

D-MBR 3707 3708

PS NFPA Repeaters

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User Manual – 00060CDUM Rev. 1.0

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COBHAM

This manual is relevant for 700/800 MHz Digital Multi-Channel Class B RF Signal Booster



D-MBR 3707-3708 PS NFPA Booster



D-MBR 3707-3708 AC feeder and battery charger

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About This Manual

This Product Manual provides the following information:

- Description of the Repeater unit
- Procedures for setup, configuration and checking the proper operation of the unit
- Maintenance and troubleshooting procedures

For whom it is intended

This Product Manual is intended for experienced technicians and engineers. It is assumed that the customers installing, operating, and maintaining Cobham Wireless Repeaters are familiar with the basic functionality of Repeaters.

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All antennas must be installed with lightning protection. Damage to power modules, as a result of lightning are not covered by the warranty.

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Danger: Electrical Shock

This equipment can either be installed indoors or outdoors. When installed outdoors - wet conditions increase the potential for receiving an electric shock when installing or using electrically powered equipment. To prevent electrical shock when installing or modifying the system power wiring, disconnect the wiring at the power source before working with un insulated wires or terminals.



Caution: Safety to personnel

Before installing or replacing any of the equipment, the entire manual should be read and understood.
The user needs to supply the appropriate AC or DC power to the booster. Incorrect power settings can damage the Booster and may cause injury to the user.
Please be aware that the equipment may, during certain conditions become very warm and can cause minor injuries if handled without any protection, such as gloves.



Caution: Safety to equipment

When installing, replacing or using this product, observe all safety precautions during handling and operation. Failure to comply with the following general safety precautions and with specific precautions described elsewhere in this manual violates the safety standards of the design, manufacture, and intended use of this product.

Axell Wireless assumes no liability for the customer's failure to comply with these precautions. This entire manual should be read and understood before operating or maintaining the booster.



Warning: Restricted Access Location

Access to the unit installation location is restricted to SERVICE PERSONNEL and to USERS who have been instructed on the restrictions and the required precautions to be taken.

Compliance with FCC



WARNING!!! This is NOT a CONSUMER device. This device is designed for installation by FCC LICENCEES and QUALIFIED INSTALLERS. You must have an FCC LICENCE or express consent of an FCC Licensee to operate this device.

Depending on the configuration, this device can operate as either a Class A or a Class B signal booster. You **MUST** register Class B signal boosters (as defined in 47 CFR 90.219) online at www.fcc.gov/signal-boosters/registration.

Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.

The installation procedure must result in the signal booster complying with FCC requirements 90.219(d). In order to meet FCC requirements **90.219(d)**, it may be necessary for the installer to reduce the UL and/or DL output power for certain installations.

FCC Part 15

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.

If not installed and used in accordance with the instructions, this equipment generates, uses and can radiate radio frequency energy. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to RF reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the Donor antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Unauthorized Changes to Equipment

Changes or Modifications not expressly approved by the manufacturer responsible for compliance could void the user's authority to operate the equipment

FCC RF Exposure Limits

This unit complies with FCC RF exposure limits for an uncontrolled environment. This equipment must be installed and operated with a minimum distance of 28cm between the radiator and any person's body.

Antenna Installation

Installation of an antenna must comply with the FCC RF exposure requirements. The antenna used for this transmitter must be mounted on outdoor or indoor permanent structures. The maximum antenna gain for indoor operation is 2.2 dBi and for the external antenna is 7dBi. Cable loss of at least 2dB is taken into account for all cases. Antennas having a gain greater than these are strictly prohibited for use with this device. In indoor applications the antenna must be installed at a minimum separation distance of 28cm from all nearby persons.

Compliance with IC

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

The Manufacturer's rated output power of this equipment is for single carrier operation. For situations when multiple carrier signals are present, the rating would have to be reduced by 3.5 dB, especially where the output signal is re-radiated and can cause interference to adjacent band users. This power reduction is to be by means of input power or gain reduction and not by an attenuator at the output of the device.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 28 cm between the antenna and your body,

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

La puissance de sortie nominale indiquée par le fabricant pour cet appareil concerne son fonctionnement avec porteuse unique. Pour des appareils avec porteuses multiples, on doit réduire la valeur nominale de 3.5 dB, surtout si le signal de sortie est retransmis et qu'il peut causer du brouillage aux utilisateurs de bandes adjacentes. Une telle réduction doit porter sur la puissance d'entrée ou sur le gain, et ne doit pas se faire au moyen d'un atténuateur raccordé à la sortie du dispositif.

Cet appareil est conforme aux limitations de la norme IC RSS-102 concernant l'exposition aux radiations dans un environnement non contrôlé. Cet appareil doit être installé et utilisé avec une distance minimale de 28 cm entre l'antenne et le corps de l'utilisateur.

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1 INTRODUCTION

This manual describes the installation and setup procedures for D-MBR Public Safety Signal Boosters providing SMR 700 and 800MHz band at 37dBm output power per band.

D-MBR 3707-3708 PS NFPA (Digital Multi Band Booster for Public Safety) is a Class B Digital Multi-Channel Signal Booster (DCSB). It features an array of up to 12 DSP based, software-controlled, variable bandwidth filters, that are user-programmable across the 700 and 800 MHz bands.

D-MBR 3707-3708 PS NFPA supports all public safety technologies. For each filter, the user can specify the start and stop frequencies to reduce the installation time of the signal booster and enable a very wide range of filters selection.

Every parameter of D-MBR 3707-3708 PS NFPA, including filter tuning and selection, can be controlled via web based management. The patented Cobham Wireless' digital RF filter enables simple initial setup for any channel plan and if necessary, allows some basic reconfiguration due to re-banding.

The SALC -Smart ALC algorithm will reduce the gain to protect the signal booster from oscillation. When the gain cannot be reduced anymore a shut-down mechanism will be triggered.

The signal booster protects against degradation of the system's sensitivity and coverage. This is implemented by the inbuilt AGC per-channel (filter) feature, which permits equalization of the channel levels for uniform coverage.

This product meets the rigid requirements as defined by the NFPA and International Fire Code developmental organizations. The amplifier is painted a Fire Life Safety Red, meets NEMA4 compliance for hose down, and provides all Alarming outputs as defined by NFPA 2010, Chapter 24 including system and antenna failures. The signal booster is a DC fed unit.

An external battery charger unit is available as well. The charger is connected to the AC and includes a circuit to charge external batteries with all the dry contact alarms as defined in the NFPA standard: AC failure, Charger failure and Low battery.

1.1 Main Features

- Class B- signal booster for SMR and public safety networks
- Supports APCO 25 phase 1 and 2 for public safety networks
- NFPA 72-2010, Chapter 24 and IFC 510.1 Compliant
- Support of 700MHz D block for LTE network
- Patented DSP filtering™ technology:
 - Supports up to 12 independent filters per band
 - User programmable bandwidth / frequency
- NEMA4 enclosure
- SALC-Smart ALC mechanism to protect the digital signal booster from oscillation and shutdown the signal booster when required
- Web based management, SNMP traps

1.2 Booster Ordering Information

NOTE: Charger ordering information is provided in section 4.1.

IDENTIFICATION	DESCRIPTION PART	NUMBER
D-MBR 3707-3708 PS with NFPA and Red painted case	Digital Multi Channel Selective Signal Booster Class B 700/800 MHz 12 filters, 37dBm composite per band, 95dB gain, DC powering with NFPA and IFC compliant Alarm Outputs and red painted case.	D-MBR 3707-3708-PS-NFPA-DC-CLASS-B

1.3 Architecture

To meet the National Fire Protection Association (NFPA) requirements, power to the Signal booster is provided via an uninterrupted power source. This can either be a UPS or (if a UPS is not available), an AC Feeder and Battery Charger (purchased separately).

NOTE: The Power Feeder Battery Charger is described in Chapter - 4).

Alarm connections to the Fire Department Control Box are used to monitor the status of the uninterrupted power source, Signal Booster and DAS system (antennas).

NOTE: As an alternative to the Fire Department Control Box connections, the D-MBR PS NFPA and UPS or Charger dry contact alarms can be connected to an Automatic Dialer. The AD-2000 Automatic Voice/Pager Dialer System is recommended.

If the AC power to the UPS fails, the required power is provided by the battery and the AC Power Fail alarm is activated.

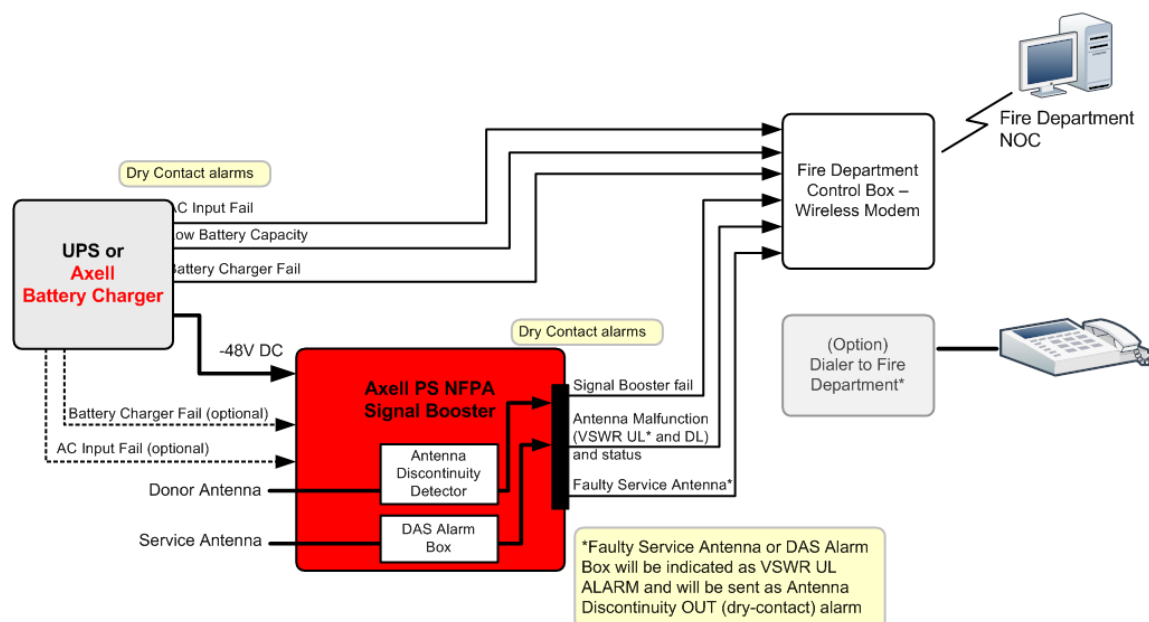


Figure 1-1. D-MBR PS NFPA Architecture

1.4 Smart-ALC Function

The Signal Booster's power amplifier includes power-monitoring circuits with Automatic Level Control (ALC) that prevents excessive output power while maintaining the power amplifier linearity

The Smart Automatic Level Control (Smart-ALC) is an innovative algorithm for automatic Signal Booster gain adjustment. Combined with advanced control algorithms, SALC is capable of learning the traffic load characteristics and adjusting the Signal Booster RF Gain to the desired value.

Note: To reset the Signal Booster to its highest set gain value, disconnect the Signal Booster power cable for several seconds and re-connect.

1.5 Power Feeder and Battery Charger

NOTE: The Power Feeder and Battery Charger is described in Chapter - 4).

For installations where UPS is not available, the AC Feeder and Battery Charger unit can be purchased (see section 4.1 for ordering information).

The charger is connected directly to the AC inlet and includes a circuit to charge external batteries (meeting the specifications described in section 4.4.6. The charger also includes the following dry contact alarms (as defined in the NFPA standard): AC failure, Charger failure and Low battery.



Figure 1-2. D-MBR Charger

1.6 Booster Interfaces

All booster interfaces are located on the underside as shown below.



WARNING! The signal booster must always be installed vertically and top-down – with the connectors on the underside for protection (see 3.4.4). Horizontal installation on a bench for long time may cause damage to the signal booster due to over-heating.

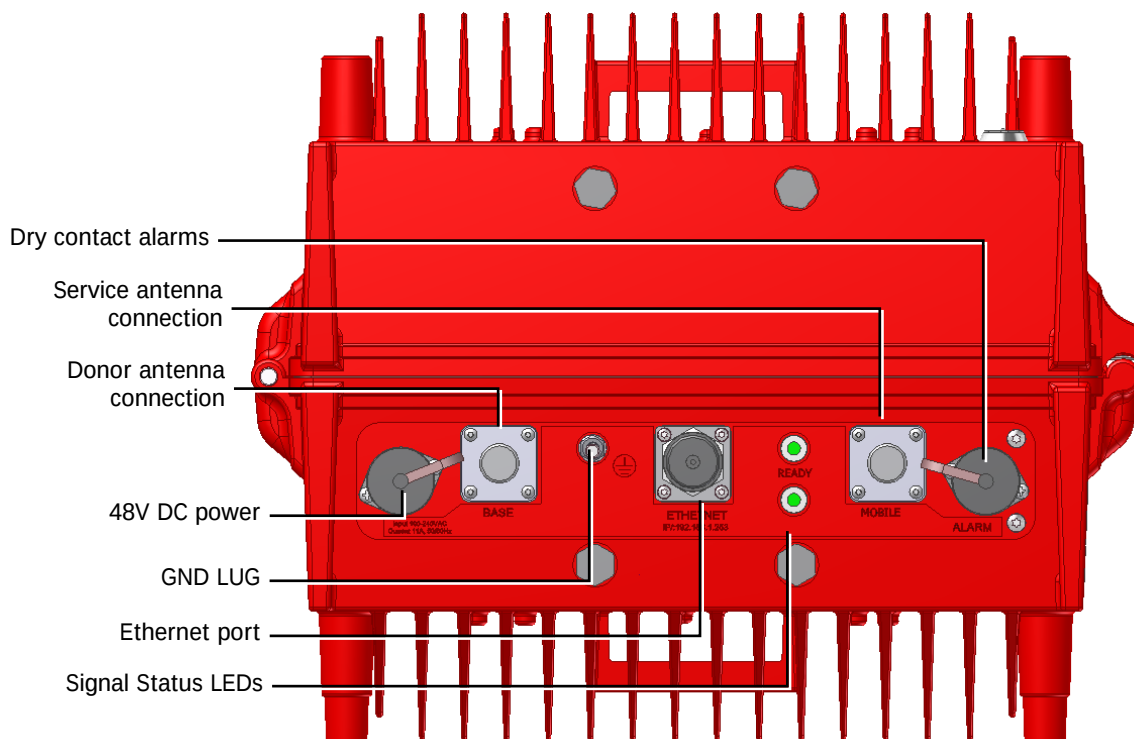


Figure 1-3. D-MBR Front Panel

Interface	Description
BASE	Donor antenna connections. See section 2.1.
MOBILE	Service antenna connections. See section 2.2.
48 VDC	Connection to 48VDC (either from UPS or from the Charger).
ALARMS	Two External (input) and two Output (relay) alarms. See section 3.8.
GND LUG	Ground connection. See section 3.5.
LED'S	Two status LEDs: 700 MHz and 800 MHz bands Upper LED: UL status (for both bands. Lower LED: DL status for both bands Status: Green (OK), Orange (Warning), Red (Fail).

1.7 Functional Description

In the downlink, the signal from the Donor antenna is filtered to the 700MHz and 800MHz bands, down converted, filtered according to the user defined (via GUI) channels, down converted and amplified. The signals are then forwarded to the service antenna. In the uplink, the process is reversed.

The maximum Analog Gain is 95dB, where Channel Gain between 0dB and 95dB is achieved by reducing the Digital Gain from the System maximum Analog Gain; therefore, filtering and attenuation is achieved through Digital Processing.

The block diagram showed in the figure below illustrates the overall functionality of the D-MBR PS NFPA Signal Boosters and shows the operation flow in the downlink path and the uplink path.

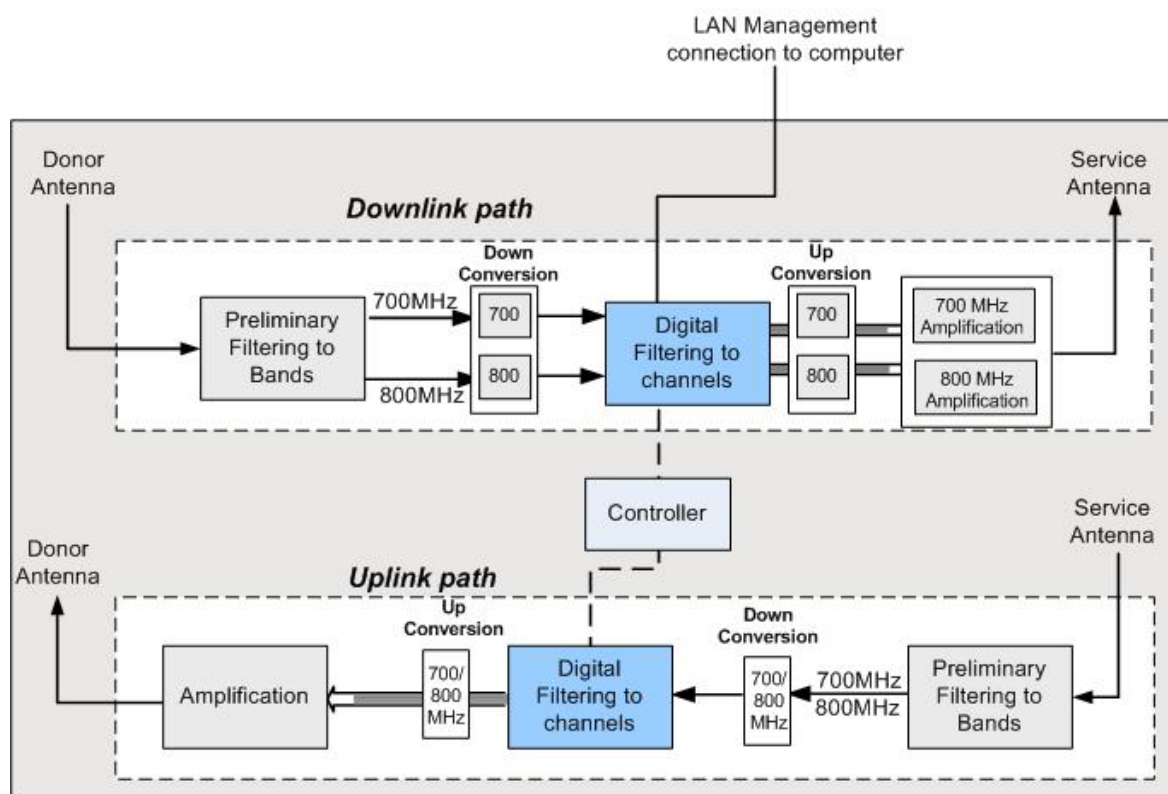


Figure 1-4 Signal Booster - Block Diagram

2 ANTENNA REQUIREMENTS

This section describes the information and specifications required for Donor and Service antennas.



WARNINGS!!

- The installer is held accountable for implementing the rules required for deployment.
- Good engineering practice must be used to avoid interference.
- Output power should be reduced to solve any IMD interference issues.

2.1 Donor Antenna

The Base (Donor) antenna is usually installed outdoors and is either a directional antenna such as a Yagi or a Panel antenna.

2.1.1 Required Antenna Information

You will require the following antenna information:

- Antenna type and characteristics
- Height
- Length and type of coaxial cable required for connecting the Donor antenna to the Signal Booster and the attenuation.

2.1.2 Donor Antenna specifications

- Yagi type or similar – 10 to 15 dBi gain, very sharp beam pointed to the BTS.
- Cable and jumper loss is at least 2dB.
- The required Base signals should be the dominant signals; at least 6 dB higher power than other signals.
- Example of antenna's typical specifications:
 - Gain: 8 dBd (=10.1 dBi)
 - VSWR: < 1:5:1
 - Impedance: 50 ohm

2.1.3 Installation Criteria

NOTE: Verify that the antennas meet requirements described in the previous sections..

Installation requirements:

- Select a location for the Donor antenna and verify that there is the signal strength is strong enough at that location.
- Install the Donor Antenna at the designated height.
- The antenna should point to the direction of the base station for maximum input power.
- Verify that the antenna is in the base stations line of sight (raise the antenna if necessary).
- Install the donor antenna at a higher level (i.e. floor) than the mobile antenna.
- Must be installed at a minimum distance of 1 meter from any personnel within the area.

2.2 Service Antenna

The Service antenna type depends on whether the Signal Booster is installed indoors or outdoors.

2.2.1 Required Information

The following antenna requirements, specifications and site considerations should be met.

- Type of installation – indoor or outdoor
- Service area size
- Height at which antenna(s) is/are installed
- Antenna type and characteristics
- Length and type of coaxial cable required for connecting the Service antenna to the Signal Booster and the attenuation.

2.2.2 Indoor Installations

2.2.2.1 Recommended Antennas

The following describes the requirements for an omni-directional mobile used for indoor applications.

Specifications:

- One or a combination of the following antennas can be used: Ceiling Mount Patch antenna, Wall Mount Patch antenna, Corner Reflector.
- Omni directional antenna with a 0 to 2 dBi typical gain, or wide beam with up to 10 dBi gain.
- Example of omni-directional antenna specifications:
 - Gain: 0 to 2 dBi
 - VSWR: < 2:1
 - Impedance: 50 ohm
- Choose an antenna with high side lobe attenuation that allows maximum isolation from the service/ mobile antenna.
- A minimum of 5 such antennas must be connected to the Signal Booster with cables and splitters.
- The maximum EIRP from each antenna shall not exceed 3W.

2.2.2.2 Installation Criteria

Installation requirements:

- An indoor antenna should be installed at a convenient location. It should be free of metallic obstruction.
- Install the Service Antenna at the designated height and tune it roughly toward the Service coverage area.
- Installation of this antenna must provide a minimum separation distance of 28 cm from any personnel within the area.

Note: If the power is divided into more than 5 antennas that have a large coverage area than the separation distance can be less than 28 cm.

- Cable and jumper loss is at least 2dB.

2.2.3 Outdoor Installations

For applications in which the Mobile antenna is installed outdoors, the antenna type is chosen according to the available infrastructure (single-pole or horizontal installation). In addition, isolation between the donor and service antennas must be taken into account when selecting the location of the antennas.

2.2.3.1 Recommended Antennas

The antenna type depends on the installation:

- For vertical *Single Pole* installations a **high side lobe suppression antenna** is required.
- For horizontal installations either on two separate poles or on two sides of one building a **high front to back ratio antenna** is required.

Specifications:

- Maximum antenna gain for outdoor operation 9dBi.
- Cable and jumper loss is at least 2dB.
- [Gain Antenna – Cable loss] should not exceed 7dB

Installation requirements:

- Installation of this antenna must provide a minimum separation distance of 62 cm from any personnel within the area.

NOTE: The Single Pole and Horizontal Installations are described in section 2.2.3.2 and 2.2.3.3.

2.2.3.2 Vertical Separation Configuration

The Vertical Separation configuration is recommended in cases where the BTS is relatively far and the service coverage area is relatively small.

In Vertical Separation configuration, the Donor antenna can be installed either above or below the Service antenna on a COMMON tower. It is required to set the distance between them to achieve maximum isolation.

The figures below illustrate the installations.



Figure 2-1. Service above Donor Antenna



Figure 2-2. Donor above Service Antenna

2.2.3.3 Horizontal Separation Configuration

In the Horizontal Separation configuration, the Donor and Service antennas are installed on two separate towers at approximately the same height. The towers can be either on the same side of the building or on different sides of the building as shown below.



Figure 2-3. Donor and Service Antennas Installed on Separate Towers



Figure 2-4. Service and Donor Antennas Installed on Opposite Sides of the Building

3 INSTALLING THE SIGNAL BOOSTER

This chapter describes the installation of the D-MBR 3707-3708 PS NFPA booster. For installations that include the Feeder and Battery Charger, refer to Chapter-4 for the installations instructions.



WARNINGS!!!

- Follow all local safety regulations when installing the Signal Booster.
- Only qualified personnel are authorized to install and maintain the Signal Booster.
- Follow Electro-Static Discharge (ESD) precautions.

NOTE: If included in the installation), the Battery Charger is installed adjacent to the Booster. Refer to chapter 4 for instructions on installing the Battery Charger.

3.1 Overview of the Physical Installation Procedure



WARNING!! Be sure to perform the power supply AFTER antennas are connected, otherwise damage may be caused to the system.

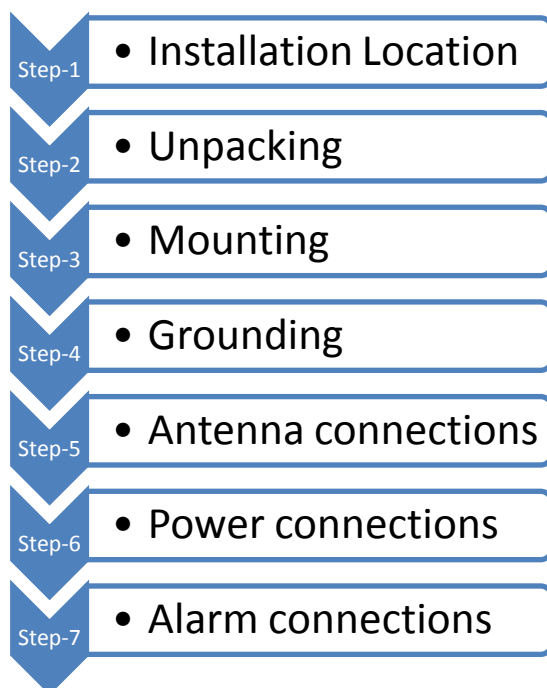


Figure 3-1 Physical Installation Workflow

3.2 Pre-installation Requirements

This section lists and details the following pre-installation requirements:

- Required BTS information
- Choosing the Booster installation location

3.2.1 Required BTS Information

Required BTS Information

- BTS channels
- BTS output power per channel
- BTS antenna gain
- BTS antenna height and distance from antenna site

3.2.2 Installation Location Criteria and Environment



WARNING!! The signal booster must always be installed vertically with the connectors on the underside for protection (see 3.4.4). Horizontal installation on a bench for long time may cause damage to the signal booster due to over-heating.

The following criteria should be considered when selecting the Signal Booster installation site location:

- Application type – indoor or outdoor
- Distance from antenna site and BTS antenna height.
It is recommended that the installation location be as close as possible to the antenna site in order to maintain the cable loss to a minimum.
- General surroundings and accessibility of location
- In outdoor applications it is recommended to install a cabinet or a shielding sunroof for further protection against weather wear.
- Use a suitable mounting surface, such as a flat back rigid wall.
- The Signal Booster is convection cooled so airflow and alternation should be possible.
- Install the Signal Booster in a shielded, ventilated, and easy-to-reach area – preferably at eye level.
- Verify that there is a minimum of a 50 cm (20”) radius of space around the Signal Booster and 1 meter in depth (3 ft) in order to allow the unit door to swing completely open, enabling easy access to the signal booster for maintenance and on-site inspection.
- Follow Electro-Static Discharge (ESD) precautions.
- Install the Signal Booster close to the service area to monitor the output power and noise figure.
- Verify that ambient temperature of the environment does not exceed 50°C (122°F)

3.3 Booster Unpacking and Package Contents

Upon receiving the D-MBR-PS-NFPA Signal Booster, perform the following:

1. Examine the shipping container for damage before unpacking the unit.
2. Perform a visual inspection to reveal any physical damage to the equipment.
3. Verify that all of the items listed in the packing list are included. Otherwise contact your Cobham Wireless service representative.

Booster Package Contents

Item	Description								
D-MBR Booster									
CD containing User's Manual and USB driver									
Mounting Brackets									
1 x Alarms Connector	Circular 8 Pin (P/N 30WEC70500) 								
DC Cable									
Additional (supplied) installation components:	<table> <tr> <th>Qty.</th><th>Description</th></tr> <tr> <td>4x</td><td>M8x12 bolts for securing the Booster to the brackets</td></tr> <tr> <td>1x</td><td>Insex tool for bolts</td></tr> <tr> <td>1 x</td><td>key</td></tr> </table>	Qty.	Description	4x	M8x12 bolts for securing the Booster to the brackets	1x	Insex tool for bolts	1 x	key
Qty.	Description								
4x	M8x12 bolts for securing the Booster to the brackets								
1x	Insex tool for bolts								
1 x	key								

3.4 Mounting the System

Note the following:

- The mounting procedure is identical for both INDOOR and OUTDOOR installations.
- The mounting procedure is identical for both BOOSTER and BATTERY CHARGER (where relevant) installations.
- The weight of the BOOSTER requires that TWO PEOPLE mount the unit on the wall.
- WASHERS are NOT SUPPLIED with the unit to be mounted.
- In addition to the bracket assembly, it is recommended to use additional fixings – an example is given in section 3.4.4.

3.4.1 Bracket Assembly

NOTE: Assemble the brackets to the unit.

- **Fix mounting brackets to the unit** – use the supplied four M8 bolts and spring washers. Fix mounting brackets to unit using M8 fixing bolts and supplied spring washers

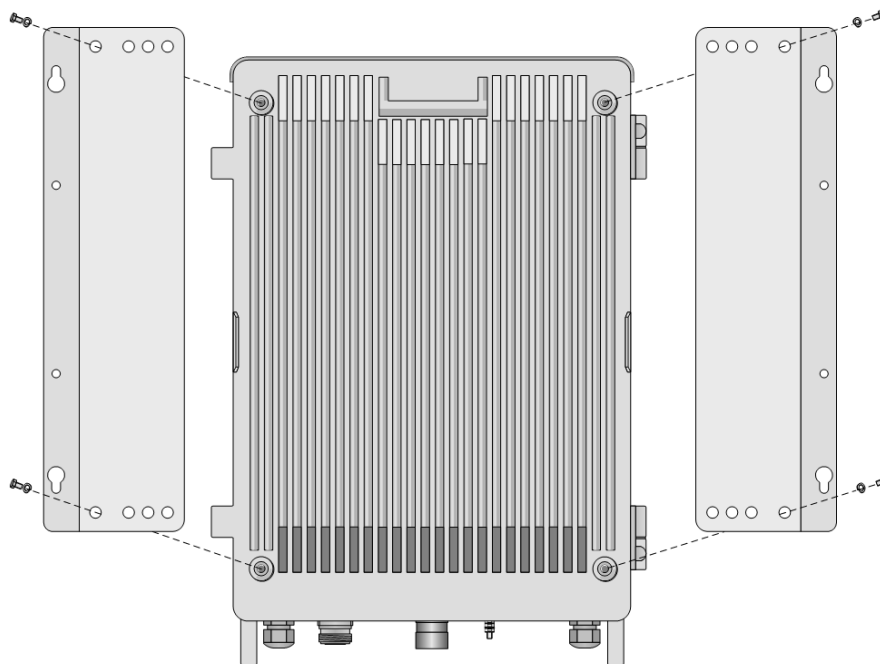


Figure 3-2: Fix mounting brackets to Unit

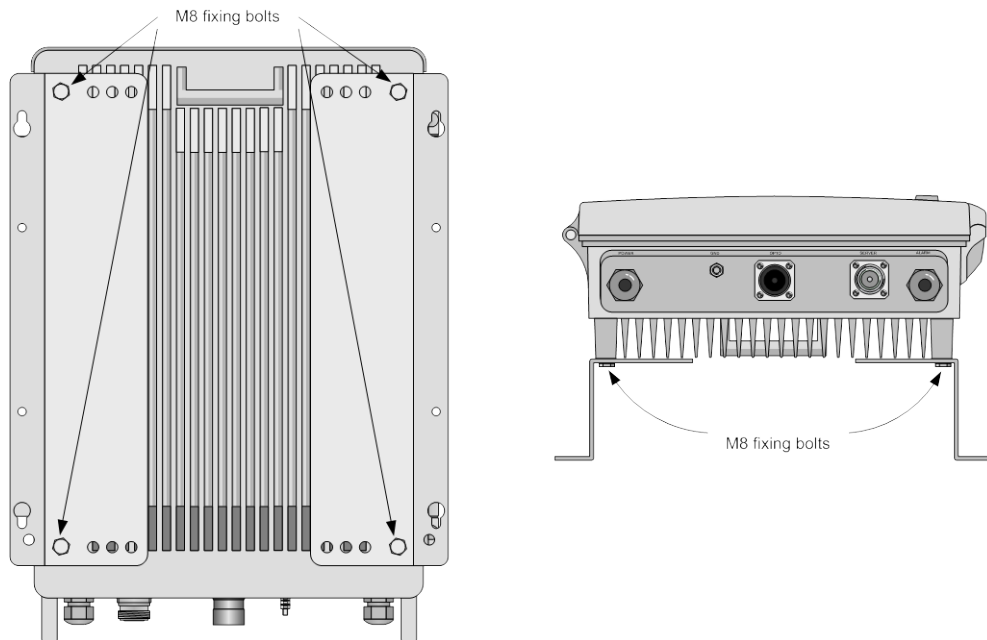


Figure 3-3: Mounting Plates Fixed to Unit (example)

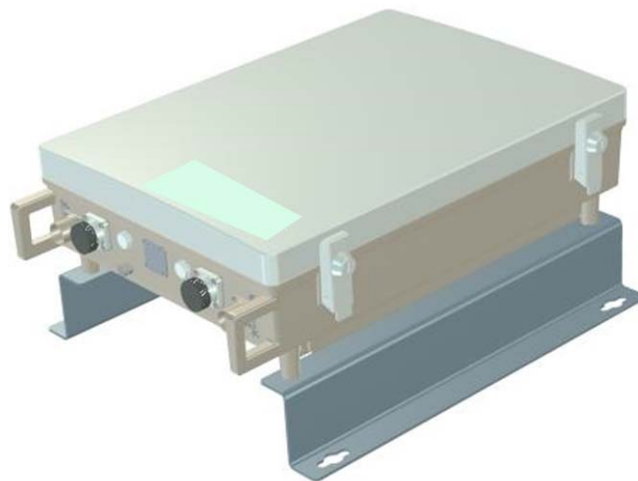


Figure 3-4: Bracket Position

3.4.2 Wall Marking and Drilling

NOTE: In addition to the bracket assembly, it is recommended to use additional fixings – an example is given in section 3.4.4.

- The unit wall mount brackets assembly should be fixed to a solid wall (these include brickwork, blockwork, and concrete.);
- To provide secure fixing to a solid wall, the most common method is drilling and plugging. The size of fixing is dependent on the item to be fixed and the nature of the wall, The unit should be fixed with mild steel, M6 (50mm to 75mm) rawlbolts or similar.
- In addition to the bracket assembly, it is recommended to use additional fixings – an example is given in section 3.4.4.
- Care must be taken to ensure the alignment of the four fixings. A spirit level or plumb line should be used to ensure horizontal/vertical alignment.

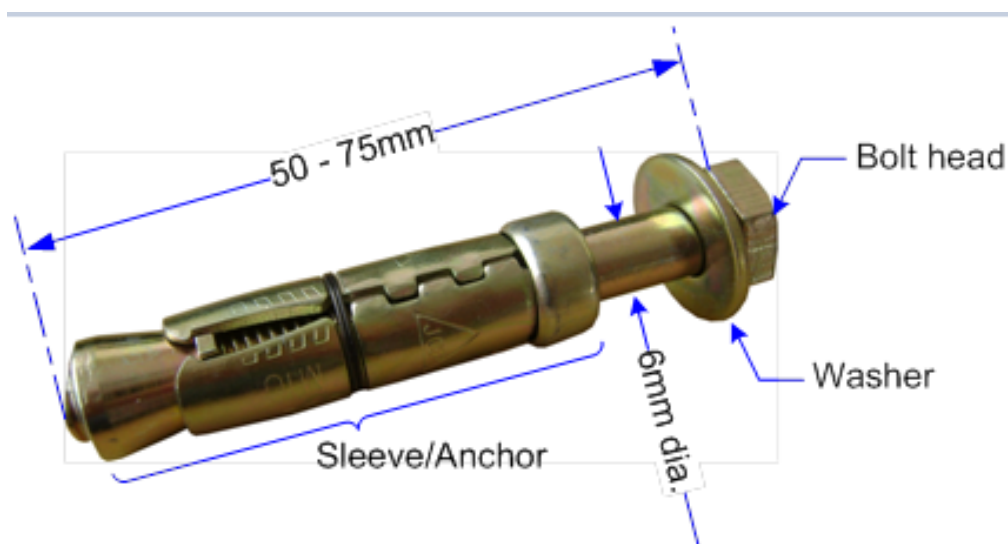


Figure 3-5: M6 Rawlbolt – recommended for wallmount.



IMPORTANT!! Always check that there are no pipes or cables hidden in the wall beneath the area to be drilled. Various pipe and cable detectors are available for this type of inspection.

To mark and drill the wall

1. Mark out the fixing centres of the Booster on the chosen wall. The unit dimensions are shown below.

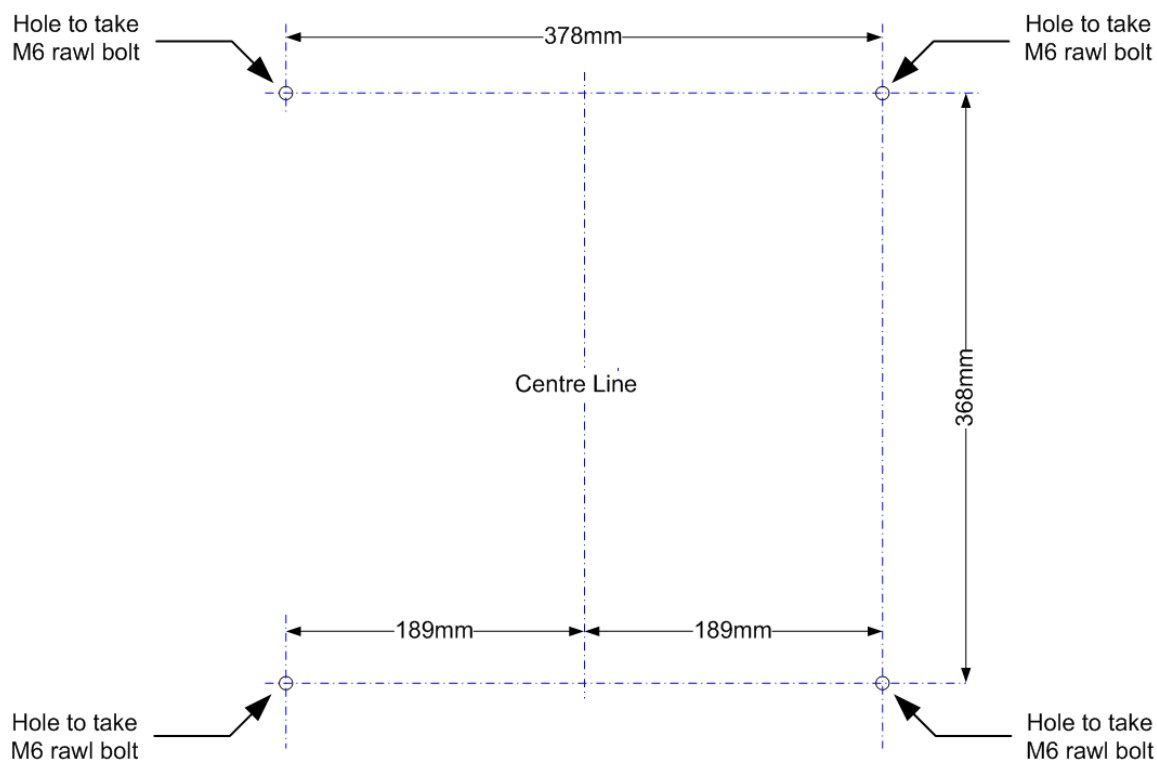


Figure 3-6: Fixing Centers

2. Mark and drill the wall with the correct size masonry bit as specified by the fixing manufacturer.

NOTE: It is good practice to wear goggles to protect your eyes from flying debris when using power tools.

3. Hold the drill bit against the mark and begin drilling slowly so that the bit does not wander from the position. The wall should be drilled to a depth which is sufficient to accommodate the full length of the fixing.
4. Insert the fixings so that the top of the sleeve/anchor section is level with the wall surface.

5. Gently tighten the bolt by hand so that the anchor section of the fixing expands and grips the inside of the hole.

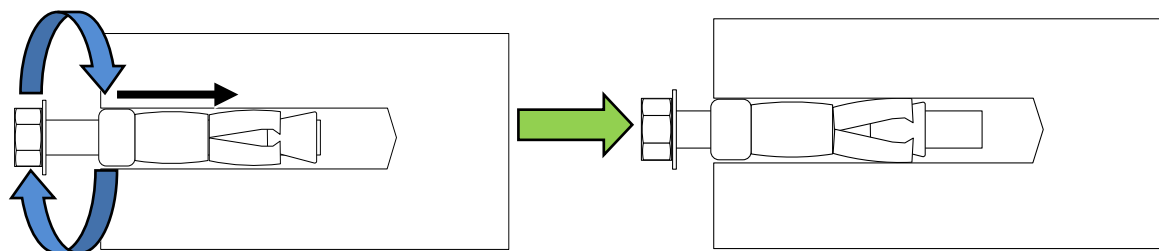


Figure 3-7: Inserting Fixing and Tightening.

6. As the bolt pulls its way in, the sides of the anchor section are forced outwards, gripping the surrounding surface.

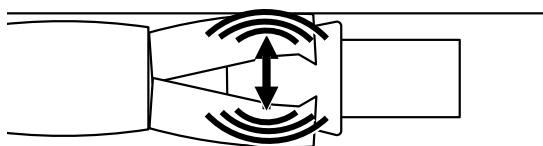


Figure 3-8: Anchor Sides Pushed Outwards.

7. Once all four fixings are in place, carefully withdraw the four bolts.

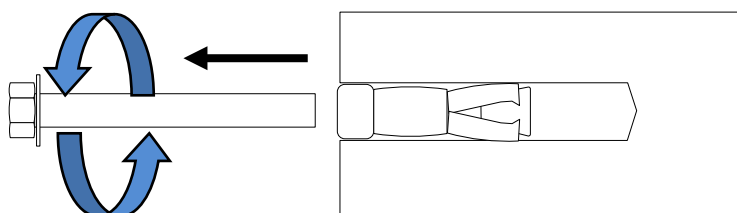


Figure 3-9: Withdraw Bolts.

3.4.3 Mount the Unit



CAUTION!!! It is recommended that two people lift the unit since (depending on the unit) it may weigh between 20 and 38 kg (44 and 84 lb).

To mount the unit

- Align unit with the four fixings. Great care should be exercised here as the Booster is very heavy. (A suitably rated heavy duty scissor lift table/trolley may be suitable for this operation.)
- Once the unit is held in the chosen position, carefully insert the fixing bolts through the mounting lugs of the unit and into the sleeve/anchor sections of the fixing in the wall and tighten the bolts.
- The unit needs to be mounted tightly to eliminate vibration.

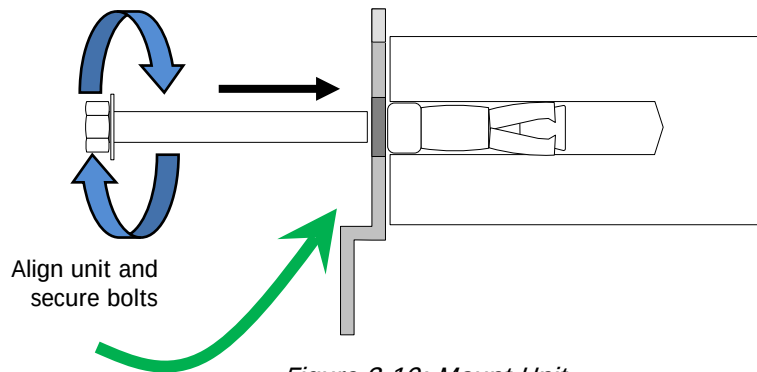


Figure 3-10: Mount Unit

3.4.4 Recommended Additional Fixing



SUGGESTED PRECAUTIONARY MEASURE!!

- Brackets are provided to securely mount the Booster on the wall; however, as an ADDITIONAL precautionary measure, it is recommended to further secure the Booster to the wall (in addition to the bracket).
- This can be done using any appropriate method.
- It is the installer's responsibility to ensure the Booster is installed in a secure manner.

The following figures provide EXAMPLES of additional fixings. In the examples, support is provided in the form of a CABLE HARNESS LOOP that is looped around the Booster handle and secured to the wall or part of the building support structure.

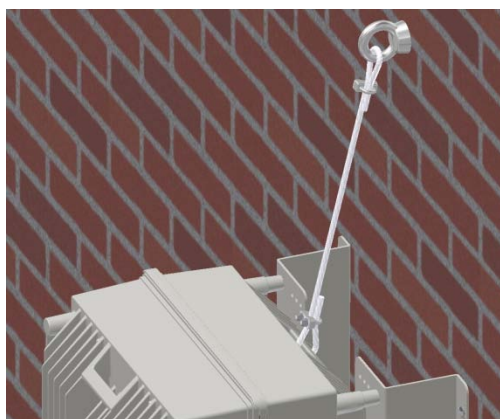
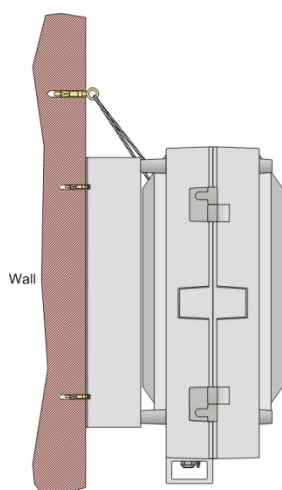


Figure 3-11: Example 1 of Additional Fixing to Wall

Another example is of a unit installed on a stadium gantry. Again, the support can be in the form of a cable harness loop, using the handle of the unit and part of the gantry structure.



ATTENTION!! Any other SECURE method can be used.

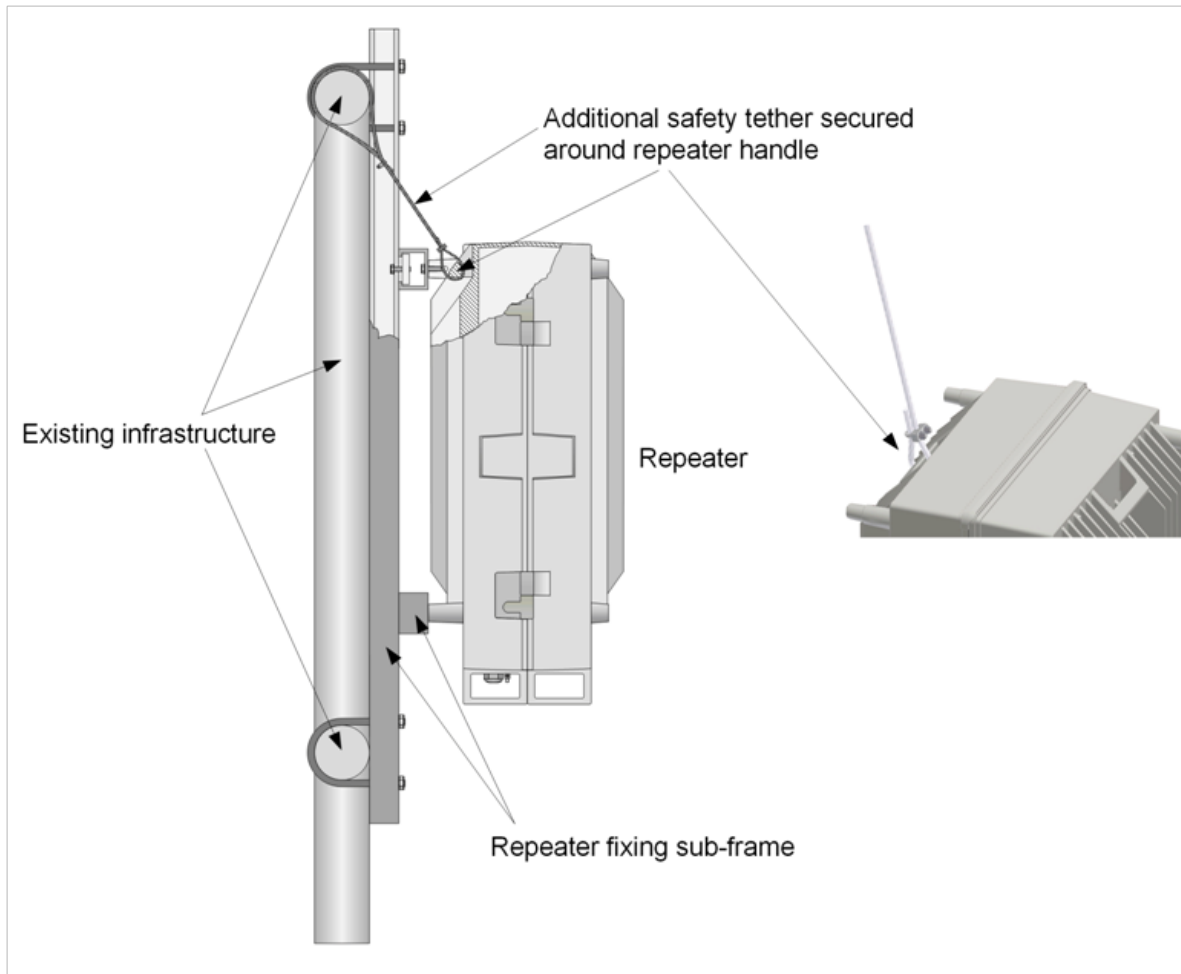


Figure 3-12: Example 2 of Additional Fixing to Gantry

3.5 Grounding

NOTE: The grounding procedure is identical for both BOOSTER and BATTERY CHARGER.

3.5.1 Grounding Wire Requirements

Requirements for grounding wires

- Protective grounding conductor - should be aluminum with cross-section 10AWG.
- Lug of the protective grounding conductor - should be aluminum
- Washers and screw - should be high Cr stainless steel, or 12% Cr stainless steel, or Cr on, Ni on steel, tin on steel

3.5.2 Grounding Units



WARNING!! Ground the Signal Booster with the booster's grounding bolt. Do not use the grounding bolt to connect external devices.

Connect the grounding wire to the GND lug on each unit as shown below.

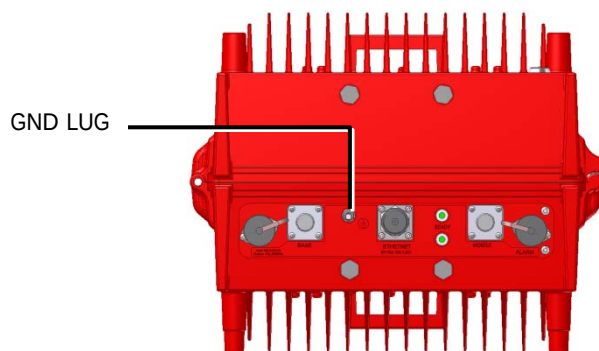


Figure 3-13 Booster GND Lug

3.6 Antenna Connections and Guidelines

This section describes the antenna connection requirements, guidelines and procedure. It includes the following procedures:

- Verifying isolation between Donor and Service antennas
- Verifying link between BTS and donor antenna
- RF cable installation guidelines
- Connecting the antennas



CAUTION!!

- Do not connect the antenna cables to the Signal Booster before verifying the installation parameters - specifically the isolation between the antennas.
- DO NOT POWER-ON the Signal Booster without either the antennas being connected or the antenna connections terminated with dummy loads.

3.6.1 Verifying Isolation between Donor and Service Antennas

Note the following:

- The isolation between the Donor and Service antennas is critical especially for high gain, outdoor applications.
- For proper operation of the Signal Booster, it is recommended that the isolation between the Donor and Service antennas be at least 15dB higher than the Signal Boosters set gain. (Lower isolation can lead to high in-band ripple, oscillations and low signal quality.)
- Ensure proper vertical or horizontal distance separation between Donor and Service antennas

To measure the isolation, proceed as follows:

1. Inject a known signal from a signal generator into one antenna (preferably the Donor antenna).
2. Measure the coupled output from the Service antenna, using the Spectrum analyzer and LNA if applicable.
3. Perform this procedure across the frequency range of both the Uplink and Downlink bands.
4. Register the lower result for system operation.

3.6.2 Verifying the Link between the BTS and the Signal Booster

This test checks the signal strength from the BTS antenna to the Signal Booster.

Proceed as follows:

1. Using a Spectrum analyzer, measure the received signal from BTS at the Donor antenna port near the Signal Booster.
2. Adjust the Donor antenna direction to receive the maximum signal strength.
3. Compare the received signal strength with the calculated signal strength from the design phase.
In case of discrepancy, check for one of the following:
 - Antenna out of direction
 - Antenna tuned to side lobe instead of main lobe
 - Antenna connector or antenna cable faulty
 - Line-of-sight problem (obstruction), etc.
4. Register the signal strength of the downlink channel for the system operation phase.

3.6.3 RF Cable Installation Guidelines

Note the following:

- For all coaxial connections to/from the Signal Booster - high performance, flexible, low loss 50 ohm coaxial communications cable.
- All cables shall be weather-resistant type.
- If the coaxial cables are NOT weather-resistant type: wrap the exterior coaxial cables with insulation and holding tape (Type 3M Rubber splicing tape) for environmental protection and to ensure longer lifetime.
- Cable length - determined by the Signal Booster installation plan. When calculating the cable length, take into account excess cable slack so as not to limit the insertion paths.

3.6.4 Connecting Antennas

- Connect the Donor and Service antennas.
- Verify all RF connectors are tightened and the cables and antennas are secured.

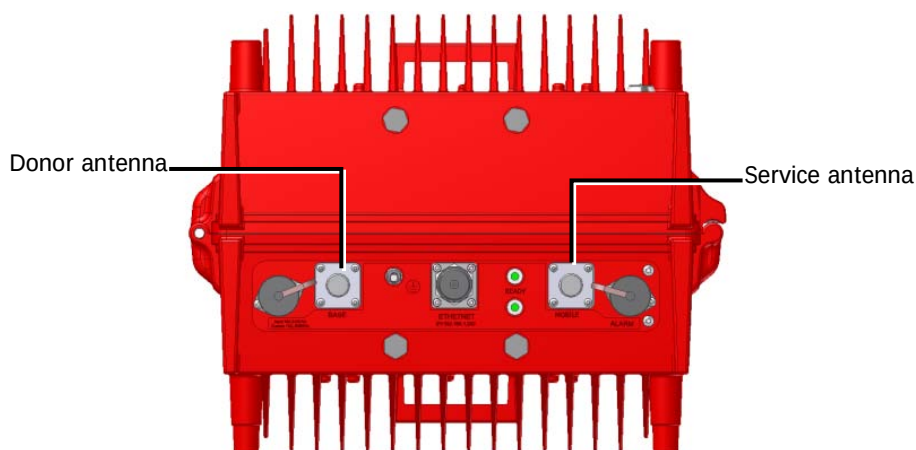


Figure 3-14 Booster GND Lug

3.7 Connecting Power and Power-Up



CAUTION!!

- DO NOT POWER-ON the Signal Booster without either the antennas being connected or the antenna connections terminated with dummy loads.
- This equipment can either be installed indoors or outdoors. When installing OUTDOORS, wet conditions increase the potential for electric shock when installing or using electrically powered equipment. To prevent electrical shock when installing or modifying the system power wiring, disconnect the power source before working with uninsulated wires or terminals.

The Signal Booster operates from a 48VDC power source – either UPS or Battery Charger (ordered separately).

NOTE: The AC Feeder Battery Charger installation and connections are described in Chapter-4.

To connect the power

1. For installations with UPS:
 - Verify the UPS is set up.
 - Connect 48VDC from the UPS or AC to DC converter (depending on the installation) to the Booster Power Connector
2. For installations with the **Battery Charger**:
 - Verify the Charger is installed properly – refer to **Chapter-4** for the Charger installation and connections.
 - Connect the Battery Charger 48VDC output to Booster power connector.
3. Power-ON.

NOTE: During the Power Up process the CPU requires approximately four minutes to boot up.

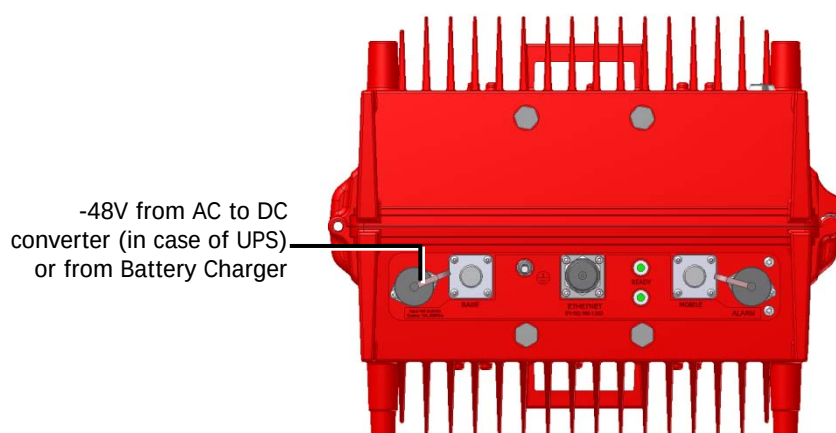


Figure 3-15. D-MBR PS NFPA Power Connections

3.8 Booster Dry-Contact Alarm Connections

This section describes the dry-contact alarm connections for the *booster*.

The D-MBR and its power source (UPS or Battery Charger), each provide dry-contact alarms towards the Fire Department Control Box. (In installations with UPS, refer to your UPS manual for instructions on dry-contact alarm connections to the Fire Department Control box).

Note the following:

- The alarms can be connected any time, before or after the system is powered-on.
- The Charger alarm connections are described in section 4.4.7.
- Optionally, the Battery Charger Fail and AC Input Fail from the UPS or Charger can be connected to the Booster alarms (requires GUI configuration as well).

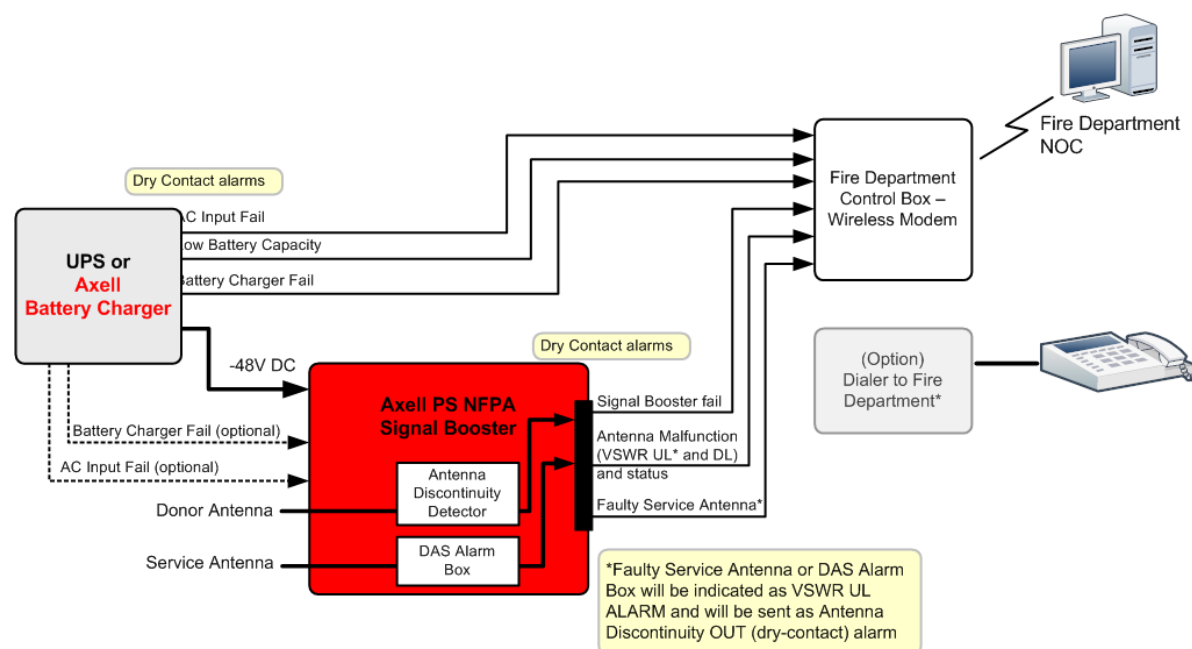


Figure 3-16. D-MBR PS NFPA with Charger Architecture

3.8.1 Load Restrictions

3.8.1.1 Alarm Dry Contact Output Restrictions

- Maximum switching voltage: 220 VDC, 125 VAC
- Maximum switching current: 2A

3.8.1.2 External Alarm Input Restrictions

- Maximum repetitive reverse voltage: 28 V
 - Impedance load: 470 Ohm
- “0” - 0V
- “1” - 3.8V - 28V

3.8.2 Booster Alarm Connector Pinout

Each alarm status is recognized by a separate wire-pair, where the colored wires are internally connected with a 4.7 K ohm resistor (serves as a pull up resistor to +5V. The following figure shows the Alarm connector pinout.

NOTE: The two external alarms can be used to connect dry-contacts **BAT LOW** and **AC Input Fail** from either the UPS or Battery Charger. It is required to configure connected external alarms according to section 5.5

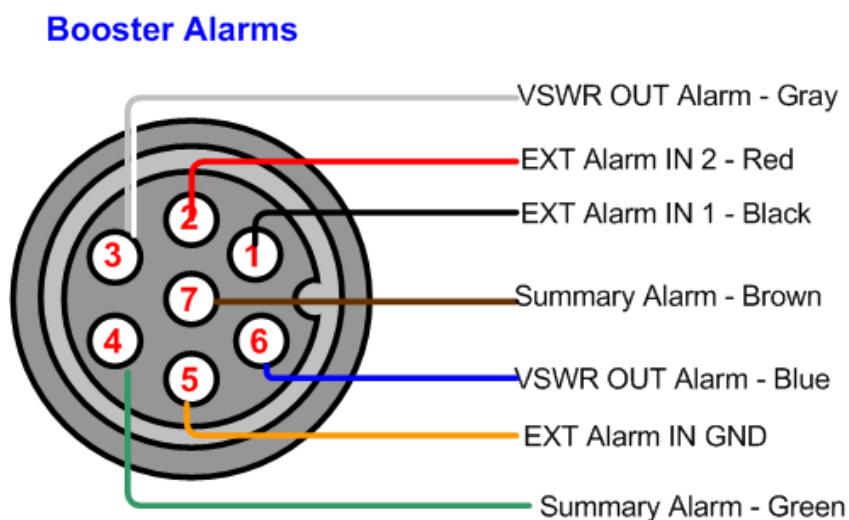


Figure 3-17. D-MBR Alarm Connector Pinout

Pin No.	Signal Name	Wire Colour
1	External Alarm #1	Black
2	External Alarm #2	Red
3	Dry Contact VSWR Alarm (Normally Closed)*	White
4	Dry Contact Summary Alarm (Normally Closed)** Triggered under one of the following conditions: • PA current from FF • Temperature High or Built-In-Test • Power failure	Green
5	GND for External Alarm	Orange
6	Dry Contact VSWR Alarm (Normally Closed)*	Blue
7	Dry Contact Summary Alarm (Normally Closed)**	Brown

*Dry Contact VSWR alarm connection is supported by a pair of wires (3,6). Also, Pins 3,6 can indicate Power Up for approximately 1 minute when system is powered up by closing contacts 3,6.** Dry Contact Summary alarm connection is supported by a pair of wires (4,7)

4 BATTERY CHARGER DESCRIPTION AND INSTALLATION

For installations where UPS is not available, the AC Feeder and Battery Charger unit can be purchased (see section 4.1 for ordering information).

The Feeder and Charger provides continuous power of 48 VDC by utilizing an external (customer purchased) battery for backup in case power failure.

The Charger provides the following dry contact alarms (as defined in the NFPA standard): AC failure, Charger failure and Low battery.

NOTE: Use only external batteries meeting the specifications given in section 4.4.6.

This section describes the Battery Charger Unit interfaces, the architecture of the installation and the installation procedure.



Figure 4-1. AC Feeder and Battery Charger

4.1 Charger Ordering Information

IDENTIFICATION	DESCRIPTION PART	NUMBER
D-MBR 3707-3708 AC feeder and battery charger	AC feeder and battery charger for 200AH batteries with NFPA and IFC compliant Alarm Outputs and red painted case.	BATT-CHARGER-110VAC- 200AH-NFPA

4.2 Charger Architecture

D-MBR installation with the Battery Charger is illustrated below. The Charger is AC powered. It simultaneously provides a 48 VDC output power to the booster and charges the external battery (external battery not provided).

The Charger supports three dry contact alarms that are connected to the Fire Department Control Box:

- AC Input Fail*
- Low Battery
- Battery Charger Fail*

As long as the AC power source is available, the *Charger* provides 48 VDC to the booster and maintains the external battery fully charged.

If the AC power source to the charger fails, the *external battery* provides the 48 VDC power to the Booster and the *AC Input Fail* Charger alarm is activated.

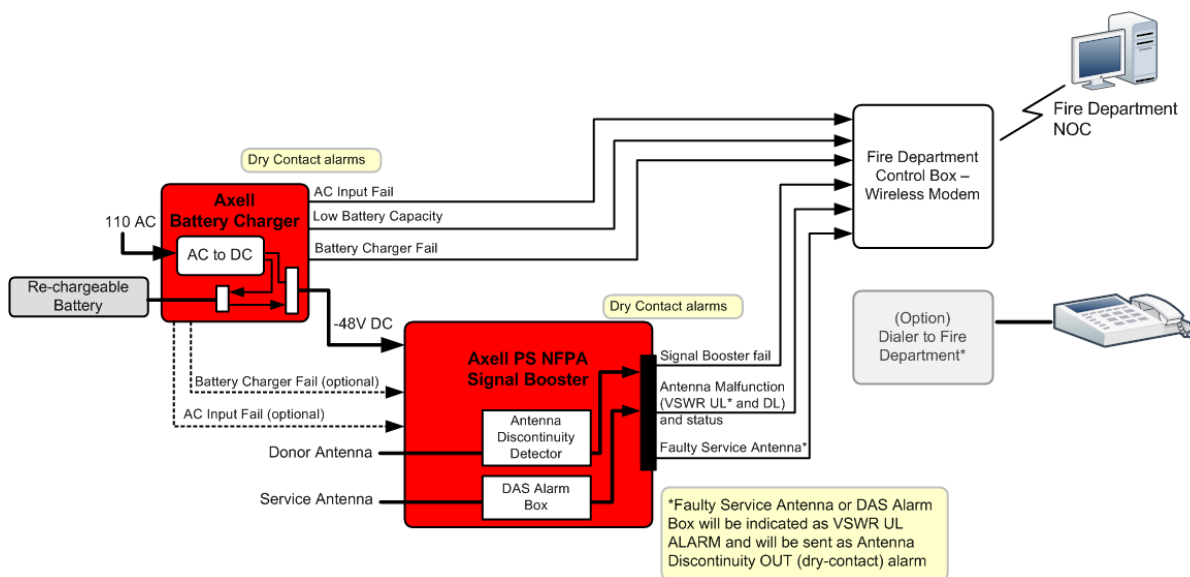


Figure 4-2. D-MBR PS NFPA with Charger Architecture

*Optionally, Battery Charger Fail and AC Input Fail can be connected to the Booster alarm connector for monitoring).

4.3 Charger Interfaces

This section describes the AC Feeder and Battery Charger interfaces.

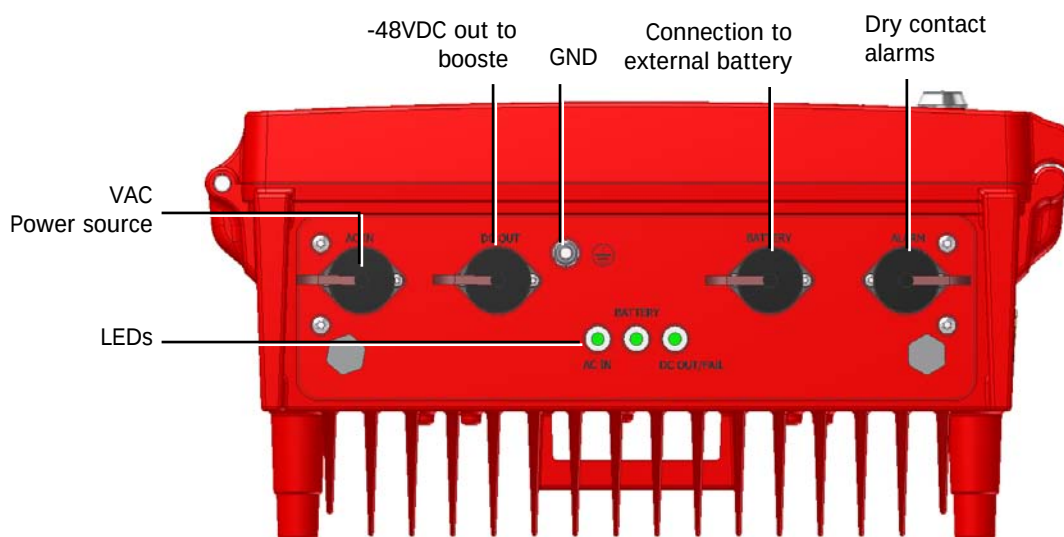


Figure 4-3. D-MBR Charger Interfaces

Interface	Description								
AC IN	110 VAC power source input								
DC OUT	48VDC, 12A max power connection to booster power input.								
GND	Ground connection								
BATTERY	Connection to external, re-chargeable 200H battery (see section 4.4.6 for external battery requirements) <i>Charging time for full 200AH battery estimated to about 20hrs.</i>								
ALARMS	Three Dry contact alarms: Battery Low – battery is not charged to the minimum value. Charger Fail – battery charger failure AC Input Fail – AC input is not detected. See section 4.4.7 for pinout.								
LED'S	<table border="0"> <tr> <td>AC in</td><td>Green – AC input detected (Off if AC input is not detected)</td></tr> <tr> <td>Battery</td><td>Green - battery is activated (due to no AC input)</td></tr> <tr> <td>DC out</td><td>Green - DC out within range (Off – no DC out, or low DC out)</td></tr> <tr> <td></td><td>Orange – Charger fail</td></tr> </table>	AC in	Green – AC input detected (Off if AC input is not detected)	Battery	Green - battery is activated (due to no AC input)	DC out	Green - DC out within range (Off – no DC out, or low DC out)		Orange – Charger fail
AC in	Green – AC input detected (Off if AC input is not detected)								
Battery	Green - battery is activated (due to no AC input)								
DC out	Green - DC out within range (Off – no DC out, or low DC out)								
	Orange – Charger fail								

4.4 Charger Installation Procedure

The Charger installation procedure consist of the following steps.

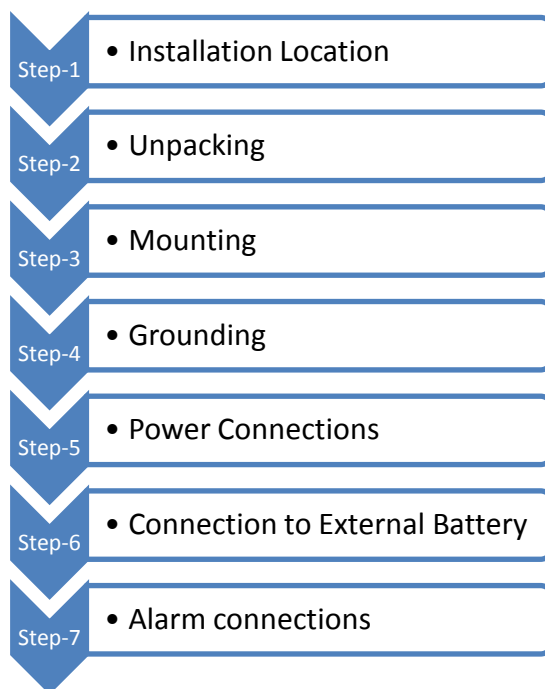


Figure 4-4 Physical Installation Workflow

4.4.1 Charger Installation Location

The charger is installed *adjacent* to the Booster either on the wall or *vertically* in a rack.
Refer to section 3.2.2 for the relevant location criteria.

4.4.2 Charger Unpacking and Package Contents

Upon receiving the D-MBR-PS-NFPA Signal Booster, perform the following:

1. Examine the shipping container for damage before unpacking the unit.
2. Perform a visual inspection to reveal any physical damage to the equipment.
3. Verify that all of the items listed in the packing list are included. Otherwise contact your Cobham Wireless service representative.

Battery Charger Package Contents

Battery Charger									
CD containing User's Manual and USB driver									
Mounting Brackets									
1 x Alarms Connector	Circular 8 Pin (P/N 30WEC70500) 								
AC Cable									
DC Connector and cable									
Additional (supplied) installation components:	<table border="1"> <thead> <tr> <th>Qty.</th><th>Description</th></tr> </thead> <tbody> <tr> <td>4x</td><td>M8x12 bolts for securing the Booster to the brackets</td></tr> <tr> <td>1x</td><td>Insex tool for bolts</td></tr> <tr> <td>2 x</td><td>keys</td></tr> </tbody> </table>	Qty.	Description	4x	M8x12 bolts for securing the Booster to the brackets	1x	Insex tool for bolts	2 x	keys
Qty.	Description								
4x	M8x12 bolts for securing the Booster to the brackets								
1x	Insex tool for bolts								
2 x	keys								

4.4.3 Charger Wallmount Procedure

The charger is mounted next to the Booster and the mounting instructions are identical to that of the Booster.

Refer to section 3.4 for instructions.

4.4.4 Charger Grounding

The grounding procedure is identical to the Booster grounding procedure. Refer to section 3.5 for the grounding instructions.

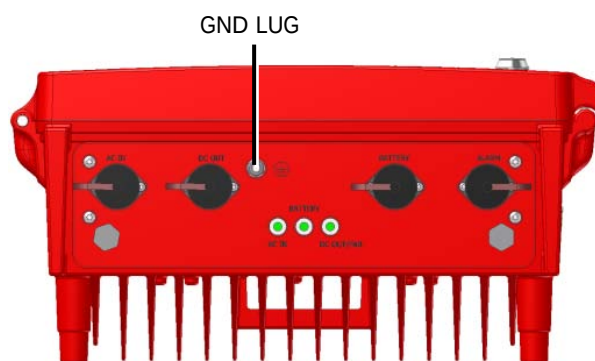


Figure 4-5 Battery Charger GND Lug

4.4.5 Charger Power Connections

To connect the Charger power:

- Connect Charger **AC IN** to 110 VAC power outlet
- Connect the Charger **DC OUT** to the Booster **Power IN**

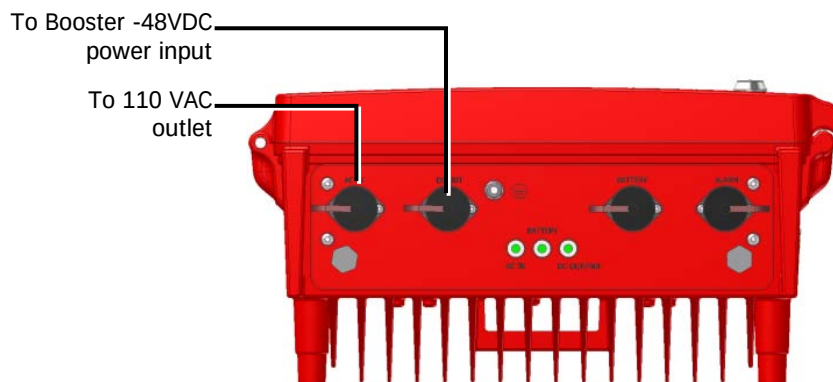


Figure 4-6 Battery Charger Power Connections

4.4.6 Connection to External Battery



ATTENTION!! The Externally Battery must meet the following requirements:

- Valve-Regulated Lead-Acid (VRLA)
- Gelled Electrolyte (gel) and Absorbed Glass Mat (AGM) Batteries or LEAD ACID

Connect the external battery to the Charger **Battery** connector:



Figure 4-7 External Battery Connections

4.4.7 Charger Alarm Connections

The Charger supports three dry contact alarms that are connected to the Fire Department Control Box:

- AC Input Fail*
- Low Battery
- Battery Charger Fail*

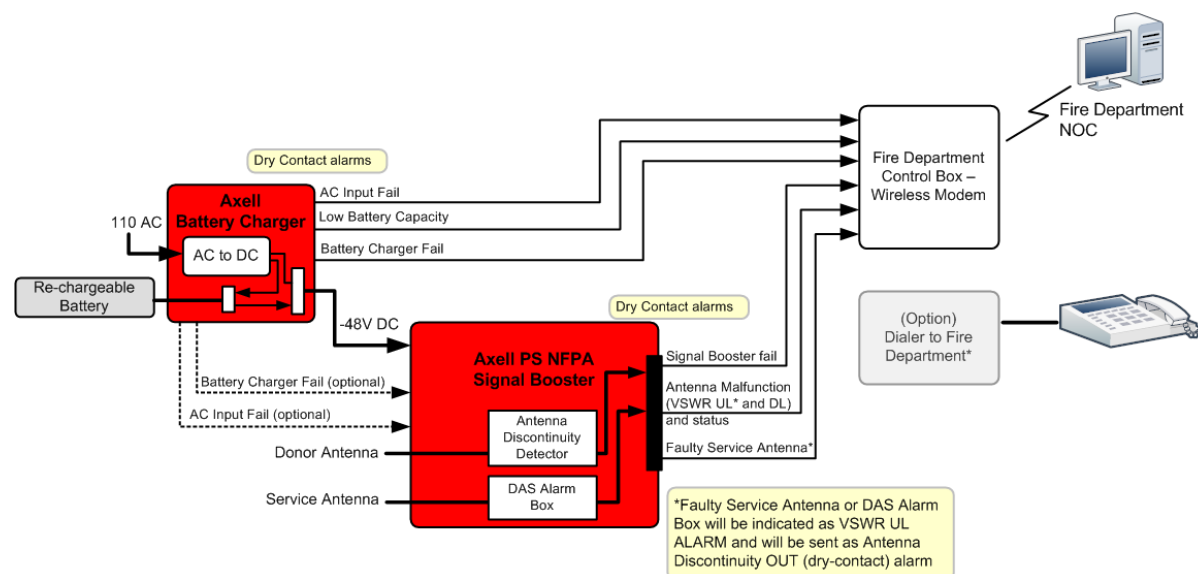


Figure 4-8. Charger Connections Architecture

*Optionally, Battery Charger Fail and AC Input Fail can be connected to the Booster alarm connector for monitoring).

4.4.7.1 Alarm Dry Contact Output Restrictions

- Maximum switching voltage: 220 VDC, 125 VAC
- Maximum switching current: 2A

4.4.7.2 External Alarm Input Restrictions

- Maximum repetitive reverse voltage: 28 V
- Impedance load: 470 Ohm

“0” - 0V

“1” - 3.8V - 28V

4.4.7.3 Charger Alarm Connector Pinout

Each alarm status is recognized by a separate wire-pair, where the colored wires are internally connected with a 4.7 K ohm resistor (serves as a pull up resistor to +5V). The following figure shows the Alarm connector pinout.

NOTE: The two external alarms can be used to connect dry-contacts BAT LOW and PSU Fail from either the UPS or Battery Charger. It is required to configure connected external alarms according to section 5.5

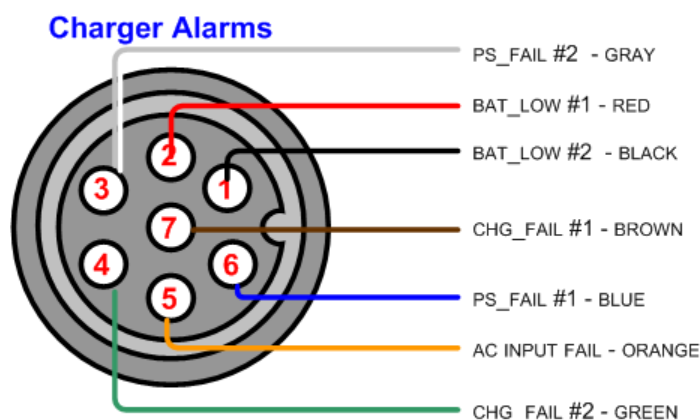


Figure 4-9. Charger Alarm Connector Pinout

Pin No.	Signal Name	Wire Colour	Contact Type
1	BAT_LOW #2	Black	dry-contact NC
2	BAT_LOW #1	Red	dry-contact NC
3	PS_FAIL #2	Grey	dry-contact NC
4	CHG_FAIL #2*	Green	dry-contact NC
5	AC INPUT FAIL *	Orange	NOT A DRY CONTACT – TTL TYPE
6	PS_FAIL #1*	Blue	dry-contact NC
7	CHG_FAIL #1*	Brown	dry-contact NC
TBD	PSU_LOW_TO_BDA	TBD	NOT A DRY CONTACT – TTL TYPE

* Can be optionally connected to the following Booster Alarms connector Pin-1 (External Alarm #1) and Pin-2 (External Alarm #2) and Pin-5 (GND for both). Refer to section 3.8.2 for the Booster Alarm pinout.

5 SETUP AND COMMISSIONING

This section describes the setup procedures for the D-MBR Booster.

5.1 Overview of the Commissioning Procedure

The Booster is designed for simple plug-and-play operation, only requiring the setup of a number of parameters via a local Web connection and verifying that the system is operating properly.

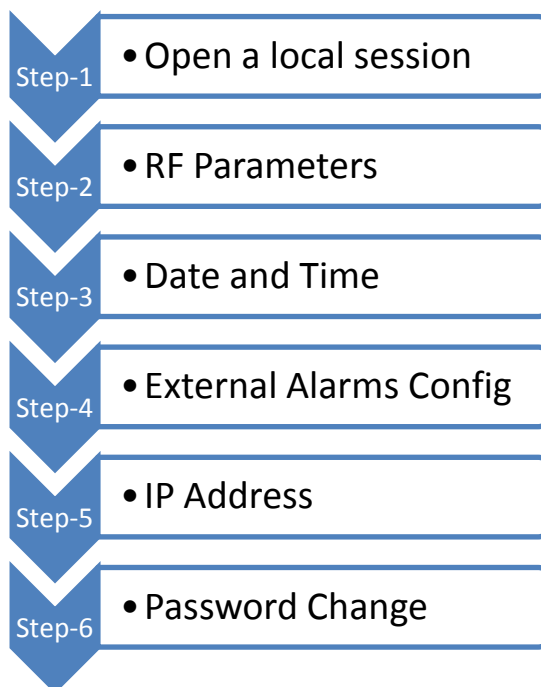


Figure 5-1 Commissioning Overview

5.2 Opening a Session to the Booster and Navigating the GUI

This section describes how to open a first time local session to the Booster and how to navigate the management Web GUI.

5.2.1 Open a First Time Local Web Session to the Booster

NOTE: To open a local session to the booster, the setup computer IP Address must be in the same subnet as that of the Booster. The booster factory set IP Address is **192.168.1.253**.

To open a local session to the booster:

1. Connect to the Boosters' front panel **Ethernet** port using the supplied Ethernet cable.

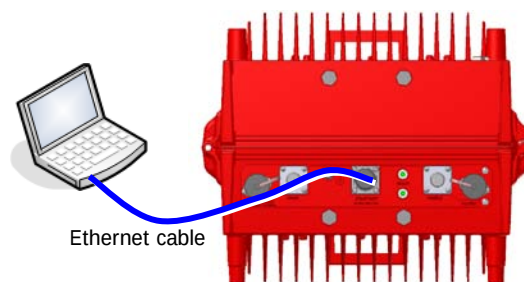


Figure 5-2. Local Setup Connection

2. Verify the setup computer's NETWORK PARAMETERS are in the same subnet as the Booster's factory assigned IP Address.

NOTE: Booster's factory assigned IP Address: **192.168.1.253**.

- On the computer, access the Internet Protocol Version 4 (TCP/IPv4) Properties dialog.
- Configure an IP address 192.168.1.x (e.g. 192.168.1.9)
- Set subnet mask to 255.255.255.0
- Click **OK** to save the definitions.

Internet Protocol
Version 4
Properties dialog

IP Address
and subnet

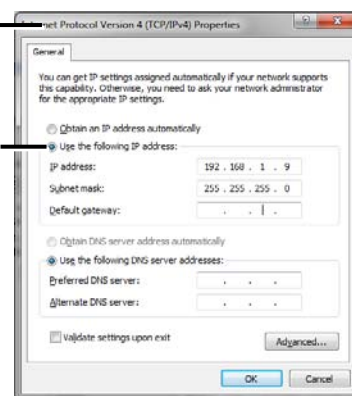


Figure 5-3. Computer's IP Address

3. Login to the Booster as follows:

- Open a standard browser (e.g. Chrome, IE or Firefox).
- In the address line, enter the IP address of the Booster.
<http://192.168.1.253>.



Figure 5-4. Factory Assigned IP Address

The Booster login dialog appears.

- Enter the authentication information:

Default User Name : **admin**

Default Password : **admin.**

NOTE: Both are case sensitive and must be entered with *lower* case letters.

- Click **Login**. The application main window appears.

NOTE: Quickly review the following section describing the application window and then proceed to configure the signal levels according to section 5.3.



Figure 5-5. Login

5.2.2 Navigating the Web GUI Application

This section describes how to navigate the Web Management application. The GUI interface provides the following items:

- Operation options – always available in the header
- Menu selection left pane – provides three types of menu options
- Menu Tabs – sets of tabs corresponding to the selected left pane menu options
- Work area – corresponds to selected tab

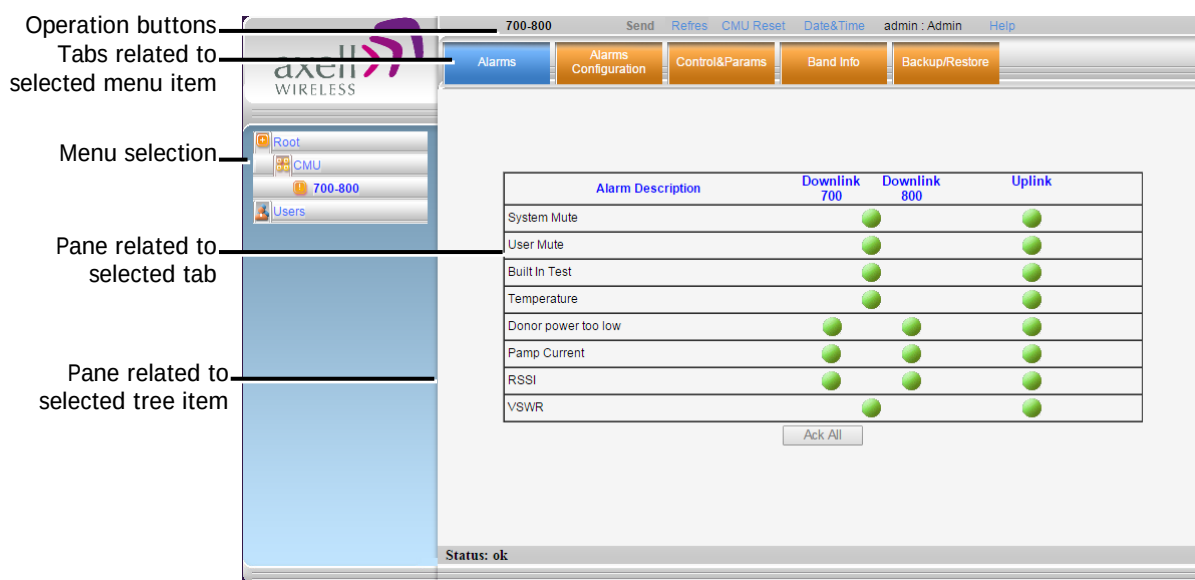


Figure 5-6. Main Window

5.2.2.1 Operation Items

The operation options are always displayed in the window header.

Selected menu item



Item	Description
CMU/band/ Users	Shows the currently selected menu item.
Send	Uploads configuration changes to the Booster.
Refresh	Refreshes the current screen and displayed data
CMU Reset	Click to reset the Web Access application, in case of failure or display issues
Date and Time	Access Booster Date and Time settings.
User	Currently logged in authentication level and user.
Logout	Click to logout current user.

5.2.2.2 Left Pane Menu Options

The left pane contains three menu items, where clicking each item invokes dedication tabs and options:

- **CMU** – communication, monitoring and administrative options.
- **700-800** – band-level RF configuration, management and monitoring options
- **Users** – user management tools, including *Password Change*.

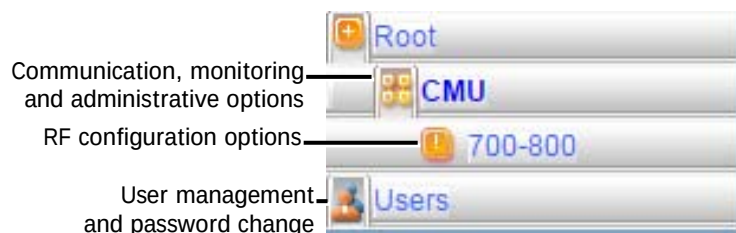
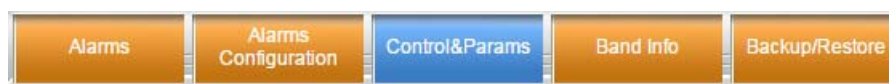


Figure 5-7. Menu Item

5.2.2.3 700-800 Menu Tabs

This section describes the tabs available when **700-800** is selected in the left pane.



Item	Band Specific Description
Alarms	Common alarms pane for both bands. See section 7.4.
Alarms Configuration	Viewing and modifying default alarm levels (critical, major, minor), major). See section 7.5.
Control & Params	RF configuration options for each band. See section 5.3.
Band Info	Band specific information, including filter width, etc. See section 6.2.2
Backup and Restore	Used to backup and manage band-level configuration files. See section 6.3.

5.2.2.4 CMU Pane and Tabs

This section describes the tabs available when the *CMU item* is selected in the left pane.



Item	Description / Values
Axell-CMU Alarms	Shows any external alarms that were generated.
CMU Info	Shows Booster level information such as SW and HW versions and identification number. In addition, enables setting minimum alarm levels (see 6.2.1).
Communication Configuration	Used to set IP Address and SNMP parameters (see 5.6)
Alarms Log	Booster level log of past and current alarms (see 7.2).
External Alarms	External alarm configuration options. (see 5.5)
Axell-CMU SW Upgrade	Options for Booster level software upgrade (see 6.4)
Modem Direct Access	N/A

5.3 RF Parameters and Channel Configuration

Define up to 12 sub-bands with dedicated parameters for the 700 MHz and 800 MHz band according to the instructions in this section. The defined filters are *graphically* displayed in the lower part of the screen.

To configure the signal level and channels

1. In the left pane, click the **700-800** item.
2. View the valid filter definition options by clicking the **Band Info** tab.

Figure 5-8. Available Filters Options

3. To define the filters:
 - Click the Control&Params tab.
 - Click the button corresponding to the required band: **700** or **800**.

Choose band: 700, 800

Global RF parameters: Root, CMU, 700-800, Users

Define up to 12 filters

Graphical view of defined filters

Filter	On	BW	Downlink					Uplink				
			Centre Freq [MHz]	Set Ch. Max Power	Set Ch. Max Gain	Meas. RSSI [dBm]	Meas. Ch. Gain [dB]	Meas. Ch. Power [dBm]	Centre Freq [MHz]	Set Ch. Max Power	Set Ch. Max Gain	Meas. Ch. Gain [dB]
1	☒	200 KHz (V)	759	20	85	-110	85	-25	789	27	85	85
2	☒	200 KHz (V)	761	20	85	-109	85	-24	791	27	85	85
3	☒	200 KHz (V)	763	20	85	-109	85	-24	793	27	85	85
4	☒	200 KHz (V)	765	20	85	-109	85	-24	795	27	85	85
5	☒	200 KHz (V)	767	20	85	-108	85	-23	797	27	85	85

UL 787.5, 787.5, 805.5
DL 787.5, 787.5, 775.5

Status: ok

Figure 5-9. Sub-band Allocation Configuration

The displayed pane is relevant to the selected band. It is divided into three areas:

- o System – overall parameters for the *selected service*.
- o Sub-band (filter) definitions area.
- o Graphical view of defined sub-bands.

4. Configure the general **System** parameters as follows:

Figure 5-10. Control and Params Tab – Required System Parameters

- Verify **RF Transmission Enable** is checked (RF transmission ON).

NOTE: Under certain conditions related to the Shut Down mechanism, the RF transmission can be disabled (unchecked) by the system. The Shut Down mechanism is described in the next step - Optional System parameters).

- Set **Max Composite DL Output Power** – set according to your site requirements and click **Send**. The **Measured Composite DL Output Power** is displayed in the adjacent field.

NOTE: If the composite output power exceeds the defined value, the Smart-ALC feature begins working (refer to section 1.4 for more information on SALC).

- Set **Max Composite UL Output Power** – set according to your site requirements and click **Send**.

5. You may modify the following **System** parameters – Shut Down Mechanism (disabled by default) and DL Output Threshold Delta (set to '0' by default):

Figure 5-11. Control and Params Tab – Optional System Parameters

- **Shut Down Mechanism** – if enabled, the system automatically disables RF transmission if an excessively high input power (from the BTS side) is detected for a specific period of time.

In that case, two operations are performed by the system:

- o **RF Transmission Parameter** is unchecked (transmission is OFF)
- o **System Mute** alarm (Alarms tab) is generated (RED).

NOTE: If the high input power issue is resolved, then it is necessary to enable RF transmission by check-marking the **RF Transmission Enable** parameter. In addition, reset the **System Mute** alarm (click Ack).

- **DL Output Threshold Delta (dB)** - delta from DL Output Power, below which the alarm 'Donor power is too low' is activated.

6. Enable the filters (up to 12 filters) and set the bandwidth as follows:
 - Checkmark to **ON** each filter row. The corresponding options will be available.
 - Select the **BW** (bandwidth) – the valid bandwidths are listed in the **Band Info** tab.

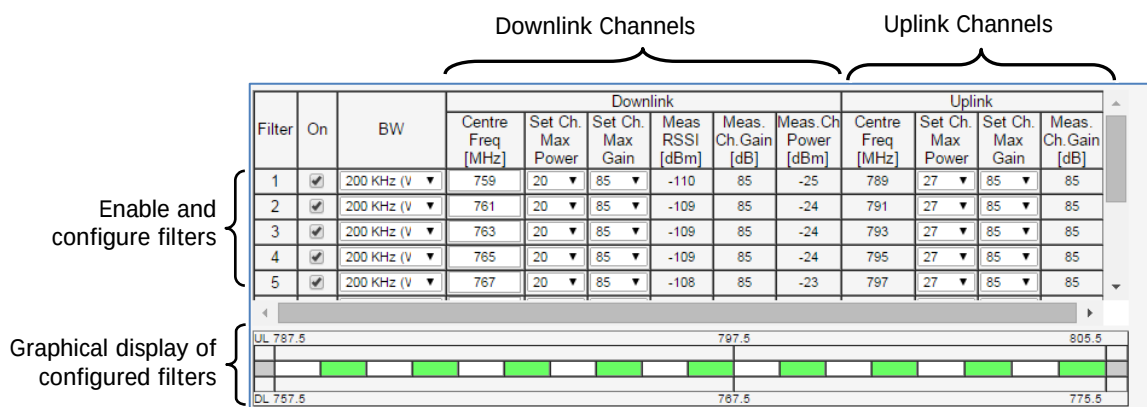


Figure 5-12. Control and Params Tab – Enabling and Configuring Filters

7. Set the **DL** parameters for the selected filter:
 - **DL Centre Freq** - the resulting bandwidth will automatically be graphically displayed and the corresponding Uplink Center frequency will automatically be allocated.
 - **Max Ch Max Power** – set to maximum level by default. Modify as needed.
You may want to click **Send** after each filter definition and view the measured Channel Power and the Composite Output Power (in the System are at the top of the screen).
 - **Max Ch Max Gain** – set to maximum by default. Modify according to the measured/calculated input power and isolation measurements.
Recommended Maximum Gain setting is approximately 16 dB less than the isolation between the service and donor antennas.
More information on **Downlink** sub-band parameters

o DL Measured RSSI	- measured DL signal.
o DL Measured Ch. Gain	- measured DL Gain (dB) for the selected sub-band.
o DL Measured Ch. Power	- measured Power (dBm) for the selected sub-band.
8. Set the **UL** parameters for the selected filter:
 (The uplink channels **and their values** are automatically allocated according to the downlink channel definitions.)
 - Set **Max Ch Max Power** – by default, the power is set to maximum level. Modify as needed.
You may want to click **Send** after each filter definition and view the measured Channel Power and the Composite Output Power (in the System are at the top of the screen).
 - Set **Max Ch Max Gain** - change the default value (maximum) according to the measured/calculated input power and isolation measurements.
Recommended Maximum Gain setting is approximately 16 dB less than the isolation between the service and donor antennas.
9. Click **Send** (top window area option).

10. After the channels have been configured and the required coverage is attained for the location, verify that no Alarms are generated:
 - Click the **Alarms** tab
 - Verify that all the indicators are GREEN in the Alarms tab

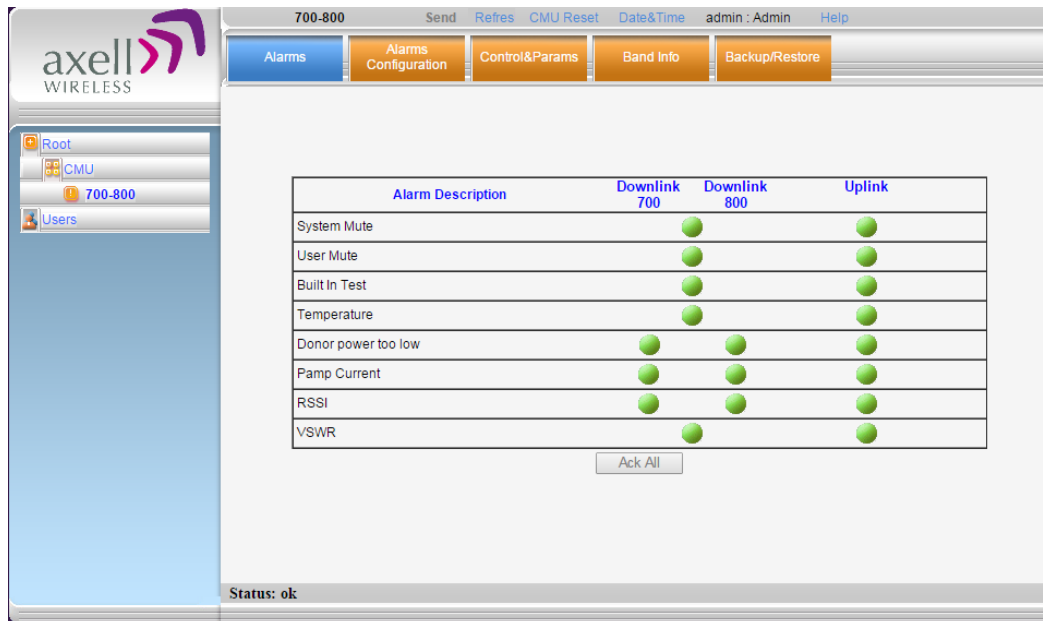


Figure 5-13. Alarms Dialog

5.4 Date and Time Settings

NOTE: It is important to set the correct date and time on the unit since this provides the timestamp for each logged event and alarm. This operation requires resetting the Booster.

To set the Boosters date and time

1. Click on **Date & Time** in the **Operations Items** bar (5.2.2.1). The following dialog appears.

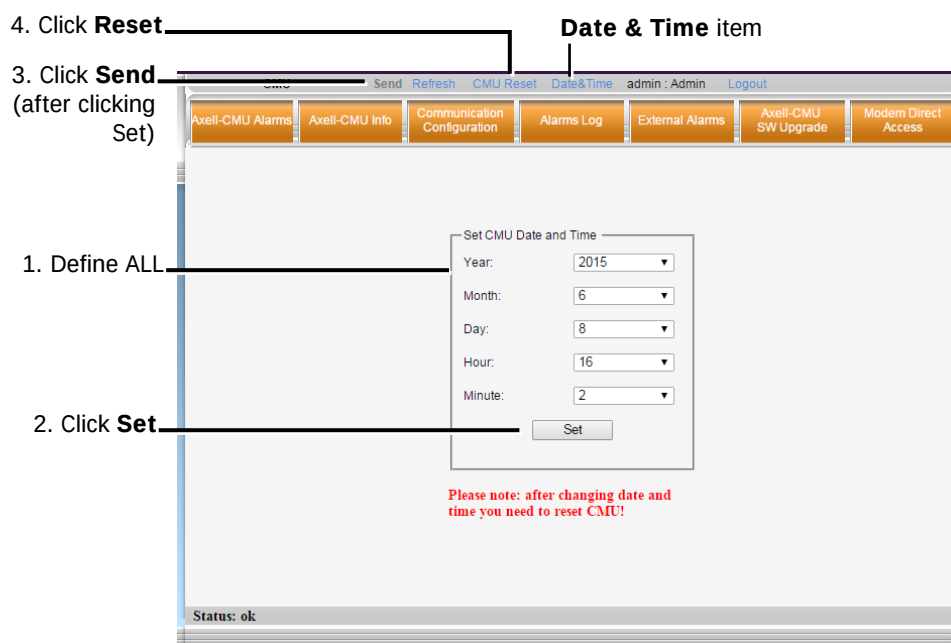


Figure 5-14. Date & Time Settings Dialog

2. Set ALL the date and time parameters.
3. Click on **Set** in the dialog and then **Send** at the top of the screen
4. Click the **CMU Reset** button in the Operations Bar.

5.5 External Alarms Configuration

It is required to configure an external alarms that have been connected to the Booster (either from the UPS / Battery Charger or from another external source, these must.

To configure external alarms

1. In the left pane, click on the **CMU** option and select the **External Alarms** tab. The following dialog appears.

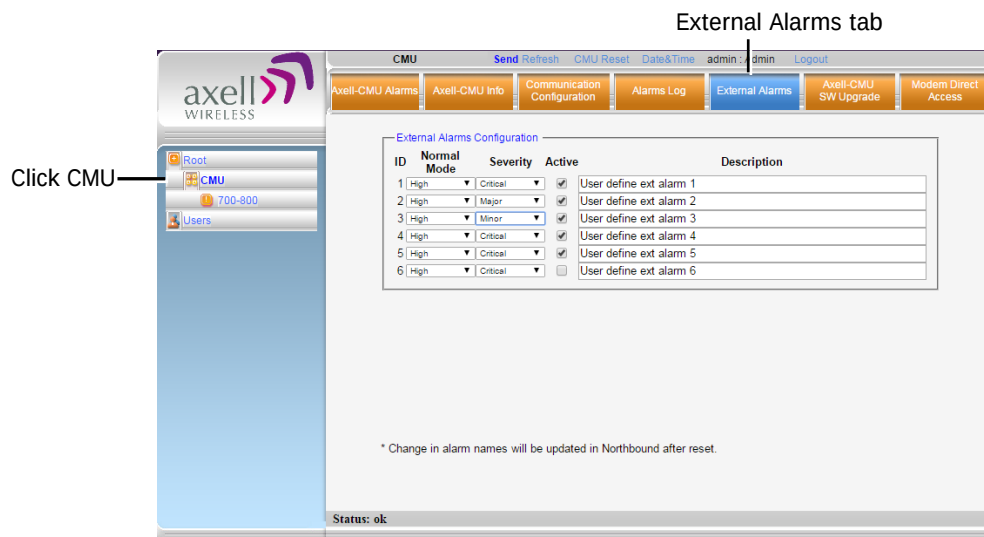


Figure 5-15. External Alarm Configuration Dialog

2. For each connected alarm:
 - Check the “**Active**” checkbox.
 - Set the alarm **Normal Mode** as High or Low.
 - In the **Description** field, assign the alarm an identifiable name (e.g. Door open). *The description will be updated after Booster reset.*

NOTE: Triggered external alarms are displayed in the **Axell-CMU-Alarms** tab.

5.6 IP Address and SNMP Notifications

This section describes how to define the following parameters:

- Booster's IP Address and SNMP notifications management
- AEM management support
- Auto-replace

All options are defined via the Communication Configuration Screen

To configure the IP Address and SNMP Notifications

1. Click on **CMU** in the left pane and select the **Communication Configuration** tab. The following screen appears.

Figure 5-16. Communication Configuration Dialog

The following areas are relevant to this Booster installation.

Area	Description
IP Configuration	Used to define Static IP Address and DHCP Address.
AEM Configuration	Used to define auto-replacement options for AEM management.
SNMP Trap options	This includes enabling SNMP Trap options and defining the relevant parameters.
AEM	Used to configure the repeater for AEM support

5.6.1 Configuring the IP Address

The Booster supports both Static and DHCP addresses. A unique technology enables applying both types to the *same* Ethernet port. Both addresses may enable local and remote management.



ATTENTION!! The Local IP Address is a static address assigned by the user to the system. The default Static IP address is **192.168.1.253**. It is highly recommended to preserve this setup. In case of a change, make sure you record the newly assign IP.

To configure the Booster IP address

1. Click the left pane **CMU** item and select the **Communication** tab.
2. To assign the unit a **Local IP Address**:

In the **IP Configuration** area, assign the unit the Local IP address, Netmask and Gateway parameters provided by your system administrator.

IP Configuration	
Local IP address	192.168.1.240
Local Netmask	255.255.255.0
Local Gateway	192.168.1.254
Request additional DHCP address	☐
DHCP Address	NA

Figure 5-17. Network Settings

3. To configure the booster to operate with a DHCP Server:
 - Checkmark Request Additional DHCP Address.
 - The assigned address can be seen in the DHCP Address field.

IP Configuration	
Local IP address	192.168.1.253
Local Netmask	255.255.255.0
Local Gateway	
Request additional DHCP address	☒
DHCP Address	192.168.171.30

Figure 5-18. Network Settings

5.6.2 SNMP Trap Configuration

The Booster can be configured provide fault notification by sending traps to up to five defined IP addresses each time a fault is triggered. The traps are sent at the defined heartbeat frequency and can be sent with a Sending Delay.

To set SNMP Trap Destination parameters

1. Click the left pane **CMU** item and select the **Communication** tab.
2. In the **SNMP Trap / SMS Destination** area, set the **Use Destination** field to the **SNMP** option

SNMP Trap / SMS Destination

Use destination: **SNMP** (Select **SNMP**)

Sending Delay TH: **0** (Optional (in minutes))

SNMP Trap Destinations:

	IP Address	Community
1:	0.0.0.0	public
2:	0.0.0.0	public
3:	0.0.0.0	public
4:	0.0.0.0	public
5:	0.0.0.0	public

Define up to five SNMP destination addresses

3. In the **Use Destination** field, select the **SNMP** option
4. For each destination:
 - Define the IP Address (where the IP addresses should be in the same subnet as the booster).
 - Define the Community names (default = public) of the computers to which traps will be sent.
5. **Sending Delay TH (Optional)** - by default, there is no sending delay ('0' value) and the alarm is continuously sent as long as the fault exists.
By configuring the Sending delay TH, the same alarm is sent again, only if the fault persists for the configured (minutes) time period.
6. In the **SNMP Trap Configuration** area, in the **Heartbeat Period** field, define the frequency (in minutes) at which traps will be sent. *It is recommended to maintain the Enterprise ID value as Axell.*

SNMP Trap Configuration

Heartbeat period: **Never**

Enterprise ID: **Axell**

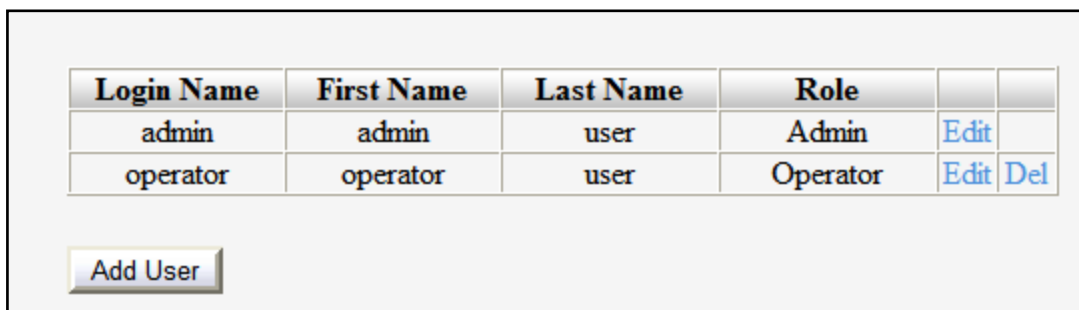
7. In the window Operations Bar, click **Send**.

5.7 Changing Password

For security, it is recommended to change the password of the Administrator.

To change the administrator password

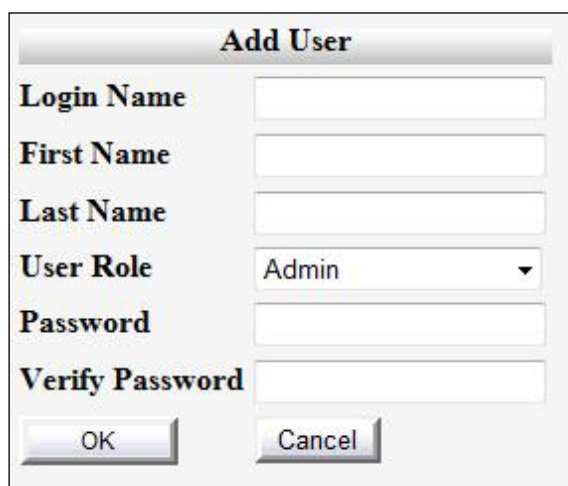
1. From the left pane, select **Users**. The list of users is displayed in the User's Pane.



Login Name	First Name	Last Name	Role		
admin	admin	user	Admin	Edit	
operator	operator	user	Operator	Edit	Del

Add User

2. In the **admin** row, click **Edit** and modify the relevant information – specifically the password.



Add User

Login Name

First Name

Last Name

User Role

Password

Verify Password

OK Cancel

Figure 5-19. Add User

3. Enter the **Password** and in **Verify Password** enter the password again for verification.
4. Click **OK**.

6 ADMINISTRATIVE OPERATIONS

The following administrative operations are described in this section:

- User Management – defining and changing users and passwords.
- Viewing the Booster information such as software and hardware versions, serial number.
- Software upgrade

6.1 User Management

This section describes how to perform the user management operations. By default, *two* users belonging to one of three authentication levels are defined on the Booster. You may add new users, modify or delete existing users.

6.1.1 User Levels

Two user levels are available:

- Admin – has access to all administration and configuration options, including user management. (Default Password **admin** and default User Name **admin**.)
- Operator – has access to all configuration options *except* for the Users list or the Loaders screen.

6.1.2 Viewing the List of Defined Users

To display the User Administration pane

From the left pane, select **Users**. The list of users is displayed in the Configuration Pane according to the identifying information and authentication level (Role).

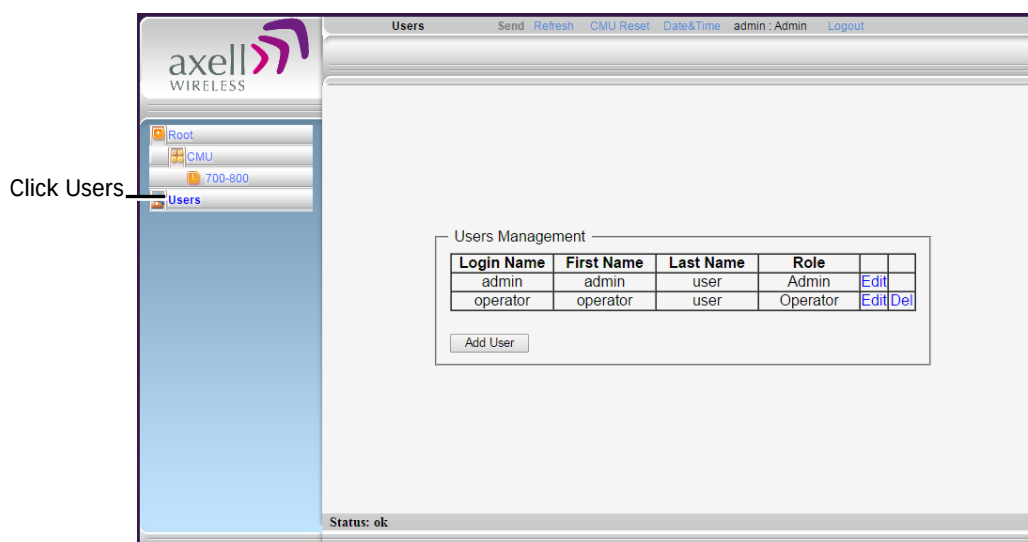


Figure 6-1. User Administration Pane

The following table provides a description of the Users dialog options.

Option	Description
Add User (button)	Adds a new user with to user defined access level and password.
Del(ete)	Deletes a selected user from the list.
Edit	Enables changing the definitions of an existing user.

6.1.3 Adding Users

NOTE: User name and password entries are case sensitive.

To add a user

1. From the left pane, select **Users**. The list of users is displayed in the User's Pane.
2. From the User's Pane, click **Add User**. The Add User dialog box is displayed.

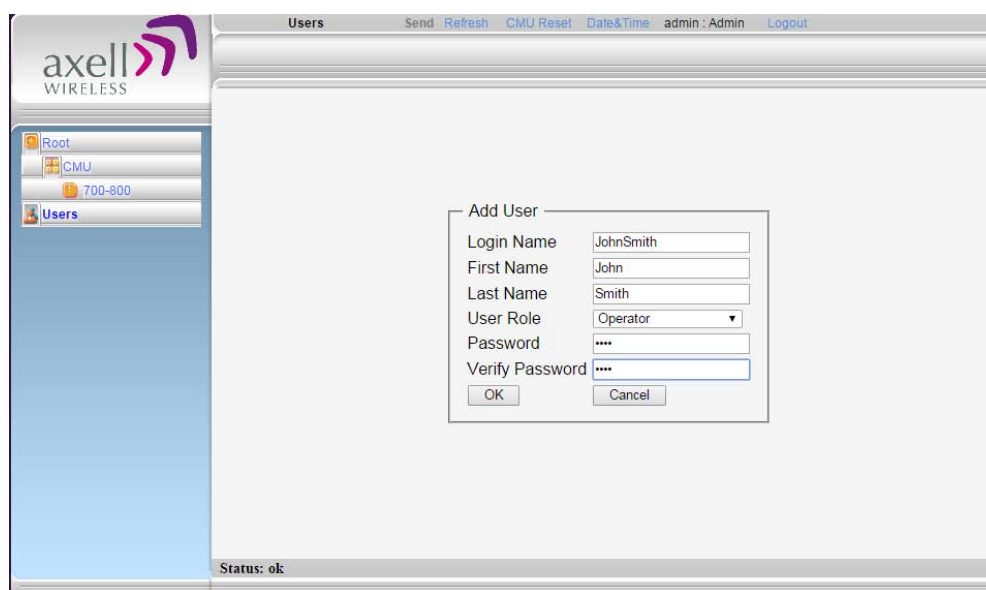


Figure 6-2. Add User

3. Enter the **Login Name** – name used by user to login.
4. Type the user's **First Name** and **Last Name** – used to identify the user.
5. Select the **User Role** – access level. This defines the operations that the user will be able to perform.
6. Enter the **Password** and in **Verify Password** enter the password again for verification.
7. Click **OK**.

6.1.4 Editing a User

To modify user definitions

1. From the left pane, select **Users**. The list of users is displayed in the **User's Pane**.
2. Select the **User** to be edited in the list.
3. Click **Edit**. The user definitions dialog appears.
4. Make the required changes and click **OK**.

6.1.5 Deleting a User

To delete a user

1. From the left pane, select **Users**. The list of users is displayed in the User's Pane.
2. Select the User to be deleted in the list.
3. From the User's Pane, click **Del**. An authorization message dialog box is displayed.

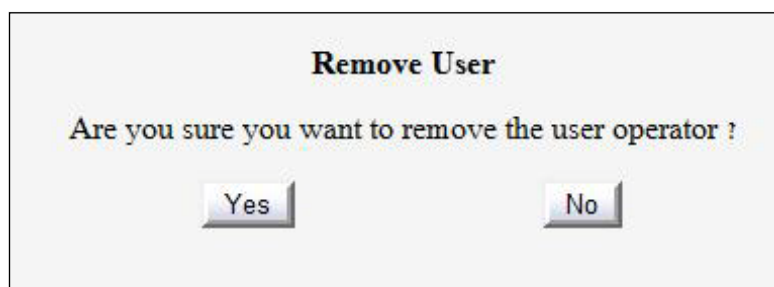


Figure 6-3. Remove User

4. Click **Yes**. The User's name is removed from the list.

6.2 Viewing General Information

The Web GUI provides Booster level information (via the CMU Info tab) and band level information (via the Band Info tab).

6.2.1 Viewing Booster Level Information

Use the **CMU Info** screen to view the hardware and software versions of the Booster and to assign the Booster a recognizable name.

To access the Band Information window

1. In the left pane, select **CMU** and click the **CMU Info** tab.
2. You may define the following parameters:
 - **Log Level** - sets the minimum fault level that is logged.
 - **CMU name** – identifiable user-defined name.

(Other fields provide version and identification information.)

The screenshot shows the 'Axell-CMU Info' tab in the CMU configuration window. The left sidebar shows a tree view with 'Root', 'CMU', '700-800', and 'Users'. The main area contains several form sections:

- CMU Section:**
 - Axell-CMU Name: cmu
 - Log Level: ERROR (dropdown)
 - Axell-CMU SW Version: 6.1.9
 - OS Version: 24_03_15
 - Serial Number: 00123456
- Repeater Info Section:**
 - Part Number: DMCU
 - Type: DMCU
 - Serial Number: 0.0.0
 - AEM CB Version: 1.8.9-CCD
- GPS Section:**
 - Use GPS-based configuration switch: ☐
 - Current Latitude: NA
 - Current Longitude: NA
- Auto ACK Section:**
 - Alarms Auto Acknowledgement: ☒

At the bottom, the status is 'Status: ok'.

Figure 6-4. CMU Level Info

6.2.2 Viewing Band Level Info

This Band Info tab displays general identification information such as build version, valid filter definitions and more.

To access the Booster Information window

1. From the left pane, select the **700-800** item.
2. Select the **Band Info** tab. The relevant parameters are displayed. This includes:
 - Build Version
 - Filters types and relevant bandwidth – this information is relevant when defining the RF parameters and sub-bands for each band.

The screenshot shows the 'Band Info' tab for the '700-800' band. The left sidebar shows a tree view with 'Root', 'CMU', '700-800', and 'Users'. The main area contains the 'Band Information' section:

	Downlink	Uplink
Serial Number	11401006	11401007
Build Version	0b010000.7080bb07.01040004.0200.02	0b010000.7080bb07.01040004.0200.02
Narrowband filters:	6.25-1000KHz (in 6.25KHz steps)	
Wideband filters:	200-20000KHz (in 200KHz steps)	
5MHz filters:	5000KHz	

At the bottom, the status is 'Status: ok'.

Figure 6-5. Band Level Information

6.3 Band-Level Configuration Backup/Restore

The Web GUI management application enables the backup and restore of the band level configuration options. A number of configuration files can be stored on the Booster for access and restoring at any time. The procedures are performed via the **Backup/Restore** tab.

6.3.1 The Backup/Restore Tab

To access Backup/Restore tab

In the left pane, click the **700-800** item and click the **Backup/Restore** tab. The following screen appears.

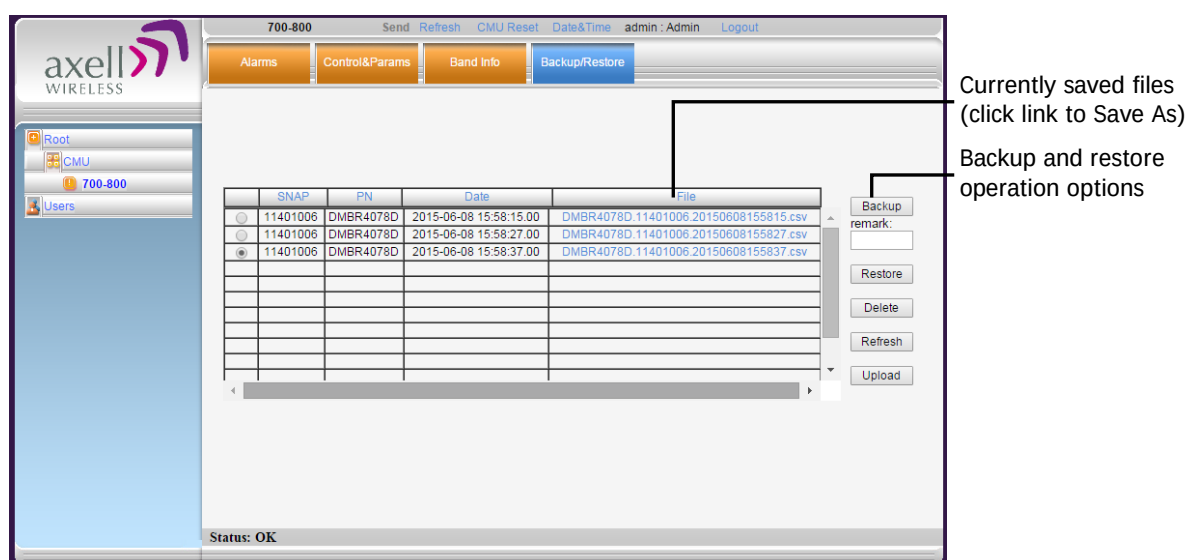


Figure 6-6. Backup and Restore

The file management buttons provide the following options:

Item	Description
Backup	Backup the currently running configuration file to a selected location. The file will be added to the list.
Remark	User defined name that will be assigned to the file saved using the Backup file. (Instead of the system assigned name).
Restore	Select and upload an existing band level configuration file.
Delete	Deletes the <i>selected</i> file from the list.
Refresh	Refreshes the displayed list of files.
Upload	Enables uploading a configuration file from another location to the Booster.
File	Click links to download files and save to another location.

6.3.2 Backup Band Configuration

To backup the current configuration

1. In the left pane, click the **700-800** item and then click the **Backup/Restore** tab.
2. To assign the configuration file a recognizable name, enter a name in the **remark** field. Otherwise, the file will be assigned a name by the system.
3. Click the **Backup** button located on the right-hand side of the tab.
4. The file will be added to the table displayed in the Backup/Restore tab.

Note: The file name (under File) is a link that enables uploading the file to another location.

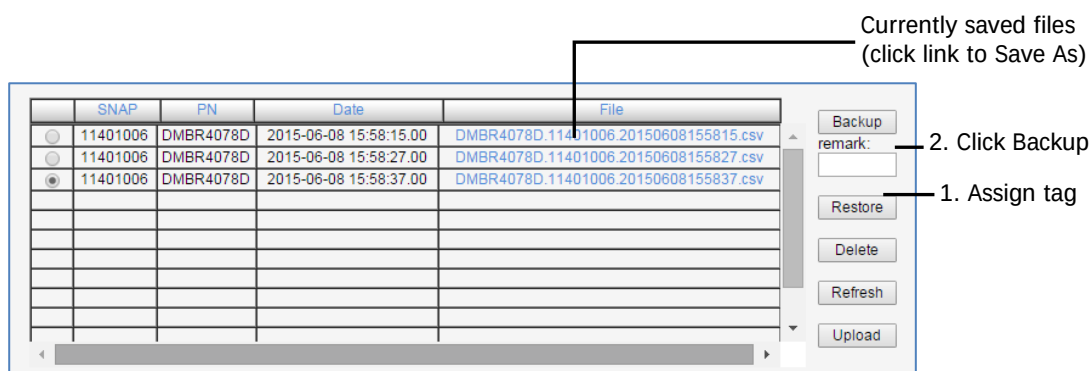


Figure 6-7. Backup Booster Info

6.3.3 Restoring Band Configuration

To restore previous configuration

1. In the left pane, click the **700-800** item and then click the **Backup/Restore** tab.
2. Select the required configuration file (enable corresponding radio button) from the available list in the Backup/Restore tab.
3. Click the **Restore** button.

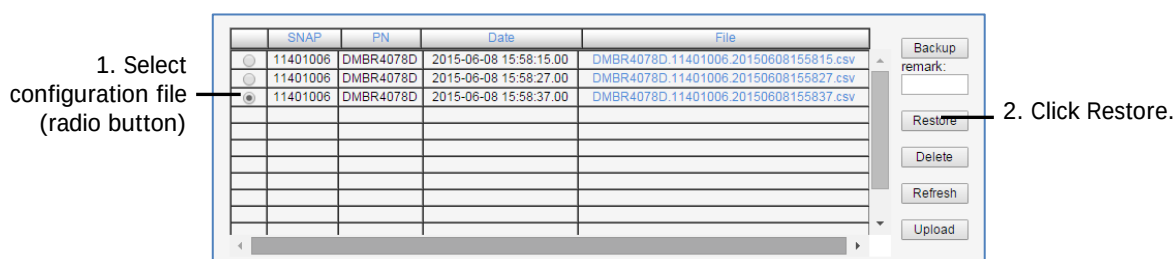


Figure 6-8. Restore Band Configuration

4. Click on the **Control and Params** tab and verify that the required configuration settings have been restored.

6.3.4 Uploading Band Configuration File

To upload configuration file to Booster

1. In the left pane, click the **700-800** item and then click the **Backup/Restore** tab.

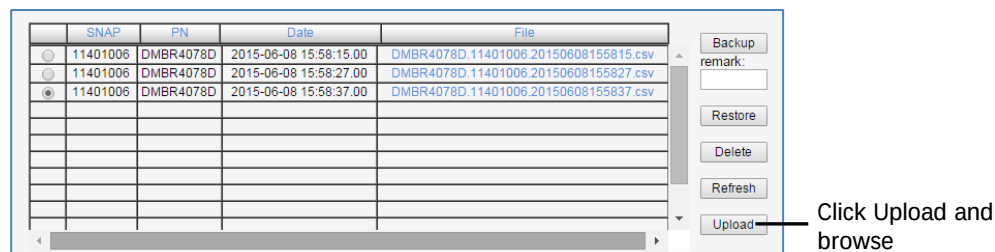


Figure 6-9. Upload Configuration File

2. Click the **Upload** button.
3. Select the file from the Browse dialog and click **Open**.
4. The file will be listed in the Backup/Restore table.

6.3.5 Saving Configuration File to Computer

To save a configuration file from the list to a selected location

1. In the left pane, click the **700-800** item and then click the **Backup/Restore** tab.

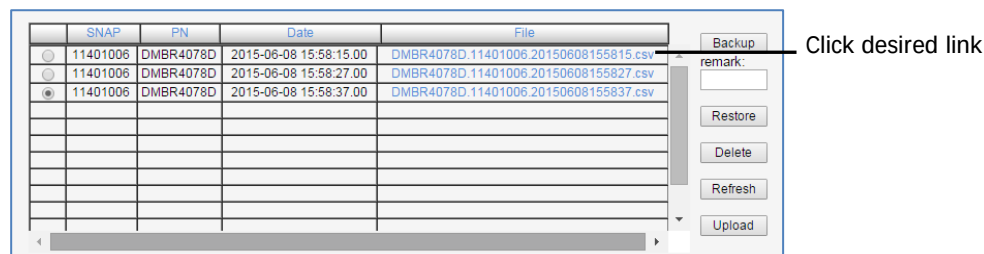


Figure 6-10. Save File in a Different Location

2. Select file from list.
3. Click the link in the **File** column.
4. Select the location in the Browse dialog

6.4 CMU Software Upgrade

NOTE: This procedure is performed for every new management version.

The procedure described in this section is used to upgrade the Booster software. The CMU SW upgrade procedure consists of loading the new software version and installing it in the CCD. The CMU can store two versions on two separate data banks enabling restore to a previous version.

To Upgrade the CMU SW

1. In the left pane, click the **CMU** item and then click the **CMU SW Upgrade** tab. The following screen appears (the Browse field will be empty).

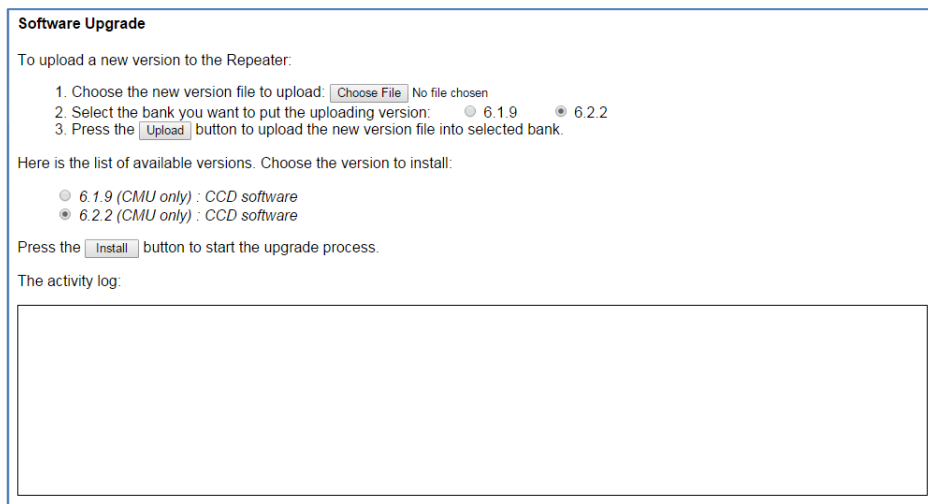


Figure 6-11. CMU Upgrade

2. Choose and save the file onto the Booster:
 - (1) Click **Choose File** to search for the location and choose the new software file. It will be displayed adjacent to the **Choose File** button.
 - (2) Select the bank where the file will be stored. (Before it is populated the bank will be named 'empty slot'. After it is populated, it will take on the name of the stored software version). Any existing software file will be replaced.
 - (3) Press Upload to save the file to the selected bank (slot). The available software files to choose from will be listed.
3. Choose the required software file and click **Install**.
4. The Activity Log will indicate status and upgrade completion.

7 MONITORING AND TROUBLESHOOTING

The D-MBR Booster provides the following indications of Booster failure:

- LED: on Booster front panel
- Booster level Alarms Log – displays a log of past and current generated alarms on a Booster level
- Band level Alarms screen – displays currently active band-level alarms

The following sections provide a description of the troubleshooting procedures according to the Booster LED indicators and the Web Alarms.

7.1 LED Troubleshooting

Two status LEDs are located on the Booster panel – one for the Uplink and one for the Downlink. The LEDs provides the following information:

Color	Description	Corrective Action
Green	Normal (UL or DL) operation	-
Red	Power failure (in UL or DL)	Corrective action: Turn off the Booster (this action causes a reset of the function), and turn it on anew. If the fault resumes, replace the unit.
Blinking Orange/red	Mute - either user- or system-initiated. (System initiated mute may be due to isolation problem or temperature).	Check gain of the booster, if gain is minimum, then it is an isolation problem -> improve isolation. Turn OFF the Booster (resets the function), and turn it ON again. If the fault resumes, replace the unit.

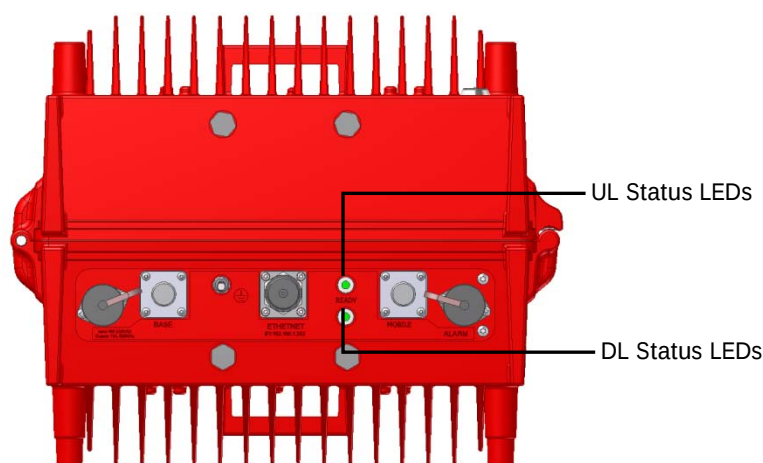


Figure 7-1. UL and DL Status LEDs located on Underside Panel

7.2 Booster Level Alarms Log

The CMU maintains log files listing every alarm triggered in the Booster. These are displayed in the Alarms Log screen. This screen provides an analysis tool to get information of any event that has occurred, its originator, when, if they return, and their type.

NOTE: Time of occurrence of the events is set according to the Booster clock (5.4).

To view the CMU log screen:

Click on **CMU** in the left pane and select the **Alarms Log** tab. The following screen appears.

Time Stamp	Source	Description
08/06/15 14:43:50	700-800	Raised: Donor power too low DL
08/06/15 14:41:51	700-800	Cleared: Donor power too low DL
08/06/15 14:41:50	700-800	Cleared: User Mute DL
08/06/15 14:38:21	700-800	Raised: User Mute DL
08/06/15 14:38:21	700-800	Raised: Donor power too low DL
08/06/15 14:37:20	700-800	Cleared: User Mute DL
08/06/15 14:37:20	700-800	Cleared: Donor power too low DL
08/06/15 14:36:48	700-800	Raised: User Mute DL
08/06/15 14:36:48	700-800	Raised: Donor power too low DL
08/06/15 14:30:44	700-800	Cleared: User Mute DL
08/06/15 14:30:44	700-800	Cleared: Donor power too low DL
08/06/15 14:29:43	700-800	Raised: Donor power too low DL
08/06/15 14:29:42	700-800	Raised: User Mute DL
08/06/15 14:28:41	700-800	Cleared: Donor power too low DL
08/06/15 14:28:11	700-800	Raised: Donor power too low DL
08/06/15 14:15:30	cmu	CCD Application started
08/06/15 13:09:13	700-800	Cleared: User Mute DL
08/06/15 13:08:41	700-800	Raised: User Mute DL
08/06/15 11:37:51	700-800	Cleared: Communication failure
08/06/15 11:33:52	700-800	Raised: Communication failure
08/06/15 11:31:51	700-800	Cleared: Communication failure
08/06/15 11:30:17	700-800	Raised: Communication failure
08/06/15 11:26:16	700-800	Cleared: Communication failure
08/06/15 11:22:47	700-800	Raised: Communication failure
08/06/15 10:42:40	700-800	Cleared: Channler Communication

Status: ok

Figure 7-2. CMU Log Screen

Item	Description
Time Stamp	The date and time the alarm was created
Source	ID of Network Element
Description	Description of event that caused the alarm

7.3 CMU Alarms

Click on **CMU** in the left pane and select the **CMU Alarms** tab. The following screen appears. The screen shows any activated Alarms – this includes any activated dry-contact alarms (if relevant).

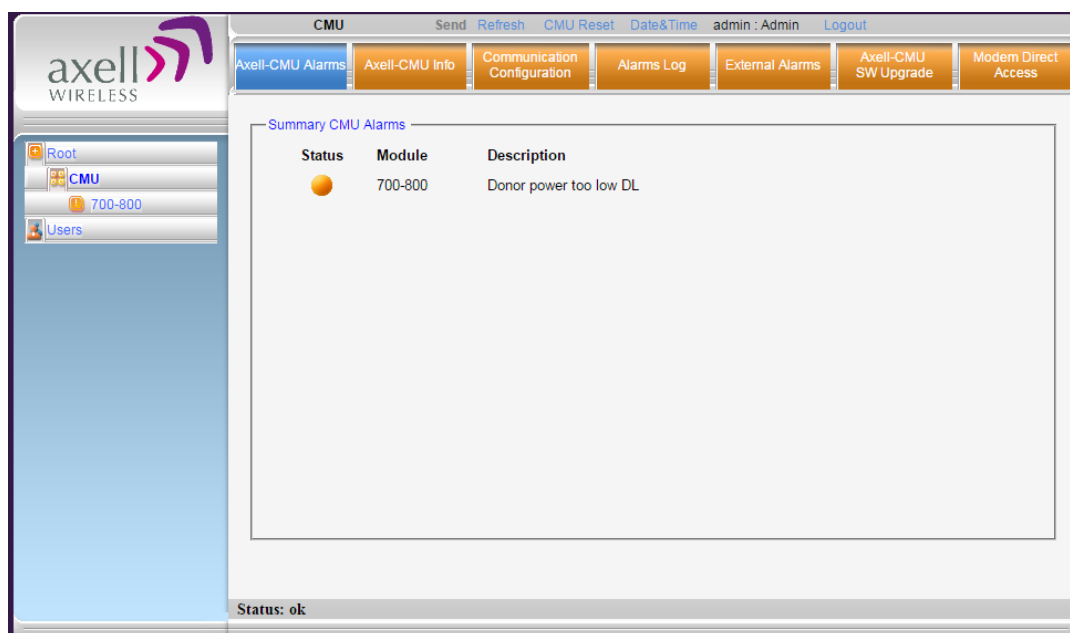


Figure 7-3. View Activated Alarms

7.4 Band-Level Alarms and Troubleshooting

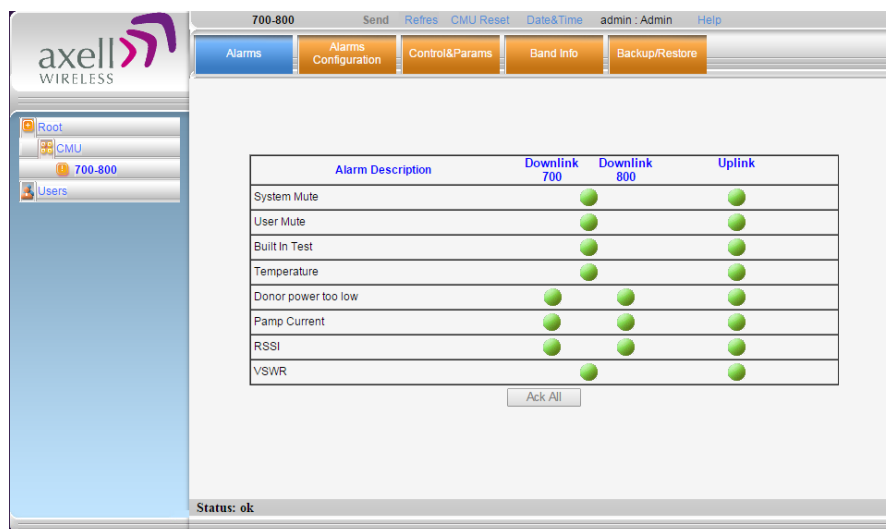
The Alarms tab displays any alarms generated by the bands. The tab is common to both bands.

To display the Band Level Alarms tab

From the left pane, select the **700-800** item and choose the **Alarms** tab. The relevant alarms are displayed.

When at fault, each generated alarm is displayed according to the factory set values for that alarm, as Minor (yellow), Major (orange) or Critical (red).

NOTE: The alarm settings can be modified via the **Alarms Configuration** tab.



See the following page for alarm descriptions.

NOTE: Use the ACK ALL button to reset ALL displayed alarms.

Alarm	Fault and most probable cause and Recommendation
System Mute	Description. Generates an alarm when Booster amplification is <i>automatically</i> muted. Possible causes: Temperature failure, Synthesizer failure, Hardware failure, High RSSI power DL/UL when the shutdown mechanize is on. Recommended action: Check the LED and other alarm from the Booster. Contact Cobham Wireless Support
User Mute	Description: Manual shutdown performed by operator from the Web GUI. Recommended action: Review unit's log
Built In Test	Possible causes: Hardware failure, Circuitry failure, Software failure Recommended action: Contact Cobham Wireless Support
Temperature	Description: Booster temperature is exceedingly high due to excessive external heat. Recommended action: Check the Booster case for external causes (sun, hot environment, air flow is blocked). Eliminate the reason for excessive heat.

Alarm	Fault and most probable cause and Recommendation
Donor Power Too Low	Description: Signal from the Donor antenna (DL) is too low - relatively to the desired output signal configured by the user. Recommended action: Check the Donor/Base connections and antenna position. Check the signal level of the Donor/Base antenna. If the alarm is still raised, then you can raise, the value of the DL Output Threshold Delta[dBm] as needed.
(PAmp) Current	Description: Power Amplifier current is not within limits (too high or too low). If the Mute option is enabled, then this is not a fault since it indicates low Power Amplifier current caused by the mute. Recommended action: Check the LEDs status in the Booster and Contact Cobham Wireless service support.
RSSI	Description: Generates an alarm when a high <i>donor</i> input signal causes system gain reduction
VSWR	Description: This alarm is triggered when the return loss of the Downlink or Uplink antenna or cable connection exceed the allowed limit. This alarm provides an indication of the status of the cable/antenna connected to the antenna. If a cable/antenna is defective, the VSWR is decreased and the alarm is triggered. Recommended action: Check the cable.

7.5 Modifying Alarm Severities

The Alarms Configuration tab is used to modify the factory set level (minor, major or critical) of specific alarms when they are activated.

To modify the Alarm Severities

From the left pane, select **700-800** item and choose the **Alarms Configuration** tab. When activated due to a fault, the alarm is displayed in the selected color. The color corresponds to the alarm level.

Each alarm can be set to one of the following levels: Minor (yellow), Major (orange) or Critical (red).

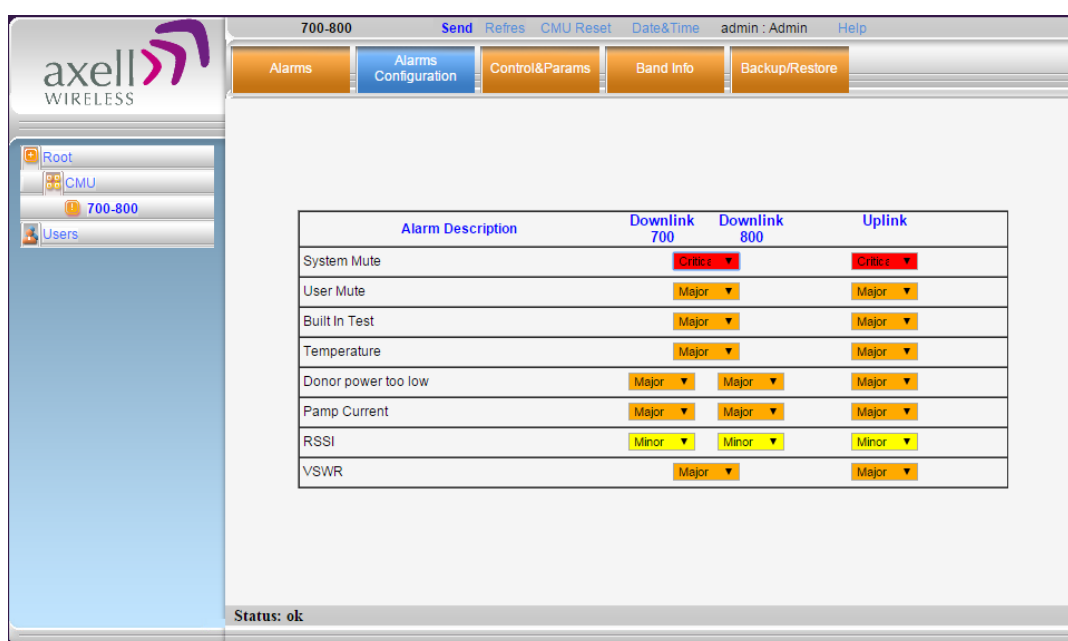


Figure 7-4. Modifying Alarm Severities

Appendix A – Booster and Charger Specifications

Electrical	Downlink	Uplink
Frequency Range: SMR 700MHz ,D block SMR 700MHz SMR 800MHz	758 - 763 MHz 763 - 775 MHz 851 - 869 MHz	788 - 793 MHz 793 - 805 MHz 806 - 824MHz
Passband Gain	55 to 95 dB Adjustable in 1 dB steps	
Passband Ripple	± 2.5 dB	± 2.5 dB
Gain attenuation range	30 dB	
Filter Bandwidth (SMR 700MHz) (*) Filter Bandwidth (SMR 800MHz) (*)	Programmable 75KHz to 1MHz at 12.5KHz steps, 1MHz-17MHz at 200KHz steps Programmable 75KHz to 1MHz at 12.5KHz steps, 1MHz-18MHz at 200KHz steps	
Number of filters in SMR 700MHz	Up to 12	
Number of filters in SMR 800MHz	Up to 12	
Composite Output Power SMR 700MHz	+ 37 dBm	+ 27 dBm
Composite Output Power SMR 800MHz	+ 37 dBm	+ 27 dBm
Noise Figure @ Maximum Gain	5.0 dB	
General		
Dimensions W x D x H	21.3 x 15 x 12.3 inches (540 x 382 x 313 mm)	
Power Supply	36-76 VDC	
Power Consumption	350 W	
Total RF Input Power (no damage)	+10 dBm	
Impedance Level	50 Ohm	
RF Connector	N-type, Female	
VSWR	1.5:1 maximum	
Compliance	IC/FCC	
Environmental		
Operating Temperature	-5 to 122° F (-10° C to +50° C)	
Humidity	10% to 90% Condensed	
Weight	73 lbs. (33kg)	
Enclosure	Aluminium (NEMA4/IP-66)	

(*) Every filter above 10MHz utilize 2 FPGA resources

Charger specs	
Dimensions W x D x H	13.78" x 18.1" x 5.7" (350 mm x 460 mm x 145 mm)
Power Supply	110VAC
Power Consumption	50 Watt
Dry contact alarms	3 relays for AC fail, charger fail and low battery
Charging time (200AH) external batteries	20 hours
Environmental	
Operating Temperature	-5 to 122° F (-10° C to +50° C)
Humidity	10% to 90% Condensed
Weight	28.8 lbs. (13kg)
Enclosure	Aluminium (NEMA4/IP-66)