DIGImini

AMERICAS

Digital Multi-band Series

User Manual – 00031UM Rev. 6.3

The most important thing we build is trust

COBHAM

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About This Manual

This Product Manual provides the following information:
- Description of the Repeater unit
- Procedures for setup, configuration and checking the proper operation of the unit
- Maintenance and troubleshooting procedures

Ordering information and DIGImini Models to which this manual applies:

ORDERING INFORMATION for DIGImini Americas Repeaters		
Identification	**Description**	**Part Number**
DIGI Mini 850&SMR800/1900	DIGI MINI 850&SMR800/1900 21/20 dBm 8 Filters	D-MINI-2108CS-2019
DIGI Mini 700U/AWS1	DIGI MINI 700 Upper /AWS1 21/20 dBm 8 Filters	D-MINI-2107U-2017
DIGI Mini AWS1+3	DIGI MINI AWS1&3 20 dBm 8 Filter SB	D-MINI-2017F-SB
DIGI Mini 700l/AWS1+3	DIGI MINI 700 Lower /AWS1&3 21/20 dBm 8 Filters	D-MINI-2107L-2017F
DIGI Mini AWS1/1900	DIGI MINI AWS1/1900 20/20 dBm 8 Filters	D-MINI-2017-2019
DIGI Mini AWS1/2600	DIGI MINI AWS1/2600 20/20 dBm 8 Filters	D-MINI-2017-2026
DMCU	External DIGI MINI Control Unit with GPRS Modem	DMCU
DMCU	External DIGI MINI Control Unit with CDMA1X Modem	DMCU-CDMA
DMCU	External DIGI MINI Control Unit with WCDMA (Telit 864) Modem	DMCU-WCDMA
DIGI Mini Accessory Kit	DIGI mini 4 bands Accessory upgrade kit	D-MINI-4B-AK
Digi Mini 19" bracket	Digi Mini 19" bracket	D-MINI 19-BRKT

For whom it is intended

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

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Safety Instructions and Warnings

Throughout this manual, important safety warnings and admonishments are included to warn of possible hazards to persons or equipment. A safety warning identifies a possible hazard and then describes what may happen if the hazard is not avoided. The safety warnings – in the form of Dangers, Warnings and Cautions must be followed at all times. These warnings are flagged by the use of a warning icon, usually the triangular alert icon seen below. The exclamation point within the triangular alert icon is intended to warn the operator or service personnel of operation and maintenance from factors relating to the product and its operating environment, which could pose a safety hazard.

Guarantees

- All antennas must be installed with lightning protection. Damage to power modules, as a result of lightning are not covered by the warranty.
- Switching on AC or DC power prior to the connection of antenna cables is regarded as faulty installation procedure and therefore not covered by the Cobham Wireless warranty.

General Safety Warnings Concerning Use of This System

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

Exclusive Remedies

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

Compliance with FCC

> ⚠ **WARNING!!** This is NOT a CONSUMER device. This device is designed for installation by FCC LICENCEES and QUALIFIED INSTALLERS. You must have an FCC LICENCE or express consent of an FCC Licensee to operate this device.
> Unauthorized use may result in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation.

FCC Part 15

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

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

- Reorient or relocate the Donor antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Unauthorized Changes to Equipment

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

FCC RF Exposure Limits

This unit complies with FCC RF exposure limits for an uncontrolled environment. This equipment must be installed and operated with a minimum distance of 20cm between the radiator and any person's body.

Antenna Installation

Installation of an antenna must comply with the FCC RF exposure requirements. The antenna used for this transmitter must be mounted on outdoor or indoor permanent structures.

The maximum antenna gain for indoor operation is 2.2 dBi and for the external antenna is 9dBi. Cable loss of at least 2dB is taken into account for all cases.

Antennas having a gain greater than these are strictly prohibited for use with this device. In indoor applications the antenna must be installed at a minimum separation distance of 20cm from all nearby persons.

Compliance with IC

> ⚠ **WARNING!!** This is NOT a CONSUMER device. It is designed for installation by an installer approved by an ISED licensee. You MUST have an ISED LICENCE or the express consent of an ISED licensee to operate this device.

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

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

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

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the antenna and your body.

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

Cet appareil est conforme aux limitations de la norme IC RSS-102 concernant l'exposition aux radiations dans un environnement non contrôlé. Cet appareil doit être installé et utilisé avec une distance minimale de 20cm entre l'antenne et le corps de l'utilisateur.

Conforme aux CNR

> Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
> 1) l'appareil ne doit pas produire de brouillage;
> 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Required for the installation/Requis par l'installation

> The installation must comply with directives provided in the following link / L'installation doit être conforme aux directives fournies dans le lien suivant:
> http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08942.html

General Safety Warnings Concerning

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

Caution labels!	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.
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: Safety to personnel	• Before installing or replacing any of the equipment, the entire manual should be read and understood. • The user needs to supply the appropriate AC or DC power to the repeater. Incorrect power settings can damage the repeater and may cause injury to the user. • Please be aware that the equipment may, during certain conditions become very warm and can cause minor injuries if handled without any protection, such as gloves.
Caution: Safety to equipment	• When installing, replacing or using this product, observe all safety precautions during handling and operation. Failure to comply with the following general safety precautions and with specific precautions described elsewhere in this manual violates the safety standards of the design, manufacture, and intended use of this product. • Changes or modifications not expressly approved by the party responsible • for compliance could void the user's authority to operate the equipment • 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.
Warning: Restricted Access Location	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.
Attention: Electrostatic Sensitivity	• Observe electrostatic precautionary procedures. • ESD = Electrostatic Discharge Sensitive Device. • 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.

Table of Contents

1 SYSTEM DESCRIPTION

Cobham Wireless' new DIGImini repeater (digital mini repeater) is an innovative flexible multiband coverage solution optimized for in-building applications.

Cobham Wireless' DIGImini offers a completely new range of possibilities. With multi technology (e.g GSM/WCDMA/LTE) applications, multiple filters are required in the operation bands. The DIGImini is designed to provide high performance digital filters with a competitive price when compared to legacy analogue mini repeaters.

Up to four different frequency bands can be implemented in two dual band DIGImini repeaters.

Each DIGImini repeater is available in a range of single-band and dual-band models, where specific single-band models can be updated to dual-band (requires license).

Easy "plug and play" allows our customers to add services as needed, thus minimizing their CAPEX. Software Defined Filtering of up to 8 sub-bands in each dual band configuration and up to 16 sub-bands for quad band configuration.

Individual Gain and ALC settings for each sub-band for multi-technology applications (e.g. GSM/ WCDMA/LTE), as well as for single and multi-operator applications.

A state-of-the-art Interference Mitigation and Oscillation Prevention (IMOP) algorithm is used to measure the isolation between the antennas and gain is reduced immediately to prevent oscillation.

The DIGImini is connected to one donor antenna placed on the roof of the building and the radiating coaxial cable or antennas in the area to be covered. Configuration and monitoring of the DIGImini can be done through an intuitive web management GUI. Remote management is done via optional wireless modem.

With the Cobham Wireless advanced supervision and control software -AEM, the entire fleet of digital multiband repeaters can be monitored.

Figure 1-1. Cobham Wireless DIGImini Repeater

1.1   Features and Capabilities

- Up to four frequency bands in two compact enclosures
- Software defined filtering of up to 8 sub-bands (up to 16 sub-bands per quad-band system)
- Individual gain and ALC settings for each sub-band for single and multi-operator applications.
- SmartALC™ technology per sub-band:
  - Automatically sets optimum gain
  - Prevents oscillations and balances coverage
  - Ensures transparent network operation
  - Supports multi-operator functionality
- Lightweight and compact footprint for easy installation
- Continuously monitors and adapts to the RF environment via Auto gain feature
- Easy commissioning and setup via web-based browser
- Optional DIGImini External modem– provides complete remote control and monitoring capabilities:
  - WCDMA/GPRS modem support
  - SMS messages
  - Ethernet network connection and SNMP traps
  - Battery backup – "last gasp" error reporting to AEM
- Optional upgrades via a purchased license file* (relevant for specific models):
  - Single band models can be upgraded to support dual-band.
  - Upgrade to support basic remote monitoring options via direct Ethernet connection to the network (supports SNMP traps) or connection to an external modem. *

* Upgrade options for single-band to dual-band software upgrade and for remote monitoring (Ethernet network or external modem) are implemented using two different licenses.

1.2   Single Unit and Dual-Unit Installations

DIGImini installation varies depending on whether one or two units are installed:

- Single DIGImini unit (supports single-band or dual-band) – details in Chapter 3.
- Dual DIGImini assembly (up to four bands) – details in Chapter 4

1.3   Single Band Unit Upgradeable to Dual-band

Single-band units can be upgraded to support two bands by acquiring the appropriate license file from Cobham Wireless support team.

1.4   Smart-ALC Function

The Smart Automatic Level Control (Smart-ALC) is an innovative algorithm for automatic repeater gain adjustment per sub-band.

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.

1.5   DMCU - Optional

The DMCU (DIGImini Control Unit) provides complete remote control and monitoring capabilities over WCDMA/GPRS, including Remote control via SMS.

The DMCU is an optional control unit that is ordered separately and is installed *externally*, where one DMCU can support a single DIGImini unit as well as an a DIGImini Quad-band assembly.

NOTE: Refer to the DMCU User Manual for the complete description of the DMCU and the configuration and management capabilities provided by the unit.

1.6   DIGImini Interfaces

The DIGImini is supplied in two physical configurations:

- Single unit supporting (one or) two bands;
- Two cascaded units supporting up to four bands.

Power supplies *dedicated to each unit* are connected externally. An optional DMCU supporting an external modem is also connected externally, where a single DMCU can serve two cascaded units.

The interfaces are located on the *front* and on the *side* panels.

1.6.1 Front Panel Interfaces

The image below shows the unit (the wallmount bracket is not shown).
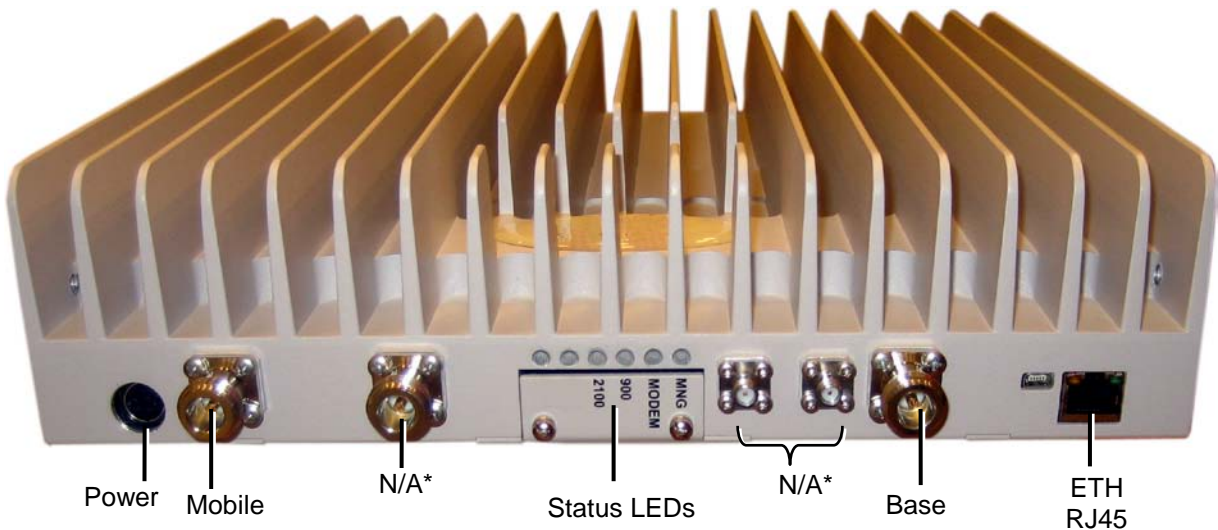
Figure 1-2: DIGImini Dual-Band Front Panel

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

Port	Description
MOBILE	Service antenna connections.
BASE	Donor antenna connections.
DC Power (12V)	Circular, 4-PIN.
RJ 45	Used for setup. *If the support for external modem License file is acquired, the Ethernet port can also be connected to the network or used to connect to an external modem.* **ATTENTION!! Do not connect to the network unless you have purchased either the DMCU or the external modem support license file.**

*Not in use. Termination is NOT required.

The following table provides a description of the front panel LED indicators (see 6.2.2 for more info).

LED	Description
Band specific LED (e.g. 850, 1900, etc)	Downlink path status and RSSI indication:
MNG	Relevant only if connected to DMCU: CCD Operation status
MODEM	Relevant only if connected to DMCU: DMCU Modem operation status

1.6.2 Side Panel Interfaces

The DIGImini side panel supports the DMCU interfaces and the side bolts used for hanging the unit on the wall bracket. For DMCU interfaces descriptions refer to the DMCU User Manual.

DMCU Antenna connection

DMCU RS485 connection
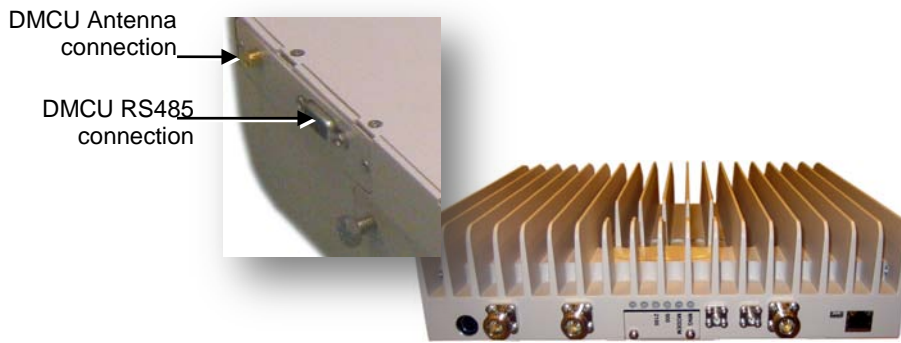
Figure 1-3. DIGImini Side Panel

Side Connector	Description
Modem	DMCU Modem Antenna connection - relevant for installation with a DMCU.
RS485	RS485 connection to DMCU option.

1.6.3 DIGImini Power Supply

The power supply requires assembly only during an upgrade procedure from a dual-band to a triple-band or quad-band solutions in which two DIGImini units are cascaded. Otherwise, it is preassembled.

Connect to Front panel DC power (12V) connector

Connect to 110/240 VAC power source

Figure 1-4: Repeater Power Supply

2 ANTENNA AND REPEATER INSTALLATION REQUIREMENTS

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

> ⚠️ **ATTENTION!!**
> The DIGImini models described in this manual have been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.
> *Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s'il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.*

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

2.1 Base (Donor) Antenna Requirements

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

• Maximum antenna gain for outdoor operation: 9dBi.
• Maximum antenna gain for indoor operation 2.2dBi
• Very sharp beam pointed to the BTS.
• Cable and jumper loss is at least 2dB.

2.1.3 Installation Criteria

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 20cm from any personnel within the area.

2.2 Service Antenna Requirements

The Service antenna is installed indoors, where the type of antenna 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 antenna to the Repeater and the attenuation.

2.2.2 Recommended Antennas

- 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 for indoor operation 2.2dBi
- Cable and jumper loss is at least 2dB.

2.2.3 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 20cm 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.
- 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.

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
- 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

Required:

- 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 SINGLE UNIT REPEATER INSTALLATION

This installation is relevant for a single DIGImini unit supporting either a single-band or a dual-band.

3.1 Overview

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

1. Unpack the Repeater kit.
2. Mount the Bracket on the wall, hang the Repeater and Power Supply on the bracket (**do not connect power**).
3. Perform the required isolation and link tests.
4. Connect the antennas.
5. Power-on the Repeater.
6. If a DMCU is available, mount the unit (adjacent to the Repeater, on the wall and connect to the Repeater according to the DMCU User Manual).

3.2 Required Tools and Materials

The following is required in order to install the Repeater:

- Standard professional tool box
- A computer (i.e. laptop for running the setup)

3.3   DIGImini Single Unit Kit

Upon receiving the 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 Cobham Wireless.

DIGImini Repeater Kit	
Description	**Image**
DIGImini Repeater	
Wallmount Bracket	
Repeater Power Supply (12V)	
2 x Ties for securing power supply	
USB with documentation	
Ethernet Cross-cable	
4 x Repeater Mounting Bolts	

3.4 Mounting the Repeater

Choose the location of the Repeater on the wall according to the following criteria:

- The location should be at normal eye level height, above ground.
- Be sure to allow easy access to the Repeater for maintenance and on-site inspection.

⚠️ **WARNING!!!** The Repeater must always be installed vertically and top-down, to allow free-flow of cooling air. Horizontal installation on a bench for prolonged period of time may cause damage to the Repeater due to over-heating

To mount the Repeater on the wall

1. Using the bracket for reference to the bolt locations, insert the appropriate bolts (not supplied) on the wall, according to the type of wall.
2. Hang the bracket on the wall.
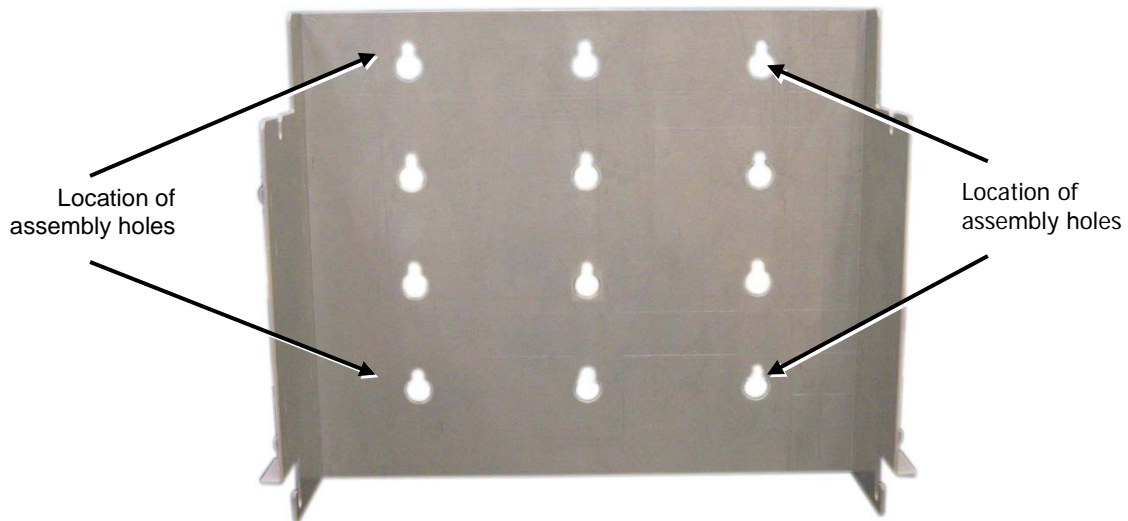
Figure 3-1. Mounting the Bracket on the Wall

Location of assembly holes

Location of assembly holes

The bracket provides two main capabilites:

- Four slots (two bottom and two top) on which to hang the Repeater.
- A step and loops on each side of the bracket for securing the power supply (on any of the sides).

Top slots for
hanging

Mounting and
securing P.S.
(on either side)

Bottom slots for
hanging
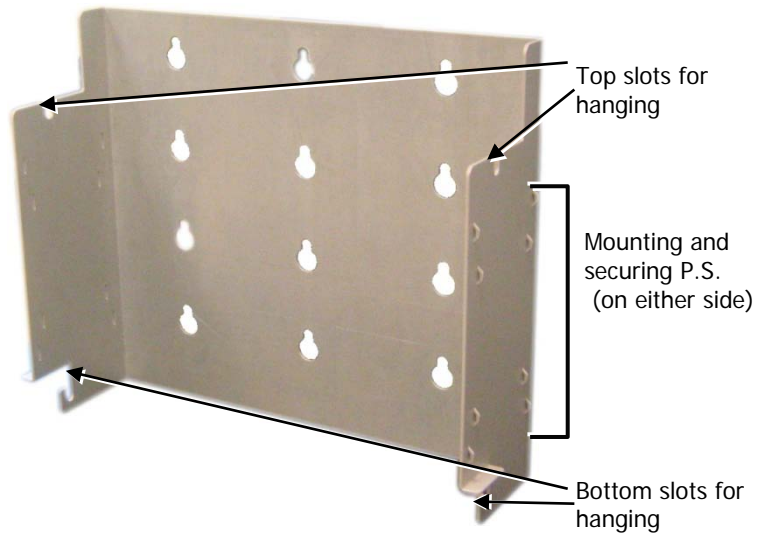
Figure 3-2. Bracket description

3. Hang the Repeater on the Bracket, ridges facing outwards as illustrated below. Use repeater (four) SIDE screws to hang the Repeater securely on the bracket side slots.

Heatsink ridges facing
Outward

Fit two BOTTOM
Repeater bolts on
bracket slots and lift UP
to slide two TOP screws
into top slots

Connectors down
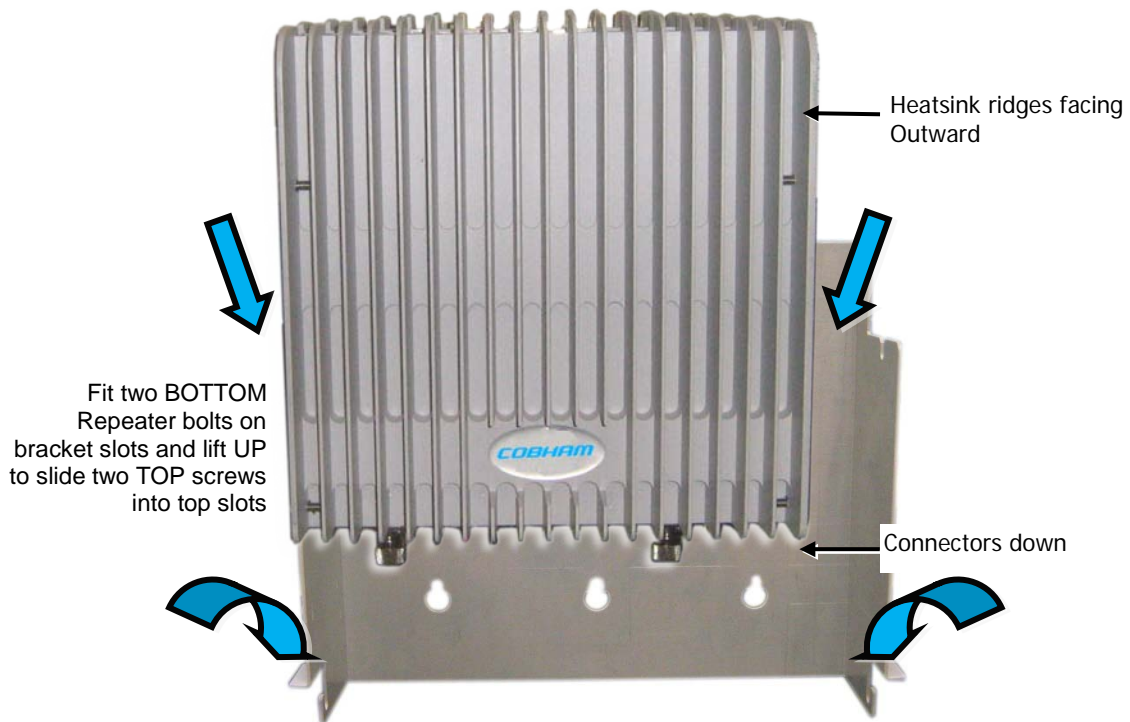
Figure 3-3. DIGImini to Bracket Mounting

4. Verify that the Repeater is firmly mounted and *tighten* the Repeater bolts so it is secured to the wall mount bracket.

5. To mount the Repeater Power Supply:

- Pass two **ties** through the **loops** at the side of the bracket.
- Position the PS on either side of the bracket, firmly on the **step** and secure the power supply to the bracket using the ties.
- Trim the ties

> ⚠️ **WARNING!!!** Do NOT connect power at this point.

Figure 3-4. Mounting Power Supply

3.5 Before Connecting the Antennas or Power

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

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

3.5.1 Verifying Donor and Service Antennas Isolation

⚠️ **CAUTION!!** The isolation between the Base/Donor and Mobile/Service antennas is critical. Lower isolation can lead to high in-band ripple, oscillations and low signal quality.

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 10dB 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.

3.5.2 Verifying Link between the BTS and the Repeater

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.

⚠️ **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.

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.

3.6   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

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. Connect the Service antenna to the Repeater MOBILE port. (Mobile antenna specifications and installation criteria are described in Chapter 2).

4. Verify all RF connectors are tightened and the cables and antennas are secured.

Figure 3-5. Antenna Connections

3.7   Power Up

To power up

Connect the Repeater P.S. to the AC power outlet and to the Repeater DC connector.

Connect to 110/240

Connect to repeater power connector

Figure 3-6. Powering Up

3.8   What Next?

- Installations *without* DIGImini Control Unit (DMCU) – continue to Chapter 5 - SETUP AND CONFIGURATION.
- Installations *with* DMCU – refer to the DMCU User Manual.

4 QUAD-BAND REPEATER INSTALLATION

This procedure describes how to assemble and install the DIGImini dual unit assembly supporting up to four bands (quad-band). The assembly consists of two repeaters. *If your installation includes a DMCU, only one DMCU is required for the complete quad-band assembly (two repeaters).*

4.1 Overview

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

1. Unpack the Repeater Tri/Quad-band kit.
2. Mount the wallmount bracket on the wall
3. Assemble the **RF Combiners** and **Combiner Spacers** onto the **Quad-band brackets**.
4. Using the supplied brackets, position the repeaters back to back on a flat surface and interconnect the required interfaces as described in section 4.5.3.
5. Pick-up the two-Repeater assembly and hang on the mounted wall bracket.
6. Mount the Power Supplies on the wall bracket (**do not connect power**).
7. Perform the required isolation and link tests.
8. Connect the antennas.
9. Power-on the Repeater.
10. For installations with a DMCU, mount the unit and refer to the DIGImini Single/Dual Band user manual for detailed instructions.

4.2 View of the Dual Unit Installation

The following figure illustrates the Quad-band DIGI-mini assembly.

The following figure illustrates the Triple/Quad-band DIGI-mini assembly.

Note the following:

- The Tri/Quad-band assembly supports *two RF combiners*, mounted on each side bracket.
- The front panel LED interfaces are interconnected and covered with a common tab.

NOTE: Illustration below shows a bottom view of the mounted Quad-band assembly (connectors face down when the assembly is wall mounted).
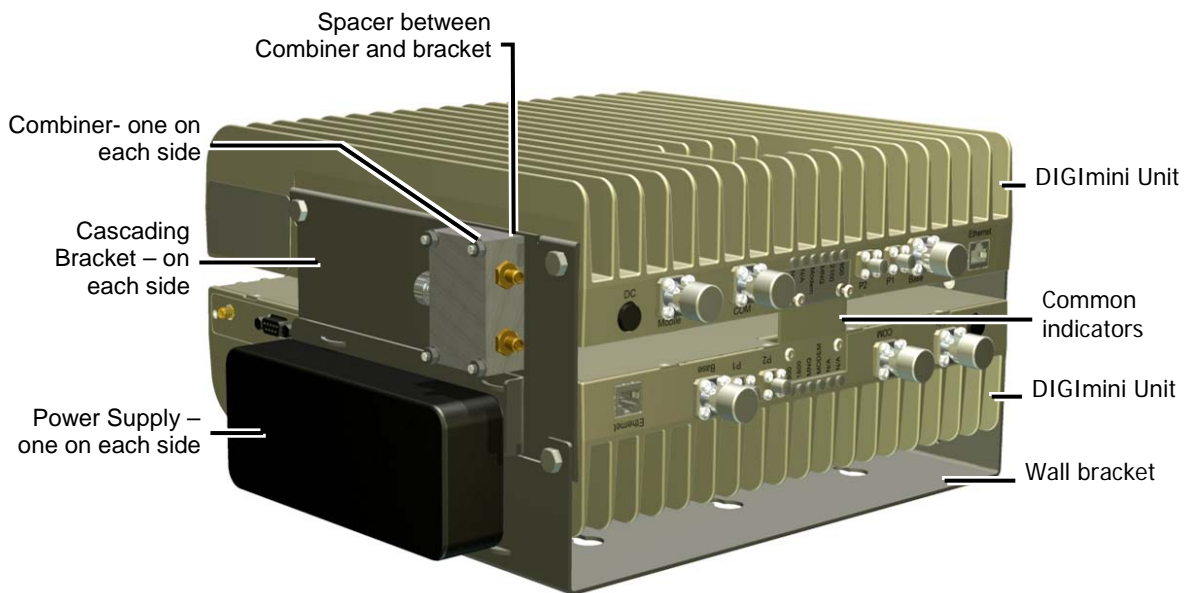
Figure 4-1: Cascaded DIGImini Tri/Quad-band

4.3 Required Tools and Materials

The following is required in order to install the Repeater:

- Standard professional tool box
- A computer (i.e. laptop for running the setup) – refer to the single/dual band user manual for setup and commissioning procedure.

4.4 DIGImini Tri/Quad-band Kit

The Quad-Band Kit contents are packaged in a single box, consisting of *three layers* of items as shown and *additional items (screws, ties, etc.) that may be located in any of the layers*.

The two mini-repeater units are supplied in a separate package.

Figure 4-2. Quad-Band Kit Package

Upon receiving the kit, 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 items.
3. Verify that all of the items are included in the relevant layer as described. Otherwise contact Cobham Wireless.

4.4.1 Top Layer Items
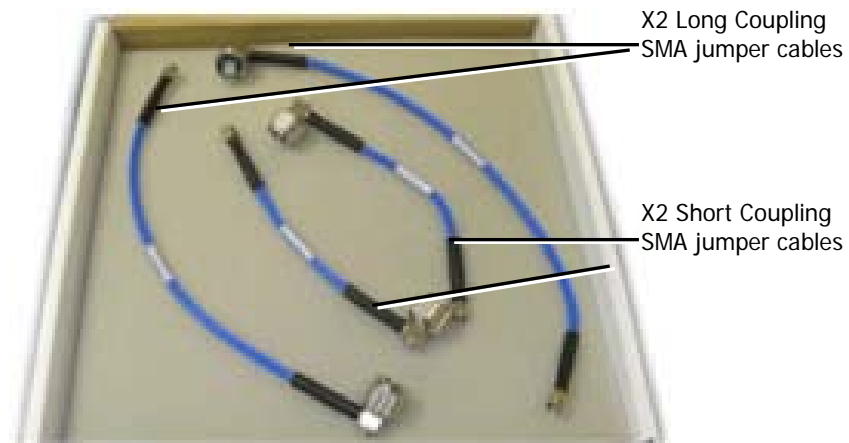
Figure 4-3. Quad-Band Kit – Top Layer

4.4.2 Middle layer Items

NOTE: References to Type I and Type II DIGImini models are explained in the following sections when the relevant instructions are given.
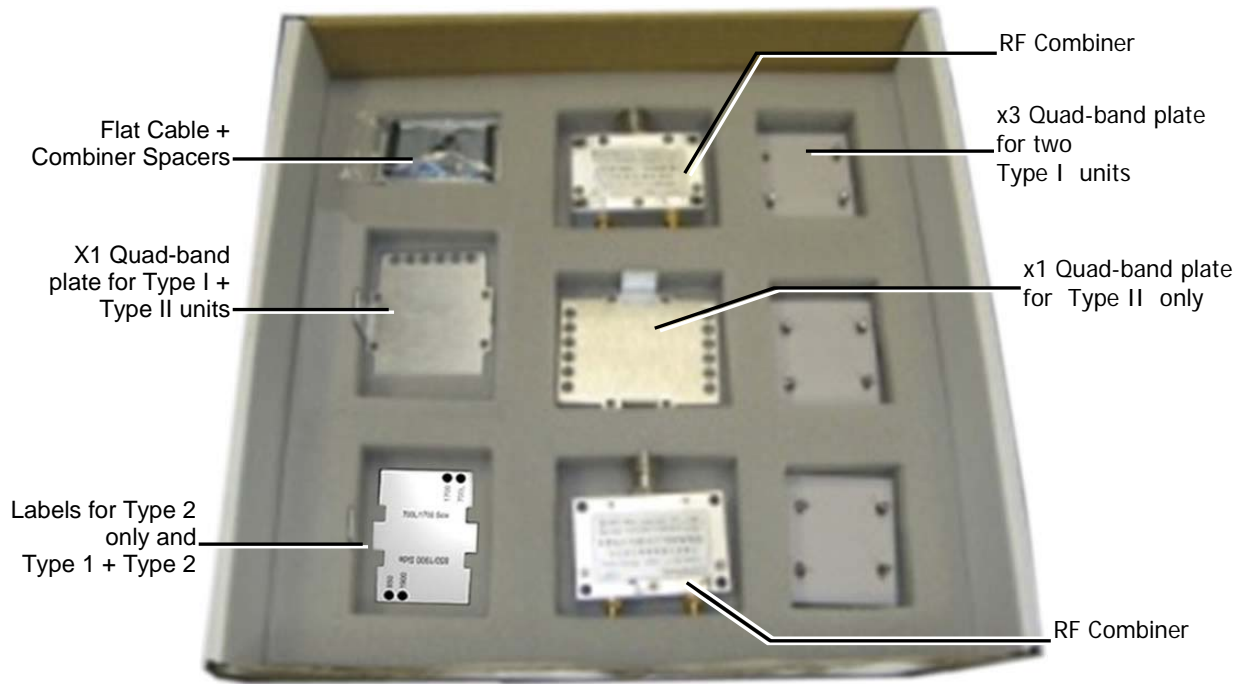
Figure 4-4. Quad-Band Kit -Middle Layer items

4.4.3 Bottom Layer Items
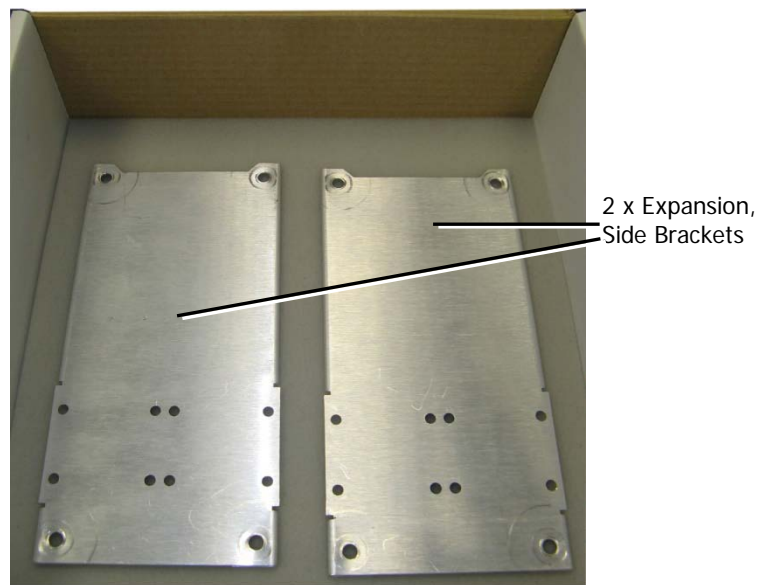
Figure 4-5. Quad-Band Kit-Bottom Layer Items

4.4.4 Additional Items

The following additional items are included in the accessory kit and may be packaged in any one of the layers.

| Item	Image
8 x Bolts, 8 x Nuts – for Combiner to Spacer to Bracket assembly	
4 x Repeater Mounting Bolts	
Ties - used for securing power supply (only x2 are required for each power supply – extra ties may be included in the kit)	
4 x Screws (In use only with the flat cable cover plate of new chassis (any Type 2 combination), to connect the plate)	

4.5 Upgrading to a Quad-Band System

4.5.1 Assemble the DIGImini Units

The upgrading procedure is partially performed on a flat surface.

1. To upgrade an existing DIGImini Dual band installation:

   - Remove power from the currently mounted DIGImini.
   - Disconnect all antenna, communication and control cables.
   - Loosen the side screws and remove the Repeater – *leaving the wallmount bracket on the wall*.
   - Continue with step 3.

2. For a complete Quad-band installation (no existing unit):

   NOTE: If holes are to be drilled, use the bracket to mark the hole locations **prior** to the following assembly procedure.

   - Follow the (wallmount) bracket mounting instructions in 3.4 - Mounting the Repeater.
   - Continue to following Step 3.

3. If not already assembled:

    Assemble each **Combiner** and **Spacer** to a **Bracket** – using the supplied bolts and nuts for *each* assembly. Note DIRECTION of the bracket and that LEFT side is assembled DIFFERENTLY than RIGHT side.

    - Left bracket – assembled on two TOP holes (and center holes) as shown below.
    - Right bracket – assembled on two BOTTOM holes (and center holes)
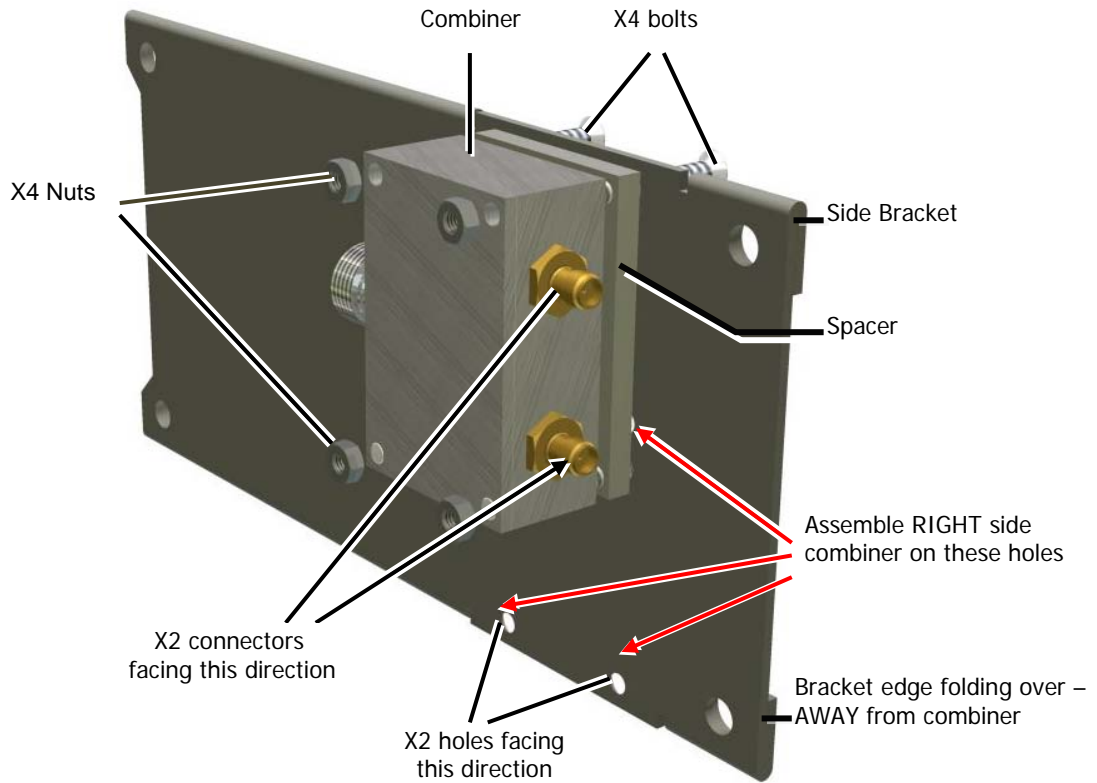
Figure 4-6. Left bracket - Combiner and Spacer Secured to Side Cascading Bracket

4. Assemble Side Brackets on **bottom** Repeater:

    - Place one of the Repeaters on a flat surface – **ridges facing down**. This will be the **bottom** repeater.

    - **Noting orientation -** *loosely* assemble the side plate brackets on both sides of the **bottom** repeater.

Assemble RIGHT side combiner on these holes and bottom holes

Close **Loosely** on each side – but enough to hold when assembly is picked up
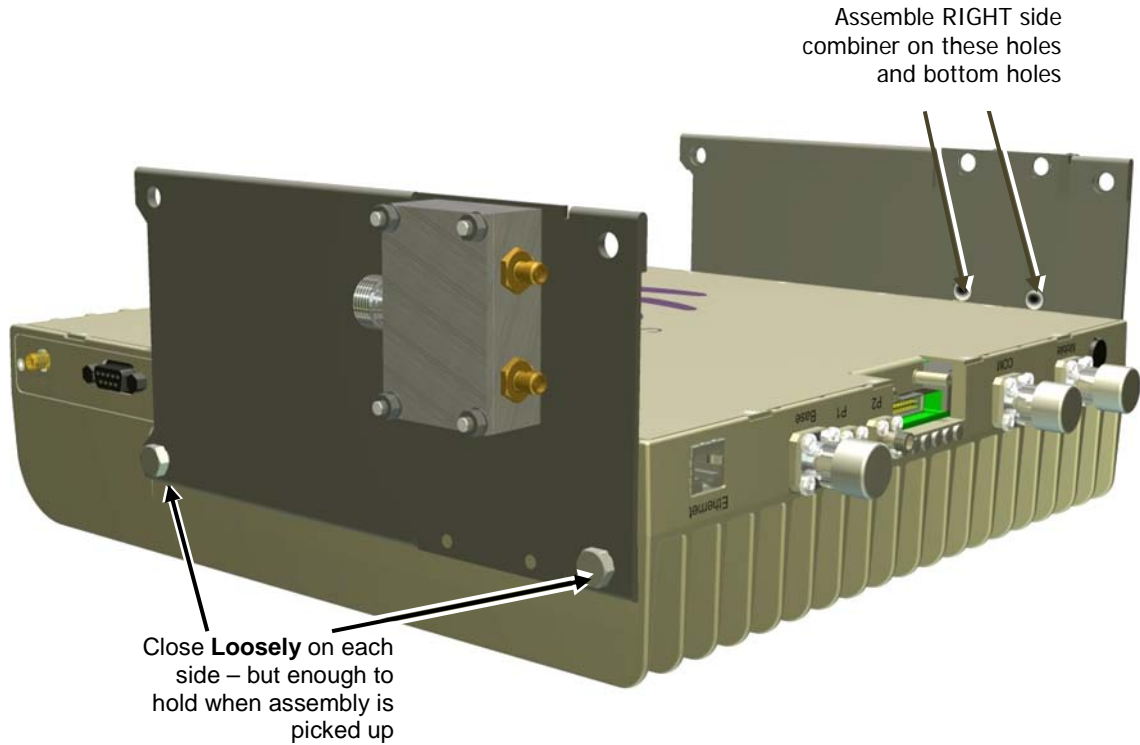
Figure 4-7. Assemble Side Brackets on Bottom Repeater

5. Assemble **top** Repeater:

- Place **second repeater** back-to-back (flat surfaces together) on bottom repeater.
- Align the **top repeater holes** with the **top side bracket holes** and **tightly secure.** (You may need to place your hand between the two repeaters in order to maintain the appropriate separation between the repeaters, allowing the alignment of the bracket holes to the repeaters.)
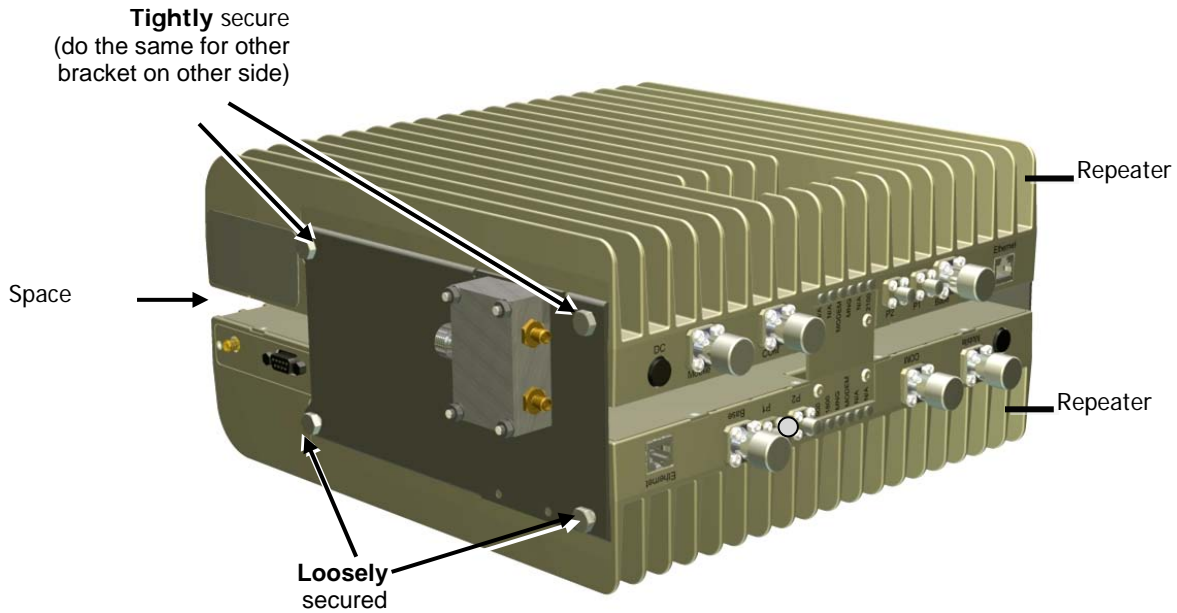
Figure 4-8. Assemble Top Repeater

6. **Remove the LED plates** of BOTH Repeaters and set them aside.
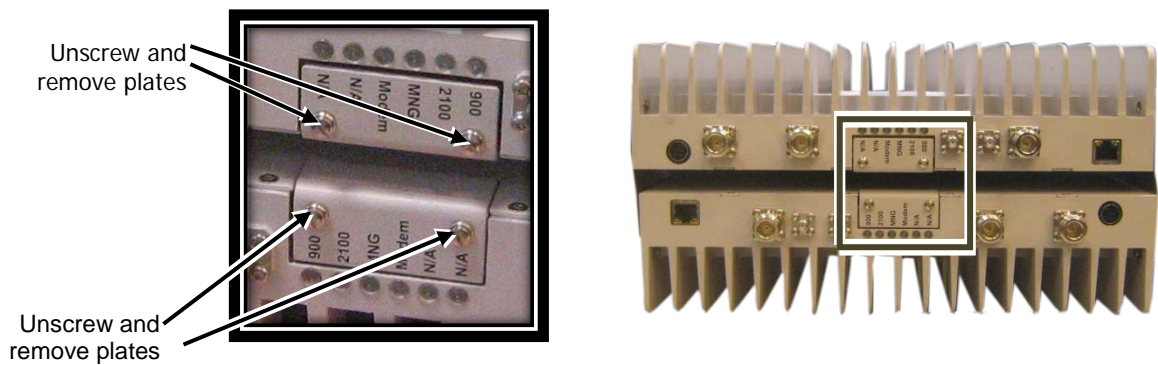
Figure 4-9. Removing Dedicated Tabs

7. **Carefully, connect the supplied flat cable** between the two connectors as shown below. Verify that the flat-cable is securely connected.

NOTE: Handle Flat Cable with care when connecting.
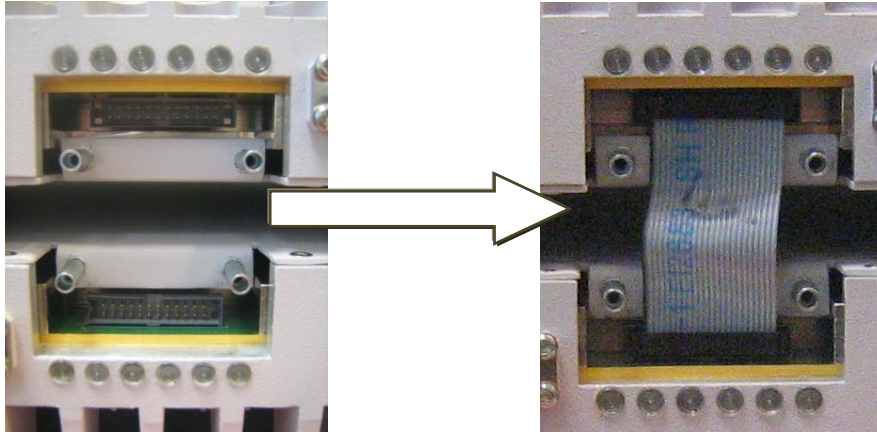
Figure 4-10. Interconnecting Flat cable

8. Referring to the following sections, choose the appropriate COVER PLATE and LABEL according to the type of unit combination that comprises the quad-band assembly section 4.5.2.

9. Cover the flat-cable with the appropriate **Flat Cable Cover Plate** and secure using the four screws.

NOTE: All labels refer to **Band-1** and **Band-2.** The band frequencies for each repeater are located on a sticker on the SIDE of the repeater. (e.g for DIGImini 900/2100, "Band 1" is 900 and "Band 2" is 2100).

Plate covering flat cable
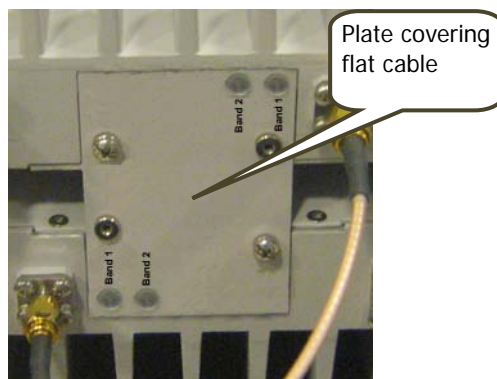
Figure 4-11. Assembling Interconnecting Cover Plate

4.5.2 Choosing the Appropriate Plate

Plates and labels are selected according to the type of repeater combinations in the quad-band assembly; there are type types of repeaters configurations: Type-I and Type-II.

4.5.2.1 Type-I and Type-II Configuration

Criteria for Type-I and Type-II units is given below; basically it is determined by *how much the plate covers the LEDs.*

NOTE: For all **Type-II** units - assemble the PLATE and LABEL (**Type-I** plate is already labelled).
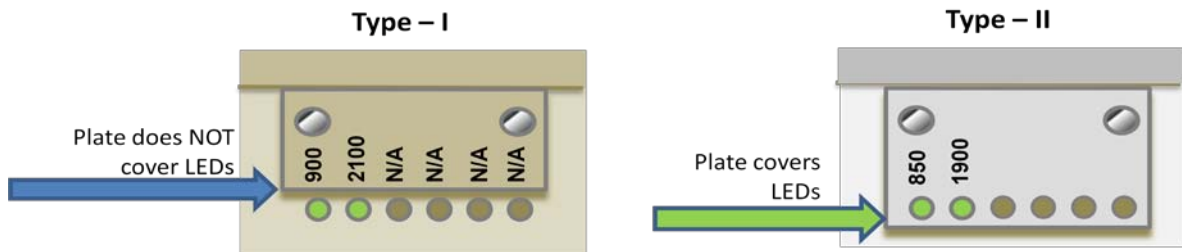
Figure 4-12.Examples of Type-1 and Type-2 Unit Plates

Three different Quad-Band plate types are provided for the following quad-band combinations:

- Both units in quad-band are Type I
- Both units in quad-band are Type II
- One of each Type (Type I + Type II)

NOTE: The band frequencies represented by Band-1 and Band-2 are located at the side of the repeater. (e.g for DIGImini 900/2100, "Band 1" is 900 and "Band 2" is 2100).

4.5.2.2 Both DIGImini Units are Type I

NOTE: The plate is labelled Band-1 and Band-2 (no need to assemble the label on the plate); the relevant bands are on the side of the corresponding repeater.

Existing Plates on both
DIGImini Type I Units
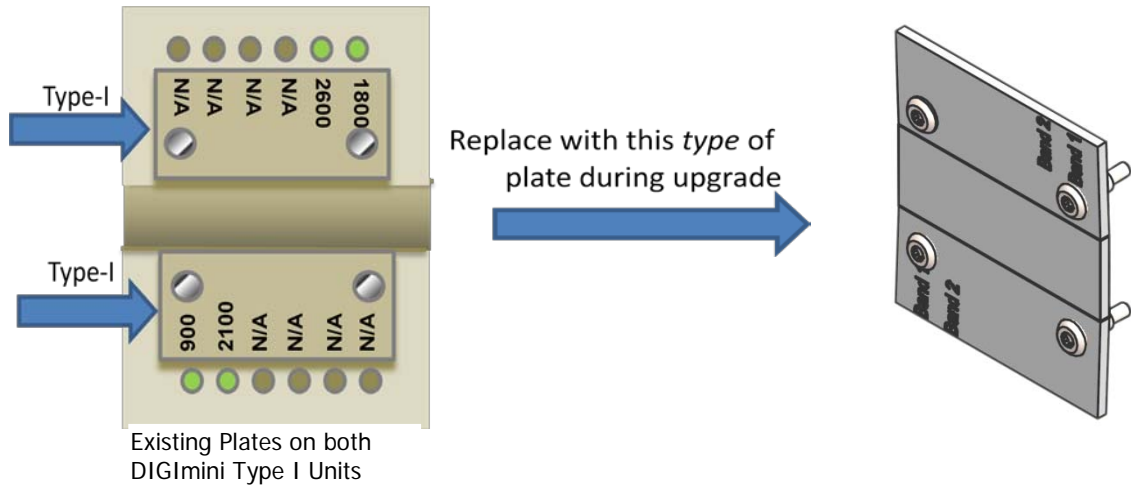
Figure 4-13.Examples of Plate Used When Both Units are Type-I

4.5.2.3 Both DIGImini Units are Type II

NOTE: Assemble the label onto the plate; the relevant bands are on the side of the corresponding repeater.

Use the following **tab** and **label** type.

Existing Plates on both
DIGImini Type II Units

New Quad-Band Plate and Label for
DIGImini Type II Units
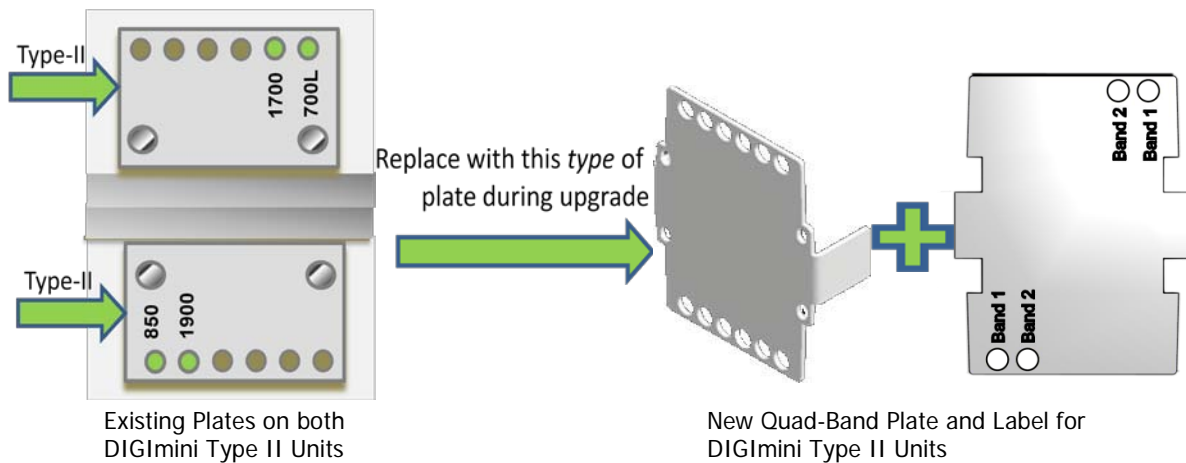
Figure 4-14.Examples of Plate Used When Both Units are Type-II

4.5.2.4   Combination of Type I and Type II DIGImini Units

NOTE: Assemble the label onto the plate; the relevant bands are on the side of the corresponding repeater.
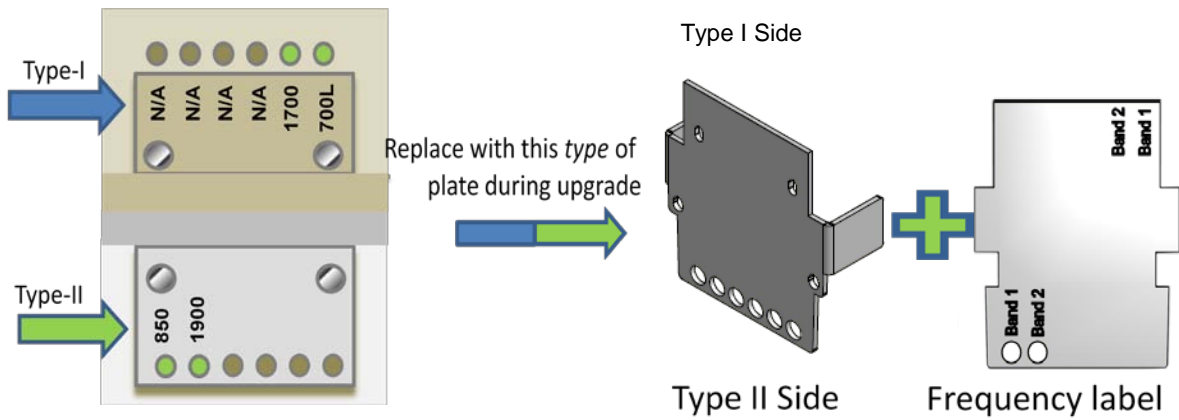
Figure 4-15.Examples of Plate Used When Both Units are Type-I

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4.5.3 Connect SMA Jumper Cables

Connect **SMA N-type jumper** cables between **Combiners and Repeater antenna ports** according to the illustration below:

NOTE: Be sure to use recommended Torque value.

Jumper Type	Connect Between
Short (170mm)	Connect between connectors labeled *1* (i.e *1 to 1*)
Short (170mm)	Connect between connectors labeled *4* (i.e *4 to 4*)
Long (340mm)	Connect between connectors labeled *2* (i.e *2 to 2*)
Long (290mm)	Connect between connectors labeled *3* (i.e *3 to 3*)
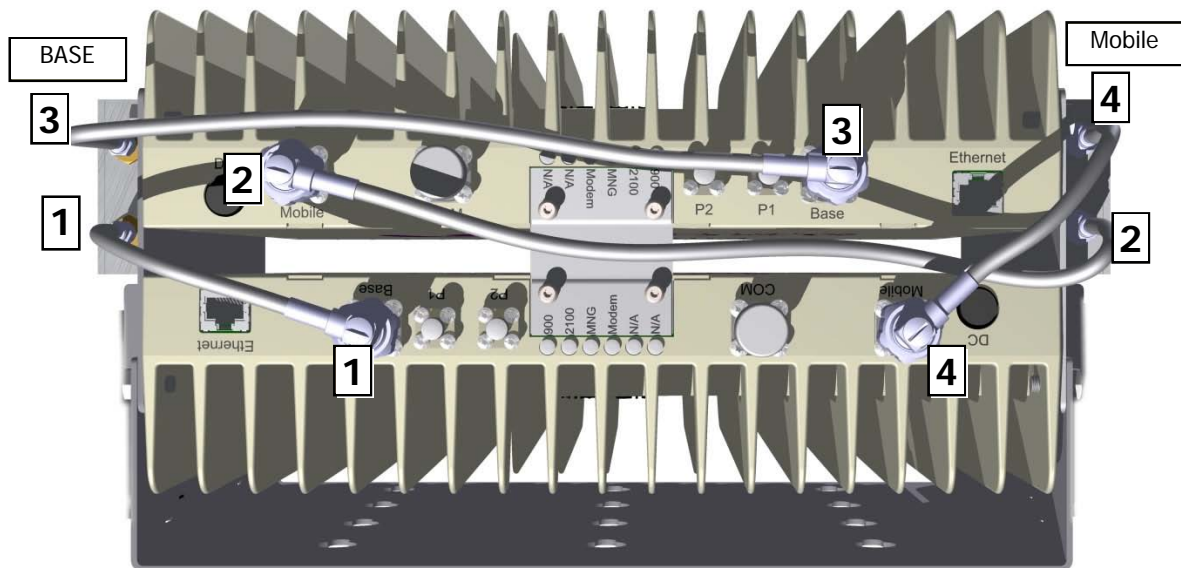
Figure 4-16. DIGImini Quad-Band Jumper Connections

4.5.4 Mount and Secure Quad-Band Assembly

1. Referring to the following figure:

   - *Carefully and securely pick* up the assembly.

   - Hang the assembly on the wall bracket, fitting the *looser* wall-side Repeater **Side Bracket** screws on the wall bracket.

   - Tighten the loose screws on each side.

Tighten screw on wall-side bracket

Figure 4-17. Mount Quadband Assembly on Wallbracket

2. **Two Power Supplies should be assembled on the wallbracket** (one on each side of the assembly). Mount one (if this is an upgrade and one is already mounted) or both (if this is a new installation) as follows:

- Thread two ties through the loops in the bracket.

Thread x2 ties through loops (1x on bottom and 1x on top)

Figure 4-18.   Insert Ties for Securing Power Supply

- Fit Power Supplies on ridge(s) on side of wallbracket.
- Secure the ties.

AC/DC Converter PS

Ties
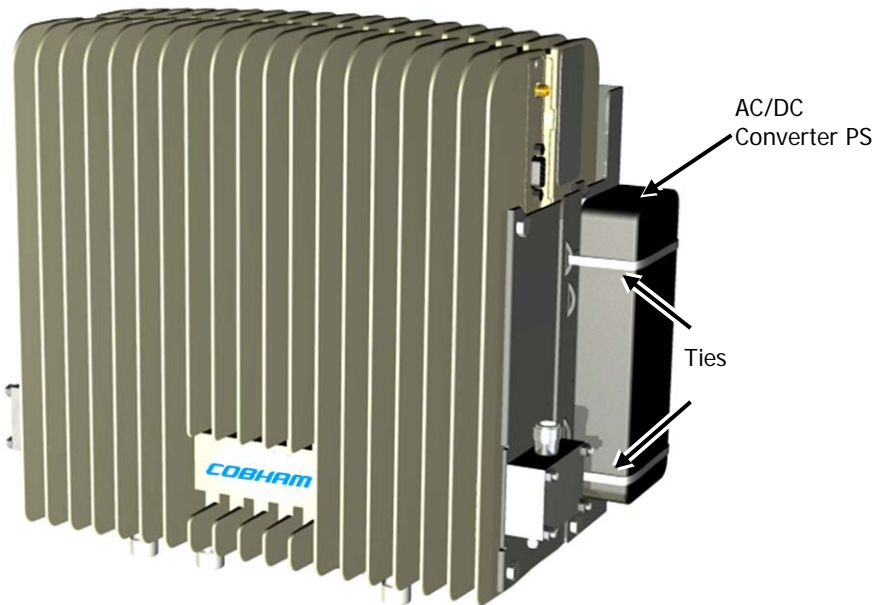
Figure 4-19.   Secure Power Supply

4.6   Before Connecting the Antennas or Power

Before connecting the antennas or power perform the procedures described in section 3.5.

4.7   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 (Base)** antenna to the **rear port of the LEFT Combiner** (connected to the Repeater BASE ports). (Donor antenna specifications and installation criteria are described in section 2.1).

3. Connect the **Service** antenna to the **rear port of the RIGHT Combiner** (connected to the Repeater MOBILE ports.) (Service antenna specifications and installation criteria are described in Chapter 2).

4. Verify all RF connectors are tightened and the cables and antennas are secured.
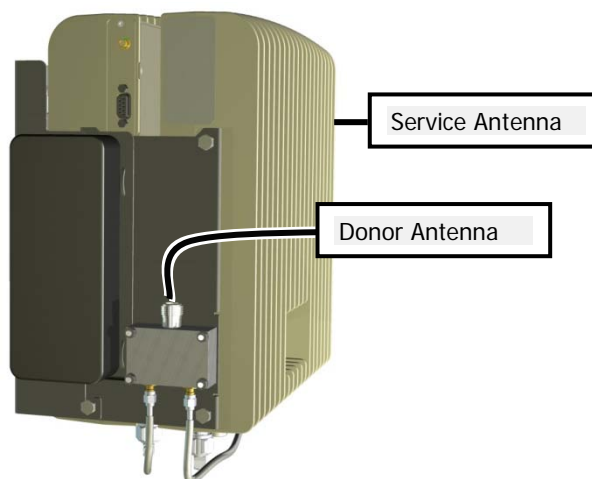
Figure 4-20. Service and Donor Antenna Connections

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4.8   Power Up

To power up

1. Connect each Power Supply (AC/DC Converter) output to a Repeater front panel **DC power connector.**

2. Connect each of the Repeater P.S. units' to the AC power outlet.

Connect to
110/240 VAC

Donor Antenna

Connect to Repeater front
panel DC connector
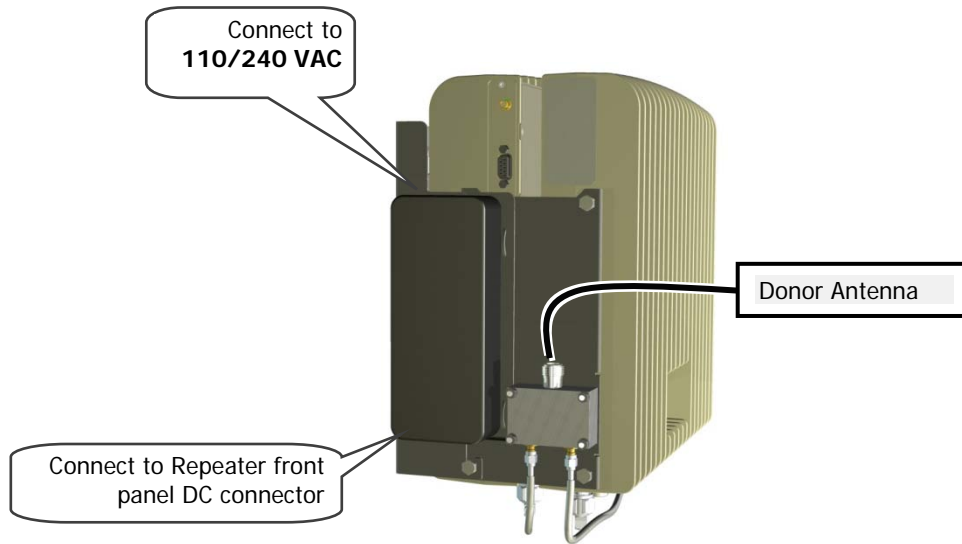
Figure 4-21. Powering Up (shown with illustration of Combiner)

4.9   What Next?

- Installations *without* DIGImini Control Unit (DMCU) – continue to Chapter 5 - SETUP AND CONFIGURATION
- Installations *with* DMCU – refer to the DMCU User Manual.

5 SETUP AND CONFIGURATION

NOTE: This section is relevant to installations that WITHOUT a DMCU. For installations with DMCU unit, refer to the DMCU User Manual.

The Mini-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.

   If you are not familiar with the Cobham Wireless Web Access application, it is recommended to quickly review the Navigating the Web GUI Application section.

2. Adjust the signal levels and configuring the sub-bands and verify that no Alarms are generated.

5.1 Open a Direct Local Web Session to the Repeater

NOTE: These instructions are valid only for installations *without* a DMCU.

The procedure consists of three steps:

- Connect the setup computer to the repeater's Ethernet port.
- Configure the computer's IP address to be in the same subnet as the repeater's IP Address
- Login to the repeater

5.1.1 Connect the Computer to the Repeater

1. Connect the supplied Ethernet cross-cable from the computer to the Repeaters' front panel.

> ⚠️ **ATTENTION!** Do not connect the Repeater ETH port to the network. It may affect your network! Remote management is available only via a DMCU.
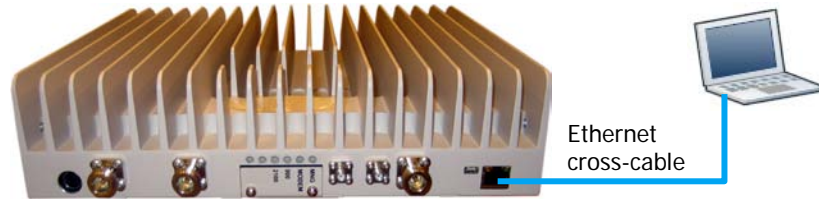
Figure 5-1. Ethernet Connection to a Single DIGImini Repeater

2. If connecting to the Quad-band assembly, connect the cable to *any* of the two repeaters. The Web GUI will allow for configuration of **both** repeaters.
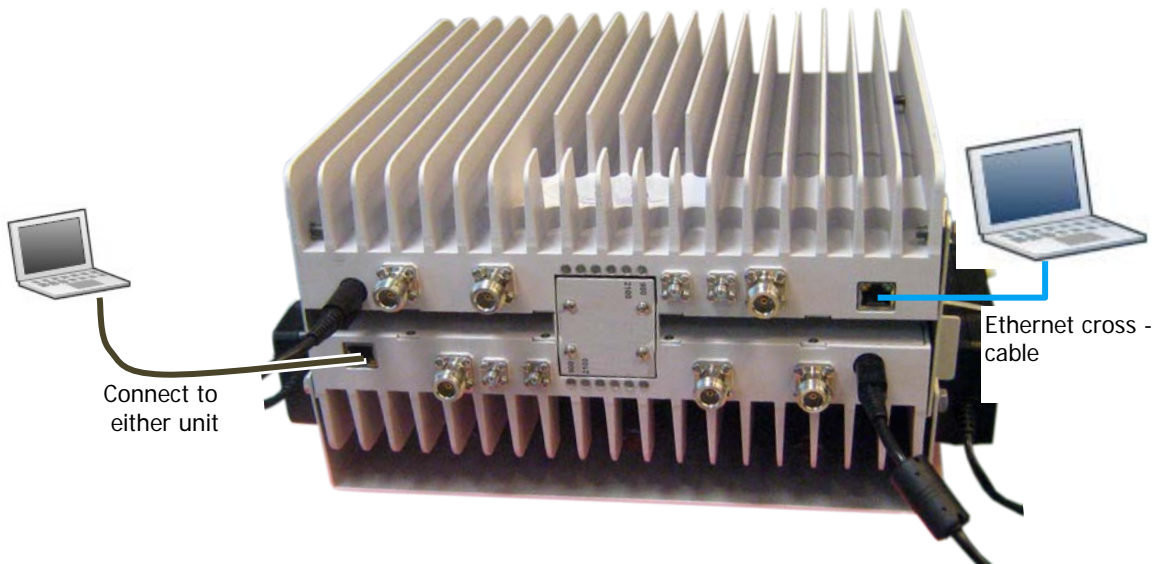
Figure 5-2: Cascaded DIGImini Quad-band

5.1.2 Configure the Computer's Network Parameters

In order to open a session to the repeater, it is required to configure the computer's network parameters to be in the same subnet as the repeater.

To configure the computer network parameters

1. Access the **Local Area Connection Properties** dialog

NOTE: The procedure may differ according to your computer's operating system.

- Access the **Network and Sharing Centre**.
- Choose **Change Adapter Settings** and select **Local Area Connection**. The Local Area Connection Properties dialog appears.

Select Internet
Protocol Version 4 ——
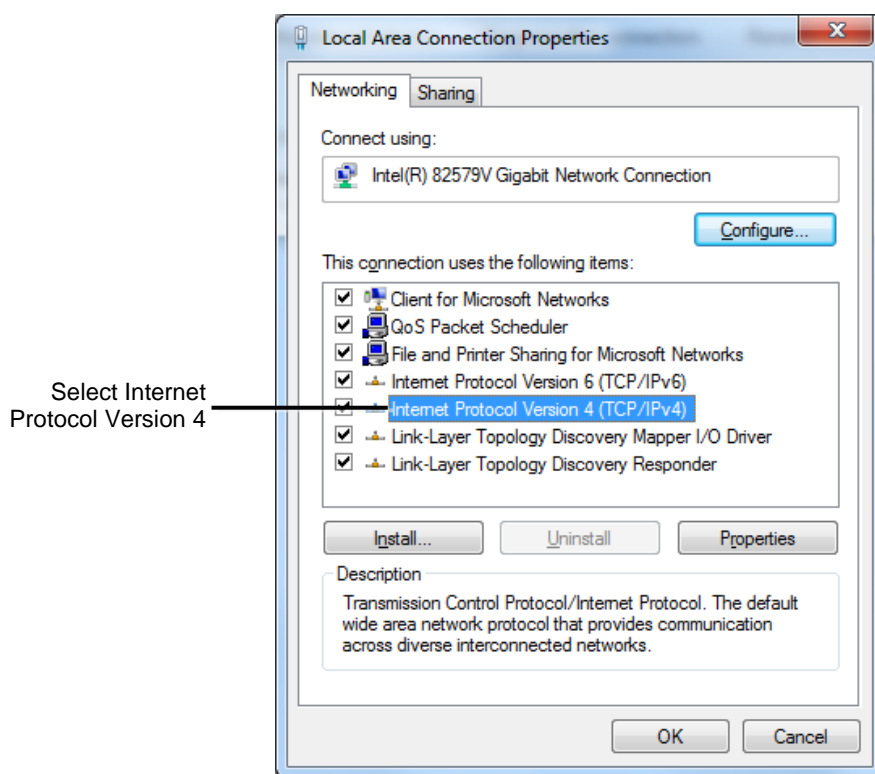
Figure 5-3 Networking Tab

2. In the Items list, double-click Internet Protocol Version 4 (TCP/IPv4).

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

Note: The Repeater is supplied with the default IP address **192.168.1.253.**
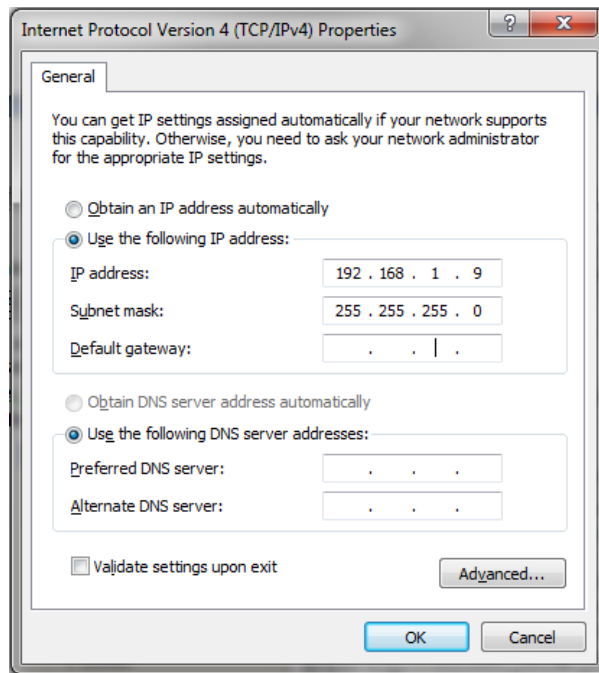
Figure 5-4 IPv4 Properties dialog

3. 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.

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5.1.3 Login to the Repeater

To login to the repeater

1. Open a standard browser.
2. In the address line, enter the default IP address of the Repeater. **http://192.168.1.253**

Figure 5-5. Repeater's default IP Address

A session will be established with the Repeater an the login dialog appears.
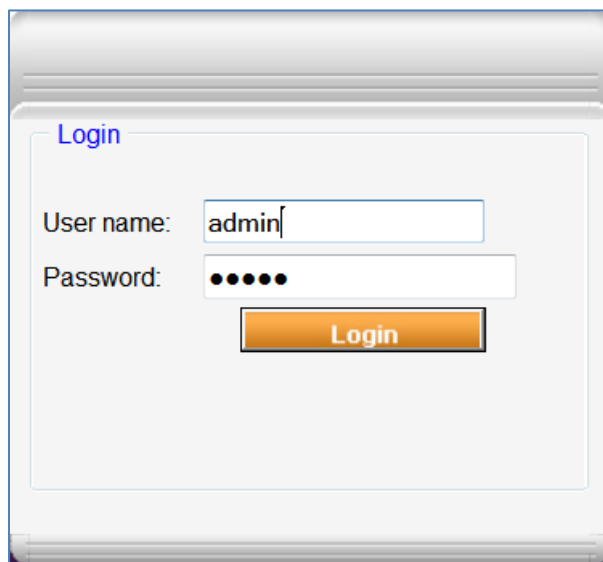
Figure 5-6 Login Dialog

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 5.3.

5.2   Navigating the Web GUI Application

This section describes how to navigate the Web Management application. The Web Access interface provides Repeater RF parameters control and monitoring options. The displayed bands depend on the supported configuration: Dual- or Quad-band configuration.

*NOTE: The **CMU** (Control Monitoring Unit) item in the topology tree is only accessible for sessions opened via the **Digital Monitoring Control Unit (DMCU)** - see the DMCU User Manual for details. For sessions opened by direct connection to a DIGImini front panel, the <u>CMU</u> item will appear but will not be accessible.*
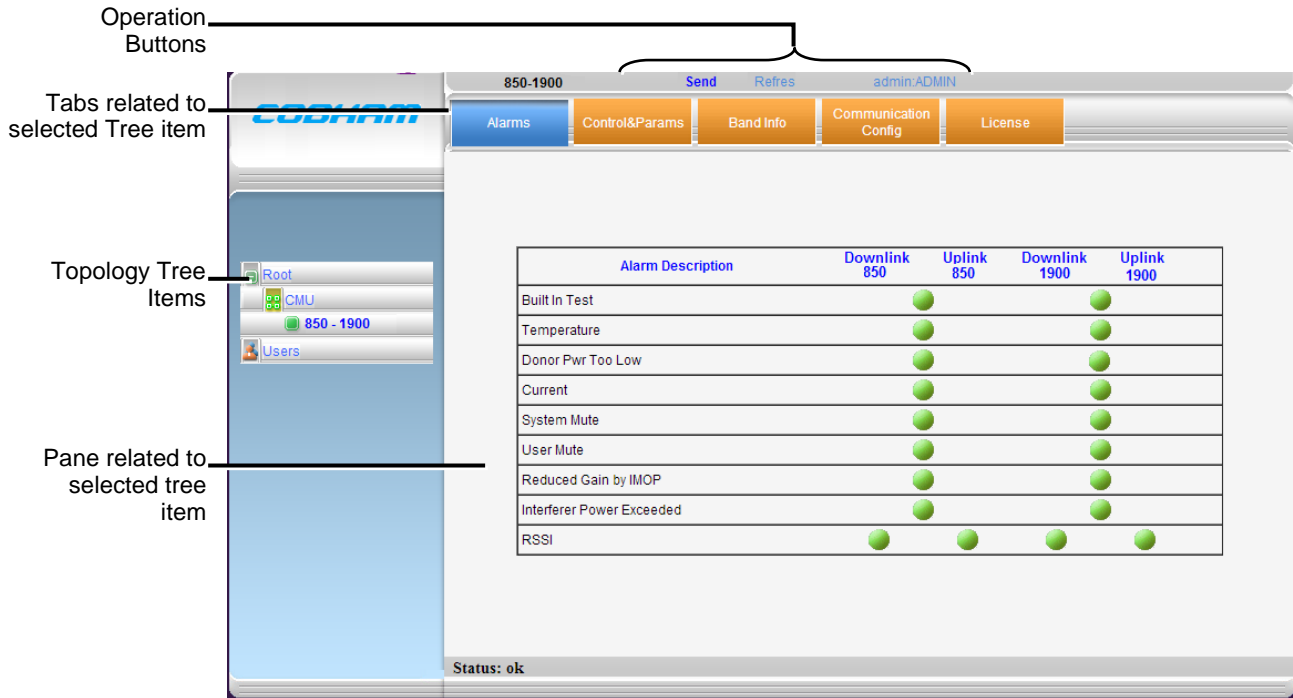
Figure 5-7. Example of Web GUI Screen (shows dual-band)

5.2.1 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 details in section 6.2.1
Control and Params	Used for adjusting RF parameters and channel configuration (signal level, gain and bandwidth). See details in section 5.3
Band Info	Shows information on the selected band, including valid definable bandwidth pre sub-band (see section 5.3.2).
Communication Config	Relevant only if you have purchased the appropriate license file. If the option is supported – it provides IP Address definitions and SNMP Destination addresses used for remote monitoring.
License	Used to download licenses for additional options.

5.2.2 Operation Buttons

The following Operation buttons are available.

Item	Description / Values
Selected Tree Item	Shows the currently selected topology tree item. Values: Band (e.g. 850-1900), 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

5.3 Signal Levels and Channel Configuration

This section provides a description of the RF Gain setting criteria (set via the Controls and Params Pane), the criteria determining the number of available bands and a step-by-step procedure of the signal level and channel configuration procedure.

5.3.1 RF Gain Setting Criteria

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

The gain range is up to 73dB for *all bands* and is set by default to its maximum value.

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 1.2 for more information on the SALC mechanism).

5.3.2 Bandwidth and the Number of Available Sub-Bands

Each repeater supports up to two bands, where a maximum total e*ight sub-bands* may be defined for both bands (e.g. two sub-bands for one band and six sub-bands for the other band).

NOTE: Since some sub-bands require more resources, less than eight sub-bands may be available.

The sub-bands are available resources are listed in the **Band Info** tab of the repeater.

This section provides a general description of the sub-band resource allocation as well as the Band Info tab.

5.3.2.1   Sub-band Resource Allocation

A maximum e*ight sub-bands* may be defined per repeater (single- or dual-band). The number of available sub-bands or channels depends on the technology and selected bandwidth as detailed below (note that some bandwidths (e.g. 15 or 20MHz at 1900MHz WCDMA) take up two channel resources).

The following table summarizes the number of available sub-band resources under various configurations.

Technology	Filter BW	Resources
GSM	200KHz – 11MHz (in 200KHz steps)	1
GSM	11.2MHz – 20MHz (in 200KHz steps)	2
WCDMA	5MHz, 10MHz	1
WCDMA	15MHz, 20MHz	2
LTE	1.4MHz, 3MHz, 5MHz, 10MHz	1
LTE	15MHz, 20MHz	2

5.3.2.2   Band Information Window

The band information window provides general information on the repeater; this includes, Serial Number, Build versions, System ID (used when acquiring license files) and resources available for various filters.

To access the Band Information window

1. From the Tree Pane, select the band item in the tree (e.g. 900-2100).
2. Select the **Band Info** tab. The relevant parameters are displayed.
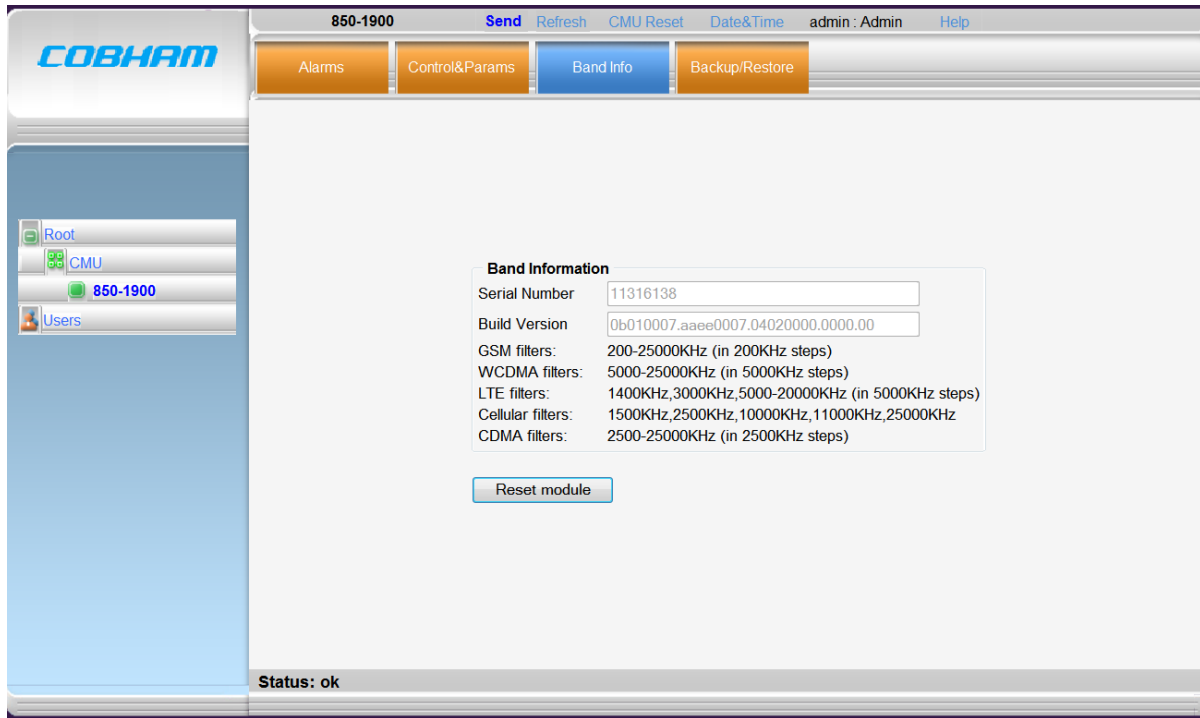
Figure 5-8. Info Tab

5.3.3 Adjusting the Signal Levels and Configuring Channels

The **Control and Params** (parameters) window is used to configure the sub-bands and Max UL/DL Power for the selected band. A dedicated filter configuration dialog is provided for each band. The dialogs and configuration procedures are identical for each band, *except for the parameter values*.

Up to eight 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 - see appendices B and C for parallel GSM channels.
- Maximum power
- Maximum gain
- Gain delta

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

To adjust the signal levels and configure the channels:

1. In the left pane (Topology Tree), select the *bands* item (e.g. 850-1900) which includes the **Band** item whose sub-bands are to be configured.

2. Click the **Control and Params** tab. For dual/quad band configurations, *click the required band* for configuration and the corresponding pane appears.

   The window is divided into the following areas:

   - System – overall parameters for the *selected service.*
   - 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.

NOTE: You may define a total of eight sub-bands for both bands; e.g. 2 sub-bands for the 850MHz band and 6 sub-bands for the 1900MHz band (see section 5.3.2 for details).
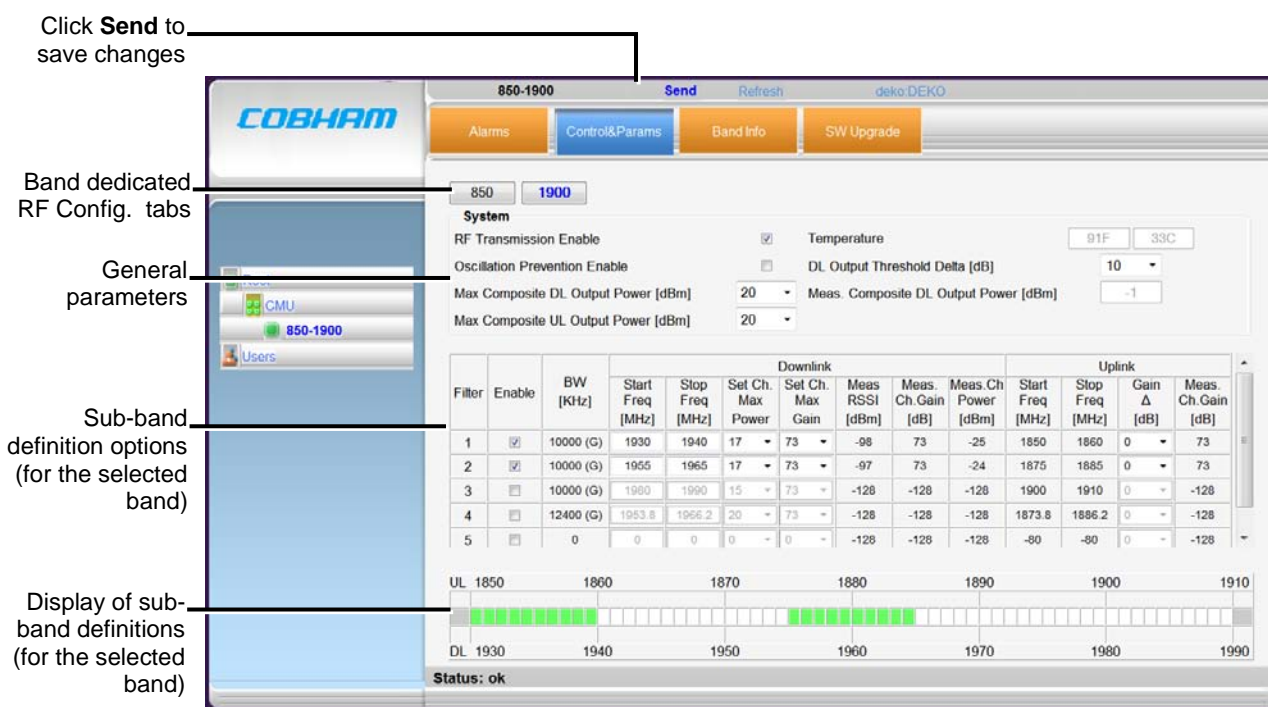
Figure 5-9. Control and Params Tab (example shows dual-band)

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.)

   NOTE: For tables of GSM frequencies Vs channels, refer to Appendix B (GSM 900 MHz) and Appendix C (GSM 1800 MHz).

The defined BW will be displayed in the BW KHz column (to the left of the Start Frequency).

- Set the (Downlink) Max Gain as follows: by default, the **MAX Gain** (DL) parameter is set to its highest level (73dB). 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**.
- 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

Figure 5-10. Example of Alarms Tab

6 ADMINISTRATION, MONITORING AND TROUBLESHOOTING

This chapter describes the following:

- Basic administration operations such as uploading license files and upgrading features
- Description of repeater GUI alarms and front panel LEDs

6.1 Administrative Operations

This section includes the following:

- License file upload
- Single-band to dual-band upgrade
- Upgrade to support connection to Ethernet and an External Modem

6.1.1 License File Upload

This section describes how to upload a license file to the repeater. License files are used to upgrade the repeater to support additional features such as dual-band (for single-band repeaters) and support for basic remote monitoring.

NOTE: Each feature is implemented using a DEDICATED license file.

To upload a license file

1. Contact your Cobham Wireless service representative and purchase the option.

   NOTE: You will be required the System ID listed in the Band Info tab (section 5.3.2.2).

2. Once the appropriate license file is available, save the file to an accessible directory.
3. Open a session to your repeater, click the *band* item and select the **License** tab.
4. Browse for the file (**Choose File)** and then click **Upload**.
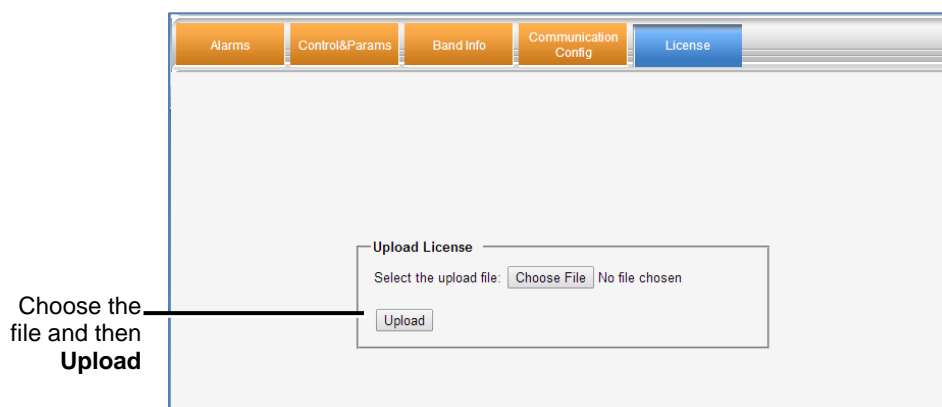
Figure 6-1. License for Updating to Dual-band

After the upload has been completed, you will be prompted to reset the unit.
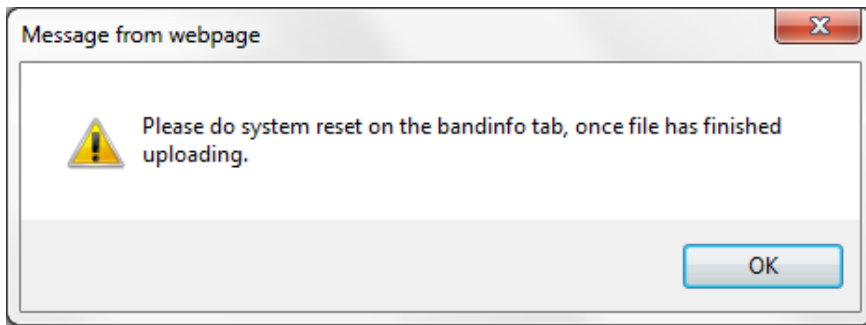
Figure 6-2. Reset Unit Prompt

5. Select the **Band Info** tab and click **Reset System.** The repeater will reset and the relevant options will be available.
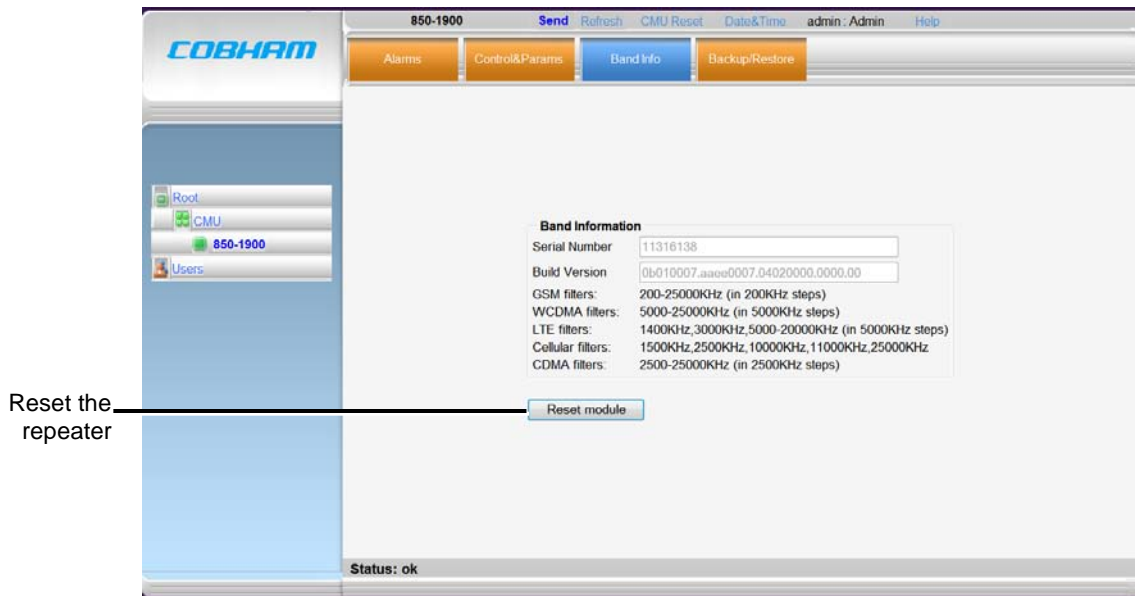
Figure 6-3. Reset Unit

6.1.2 Dual-band Support

To configure a single-band repeater to support two bands

Upload the *appropriate* license file according to section 6.1.1. The second band will be displayed in the Topology Tree and the relevant tabs will be updated in the display area.

6.1.3 Connection to an Ethernet Network

NOTE: This is not relevant for installations with DMCU.

Units without DMCU can be upgraded, by purchasing the appropriate license file, to support some basic remote management options through connection to an Ethernet network.

To configure for connection to the Ethernet Network

1. Purchase and upload the appropriate license file according to section 6.1.1. The relevant tabs will be updated and become available.
2. To configure the unit for connection to the Ethernet network:
   - Select the *band* item.
   - Click the **Communication Config** tab.
   - Set the IP Configuration parameters:
     - Set **DHCP** to **None.**
     - Configure the **Local IP Address, Local Netmask** and **Local Gateway** parameters.
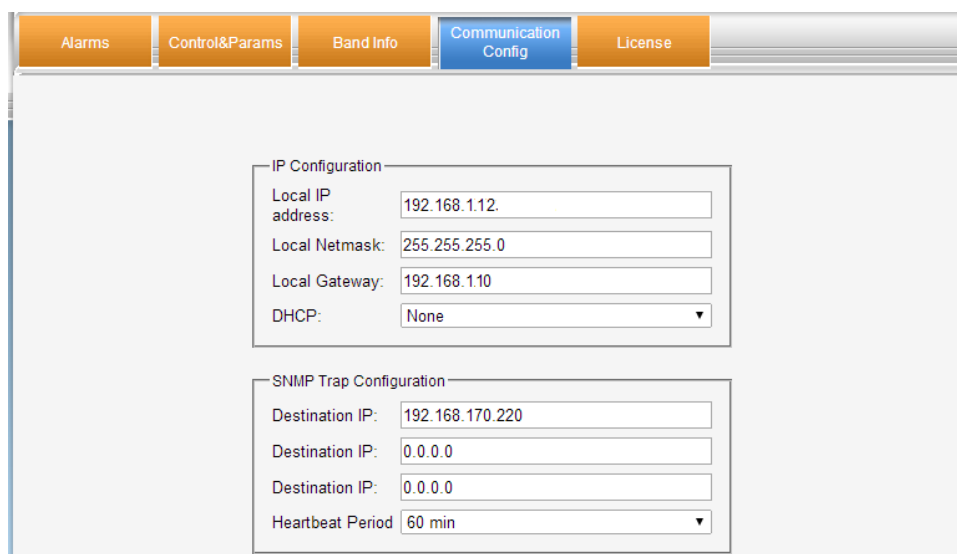
3. You can configure up to three destination addresses to which traps will be sent.

   NOTE: By default, a trap will be sent if a Heartbeat signal is not detected for 60 minutes. The heartbeat period may be modified or disabled (set to '0').

4. Click **Send**.
5. Connect the unit Ethernet port to the network.

6.1.4 Connection to an External Modem

NOTE: This option is relevant to installations without DMCU.

Units without DMCU can be upgraded to support some basic remote management options through connection to an external modem. (For full remote management capabilities, the DMCU is required).

To configure for connection to an External Modem

1. Download the appropriate license file according to section 6.1.1. The relevant tabs will be updated and become available.

2. Select the *band* item and click the **Communication Config** tab.

3. Set **DHCP** to **None.**

4. Set the **IP Address** parameters as follows:
   - **IP Address** – set to be in the SAME SUBNET as the internal IP Address of the MODEM.

     For example:

If the Modem IP Address is	192.168.1.**10**
Then set the Repeater Local IP Address to	192.168.1.**12**
   - **Local Netmask** – set to **255.255.255.0**
   - **Local Gateway** set to be EXACTLY the same as the internal IP Address of the MODEM. For example:

If the Modem IP Address is	192.168.1.10
Then set the Repeater Local Gateway to	**192.168.1.10**

5. Click **Send**.

6. Connect the unit Ethernet port to the external modem.

6.2 Monitoring and Troubleshooting

DIGImini provides two types of indications of Repeater failure:

- Alarms screen in Web access application
- 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.

6.2.1 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 and choose the **Alarms** tab. The relevant parameters are displayed for the supported bands.

Alarm severity

NOTE: 🟡 Yellow and 🟠 Orange level LEDs are only available if the unit is connected to DMCU; otherwise, only RED and GREEN LEDs are available.

Color	Description
🟢 Green	OK
🟡 Yellow	**Warning**. Does not require immediate action
🟠 Orange	**Major**. Higher priority, requires user attention
🔴 Red	**Critical.** Requires user's immediate action

Alarm Descriptions

Alarm	Fault and most probable cause and Recommendation
Built In Test	Description: Self test. Possible causes: Hardware failure, Circuitry failure, Software failure Recommended action: Wait 12 hours before contacting Cobham Wireless Support
Temperature	Description: High temperature indicated Possible causes: Unit temperature becomes high due to excessive heat. Recommended 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	Description: The signal from the Donor antenna is too low. Recommended action: Check connections and antenna position.
(PAmp) Current	Description: Generates an alarm when the Power exceeds the allowed limits. Possible causes: Fault in the DL or UL path, Downlink (Uplink) power amplifier module outputs a low current. Recommended action: Check the LEDs status in the Repeater
System Mute	Description. Generates an alarm when Repeater amplification is muted (automatically). Possible causes: Oscillation detected, Power at coverage port too high, Synthesizer failure, Hardware failure, Software failure, Out-of-band emissions out of spectrum, Interferer Power exceeded, Temperature. Recommended action: Contact Cobham Wireless Support
User Mute	Description: Repeater amplification is muted. Possible causes: Manual shutdown performed by operator. Recommended action: Review unit's log
Reduced Gain by IMOP	Description: Alarm is generated when the IMOP mechanism was activated and the system reduces gain in order to respond to detected oscillations. Recommended 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).
Interferer Power Exceeded	Description: Alarm is activated if external interference is at a level that may affect the operation of the unit. Recommended action: It is recommended to identify the source of the interference and distance the source or the unit from each other. NOTE: When the interferer is at HIGH Level it can cause the RSSI alarm to be ON as well
RSSI	Description: Generates an alarm when a high donor input signal causes system gain reduction

6.2.2 DIGImini LED Troubleshooting

The DIGImini repeater includes six LEDs on its front panel (see section 1.6.1). The following table provides a description of the LED troubleshooting procedures.

Indicator	Description	
Band Specific LED (i.e 900/1800/2100)	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
(Ethernet) MNG	Relevant only if connected to DMCU: Green Blinking – normal operation of CCD	
(Ethernet) Modem	Relevant only if connected to DMCU: • 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	

Appendix A: Specifications

700 MHz Frequency band	Uplink	Downlink
Operating Frequency Range	Lower band - 698-716MHz or Upper band - 776 - 787MHz	Lower band - 728-746MHz or Upper band - 746 - 757MHz
Output power at antenna port (composite)(*)	21dBm	21dBm
Pass band maximum gain	73dB	73dB
Gain attenuation range	0-25dB (in 1dB steps)	0-25dB (in 1dB steps)
Pass band ripple	± 2.5dB	± 2.5dB
Noise Figure @ max gain	6dB	6dB
Propagation delay	6 µsec	6 µsec
Number of filters per band(**)	Up to 8	Up to 8
1700 MHz (AWS1 +3) Frequency band	Uplink	Downlink
Operating Frequency Range(***)	1710-1780MHz	2110-2180MHz
Output power at antenna port (composite) (*)	20dBm	20dBm
Pass band maximum gain	73dB	73dB
Gain attenuation range	0-25dB (in 1dB steps)	0-25dB (in 1dB steps)
Pass band ripple	± 2.5dB	± 2.5dB
Noise Figure @ max gain	6dB	6dB
Propagation delay	6 µsec	6 µsec
Number of filters per band(**)	Up to 8	Up to 8
850MHz (Cellular) and SMR 800 (Upper 7MHz) Frequency band	Uplink	Downlink
Operating Frequency Range	817-849MHz	862-894MHz
Output power at antenna port (composite) (*)	21dBm	21dBm
Pass band maximum gain	73dB	73dB
Gain attenuation range	0-25dB (in 1dB steps)	0-25dB (in 1dB steps)
Pass band ripple	± 2.5dB	± 2.5dB
Noise Figure @ max gain	6dB	6dB
Propagation delay	6 µsec	6 µsec
Number of filters per band(**)	Up to 8	Up to 8
1900 MHz (PCS) Frequency band	Uplink	Downlink
Operating Frequency Range	1850-1915MHz	1930-1995MHz
Output power at antenna port (composite) (*)	20dBm	20dBm
Pass band maximum gain	73dB	73dB
Gain attenuation range	0-25dB (in 1dB steps)	0-25dB (in 1dB steps)
Pass band ripple	± 2.5dB	± 2.5dB
Noise figure @ max gain	6dB	6dB

Propagation delay	6 µsec	6 µsec
Number of filters per band(**)	Up to 8	Up to 8
2600 MHz Frequency band	**Uplink**	**Downlink**
Operating Frequency Range	2500-2570MHz	2620-2690MHz
Output power at antenna port (composite) (*)	20dBm	20dBm
Pass band maximum gain	73dB	73dB
Gain attenuation range	0-25dB (in 1dB steps)	0-25dB (in 1dB steps)
Pass band ripple	± 2.5dB	± 2.5dB
Noise figure @ max gain	6dB	6dB
Propagation delay	6 µsec	6 µsec
Number of filters per band(**)	Up to 8	Up to 8
Electrical specification		
Power supply	110/240 VAC	
Power consumption	<70 Watt for dual band, < 45 W for single band	
Environmental specification		
Operating temperature range	14 to 122°F	
Humidity	85%, ETS 300 019-1-3 Class 3.1	
Mechanical specification		
Dimensions	11.77" x 12" x 3.03" (b x h x d)	
Installation	Wall mount	
Weight	8.9 lbs for dual band	
Ingress protector	IP41	
Complies with	FCC (NEO-DMINI21082019, NEODMINI2107L2017, NEODMINI2107U2017) IC (8794A-DM7L17, 8794A-DM7U17, 8794A-DM819)	

(*) 3.5dB less in quad band configurations due to combining loss
(**) Supports every BW option 200kHz-25MHz by setting the start-stop frequency. Total number of filters is 8 in dual band
(***)Some of the variants supports AWS 1 frequencies only. Please refer to the ordering information for details