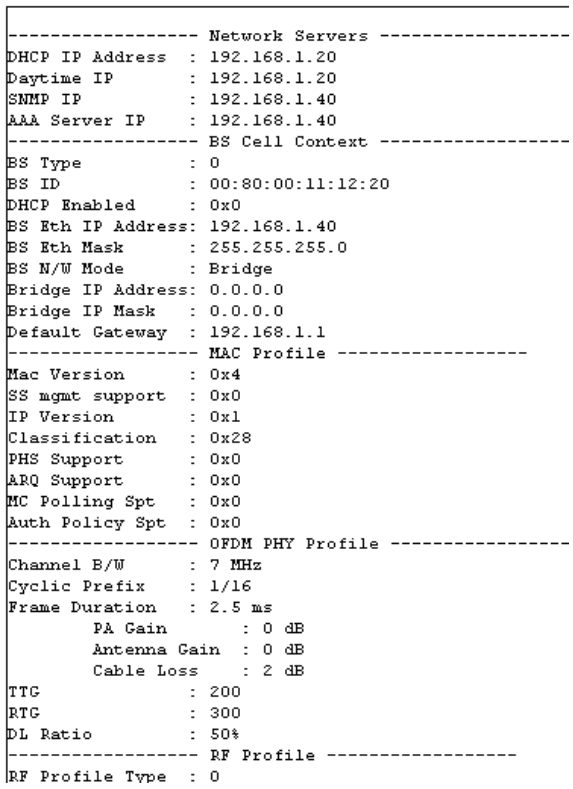


Figure 0-28: Current Configuration

1.41.4 IP Configuration

IP and MAC address of BS ODU can be known by clicking on 'Stats', then on 'Basic' and then on 'IP Configuration'

1.41.5 Current Configuration

Major current configuration is listed on this section.

1.42 Utilities

1.42.1 Change Password

Password can be changed by using this feature. Once the password has been changed, the user must Logout for the new password settings to take effect.

1.42.2 Ping

Ping assists network administration and troubleshooting.

1.42.3 Dump Logs

This feature will clear the log files from the base station.

1.42.4 Backup Configuration

Use this feature to save an existing configuration file. When the "Download" button is pressed, the user will be prompted to download a compressed configuration file that can be saved on the local computer. This file can be used to recover a lost configuration, or to load a second base station with similar settings. The configuration can be re-loaded using the Upload Configuration function.

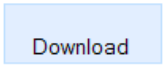


Figure 0-29: Download Backup Configuration

1.42.5 Upload Configuration

Once you have saved a configuration file, the tar.gz file can be used to restore the previous configuration of the base station, or to load a known good configuration from another base station.

NOTE: Prior to restoring a configuration, EION recommends that the Base Station is reset to default values and rebooted.

ATTENTION: Ensure that the configuration filename is saved as "config.tar.gz" Special characters in the filename will cause the upload configuration to fail.

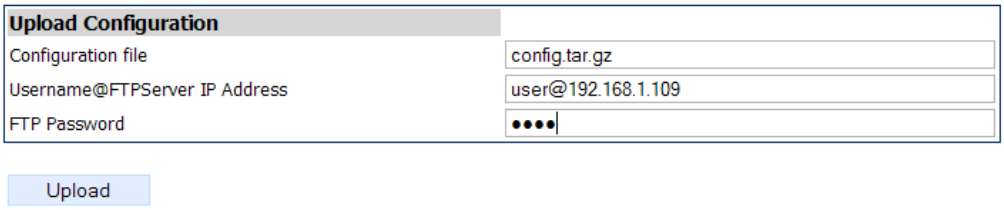


Figure 0-30: Upload Configuration Page

To restore a configuration tar.gz file, place the file on an FTP server that is accessible from the base station. Enter the path to the configuration file in the "configuration file" field and the coordinates of the FTP server as shown in the example above. When the upload button is pressed, the tar.gz file will be loaded into the base station and the configuration will be overwritten. In order for the new settings to take effect, the base station must be rebooted.

NOTE: The existing GUI password will be overwritten by the password that was saved in the configuration being uploaded.

1.43 Restore Factory Default

This feature sets all configurations to factory default, including IP address and frequency configuration. Major factory settings are as follows:

Parameter	Value
IP Address	192.168.1.40
NMS Server	192.168.1.40
AAA Server	192.168.1.40
Frequency:	5725000 kHz
Channel Bandwidth	10 MHz
BS Transmit Power	-50 dBm

Subscriber stations and QoS parameters are not restored by factory default. You will have to configure them manually.

1.44 IP Address Recovery

Loss of the Base Station's IP address leads to loss of accessibility to the Base Station and ability to manage the Base Station. This feature provides the ability to recover the accessibility to the Base Station by assigning a new IP address to the Base Station.

This feature would require a utility program called **"iprecover"** to be executed from a **linux desktop** that is connected to the Ethernet interface of the Base Station.

The iprecover utility can be executed as shown below. Executing the utility without specifying any parameters will display a brief help on the various parameters that should be provided while executing the utility.

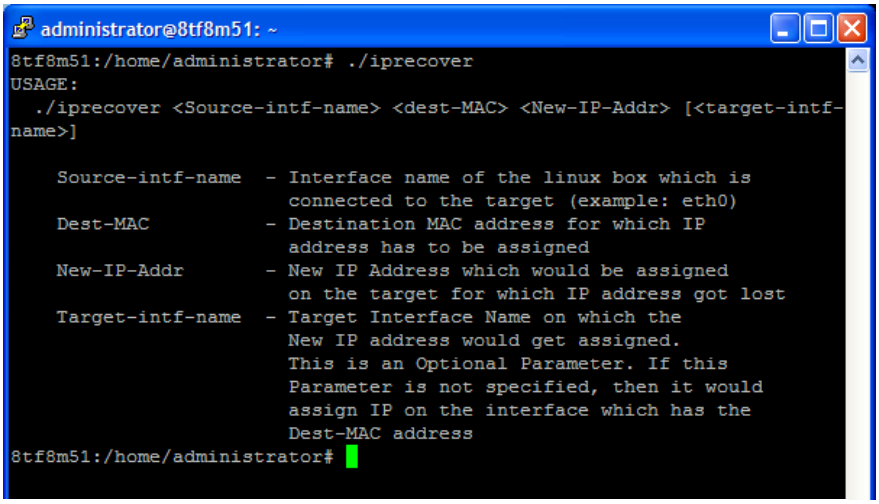


Figure 0-31: Executing the IP recovery utility without specifying any parameters will display a help file

The values for each of the parameters in the iprecover utility adhere to the following:

- **Source-intf-name** is the name of the interface which is connected to the Base Station
- **Dest-MAC** is the MAC Address of the Base Sation for which a new IP address has to be assigned.
- **New-IP-Addr** is the IP Address that will be assigned to the Base Station
- **Target-intf-name** must be IXP0 when assigning a new IP Address for the Base Station

An illustration of the command usage is shown below:

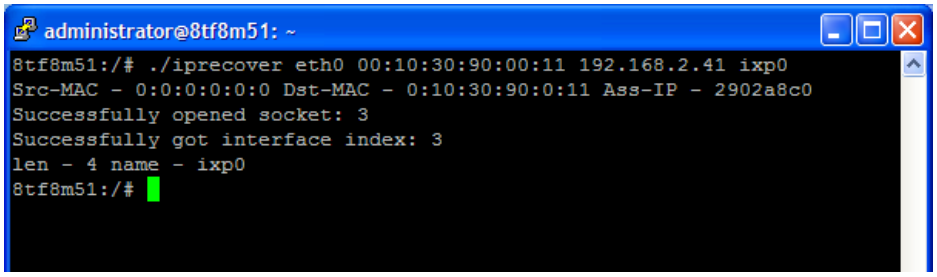


Figure 0-32: In this example, the IP address 192.168.2.41 is assigned to the Base Station having a MAC address 00:10:30:90:00:11

NOTE: The new IP address assigned after the above step is complete is only a temporary IP address and will not be reflected in the Base Station GUI. Also, the new IP Address will be lost when the Base Station is rebooted.

Once the above step is completed and the Base Station is accessible with the new IP address, the IP address should be updated (or recorded) appropriately from the Base Station GUI to make it as a permanent IP address.

Sector Card / Indoor Unit

1.45 Sector Card Management

Sector card plugs into any of the gray slots of the indoor unit chassis and is a part of Libra MAX-HD Chassis. This allows configuration of multiple Base Stations as well as their monitoring. It also provides the data path for multiple BS ODUs to their data source (such as router or a switch) inside the NOC.

Since one sector card can manage multiple BS ODUs, management of sector card itself is less frequent and is usually done at the time of its installation only. Most common parameters to be changed on sector card are time zone and its network parameters (such as IP address and subnet mask). Besides, sector card can be reset or shutdown using its management interface.

1.45.1 Accessing Sector Card

In order to access sector card, open a web browser and type the following URL:

`https://192.168.1.200:10101`

Please note that it uses 'HTTPS' and that the IP address is factory default. On the screen that appears next, log in with the following username and password.

Username: admin

Password: admin123

Figure 0-1: SC-Management – Log In

After successful login, the following screen appears.

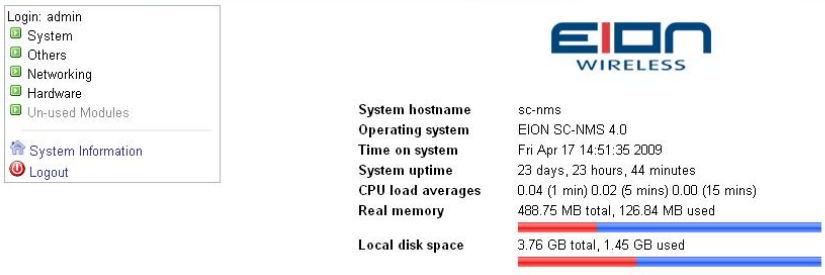


Figure 0-2: SC-Management – Post Log In

1.45.2 Time Configuration

In order to set up time, log into to SC-Manager and then click on 'Hardware' – 'System Time'. The following window will appear. Configure your current time under 'System Time' and then click on 'Apply'. Ignore the configuration for 'Hardware Time'.

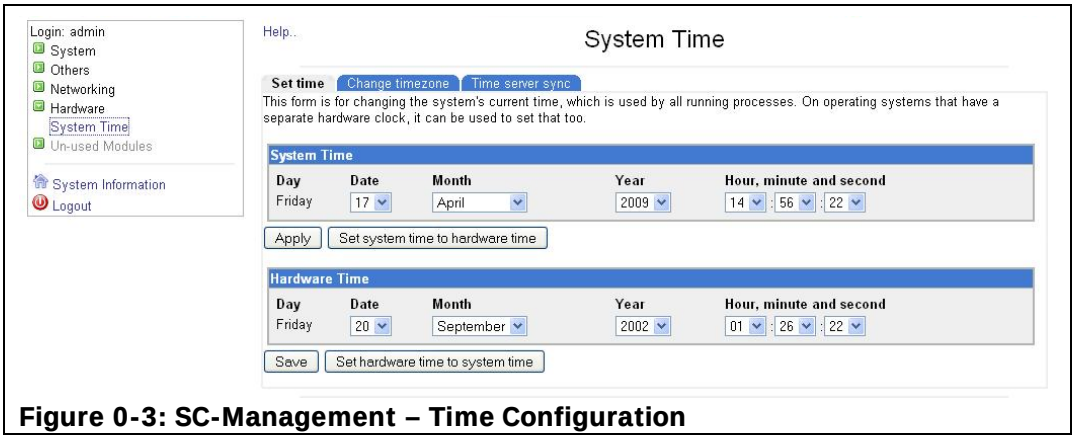


Figure 0-3: SC-Management – Time Configuration

1.45.3 Network Configuration

In order to configure network settings of sector card, log into to SC-Manager and then click on 'Networking' – 'Network Configuration' so that the following screen appears.

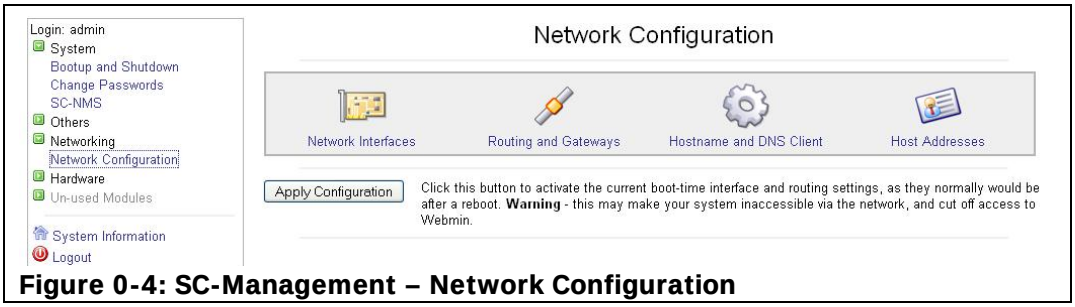


Figure 0-4: SC-Management – Network Configuration

To configure IP address, subnet mask and MTU of the sector card, click on 'Network Interfaces' and the screen as shown on Figure 0-5: SC-Management – Network Interfaces appears.

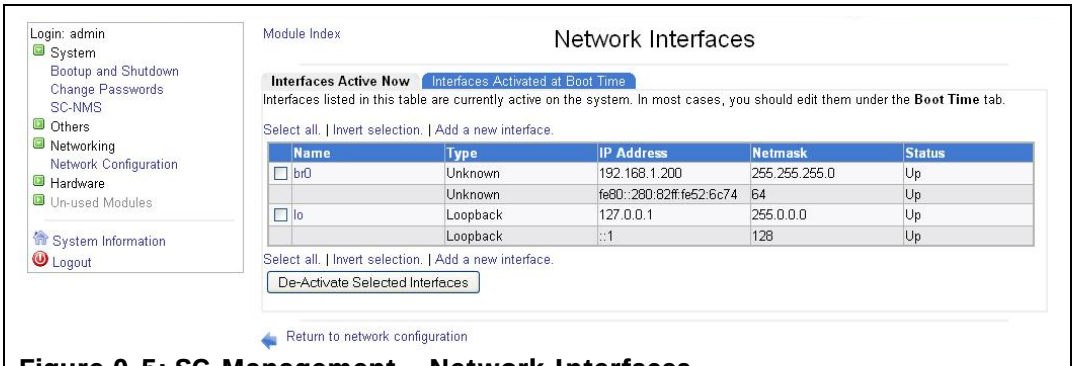


Figure 0-5: SC-Management – Network Interfaces

Next, click on 'br0' and the screen as shown in Figure 0-6: SC-Management – Change IP Address appears. Configure the desired IP address, subnet mask and MTU for the interface and then click on 'Save'. Please note that although there are multiple ports on the sector card, they are bridged into one. This allows use of either of the Ethernet

ports.

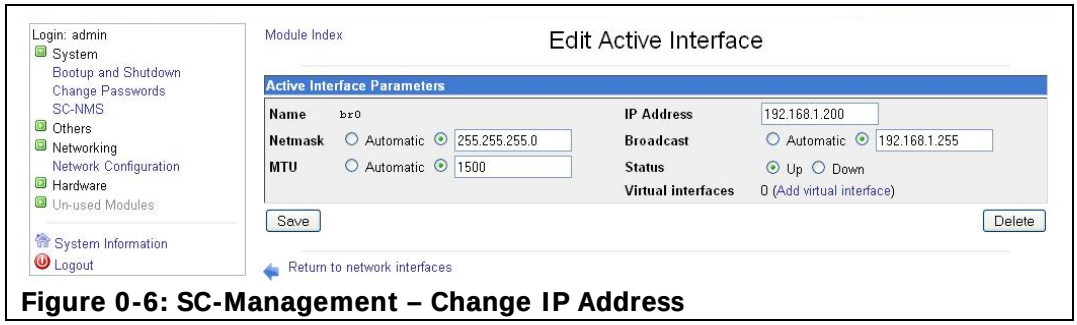


Figure 0-6: SC-Management – Change IP Address

Static Routes and Gateway can be added by clicking on 'Routing and Gateways' in Figure 0-4: SC-Management – Network Configuration.

Hostname of the sector card and DNS client information can be configured under 'Hostname and DNS Client' in Figure 0-4: SC-Management – Network Configuration.

1.45.4 Change Password

Password of the sector card manager can be changed by clicking on 'System' and then on 'Change Passwords'

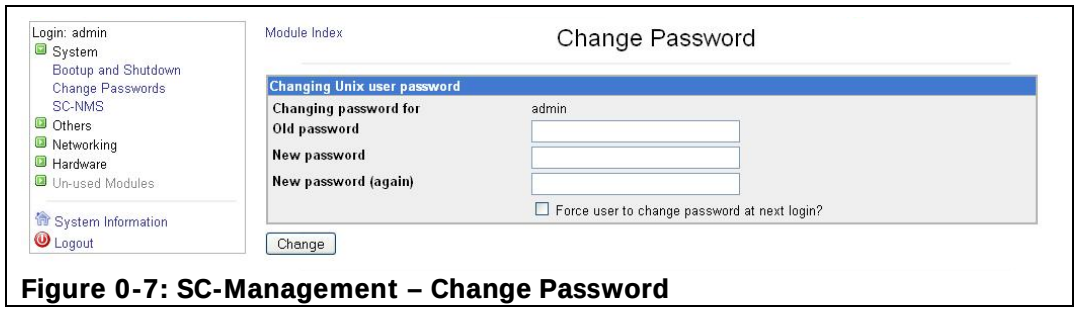


Figure 0-7: SC-Management – Change Password

1.45.5 Reboot/Shutdown Sector Card

Sector card can be reset or shutdown by clicking on 'System' and then the following screen appears upon clicking on 'Bootup and Shutdown'. Sector card can be either reset or shutdown using the respective button. Please note that if you shutdown the sector card, it would have to be unplugged and then plugged back again for it to start up.

Figure 0-8: SC-Management – Change Password

1.46 BS Configuration

Libra MAX Base Station Manager controls the operation and configuration of a Libra MAX Base Station. It is administered over an Ethernet connection using a web-based GUI.
This guide will cover the basic operation of the **Libra MAX BS ODU** and **Libra MAX Lite**. It does not cover the installation of the Libra MAX BS or Libra MAX Lite hardware. Please refer to installation guide for hardware installation.

1.46.1 Connect to the BS Manager

Requirements:

- PC running Windows
- Web browser (Internet Explorer or Firefox)
- Java

To connect to the Libra MAX BS do the following:

6. Configure a PC in the same subnet as the Libra MAX BS ODU.
7. Open Firefox web browser on the PC.
8. Type the following URL including the port into the address bar:

   `http://192.168.1.40:28086`

Note: The IP Address listed above is the default value.

9. The BS Manager Login Screen (Figure 0-1) will appear. Log in with the following:

   Username: root

   Password: BS4400

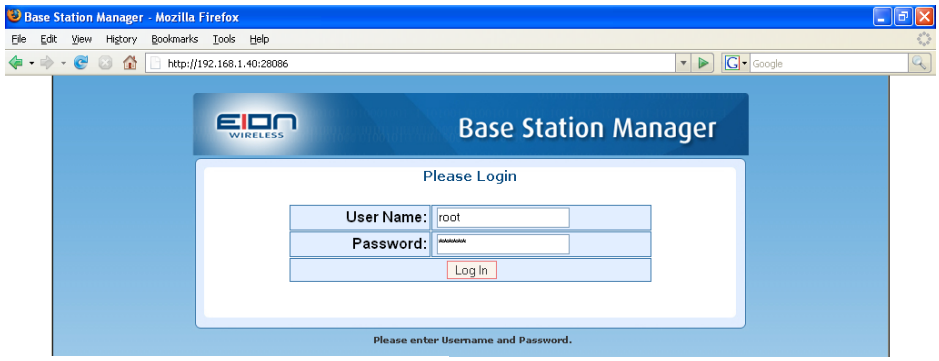


Figure 0-9: BS Manager Login Screen

10. After successful login the Post-login screen (Figure 0-2) appears.

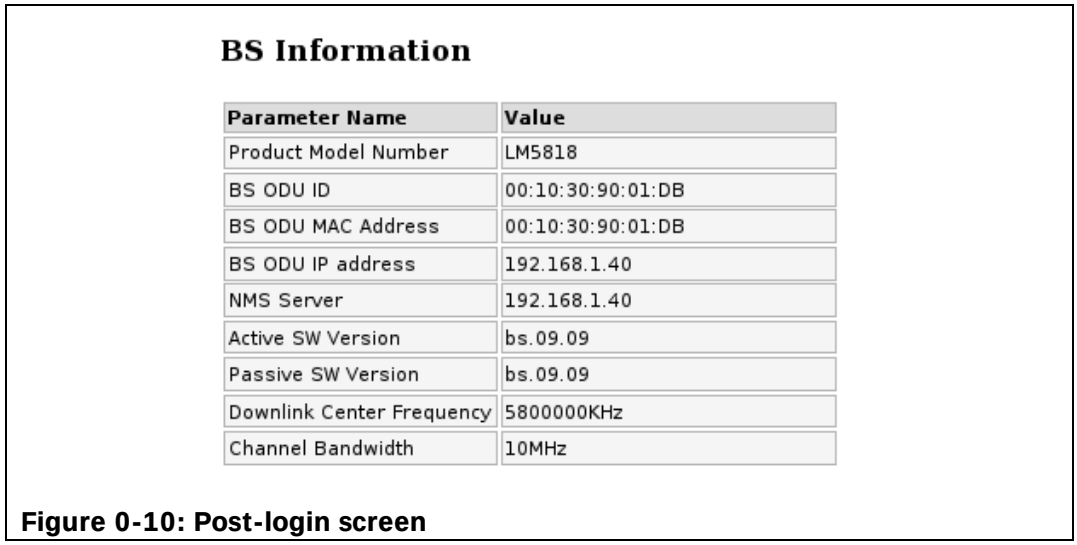


Figure 0-10: Post-login screen

1.46.2 Basic Configuration

This screen appears after clicking on 'BS', then on 'Configuration' and then on 'Basic'. It allows configuration of the following:

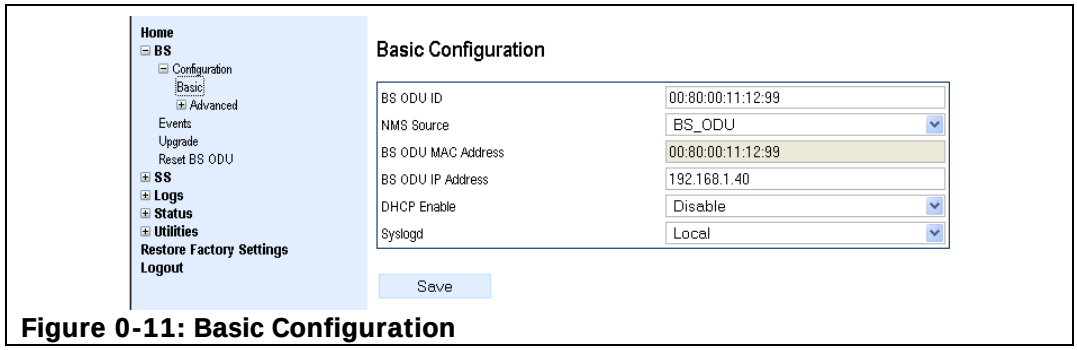


Figure 0-11: Basic Configuration

BS ODU ID – It is a globally unique numeric identifier for the BS ODU and hence the network. It is 6 bytes (48 bits) in length. This identifier has to be entered in the subscriber stations for them to communication with this particular BS. By default this is set as the MAC Address of the BS ODU.

NMS Source – It configures whether the NMS and AAA server to be used should be loaded from the BS ODU itself or a sector card with standalone NMS/AAA server. This has to be set to BS_ODU for MAX-LT. For MAX-HD it can be set to either BS_ODU or SECTOR_CARD as needed.

BS ODU MAC Address – It displays the MAC address of the active port of the BS ODU. This MAC address has to be configured into subscriber stations if you want them to specifically connect to the particular BS ODU of interest. MAC address is not configurable by user.

BS ODU IP Address – It is the IP of the active port of the BS ODU. IP address has to be in the same subnet as the subscriber station.

Note: Click on 'Restart' button for change in IP address to take effect.

DHCP Enable – Setting it to 'Enable' activates a DHCP server in BS ODU so that subscriber stations associated with it can receive IP address automatically. It is disabled by default.

Syslogd – It configures where the log files for the BS ODU are stored. Its value is set to 'Local' by default

After configuring the values, click on 'Save' button so that changes are saved.

1.47 SC-NMS Configuration

SC-NMS and ODU work together as a single entity. Both of them have to be in the same subnet for them to communicate with each other. SC-NMS is used to configure RF, MAC and classifiers for the BS ODU.

SC-NMS can be accessed either via SC-Manager by clicking on 'System' and then on 'SC-NMS' or directly at the following URL:

`http://192.168.1.200:8080/nms`

Username: admin

Password: eionnms

Figure 0-12: SC-NMS – Log In

1.47.1 Screen Layout

The NMS GUI is divided into four distinct areas.

Left Panel: This area contains a hierarchical view of all the elements in the system. You can expand and collapse the sections by clicking on the '+' and '-' symbols beside each element icon. Each SC-NMS is shipped with sample data that allows new users to gain familiarity with the SC-NMS. The instructions below will refer to this sample data. Once you are comfortable using the NMS, you may delete these examples.

Main Menu: Select different NMS functions in the main menu
Contextual Menu: This menu shows different options depending on the selection chosen in the main menu.
Main Screen: The main portion of the screen shows configuration settings, topological maps and performance charts.

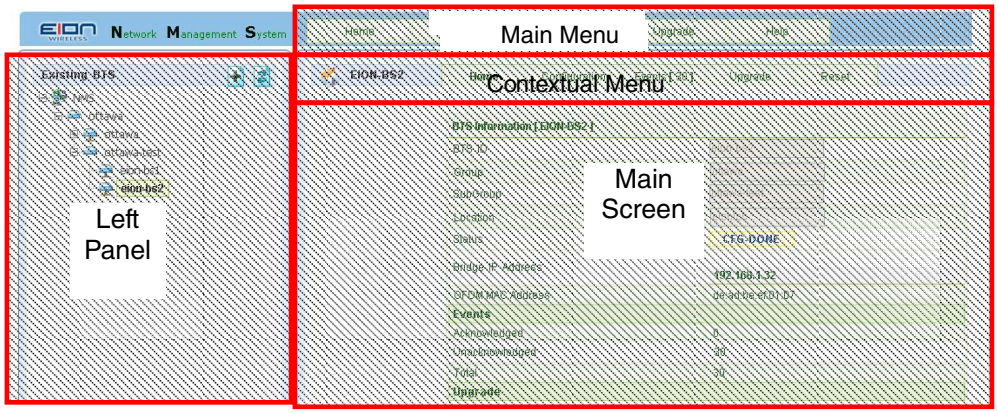


Figure 0-13: SC-NMS – Screen Layout

Groups and Subgroups: Elements in the NMS must belong to both a group and a sub-group. In the example screen shot "ottawa" is the group name; and "ottawa" and "ottawa-test" are the sub-groups. Typically, system elements are grouped based on their geographical location (e.g. city and neighborhood).

Navigating Groups: Click on the '+' sign to the left of a group icon to expand the group. This will display any sub-groups that belong to this group. Click on the BS name of a pre-configured BS station and information about the BS will appear. You will be able to see its ID, current status, OFDM MAC address including its software and hardware versions displayed in the main screen area.

1.47.2 BS Configuration Using SC-NMS

In order to configure BS ODU using SC-NMS, the following are the pre-requisites:

- Sector card has to be plugged on to any of the gray colored slots on the front of the chassis
- PoE card at the rear has to be plugged in to the corresponding slot where sector card is plugged in at the front of the chassis.
- BS ODU has to be physically connected to the sector card or to the PoE card at the rear. Either of the two Ethernet ports of the sector card can be used.

- Both BS ODU and the sector card have to be on the same subnet. Factory shipped units are all in the subnet 192.168.1.0/24

- BS ODU has to be configured so that its 'NMS Source' is set to 'SECTOR_CARD' and the IP address of the NMS server has to be configured as that of the sector card.

Once these prerequisites are satisfied, turn on the chassis and this will also turn on the sector card. It usually takes up to 3 minutes for the sector card to start up.

Then turn on the BS ODU. It takes up to a minute for the BS ODU to start up.

Subscriber Station Configuration

1.48 Introduction

Libra MAX-58 Subscriber Station Manager controls the operation and configuration of a Libra MAX-58 Subscriber Station. It is administered over an Ethernet connection using a web-based GUI.

This chapter covers the basic operation of the **Libra MAX-58 SS** and the Subscriber portion of the **Libra MAX-RBS**.

1.49 Connect to the SS Manager

Requirements:

- PC
- Web browser
- Java

To connect to the Libra MAX-58 BS do the following:

1. Configure a PC in the same subnet as the Libra MAX-58 BS ODU.
2. Open Firefox web browser on the PC.
3. Type the following URL into the address bar:

http://192.168.1.150

Note: The IP Address listed above is the default value.

4. The BS Manager Login Screen (Figure 0-1) will appear. Log in with the following:

Username: admin

Password: admin123

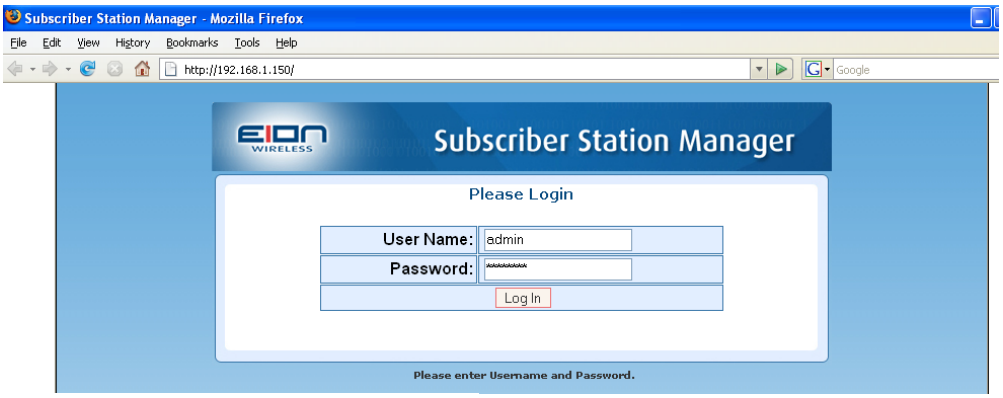


Figure 0-1: SS Manager Login Screen

1.50 Screen Layout

The Web interface GUI is divided into four distinct areas (Figure 0-2: Screen Layout).

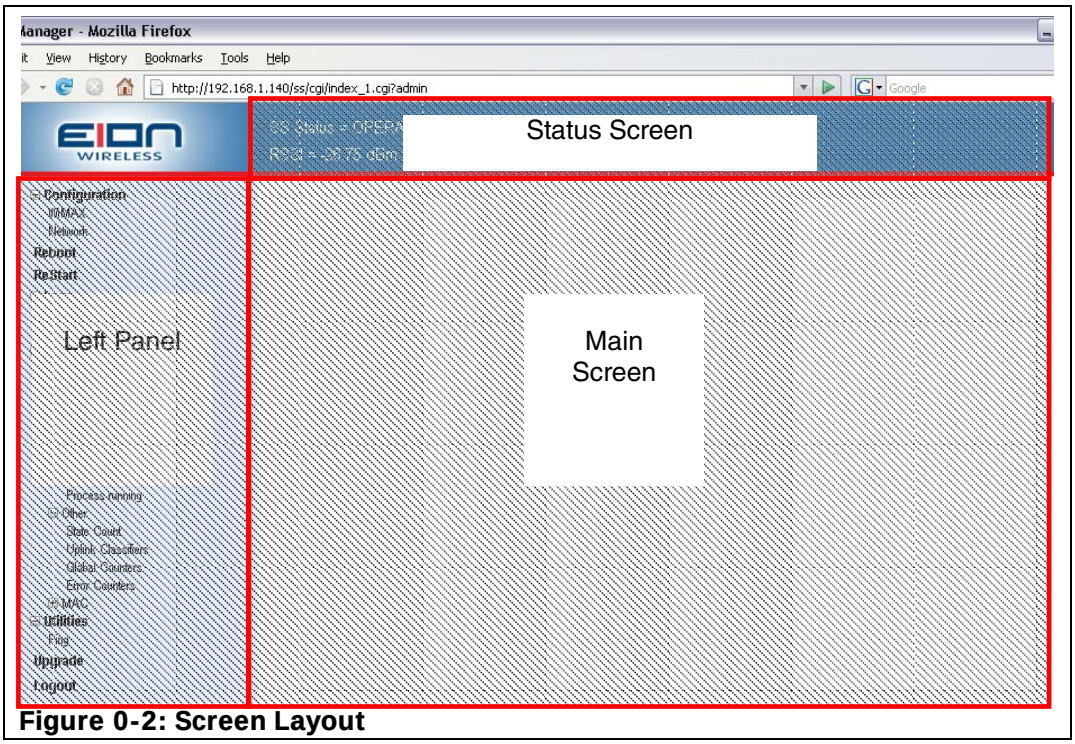


Figure 0-2: Screen Layout

Left Panel: This area contains a hierarchical view of all the elements in the system. You can expand and collapse the sections by clicking on the '+' and '-' symbols beside each element icon.

Main Screen: The main portion of the screen shows configuration.

Status Screen: Status screen displays the current status of the SS. After a SS successfully associates with a base station, SS Status becomes 'Operational'. This screen also displays other relevant information such as BS ID the SS is connected to, RSSI and CINR at the SS.

Navigating Groups on Left Panel: Click on the '+' sign to the left of a group icon to expand the group. This will display relevant configuration tree for a group.

1.51 Configuration

Configuration of SS mainly involves entering the radio and network parameters. It contains two sub-sections – WiMAX Radio and Network. WiMAX settings deal with RF portion whereas Network is for IP settings.

WiMAX Radio

This section can be accessed by clicking on 'Configuration' and then on 'WiMAX'. Radio or RF configuration is done on this section. It allows configuration of the following:

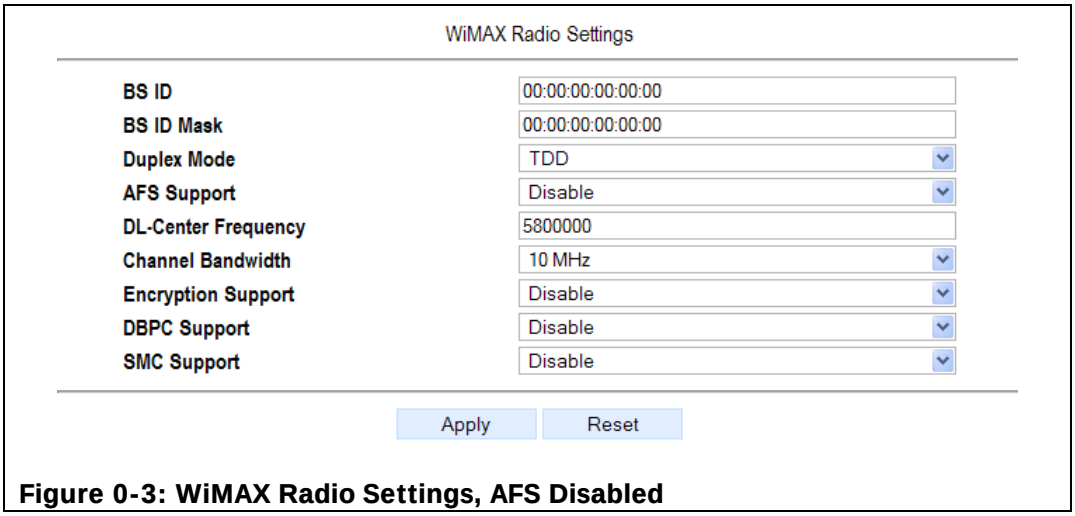


Figure 0-3: WiMAX Radio Settings, AFS Disabled

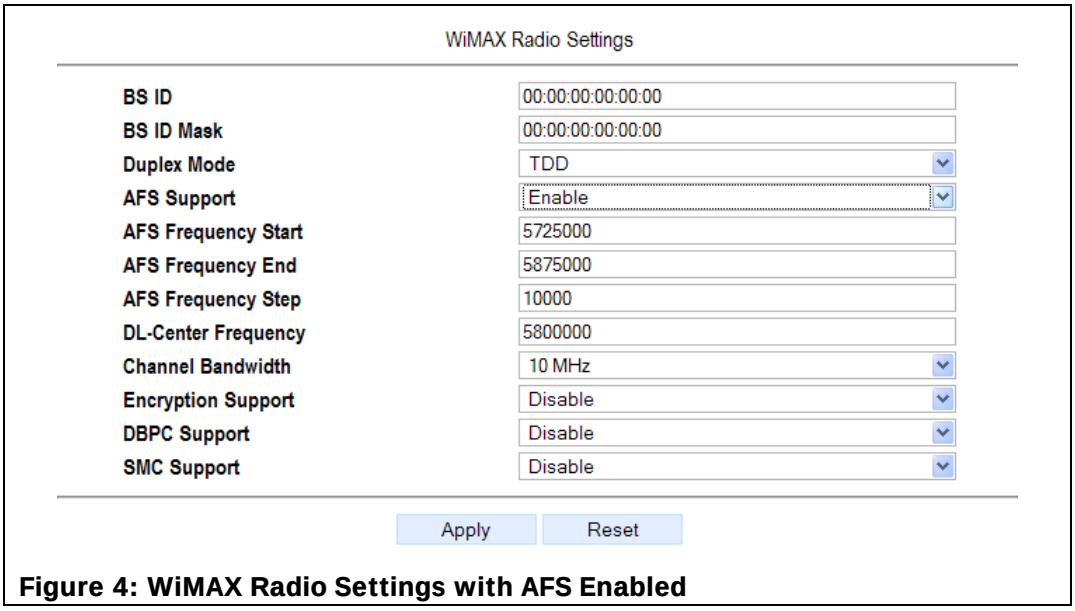


Figure 4: WiMAX Radio Settings with AFS Enabled

BS ID – It is the identifier of the BS to which the subscriber station is to be associated. It is usually the MAC of the BS ODU. By default, SS is configured to be associated with any Libra MAX-58 BS ODU.

BS ID Mask – This is the mask for BS ID. Its default value is 00:00:00:00:00:00

Duplex Mode – This is set to TDD as only TDD is supported at present.

AFS Support – Automatic Frequency Scanning mode allows selection of frequency automatically within the range and in step size specified. Set the start and end frequency range including the step size and a center frequency. Subscriber station will then scan within the range of frequencies and locks the center frequency to the one where the signal strength is optimum.

DL-Center Frequency – This should be set to that of the BS ODU. For a SS to communicate with the BS, both have to be on the same frequency. Since, it's a TDD system, both uplink and downlink frequency will be the same.

Channel Bandwidth – For BS Type FBW-1050 (5.725 to 5.875 GHz), channel bandwidth is 10 MHz. Larger the bandwidth, higher the throughput.

Encryption Support – This field indicates Encryption Support is Enabled or not. This

is disabled by default.

DBPC Support – This field indicates DBPC (Down-Link Burst Profile Change) Support is Enabled or not. It is disabled by default.

SMC Support – This field indicates SMC (Secondary Management Connection) is Enabled or not. It is disabled by default.

1.52 Network

The following network related parameters are configured in this section.

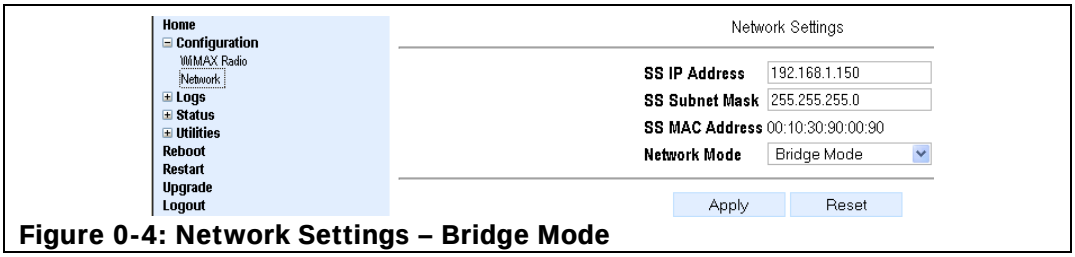


Figure 0-4: Network Settings – Bridge Mode

SS IP Address – This is the IP address of the subscriber station.

SS Subnet Mask – Subnet mask of the subscriber station is configures in this section.

SS MAC Address – MAC Address of the subscriber station is displayed here. This MAC address needs to be configured in the list of SS in the Base Station for them to communicate.

Operation Mode – Subscriber station can work either in bridge mode or router mode. It operates at bridge mode by default. In the router mode, traffic IP and its subnet has to be configured.

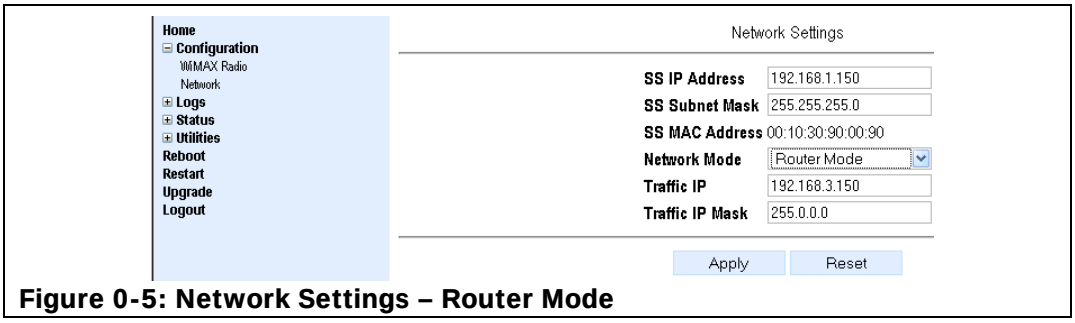


Figure 0-5: Network Settings – Router Mode

1.53 Reboot

This will reset the subscriber station. Configurations are still retained on reboot.

1.54 Restart

This will stop and then restart the wireless interface of the subscriber station. It is recommended to restart subscriber station after making changes. Restart takes shorter time then reboot.

1.55 Logs

This section contains information about the recent system activities and helps

troubleshoot system errors.

1.55.1 Current Logs

Current logs are generated after any system event. It lists sequence of activities happening within a subscriber station. This is useful in troubleshooting in case SS does not associate with the BS of interest.

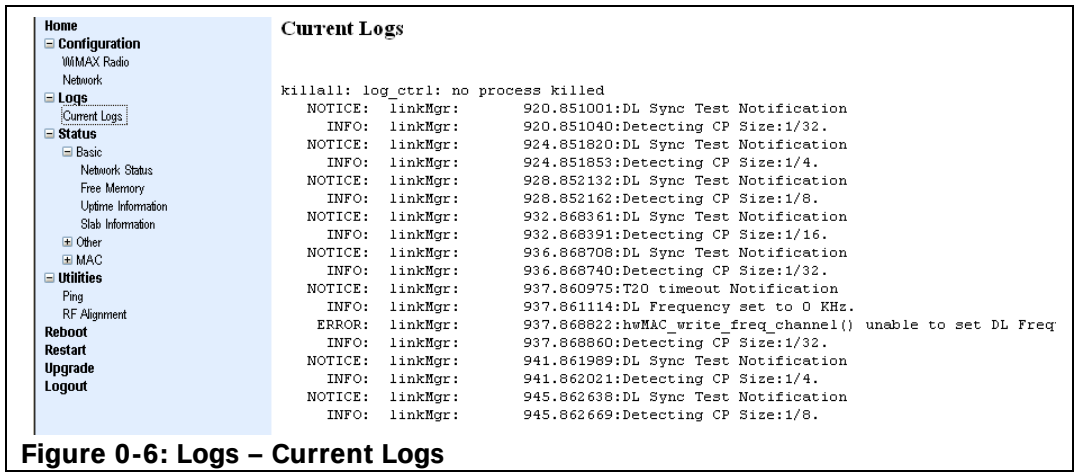


Figure 0-6: Logs – Current Logs

1.56 Status

Statistics provides information about the SS system such as its IP and MAC addresses, uptime and system memory. It also provides statistics on uplink classifiers.

1.56.1 Network Status

IP and MAC address of SS can be known by clicking on 'Stats', then on 'Basic' and then on 'IP Configuration'. In order for the SS to associate with the BS, correct OFDM MAC address of the SS has to be entered in the SS list. OFDM MAC address is also printed on the label pasted on the unit. This feature displays the network status in tabular form.

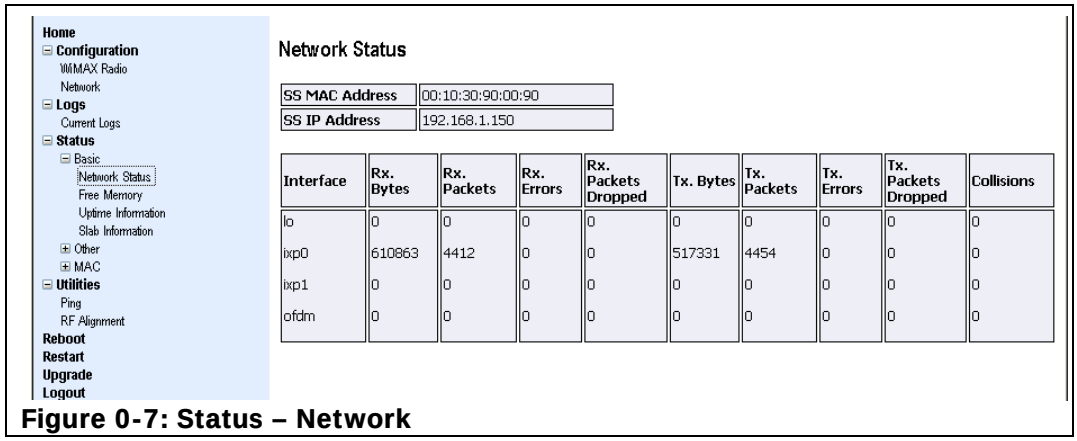


Figure 0-7: Status – Network

1.56.2 Other

Other statistics such as state count, uplink classifiers, global counters and error counters are grouped under this section.

1.56.3 MAC

MAC related statistics such as ARQ counters, DCD/UCD counters, PKM TEK/TK , counters, PDU MGR counters and QoS counters are grouped under this section.

1.57 Utilities

Utilities such as Ping assist network administration and troubleshooting.

1.57.1 Ping

It is a useful tool to verify if subscriber station can ping a particular IP address.

1.57.2 RF Alignment

A useful tool for antenna alignment. It displays the real time value of CINR, RSSI and Transmit Power.

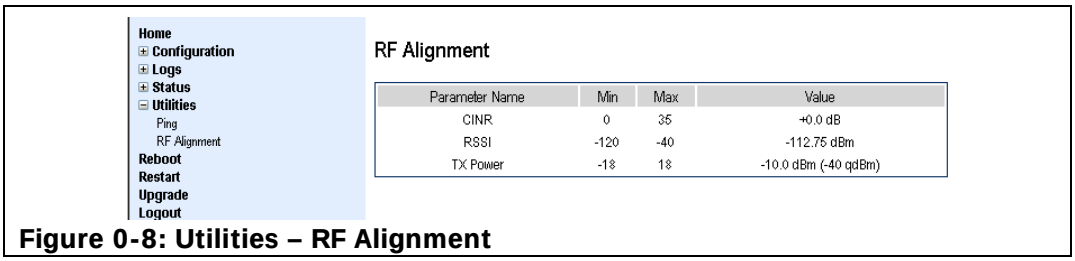


Figure 0-8: Utilities – RF Alignment

1.58 Upgrade

This option is currently not available. Please contact EION Tech Support for the latest available firmware and procedure to upgrade.

1.59 Logout

Once the configuration is completed, it is advisable to logout using this feature.

Troubleshooting

1.60 Preventative Maintenance

Administering and maintaining your system properly can prevent many problems and alert you to minor problems before they become serious. Some recommendations follow.

- Measure and document system performance at the time of the original installation.
- Change menu passwords so that only authorized people can reconfigure the system.
- Maintain the integrity of the system design when adding to or changing a system. The introduction of new elements to a system can cause problems unless you revise the network plan to take into account the changes. For example, improper installation of a co-located antenna can add unwanted system interference.
- Keep records of all changes. Especially document the addition of units, hardware and software changes, and changes to configuration settings. Configuration errors often cause other problems. Current records can be compared with original installation records and function as benchmarks to help in troubleshooting.
- Keep a log of past and present problems and solutions. Store the log on-site for easy reference, if possible. The log identifies common failure points and fixes. Before contacting EION's Technical Assistance Center, document the symptoms of the fault and the steps taken to diagnose and fix the problem. Record the current configuration of the system.
- Perform preventive maintenance at a regular interval, for example every six months.
- Perform link monitor tests to verify the system after periods of extreme weather, and inspect towers, antennas, ODUs, cables, and connectors for damage.
- Monitor system performance regularly. Environmental change as well as normal wear and tear on components can affect system performance.
- In some cases a bench test is a useful tool in diagnosing problems.

1.61 Troubleshooting Areas

There are four areas to keep in mind with troubleshooting:

1. Network integrity: The continued performance and reliability of a network depend upon maintaining the integrity of the network. If you change a network's design, you will affect its operation. Be aware of recent changes to your network.
2. Quality of RF links: Data communication depends first on good RF links. If you establish and maintain high-quality RF links, then you can be sure the links will carry high-speed data. If the quality of the RF links degrades for some reason, the quality of the data and the associated performance will also degrade.

3. Radio Hardware: This consists of three parts: Main unit, antenna, and mounting hardware.. (To verify the radio performance, you can run diagnostic tests, such as RSSI and CINR)
4. Correct Unit Configuration: Units must be configured properly, according to the network plan. Configuration errors can cause an inability to communicate or poor performance. The addition of units or other changes to your system may require you to change configuration settings.

1.62 Troubleshooting Chart

Indication	Possible Cause	Corrective Action
High BER	Signal strength is too low	• Record RSSI to determine fade margin • Check for RF absorbent obstacles in the antenna path • Search for indirect RF paths between antennas (i.e. ones that use beneficial reflections or multipaths) • Check and replace cables if necessary • Reposition antenna or if possible remove obstruction
High BER	Signal strength is too high	• Adjust antennas • Increase distance between units to add attenuation • Adjust Tx Power level
High BER	Interference	• Change center frequency • Increase RF power • Change polarization of antennas • Increase separation or change location of antenna • Increase separation between co-located antennas
High BER	Radio Performance (Tx/Rx)	• Contact EION Inc. Technical Support

Indication	Possible Cause	Corrective Action
No Ethernet connection	Bad CAT-5 cable	• Visually inspect cable • Change cable
No Ethernet connection	Bad Connectors	• Visually inspect connectors • Change cable/connectors
No Ethernet connection	Temperature	• Determine if ambient operating temperature is too high or low • Change ambient temperature to specified range
Low signal strength or fade margin	Bad ratio	• Bench test system • Change Libra MAX-58 unit
Low signal strength or fade margin	Poor antenna alignment	• Use RF diagnostics to realign antenna
Low signal strength or fade margin	Bad cable	• Visually inspect cables/connectors • Sweep cable • Change cable/connectors
Low signal strength or fade margin	Incorrect radio configuration	• Bench test the radio to confirm configuration • Reconfigure radio
Low signal strength or fade margin	No Fresnel zone clearance or severe NLOS	• Check LOS for obstacles such as trees • Change alignment of antenna to take advantage of beneficial multipath signals • Increase antenna height to obtain clearance • Move antenna to better location or remove obstacle if possible

Indication	Possible Cause	Corrective Action
High packet loss	Signal to strength too low	• Record RSSI to determine fade margin • Check for obstacles in RF path • Check for interference • Point antenna in different directions to take advantage of beneficial multipaths • Reposition antenna to establish better LOS • Replace Libra MAX-58 and perform bench test
High packet loss	Interference	• Change center frequency • Increase RF power • Change polarization of antennas • Get separation or change physical location of antenna
High packet loss	Temperature	• Determine if ambient operating temperature is too high or low • Increase or reduce ambient temperature

Indication	Possible Cause	Corrective Action
No communication between units	Configuration problems	Check the following configuration settings: • MAC Address–Each unit must have a unique MAC Address • SS must have BS ID set to 00:00:00:00:00:00 • Center frequency–Units must have the same center frequency to communicate • IP address/subnet mask–Incorrectly configured • IP addresses result in units being unable to communicate. Check that IP addresses are unique for each unit within a subnet and that the correct subnet mask is being used.
Poor Link Performance	Distance	• Check the distance configuration setting on SS
Poor Link Performance	Signal absorption	• Check LOS for obstacles such as trees • Change alignment of antenna to take advantage of beneficial multipath signals • Move antenna to better location or remove obstacle if possible
Poor Link Performance	Interference	• Set units from different systems in the same geographical area to different center frequencies. Overlapping wavelengths from other systems will degrade performance.
Poor Link Performance	Overpowering Colocated Unit	• Output power from one unit can overpower another, colocated, radio, even if units operate on different channels
New configuration will not take	Incorrectly upgraded software	• Reload the software image

Indication	Possible Cause	Corrective Action
Unable to access main configuration menu	Invalid Passwords	• Contact EION, Inc. for information about how to re-enter your system. • Units will need to be reset
Unit will not operate	Faulty unit	• Bench test unit
Unit will not operate	Corrupt unit software	• Reload unit software

Appendix A: Definitions

Base station (BS): Generalized equipment set providing connectivity, management, and control of the subscriber station (SS).

Subscriber station (SS): Generalized equipment set providing connectivity between subscriber equipment and a base station (BS).

Multicast polling group: A group of zero or more subscriber stations (SSs) that are assigned a multicast address for the purposes of polling.

Security association identifier (SAID): An identifier shared between the base station (BS) and subscriber station that uniquely identifies a security association (SA).

IPV6: A network layer for packet-switched internetworks. It is designated as the successor of IPv4, the current version of the Internet Protocol, for general use on the Internet.

Ipv4: The fourth iteration of the Internet Protocol (IP) and the first version of the protocol to be widely deployed. IPv4 is the dominant network layer protocol on the Internet and apart from IPv6 it is the only standard internetwork-layer protocol used on the Internet.

MAC Address: Media Access Control Address, a quasi-unique identifier attached to most network adapters (NICs). It is a number that acts like a name for a particular network adapter.

IP Address: A unique address that certain electronic devices currently use in order to identify and communicate with each other on a computer network utilizing the Internet Protocol standard (IP).

SAID: Security Association Identifier is an identifier shared between the base station and a subscriber station that uniquely identifies a security association (SA).

PCID: Provisional Connection identifier. It's a provisional service given by the operator. PCID is equivalent to provisional service flow in IEEE 802.16D standard.

QOS: Quality of Service refers to resource reservation control mechanisms rather than the achieved service quality. Quality of Service is the ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level of performance to a data flow.

Classifier: A classifier is a set of matching criteria applied to each packet entering the IEEE standard 802.16 network. It consists of some protocol-specific packet matching criteria (destination IP address, for example), a classifier priority, and a reference to a CID. If a packet matches the specified packet matching criteria, it is then delivered to the SAP for delivery on the connection defined by the CID. Implementation of each specific classification capability (as, for example, IPv4 based classification) is optional. The service flow characteristics of the connection provide the QoS for that packet.

Configuration: A set of parameters by which a BS (base station) is configured to take specific values and operate in that range.

Events: The information of the particular BS (base station) which is reported by a BS on occurrence of state changes and faults.

Slab: Identifies a period of time used for billing purposes.

Upgrade: To update the software on the BS from existing load to another load.

Mapped SS: Shows the numbers and the detail of the SS which are associated to the

particular BS

UN Mapped SS: Unmapped SS are the SS which have been created by the operator and have not been associated to any BS yet. The SS will get associated with the BS once it starts communicating with the BS.

Deregister: This is the operation to delink the connectivity between the SS and BS.

Appendix B: Abbreviations

ATM	Asynchronous transfer mode
ARQ	Automatic repeat request
BS	Base station
BE	Best effort
CRC	Cyclic redundancy check
DCD	Downlink channel descriptor
DSx	Dynamic service addition, change, or deletion
DES	Data encryption standard
DL	Downlink
FDD	Frequency division duplex or duplexing
FSN	Fragment sequence number
H-FDD	Half-duplex frequency division duplex
IDU	Indoor Unit
IP	Internet protocol
MAC	Medium access control layer
NRTPS	Non-real-time polling service
ODU	Outdoor Unit
OFDM	Orthogonal frequency division multiplexing
PHS	Payload header suppression
PDU	Protocol data unit
PHY	Physical Layer
PKM	Privacy key management
QoS	Quality of Service
RBS	Rapid Backhaul System
RSSI	Receive signal strength indicator
rtPS	Real-time Polling Service
Rx	Receiver
RNG	Ranging
SAP	Service access point
SA	Security association
SAID	Security association identifier
SS	Subscriber Station
SF	Service flow
TDD	Time division duplex or duplexing
Tx	Transmitter
UCD	Uplink channel descriptor
UGS	Unsolicited grant service
UL	Uplink