

Digital Band Selective Repeater

Product Description and User's Manual for Axell BSR 3308-PS / BSR 3308-PS NFPA

Doc PN 4000004131 Rev. 2.7

THIS DOCUMENT IS VALID FOR THE FOLLOWING REPEATER MODELS:
BSR 3308-PS; BSR 3308-PS NFPA; BSR 3308-PS-NFPA-DC



BSR 3308-PS



BSR 3308-PS NFPA

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About This Manual

This Product Manual provides the following information:

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

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Guarantees

- **All antennas must be installed with lightning protection.** Damage to power modules, as a result of lightning are not covered by the warranty.
- **Antennas must be connected before switching on AC or DC power.** Switching power on prior to the connection of antenna cables is regarded as faulty installation procedure and therefore not covered by the Axell Wireless warranty.
- **The repeater box should be closed using the two screws.** The screws must be fully tightened. Failure to do so may affect the IP65 compliancy and therefore any warranty.

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

Exclusive Remedies

The remedies provided herein are the Buyer's sole and exclusive remedies. Axell Wireless shall not be viable for any direct, incidental, or consequential damages, whether based on contract, tort, or any legal theory.

Compliance with FCC

Note the following: This repeater can be operated as both a Part 20 and/or Part 90 Class B repeater.

FCC Part 90 Warning Statement



WARNING: This is NOT a CONSUMER device. It 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.

This is 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.

Note the following

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 20 Warning Statement



WARNING: This is NOT a CONSUMER device. It 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.

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

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.

Only for in-building applications

One must be aware that FCC regulation mandate that this repeater is to be used *only* for in-building applications and thus feed passive or active DAS (Distributed Antenna Systems) accordingly.

FCC RF Exposure Limits

This unit complies with FCC RF exposure limits for an uncontrolled environment. This equipment can only be installed in in-building applications, driving passive or active DAS systems. All antennas must be operated at a minimum distance of 30 cm 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 permanent structures.

The FCC regulation mandate that the EIRP of type B signal boosters should not exceed 5W.

Therefore the max antenna gain allowed for this type of signal booster should be limited to the values given by equation (1) for the service antenna and equation (2) for the donor antenna

Equation (1) - Max SERVICE antenna gain

Max SERVICE antenna gain (dBi) = $37 - (33\text{dbi} - \# \text{ of antennas in dbi} - \text{cable losses in dbi})$.

For example:

No. of Antennas	Cable Losses	Max Allowed Antenna Gain
4	3	$37 - (33-6-3) = 13\text{dBi}$
1	3	$37 - (33-3) = 7\text{dbi}$
10	3	$37 - (33-10-3) = 17\text{dbi}$

Equation (2) - Max DONOR antenna gain

Max DONOR antenna gain (dBi) = $37 - (27\text{dbi} - \text{cable losses in dbi})$.

Compliance with FCC deployment rule regarding the radiation of noise

Good engineering practice must be used in regard to the signal booster's noise radiation. Thus, the gain of the signal booster should be set so that the EIRP of the output noise from the signal booster should not exceed the level of -43 dBm in 10 kHz measurement bandwidth.

In the event that the noise level measured exceeds the aforementioned value, the signal booster gain should be decreased accordingly.

In general, the ERP of noise on a spectrum more than 1 MHz outside of the pass band should not exceed -70 dBm in a 10 kHz measurement bandwidth.

The 3308 signal booster has a noise level of -43 dBm in 10 kHz measurement at 1 MHz spectrum outside the passband of the signal booster and an *in-band* noise level at around -37 dBm in a 10 kHz bandwidth. Therefore, the noise at the antenna input port should be calculated based on equation (3).

Equation (3) - Input Noise to service antenna

Input Noise to service antenna:

$-43 \text{ dBm} + \text{Service Antenna gain} - \text{Antenna splitter losses in dBi} - \text{cable loss in dB}$

Example:

Signal booster connected to 10 service antennas with a 100m long ½ inch cable.

- Losses of such a cable with the connectors = ~ 11dB
- Gain = ~ 2 dBi

Assuming 10 service antennas: antenna splitter losses = 11 dB

Based on equation (3) Input antenna noise (to the antenna) = $-43+2-11-11=-63$ dBm

The inband input noise to the antenna should be $-37+2-11-11=-57$ dbm

NOTE: In this example you may be required in general to add an external bandpass filter that would attenuate by additional 7 dB the out of band noise.

Conclusion:

Good engineering practice requires that in general when the out of band noise measured at the service antenna input is more than -70 dbm per 10 kHz measurement bandwidth, an external band pass filter should be added to attenuate the out of band noise level.

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 of 30 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 3.5dB, 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 30 cm entre l'antenne et le corps de l'utilisateur.

General Safety Warnings Concerning Use of This System

Always observe standard safety precautions during installation, operation and maintenance of this product.

 <p>Caution labels!</p>	<p>Throughout this manual, there are "Caution" warnings. "Caution" calls attention to a procedure or practice, which, if ignored, may result in injury or damage to the system, system component or even the user. Do not perform any procedure preceded by a "Caution" until the described conditions are fully understood and met.</p>
 <p>Danger: Electrical Shock</p>	<p>This equipment must be installed indoors only. . 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.</p>
 <p>Caution: Safety to personnel</p>	<p>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 repeater. Incorrect power settings can damage the repeater 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.</p>
 <p>Caution: Safety to equipment</p>	<p>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 repeater.</p>
 <p>Warning: Restricted Access Location</p>	<p>Access to the Axell 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.</p>
 <p>Attention: Electrostatic Sensitivity</p>	<p>Observe electrostatic precautionary procedures. ESD = Electrostatic Discharge Sensitive Device. Semiconductor transmitters and receivers provide highly reliable performance when operated in conformity with their intended design. However, a semiconductor may be damaged by an electrostatic discharge inadvertently imposed by careless handling. Static electricity can be conducted to the semiconductor chip from the centre pin of the RF input connector, and through the AC connector pins. When unpacking and otherwise handling the repeater, follow ESD precautionary procedures including use of grounded wrist straps, grounded workbench surfaces, and</p>

	grounded floor mats.
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Table of Contents

1	Introduction	1
1.1	Features	2
1.2	Repeater Models	3
1.3	Applications	3
1.4	NFPA Installation Architecture.....	4
1.5	Special Features	4
1.5.1	Smart-ALC Function	4
1.5.2	Switchable Bandwidth.....	5
1.5.3	Protection.....	5
1.6	Interfaces.....	6
2	Antenna Requirements.....	7
2.1	Base (Donor) Antenna Requirements.....	7
2.1.1	Required Antenna Information	7
2.1.2	Donor Antenna specifications	7
2.1.3	Installation Criteria	7
2.2	Service Antenna Requirements	8
2.2.1	Required Antenna Information.....	8
2.2.2	Recommended Antennas	8
2.2.3	Installation Criteria	8
3	Installing the Repeater	9
3.1	Pre-Installation Requirements.....	9
3.1.1	Safety Guidelines.....	9
3.1.2	Required BTS Information	9
3.1.3	Criteria for Repeater Installation Location	9
3.1.4	RF Cable Installation Guidelines	10
3.1.5	Overcurrent Protection.....	10
3.1.6	Grounding Wires Requirements	10
3.2	Overview of the Installation Procedure.....	10
3.3	Required Tools and Materials	11
3.4	Unpacking	12
3.5	Mounting the BSR 3308	13
3.5.1	Pre-Mounting Procedure.....	13
3.5.2	Installing the Mounting Bracket.....	14
3.5.3	For AC Models - Preparing Power Supply Cables	14
3.5.4	Mounting the Repeater	15
3.6	Grounding	17
3.7	Before Connecting the Antennas or Power	17
3.7.1	Verifying Isolation between Donor and Mobile Antennas.....	17
3.7.2	Verify Link between BTS and Repeater	18
3.8	Antenna Connections.....	19
3.9	Powering Up the BSR 3308 Repeater	19
3.9.1	Non-NFPA AC Model - Power Connection.....	19
3.9.2	BSR 3308-PS NFPA Power Connection	20
3.10	Dry Contact Alarm Connections	21
3.10.1	General	21
3.10.2	Alarm Connector Pinout.....	22

3.10.3	Load Restrictions	22
3.10.4	Summary Alarms Trigger Criteria	23
3.10.5	BSR 3308-PS NFPA Installation Alarm Connections	23
4	Initial Setup and Commissioning	24
4.1	Open a Local WEB Session to the Repeater	24
4.1.1	Connecting to the Repeater	24
4.1.2	Configure the Computer Network Parameters	25
4.1.3	Login to the Repeater	27
4.2	Navigating the Web GUI Application	28
4.2.1	Operation Buttons	29
4.2.2	Axell3308 Tabs	29
4.2.3	CMU Pane and Tabs	30
4.3	Configuring the RF Parameters and Sub-band	30
4.3.1	Reducing the Max Output Power and Gain – Optional.....	30
4.3.2	Defining the Sub-band	32
4.3.3	Verify No Alarms are Generated.....	34
4.4	Configuring the External Alarms	35
4.5	Setting Date and Time	36
4.6	Configuring the System Parameters	37
4.6.1	The Communication Configuration Tab	37
4.6.2	IP Address Configuration	38
4.6.3	Configuring SNMP Trap Destinations	39
4.7	What Next?	39
5	Administration.....	40
5.1	User Management.....	40
5.1.1	User Levels	40
5.1.2	Viewing the List of Defined Users.....	40
5.1.3	Adding Users	41
5.1.4	Editing a User	41
5.1.5	Deleting a User	42
5.2	Repeater Level and Band Level Information	43
5.2.1	Repeater Level Information	43
5.2.2	Band Level Info	44
5.3	Software Upgrade	45
5.3.1	CMU Software Upgrade.....	45
5.3.2	Band Module Software Upgrade.....	46
5.4	Backup/Restore of Repeater Configuration.....	47
5.4.1	Backup of Repeater Configuration.....	48
5.4.2	Restoring Previous Repeater Configuration	48
5.4.3	Uploading New Configuration File to Repeater	48
5.4.4	Saving Configuration File to Computer.....	48
6	Maintenance and Troubleshooting	50
6.1	Periodic Maintenance.....	50
6.2	Failure Display	50
6.2.1	Status LEDs on the Repeater Front Panel	50
6.2.2	Alarms Screen	52
6.3	Viewing Alarms Log	54
6.4	Dry-Contact External Alarms.....	55
	Appendix A: Specifications	56

1 Introduction

The Axell BSR 3308 is a band-selective mini-repeater that supports the 800MHz band for public safety and commercial cellular 800 MHz band applications.

The repeater is specifically designed for the operation of ESMR 800 MHz and is band selectable in the 800 MHz range [3 MHz, 10 MHz or 18 MHz bandwidth]. This allows setting the optimum pass-band for each of the rebanding phases without the need to change any hardware. The standard configurations accommodate most of the pass band requirements for public safety, ESMR and SMR networks including the Southeast region.

BSR 3308 has switchable and tunable IF-SAW. These enable highly accurate out-of-band-rejection and provide simple, fast procedures for adjusting the pass band according to customer requirements.

BSR 3308 PS NFPA includes Axell Wireless' proprietary Smart Automatic Level Control (SmartALC). This algorithm allows the installer to quickly set up the unit by automatically optimizing site coverage according to user set power and gain limits as designated by the system engineers. The SmartALC power control algorithm automatically optimizes the gain setting by learning the actual range of RSSI levels over a user-specified period of time.

The efficient thermal characteristics of the BSR 3308 PS NFPA careful component selection and robust design result in high system reliability.

This Axell 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 antenna system failure (up or down link) and 70 percent low battery.

Setup and monitoring is performed via Ethernet connection and intuitive web GUI.

1.1 Features

- ESMR Band Selective Mini-repeater
- Single frequency block in the ESMR band, where the block is:
 - Independently tunable across the entire 800 MHz SMR band
 - Selectable bandpass filter to one of the following: 3MHz, 10MHz or 18 MHz
- RF gain: 85 dB
- Composite power
 - FCC Composite Power: DL 33dBm, UL 27dBm (in accordance with FCC product measurements)
 - IC Rated Power: DL 30dBm, UL 25dBm (the rated power is equivalent to the Pmean power measured with a two tone test in accordance with Industry Canada procedures).
- SmartALC™ technology - automatically sets optimum gain and in addition:
 - Prevents oscillations and balances coverage
 - Shut down the BDA if high input signal is detected
 - Ensures transparent network operation
 - Built-in power measurement and RSSI indication.
- Front panel LED provides received signal strength level indication to help align the donor antenna for optimal performance.
- High linear amplification, high spectral purity and highly accurate frequency selection
- Excellent out-of-band interference prevention
- IF-SAW filtering – tunable, sharp out-of-band rejection
- Built-in power measurement and RSSI indication
- For NFPA models, designed to meet NFPA requirements:
 - For AC models – requires UPS Backup battery (not supplied): 12/24 hours
 - For DC models – requires ±48VDC trickle charged battery (not supplied)
 - All models - dry-contacts alarms to the Fire Control Panel: PS (UPS) alarms, Repeater Summary alarm and Antenna alarm.
- **Management** – Web GUI setup and management via an Ethernet connection

1.2 Repeater Models

Axell provides the following models for the Axell BSR SMR 800MHz PS Repeater:

ORDERING INFORMATION		
Identification	Description	Part Number
BSR 3308-PS	Band Selective 800 repeater, three (3MHz, 10MHz, 18MHz) GUI selectable filters, 33dBm Composite power, 85 dB gain. NFPA and IFC compliant Alarm Outputs. <i>AC powering, Neutral colored case.</i>	BSR 3308-PS
BSR 3308 PS Supporting NFPA	Band Selective 800 repeater, three (3MHz, 10MHz, 18MHz) GUI selectable filters, 33dBm Composite power, 85 dB gain. NFPA and IFC compliant Alarm Outputs. <i>AC powering, RED colored case.</i>	BSR 3308-PS-NFPA
BSR 3308 PS Supporting NFPA DC power	Band Selective 800 repeater, three (3MHz, 10MHz, 18MHz) GUI selectable filters, 33dBm Composite power, 85 dB gain. NFPA and IFC compliant Alarm Outputs. <i>DC powering, RED colored case.</i>	BSR 3308-PS-NFPA-DC

NOTE: Optional 24VDC input power model is available on request.

1.3 Applications

The BSR-3308 PS NFPA Repeater is suitable for deployment in dense urban environments, tunnels and other areas where physical structures cause low cellular coverage.

The Mini-Repeater introduces new system capabilities that enable a wide variety of applications particularly when adjacent band selectivity and/or very high spectral purity are required. This repeater provides a solution to situations in which flexible, high quality and high resolution filtering methods are necessary.

The BSR-3308 PS NFPA Mini-Repeater helps improve in-building coverage, as the driver for a single antenna for spot coverage or a distributed antenna system (DAS) for larger coverage areas.

1.4 NFPA Installation Architecture

To meet the National Fire Protection Association (NFPA) requirements, power to the Repeater is provided via a UPS/ $\pm 48\text{VDC}$ battery and the status of the UPS/battery, Repeater and DAS system (antennas) is monitored via alarm connections to the Fire Department Control Box.

NOTE: An alternative to the Fire Department Control Box connections is to connect the BSR PS NFPA and UPS dry contact alarms to an Automatic Dialer. Axell Wireless recommends the AD-2000 Automatic Voice/Pager Dialer System.

The alarms are connected as follows:

- From the UPS - the power indicator alarms are connected directly to the Fire Department Control Box.
- From the Repeater – the Booster status and antenna status alarms are connected to the Control Box

NOTE: The following figure illustrates an AC repeater architecture. In case of DC model repeaters, the repeater is fed by a $\pm 48\text{VDC}$ trickle charged battery. Make sure to keep the battery fully charged.

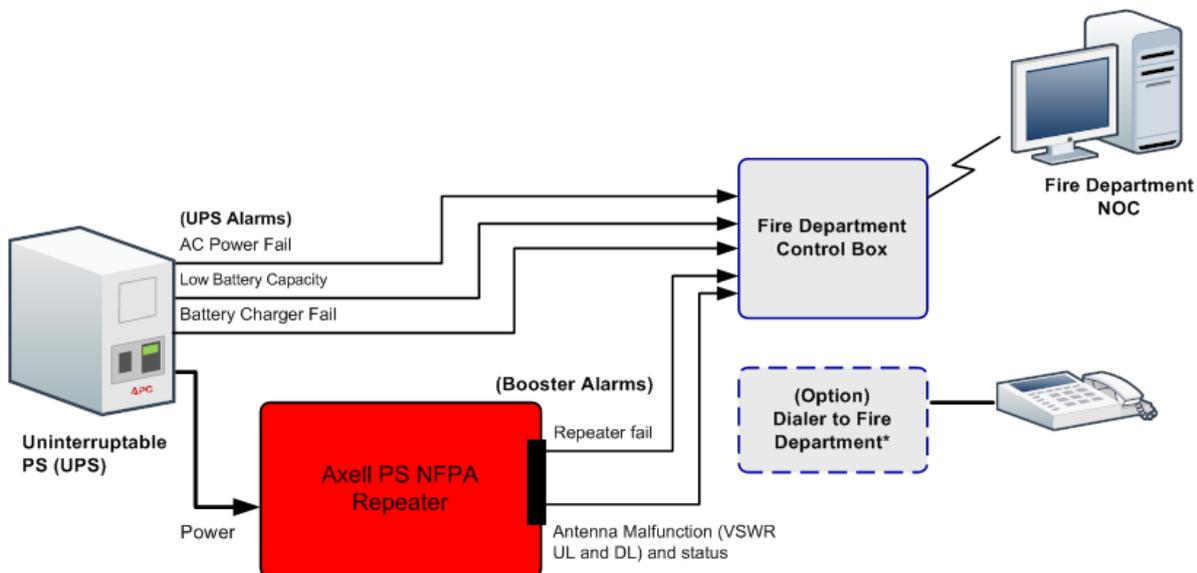


Figure 1-1. BSR 3308 BSR PS NFPA Architecture

1.5 Special Features

1.5.1 Smart-ALC Function

The Smart Automatic Level Control (Smart-ALC) is an innovative solution for automatic repeater gain adjustment. Combined with advanced control algorithms, SALC can perform gradual learning of traffic load characteristics and adjust the Repeater RF Gain to an optimal value.

Some of the SALC advantages are:

- **Network friendly** - The SALC continuously adjusts gain for optimal performance and minimum noise by keeping the same gain for full traffic as well as for pilot only transmissions.

- **No adjustments are required** - the tuning procedure is accomplished automatically, thus saving work hours and equipment usage time for a “plug & play” foolproof deployment.
- **Uplink and downlink balance is preserved** – a single adjustment is required for UL and for DL channels. If the gain of downlink path changes by some value, the uplink path is changed by the same value. Both channels have to be balanced for the proper seamless integration of the repeater in the network. Unbalanced operation bares the risk of reducing the dynamic range of the base station itself.
- **Constant output power** - The system continuously measures the output power and adjusts Gain to counter effects of oscillation or high input signal. If Gain cannot be further reduced beyond its dynamic range and oscillation still exists above user max power setting, the signal booster power amplifier will shut-down.
- **Shut-down** -In order to comply with public safety guidelines (required in certain jurisdictions), the BDA will mute if the DL (composite) power exceeds -25 dBm. You may need to connect an external attenuator at the input of the BDA, to ensure the exceedingly high signal levels are not available at the BDA input.
- **Reduction of isolation problems** - whenever the isolation drops for some reason the repeater automatically reduces the gain in accordance with the new isolation conditions. Once the isolation problem is solved the repeater automatically raises the gain again.

1.5.2 Switchable Bandwidth

The internal SAW Switcher enables implementing the Switchable Bandwidth option. This function enables more efficient and better adaptability of the Repeater to your needs. This capability enables you to install the Repeater in different operation environments or adapt it to the evolving operating environment.

In standard configuration, the Switchable Bandwidth function provides the capability to set up to three pre-determined different frequency blocks of 3, 10 and 18MHz bandwidth respectively, as per requirement. The operating center frequency is user adjustable anywhere within the SMR band.

This capability ensures that in case of bandwidth evolution at the installation site, you are not required to replace the installed repeater, just set the second bandwidth.

1.5.3 Protection

The Repeater includes protection against high V.S.W.R.

An auto recovery mechanism returns the unit to normal operation, after power or other failures.

1.6 Interfaces

The following figure shows the interfaces on the BSR Repeater.

NOTE: The interfaces described in this section are the same for all BSR 3308 models.

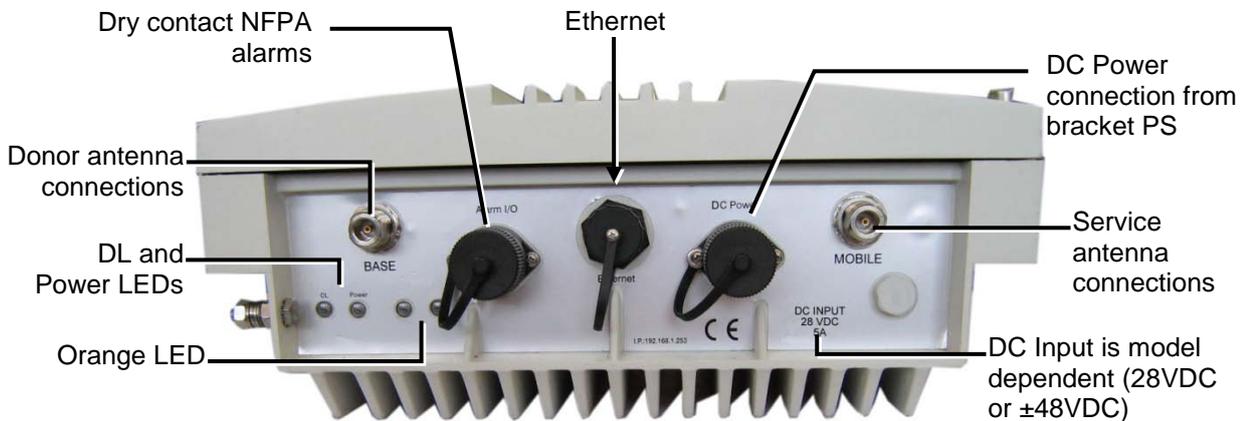


Figure 1-2. BSR 3308 BSR PS NFPA Front Panel Interfaces

The following table provides a description of the front panel ports and connections.

Port	Description
Base	Connection to Base side (donor) antenna
Mobile	Connection to mobile side antenna
Ethernet	Ethernet connection for local setup and remote management.
Dry contact NFPA alarms	See section 3.10 for description of alarm connections.
DC Power	DC models – $\pm 48\text{VDC}$ input power, connect directly to power source. AC models – 28VDC, connect to the AC to DC power converter. ATTENTION: The AC/DC converter is pre mounted on the wall bracket. Do not connect directly to any other type of power supply!!!

Below are descriptions of the front panel indicators. Detailed troubleshooting procedures are provided in section 6.2.1 - Status LEDs on the Repeater Front Panel

LED	Description
DL	Downlink path status and RSSI indication: Steady Green – Normal operation Blinking Green - Low power Orange – Input signal exceeds max. level Red – Major alarm
Power	Power\Major alarms status indication: Steady Green – Normal operation Orange – Major malfunction Red – Blinking panel mask
Orange LED	ON – normal operation.

2 Antenna Requirements

This chapter provides information on the specifications of the donor and service antennas suitable for operation with this repeater, on the installation requirements of the antennas and on the Repeater installation site and cable requirements.

ATTENTION!!

The BSR-3308 models described in this manual have been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s'il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

2.1 Base (Donor) Antenna Requirements

The Base (Donor) antenna should be 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 Repeater and the attenuation.

2.1.2 Donor Antenna specifications

- Max DONOR antenna gain (dBi) = 37 – (27dbi - cable losses in dbi).
- Very sharp beam pointed to the BTS.
- Minimum cable and jumper loss = 2dB.

2.1.3 Installation Criteria

NOTE: Verify that the antennas meet requirements described in Chapter 2 - Antenna Requirements.

Installation requirements:

- Verify the Donor antenna location provides a line-of-sight to the Base Station and maximum input power.
- Install the Donor Antenna at the designated height.
- Install the donor antenna at a higher level (i.e. floor) than the mobile antenna.
- Must be installed at a minimum distance of 30 cm for indoor applications from any personnel within the area.

2.2 Service Antenna Requirements



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.

2.2.1 Required Antenna Information

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

- Type of installation – indoor only
- Service area type and size and characteristics
- Height
- Length and type of coaxial cable required for connecting the antenna to the Repeater and the attenuation.

2.2.2 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.
- Choose an antenna with high side lobe attenuation which enables maximum isolation from the service/ mobile antenna.
- Maximum Antenna Gain = $37 - (33\text{dbi} - \# \text{ of antennas in dbi} - \text{cable losses in dbi})$.

2.2.3 Installation Criteria

Determine the antenna installation configuration, according to the transmission requirements and the installation site conditions.

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 30 cm from any personnel within the area..

3 Installing the Repeater

3.1 Pre-Installation Requirements

3.1.1 Safety Guidelines

Before installing the Repeater, review the following safety information:

- Follow all local safety regulations when installing the Repeater.
- Only qualified personnel are authorized to install and maintain the Repeater.
- Ground the Repeater with the grounding bolt located on the external lower side of the Repeater).
- Do not use the grounding bolt to connect external devices.
- Follow Electro-Static Discharge (ESD) precautions.
- Use low loss cables to connect the antennas to the Repeater.

3.1.2 Required BTS Information

Required BTS Information

- BTS channels
- BTS output power per channel
- BTS antenna gain
- BTS antenna height
- Distance from Repeater site to BTS

3.1.3 Criteria for Repeater Installation Location

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

- Application type
- General surroundings
- Available installation
- Install the Repeater in a shielded, ventilated, and easy-to-reach area.
- Verify that there is a minimum of a 50 cm (20") radius of space around the Repeater, enabling easy access to the repeater for maintenance and on-site inspection.
- Distance from antenna site - 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.
- The Repeater is convection cooled so airflow and alternation should be possible.
- Follow Electro-Static Discharge (ESD) precautions.
- Install the Repeater close to the service area to monitor the output power and noise figure.
- Use low loss cables to connect the antennas to the Repeater.

3.1.4 RF Cable Installation Guidelines

Required:

- For all coaxial connections to/from the Repeater - high performance, flexible, low loss 50Ω coaxial communications cable.
- All cables shall be weather-resistant type.
- Cable length - determined by the Repeater installation plan. When calculating the cable length, take into account excess cable slack so as not to limit the insertion paths.

3.1.5 Overcurrent Protection

NOTE: The over current protection depends on the building installation.

3.1.6 Grounding Wires 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

3.2 Overview of the Installation Procedure

The overview procedures include dedicated instructions relevant for the PS-NFPA model.

NOTE A: The Donor and Mobile antennas can be positioned and installed (without connection to the Repeater) at any time either before or after mounting and grounding the Repeater.

NOTE B: It is important to perform the installation procedure according to the order previously described.

BSR-PS/NFPA Installation

ATTENTION!!! Be sure to perform the power supply connection last, otherwise damage may be caused to the system!

1. Unpack the **Repeater kit**.
2. Mount the supplied **Mounting Fixture** on wall (section 3.5.2).
3. Mount the Repeater on the fixture (section 3.5.4).
4. Ground the Repeater (section 3.6).
5. If you have not already done so, position and install the Base and Mobile antennas in the relevant locations.
6. **Before connecting the antennas to the Repeater:**
 - Verify isolation between the donor and mobile antennas (section 3.7.1)
 - Verify link between the BTS and Base Repeater (section 3.7.2).
7. Connect the Donor and Service antennas to the Repeater.
8. Connect the power (section 3.9):
 - **Standard** (non-NFPA) installation – connect the power to the repeater (see 3.9.1)

- **NFPA** installation – (if required) connect the power via the UPS (for AC models) or to a $\pm 48\text{VDC}$ trickle charged battery (for DC models) (see 3.9).
9. Dry-contact alarms (this can be done at any time, before or after powering up the Repeater):
- **Standard** (non-NFPA) installation – optional.
 - **NFPA** installation - connect the Alarms from the Repeater and (if required) from the UPS to the Fire Department Control module (see 3.10.5).
10. Commission the system. See Chapter 4.

3.3 Required Tools and Materials

The following tools are required for the BSR 3308 installation procedure:

- Standard professional tool box (not supplied)
- Adjustable wrench (not supplied)
- Power Drill Driver (not supplied) - supporting 12 mm concrete drills
- Allen screwdriver (supplied)

3.4 Unpacking

Upon receiving the BSR 3308 unit, perform the following:

- Examine the shipping container for damage before unpacking the unit.
- Perform a visual inspection to reveal any physical damage to the equipment.
- Verify that all of the equipment (listed below) is included (see also the following page). Otherwise contact Axell Wireless.

BSR 3308-PS NFPA Repeater																												
Ethernet cross-cable																												
CD with documentations																												
Mounting Bracket. AC models – with AC/DC premounted converter and AC outlet power cable. DC models – no converter, with DC source power cable.																												
AC outlet power cable																												
DC source power cable P/N 40WVC70900																												
Additional (supplied) installation components:	 <p style="text-align: center;"><i>Figure 3-1. Installation Components</i></p>																											
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">No</th> <th style="width: 80%;">Description</th> <th style="width: 10%;">No.</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Flange nut, 5/16</td> <td>4</td> </tr> <tr> <td>2</td> <td>Wedge anchor, Ø 12 x 65 mm</td> <td>4</td> </tr> <tr> <td>3</td> <td>Hex washer head screw, Ø 8 mm</td> <td>4</td> </tr> <tr> <td>4</td> <td>Washer, spring, Ø 8 mm</td> <td>4</td> </tr> <tr> <td>5</td> <td>Washer, flat, Ø 8 mm</td> <td>2</td> </tr> <tr> <td>6</td> <td>Clamp</td> <td>2</td> </tr> <tr> <td>7</td> <td>Washer, flat, Ø 28 mm</td> <td>4</td> </tr> <tr> <td>8</td> <td>Screwdriver, Allen</td> <td>1</td> </tr> </tbody> </table>		No	Description	No.	1	Flange nut, 5/16	4	2	Wedge anchor, Ø 12 x 65 mm	4	3	Hex washer head screw, Ø 8 mm	4	4	Washer, spring, Ø 8 mm	4	5	Washer, flat, Ø 8 mm	2	6	Clamp	2	7	Washer, flat, Ø 28 mm	4	8	Screwdriver, Allen	1
No		Description	No.																									
1		Flange nut, 5/16	4																									
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6	Clamp	2																										
7	Washer, flat, Ø 28 mm	4																										
8	Screwdriver, Allen	1																										

3.5 Mounting the BSR 3308

3.5.1 Pre-Mounting Procedure

1. Choose the location of the Repeater on the wall according to the following criteria:
 - The location should be at normal eye level height, above ground.
 - Be sure to allow easy access to the Repeater for maintenance and on-site inspection.
2. Place the Mounting Bracket against the wall and mark the *four* holes to be drilled at the extreme four corners of the bracket (additional optional installation holes are also provided).
3. Drill four holes 12mm in diameter and 65mm in depth.

The following illustration shows the bracket with the bracket pins.

NOTE: The figure illustrates an AC repeater model bracket assembly. The DC bracket assembly does not include a power converter and is fed directly by a ± 48 VDC battery.

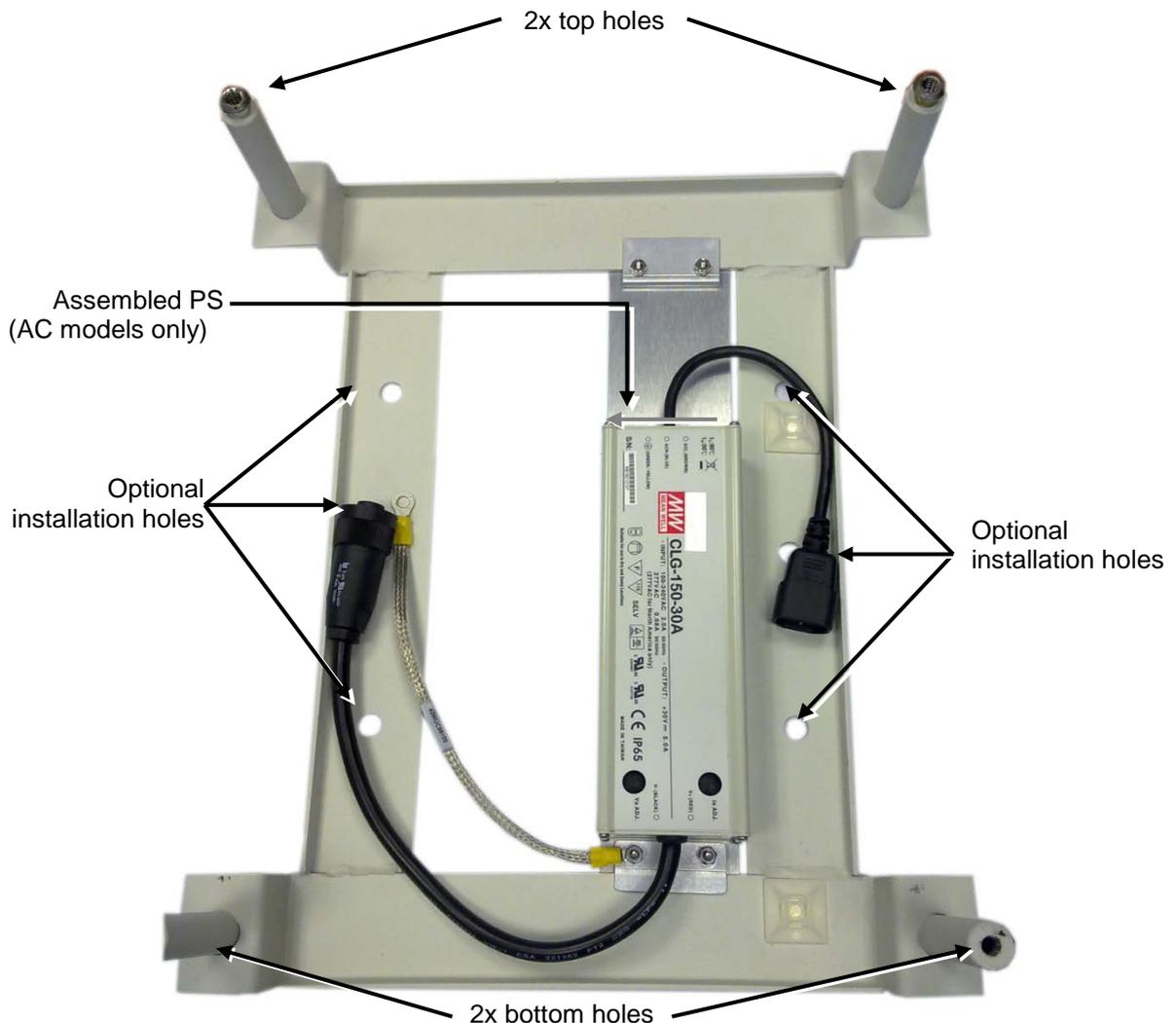


Figure 3-2. BSR 3308 Mounting Holes and Pins

3.5.2 Installing the Mounting Bracket

To install the mounting bracket

1. Insert the four wedge anchors (see item no. 2 in Figure 3-1) into the drilled holes and secure them with an adjustable wrench.
2. Remove the hex nut, spring washer and flat washer from each wedge anchor, revealing a screw from each anchor.
3. Insert a flat washer 28mm in diameter in each of the anchors (see item 7 in Figure 3-1).
4. Fit the support bracket on to the anchors and secure with the flat washers, spring washers and hex nuts removed in Step 2.
5. Verify that the bracket is firmly mounted.

3.5.3 For AC Models - Preparing Power Supply Cables

NOTE: This section is only applicable to AC repeater models.

1. Secure the AC/DC Converter power cable (with kettle socket) to the mounting bracket using one of the supplied cable ties.
2. Connect the provided AC plug cable (EURO/UK) to the power supply kettle socket, routing it to the bottom of the bracket, and secure with supplied cable tie.
3. DO NOT connect the AC or DC power cables at this stage – wait until instructed to do so.

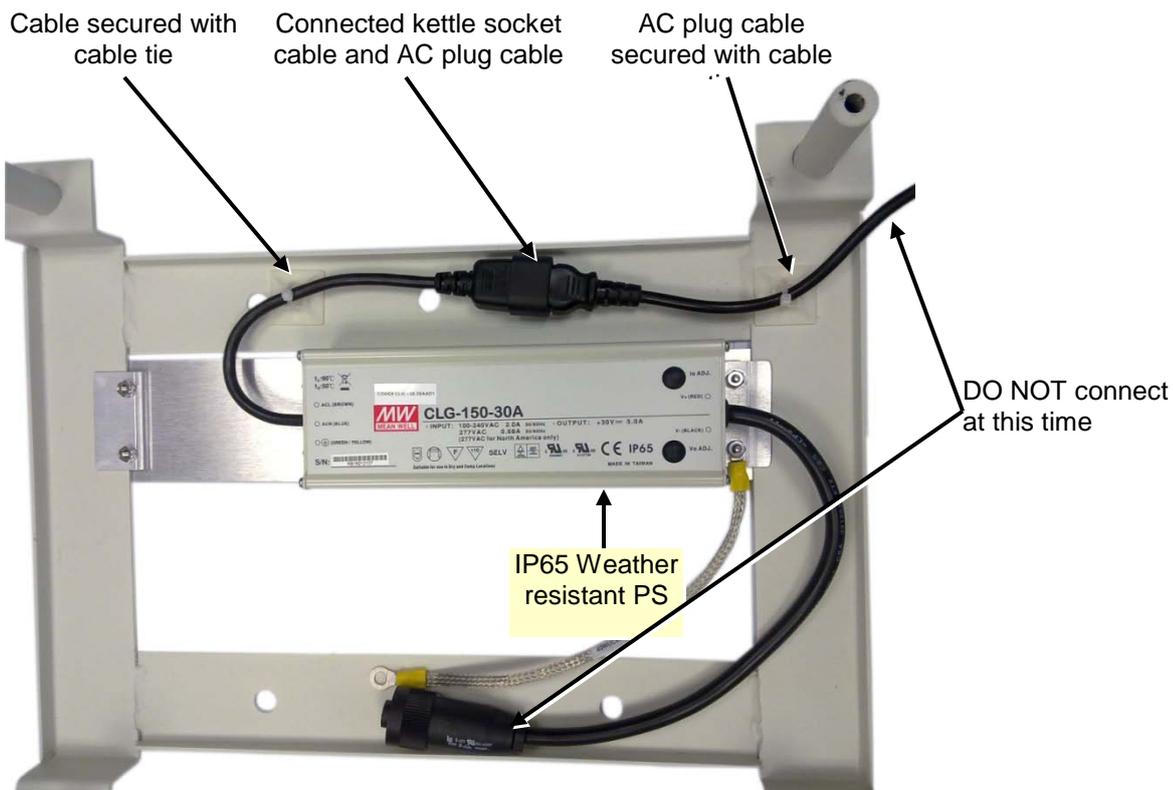


Figure 3-3. BSR 3308 PS Cables

3.5.4 Mounting the Repeater

1. Pick up the Repeater and align the Repeaters' four installation holes with the Mounting Brackets' pins.
2. Slide the brackets pins through the Repeater holes until the upper side is locked with the installation head nuts at the top of the bracket. See Figure 3-5.
3. Release the four captive screws locking the Repeater cover.

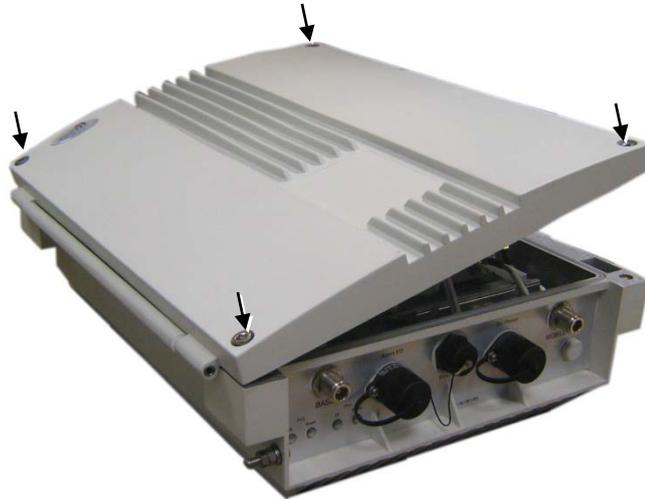


Figure 3-4. Loosen Captive Screws and Swing Open Door

4. Swing the top cover open.

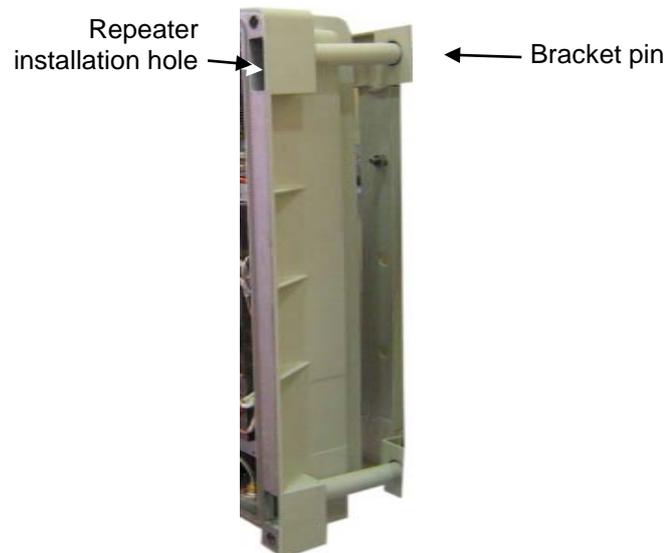


Figure 3-5. BSR 3308 Mounted on Support Bracket

5. Set both clamps with a hex washer head screw (item 3 in Figure 3-1).

6. Insert the clamps including the screws in to the upper orifices leading inside the Repeater.

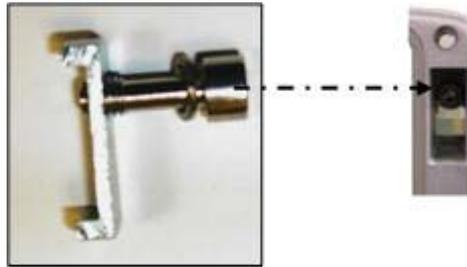
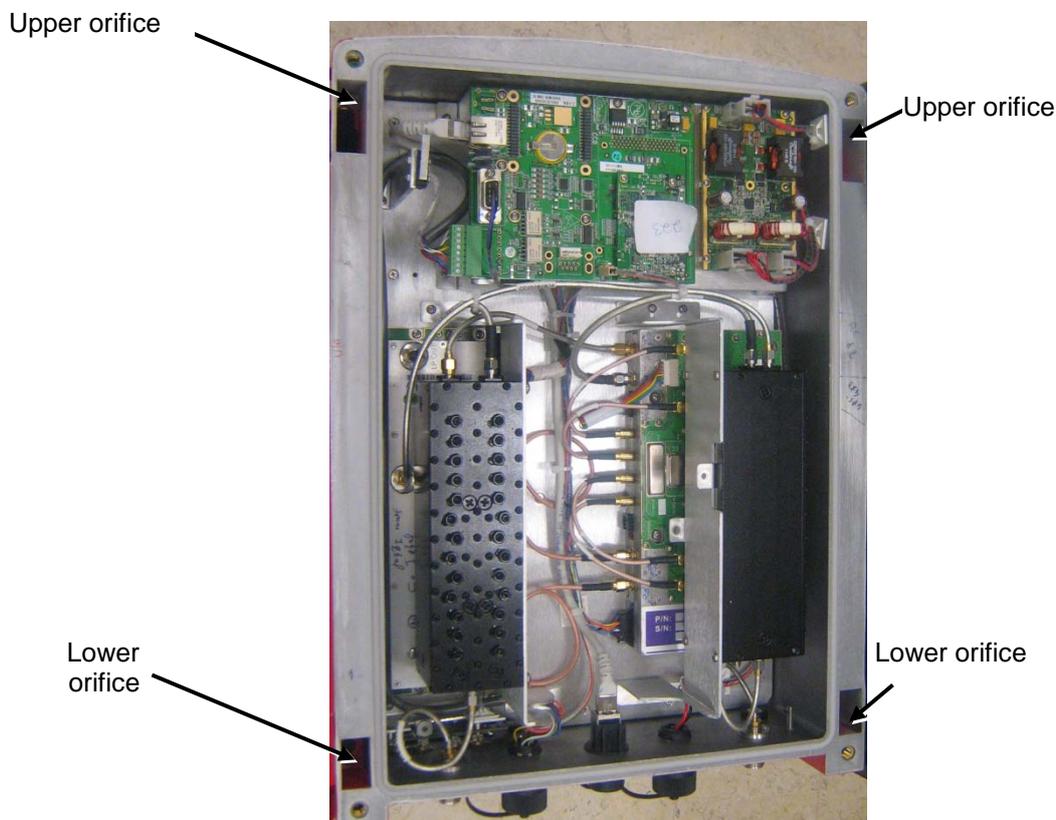


Figure 3-6. Locking Clamp

7. Using the Allen screwdriver (item 8 in Figure 3-1), tighten the hex screw of the clamp.
8. Insert two hex washer head screws (item 3 in Figure 3-1) including spring washers (item 4 in Figure 3-1) into the lower orifices of leading inside the Repeater.



9. Use the Allen screwdriver (8 in Figure 3-1) to tighten the hex screws.
10. Verify that the Repeater is firmly mounted.
11. Close the Repeater cover. *Do not lock yet since you will need to open it to perform the Local setup procedure.*

3.6 Grounding

NOTE: Refer to section 3.1.6 for the grounding requirements.

WARNING! Do not use the grounding bolt to connect external devices.

To ground repeater

Connect main ground to Repeater grounding lug.



3.7 Before Connecting the Antennas or Power

Before connecting the antennas or power perform the following procedures described in this section:

- Verify isolation between the donor and mobile antennas
- Verify link between the BTS and the Repeater

3.7.1 Verifying Isolation between Donor and Mobile Antennas

The isolation between the Base/Donor and Mobile/Service antennas is critical.

- For proper operation of the Repeater, it is recommended that the isolation between the Donor and Service antennas be at least 15dB higher than the Repeaters set gain.
- Insure proper vertical or horizontal distance separation between Donor and Service antennas

NOTE: Lower isolation can lead to high in-band ripple, oscillations and low signal quality.

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.

3.7.2 Verify Link between BTS and Repeater

WARNING!

Perform this procedure before connecting the antennas to the Repeater or powering on the Repeater. The Repeater should not be operated prior to the verification of the operating parameter in its installation environment.

Before connecting the antennas or powering up the Repeater, verifying the Link between the BTS and the Repeater

This test checks the signal strength from the BTS antenna to the Repeater.

Proceed as follows:

1. Using a Spectrum analyzer, measure the received signal from BTS at the Donor antenna port near the Repeater.
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.

3.8 Antenna Connections

CAUTION!

Do not connect the antenna cables to the Repeater before verifying the installation parameters.
DO NOT POWER-UP the Repeater without either the antennas being connected or the antenna connections terminated with dummy loads.

To connect the antennas to the Repeater

NOTE: 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.

1. Install the antenna cables along their path to the Repeater, and connect them to the Antennas.

NOTE: Be sure to use low loss cables.

2. Connect the Donor antenna to the Repeater BASE port. (Donor antenna specifications and installation criteria are described in Chapter 2).
3. Connect the Service antenna to the Repeater MOBILE port. (Mobile antenna specifications and installation criteria are described in Chapter 2).
4. Verify all RF connectors are tightened and the cables and antennas are secured.

3.9 Powering Up the BSR 3308 Repeater



Warning: Electrical Shock

This equipment must be installed indoors only. . 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.

3.9.1 Non-NFPA AC Model - Power Connection

- Connect the cable from the **AC/DC converter** to the front panel **DC Power port** and connect the **AC/DC converter power** cable to the **AC outlet**.



3.9.2 BSR 3308-PS NFPA Power Connection

NOTE: BSR 3308-PS NFPA Repeaters may be (if required) connected to the power source via a UPS.



DC Input connection:

- AC model – from premounted AC/DC Converter.
- DC model - from -48VDC trickle charge battery

3.9.2.1 For AC repeater models:

1. Locate the AC power outlet, with at least a 6A slow blow fuse.
2. Connect the **BSR 3308 AC/DC converter** power cable to the **UPS**.
3. Connect the **UPS alarms** to the **Fire Department Control Box**. Refer to the instructions in the UPS Installation Guide provided with the UPS unit.

NOTE: System power-up may take up to a few minutes.

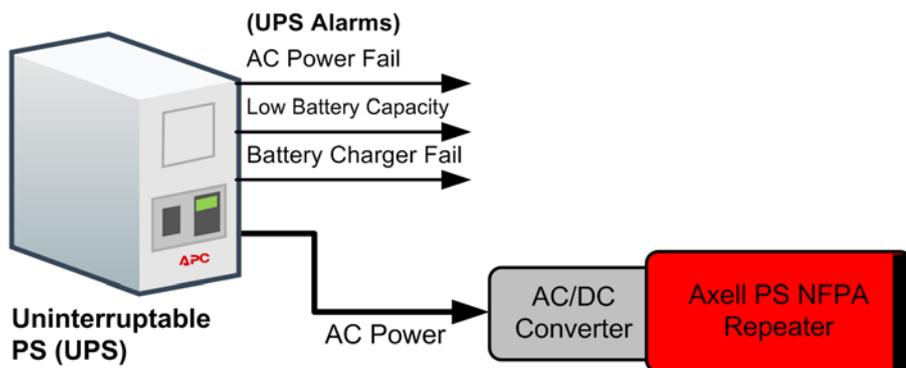


Figure 3-7. NFPA UPS Power Connections

3.9.2.2 For DC repeater models:

- Make sure to fully charge the $\pm 48\text{VDC}$ trickle charge battery.
- Connect the cable from a $\pm 48\text{VDC}$ battery to the repeater **DC Power** port.

NOTE: System power-up may take up to a few minutes.

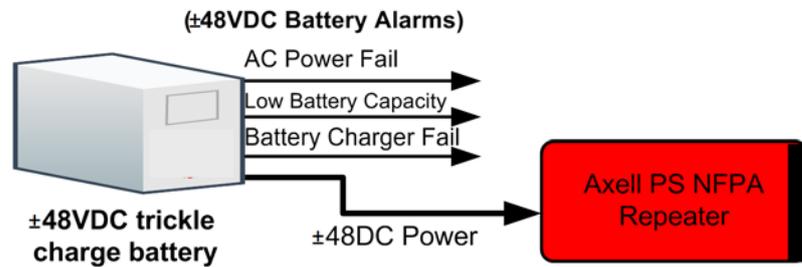


Figure 3-8. NFPA Battery Power Connections

3.10 Dry Contact Alarm Connections

Notes: The alarms can be connected any time, before or after the system is powered-on.

For an illustration of NFPA connections, see section 3.10.5.

3.10.1 General

The Repeaters' front panel Alarm connector provides two types of alarm connections:

- **External (Input) Alarms** - connected to external sources such as Repeater Door.

To activate the External alarms:

- Connect – Pin-1 (Ext Alarm-1) Pin-5 (GND) to the desired alarm source (i.e. Repeater Door). For another External Alarm, repeat for Pin-2 and Pin-5.
- Any generated alarms can be viewed in the *Alarms* tab.
- **Dry Contact** – two dry-contact *Normally Closed* output alarms that are dedicated to the following:
 - VSWR alarm – pins 3 and 6
 - Booster Summary alarm – pins 4 and 7

3.10.2 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.

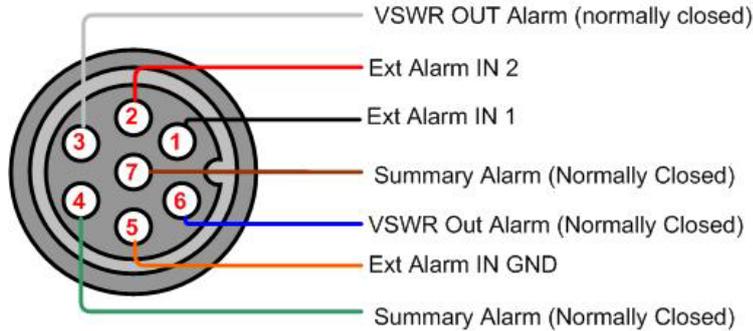


Figure 3-9. Alarm Connector Pinout

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)**	Green
5	GND for External Alarm	Orange
6	Dry Contact Antenna Malfunction (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).

**Dry Contact Summary alarm connection is supported by a pair of wires (4,7).

3.10.3 Load Restrictions

3.10.3.1 Alarm Dry Contact Output Restrictions

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

3.10.3.2 External Alarm Input Restrictions

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

"0" -	0V
"1" -	3.8V - 28V

3.10.4 Summary Alarms Trigger Criteria

The Summary alarm (pins 4 and 7) is triggered under one (or more) of the following:

- PA Current from FF OR
- Channeler Current OR
- Temperature High OR
- PLL Lock
- Repeater power OFF

The summary alarm pins respond as follows:

STATUS	External Alarm on USER connector	RESULT
Power OFF	Contacts 4,7 OPEN	ALARM
Power ON	Contacts 4,7 CLOSE	NO ALARM
Summary ALARM Active	Contacts 4,7 OPEN	ALARM

3.10.5 BSR 3308-PS NFPA Installation Alarm Connections

The Repeater Alarm connector contains two sets of dry contact alarms that are connected to the Fire Department Control Box (see sections 3.10.1 and 3.10.2 above).

- Antenna Malfunction (VSWR) (Pins 3,6)
- Summary (Pins 4,7)

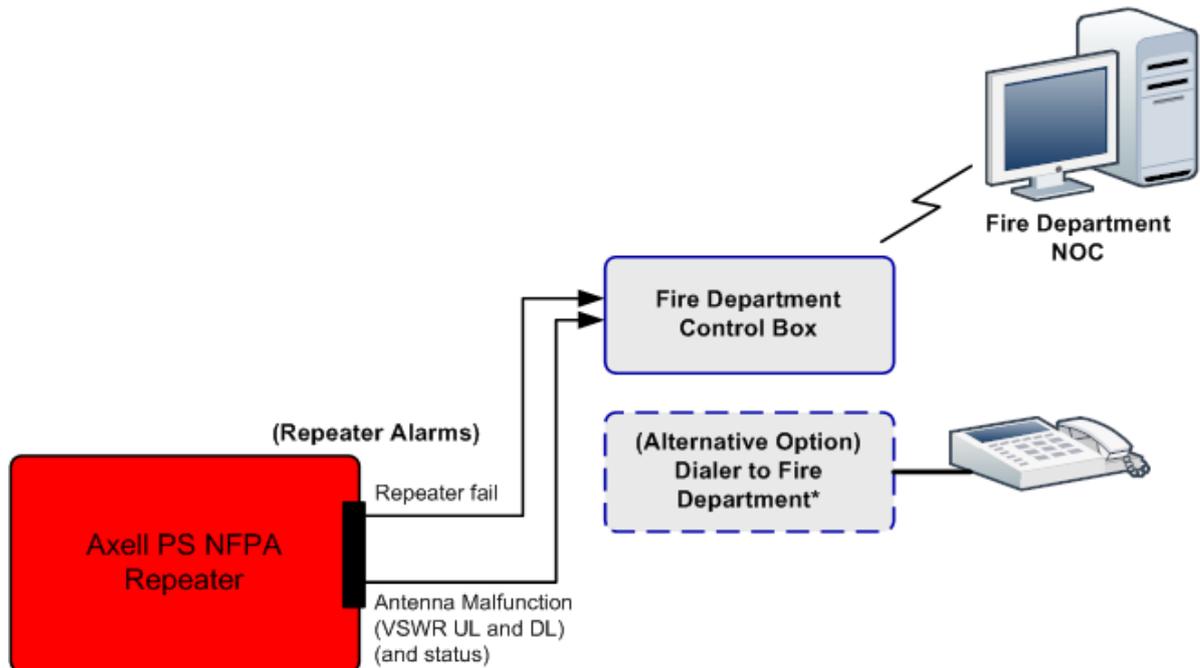


Figure 3-10. BSR 3308 PS NFPA Architecture

4 Initial Setup and Commissioning

This section provides the setup procedures for the BSR 3308 Repeater. The Repeater is designed for simple plug-and-play operation with only minimal configuration requirements.

Perform the setup procedure according to the following steps:

1. Open a local Web session to the Repeater (this requires configuring the communication parameters of the computer used).
2. If you are not familiar with the Axell Web Access application, it is recommended to quickly review the *Navigating the Web GUI Application* section.
3. Optional – modify maximum gain and output power.
4. Set the sub-band.
5. Verify that no Alarms are generated before connecting to the main control center.
6. Set the Repeater time and date.
7. **Optional** - Configure the external alarms.
8. Configure the system parameters.

4.1 Open a Local WEB Session to the Repeater

4.1.1 Connecting to the Repeater

To connect Repeater to computer

Interconnect the computer and the Repeaters' front panel **Ethernet** ports with the supplied Ethernet cross-cable as shown below.

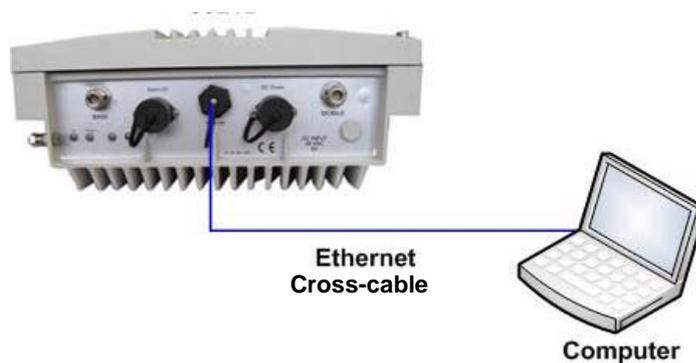


Figure 4-1. Local Ethernet Cross-cable Connection

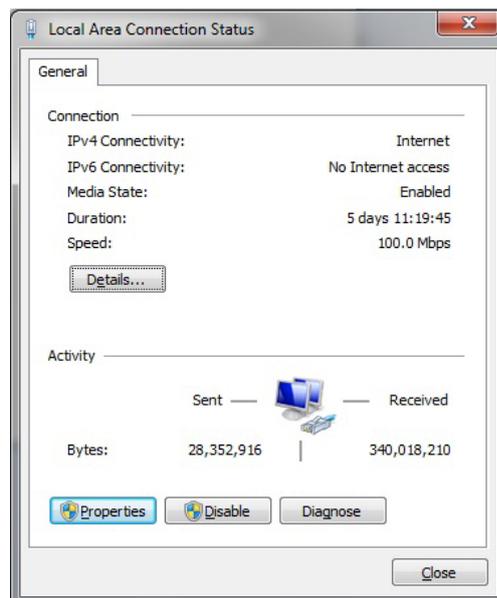
4.1.2 Configure the Computer Network Parameters

Configure the computer network parameters to communicate with the Repeater. Note that the procedure may vary slightly depending on the operating system installed on your computer. The following procedure is for Windows 7.

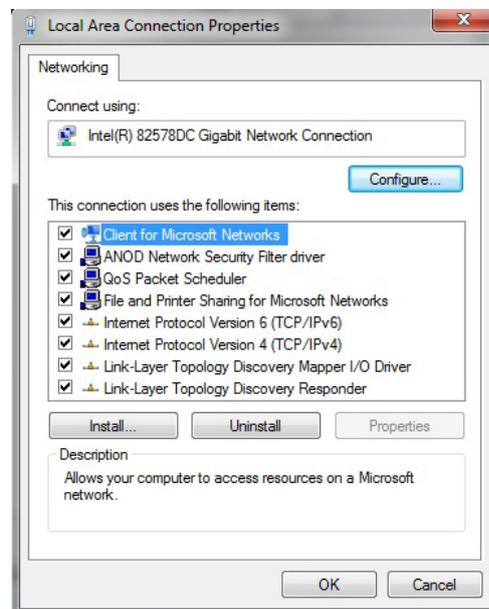
To configure the computer's network parameters:

1. Click the **Start** menu and choose **Control Panel**.
2. In the Control Panel, click **Network and Internet**.
3. Click Network and Sharing Center and then click Local Area Connection.

The **Local Area Connections Status** dialog appears with the General tab displayed by default.



4. Click the **Properties** button. The **Networking** tab appears.



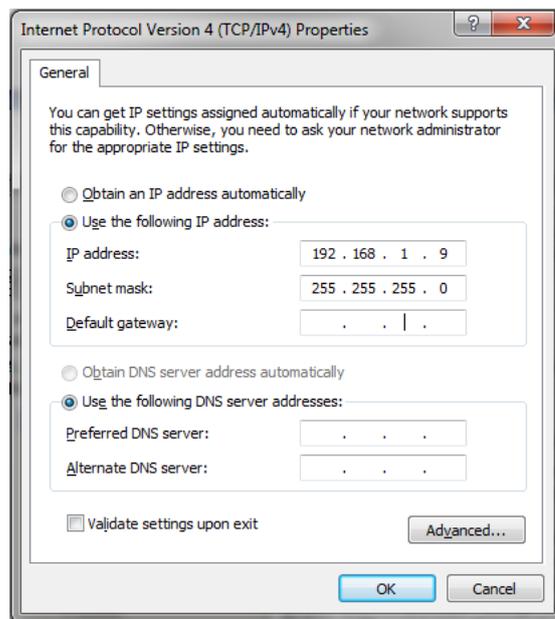
5. In the Items list, double-click the “Internet Protocol Version 4 (TCP*IPv4)” item.

6. The **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog appears.

NOTE: The Repeater is supplied with the default IP address 192.168.1.253.

7. Assign your computer an IP address in the same subnet, in order to communicate with the unit.

- In the IP address area:
- Enter the IP address 192.168.1.x, where 'x' can be any number between 2 and 250 inclusive. For example, (192.168.1.9)
- Define the subnet mask as shown (255.255.255.0)



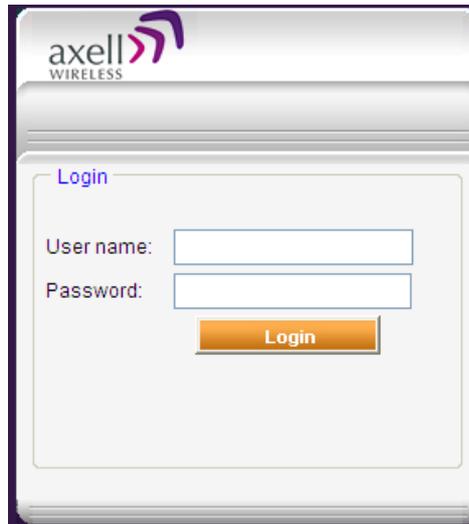
- Click OK. The computer communication parameters are now defined and you can open a session to the Repeater.

4.1.3 Login to the Repeater

NOTE: The Repeater is factory assigned the address 192.168.1.253. Initial login is performed using this address; however it is recommended to make the necessary modifications according to information provided by your network administrator.

To login to the Repeater

1. Open a standard Flash-enabled browser (e.g. IE or Firefox).
2. In the address line, enter the IP address of the Repeater. `http://192.168.1.253` . A session will be established with the Repeater and the login dialog appears.



3. Type the default User Name **admin** and the default Password **admin**.

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

4. Click **Login**. The application main window appears.
5. Quickly review the following section describing the application window and then proceed to configure the signal levels according to section 4.3.

4.2 Navigating the Web GUI Application

This section describes how to navigate the Web Management application. The Web Access interface provides three groups of options, listed in the left side Topology Tree items:

- **CMU** – Repeater level configuration and monitoring options such as log even monitoring, dry-contact configuration, software download and upload and and communication parameter settings.
- **Axell3308**– Band RF parameters as well as control and monitoring options.
- **Admin** – User definition and management options, enables changing user passwords.

The available **Operation Buttons** at the top of the pane depend on the selected menu option (CMU, Axell 3308 or Admin).



Operation Buttons

Relevant tabs

Topology Tree Items

Pane related to selected tree item

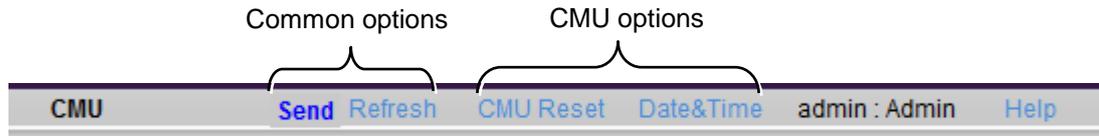
Alarm Description	Downlink	Uplink
Power Below Threshold		●
PAmp Current	●	●
Channler Current	●	●
RSSI	●	●
Temperature High Level	●	
System Mute	●	
User Mute	●	
Panel Switch Mask		●
PLL Lock Detect	●	●
VSWR	●	●

Ack All

Status: ok

4.2.1 Operation Buttons

The following main menu options are available.



Item	Description / Values
CMU, Axell 3308 or Users	Shows the currently selected topology tree item.
Send	Common to all options. Click after completing the new data input and values update in any screen in order to insert the new values into the Repeater, and implement the changes
Refresh	Common to all options. Click to refresh the current screen and update the displayed data
CMU Reset	CMU only. Click to reset the controller - in case of failure or display problems
Date & Time	CMU only. Accesses the Repeater Date and Time settings.
User Login Info	User name and password of currently logged in user
Help	Click Help to display an e-guide line for the system operation. This Help is general by its nature and some features may not be included.

4.2.2 Axell3308 Tabs

This section describes the tabs available when the CMU option is selected.



Item	Description / Values
Alarms	Displays various alarms generated by the Repeater and enables monitoring. See section 0.
Control and Params	Used for adjusting RF parameters and channel configuration (signal level, gain and bandwidth). See section 4.6.1
Filter Switch	Configure the band channels (bandwidths, frequency range and frequency shift). See section 4.3.2
Repeater Info	Shows system information. See section 5.2.2
Backup/Restore	Configuration files management options (configuration files can be stored on the Repeater for access). See section 5.4
SW Upgrade	Upload and upgrade existing system software. See section 5.3.2

4.2.3 CMU Pane and Tabs

When the CMU item is selected in the Topology Tree, the following menu items are available.



Item	Description / Values
Axell-CMU Info	Shows Repeater level information such as SW and HW versions and identification number. In addition, enables setting minimum alarm levels. See section 5.2.1.
Communication Configuration	Used to set local IP communication and SNMP destinations. See section 4.3.
Alarms Log	Log of past and current system events. See section 6.2.2.2
Axell-CMU Alarms	System alarms. See section 6.4
External Alarms	Used to define any connected external alarms. See section 4.4
Axell-CMU SW Upgrade	Options for CMU software upgrade. See section 5.3.1.

4.3 Configuring the RF Parameters and Sub-band

The RF configuration procedure consists of two simple phases – one of which is optional:

- Setting RF parameters – **optional**.
- Defining the sub-band

4.3.1 Reducing the Max Output Power and Gain – Optional

The repeater is automatically configured by the SALC mechanism for optimal coverage and maximum power (see section 1.5.1 for more information). If required, the user can reduce maximum output power and/or gain according to the instructions given in this section in order to reduce the coverage area or resolve issues such as isolation.

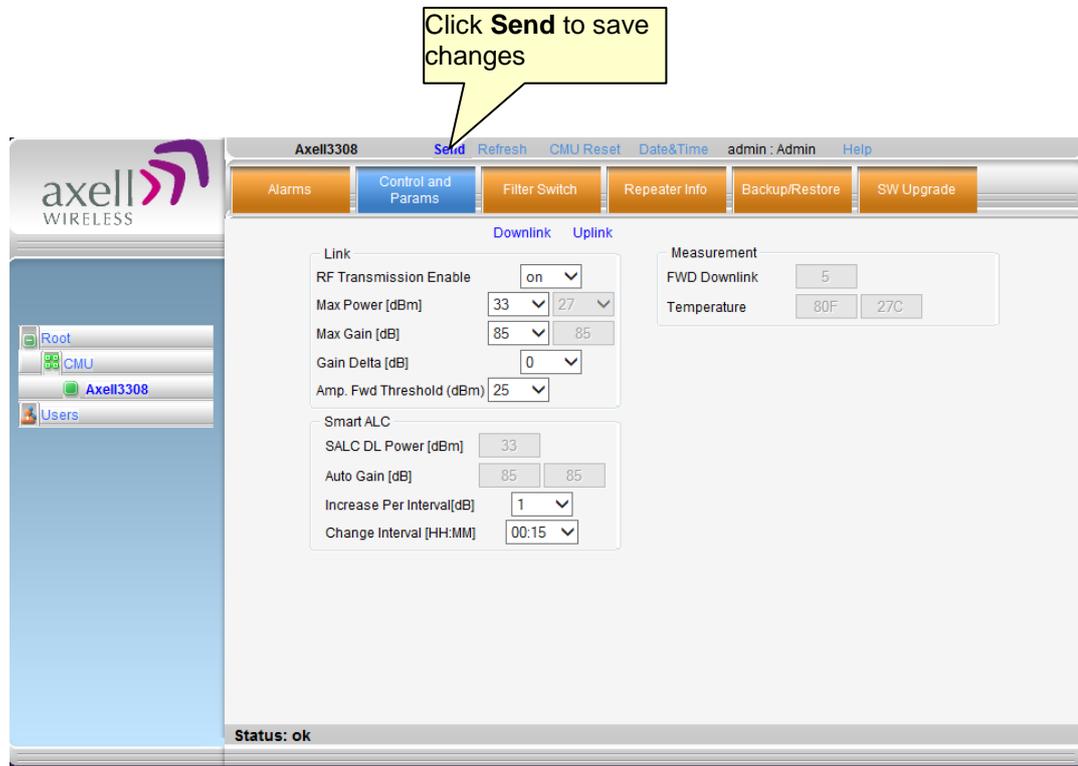
To reduce the maximum power and gain

NOTE: For IC applications, maximum DL power = 30 dBm and maximum UL power = 25 dBm.

1. In the topology tree, click **Root** and choose the **Axell 3308** item.
2. Click the **Control and Params** tab. The corresponding pane appears. The following pane shows the Axell 3308 **Control and Params** tab.

*NOTE: Be sure to click **Send** when completing all the changes.*

3. Verify that the **RF Transmission Enable** = **ON**.



4. You can modify (DL) **Max Power** according to your site coverage requirements. Click **Send**.
5. You can modify (DL) **Max Gain** for special requirements such as isolation issues.
6. The Amp Fwd Threshold parameter is factory set to 8dBm *less* than the *maximum* value of the Composite Output Power per band (i.e. if the maximum value of the Composite Output power per band is = to 33dBm, then the Amp Fwd Threshold =25dBm).
7. Click **Send** (top window area option).
8. Configure the bandwidth filter according to the following section.
9. SmartALC parameters:

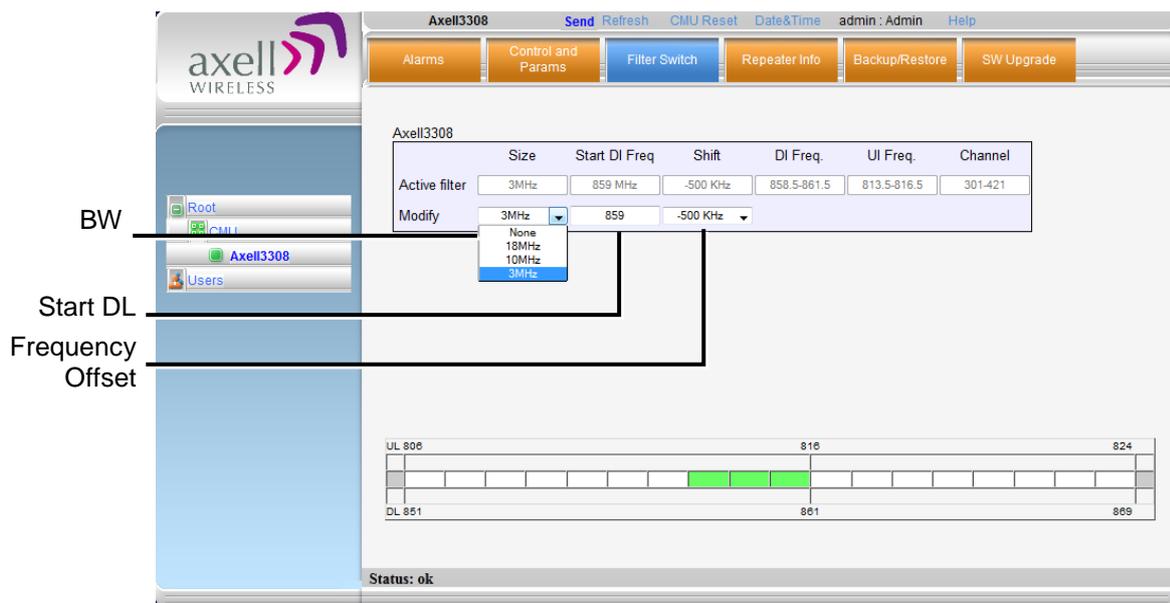
NOTE: It is recommended to leave the SmartALC parameters at their factory set values. The SmartALC parameters define the rate at which the gain is increased if it was automatically decreased by the system (due to various reasons such as high input power, etc.), The rate at which the gain is increased again is defined by Increase Per Interval (dBm) and Change Interval (hours:min). For example, in the above screen it will be raised by 1dB per 15 minutes). Minimum recommended time for Change Interval = 15min (factory set value).

4.3.2 Defining the Sub-band

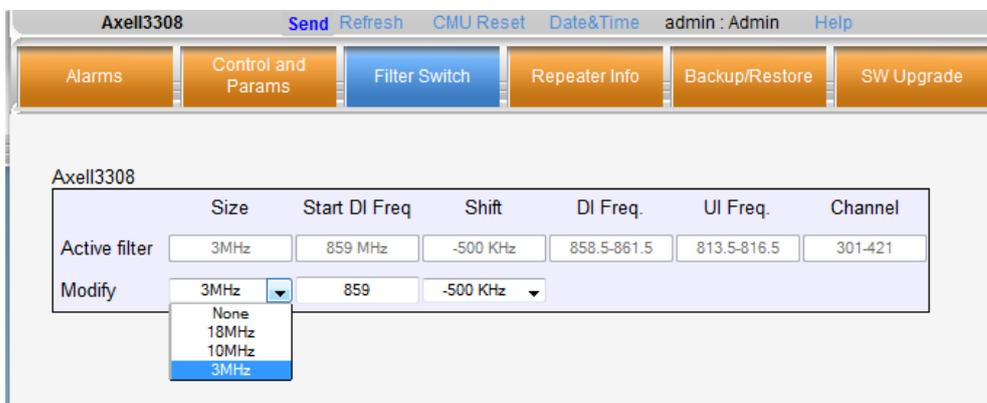
The Filter Switch pane is used to select the required bandwidth and frequency shift. You may choose one of three bandwidth blocks: 18MHz or 10MHz or 3MHz.

To define the sub-band

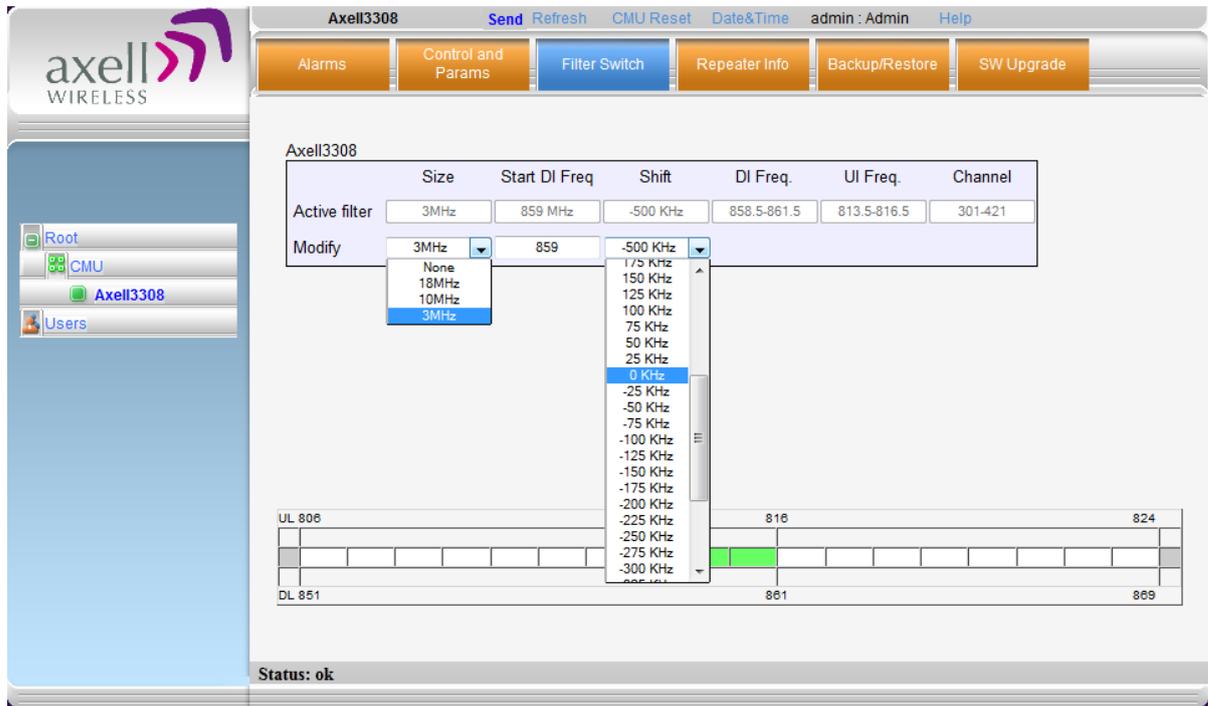
1. Click the **Axell 3308** button in the tree pane and then click the **Filter Switch** tab. The following pane appears.
2. Select the appropriate filter **Size** according to customer frequency band: 18, 10 or 3MHz.
3. Select the **Start DL Freq.**
4. If necessary, you may also fine tune the position of the filter and set the frequency offset up to 500KHz by selecting the **Shift by** value.



In the example below the selected BW is 3MHz and the DL start frequency is 859MHz.



- You may fine tune the position of the filter by using the **Shift** options (frequency offset) to lower or increase the channel Start Frequency by up to 500 kHz. (Shift options).



The selected deviation will be added to the positioning of the filter. For example, if you select **250 KHz** shift for the **865 MHz start frequency**, the DL and UL frequencies will be displayed as follows: **DL Freq. range: 864.75 MHz-867.75 MHz**

- Click **Send**. The following responses will be displayed:
 - The DL and UL frequency ranges and the Channel will be displayed according to the selection.
 - If the bandwidth selection is within the valid range, the relevant block in the allocation map at the bottom of the pane will be colored green.

If the input is invalid or out of range the following warning message will be displayed at the bottom of the window: *Status: Error, selected frequency exceed band limit*

4.3.3 Verify No Alarms are Generated

After the required coverage is attained for the location, verify that no Alarms are generated before connecting to the main control center.

To view alarms

1. Click the **Alarms** tab (alarms are described in 6.2.2).
2. Verify that all the indicators (*except for the Panel Switch Mask that is not relevant*) are GREEN in the Alarms tab
3. For a full description of the alarms, refer to section 06.2.2. The following example shows an Alarms screen with a Power below Threshold fault.

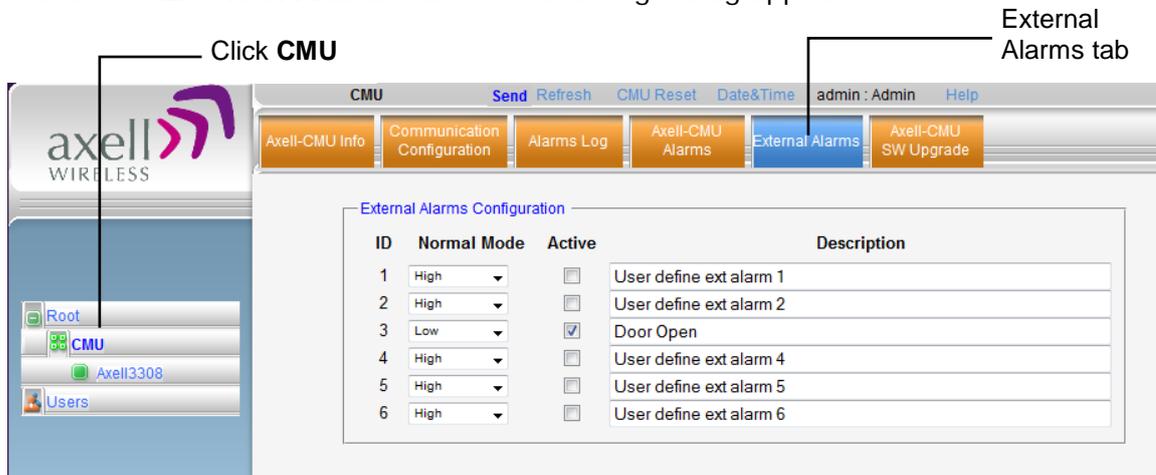


4.4 Configuring the External Alarms

Any connected alarms (section 3.10) must be enabled and configured according to the instructions provided in this section.

To configure external alarms

1. Click on **CMU** in the tree pane.
2. Click the **External Alarms** tab. The following dialog appears.



3. For each connected alarm:
 - Checkmark the **Active** checkbox.
 - Set the alarm **Normal Mode** as High or Low.
 - In the **Description** field, assign the alarm an identifiable name.

NOTE: Each external alarm status is displayed under Axell-CMU Alarms. See section 6.4 for details.

4.5 Setting Date and Time

It is important to set the correct date and time on the unit since this provides the timestamp for each logged event and alarm.

To set the Repeaters date and time

1. Click on **CMU** in the tree pane.
2. Click on **Date & Time** in the menu bar.



The following dialog appears.



The dialog box is titled 'Set CMU Date and Time'. It contains five dropdown menus for 'Year', 'Month', 'Day', 'Hour', and 'Minute'. The values are 2007, 11, 15, 15, and 37 respectively. Below the dropdowns is a 'Set' button. At the bottom of the dialog, there is a red note: 'Please note: after changing date and time you need to reset CMU!'.

3. Set the date and time parameters and click on **Set**.
4. Click the **CMU Reset** button in the main menu (shown above).

4.6 Configuring the System Parameters

The Communication Configuration tab provides the IP and SNMP trap configuration parameters.

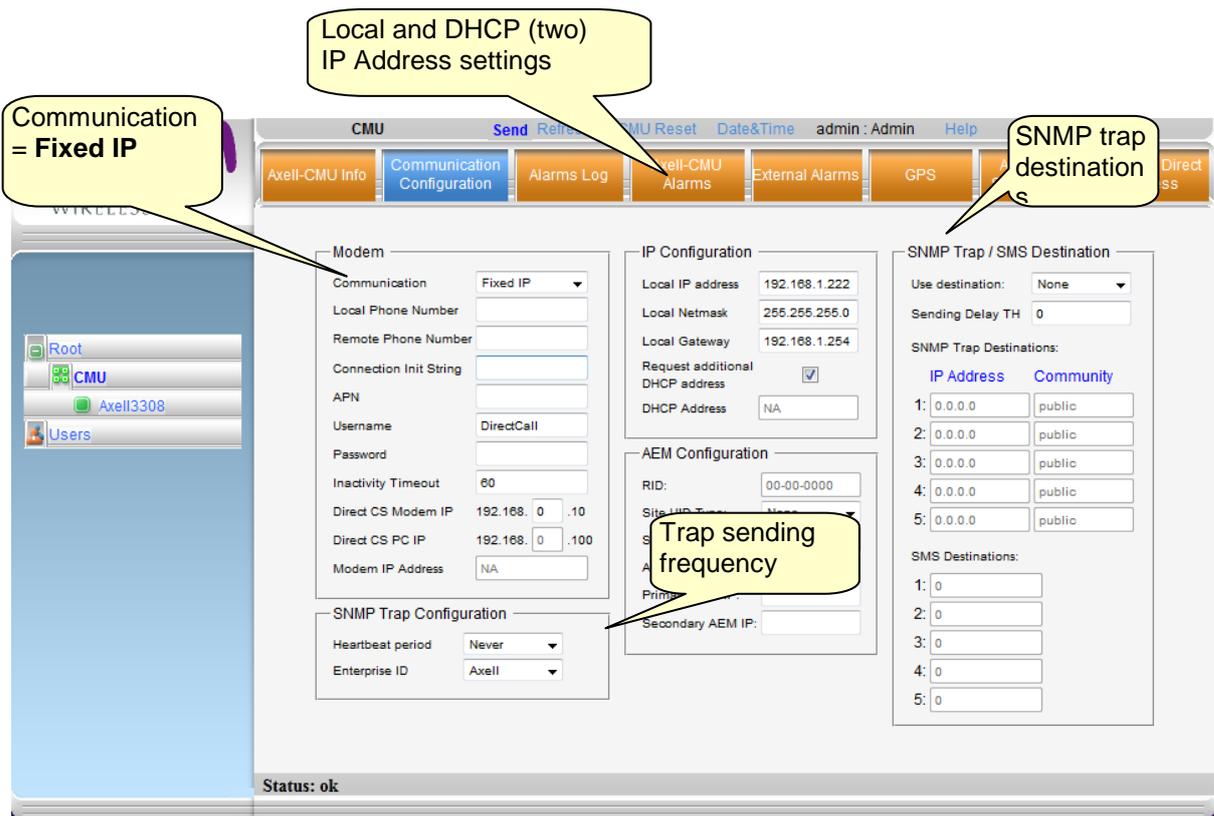
This section describes how to access the dialog. The following sub-sections provide detailed information on each configuration option:

4.6.1 The Communication Configuration Tab

To access the Communication Configuration tab

In the left tree pane, click **CMU**. From the available tabs in the work area, choose the **Communication Configuration** tab.

NOTE: Not all tab areas are relevant.



The screenshot shows the 'Communication Configuration' tab in a web browser. The interface includes a left-hand navigation tree with 'Root', 'CMU', 'Axell3308', and 'Users'. The main content area is divided into several configuration sections:

- Modem Configuration:** Includes fields for 'Communication' (set to 'Fixed IP'), 'Local Phone Number', 'Remote Phone Number', 'Connection Init String', 'APN', 'Username' (set to 'DirectCall'), 'Password', 'Inactivity Timeout' (set to '60'), 'Direct CS Modem IP' (192.168.0.10), 'Direct CS PC IP' (192.168.0.100), and 'Modem IP Address' (set to 'NA').
- IP Configuration:** Includes 'Local IP address' (192.168.1.222), 'Local Netmask' (255.255.255.0), 'Local Gateway' (192.168.1.254), 'Request additional DHCP address' (checked), and 'DHCP Address' (set to 'NA').
- AEM Configuration:** Includes 'RID' (00-00-0000), 'Site ID', 'Trap sending frequency' (indicated by a callout), 'Primary AEM IP', and 'Secondary AEM IP'.
- SNMP Trap / SMS Destination:** Includes 'Use destination' (set to 'None'), 'Sending Delay TH' (0), and a table for '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
- SNMP Trap Configuration:** Includes 'Heartbeat period' (set to 'Never') and 'Enterprise ID' (set to 'Axell').

Callouts in the image highlight: 'Communication = Fixed IP', 'Local and DHCP (two) IP Address settings', 'SNMP trap destination', and 'Trap sending frequency'. The status bar at the bottom indicates 'Status: ok'.

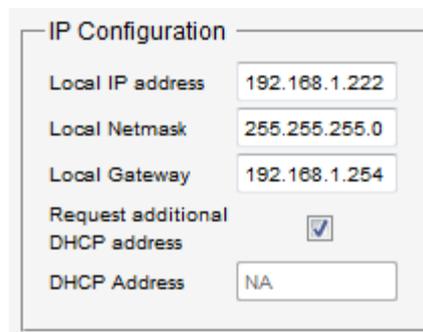
4.6.2 IP Address Configuration

The Repeater simultaneously supports two IP addresses: a Local address and a DHCP address. A unique technology enables applying both types to the *same* Ethernet port. Both addresses may enable local and remote management.

- Local IP Address – Static IP 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.
- DHCP Address – address assigned by DHCP server – used for remote management via an Ethernet connection.

To assign the unit IP addresses

1. Access the **CMU Configuration** tab (see 4.6.1).
2. You may modify the **Local IP Address** and relevant parameters. Note that this is the address required when connecting locally for setup. Be sure to record the new address.
3. To setup an additional DHCP address – checkmark the **Request Additional DHCP Address**. If a DHCP Server is available, the Address will be displayed in the DHCP Address field.
4. Click **Send** to apply changes.



The screenshot shows a dialog box titled "IP Configuration" with the following fields and options:

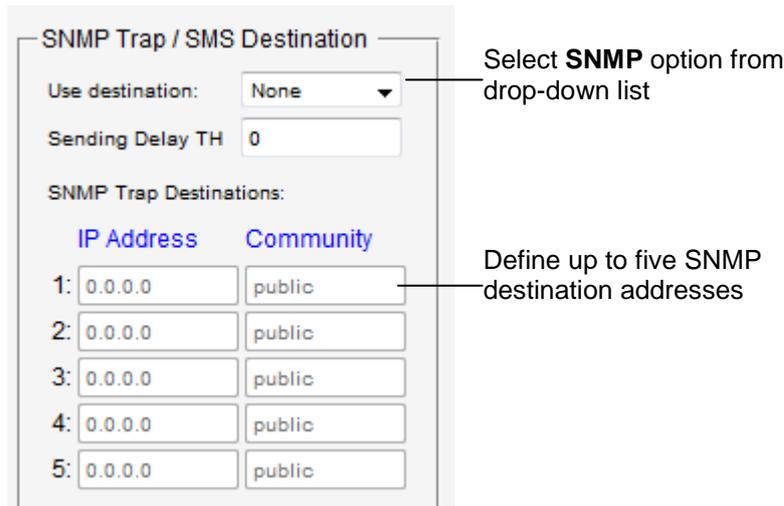
Local IP address	192.168.1.222
Local Netmask	255.255.255.0
Local Gateway	192.168.1.254
Request additional DHCP address	<input checked="" type="checkbox"/>
DHCP Address	NA

4.6.3 Configuring SNMP Trap Destinations

You may configure traps to be sent to five destination addresses each time a fault is triggered. The traps are sent at the defined heartbeat frequency.

To set SNMP Trap Destination parameters

1. In the **Use Destination** field, select the **SNMP** option
2. For each destination:
 - Enter the IP Address (where the IP addresses should be in the same subnet as the repeater).
 - Define the Community names (default = public) of the computers to which traps will be sent.

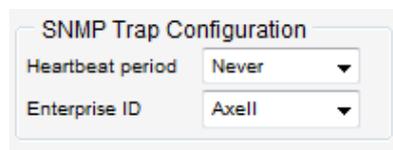


Select **SNMP** option from drop-down list

Define up to five SNMP destination addresses

3. In the **SNMP Trap Configuration** area, in the **Heartbeat Period** field, define the frequency (in minutes) at which traps will be sent.

NOTE: It is recommended to maintain the Enterprise ID as Axell.



4. Click **Send**.

4.7 What Next?

You have now completed the setup procedure. You may define Users according to the following chapters.

5 Administration

5.1 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 Repeater. You may add new users, modify or delete existing users.

5.1.1 User Levels

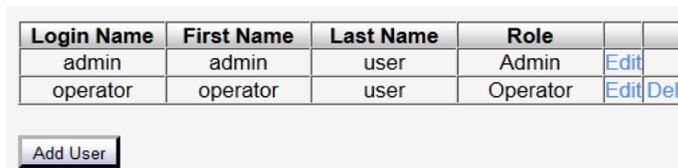
Three user levels are available:

- 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.

5.1.2 Viewing the List of Defined Users

To display the User Administration pane

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



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

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

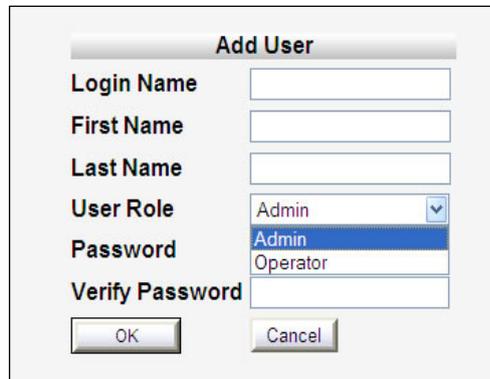
Option	Description
Add User	Adds a new user with user defined access level and password.
Del(ete)	Deletes a selected user from the list.
Edit	Enables changing the definitions of an existing user.
Reset Password	Resets the password to default value.

5.1.3 Adding Users

NOTE: User name and password entries are case sensitive.

To add a user

1. From the Tree 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.



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**.

5.1.4 Editing a User

To modify user definitions

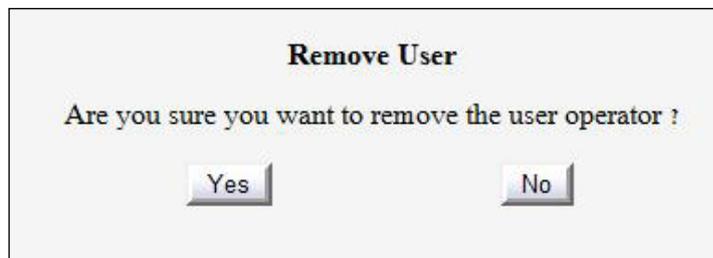
1. From the **Tree Pane**, select **Users**. The list of users is displayed in the **User's Pane**.
2. Select the **User** to be edited in the list.
3. Click **Edit**. The user definitions dialog appears.
4. Make the required changes and click **Update**.



5.1.5 Deleting a User

To delete a user

1. From the Tree 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.



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

5.2 Repeater Level and Band Level Information

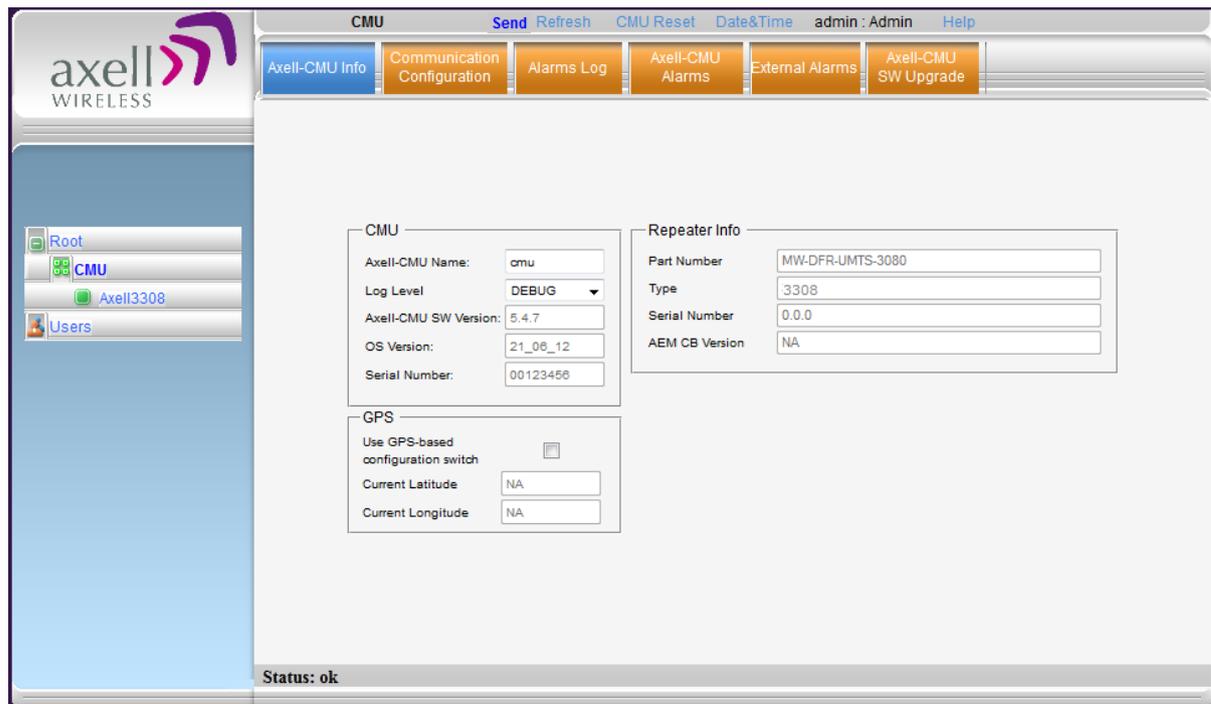
Viewing The Web GUI provides Repeater level information (via the CMU Info tab) and band level information (via the Band Info tab).

5.2.1 Repeater Level Information

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

To access the Band Information window

1. From the Tree Pane, select **Axell3308**.
2. Select the **Axell-CMU Info** tab. The relevant parameters are displayed.
3. Use the **Log Level** to set the minimum fault level that is logged. Other fields provide version and identification information.



The screenshot shows the Axell Wireless Web GUI. The top navigation bar includes 'Send', 'Refresh', 'CMU Reset', 'Date&Time', 'admin : Admin', and 'Help'. Below this is a tabbed interface with 'Axell-CMU Info' selected. The main content area is divided into three sections:

- CMU:**
 - Axell-CMU Name:
 - Log Level:
 - Axell-CMU SW Version:
 - OS Version:
 - Serial Number:
- Repeater Info:**
 - Part Number:
 - Type:
 - Serial Number:
 - AEM CB Version:
- GPS:**
 - Use GPS-based configuration switch:
 - Current Latitude:
 - Current Longitude:

The status bar at the bottom indicates 'Status: ok'.

5.2.2 Band Level Info

Use the **Repeater Information** screen to view the hardware and software versions of the Axell BSR 3308 PS Repeater and to assign the Repeater a recognizable name.

To access the Repeater Information window

1. From the Tree Pane, select **Axell3308**.
2. Select the **Repeater Info** tab. The relevant parameters are displayed.



The screenshot shows the Axell3308 web interface. The top navigation bar includes 'Send', 'Refresh', 'CMU Reset', 'Date&Time', 'admin: Admin', and 'Help'. Below this is a tabbed interface with 'Alarms', 'Control and Params', 'Filter Switch', 'Repeater Info' (selected), 'Backup/Restore', and 'SW Upgrade'. The 'Repeater Info' tab displays the following parameters:

Channler Serial Number	12105001	Bootloader Version	2.1.0.C
Channler HW Version	1.	Firmware Version	7.0.0.3
Channler boot ver	1.C	Repeater Nickname	Axell3308
Application SW ver	703		
Repeater SN	08050004		
Repeater HW Version	1.B		
Inventory Time Stamp	12200		
SAW Switcher SN	12020535		

The status bar at the bottom left indicates 'Status: ok'.

5.3 Software Upgrade

The software upgrade procedure consists of two steps: CMU and Band level upgrade. Depending on the version, you may be required to upgrade either one or both modules. This section describes both upgrade procedures.

5.3.1 CMU Software Upgrade

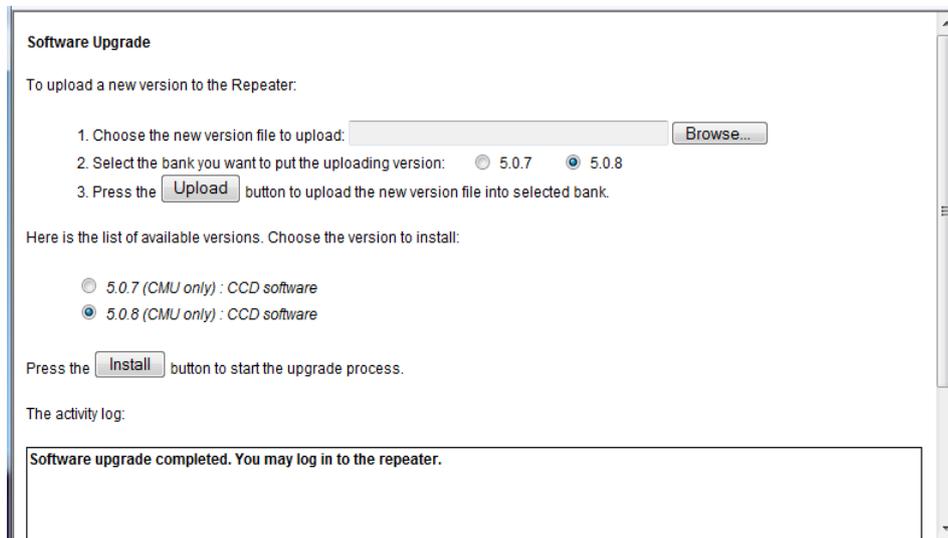
The procedure described in this section is used to upgrade the repeater's **CMU** software.

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

The CMU SW upgrade procedure consists of loading the available updated versions and installing it in the Repeater.

To Upgrade the CMU SW

1. From the Tree Pane, select **CMU**.
2. Select the **Axell CMU SW Upgrade** tab. The CMU SW Upgrade screen shown below appears.
3. Choose the version to upload and perform the procedure according to the instructions displayed on-screen.



The screenshot shows a web-based interface titled "Software Upgrade". It contains the following elements:

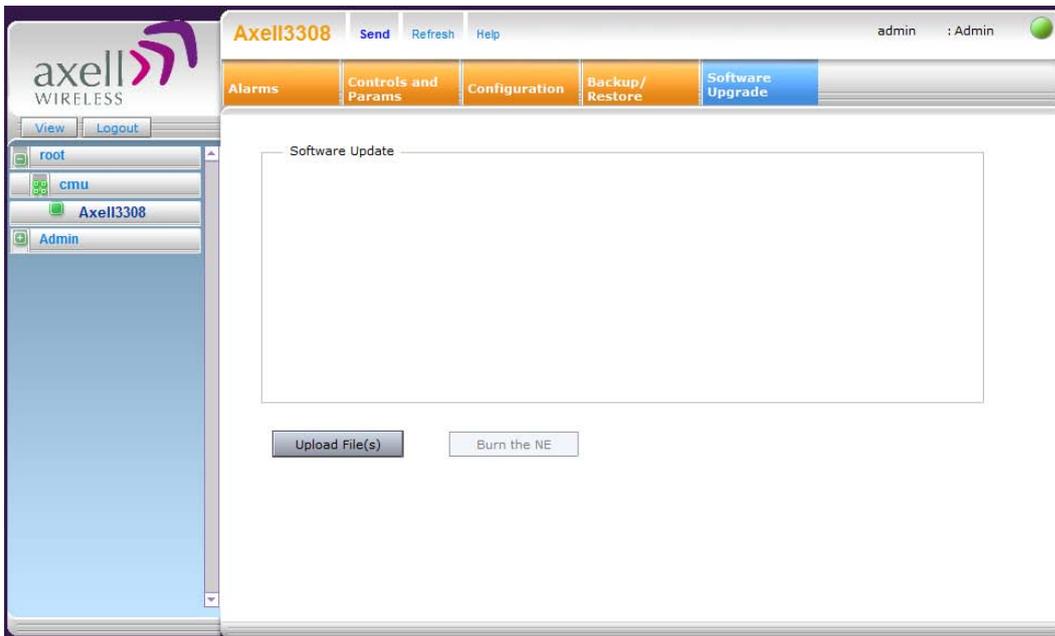
- Instructions:** "To upload a new version to the Repeater." followed by three numbered steps:
 1. Choose the new version file to upload: [text input field] [Browse...]
 2. Select the bank you want to put the uploading version: 5.0.7 5.0.8
 3. Press the [Upload] button to upload the new version file into selected bank.
- Available Versions:** "Here is the list of available versions. Choose the version to install:"
 - 5.0.7 (CMU only) : CCD software
 - 5.0.8 (CMU only) : CCD software
- Action:** "Press the [Install] button to start the upgrade process."
- Activity Log:** "The activity log:" followed by a text box containing the message: "Software upgrade completed. You may log in to the repeater."

5.3.2 Band Module Software Upgrade

The procedure described in this section is used to upgrade the repeater's software (GUI and other software updates).

To Upgrade the Repeater SW

1. From the Tree Pane, select **Axell3308**.
2. Select the **Software Upgrade** tab. The SW Upgrade screen shown below appears.
3. Browse for the relevant software provided.
4. Click on **Upload**.



5.4 Backup/Restore of Repeater Configuration

The BSR 3308 Web GUI management application enables the backup and restore of the repeater configuration files. The procedures are performed via the **Backup/Restore** tab.

A number of configuration files can be stored on the Repeater for access at any time.

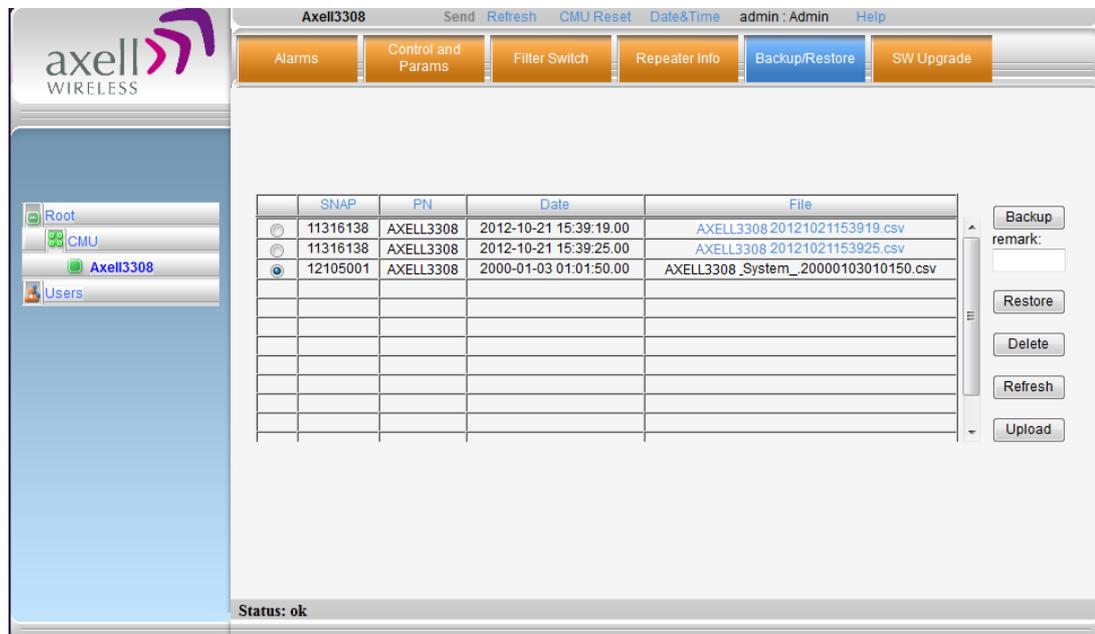
You can perform the following operations:

- Backup of the currently active configuration
- Restoring a previously saved file
- Uploading a configuration file from another location to the Repeater
- Downloading a configuration file from the Repeater to another location

To access Backup/Restore tab

1. From the Tree Pane, select the **Axell3308** item.
2. Select the **Backup/Restore** tab. The following tab appears.

*NOTE: The following figure is only an **example** of the Backup/Restore tab.*



The following table provides a description of the available options (buttons) in the **Backup /Restore** tab shown above.

Button	Description
Backup	Backup the currently running configuration file
Remark	User defined name that will be assigned to the file saved using the Backup file. (Instead of the system assigned name).
Restore	Activates the system with the <i>selected</i> file.
Delete	Deletes the <i>selected</i> file.
Refresh	Refreshes the displayed list of files.
Upload	Enables uploading a configuration file from another location to the

Button	Description
	Repeater.

5.4.1 Backup of Repeater Configuration

NOTE: The backed file will automatically be assigned a name according to the backup date and unit ID. The name cannot be modified while the backup file is saved onto the Repeater. However, before the backup procedure begins, the user may assign the file a recognizable name via the Remark field.

To perform backup procedure

1. 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.
2. Click the **Backup** button located on the right-hand side of the tab.
3. The file will be added to the table displayed in the Backup/Restore tab.

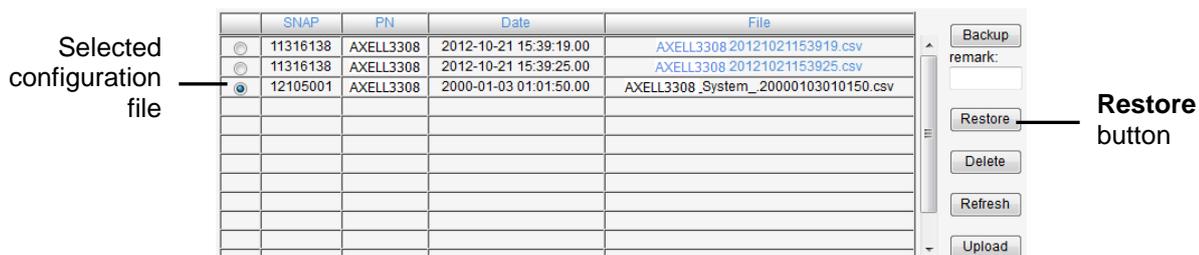
NOTE: The file name (under File) is a link that enables uploading the file to another location.

	SNAP	PN	Date	File
<input type="radio"/>	11316138	AXELL3308	2012-10-21 15:39:19.00	AXELL3308 20121021153919.csv
<input type="radio"/>	11316138	AXELL3308	2012-10-21 15:39:25.00	AXELL3308 20121021153925.csv
<input checked="" type="radio"/>	12105001	AXELL3308	2000-01-03 01:01:50.00	AXELL3308_System_20000103010150.csv

5.4.2 Restoring Previous Repeater Configuration

To restore previous configuration

1. Select the required configuration file (enable corresponding radio button) from the available list in the Backup/Restore tab.
2. Click the **Restore** button.



The screenshot shows the Backup/Restore interface. On the left, a table lists configuration files with columns for SNAP, PN, Date, and File. The third row is selected, indicated by a blue circle in the radio button column and a label 'Selected configuration file' with an arrow. On the right, there are control buttons: 'Backup', 'Restore', 'Delete', 'Refresh', and 'Upload'. The 'Restore' button is highlighted with a label 'Restore button' and an arrow. A 'remark:' field is also visible below the 'Backup' button.

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

5.4.3 Uploading New Configuration File to Repeater

To upload configuration file to Repeater

1. Click the **Upload** button.
2. Select the file from the Browse dialog and click Open.
3. The file appears in the list displayed in the Backup/Restore table.

5.4.4 Saving Configuration File to Computer

To save a configuration file from the available list in the Backup/Restore table to a location in a connected computer:

- Select file from list.

- Click the link in the **File** column.
- Select the location in the Browse dialog.

6 Maintenance and Troubleshooting

This section provides the maintenance and troubleshooting procedures for the Repeater.

6.1 Periodic Maintenance

There is no periodic maintenance required for the Repeater. As long as it is installed in a shaded area not subject to extreme temperatures and with adequate ventilation, it will provide long term, problem-free operation.

6.2 Failure Display

Axell 3308-PS NFPA provides two modes for failure display:

- Status LEDs in Repeater
- Alarms screen in Web GUI
- Alarms Log
- Display of external dry-contact alarms

6.2.1 Status LEDs on the Repeater Front Panel

The Repeater includes three LED status indicators (**DL** and **Power**) located on the front panel.



Check the following normal LEDs status on the front panel of the Repeater:

- At turn on, the LEDs show the built-in test procedures: the LEDs turn from Orange to Red to Green.
- During normal operation, all LEDs are green
- LEDs in Red signify major malfunction. Orange displays high input power. Blinking Green shows low power transmission.

Whenever the LEDs are lit differently after the startup test is completed, they indicate a malfunction. Refer to the following paragraph for troubleshooting.

LED Condition	Description and Recommended Response
DL LED Blinks Green	<p>A blinking green DL LED indicates a low input signal at the Donor antenna. As a result, the Mini-Repeater cannot provide a sufficient power output.</p> <p><i>Most probable cause</i> Low input signal at the Donor antenna.</p> <p><i>Corrective action</i> Check the Donor antenna output power, and try aim it to obtain maximum signal from the BTS.</p>
DL LED Is Constantly Lit In Orange	<p>A constant orange DL LED indicates two optional operational statuses: Donor power input too high or low isolation in the system.</p> <p><i>Most probable cause</i> Donor power input is too high.</p> <p><i>Corrective action</i> Lower the input power by either setting the antenna to receive less power, or by adding an attenuator at the BASE connector.</p> <p>Caution! Turn off (disconnect from mains) the repeater before connecting the attenuator. Once installed, turn the power on.</p> <p><i>Second most probable cause</i> Isolation of the system, or internal problem. If the UL Led is also lit in Orange, the most probable cause is low isolation of the system.</p> <p><i>Corrective actions</i> Verify the isolation of the system</p> <p>If the isolation is satisfactory, the Repeater is faulty. Replace the unit.</p>
DL LED Is Constantly Lit In Red	<p>A red DL LED indicates a major malfunction.</p> <p><i>Most probable cause</i> Repeater failure</p> <p><i>Corrective action</i> Replace the unit</p>
Power LED Is Constantly Lit In Red	<p>A red Power LED indicates a major malfunction.</p> <p><i>Most probable cause</i> Repeater failure due to overcurrent of PAs or PLL out of lock</p> <p><i>Corrective action</i> Turn off the Repeater (this action causes a reset of the function), and turn it on anew. If the fault resumes, replace the unit</p>
Power LED Is Lit In Orange	No failures, OK

6.2.2 Alarms Screen

This section provides a description of each alarm and of the indicator colors.



6.2.2.1 Alarm Description

The following table provides a description of the alarms displayed in the Alarms screen.

Alarm	Description and probable cause	Recommendation
Power Below Threshold	Malfunction in the Downlink path – caused by the output power being less than the minimum threshold limit	Check the Max Power Value in the Controls and Parameters.
PAmp Current DL/UL	Malfunction in UL/DL path. Probable cause: Power amplifier module consumes low/high current.	Check the Repeater LEDs. Section above.
Channeler Current DL/UL	Malfunction in UL/DL path. Probable cause: channeler unit current consumption.	Check the Repeater LEDs. Section above.
RSSI DL/UL	Malfunction in UL/DL path caused by a excessively high input signal	Check the Repeater LEDs. Section above.
VSWR DL/UL	Indicates problem at the Mobile or Donor antenna.	Problem with connection at Mobile/Donor antenna port, with the cable or with antenna.
Temperature	High unit temperature	Check the Repeater case for external causes (sun, hot environment, air flow is blocked) and eliminate the reason for excessive heat. Caution: Do not cool with water.

Alarm	Description and probable cause	Recommendation
System Mute	Most probable cause – Repeater amplification is muted (automatically)	Check the Repeater LEDs
*Panel Switch Mask	Not Applicable	Ignore
PLL Lock Detect	Malfunction in UL/DL path. Probable cause: channeler module lock-detect failure	Check the Repeater LEDs. Section above.

6.2.2.2 Alarm Analysis

The alarms display in this tab have two types of indications: external and internal:

Each alarm icon consists of two elements: the inner circle and the perimeter belt.

The colors of the inner circle indicate mode while the perimeter belt color indicate the alarm severity.

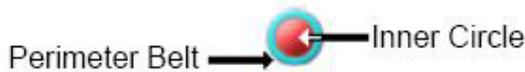


Figure 2: Axell -CMU - Interpretation of Alarm Icons

The following table provides a description of the Alarms color code that appears at the bottom of the Alarms window.

Inner Circle	Alarm	Description
		Green - indicates that the element is functioning
		Red – indicates that the element is not functioning
		Grey (Masked) - indicates that the Administrator has disabled the display of that element.
Perimeter Belt		Grey (Mask) - indicates that the Administrator has disabled the display of that element.
		Light blue - indicates a minor issue.
		Yellow - indicates a major issue.
		Orange - indicates a critical issue.

The following figure shows an example of the Axell -CMU alarm design.



Figure 3. Axell -CMU - Two Examples of Alarm Design

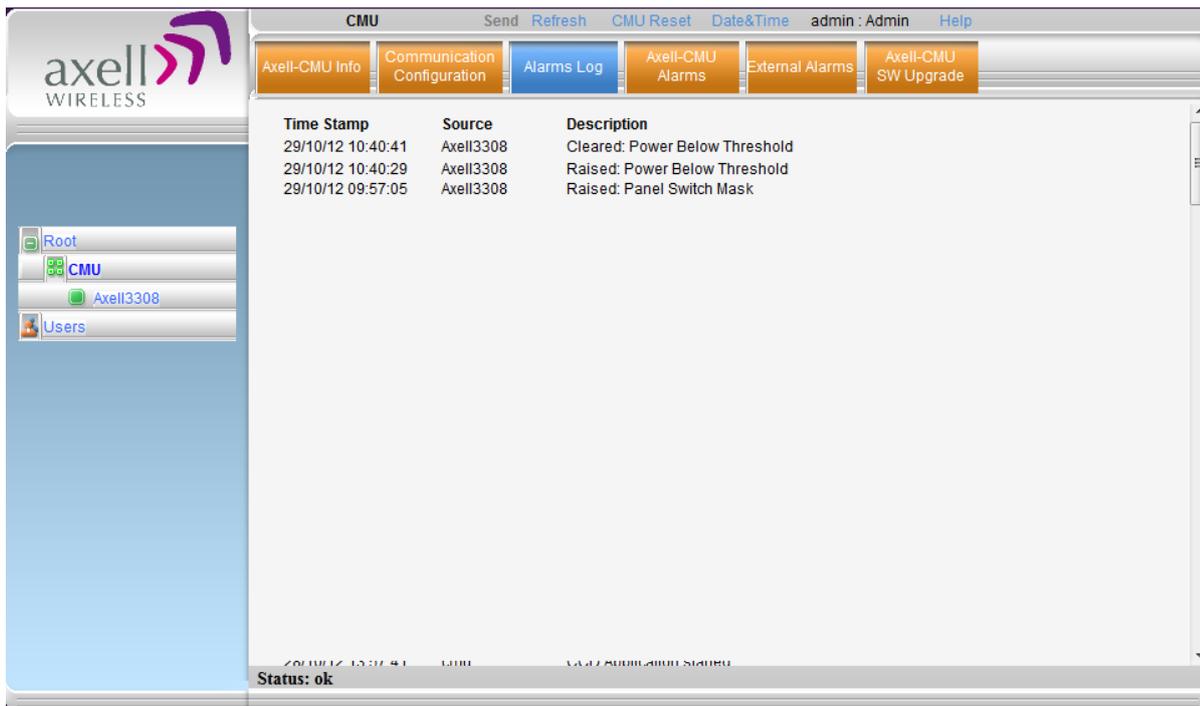
6.3 Viewing Alarms Log

The Alarms Logs screen lists the alarms (events) that have occurred. The CMU maintains log files listing every alarm triggered and in the Repeater. 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: Set the clock in order to synchronize the events time of occurrence - click on **Date & Time**.

To view the CMU log screen:

1. Open and login to the Web application.
2. From the Tree Pane, select **CMU**.
3. Click **Alarms Logs**. CMU displays the Alarms Log Table.



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

6.4 Dry-Contact External Alarms

The **Axell-CMU Alarms** screen displays the status of the activated external alarms.

NOTE: See ext. alarms settings in section 4.4) for information on alarms triggering criteria and alarm connections and pins.

- GREEN = Alarms status OK
- RED = Alarm activated



Appendix A: Specifications

This section provides the electrical, mechanical and environmental specifications of the Axell BSR 3308 PS and BSR PS-NFPA.

Electrical	Downlink	Uplink
Frequency Range ¹	851 - 869 MHz	806 - 824 MHz
Passband Gain	85 dB	85 dB
Passband Ripple	± 1.5 dB	± 1.5 dB
Gain Attenuation Range (in 1 dB steps)	0 to 25 dB (in 1dB steps)	0 to 25dB (in 1dB steps)
FCC Composite Power: (in accordance with FCC product measurements).	33 dBm	27 dBm
IC Rated Power: (the rated power is equivalent to the Pmean power measured with a two tone test in accordance with Industry Canada procedures).	30dBm	25 dBm
Noise Figure @ Max. Gain (typical)	5 dB	5 dB
Propagation Delay	< 5 µsec	< 5 µsec

¹ 3 Selectable and tunable sub-bands are standard

General	
Power Supply	220/110 VAC or 48VDC
Power Consumption	120W
Total RF Input Power (no damage)	+10 dBm
RF Connector	N-type, Female
V.S.W.R	1.7:1
Compliance	FCC – please refer to new FCC guidelines at the beginning of this document.
Environmental	
Operating Temperature	-20° C to + 50° C
Storage Temperature	-30° C to + 80° C
Humidity	10% - 90% (condensed)
Dimensions L x W x H	13.78" x 18.11" x 5.7" (350 mm x 460 x 145 mm)
Weight	28.8 lbs (13kg) max.
Weatherproof	IP-65, NEMA-4