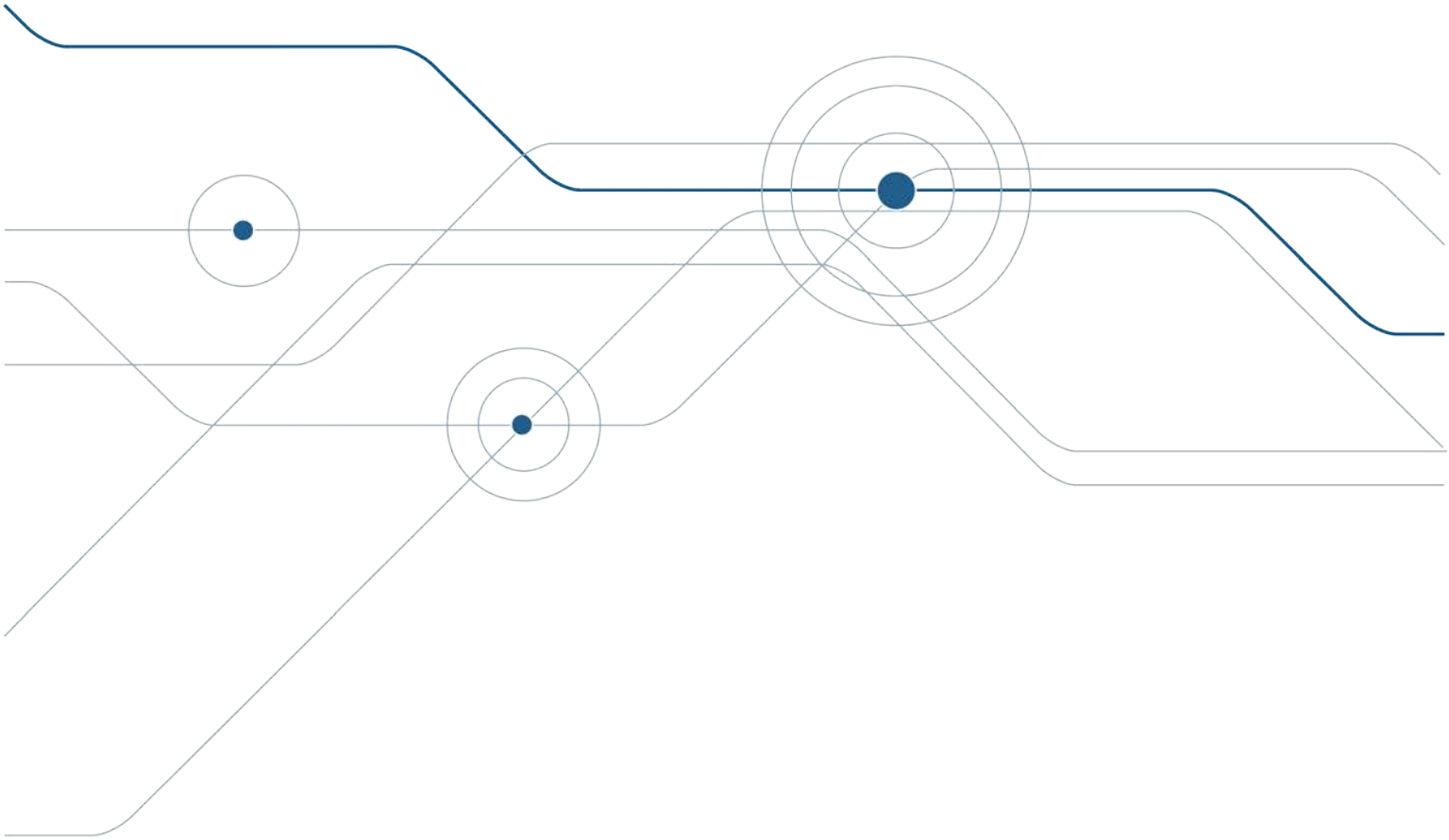
DetNet - RF Repeater | UTM-00233 | Rev 3



APPROVER: 2019/01/21

Vinesh Naidoo yyyy/mm/dd

APPROVED

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1 USERS OF THIS MANUAL

DetNet endeavours to upgrade BlastWeb software annually to comply with new challenges and needs faced by Centralized Blasting users in the market. As new software becomes available, the DetNet version control policy requires that all control equipment be upgraded to ensure support is provided on the latest software version installed on Surface Blast Controllers as deployed on customer sites.

1.1. Purpose of this manual

The purpose of this manual is to provide a step-by-step guideline explaining how to successfully perform an installation of a BCU.

This manual is only to be used for the BlastWeb System and the applicable software version as displayed.

1.2. End User

1.2.1. Requirements

- Only trained personnel, and personnel found competent, are allowed to operate the system.
- Users of the system shall be aware of the recommended procedures for using the BlastWeb BCU System as per manufacturer's recommendations.
- These recommendations do not supersede the method as required by local mine, explosives or statutory regulations/procedures/codes of practise regarding the use of detonators. In such cases, the MOST STRINGENT set of rules between the mine, explosives or local regulations/procedures/codes of practise and the manufacturer must be followed.

1.3. Training

Training and software upgrades shall only be performed by a DetNet SA subject matter expert.
Contact the DetNet head office for additional information.

ALL USERS OPERATING THE BCU SYSTEM SHALL HAVE SUCCESSFULLY COMPLETED THE SPECIFIC TRAINING BEFORE PERFORMING ANY WORK WITH THE DEVICE(S).

1.4. Information

Refer to http://www.detnet.com/ for additional detail and documentation.

2 BlastWeb SYSTEM PRODUCT SAFETY

2.1. DetNet Safety Philosophy

DetNet safety philosophy is to design, manufacture and provide control equipment, detonators and accessories to the highest safety standards.

- SmartKeys remains in possession of the accountable person, and should only be used to authorize the blast process at such a time as stipulated by the Mine after completion of the required Risk Assessment.
- All products must conform to local and international standards before it is sold for use.
- DetNet complies to ISO 9001, SANS 551:2009, CEN/TS 13763-27 which is acceptable to countries we operate in; in countries not subscribing to the above marks, we advise users to engage with DetNet to ensure that all equipment comply to local regulations.

2.2. User Safety

Safety is ensured when the user supplements the product's in-built safety systems through adequate training in the safe use of the product:

- Induction training
- Refresher training

DetNet continuously upgrades software to make our products more user friendly and to ensure that users stay abreast on latest developments, it is important that users get trained on the relevant changes before their equipment is updated.

2.3. Transportation, Storage and Handling

BlastWeb equipment must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations. Control equipment and accessories should be handled with due care and not dropped, mishandled, subjected to excessive vibration or exposed to any chemical agents. Connectors should be kept clean and the equipment must be kept in a safe environment to avoid misappropriation or misuse.

2.4. Maintenance Schedule

All equipment in the field will need to be returned to DetNet, or its repair centres, for service at the following intervals:

- Handheld Equipment (Tagger, etc.) – 18 Months.
- Other equipment (Excluding accessories) – 24 Months.

2.5. Information in case of emergency

Refer to http://www.detnet.com/ for additional detail and documentation.

2.6. RF Repeater General Safety Warnings

- The RF Repeater may operate with mains power or with a solar panel. Do not open the unit while it is connected to mains.
- The battery installed in the RF Repeater is a sealed Lead-acid type. Observe appropriate lead-acid handling precautions and lead disposal methods.
- Lead-acid batteries generate hydrogen while charging which is highly flammable and constitutes a fire hazard.
- Although the battery as used is of the sealed type, under extreme conditions, the acid solution may leak from the battery. Observe appropriate sulphuric acid handling precautions.
- All work performed on the unit shall be carried out in a dry and well-ventilated area.
- Note that battery connections are polarity sensitive

2.7. Warning, Caution, and Note Statements

WARNING, ***CAUTION***, and ***NOTE*** statements are used throughout this manual to emphasise important and critical information. Observe these statements to ensure safety and to prevent product damage. The statements are *defined as follows:*

A WARNING MEANS THAT INJURY OR DEATH IS POSSIBLE IF THE INSTRUCTIONS ARE NOT OBEYED.

Warnings draw special attention to anything that could injure or kill the reader/user. *Warnings* are generally placed before the step in the procedure they relate to. Warning messages are repeated wherever they apply.

A CAUTION MEANS THAT DAMAGE TO EQUIPMENT IS POSSIBLE.

Cautions draw special attention to anything that could damage equipment or cause the loss of data and will normally describe what could happen if the caution is ignored. *Cautions* are generally placed before the step in the procedure they relate to.

Notes are added to provide additional information.

Notes are used to emphasise important information by visually distinguishing this from the rest of the text. Notes can contain any type of information except safety information, which is always placed in cautions or warnings.

Refer to http://www.detnet.com/ for additional detail and documentation.

2.8. *RF compliance - FCC (USA) and ICES (Canada)*

2.8.1. Unauthorised Changes

DetNet South Africa has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

DetNet South Africa *n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.*

2.8.2. Radio Interference

This device complies with Part 15 of the FCC Rules and Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

2.8.3. RF Exposure

This equipment complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body. Antenna gain must be below 30 dBm
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet appareil est conforme aux limites d'exposition aux rayonnements de la IC pour un environnement non contrôlé. L'antenne doit être installé de façon à garder une distance minimale de 20 centimètres entre la source de rayonnements et votre corps. Gain de l'antenne doit être ci-dessous 30dBm
L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur.

2.8.4. FCC Class B digital device notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television 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 receiving 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.
- Consult the dealer or an experienced radio/TV technician for help.

2.8.5. Labelling Requirements for the Host device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the FCC ID and IC of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:
Contains FCC ID: 2ARNH-09230850

L'appareil hôte doit être étiqueté comme il faut pour permettre l'identification des modules qui s'y trouvent. L'étiquette de certification du module donné doit être posée sur l'appareil hôte à un endroit bien en vue en tout temps. En l'absence d'étiquette, l'appareil hôte doit porter une étiquette donnant le FCC ID et le IC du module, précédé des mots « Contient un module d'émission », du mot « Contient » ou d'une formulation similaire exprimant le même sens, comme suit :
Contains IC: 24476-09230850

2.8.6. CAN ICES-3 (B) / NMB-3 (B)

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003.

2.9. DISCLAIMER

This document forms part of the User Manual for the BlastWeb System and is considered to be confidential. This document contains restricted information for company and channel partners' application only.
Should any of the restricted information contained in this document be disclosed to any third party either intentionally or unintentionally, DetNet South Africa will not be held responsible, accountable or liable for any resulting event and or issue.

3 RF Repeater

The RF repeater is a communication device designed to amplify or regenerate data signals in order to transfer RF communication signals between the Bench Box and Base Station.

- The RF Repeater function is to receive a signal from a Base Station or Bench Box which has weakened as a result of being propagated over a long distance or other electromagnetic interference.
- The RF repeater is a bidirectional amplifier which, when located between two antennas, relays signals in remote locations, or in order to bypass obstructed paths.
- Once the RF Repeater receives this signal, it amplifies the signal before transmitting it on a different channel, effectively increasing the distance over which RF communication between the Base Station and Bench Box can take place.
- RF Repeater must be in Line-of-Sight of both Bench Box(es) and Base Station.

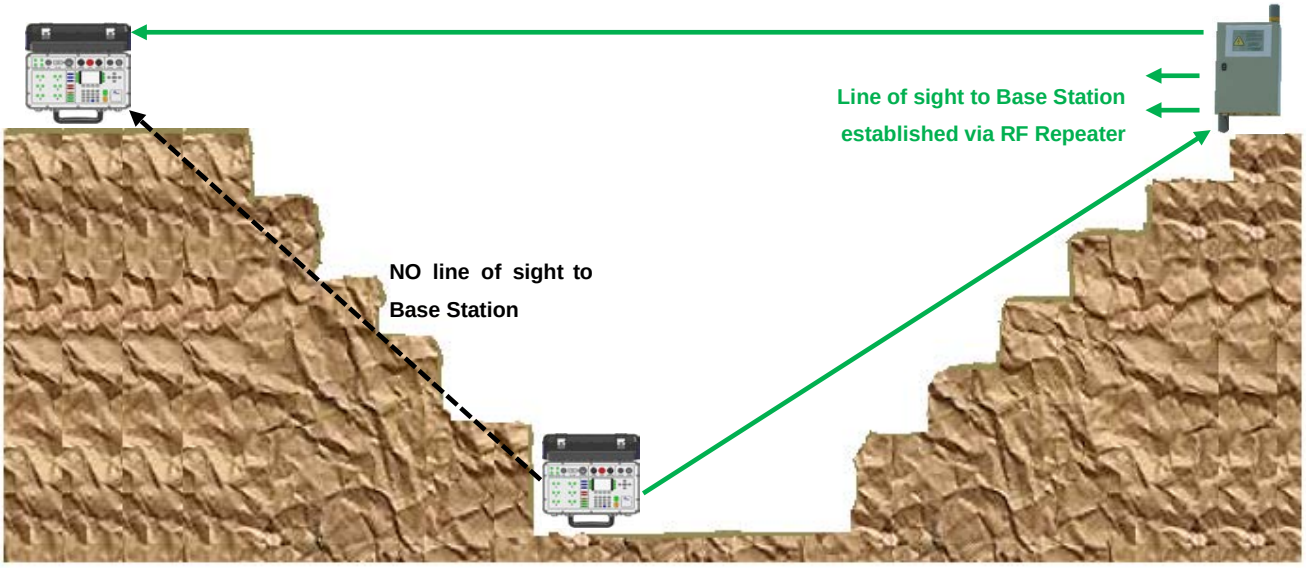


Figure 1: Line of sight clarification

3.1. Components

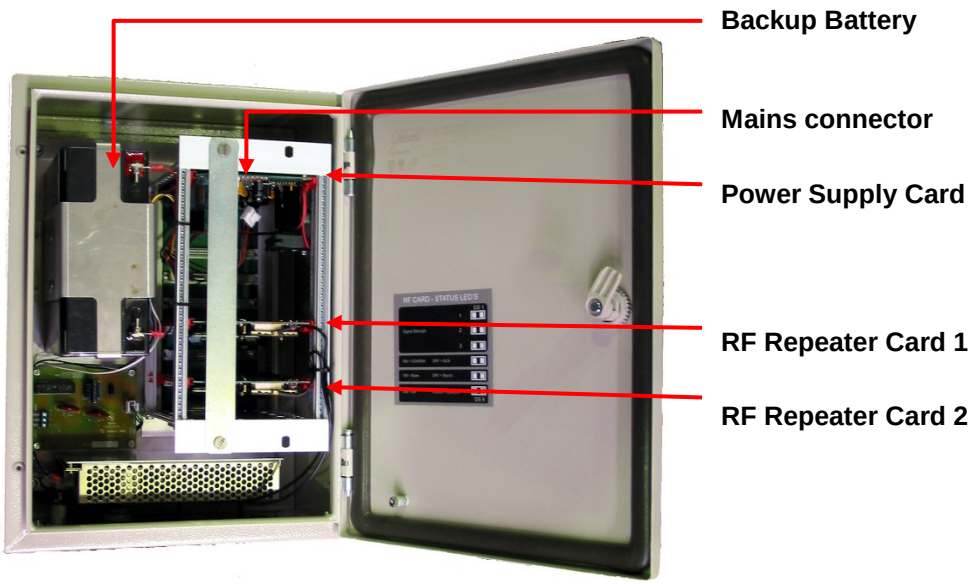


Figure 2: Repeater components

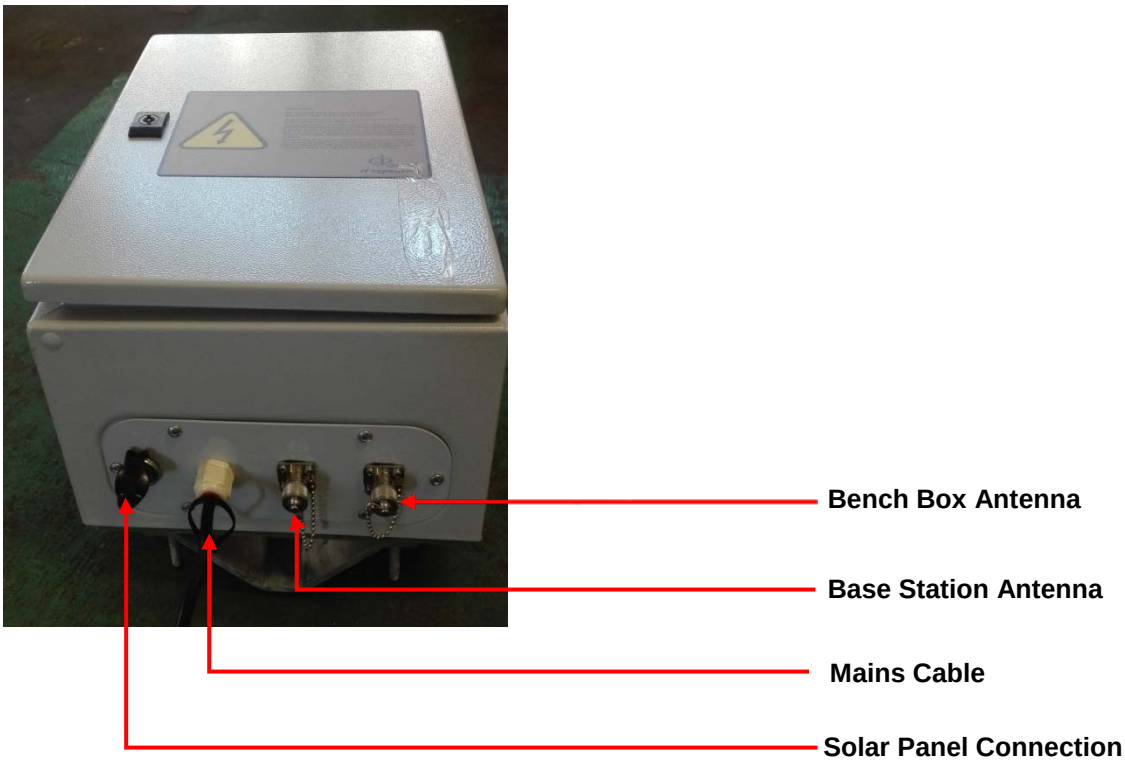


Figure 3: Cable Connectors

4 Installing RF Repeater

4.1. Mounting RF Repeater

Figure 4: Installed Repeater

- Mount the RF Repeater unit on a 75-100mm diameter pole
- Secure the unit to the pole using the pole clamps and mounting plates with M8 nuts, washers and spring washers, using a 13mm spanner.
- Ensure that no metal objects are in line of sight of both the Bench Box(es) and the Base Station which may cause interference with the signal.

4.2. Connecting Antennae

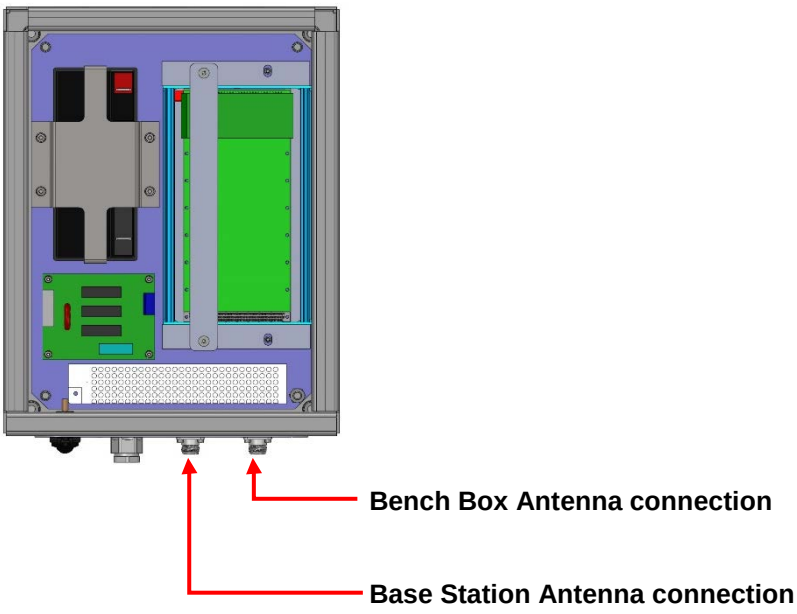
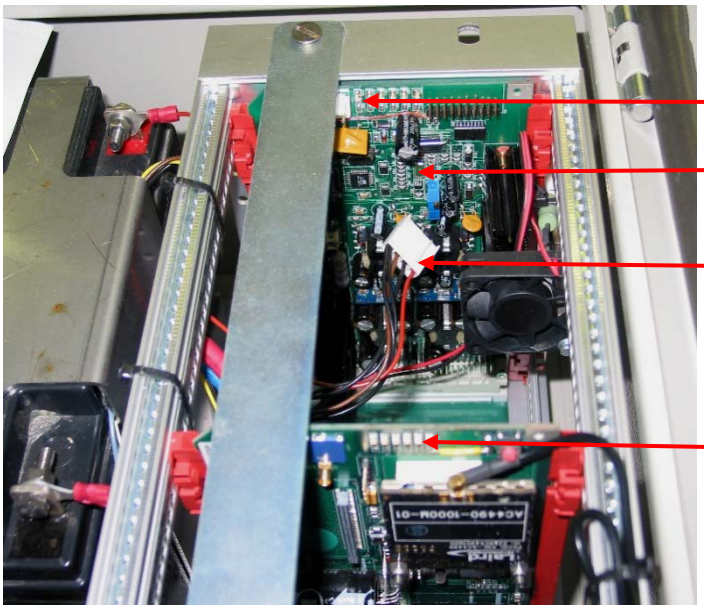


Figure 5: Antennae connection points

- Connect Bench Box Antenna in corresponding connector
- Connect Base Station Antenna in corresponding connector
- Place the antennas in such a way that there is a clear line of sight between the Base Station and Bench Box RF antenna and the RF Repeaters corresponding antenna. (Also refer to figure 3)
- Ensure that the antennas are mounted vertically and that their sides are not close to large metal objects.

4.3. Backup Battery



- Connect backup battery connector P1 to the PSU Card by connecting P1 to battery connector.
- Switch the power on

4.4. Main Power

4.4.1. Mains supply

The RF Repeater is compatible with either 115VAC or 230VAC mains supply

The required supply voltage have to be configured during production and has to be specified on the order.

4.4.2. Connecting Mains Supply

The Mains Protection PCB provides over current protection and over voltage protection.

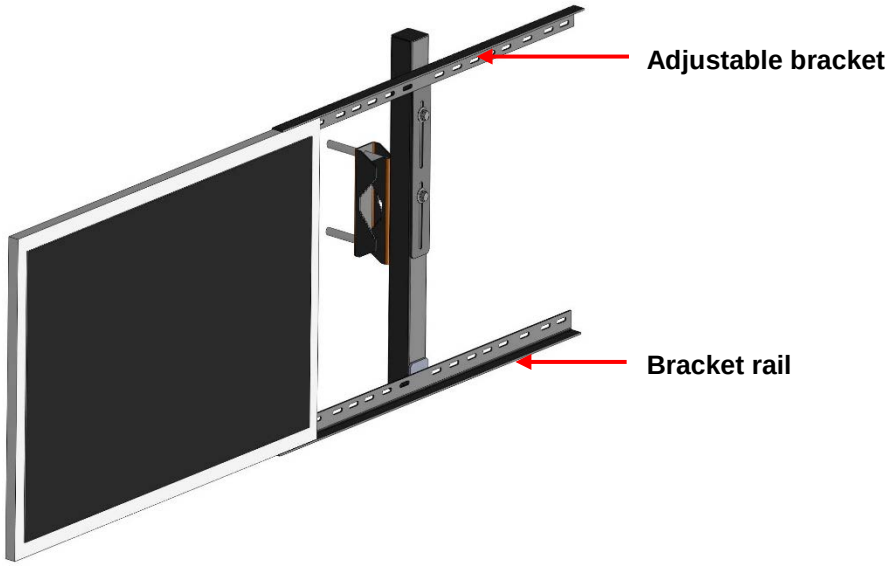
- **NEVER CONNECT 115VAC TO A RF REPEATER CONFIGURED FOR A 220VAC SUPPLY**
- **NEVER CONNECT 230VAC TO A RF REPEATER CONFIGURED FOR A 115VAC SUPPLY**
- **NEVER CONNECT 525VAC TO A RF REPEATER.**

If the RF Repeater does not switch on when mains power is switched on for the first time or after an extended period, it is likely that the backup battery voltage is below 12.5V. If so, change the battery until it is fully charged and the unit should switch on.

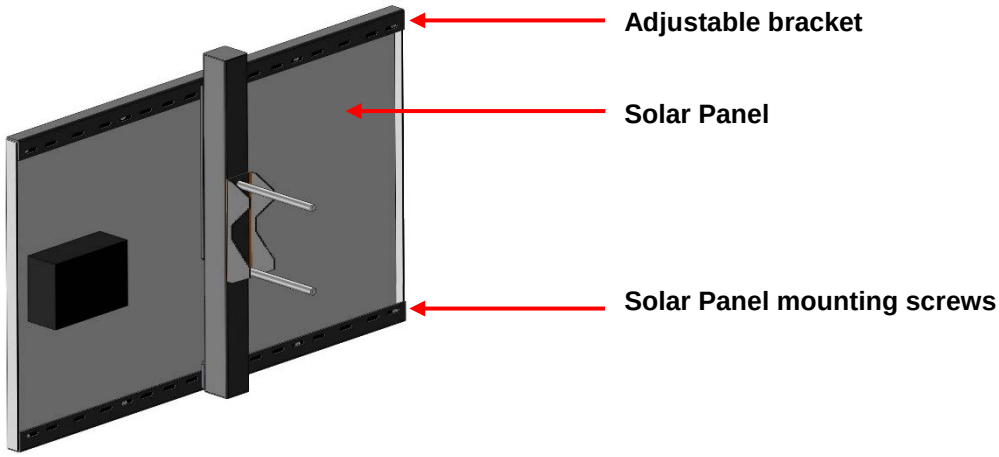
5 Solar Panel (Optional)

5.1. Mounting Solar panel to bracket

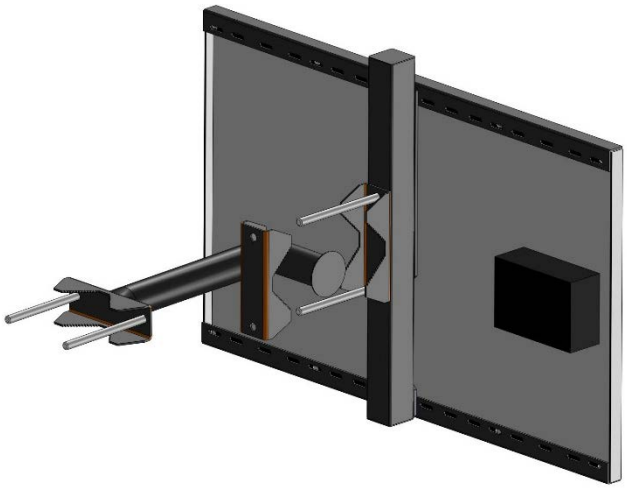
Install solar panel close to RF Repeater, keeping the cable between the repeater and solar panels as short as possible



- Loosen bolts on top adjustable bracket
- Adjust bracket to fit width of solar panel
- Tighten nuts to hold adjustable bracket in place
- Slide solar panel into place along bracket rail
- Secure bracket to the solar panel from the back of the solar panel using the eight screw provided

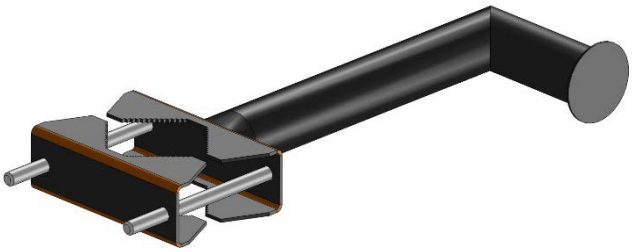


5.2. Connecting arm



- Loosen the two nuts on pole clamp
- Open the pole clamp and insert the arm between the pole clamps
- Secure and tighten the pole clamps

5.3. Securing arm to a fixed pole

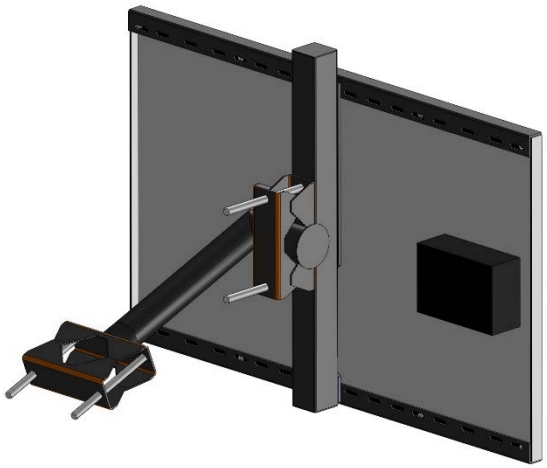


- Loosen the two nuts on the pole clamp
- Clamp around a 75-100mm diameter pole
- Secure and tighten pole clamps

5.4. Adjusting Solar panel

5.4.1. Location of Solar Panels

- Southern Hemisphere, the solar panel should face north for the longest exposure to sunlight per day
- Northern Hemisphere, the solar panel should face south for the longest exposure to sunlight per day
- Adjust tilt position with the season change for optimal results.



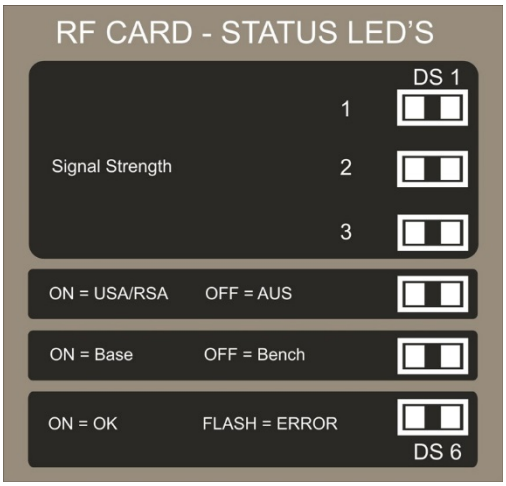
- Loosen the two nuts on the pole clamp attached to the bracket
- Swivel solar panel up or down for best results
- Tighten and secure nuts.
- For optimal performance, ensure that excessive dust and or snow does not accumulate on the solar cell.

6 Channel Setup

When ordering a RF Repeater, country selection must be supplied as the regulatory allowable channel-frequency settings can only be set in the factory.

Ensure that the Base Station / Bench Box is set to the correct country when configuring the system in the field. The two selectable options are as follows:

- RSA/USA
- Australia



7 Troubleshooting

7.1. Replace main supply cable

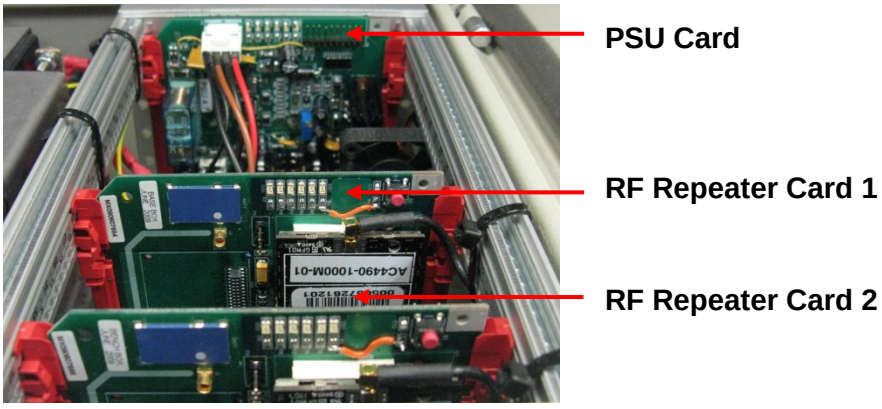
- Ensure that the mains supply is switched off and there is no mains Voltage present.
- Loosen the plastic gland, insert 3 core mains cable.
- Thread the mains cable round around the PSU to the Mains Input 3 way screw terminals on the Main Protection PCB**.**
- Using a small flat screwdriver, connect the three-core mains cable to the clearly marked 3 way screw terminals:
    - Brown – Live (230VAC or 115VAC)
    - Blue – Neutral
    - Yellow/green – Earth

7.2. Low Battery

- Switch on the power by connecting the appropriate wires to the battery.
- Connect the unit to mains and switch on the mains power.
- If the RF Repeater does not switch on when mains power is switched on, it is likely that the battery voltage is below 12.5V. If so, allow the battery to charge until its voltage is above 12.5V. The unit should now switch on.

7.3. PSU Card and RF Repeater Cards

The cards are equipped with LED's that can assist during diagnostics.



7.3.1. PSU LED's

DS1 LED On, everything is working
LED Off, power Supply Unit faulty

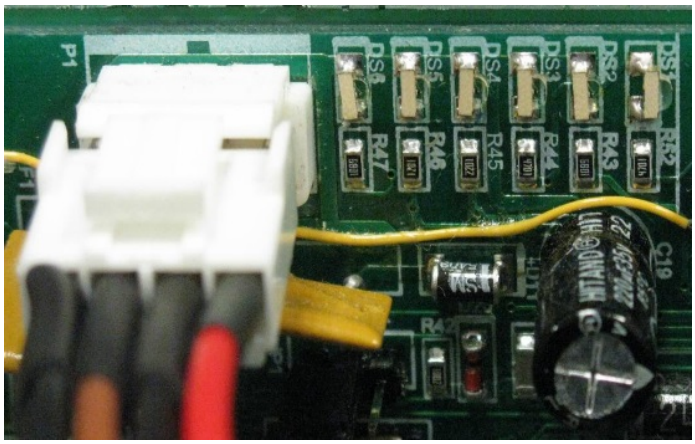
DS2 LED On, Relay engaged
LED Off, Relay disengaged

DS3 LED On, 10V6 Supply Rail Good
LED Off, faulty return for repair

DS4 – LED On, 5V Supply Rail Good
LED Off, faulty return for repair

DS5 – LED On, 3V3 Supply Rail Good
LED Off, faulty return for repair

DS6 – LED On, charge source present
LED Off, not charging



7.3.2. RF Repeater LED's

DS1 – LED On, signal strength
LED Off, weak signal (no signal)

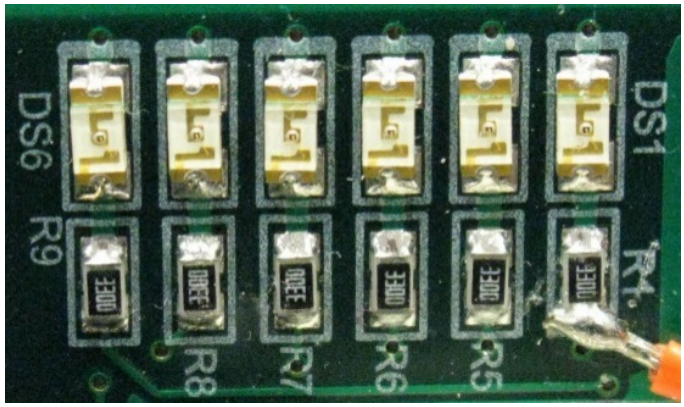
DS2 - LED On, Medium signal strength
LED Off, weak signal

DS3 – LED On, Good signal strength
LED Off, weak signal

DS4 – LED On, denotes channel select USA/RSA
LED Off, denotes channel select AUS

DS5 – LED On, denotes Base Station card
LED Off, denotes Bench Box Card

DS6 – LED On, everything is working
LED Flashing, error communicating



NOTE

Refer to the label placed inside the door for reference to the RF Repeater Cards Status LEDs