

Digital IP-65 Channel/Band Selective High Power Repeater

Product Description and User's Manual
for Axell D-SBR 3709S Repeater

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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

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 Axell Wireless Repeaters are familiar with the basic functionality of Repeaters.

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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.

Compliance with FCC



WARNING: This is NOT a CONSUMER device. This device 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.

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.
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.

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. All antennas must be operated at a minimum distance of 35 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 mandates 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 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 3709 signal booster has a noise level of -50 dBm in 10 kHz measurement at 1 MHz spectrum outside the passband of the signal booster and an *in-band* noise level at around -34 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) = $-51.1+2-11-11=-71.1 \text{ dBm}$

The inband input noise to the antenna should be $-32+2 -11-11= -52 \text{ dbm}$




NOTE: In this example there is no need to add an external bandpass filter to attenuate the out 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.

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 only indoors. 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: RF Exposure</p>	<p>RF radiation, arising from transmitter outputs connected to AWL's equipment, must be considered a safety hazard.</p> <p>This condition might only occur in the event of cable disconnection, or because a 'spare' output has been left un-terminated. Either of these conditions would impair the system's efficiency. No investigation should be carried out until all RF power sources have been removed. This would always be a wise precaution, despite the severe mismatch between the impedance of an N type connector at 50 ohm, and that of free space at 377 ohm, which would severely compromise the efficient radiation of RF power. Radio frequency burns could also be a hazard, if any RF power carrying components were to be carelessly touched!</p> <p>Antenna positions should be chosen to comply with requirements (both local & statutory) regarding exposure of personnel to RF radiation. When connected to an antenna, the unit is capable of producing RF field strengths, which may exceed guideline safe values especially if used with antennas having appreciable gain. In this regard the use of directional antennas with backscreens and a strict site rule that personnel must remain behind the screen while the RF power is on, is strongly recommended.</p> <p>Where the equipment is used near power lines or in association with temporary masts not having lightning protection, the use of a safety earth connected to the case-earthing bolt is strongly advised.</p>






 <p>Caution: Safety to personnel.</p>	<p>Before installing or replacing any of the equipment, the entire manual should be read and understood.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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 grounded floor mats.</p>
 <p>Caution: Battery Replacement</p>	<p>Risk of explosion if battery is replaced with incorrect type. Dispose of used batteries according to instructions.</p>

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1 Introduction

This manual describes the Axell D-SBR 3709S IP65 High Power Digital Channel/Band Selective Repeater. The repeater is designed for indoor installations and includes advanced filtering capabilities to support the SMR 900MHz band for public safety and commercial operations.

The D-SBR 3709S repeater supports up to eight non-contiguous sub-bands/channels, where the gain and output power of each sub-band is independently tunable across the entire band. This provides an optimal solution for operators that have a non-contiguous spectrum.

The system supports advanced Digital Signal Processing (DSP) technology, programmable digital filters. These capabilities enable the user to quickly and simply customize the Repeater according to changing site requirements.

Highly linear MCPA components and unparallel innovative DSP filtering provide top level performance that support high throughput of the latest modulation technologies such as HSPA and LTE.

The Smart-ALC power control algorithm automatically optimizes the gain setting by learning the actual range of RSSI levels over a user-specified period of time. The Smart-ALC algorithm prevents oscillations, reduces the amount of isolation required by the system and optimizes the system to minimize noise rise at the donor cell site.

Intuitive Web access monitoring and management GUI is accessible via a local or remote Ethernet connection.



Figure 1-1. Axell D-SBR 3709S Repeater

1.1 Features and Capabilities

- Composite Power: DL +37 dBm; UL +23 dBm
- RF Gain: Up to 90dB Gain
- Up to eight software selectable non-contiguous sub-bands in any combination (the number of supported bands depend on the selected bandwidth of each sub-band)
- Individual gain and power settings for each sub-band
- High linear amplification and spectral purity and highly accurate frequency selection
- Excellent out-of-band interference prevention
- Mechanism for tunable rejection of interference from adjacent cellular and paging frequencies
- SmartALC™ technology:
 - Automatically sets optimum gain
 - Prevents oscillations and balances coverage
- Intuitive Web management GUI application provides simple setup, monitoring and control via a local or remote Ethernet connection
- SNMP fault notification
- Wallmount, IP65 (NEMA4) Enclosure.
- MCPA technology supporting top level EVM, ACRR and emission performance

1.2 Model Ordering Information

ORDERING INFORMATION for Axell D-SBR 3709S SMR 900MHz			
Part Number	Comp. DL Pwr	Max RF Gain	Filters
D-SBR 3709S	37dBm	90dB	8 filters, AC feeding

1.3 Smart-ALC Function

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

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

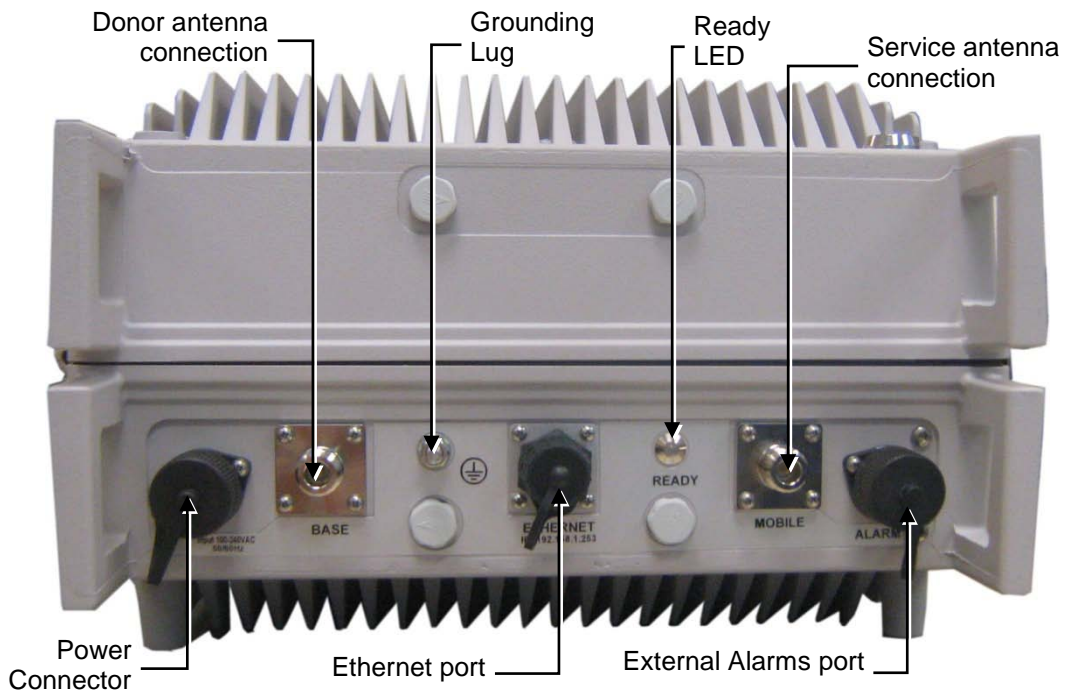
1.4 Front Panel Interfaces and LEDs

The D-SBR Repeater includes external and internal interfaces (that require opening the repeater). The interfaces relevant to the user are described in the following sections.

1.4.1 External Interfaces

The D-SBR Repeater external connections and READY LED are located on the underside panel of the unit. Two additional LEDs are located inside the repeater, as described in 6.1.

The following connections are available: Base and Donor antenna connections, Ethernet port, external alarms, power connection and grounding lug.



The following table provides a description of the front panel interfaces.

Interface	Description
BASE	Donor antenna connections. See section 2.1.
MOBILE	Service antenna connections. See 2.2.
POWER	110VAC
ETHERNET	Connection to Ethernet network and used for local setup connection
ALARM	Option for connecting two external alarms (section 3.10) – require configuration (section 4.4).
GROUNDING LUG	Ground connection
READY LED	Power\Major alarms status indication (see 6.1):

1.4.2 Internal Interfaces

The D-SBR repeater includes internal UL and DL LEDs – required for troubleshooting purposes (see section 6.1)

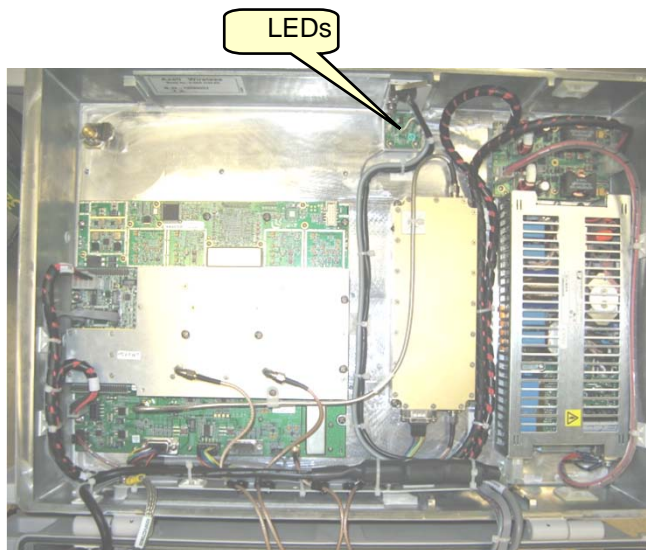


Figure 1-2. Axell D-SBR 3709 Internal View

2 Antenna Specifications and Installation

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

2.1 Base (Donor) Antenna

The Base (Donor) antenna 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 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

Installation requirements:

- The donor antenna should point to the direction of the base station for maximum input power.
- Install the Donor Antenna at the designated height.
- 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. higher floor) than the mobile antenna.
- Donor antenna must be installed at a minimum distance of 35 cm from any personnel within the area.

2.2 Service Antenna Requirements



WARNING!!!

- 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 – indoors only
- Service area type and size
- Antenna type 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:

- The 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 35 cm from any personnel within the area.

2.3 Repeater Pre-Installation Requirements

2.3.1 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.
- Follow Electro-Static Discharge (ESD) precautions.

2.3.2 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

2.3.3 Criteria for Repeater Installation Location

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

- Application type and 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.
- Use low loss cables to connect the antennas to the Repeater.

2.3.4 RF Cable Installation Guidelines

- For all coaxial connections to/from the Repeater - high performance, flexible, low loss 50 ohm 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 Installing the Repeater

3.1 Overview of the Installation Procedure

NOTE: 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.

1. Determine an appropriate location for the system according to the requirements described in section 2.3.
2. Unpack the Repeater kit (see 3.3).
3. Assemble the brackets and mount the D-SBR Repeater on the (concrete or brick) wall (see 3.4).
4. Ground the Repeater (see 3.5)
5. If you have not already done so, position and install the Base and Mobile antennas in the relevant locations.
6. Before powering up the Repeater:
 - Verify isolation between the donor and mobile antennas (see 3.6)
 - Verify link between BTS and Base Repeater (see 3.7)
 - Connect the Donor and Service antennas to the Repeater (see 3.8).
7. Power-up the Repeater (see 3.9)



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

8. Optional - Connect the external alarms. This can be done at any time, before or after powering up the Repeater (see 3.10).
9. Commission the system. See Chapter 4.

Note: It is important to perform the installation procedure according to the order described above.



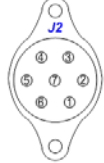


3.2 Required Tools and Materials

A standard professional toolbox is required in order to mount the Repeater.

3.3 Unpacking

Upon receiving the D-SBR Repeater 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 equipment (listed below) is included. Otherwise contact Axell Wireless Ltd. The D-SBR Repeater is shipped with the following equipment:

D-SBR single-band Repeater		
Ethernet RJ-45 LAN cable		
Ext. Alarms Cable (P/N 40WEC70500)		
CD with documentations		
Mounting Brackets		
Additional (supplied) installation components:	Qty.	Description
	4x	M4 bolts for mounting brackets to wall (concrete or brick only)
	4x	M6 screws for securing the Repeater to the brackets
	1x	110VAC Power Cable
Optional equipment	2 x	Sets of keys
	AC Cable [30 ft.] – Long cable for AC power Alarm Cable [30 ft.] – Long cable for External Alarms Input	

3.4 Mounting the Repeater

- Notes:
1. The weight of the unit requires that two people mount the unit on the wall.
 2. Washers are not supplied with the repeater.

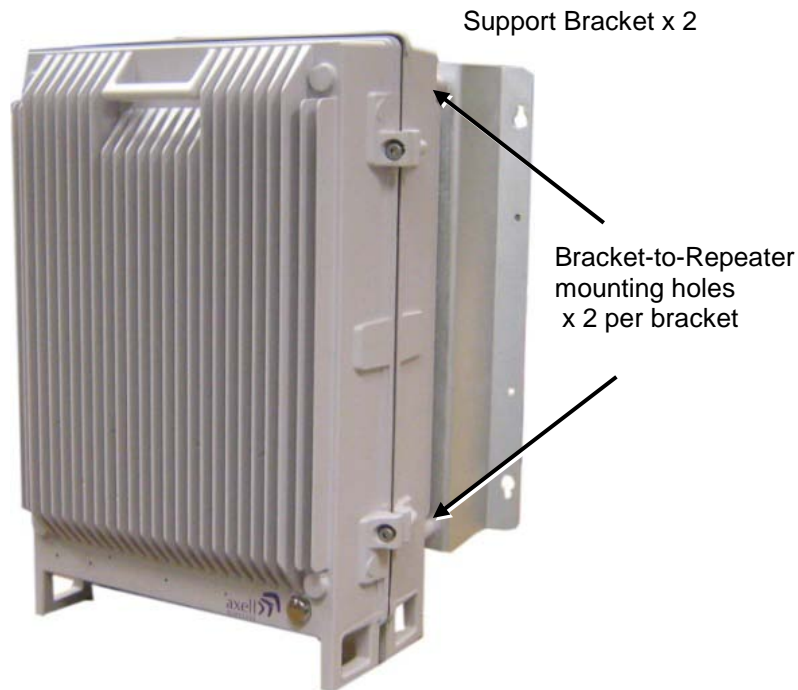
Mounting the D-SBR Repeater consists of assembling the brackets on the repeater and then mounting the unit on to the wall.

To mount the Repeater on the wall

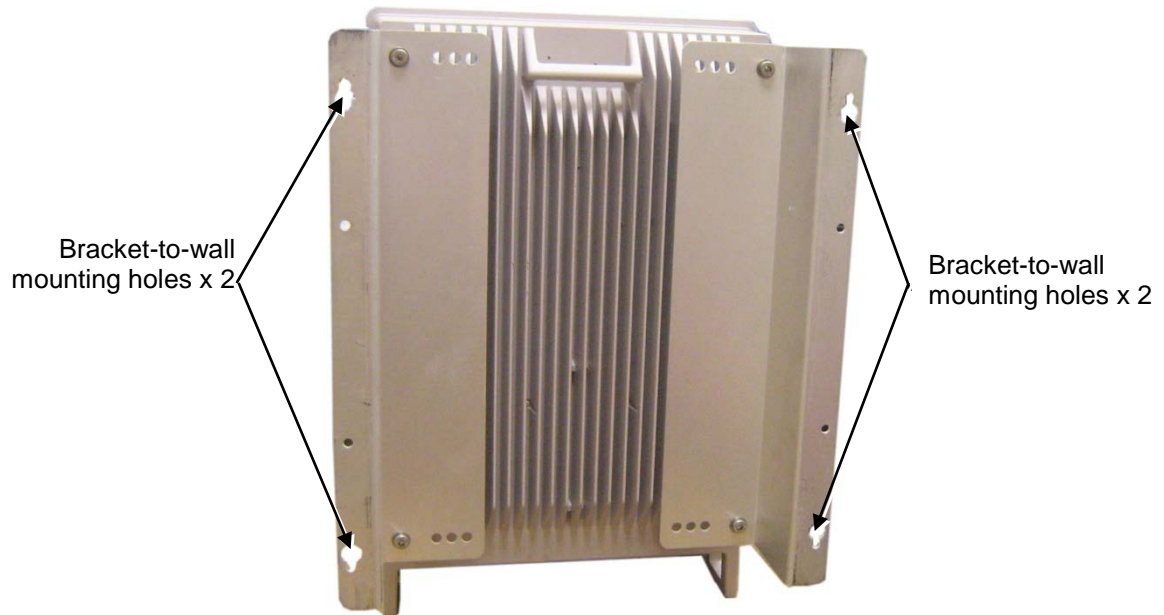


IMPORTANT!! The D-SBR repeater mounting procedure is for concrete or brick walls only.

1. Determine the location of the Repeater on the wall according section 2.3.3.
2. Assemble the brackets to the D-SBR Repeater using the supplied 4 x M4 bolts as shown in the following figure.



3. Place the brackets against the wall and mark the *four* holes to be drilled.



4. Drill the four holes in the wall.
5. Align the bracket-to-wall mounting holes with those drilled in the wall.
6. Use the appropriate bolts (supplied) and washers (not supplied) to secure the bracket firmly to the wall.

3.5 Grounding



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

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

To ground Repeater

- Ground the Repeater with the grounding bolt located on the underside of the Repeater.
- **Do not use the grounding bolt to connect external devices.**



Figure 3-1. D-SBR Repeater Grounding Lug

3.6 Verifying Isolation between Donor and Mobile Antennas



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 power, verify isolation between the 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 12dB 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 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.
4. 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.
 - 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 - specifically the isolation between the antennas.

DO NOT POWER-ON the Repeater without either the antennas being connected or the antenna connections terminated with dummy loads.

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.

To connect the antennas to the Repeater

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 section 2.1).
3. Connect the Service antenna to the Repeater MOBILE port. (Service antenna specifications and installation criteria are described in section 2.2).
4. Verify all RF connectors are tightened and the cables and antennas are secured.

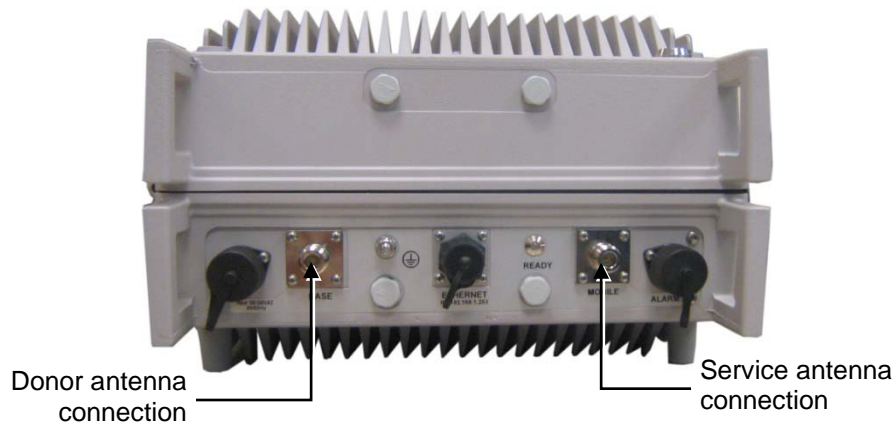




Figure 3-2. Antenna Connections

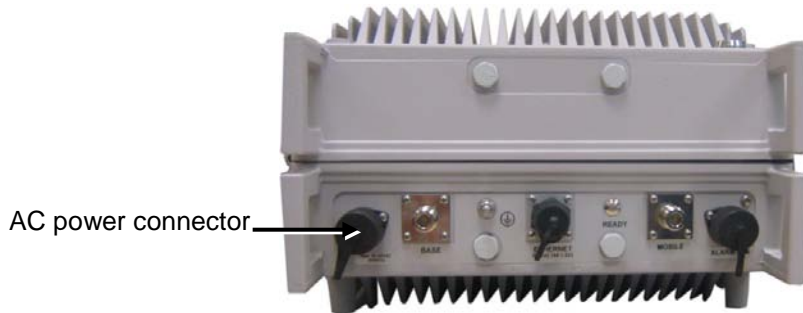
3.9 Powering Up the Repeater

The Repeater operates from a 110 VAC power source.

 WARNING!!! Electrical Shock	This equipment must be installed indoors. To prevent electrical shock when installing or modifying the system power wiring, disconnect the wiring at the power source before working with uninsulated wires or terminals.
 CAUTION!	DOUBLE POLE/NEUTRAL FUSING

To power up the repeater

1. The following slow fuse should be installed at the power outlet:
 - The AC input should be supplied on a 10A dual pole circuit breaker protected line with 3mm contact gap suitable for the end application.
2. Connect the front panel power connector to the AC power source.

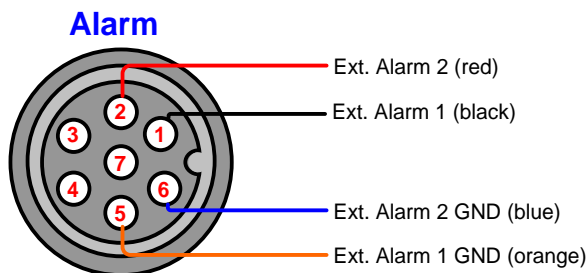


3.10 External Alarm Connections

The front panel **Alarm** port supports two alarm connections from two external sources.

Note the following:

- The alarms can be connected any time, before or after the system is powered-on.
- The alarms cable is supplied in the product kit.
- The connections must conform to the following load restrictions: maximum repetitive reverse voltage: 28V; Impedance load: "0" = 0V or GND; "1" = 3.8V - 28V
- After connecting, enable the External Alarms via the Web GUI **CMU** option, **External Alarms** tab.



The Alarm connector pinout is described below.

Wire color	Signal	Pins number	Operation
Black	Ext Alarm_1 IN	1	Triggers Alarm ID 1
Orange	GND	5	Ground, galvanic short to Repeater chassis.
Red	Ext Alarm_2 IN	2	Triggers Alarm ID 2
Blue	GND	6	Ground, galvanic short to Repeater chassis.

4 Initial Setup and Commissioning

This section provides the setup procedures for the D-SBR Repeater. The Repeater is designed for simple plug-and-play operation, only requiring the setup of a number of parameters (such as DL Output Power, bandwidth and Gain) via a local Web connection and verifying that the system is operating properly.

The procedures are performed through an Ethernet connection between the Axell D-SBR repeater and a computer.

The setup procedure consists of the following steps:

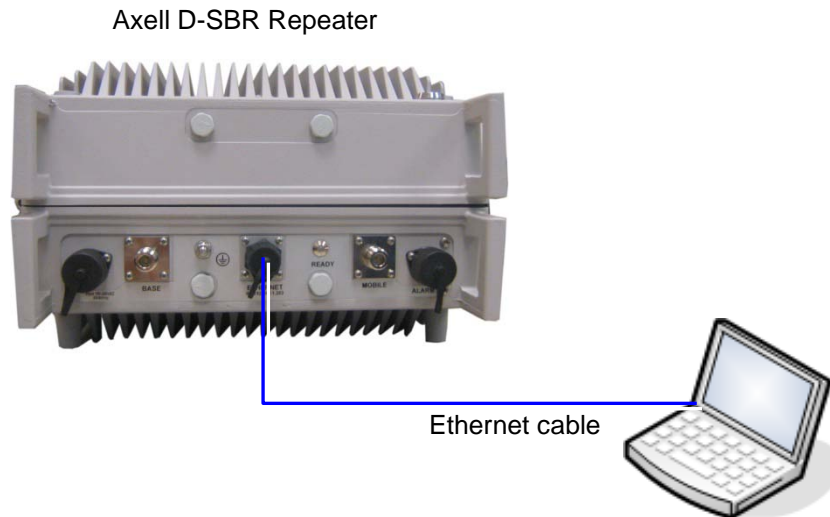
1. Open a local Web session to the Repeater (this requires configuring the communication parameters of the computer used), see 4.1.
If you are not familiar with the Axell Web Access application, it is recommended to quickly review the Navigating the Web GUI Application section (see 4.2).
2. Adjust the signal levels and configuring the sub-bands (see 4.3).
3. After the required coverage is attained for the location, verify that no Alarms are generated before connecting to the main control center.
4. Set the Repeater time and date (see 4.3.3).
5. If external alarms are connected - configure the external alarms (see 4.4).

4.1 Open a Local Web Session to the Repeater

4.1.1 Connect the Repeater to the Computer

To connect Repeater to Computer

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



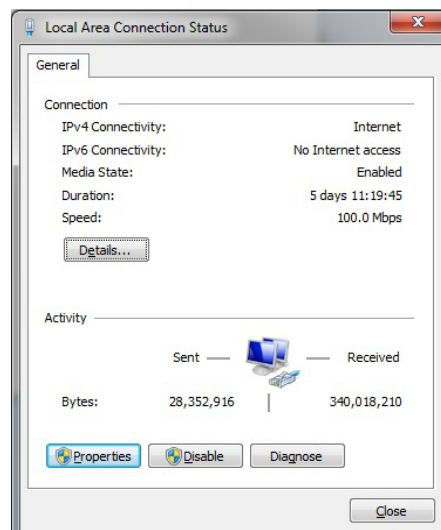
4.1.2 Configure the Computer Network Parameters

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 MS Windows 7.

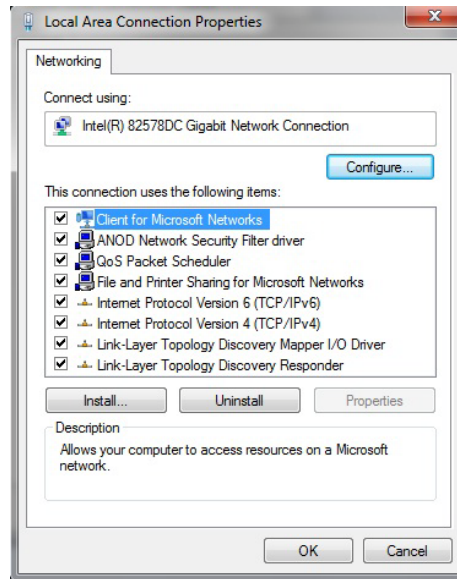
To configure the computer's network parameters:

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.



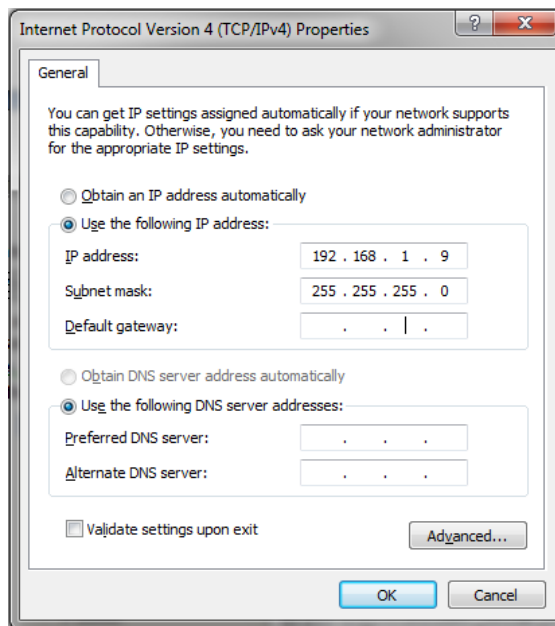
5. In the Items list, double-click the "Internet Protocol Version 4 (TCP*IPv4)" item.

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)



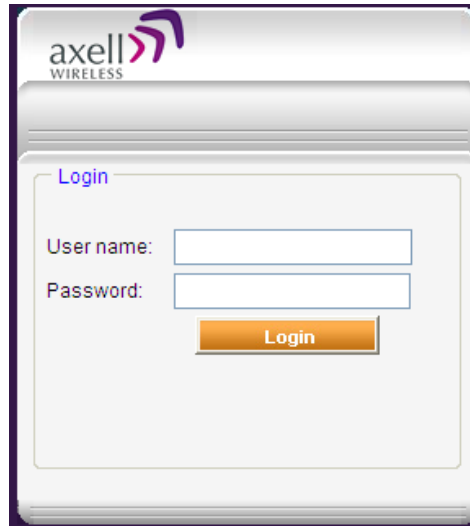
- Click OK. The computer communication parameters are now defined and you can open a session to the Repeater.

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**.

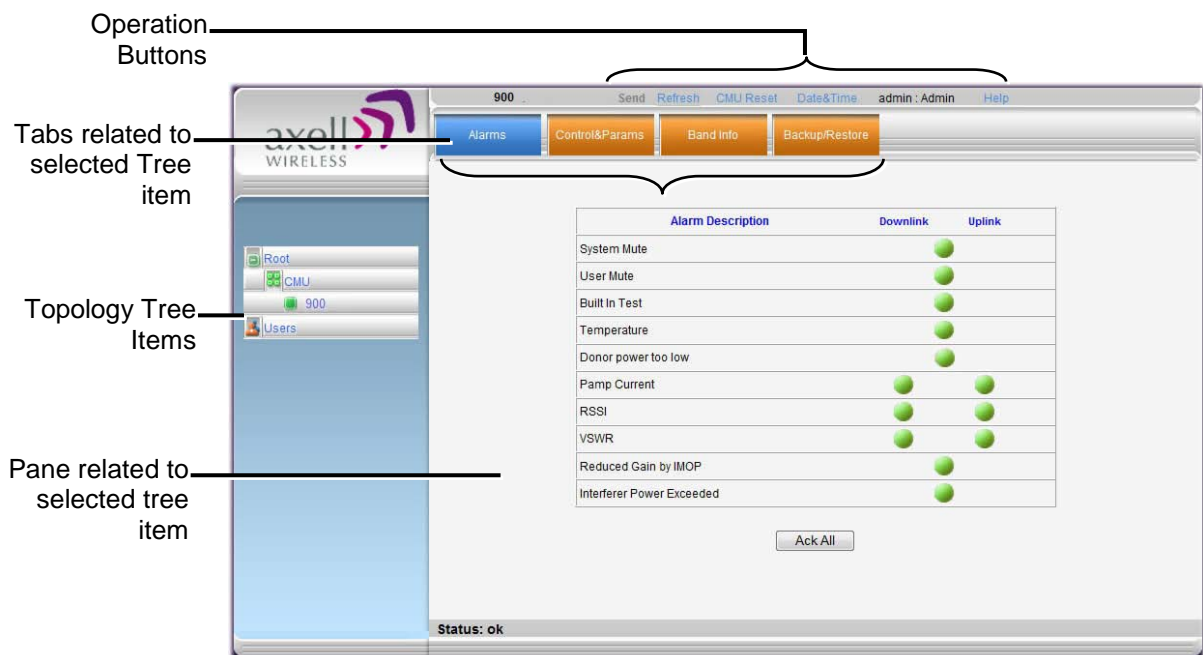
Note that both are case sensitive and must be entered with lower case letters.

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 4.3.2.

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** – Communication parameters, dry-contact alarm configuration and software upgrade options. configuration, software download and upload and and communication parameter settings.
- **900** – RF parameters, monitoring and backup and restore options.
- **Admin** – User definition and management options and enables changing user passwords.



4.2.1 Main Window Operation Buttons

The following main window operation buttons are available.



Item	Description / Values
Selected Tree Item	Shows the currently selected topology tree item. Values: CMU / Band / Users
Send	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	Click to refresh the current screen and update the displayed data
CMU Reset	Click to reset the Web Access application, in case of failure or display problems
Date and Time	Accesses the Repeater Date and Time settings.
User Login Info	User name and password of currently logged in user (e.g. admin:admin)
Help	Click Help to display an e-guideline for the system operation. This Help is general by its nature and some features may not be included.

4.2.2 Band Pane and Tabs

The upper area of each selected pane shows the tabs corresponding to that pane.



Item	Description / Values
Alarms	Displays various alarms generated by the Repeater and enables monitoring. See section 6.2.
Control & Params	Used for adjusting RF parameters and channel configuration (signal level, gain and bandwidth). See section 4.3.
Repeater Info	Viewing the repeater information. See section 5.2.
Backup and Restore	Configuration files management options (configuration files can be stored on the Repeater for access). See section 5.3.

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 5.2.1).
Communication Configuration	Used to set IP, SNMP and other communication parameters
Alarms Log	Log of past and current alarms (see 6.3).
Axell-CMU Alarms	Shows any external alarms that were generated.
External Alarms	Used to define any connected external alarms (see 4.4)
Axell-CMU SW Upgrade	Options for CMU software upgrade (see 5.3).

4.3 Signal Levels and Channel Configuration

This section provides a description of the RF Gain setting criteria (set via the Controls and Params Pane), a full description of the *Control and Params* pane, and a step-by-step procedure of the signal level and channel configuration procedure.

4.3.1 RF Gain Setting Criteria

The gain range is up to 90dB and is set by default to its maximum value. The defined gain will be optimized by the SALC mechanism.

4.3.2 Adjusting the Signal Levels and Configuring Channels

The **Control and Params** (parameters) window is used to configure each of the supported band's sub-bands and Max UL/DL Power. This section describes each of the fields.

Each sub-band is *individually* defined by setting the following:

- Bandwidth (start and stop frequency)
- Maximum power
- Maximum gain
- Gain delta (used for noise control)

The defined sub-bands are displayed in the lower part of the screen for reference.

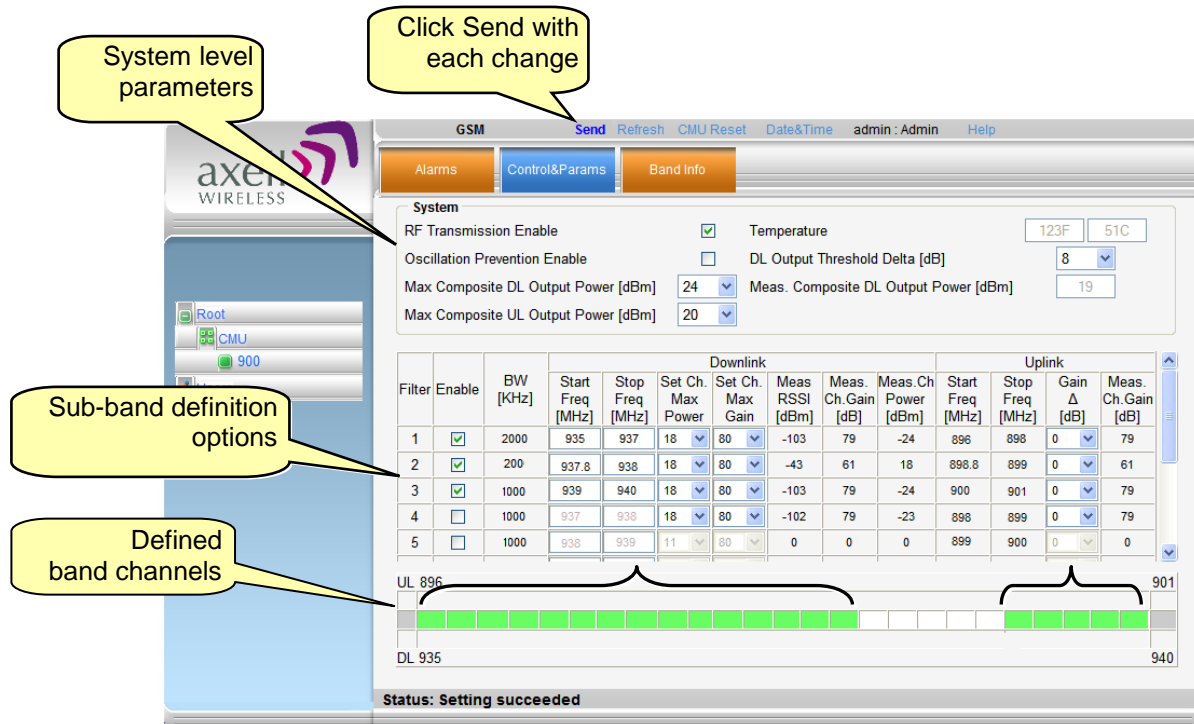
To adjust the signal levels and configure the channels

Note: Be sure to click **Send** with each change.

1. In the topology tree, click **Root**, then click **CMU** and then click the repeater Band.
2. Click the **Control and Params** tab. The corresponding pane appears.

The window is divided into the following areas:

- System – overall parameters for the *service*.
- Sub-band (filter) definitions – used to define up to eight sub-bands and their RF parameters.
- Sub-bands view – graphical display of defined sub-bands for the service.



Click Send with each change

System level parameters

Sub-band definition options

Defined band channels

Filter	Enable	BW [KHz]	Downlink					Uplink					
			Start Freq [MHz]	Stop Freq [MHz]	Set Ch. Max Power	Set Ch. Max Gain	Meas. RSSI [dBm]	Meas. Ch. Gain [dB]	Meas. Ch. Power [dBm]	Start Freq [MHz]	Stop Freq [MHz]	Gain Δ [dB]	Meas. Ch. Gain [dB]
1	<input checked="" type="checkbox"/>	2000	935	937	18	80	-103	79	-24	896	898	0	79
2	<input checked="" type="checkbox"/>	200	937.8	938	18	80	-43	61	18	898.8	899	0	61
3	<input checked="" type="checkbox"/>	1000	939	940	18	80	-103	79	-24	900	901	0	79
4	<input type="checkbox"/>	1000	937	938	18	80	-102	79	-23	898	899	0	79
5	<input type="checkbox"/>	1000	938	939	11	80	0	0	0	899	900	0	0

UL 896 901

DL 935 940

Status: Setting succeeded

3. Set the System Level parameters:

- Verify that the **RF Transmission Enable** parameter is checked.
- Set the **Max Composite DL Output Power** according to your site requirements and click **Send**. The Measured Composite DL Output Power is displayed in the adjacent field.

If the composite output power exceeds the defined value, the Smart ALC feature begins working.

- Set the **Max Composite UL Output Power** according to your site requirements.

Additional parameters (not required for initial setup) are:

- Oscillation Prevention Enable - Enables oscillation detection mechanism that maintains repeater functionality.
- Temperature - Displays Repeater ambient temperature.
- DL Output Threshold Delta (dB) - the delta from the set Composite Output Power, below which the alarm 'Donor power is too low' is activated.

For example, if the DL Output Threshold value is set to 8dB, when the *Measured* Composite DL output power is 8dB less than the *set* Composite Output Power, an alarm is generated.

- Meas. Composite DL Output Power – displays the currently measured output signal level.
4. To configure each sub-band:
 - Checkmark **Enable**. The configuration parameters in that row will be available.
 - In the Downlink area, set the **Start** and **Stop** DL Frequency (MHz). (The Uplink Start and Stop frequencies will be automatically allocated.)
The defined BW will be displayed in the BW KHz column (to the left of the Start Frequency).
Be sure to choose Start/Stop values displayed in the **Band Info** tab.
 - Set the (Downlink) Max Gain as follows: by default, the **MAX Gain** (DL) parameter is set to its highest level (90dB). Change the **Channel Max Gain** (DL) according to the measured/calculated input power and isolation measurements.
 - The recommended Maximum Gain setting is approximately 12 dB less than the isolation between the service and donor antennas.
 5. If the site NOISE LEVEL is high enough to cause interference, adjust the noise level as follows:
 - Adjust the Gain Delta parameter – this sets the delta between the uplink and downlink gain (so the uplink gain is relatively lower than the downlink gain).
 - Click **Send**.
 - Repeat the procedure until the desired coverage is achieved.
 6. More information on parameters for the *selected* sub-band:
 - DL Set Ch. Max. Gain Sets the power for the antennas. The value is about 15 dB less than the isolation between the donor antenna and the mobile antenna.
The Value defined in the DL path is reflected in the UL path, however to define different UL and DL path values the Gain Delta parameter is used and its defined value is added to the UL value.
 - DL Measured RSSI - measured DL signal.
 - DL Measured Ch. Gain - measured DL Gain (dB) for the selected sub-band.
 - DL Measured Ch. Power - measured Power (dBm) for the selected sub-band.

- UL Gain Δ - used for noise control. Sets the difference between UL and DL gain.
 - UL Measured Ch. Gain - measured UL Gain (dB) for the selected sub-band.
7. Click **Send** (top window area option).
 8. 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.



4.3.3 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, click on **Date & Time** in the menu bar.



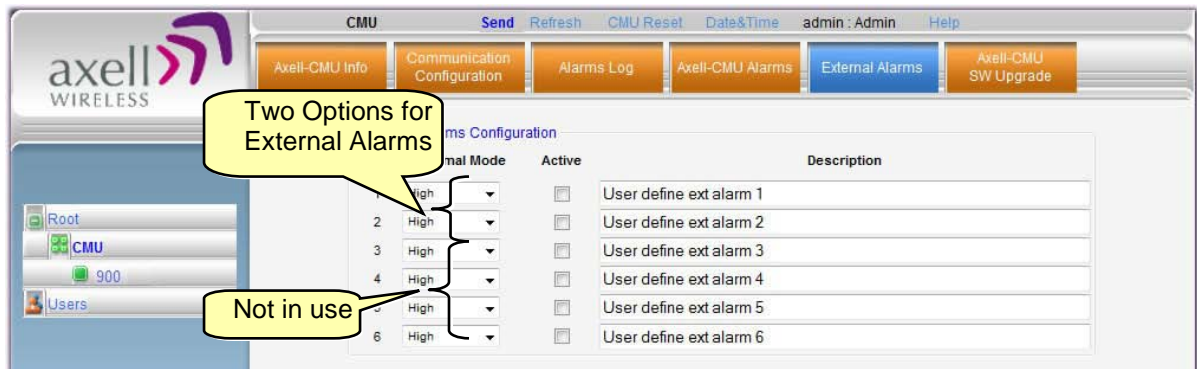
2. Set the date and time parameters and click on **Set**.
3. Click **Reset CMU** at the top of the Main window.

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.

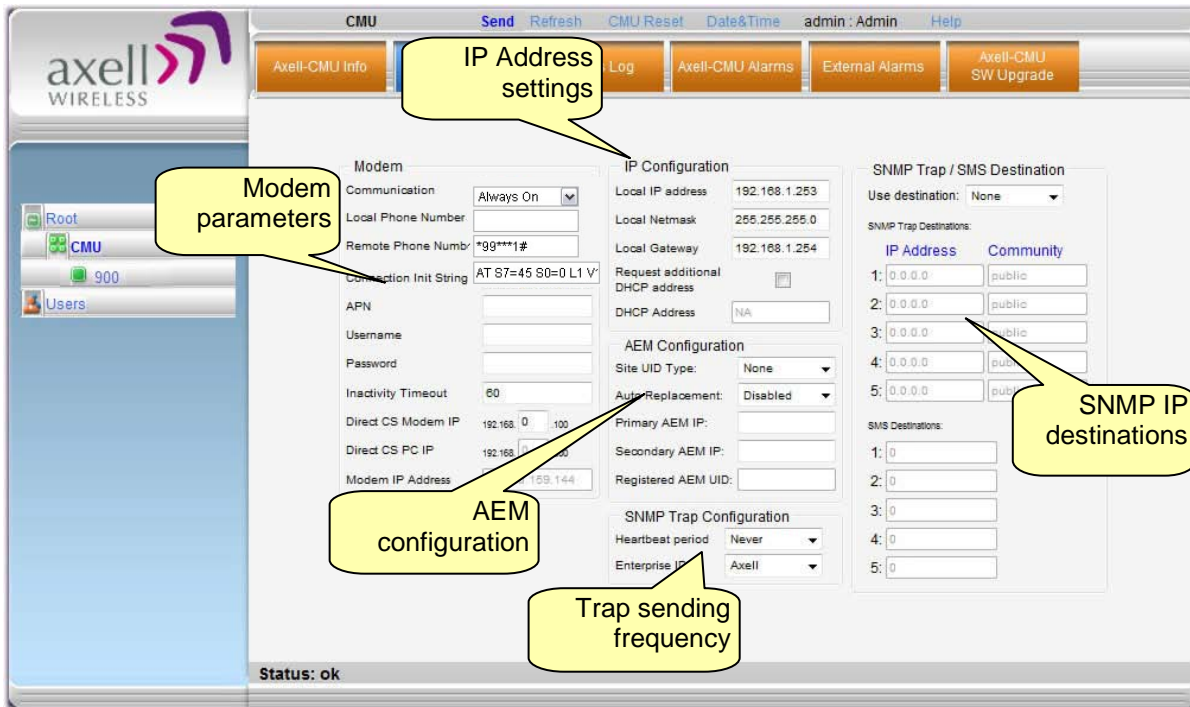
4.5 Communication and System Parameters

The Communication Configuration tab provides the IP, AEM and SNMP trap configuration parameters. This section describes how to access the dialog. The following sub-sections provide detailed information on each configuration option.

4.5.1 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.



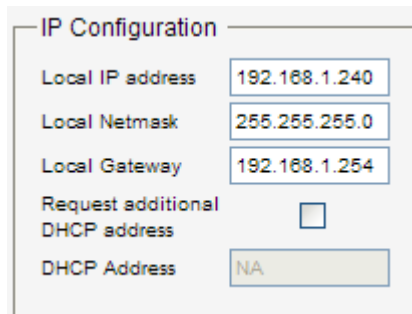
4.5.2 IP Address Setup and Repeater Name

The Repeater 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.

- 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 a name and IP address

1. Access the Communication tab according to section 4.5.1.
2. To assign the unit addresses:
 - Local address - in the **IP Configuration** area, assign the unit the Local IP address, Netmask and Gateway parameters provided by your system administrator.
 - DHCP server address – checkmark the option **Request Additional DHCP Address**. The assigned address can be seen in the DHCP Address field.



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	<input type="checkbox"/>
DHCP Address	NA

4.5.3 AEM (Axell Element Manager) Configuration

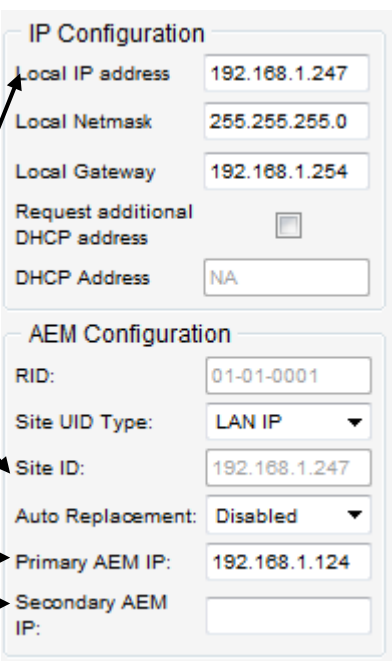
AEM repeater management configuration is performed only on the AEM side – it is only required to add the new repeater (element) IP address to the AEM.

This section describes how to configure the repeater for Auto Replacement. Auto Replacement is used when a repeater is replaced. The new repeater is assigned the same IP address as the previous repeater and configured with Auto Replacement. This enables the AEM to download the previous repeater configuration to the new repeater, minimizing downtime.

To configure the repeater for AEM management

1. Access the **Communication Configuration** tab (see 4.5.1).

NOTE: The RID (Repeater ID) is automatically detected by the system.



Site ID set to LAN IP

AEM server IP address

IP Configuration	
Local IP address	192.168.1.247
Local Netmask	255.255.255.0
Local Gateway	192.168.1.254
Request additional DHCP address	<input type="checkbox"/>
DHCP Address	NA

AEM Configuration	
RID:	01-01-0001
Site UID Type:	LAN IP
Site ID:	192.168.1.247
Auto Replacement:	Disabled
Primary AEM IP:	192.168.1.124
Secondary AEM IP:	

2. To configure the replacement Repeater for Auto Replacement:
 - Set Auto Replacement to **Enable**.
 - Set **Site UID Type** to **LAN IP** – this identifies the site IP Address
 - Verify that the repeater's IP address is Fixed – section 4.5.2.

5 Administrative Operations

The following administrative operations are described in this section:

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

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

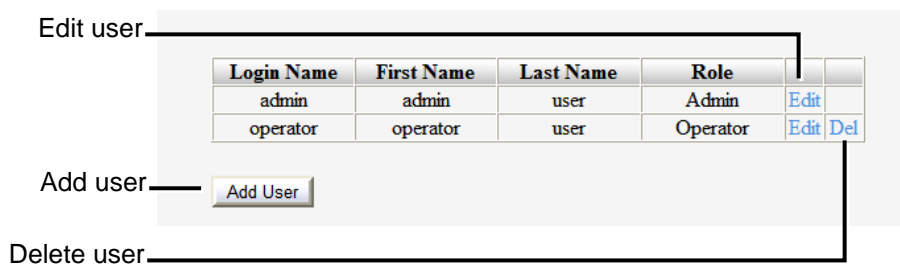
Three user levels are available:

- 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 **Users**. The list of users is displayed in the Configuration Pane according to the identifying information and authentication level (Role).



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.

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.

The image shows a dialog box titled "Add User". It contains several input fields: "Login Name", "First Name", "Last Name", "User Role" (a dropdown menu currently showing "Admin"), "Password", and "Verify Password". At the bottom of the dialog are two buttons: "OK" and "Cancel".

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 **OK**.

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 Viewing Repeater and Band Information

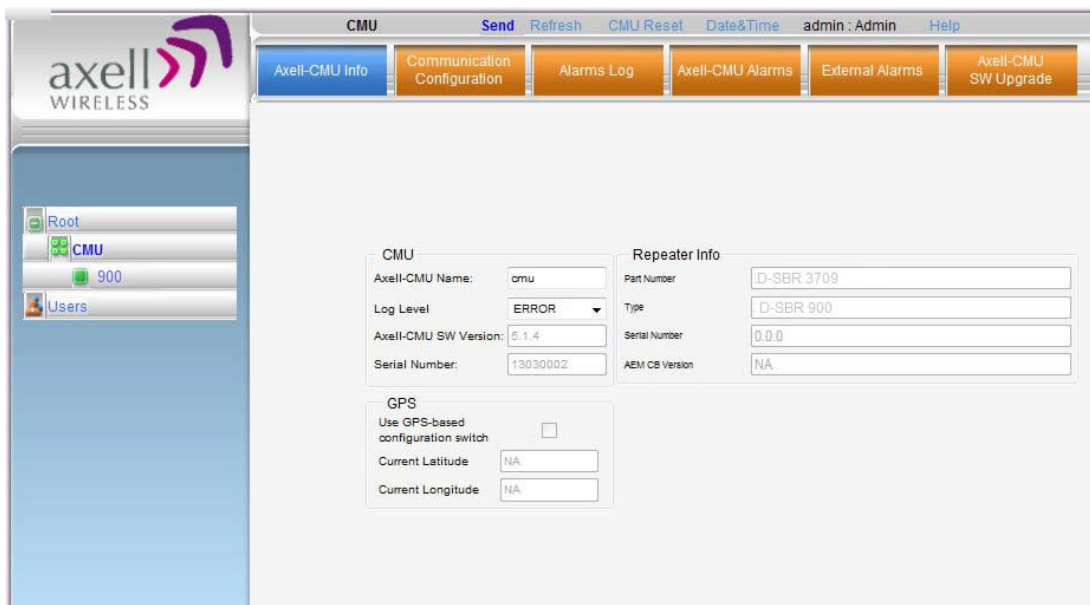
5.2.1 Viewing Repeater Level Information

Use the **CMU-Info** screen to view the hardware and software versions of the Axell D-SBR Repeater. In addition, the screen provides configuration options for setting the minimum Log Level and assigning the Repeater a recognizable name.

NOTE: Read-only or irrelevant parameters are grayed out.

To access the Repeater Information window

1. From the Tree Pane, select the **CMU** item.
2. Select the **Axell CMU Info** tab.



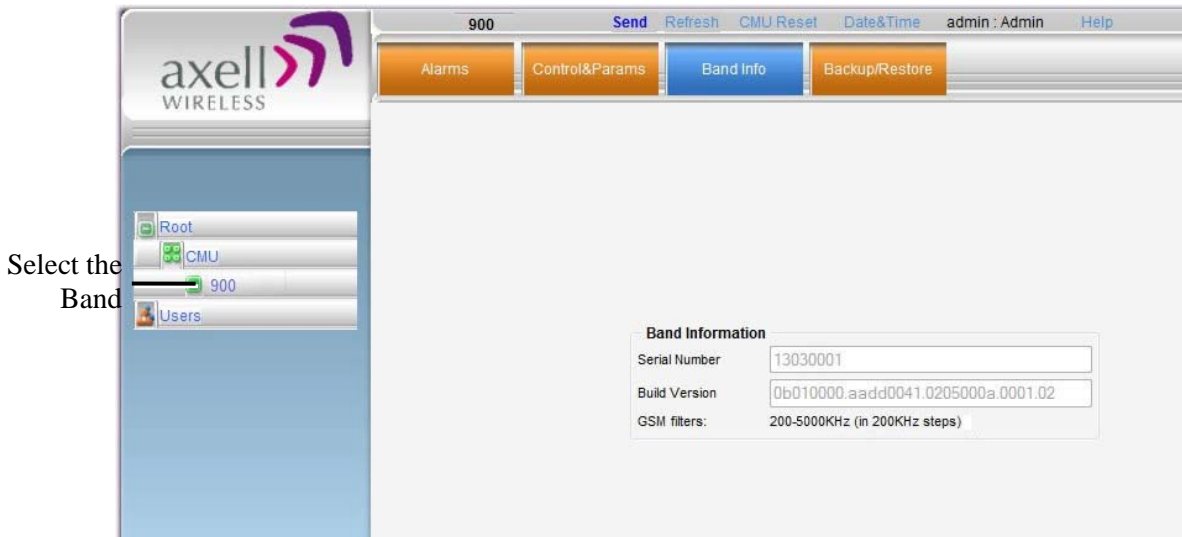
5.2.2 Viewing Band Information

Use the **Repeater Information** screen to view the hardware and software versions of the Axell D-SBR Repeater and to assign the Repeater a recognizable name.

Note: Usually, these fields are grayed-out. Grayed-out fields indicate that the display is Read-only. Active fields indicate that the parameter values can be defined.

To access the Repeater Information window

1. From the Tree Pane, select the repeater **Band** (i.e. 900).
2. Select the **Repeater Info** tab. The relevant parameters are displayed.



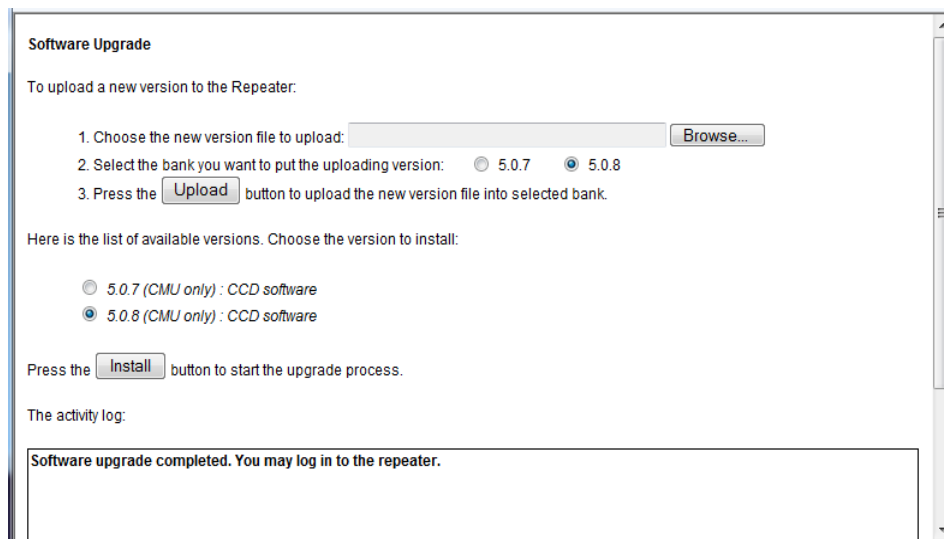
5.3 CMU Software Upgrade

The procedure described in this section is used to upgrade the repeater CMU.

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

To Upgrade the Repeater 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 in the screen.



5.4 Backup/Restore of Repeater Configuration

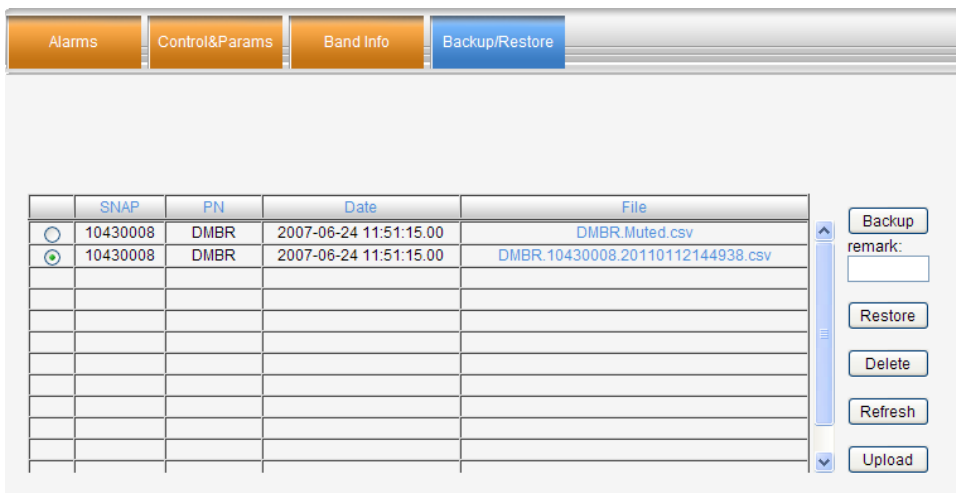
The D-SBR Web GUI management application enables the backup and restore of the repeater configuration files. This section provides a description of the following procedures:

- Backup of current Repeater configuration
- Restoring previous Repeater configuration from available files
- Uploading new configuration file from computer
- Saving configuration settings to other location (i.e. computer)

To access Backup/Restore tab

1. From the Tree Pane, select the **Band** item (i.e. **900**).
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	Used to backup the current repeater configuration. See section 5.4.1.
Remark	Used to assign the repeater configuration file (to be backed up) a recognizable name. See section 5.4.1.
Restore	Used to restore previous repeater configuration. See section 5.4.2.
Delete	Select file from list and click Delete to remove.
Refresh	Click Refresh to list of available configuration files
Upload	Used to upload new configuration file to repeater. See section 5.4.3.

5.4.1 Backup of Repeater Configuration

To perform backup procedure

1. To assign the configuration file a recognizable name, enter a name in the **remark** field.

Note: This must be performed before performing the backup operation; otherwise the file will automatically be assigned a name according to the backup date and unit ID. The name cannot be modified once the backup has been performed.

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.

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.

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

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.

Note: The following figures are only an **example** of the Backup/Restore tab.

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 Monitoring and Troubleshooting

The D-SBR repeater provides the following indications of Repeater failure:

- LEDs: on Repeater front panel and inside the repeater
- Alarms screen in Web access application
- Alarms Log – used to view a record of past generated alarms

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

6.1 LED Troubleshooting

The D-SBR High Power Repeater provides an external LED and two internal LEDs, indicating the repeater operation status.

6.1.1 External LED

A READY LED is located on the underside panel of the repeater.

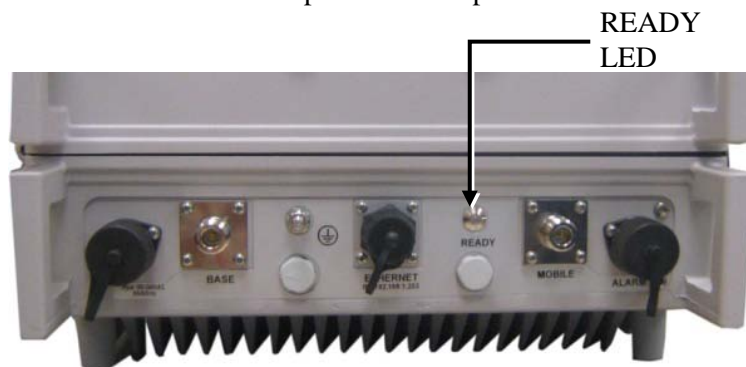


Figure 6-1. READY LED located on Underside Panel

The following table provides a description of the READY LED troubleshooting procedures.

LED	Color	Status and Probable Cause	Recommendation
READY/ POWER (External LED)	Green	Normal operation	-
	Red	Power failure	Corrective action: Turn off the Repeater (this action causes a reset of the function), and turn it on anew. If the fault resumes, replace the unit.
	Blinking Orange/red	User mute System mute - Due to isolation problem or temperature	Check gain of the repeater, if gain is minimum, then it is an isolation problem -> improve isolation. Turn OFF the Repeater (resets the function), and turn it ON again. If the fault resumes, replace the unit.

6.1.2 Internal LEDs

Two LEDs (UL and DL) located inside the repeater provide an indication on the UL and DL signals.

The following figures show an example of the LED locations (the location may differ on your unit).

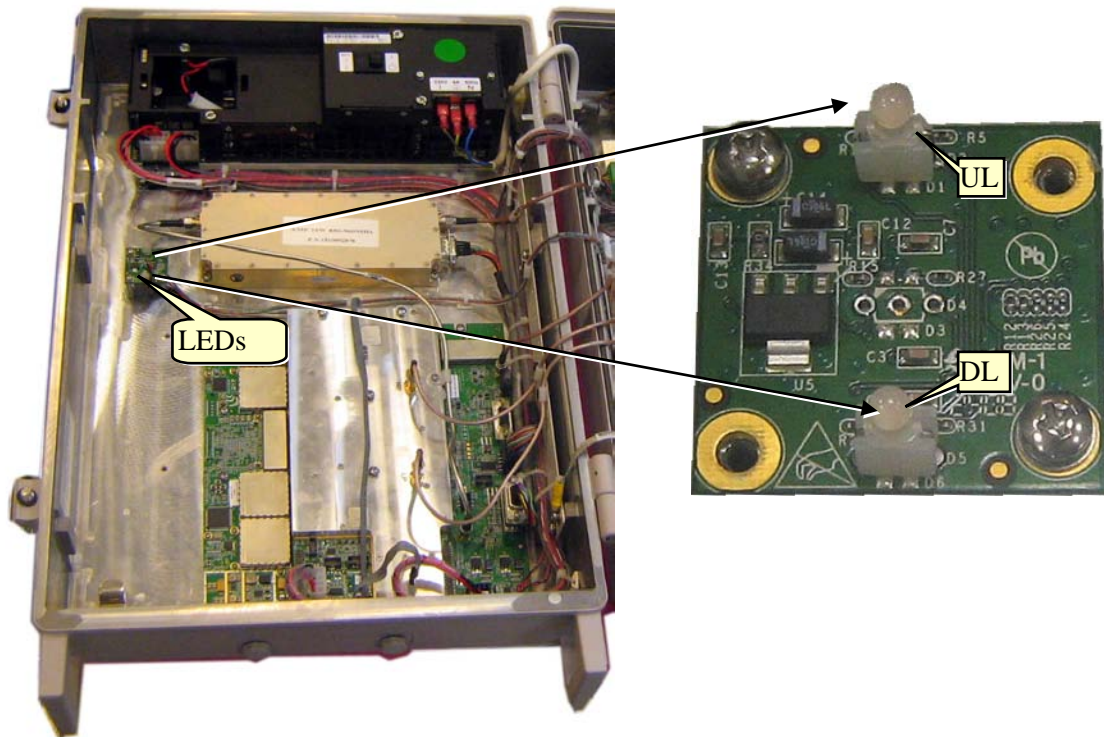


Figure 6-2. Axell D-SBR 3709S Internal View

The following table provides a description of the **UL and DL LED** troubleshooting procedures.

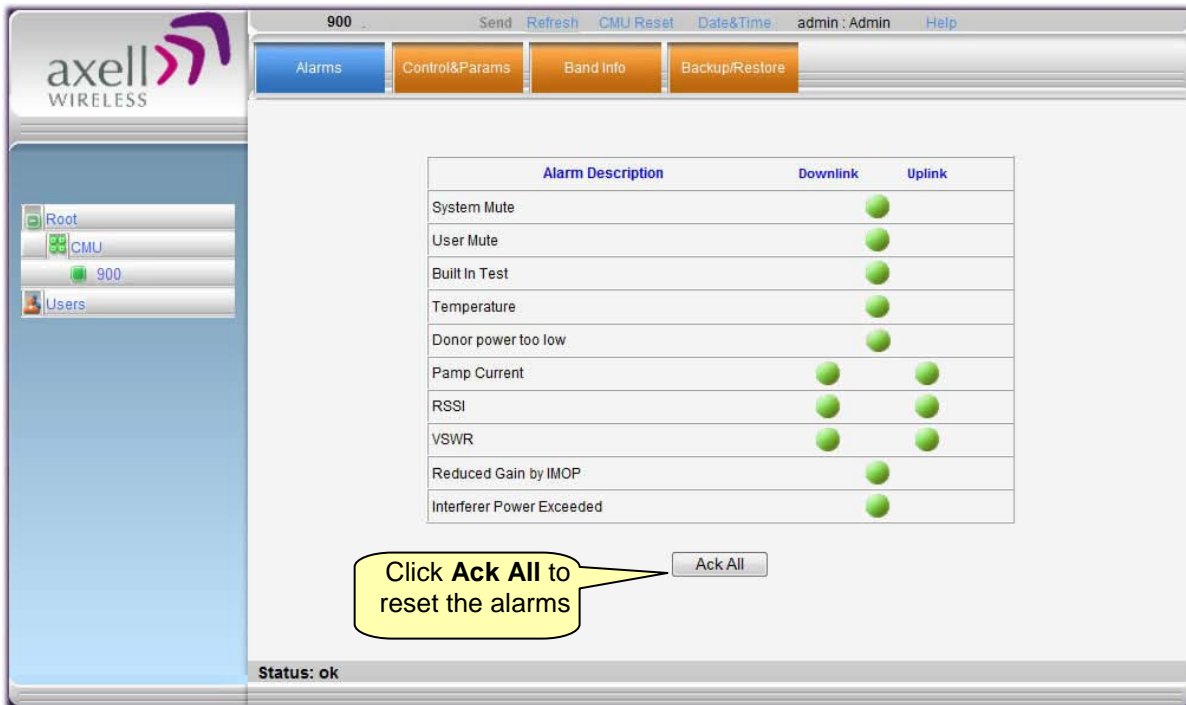
Color	Status and Probable Cause	Recommendation
Green	Normal operation	-
Red	Major error	The Repeater must be replaced
Blinking Green	Low input signal from Donor/Mobile antenna	Check the Donor antenna input power
Orange	High out of band signal input power from Donor/Mobile antenna	Redirect donor azimuth or add attenuator before base port. Caution! Disconnect power to the repeater before connecting the attenuator. Once installed, reconnect power.
Blinking Orange/red	User mute System mute - Due to isolation problem or temperature	Check gain of repeater. If gain is minimum, then it is likely an isolation problem -> improve the isolation. Reset the Repeater by turning it off and on again. If the fault continues, replace the unit.

6.2 Repeater Alarms and Troubleshooting

The Alarms tab provides the alarms generated by the Repeater, enabling the user to monitor the system operation.

To access the Alarms window

From the Tree Pane, select the Band item (e.g. 900) and choose the **Alarms** tab. The relevant parameters are displayed. See the following page for alarm descriptions.



Alarm	Fault and most probable cause	Recommendation
System Mute	Cause: Repeater amplification is muted (automatically).	-----
User Mute	Cause: Repeater amplification is muted (manually) as a result of an operator action.	-----
Built In Test	Cause: Self test.	-----
Temperature	Fault: High temperature. Most probable cause: Unit temperature becomes high. Excessive heat.	Corrective action: Check the Repeater case for external causes (sun, hot environment, air flow is blocked). Eliminate the reason for excessive heat.
Donor Power too Low	The signal from the Donor antenna is too low.	Check connections and antenna position.
PAmp Current	Fault: the Pre Amplifier current exceeds the allowed limits. Fault in the DL or UL path. Most probable cause: Downlink (Uplink) power amplifier module outputs a low current.	Corrective action: Check the LEDs in the Repeater (see 6.1).
RSSI	Fault: Fault in the DL or UL path Most probable cause: Excessively high input signal	Corrective action: Check the LEDs in the Repeater (see 6.1).
VSWR	Fault: The return loss of the Downlink antenna or cable connection exceeds 6 dB (VSWR 3:1). Most probable cause: This alarm provides an indication of the status of the cable connected to the antenna. If a cable is defective, the VSWR is decreased and the alarm is triggered again.	Corrective action: Check cable connected to the antenna.
Reduced Gain by IMOP	Description: Shows when the iMOP mechanism was activated in order to respond to detected oscillations. GREEN – normal operation – no oscillations were detected. RED – oscillations were detected and the system reduced gain in order to eliminate the oscillations.	Corrective action: Check the Donor and Mobile antenna installations for isolation. After isolation is within the required levels, the system will automatically increase gain (since it will no longer affect oscillations) and the LED will turn GREEN.
Interferer Power Exceeded	Indicates if there is any external interference at a level that may affect the operation of the unit. Green – low or no interference. Unit operation is not affected. Red – high external interference that may affect the operation of the unit.	It is recommended to identify the source of the interference and distance the source or the unit from each other.

6.3 Viewing the 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 (see 4.3.3).

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

Appendix A: Specifications (@+25°C)

Electrical		
Parameter	Downlink	Uplink
Frequency Range (GSM)	935-940MHz	896-901MHz
Passband Gain	90 dB	
Passband Ripple	± 2 dB	± 2 dB
Gain Attenuation Range	0-25 dB (in 1 dB steps)	
Composite Output Power	+37dBm	+23dBm
Number of Filters (*)	1 to 8	
Noise Figure @ Maximum Gain (typical)	5 dB	
Propagation Delay	6 µsec	
General		
Power Supply	110VAC, 350W	
Total RF Input Power (No Damage)	+ 10 dBm	
Impedance Level	50 Ohm	
RF Connector	N-Type, Female	
V.S.W.R	1.5:1	
Environmental		
Operating temperature	-4 to +122°F (-20 to +50°C)	
Storage temperature	-22 to +158°F (-30 to +70°C)	
Dimensions W x H x D	540 x 382 x 313 mm	
Weight	33kg	
Enclosure	IP-65, NEMA 4	
Conformance Standard	FCC	

(*) Supports any BW option 200 KHz - 5MHz by setting the start-stop frequency