

High Selectivity Digital Multi-Band Repeater

Product Description and User's Manual
for Axell D-MBR-USA
700LTE/850CELL/1700AWS/1900PCS



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Contact Information

Headquarters	Axell Wireless Aerial House Asheridge Road Chesham Buckinghamshire HP5 2QD United Kingdom Tel: +44 1494 777000 Fax: +44 1494 777002
Commercial inquiries	info@axellwireless.com
Web site	www.axellwireless.com
Support issues	support@axellwireless.com
Technical Support Line, English speaking	+44 1494 777 777

Contact information for Axell Wireless offices in other countries can be found on our web site, www.axellwireless.com

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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General Safety Warnings Concerning Use of This System

Always observe standard safety precautions during installation, operation and maintenance of this product. Only a qualified and authorized personnel should carry out adjustment, maintenance or repairs to the components of this equipment.



Danger: Electrical Shock

To prevent electrical shock when installing or modifying the system power wiring, disconnect the wiring at the power source before working with un insulated wires or terminals.



Caution: RF Exposure

Installation of an antenna must comply with the FCC RF exposure requirements.

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1 Introduction

Axell's Digital Multi-Band Repeater for USA (D-MBR-USA) is an in-building, band-selective repeater with advanced digital filtering capabilities that operates in the LTE 700MHz (*simultaneously in upper and lower band*), CELL 850MHz, AWS 1700MHz and PCS 1900MHz bands. It provides an excellent single unit solution for multi-operators or for operators with a non-contiguous spectrum.

Up to eight or twelve (model dependent) non-contiguous sub-bands can be user configured for each band, where the gain and power of each of the sub-bands can be individually defined.

The Repeater provides highly accurate out-of-band-rejection and simple, GUI based procedures for adjusting the pass band according to the relevant frequency spectrums.

D-MBR-USA includes the SmartALC power control algorithm that automatically optimizes the gain setting by learning the actual range of RSSI levels over a user-specified period of time. The SmartALC 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.

GUI based web management is supported through both Ethernet and remote wireless connections provided by an integrated CDMA modem. Local setup can be performed through a connection to the Ethernet port using a cross-cable.



Figure 1. Axell D-MBR-USA Repeater

1.1 Features

- Indoor Repeater supporting the following bands:
 - LTE 700 MHz – *simultaneously over the complete upper and lower band spectrum*
 - CELL 850 MHz, AWS 1700MHz and PCS 1900 MHz.
- Composite Downlink Output Power:
 - LTE 700 MHz: 33 dBm
 - CELL 850MHz: 33 dBm
 - AWS 1700MHz: 30 dBm
 - PCS 1900 MHz: 30 dBm
- Composite Uplink Output Power: + 27 dBm per band
- RF Gain: 80 dB
- Single module support for Lower/Upper LTE 700MHz band
- Up to 8 or 12 software selectable non-contiguous sub-bands with individual gain and power settings for each sub-band – *the number of supported sub-bands depends on the defined bandwidth of each sub-band*
- High linear amplification and spectral purity
- Excellent out-of-band interference prevention
- Highly accurate frequency selection
- SmartALC™ technology:
 - Automatically sets optimum gain
 - Prevents oscillations and balances coverage
 - Ensures transparent network operation
- Simple mounting in a standard 19" rack
- Simple setup via an intuitive GUI application
- Simultaneous support for both static and dynamic address allocation (two independent IPs)
- Supports SMS and SNMP fault notification
- Remote Web access monitoring and control via either an Ethernet or a wireless connection (implemented through an integrated GPRS/CDMA modem)

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1.2 Models and Ordering Information

Part Number	Product Name	Service & Frequency [MHz]	Supported sub-bands /filter
D-MBR-CH	DMBR Chassis	4 band D-MBR chassis, power supply, communication card	--
D-MBR-CDMA-M	DMBR Modem	D-MBR CDMA 1X Modem	--
D-BM-3307	DMBR 700 33 dBm module	33 dBm, 8 filter 700 LTE module for DMBR	700 - all LTE filters 1.4/3/5/10/15/20 MHz
D-BM-3307-12	DMBR 700 33 dBm module	33 dBm, 12 filter 700 LTE module for DMBR	700 - all LTE filters 1.4/3/5/10/15/20 MHz
D-BM-3308	DMBR 850 33 dBm module	33dBm, 8 filter 850 Cellular module for DMBR	Cellular A , A' , A" , B, B' , up to 25MHz in 2.5MHz steps and all LTE filters;
D-BM-3308-12	DMBR 850 27 dBm module	33 dBm, 12 filter 850 Cellular module for DMBR	Cellular A , A' , A" , B, B' , up to 25MHz in 2.5MHz steps and all LTE filters;
D-BM-3017	DMBR 1700 30 dBm module	30 dBm, 8 filter 1700 AWS module for DMBR	AWS up to 20Mhz in 2.5Mhz steps and all LTE filters
D-BM-3017-12	DMBR 1700 30 dBm module	30 dBm, 12 filter 1700 AWS module for DMBR	AWS up to 20Mhz in 2.5Mhz steps and all LTE filters
D-BM-3019	DMBR 1900 30 dBm module	30 dBm, 8 filter 1900 PCS module for DMBR	PCS up to 20Mhz in 2.5Mhz steps and all LTE filters
D-BM-3019-12	DMBR 1900 30 dBm module	30 dBm, 12 filter 1900 PCS module for DMBR	PCS up to 20Mhz in 2.5Mhz steps and all LTE filters
D-MBR-9P	D-MBR 9 Plexer	9 Plexer to support 700 / 850 / AWS / PCS for DMBR	700 / 850 / 1700 / 1900
D-MBR-7P-7-8-19	D-MBR 7 Plexer	7 Plexer to support 700 / 850 / PCS for DMBR	700 / 850 / 1900
D-MBR-7P-7-8-17	D-MBR 7 Plexer	7 Plexer to support 700 / 850 / AWS for DMBR	700 / 850 / 1700
D-MBR-7P-7-17-19	D-MBR 7 Plexer	7 Plexer to support 700 / PCS /AWS for DMBR	700/1700/1900

Part Number	Product Name	Service & Frequency [MHz]	Supported sub-bands /filter
D-MBR-6P	D-MBR 6 Plexer	6 Plexer to support 850 / AWS / PCS for DMBR	850 / 1700 / 1900
D-MBR-5P-7-19	D-MBR 5 Plexer	5 Plexer to support 700 / PCS for DMBR	700 / 1900
D-MBR-5P-7-8	D-MBR 5 Plexer	5 Plexer to support 700 / 850 for DMBR	700 / 850
D-MBR-4P-8-19	D-MBR 4 Plexer	4 Plexer to support 850 / PCS for DMBR	850 / PCS
D-MBR-3P-7	D-MBR 3 Plexer	3 Plexer to support 700 only for DMBR	700
D-MBR-2P -8	D-MBR 2 Plexer	2 Plexer to support 850 for D-MBR	850
D-MBR-2P -17	D-MBR 2 Plexer	2 Plexer to support AWS for D-MBR	1700
D-MBR-2P -19	D-MBR 2 Plexer	2 Plexer to support PCS for D-MBR	1900
D-MBR-WM-AK	D-MBR AK	Wall mount accessory kit for DMBR	

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.

Smart ALC eliminates the need to perform initial settings for maximal traffic load conditions and on-site gain adjustments.

Smart-ALC maintains the Uplink/Downlink gain balance for system transparency. In addition, Smart-ALC prevents oscillations that may occur due to insufficient isolation while maintaining the gain in a linear range operation by adjusting the repeater paths' gain accordingly.

IMOP (Isolation Measurement and Oscillation Prevention) algorithm effectively reduces oscillation problems.

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 Axell D-MBR-USA Interfaces

The repeater's interfaces are located on the front panel. These include Ethernet port, Mobile and Base antenna connections, Alarm I/O, LED indicators, and power connection

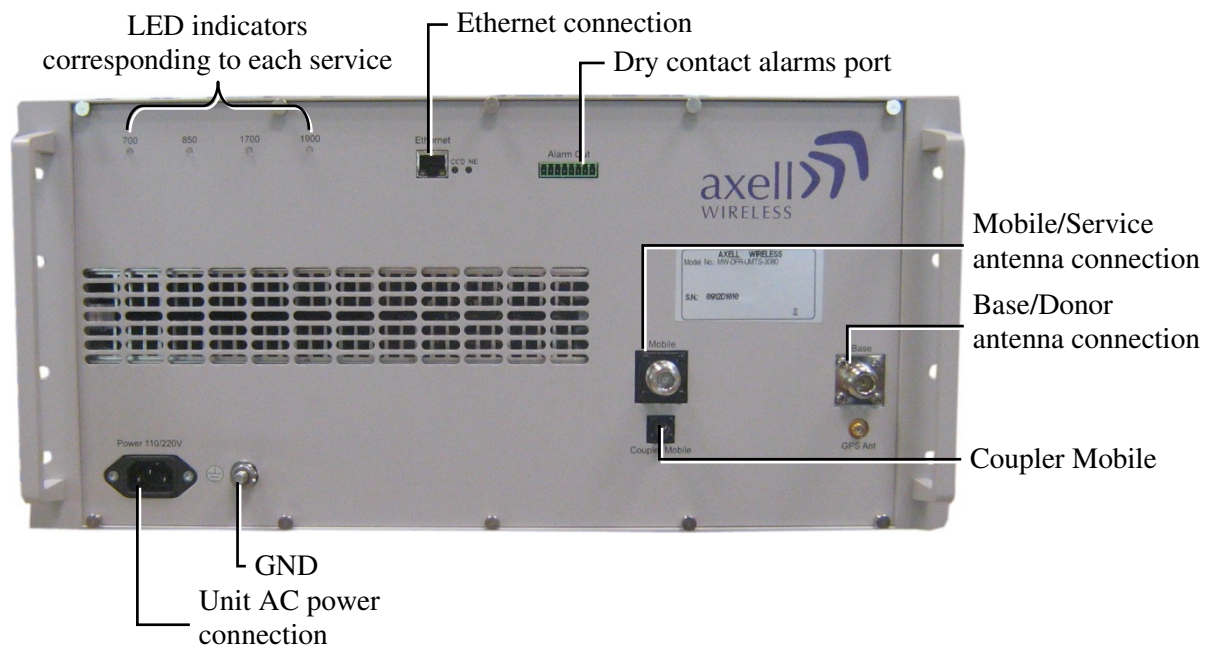


Figure 2. D-MBR-USA Front Panel

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

Interface	Description
ETHERNET	RJ45 Ethernet port for Web management.
MOBILE	Service antenna RF connection. See section 3.8
BASE	Donor antenna RF connection. See section 3.8
COUPLERS MOBILE	SMA Female Mobile coupling connectors (-20 dB). Used to test input signals from the Base and Mobile antennas.
ALARM OUT	Dry-contact alarm port for external alert devices. See section 3.11.
GPS	N/A
POWER	Connection to 110/220VAC.
GND	Ground connection

The front panel also includes the following LED indicators:

Indicator	Description
700 (LTE) 850 (CELL) 1700 (AWS) 1900 (PCS)	One Indicator per –band:
	RED Steady - service muted due to general fault Blinking – service muted by user
	ORANGE Blinking – service initiating on power up or reset Steady – high DL/UL signal or VSWR
	GREEN and ORANGE Blinking- Reduced gain by IMOP
	GREEN Blinking – DL power below threshold Steady - normal service operation
MDM (NEAR RJ45 CONNECTOR)	<ul style="list-style-type: none"> • Green Steady - modem is either not defined, or defined modem is operating normally. • Orange Steady– modem is trying to connect • Red Steady– modem failed to connect
CCD (NEAR RJ45 CONNECTOR)	Green Blinking – normal operation of CCD

1.5 Modem Support

The Repeater supports two types of integrated modems that required different setup procedures:

- CDMA – modem is continuously ON. Setup according to section 4.7.2
- GSM/GPRS – insert SIM card according to section 3.6 and setup up modem according to section 4.7.

2 Antenna Specifications and Installation Requirements

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 usually installed outdoors and is either a directional antenna such as a Yagi or a Panel antenna.

2.1.1 Required Antenna Information

You will require the following antenna information

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

2.1.2 Donor Antenna specifications

- Yagi type or similar – 12 to 20 dBi gain, very sharp beam pointed to the BTS.
- Cable and jumper loss is at least 2dB.
- Example of antenna's typical specifications:
Gain: 8 dBd (=10.1 dBi)
VSWR: < 1:5:1
Impedance: 50 ohm

2.1.3 Installation Criteria

NOTE: Verify that the antennas meet requirements described in section 2.1.

Installation requirements:

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

2.2 Mobile (Service) Antenna

The Mobile (Service) antenna is installed indoors and the type depends on the application.

2.2.1 Required Antenna Information

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

- Service area type and size
- Antenna type and characteristics
- Height
- Length and type of coaxial cable required for connecting the Donor 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.
- Omni directional antenna with a 0 to 2 dBi typical gain, or wide beam with up to 10 dBi gain.
- Example of omni-directional antenna specifications:
 - Gain: 0 to 2 dBi
 - VSWR: < 2:1
 - Impedance: 50 ohm
- Choose an antenna with high side lobe attenuation which enables maximum isolation from the service/ mobile antenna.

2.2.3 Mobile (Service) Antenna 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 20 cm from any personnel within the area.

Note: If the power is divided into more than 5 antennas that have a large coverage area than the separation distance can be less than 20 cm.

- Cable and jumper loss is at least 2dB.

3 Installing the Repeater

3.1 Repeater 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 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.

3.2 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 the Repeater.*

1. Unpack the Repeater kit.
2. Install the Repeater in the rack
3. **For GPRS modems only:** Open the Repeater and insert the SIM card. (CDMA modems do NOT required SIM cards).
4. **Before powering up the Repeater:**
 - Verify isolation between the donor and mobile antennas
 - Verify link between the BTS and Base Repeater.
5. Connect the antennas to the Repeater
6. GND and Power-up the Repeater.
7. **Optional** - Connect the dry-contact alarms. This can be done at any time, before or after powering up the Repeater.

3.3 Required Tools and Materials

- Standard professional tool box (not supplied)

3.4 Unpacking

Upon receiving the D-MBR-USA, 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.
 - D-MBR-USA Repeater
 - AC power cable
 - Alarms cable
 - Ethernet cross cable – for setup connection between computer and Repeater
 - RS232 cable for CDMA modem setup
 - CD with documentation

3.5 Criteria for Repeater Installation Location

NOTE: The D-MBR-USA Repeater is usually installed in a rack-type enclosure in the communication room.

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

- Install the Repeater in a shielded, ventilated, and easy-to-reach area.
- Ventilation:
 - The repeater is cooled by forced air provided internally by high MTBF fan. Allow air flow at front and rear of the Repeater.
 - Ensure that adequate airflow and ventilation within the rack and around the installed components so that the safety of the equipment is not compromised. It is recommended to allow for at least about 2 cm of airspace between devices in the rack.
- 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.
- Only trained and qualified personnel should be allowed to install or replace this equipment.
- Verify that ambient temperature of the environment does not exceed 55°C (131°F)
- **Verify that the equipment is grounded as required – especially the supply connections.**

3.6 For GSM/GPRS Modems – SIM Card Installation

This procedure is NOT relevant for CDMA modems. CDMA modems do NOT require SIM cards.

WARNING! Be sure that the repeater is powered off (disconnect the power connector) before inserting or removing the SIM card.

To install the SIM card

1. Remove the Repeater front panel by releasing the captive screws.



Figure 3-1. Opening Front Panel

2. Release the captive-screw on the modem card and gently pull modem card *half-way* out.

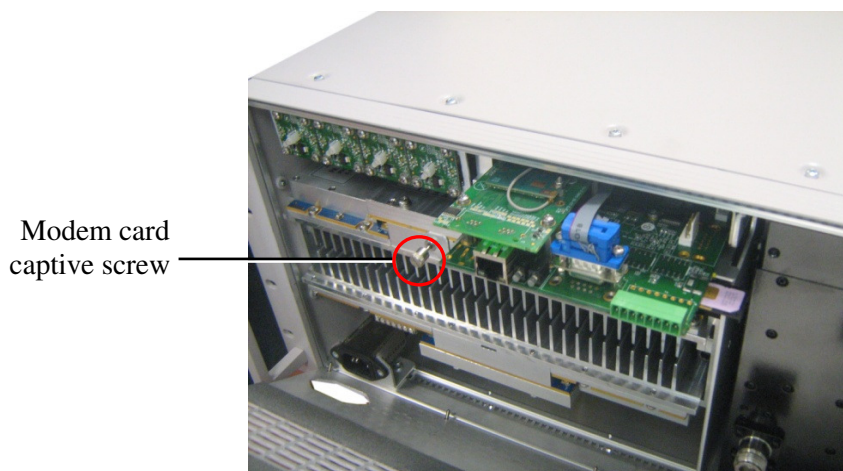
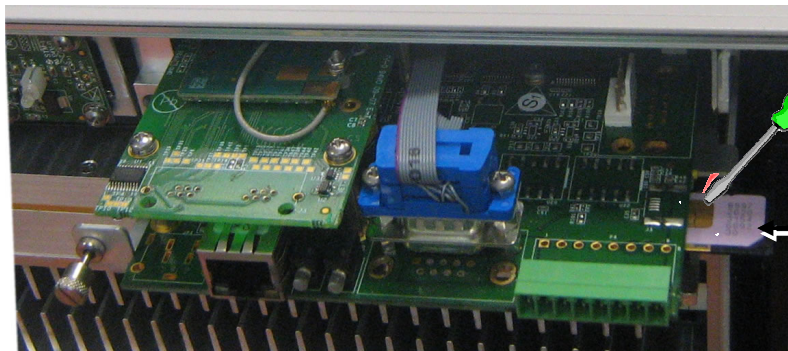


Figure 3-2. D-MBR Captive Screw

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- Press the protrusion on the right side to extract the SIM card tray.



- . Press right-side protrusion CONTINUOUSLY until the SIM tray comes OUT.
- ! You may need to use as small sharp object (*do NOT use a pencil*).
- ! Insert SIM card and push in gently till it CLICKS.

Figure 3-3. Extracted SIM Card Tray

- Place the SIM card in the tray and push the tray in gently *until it clicks*.
- Push the card in again, close the cover and tighten the captive screws.



Figure 3-4. D-MBR with Secured Cover

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 BTS and Repeater

3.7.1 Verifying Isolation between Donor and Mobile Antennas

The isolation between the Base/Donor and Mobile/Service antennas is critical especially for high gain, outdoor applications.

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.

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

3.9 Grounding

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
- The protective grounding conductor is copper with a 10AWG cross-section.

To ground repeater

Connect main ground to Repeater grounding lug.



3.10 Power Connections

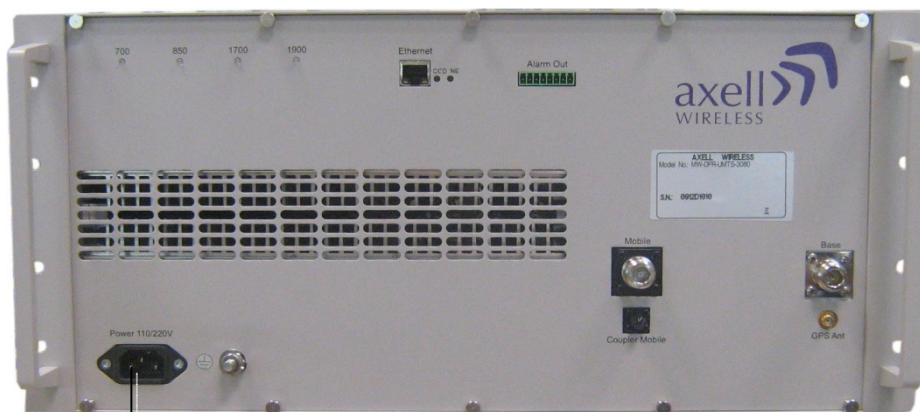
The Repeater operates from the power source. The power consumption is Max 320W for 3 bands, Max 400W for 4 bands.



WARNING! Electrical Shock

- A. 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.
- B. The AC input should be supplied on a 10A dual pole circuit breaker protected line with 3mm contact gap suitable for the end application.

1. Connect the GND.
2. Locate the 110/220V AC power outlet.
3. Connect the AC power cable to the Repeaters front panel Power connector.



*AC Power
connector*

3.11 Dry Contact Alarm Connections

NOTE: The dry-contact alarms may be connected at any time – before or after the Repeater is powered-up.

This option can be used to monitor third party equipment such as air-conditioners or power supplies that are located in the communication room.

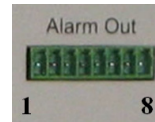
The D-MBR-USA 8-pin **Alarm** port supports dry-contact alarms and system alarm monitoring from an external source.

To activate alarms

1. Connect the alarm according to the table in this section.
2. Activate and set the alarm in the External Alarms tab, according to section 4.5.

To connect the dry contact alarm

Connect the supplied Alarm 8-pin connector (DEGSOM P.N: 15EDGK-3.5-08P-14-00A) to the D-MBR-USA **ALARM** port, located on the front panel.



Note 1: The wire connections to the Alarm connector can be secured with screws (no soldering is required).

Note 2: In order to activate an alarm, it must be configured via the Web Management application (see 4.5)

Pin No.	Description	Operation
1	External Alarm_1	Triggers CMU Alarm ID 1 if set in the External Alarms tab.
2	GND	Ground, galvanic short to Repeater chassis.
3	External Alarm_2	Triggers CMU Alarm ID 2 if set in the External Alarms tab.
4	GND	Ground, galvanic short to Repeater chassis
5	External Alarm_3	Triggers CMU Alarm ID 3 if set in the External Alarms tab.
6	Dry contact-common	Dry contact relay common port
7	Dry contact relay Normally Closed (NC)	Normally Closed – Dry contact is <i>Normally Closed</i> to the relay common port. The contact is <i>closed</i> (shorted) during normal Repeater operation <i>opens</i> when either a Major Alarm is detected or the Repeater is switched off.
8	Dry contact relay Normally Open (NO)	Normally Open – Dry contact is <i>Normally Open</i> to the relay common port. The contact is <i>open</i> during normal Repeater operation and <i>closes</i> when either a Major Alarm is detected or the Repeater is switched off.

4 Initial Setup and Commissioning

This section provides the setup procedures for the D-MBR-USA 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) through a local Web connection and verifying that the system is operating properly.

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).
2. If you are not familiar with the Axell Web Access application, we suggest you quickly review the section on Navigating the Web GUI Application. It is only a couple of pages and you will find it useful.
3. For each service, adjust the signal levels and configuring the sub-bands.
4. After the required coverage is attained for the location, verify that no Alarms are generated before connecting to the main control center.
5. Set the Repeater time and date.
6. Configure the external alarms.
7. Configure the communication and system parameters.

4.1 Open a Local WEB Session to the Repeater

4.1.1 Connect the Repeater to the Computer

Interconnect the Repeater Ethernet port and the computer Ethernet port using the supplied Ethernet cross-cable.



Figure 5.D-MBR-USA and Computer Ethernet Connection

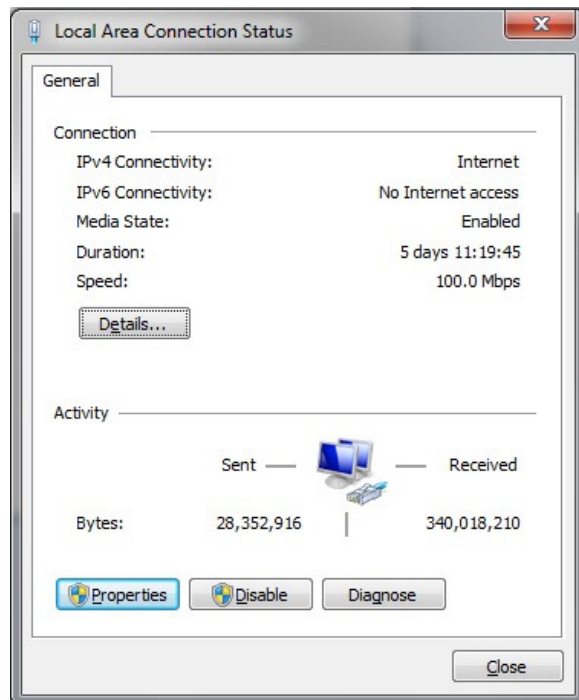
4.1.2 Configure the Computer Network Parameters

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.

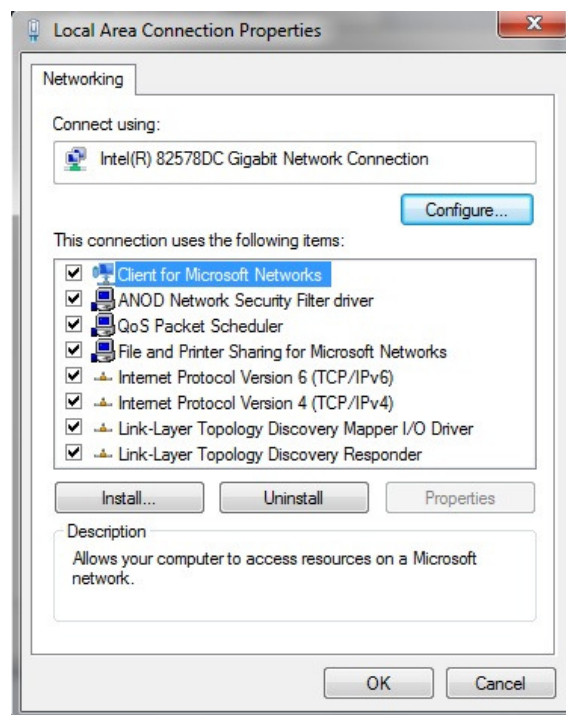
To configure the computer's network parameters:

1. Click the **Start** menu and choose **Control Panel**.
2. In the **Control Panel**, click **Network and Internet**.

- 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.



- Click the **Properties** button in the displayed **Local Area Connection Status** dialog.

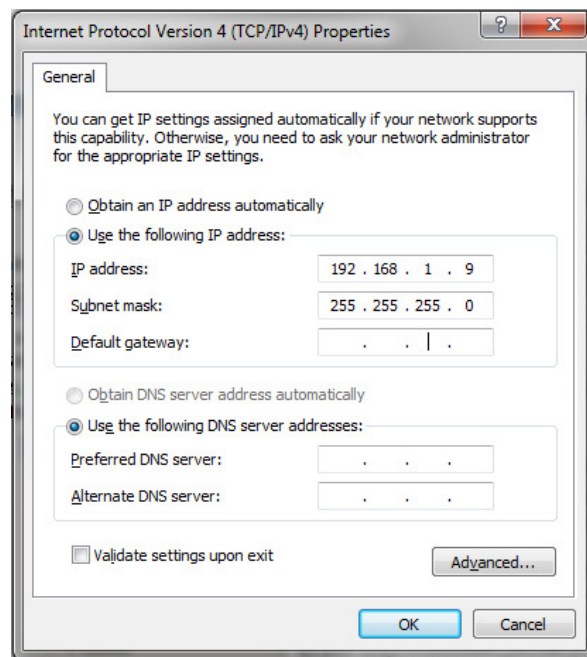


- In the Items list, double-click the **Internet Protocol Version 4 (TCP*IPv4)** item. The **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog appears.

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

6. 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)



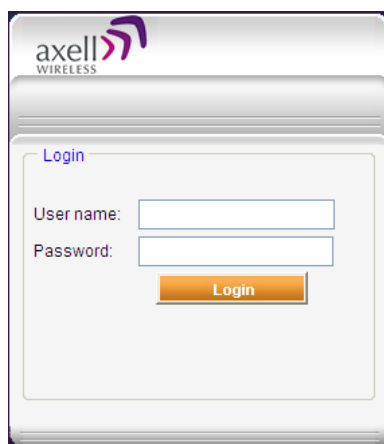
- Click **OK**. The computer communication parameters are now defined and you can open a session to the Repeater.

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 one of the Flash-enabled browsers listed in the system requirements.
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. Continue according to the following section.

4.2 Navigating the Web GUI Application

This section describes how to navigate the Web Management application. Each service (AWS, LTE, PCS and CELL) has a dedicated set of configuration and monitoring menus (Alarms, ConfigParams and Band Info). The Web Access interface provides three groups of options, listed in the left side Topology Tree items:

- **CMU** – management, monitoring , configuration and administration options at the Repeater level.
- **Sevice (LTE/CELL/AWS/PCS)** – band level RF parameters control and monitoring options.
- **Users** – user definition and management options and enables changing user passwords.

The figure below shows the Alarms pane for the LTE service.



4.2.1 Operation Buttons

The following Operation buttons are available.

LTE Send Refresh CMU Reset Date&Time admin : Admin Help

Item	Description / Values
<i>Selected Tree Item (i.e. LTE)</i>	Shows the currently selected topology tree item. Values: CMU, Band (e.g. LTE), 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	Provides access to date and clock settings.
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 Service Pane and Tabs

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



Item	Description / Values
Alarms	Band level alarms
Control and Params	RF settings and configuration of sub-channels.
Band Info	Shows band related identification information

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	Repeater identification, SW versions.
Communication Configuration	Used to set IP, SNMP and SMS notification, modem communication parameters and AEM related settings.
Alarms Log	Log of previous and current system level alarms
Axell-CMU Alarms	Current system alarms
External Alarms	Used to enable and configure any connected external alarms.
Axell-CMU SW Upgrade	Options for CMU software upgrade.

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) and a step-by-step procedure of the signal level and channel configuration procedure.

4.3.1 RF Gain Setting Criteria

The RF Gain is set automatically by the Repeater's SALC function (section 0). The function sets the optimum gain without exceeding the isolation limit.

The gain range is up to 80dB for *all bands* and is set by default to its maximum value of 80dB.

The gain will then be modified automatically to its optimum value by the SALC mechanism. This mechanism performs gradual learning of traffic load characteristics and adjusts the Repeater RF Gain accordingly. (See section 0 for more information on the SALC mechanism).

4.3.2 Adjusting the Signal Levels and Configuring Channels

The **Control and Params** (parameters) window is used to configure up to 8 channels for each band and the RF parameters. This section describes each of the fields.

Up to 8 sub-bands referred to as *filters* can be defined, where each sub-band is *individually* defined by setting the following:

- Bandwidth (start and stop frequency) - each sub-band can be set over specific bandwidths. For example, LTE sub-channels can be defined over the full (upper and lower) LTE for the following bandwidths: 1.4MHz, 3MHz, 5MHz, 10MHz or 15MHz
- Maximum power
- Maximum gain
- Gain delta

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

*Refer to the **Band Info** tab for information on the relevant bandwidths for each frequency. If you attempt to define a bandwidth (block) that is not appropriate for the selected frequency, the appropriate notification will appear.*

Note that the number of supported channels depends on the technology as indicated below.

Filter BW	Technology	Frequency bands	Number of FPGA Resources
2.5Mhz-20MHz (in 2.5MHz steps)	CDMA	850/1700/1900 MHz	2
1.5,2.5,11Mhz	CDMA	850MHz	2
1.4,3,5,10,15,20Mhz	LTE	700/850/1700/1900 MHz	2

To adjust the signal levels and configure the channels

1. In the left pane (Topology Tree), select the band (LTE, CELL, etc.) whose sub-bands are to be configured.
2. Click the **Control and Params** tab. The relevant window appears.

The window is divided into the following areas:

- System – overall parameters for the *selected service*.
- Filter definitions – used to define up to 8 sub-bands and their RF parameters.
- Sub-bands view – graphical display of defined sub-bands for the selected service.

Note: The following pane shows the LTE **Control and Params** tab (other band tabs are similar, except for the parameter values).

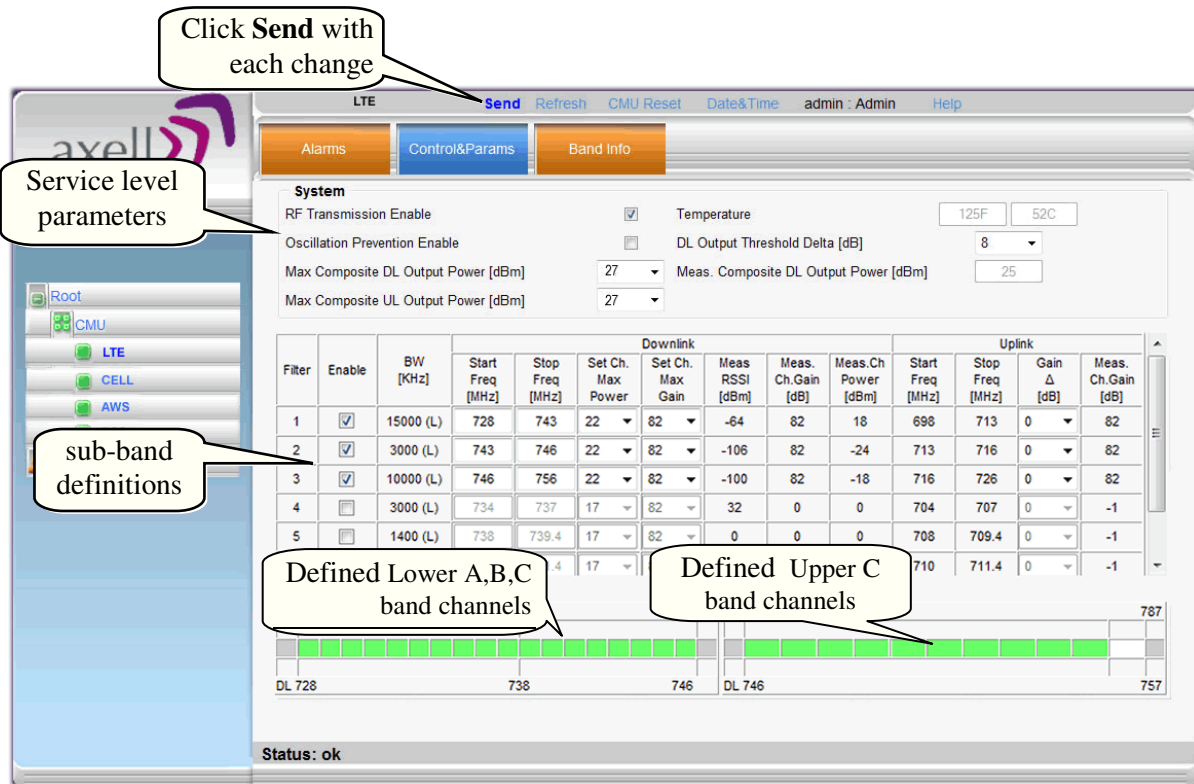


Figure 4-6. Params and Control Tab

3. In the System area:

- Verify that the **RF Transmission Enable** parameter is checked. (This parameter is used to disable (and re-enable) RF transmission for the band.)
- Set the user defined maximum output signal level for this band by defining the **Max Composite DL Output Power** according to your site requirements (click **Send**). (The *Measured* Composite DL Output Power is displayed in the adjacent field.)
If the Max Composite DL Output Power 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. This is the maximum output signal level for this band.

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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. Configure each required sub-band (Filter) as follows and then click **Send**:

- Check the **Enable** box to activate the sub-band. The configuration parameters in that row will be available.
- Set the **Start** and **Stop** DL Frequency (MHz) in the corresponding fields. (The UL frequencies are automatically defined according to the DL values).
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 that provide the appropriate BW (i.e. for LTE 1.4MHz, 3MHz, 5MHz, 10MHz or 15MHz).
- Set the (Downlink) Max Gain as follows: by default, the **MAX Gain** (DL) parameter is set to its highest level (82dB). Change the **Channel Max Gain** (DL) according to the measured/calculated input power and isolation measurements.
The recommended Maximum Gain setting is approximately 15 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**. The defined sub-band will appear in the display in the appropriate area.
 - Repeat the procedure until the desired coverage is achieved.
-

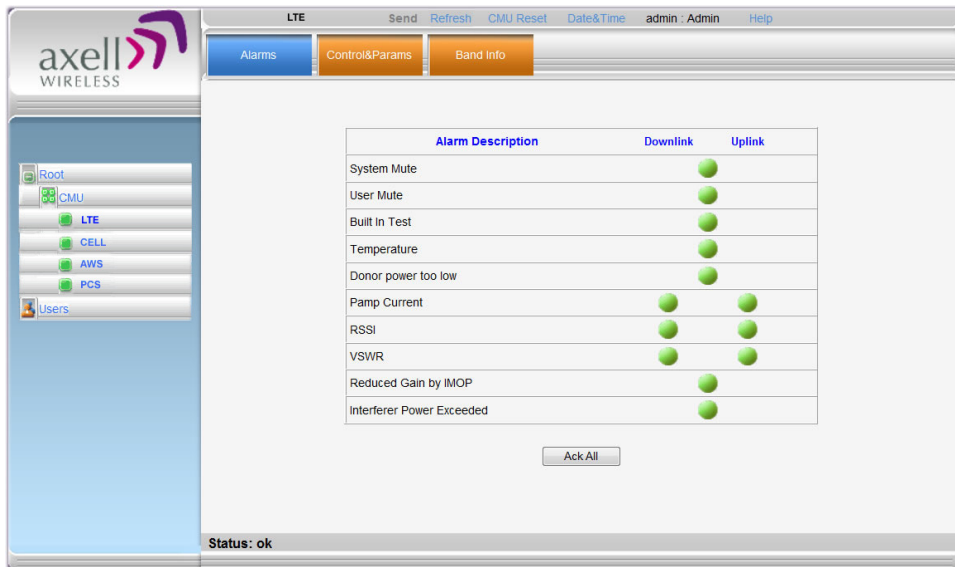
6. More information on parameters for the *selected* sub-band:

- 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.

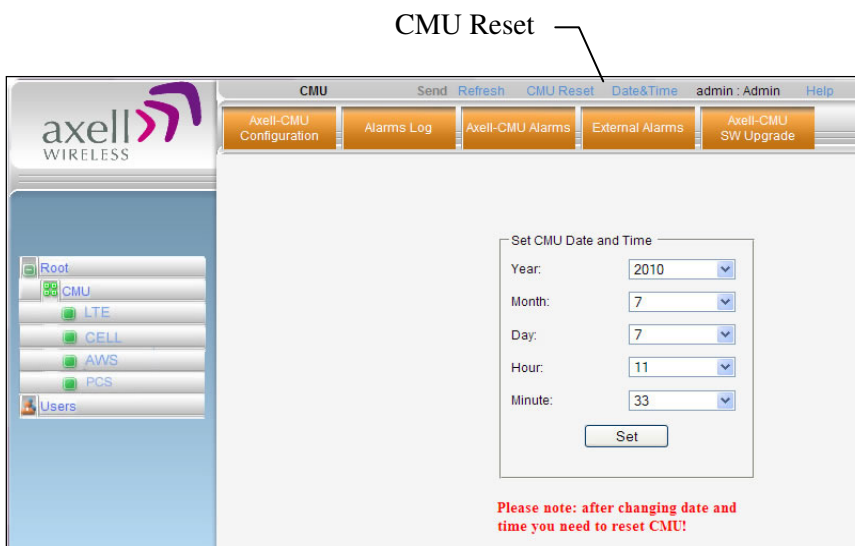


4.4 Setting Date and Time

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.



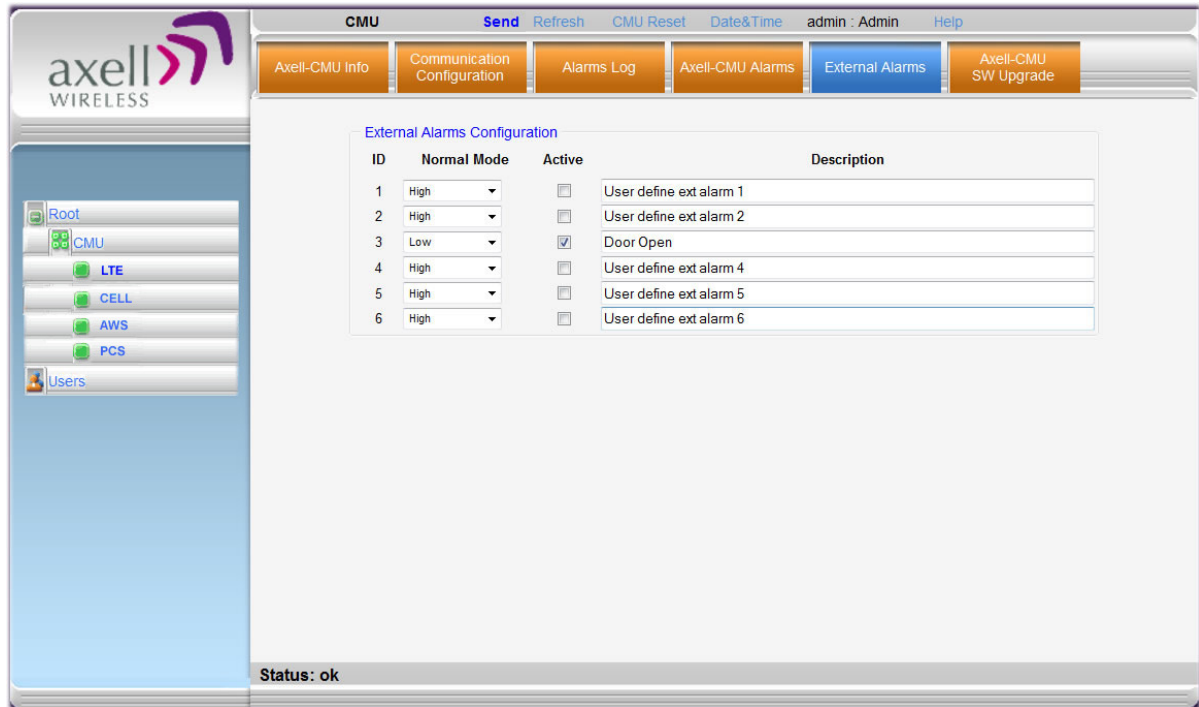
3. Set the date and time parameters and click on **Set**.
4. Click **CMU Reset**.

4.5 Configuring External Alarms

Any connected alarms (section 3.11) 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.

4.6 Communication and System Parameters

The Communication Configuration tab is used to define the IP parameters, modem parameters, and trap notification (SNMP or SMS).

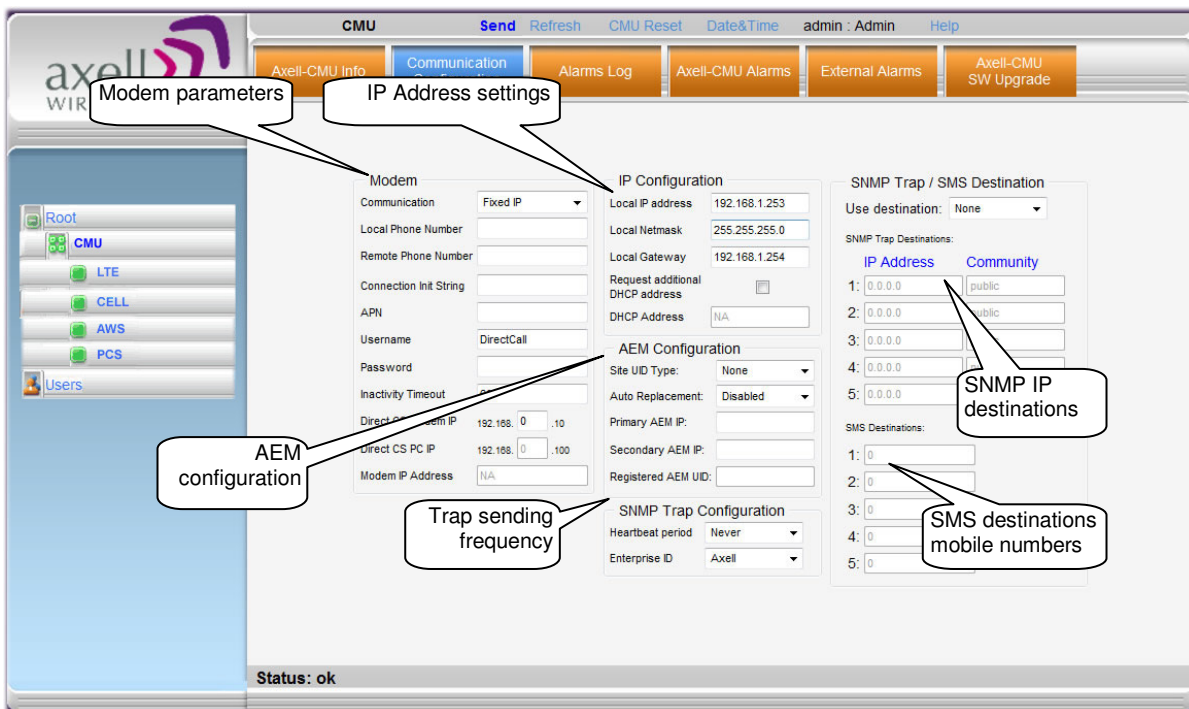
This section describes how to access the dialog. The following sub-sections provide detailed information on each configuration option.

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.

The various options are grouped into dedicated areas as illustrated below.



4.6.2 IP Address Configuration

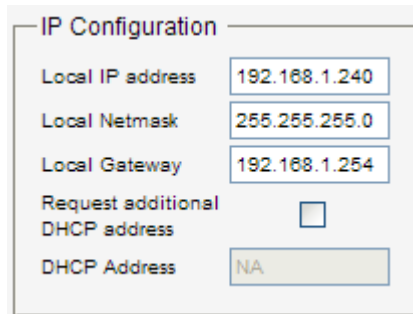
The Repeater supports both Static and DHCP addresses. A unique technology enables applying both types to the *same* Ethernet port. Both addresses may enable local and remote management.

- 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.

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To assign the unit IP address

1. Access the **CMU Configuration** tab according to section 4.6.1.
2. To assign the unit addresses:
 - **Local address** - in the **IP Configuration** area, assign the unit the 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.



The screenshot shows the 'IP Configuration' form with the following fields:

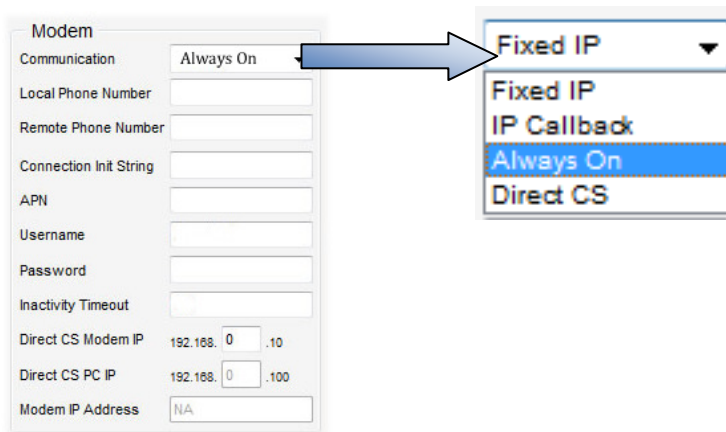
- Local IP address: 192.168.1.240
- Local Netmask: 255.255.255.0
- Local Gateway: 192.168.1.254
- Request additional DHCP address:
- DHCP Address: NA

4.7 Modem Communication Setup

This section describes how to access the modem communication settings. The following sections describe how to configure for specific communication requirements: packet switch (GSM/GPRS or CDMA), Direct Circuit Switch (GSM/GPRS only) or other settings.

To access the modem settings

Click the **Communication Configuration** tab and in the **Modem** area choose **Communication** field as illustrated below (the options are described in the following table).



The screenshot shows the 'Modem' configuration form. The 'Communication' field is set to 'Always On'. A blue arrow points from this field to a dropdown menu that is open, showing the following options: Fixed IP, Fixed IP, IP Callback, Always On (highlighted), and Direct CS.

In the communication field, select ...	For this communication mode.
Fixed IP.	Modem OFF
Always ON.	Packet Switch mode: refer to the GSM/GPRS or CDMA sections below – according to your modem. Additional parameters: define according to your operator requirements. Note: After the modem connects to the network, the Modem IP Address is displayed.
Direct CS.	Direct Circuit Switch. (See 4.7.3) Additional parameters: Also (depending on the configuration required by your operator), define the Connection Init string, User Name, Password and Direct CS Modem IP (an internal address used for Web surfing).
IP Callback	Special mode for specific installation types.

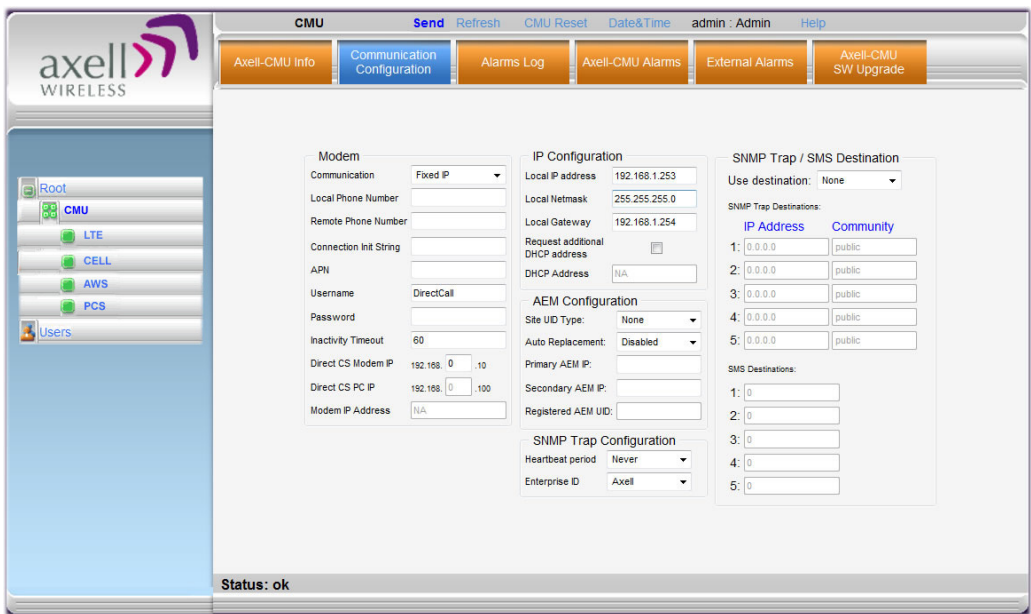
4.7.1 GSM/GPRS Communication

For GSM/GPRS communication, GSM/GPRS modems are installed. These modems support both a Packet Switch and a Direct Circuit Switch connection.

NOTE: It is assumed that the SIM card is already installed according to section 3.6.

To define the modem parameters

1. Click **CMU** in the left tree pane and select the **Communication Configuration** pane.



2. In the **Modem** area, set the **Communication** mode as **Always ON**.
3. Define any additional parameters as required by your operator.

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4.7.2 Verizon CDMA Modem Communication Configuration

Configure the modem parameters and activate the modem in the Verizon network.

4.7.2.1 Configuring the Modem Parameters

Modem Communication: Always On Local Phone Number: Remote Phone Number: #777 Connection Init String: APN: Username: DirectCall Password: Inactivity Timeout: 60 Direct CS Modem IP: 192.168.0.10 Direct CS PC IP: 192.168.0.100 Modem IP Address: NA	IP Configuration Local IP address: 192.168.1.253 Local Netmask: 255.255.255.0 Local Gateway: 192.168.1.254 Request additional DHCP address: <input type="checkbox"/> DHCP Address: NA AEM Configuration Site UID Type: None Auto Replacement: Disabled Primary AEM IP: Secondary AEM IP: Registered AEM UID: SNMP Trap Configuration Heartbeat period: 20 min Enterprise ID: D-MBR USA	SNMP Trap / SMS Destination Use destination: None SNMP Trap Destinations: <table border="1"> <thead> <tr> <th></th> <th>IP Address</th> <th>Community</th> </tr> </thead> <tbody> <tr><td>1:</td><td>0.0.0.0</td><td>public</td></tr> <tr><td>2:</td><td>0.0.0.0</td><td>public</td></tr> <tr><td>3:</td><td>0.0.0.0</td><td>public</td></tr> <tr><td>4:</td><td>0.0.0.0</td><td>public</td></tr> <tr><td>5:</td><td>0.0.0.0</td><td>public</td></tr> </tbody> </table> SMS Destinations: 1: 0 2: 0 3: 0 4: 0 5: 0		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
	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																		

To configure for a CDMA modem

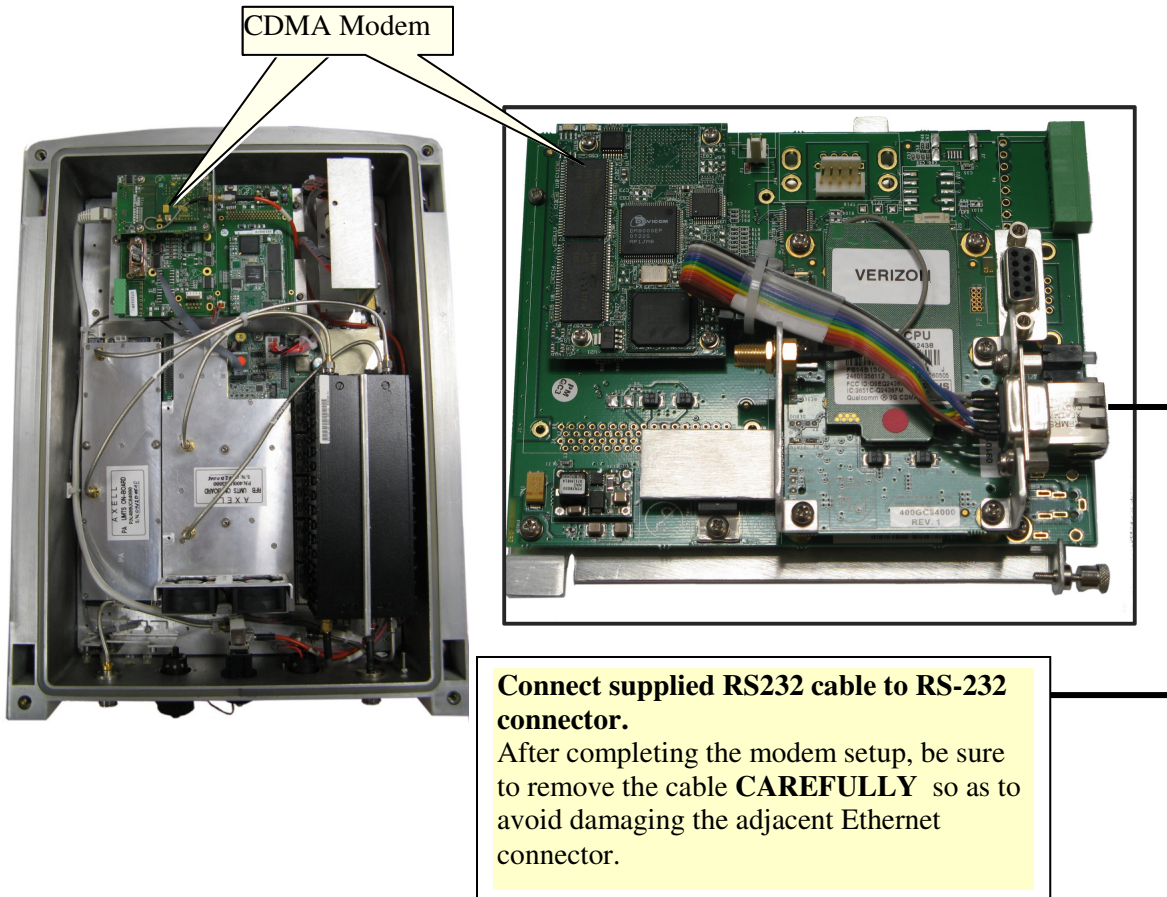
- In the **Modem** area above, verify that:
 - Modem Communication = **Always On**
 - Remote Phone no. = **#777**
 - Modem Init String = *empty field* (blank)
 - Enterprise ID = **Verizon**.
- Activate the modem in the Verizon network according to the following section.

4.7.2.2 Activating the modem in the Verizon network

WARNING!!! Settings of the Modem are sensitive to changes. Insert values and parameters with particular care in order to enable the remote connection.

Below is the activation procedure for the modem in the Verizon Wireless Network.

1. Open the Repeater and connect the RS-232 cable (provided in the accessory kit) to the CMU card RS-232 connector.



2. Open HyperTerminal with (or equivalent program)
3. Set connection speed to 115,200, no flow control.
4. Type AT → and you should get a response OK.
5. Use the command ATD*22899; (ensure there is a semi-colon “;” after the dial string, otherwise you will make a circuit data call). This will start your OTASP (Over-The-Air, Service Provisioning) session.

The following messages should be displayed:

- +WOT1: “Programming in Progress”
- +WOTS: “SPL unlocked”
- +WOTP: “PRL download OK”
- +WOTM: “MDM download OK”
- +WOTC: “Commit successful”
- +WOT2: “Programming Successful!”

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IMPORTANT* After programming, remove the RS-232 cable for proper modem function on the Verizon network.

6. After a few minutes, a Modem IP Address should appear on the CMU GUI screen. This indicates the modem is functioning on the Verizon Network. The module is then set up for both voice and data.

4.7.3 Direct Circuit Switch Connection

A. On the Repeater, set the Repeater Modem parameters (above) as follows:

- Communication - **Direct CS**
- To provide security, set the **User Name** and **Password** for the repeater (the same User Name and Password will be defined on the dial-up connection).
- You *may* modify (optional) the **Direct CS Modem IP** – this is the Web address used to open a Repeater session. Otherwise, the default displayed value can be used.

B. On your computer, set up a dial-up connection as follows:

1. Via **Network Connections**, create a **Dial-up** connection on your computer (Connect using a dial-up modem). The procedure may vary slightly depending on your Operating System.
2. Define the parameters as follows:
 - ISP connection name – user defined, recognizable name for this connection for future reference.
 - Phone Number – the number corresponding to the SIM card installed on the Repeater.
 - User Name and Password – the User Name and Password (if assigned) that you allocated in the Modem parameters in the Communication dialog (see previous section).

C. Open a session to the Repeater:

1. On your computer, click the relevant dial-up connection item or the icon, to open a dial-up route to the Repeater.
2. Open a Web Browser and enter the **Direct CS Modem IP** that is defined in the Modem parameters on your Repeater. A session will be opened to the Repeater.

4.8 Configuring Notification Method - SNMP Trap or SMS

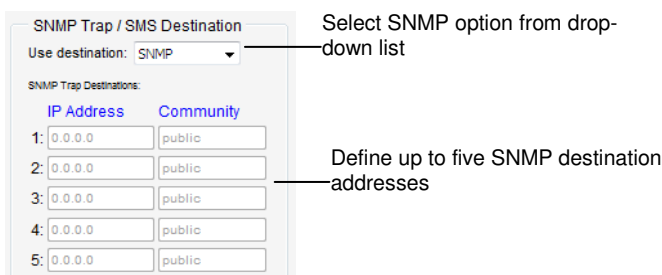
The Repeater can be configured provide fault notification *either* by sending traps to defined IP addresses *or* by sending an SMS message to configured destinations (only *one* option can be selected).

4.8.1 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.



SNMP Trap / SMS Destination

Use destination: **SNMP** (Select SNMP option from drop-down list)

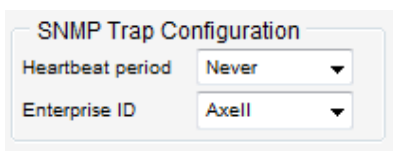
SNMP Trap Destinations:

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

(Define up to five SNMP destination addresses)

3. In the **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.



SNMP Trap Configuration

Heartbeat period: **Never**

Enterprise ID: **Axell**

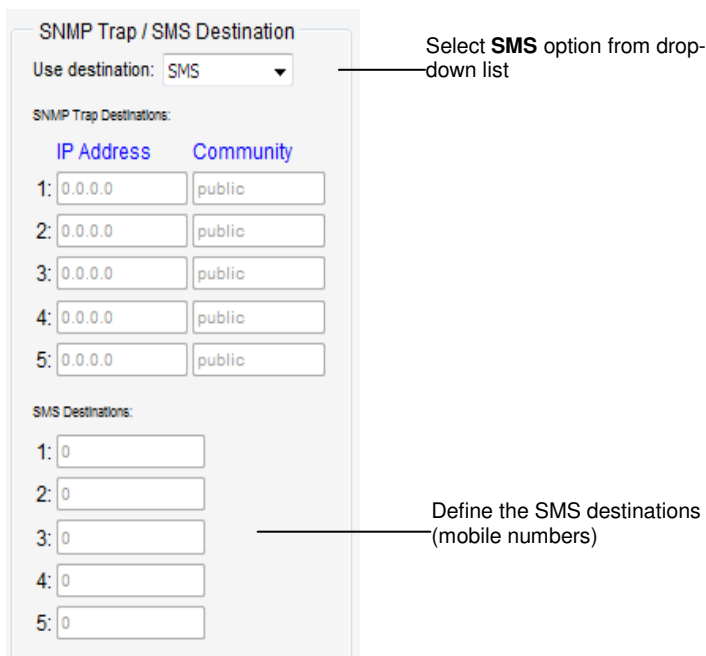
4. Click **Send**.

4.8.2 Configuring SMS Notification Destinations

You may configure up to five SMS destinations (mobile numbers).

To set SMS Destination parameters

1. In the **Use Destination** field, select the **SMS** option from drop-down list.



SNMP Trap / SMS Destination

Use destination: **SMS** (Select **SMS** option from drop-down list)

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

SMS Destinations:

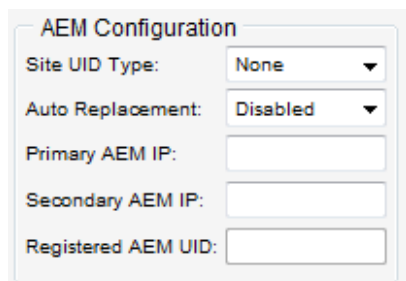
1:	0
2:	0
3:	0
4:	0
5:	0

Define the SMS destinations (mobile numbers)

2. Define up to five SMS destinations (for example, + xxx541234567):
3. Click **Send**.

4.8.3 AEM (Axell Element Manager) Configuration

Configure the AEM parameters provided by the system administrator so that the 3018D Repeater is integrated in the network and can be centrally managed.



AEM Configuration

Site UID Type: **None**

Auto Replacement: **Disabled**

Primary AEM IP:

Secondary AEM IP:

Registered AEM UID:

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 two authentication levels are defined on the Repeater. You may add new users, according to one of the available profiles, modify or delete existing users.

5.1.1 User Levels

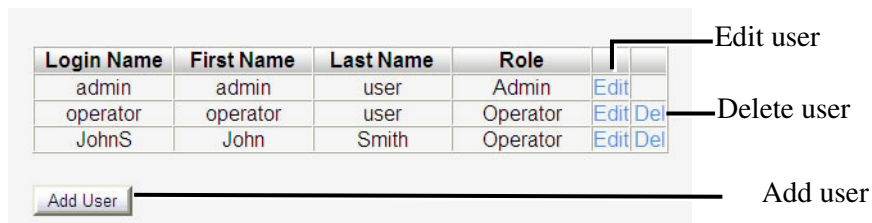
Two user levels are available:

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

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.

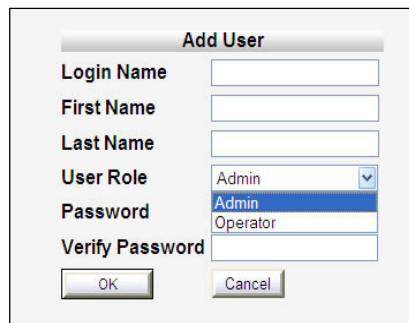
PRODUCT DESCRIPTION AND USER'S MANUAL

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.


 A screenshot of the 'Add User' dialog box. It contains the following fields: 'Login Name' (text input), 'First Name' (text input), 'Last Name' (text input), 'User Role' (dropdown menu with 'Admin' selected), 'Password' (text input), and 'Verify Password' (text input). At the bottom are 'OK' and 'Cancel' buttons.

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**.


 A screenshot of the 'Edit User' dialog box. It contains the following fields: 'Login Name' (text input with 'JohnS'), 'First Name' (text input with 'John'), 'Last Name' (text input with 'Smith'), 'User Role' (dropdown menu with 'Operator' selected), 'Password' (text input), and 'Verify Password' (text input). At the bottom are 'Update' and 'Cancel' buttons.

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.

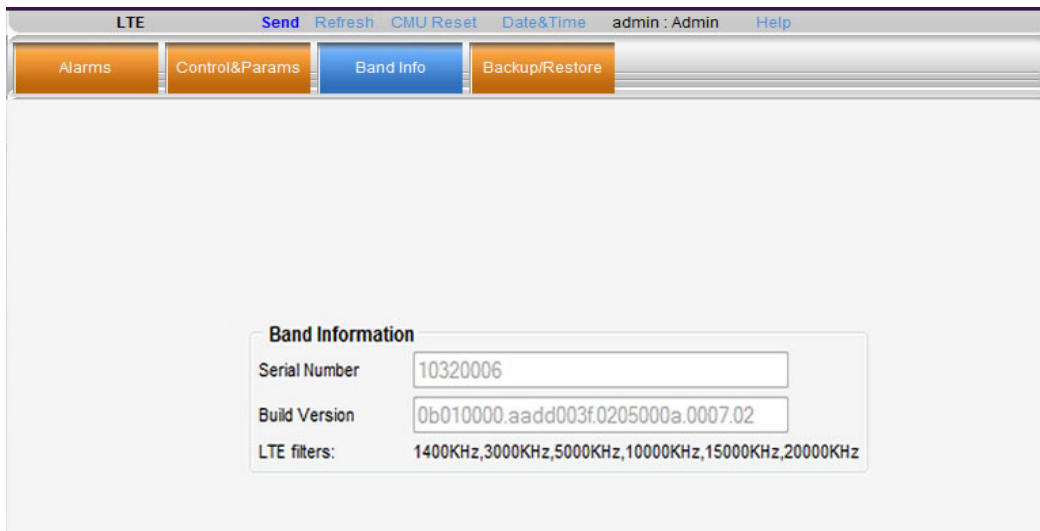
5.2 Viewing Band Information

Use the **Band Information** screen to view the hardware and software versions of the D-MBR-USA Repeater.

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 Band Information window

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



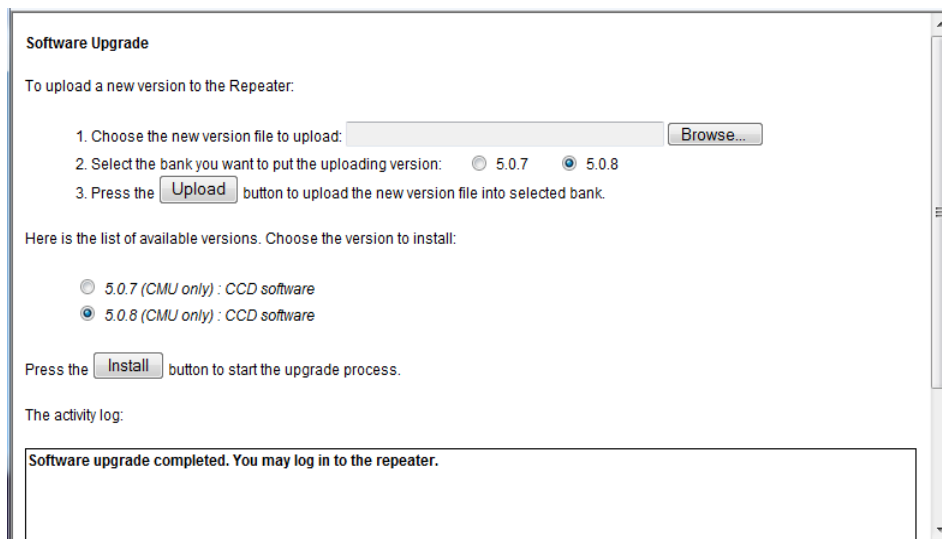
5.3 CMU Software Upgrade

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.



Software Upgrade

To upload a new version to the Repeater:

1. Choose the new version file to upload:
2. Select the bank you want to put the uploading version: 5.0.7 5.0.8
3. Press the button to upload the new version file into selected bank.

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

Press the button to start the upgrade process.

The activity log:

Software upgrade completed. You may log in to the repeater.

6 Monitoring and Troubleshooting

D-MBR-USA provides an automatic system shutdown and recovery mechanism that is activated when certain alarms are active. In addition, the repeater provides three types of indications and troubleshooting tools:

- Alarms screen in Web access application
- Alarms Log – used to view a record of past generated alarms
- Status LEDs on Dual-Band Repeater front panel

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

6.1 Shutdown and Recovery Mechanism

The D-MBR-USA shutdown-recovery mechanism mutes the system in the event of specific alarms generation and re-activates the signal after the alarms are shut off.

The following alarms cause the system to enter the shutdown mode:

- Uplink RSSI.
- Downlink RSSI.
- Detection of oscillation.
- Uplink high output power out of range.
- Downlink high output power out of range.

The system periodically samples the above alarms at 0.5 seconds intervals (by default). If an alarm is active for nine sequential loops (e.g. $0.5 * 9 = 4.5$ seconds), the system will 'shut down' by muting the PAMP.

When the system is in “Shutdown” mode, the recovery function will periodically sample the alarms every two hours (by default). If the relevant alarm is no longer active, the system will return to normal operation mode and reactive the signal.

The sampling and timing mechanisms can be modified by a technician level user.

The shutdown mode can be turned off by the user and the system re-enabled in normal operation mode by setting RF Transmission Enable to ON.

6.2 Alarms Screen

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 (LTE/CELL/AWS/PCS) and choose the **Alarms** tab. The relevant parameters are displayed.

*NOTE: The alarm status remains RED once the alarm was triggered. To return the status to normal operation (Green), click the **ACK All** button.*



Ack All

Click **Ack All** button to reset the alarms

Alarm Descriptions

Alarm	Fault and most probable cause and Recommendation
System Mute	Generates an alarm when Repeater amplification is muted (automatically)
User Mute	Repeater amplification is muted (manually) as a result of an operator action.
Built In Test	Self test.
Temperature	High temperature. Most probable cause: Unit temperature becomes high. Excessive heat. Recommendation: 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	Generates an alarm when the Power exceeds the allowed limits. Fault in the DL or UL path.

Alarm	Fault and most probable cause and Recommendation
	<p>Most probable cause: Downlink (Uplink) power amplifier module outputs a low current.</p> <p>Recommendation: Check the LEDs in the Repeater</p>
RSSI	<p>Fault in the DL or UL path</p> <p>Most probable cause: caused by a excessively high input signal</p> <p>Recommendation: Check the LEDs in the Repeater</p>
VSWR	<p>This alarm is triggered when the return loss of the Downlink antenna or cable connection exceeds 3 dB (VSWR 6:1).</p> <p>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.</p>
Reduced Gain by IMOP	<p>Shows when the IMOP mechanism was activated in order to respond to detected oscillations.</p> <p>GREEN – normal operation – no oscillations were detected.</p> <p>RED – oscillations were detected and the system reduced gain in order to eliminate the oscillations.</p> <p>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) and the LED will turn GREEN.</p>
Interferer Power Exceeded	<p>Indicates if there is any external interference at a level that may affect the operation of the unit.</p> <p>Green – low or no interference. Unit operation is not affected.</p> <p>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.</p>

6.3 Alarms Log

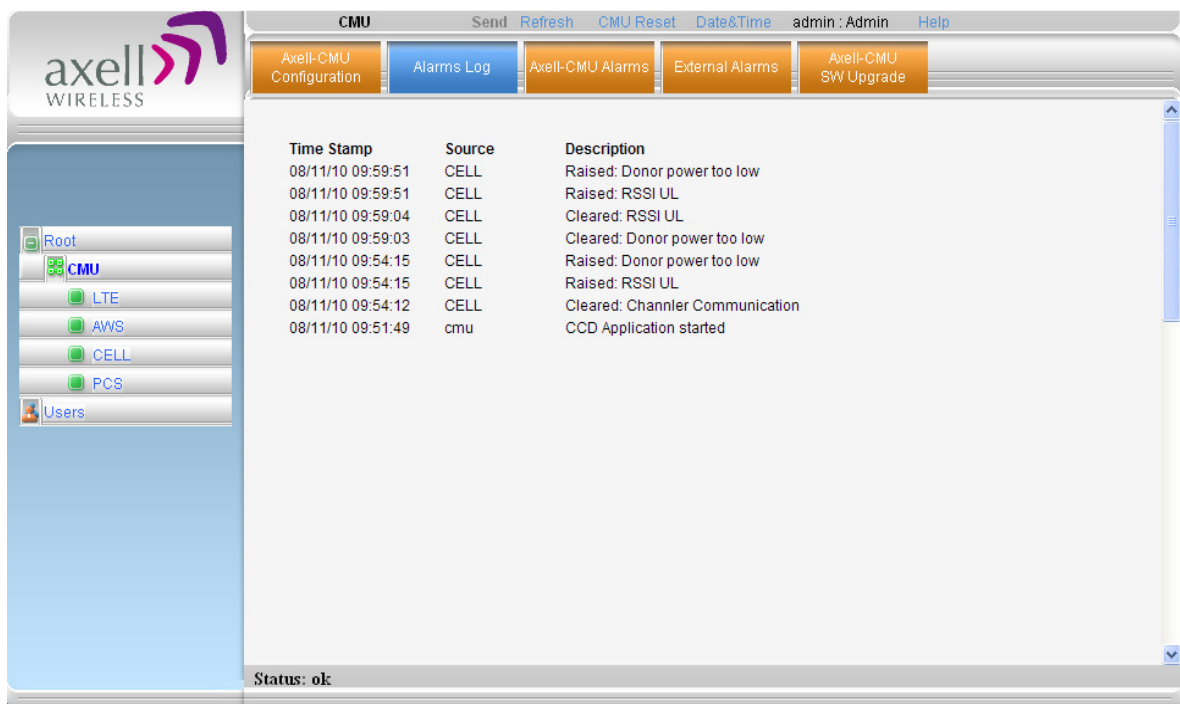
The Alarms Logs screen lists the alarms (events) that have occurred. The CMU maintains log files listing every alarm triggered and in the Repeater. This screen provides an analysis tool to get information of any event that has occurred, its originator, when, if they return, and their type.

*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.

The following figure provides an example of the Alarms Log.



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 D-MBR-USA Front Panel LED Troubleshooting

The D-MBR-USA Repeater includes LED indicators for each supported band on its front panel (see 1.4) in addition to the two Ethernet LEDs. The following table provides a description of the Service and Ethernet LED statuses and troubleshooting procedures.

LED	Color	Status and Probable Cause	Recommendation
Service	Green	Normal operation	-
	Red	Major error	The Repeater must be replaced
	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.
CCD	Blinking Green	System initiating	-
MDM	Steady Green	Modem isn't defined or modem operating normally.	
	Blinking Green	Modem is trying to connect.	
	Steady Red	Modem is trying to connect	

Appendix A: Specifications

RF Per Band

Parameters	DL				UL			
	LTE 700 MHz	CELL 850 MHz	AWS 1700 MHz	PCS 1900 MHz	LTE 700 MHz	CELL 850 MHz	AWS 1700 MHz	PCS 1900 MHz
*Frequency Range (MHz)	L728-746	869-894	2210-2155	1930-1990	L698-716	824-849	1710-1755	1850-1910
	U746-757	-	-	-	U776-787	-	-	-
Selectable Blocks	Up to 8 or 12 sub-bands model dependent							
Passband Gain (max)	82 dB							
Passband Ripple	± 2.5 dB							
Gain Attenuation (1dB steps)	0-25 dB							
Composite Output Power	+ 33dBm	+33dBm	+30dBm	+30dBm	+27dBm	+27dBm	+27dBm	+27dBm
Propagation Delay	< 6 µsec							

* U – Upper LTE frequency; L – Lower LTE Frequency

**700 - all LTE filters 1.4/3/5/10/15/20 MHz; Cellular A , A' , A'' , B, B' , up to 25MHz in 2.5MHz steps and all LTE filters; AWS up to 20Mhz in 2.5Mhz steps and all LTE filters; PCS up to 20Mhz in 2.5Mhz steps and all LTE filters

Power Supply

Parameter	Description
Power Supply	110/240 VAC
Power Consumption	Max 320W for 3 bands, Max 400W for 4 bands
Total RF Input Power (No Damage)	+ 10 dBm
Impedance Level	50 Ohm
V.S.W.R	1.5:1

Mechanical Specifications

Parameter	Description
Size B x H x D	450 mm x 225 x 500 mm (19" x 5U x 19.7")
Weight	77 lbs(35Kg) for 3 bands, 86 lbs (39Kg) for 4 bands

Environmental Specifications

The Repeater is designed for indoor installation.

Parameter	Description
Environmental conditions	Indoor, forced cooling
Operating temperature	-10 to +50 °C (14 to 122 °F)
Storage temperature	-40 to +85 °C (-40 to +185 °F)
Humidity	85%
MTBF, Complete System	> 70 000 hrs.

Connectors

Connector	Type
RF Connectors: Base/Mobile	N-Type, Female
Communications	RJ-45
Coupling Connectors (-30dB) Base/Mobile	SMA Female
Alarms - optional	Dry Contacts – 8 pins (See section 3.11) Normally Closed (NC); Common; Normally Open (NO)

(*) All parameters are typical @ +25°C