

# PSR-78-9537-UA MANUAL

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**VERSION 0.25**



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# Terms and Abbreviations

The following is a list of abbreviations and terms used throughout this document.

Abbreviation/Term	Definition
<b>AGC</b>	Automatic Gain Control
<b>ALC</b>	Automatic Level Control
<b>AROMS</b>	ADRF Repeater Operation and Management System
<b>BDA</b>	Bi-Directional Amplifier
<b>BTS</b>	Base Transceiver Station
<b>CDMA</b>	Code Division Multiple Access
<b>CFR</b>	Crest Factor Reduction
<b>CP</b>	Cyclic Prefix
<b>CW</b>	Continuous Wave (un-modulated signal)
<b>DAS</b>	Distributed Antenna System
<b>DL</b>	Downlink
<b>HPA</b>	High Power Amplifier
<b>HW</b>	Hardware
<b>IF</b>	Intermediate Frequency
<b>LNA</b>	Low Noise Amplifier
<b>LTE</b>	Long Term Evolution
<b>MS</b>	Mobile Station
<b>OFDM</b>	Orthogonal Frequency-Division Multiplexing
<b>OFDMA</b>	Orthogonal Frequency-Division Multiple Access
<b>PAR (PAPR)</b>	Peak to Average Power Ratio (Crest Factor)
<b>PLL</b>	Phase Locked Loop
<b>PSU</b>	Power Supply Unit
<b>QAM</b>	Quadrature Amplitude Modulation
<b>QPSK</b>	Quadrature Phase Shift Keying
<b>RB</b>	Resource Block
<b>RF</b>	Radio Frequency
<b>SC-FDMA</b>	Single Carrier-Frequency Division Multiple Access
<b>SQE</b>	Signal Quality Estimate
<b>SW</b>	Software
<b>UE</b>	User Equipment
<b>UL</b>	Uplink
<b>VSWR</b>	Voltage Standing Wave Ratio



## 1. SINTRODUCTION

PSR-78-9537-UA bi-directional amplifiers (BDAs) extend the coverage area of radio communications in buildings and RF shadow environments. These units feature low noise figure and wide dynamic range and are certified to UL 2524.

The PSR-78-9537-UA is a revolutionary digital public safety repeater designed to protect the lives of first responders and building occupants.

The PSR-78-9537-UA is the best-in-class public safety repeater with FirstNet support and it is fully compliant with International Fire Code (IFC) and National Fire Protection Association (NFPA).

### Product Features

- NFPA 1221 2016 code compliant and FirstNet compliant
- Alarming output to supervised circuits for: antenna, amplifier, power supply, battery, and charger failure
- IP66 compliant enclosure for both indoor and outdoor environments
- Class B wideband repeater designations
- Up to 95dB of gain and up to 37 dBm downlink output power per band and up to 30 dBm uplink output power shared

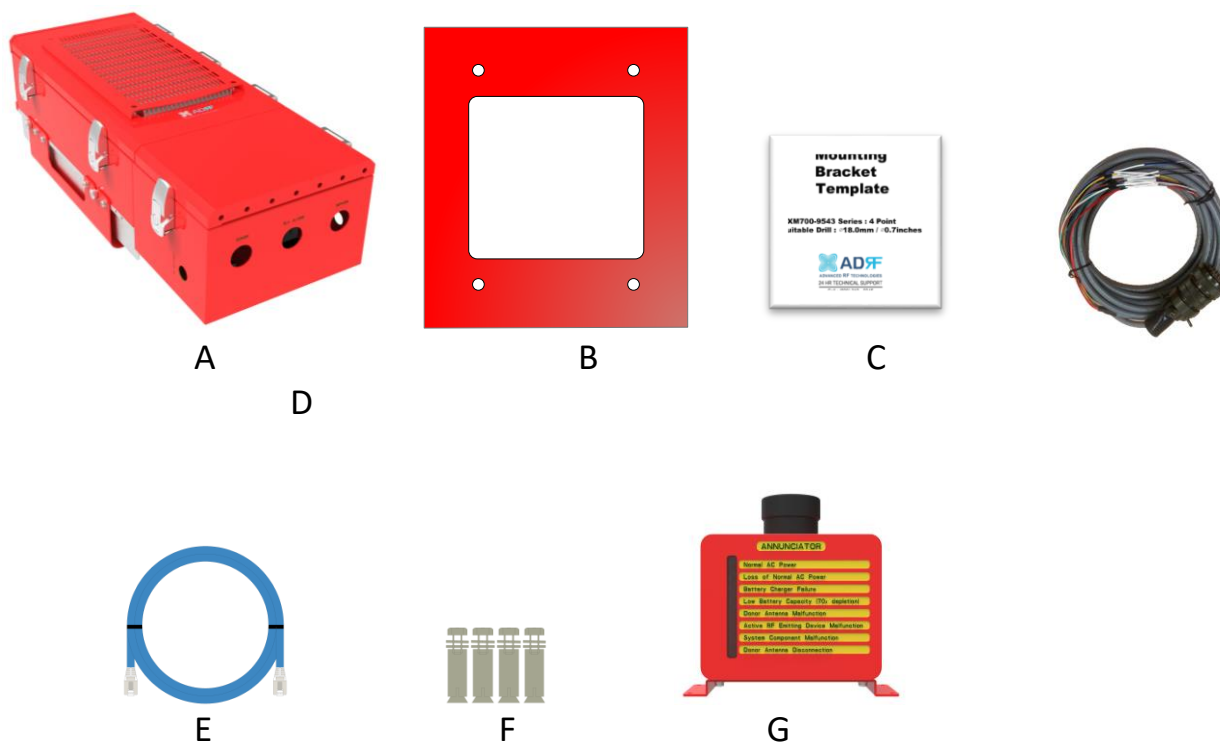
### 1.1 Highlights

- UL 2524 Certified
- Supports both 700MHz and 800MHz Public Safety Frequencies in a single repeater
- Air convection cooling without fans
- Sharp Filter Roll-off performance (Wide: 60dBc @ Filter Bandwidth Edge + 1MHz | Narrow: 55dBc @ Filter Bandwidth Edge + 3 \* Filter BW)
- Supports SNMP v1, v2c, v3 (get and set)
- Web-based GUI Interface; No 3rd party GUI software required
- Web-GUI connectivity via DHCP in host mode
- External Alarm Function supporting dry contacts (11 outputs, 1 input)
- Support Emergency Power Off Switch

## 1.2 Parts List

**Table 1-1 Parts List**

Label	Quantity	Description
A	1	<b>PSR-78-9537-UA</b>
B	1	Wall Mount Bracket
C	1	Mounting Bracket Template
D	1	AAI Alarm Cable
E	1	Ethernet Cable (Crossover)
F	4	Anchor Bolt
G	1	PSR-ANN (Annunciator Panel)



**Figure 1-1 PSR-78-9537-UA Repeater Parts List**

### 1.3 Quick View



Figure 1-2 PSR-78-9537-UA External Ground Terminal

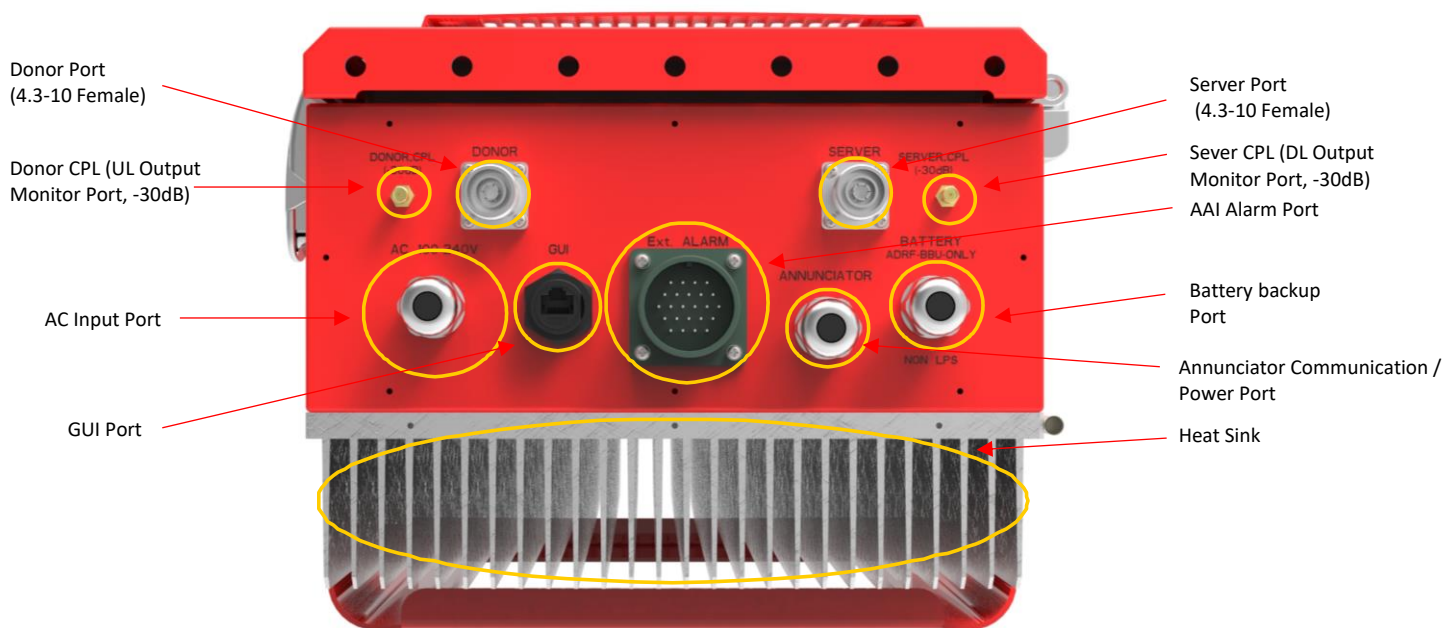


Figure 1-3 PSR-78-9537-UA Quick View (Bottom)



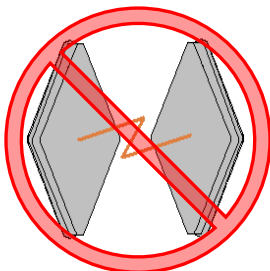
Figure 1-4 PSR-ANN Annunciator

## 1.4 Warnings and Hazards



### WARNING! ELECTRIC SHOCK

Opening the PSR-78-9537-UA could result in electric shock and may cause severe injury.



### WARNING! DAMAGE TO REPEATER

Operating the PSR-78-9537-UA with antennas in very close proximity facing each other could lead to severe damage to the repeater.

### RF EXPOSURE & ANTENNA PLACEMENT Guidelines

Actual separation distance is determined upon gain of antenna used.

Please maintain a minimum safe distance of 630 cm while operating near the donor and the server antennas. Also, In accordance with the FCC regulations (90.219), this device must meet 5W ERP requirements.

### WARRANTY

Opening or tampering the PSR-78-9537-UA will void all warranties.

**Lithium Battery: CAUTION. RISK OF EXPLOSION IF BATTERY IS REPLACED BY INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO INSTRUCTIONS.**

**Ethernet Instructions:** This equipment is for indoor use only. All cabling should be limited to inside the building. Ethernet connection can only be used for programming/troubleshooting purposes only and is not to be connected during normal operation.

**Preclude indications that Home/ personal use are prohibited.**

**Use of unauthorized antennas, cables, and/or coupling devices not conforming with ERP/EIRP is prohibited.**

### **FCC Part 15.21**

**Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.**

### **FCC Part 15 Class A**

**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

### **Part 90 Signal Boosters**

### **This is A 90.219 CLASS A DEVICE**

**WARNING.** THIS is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC Licensee to operate this device. You MUST register Class B signal boosters (as defined in 47 CFR 90.219) online at [www.fcc.gov/signal-boosters/registration](http://www.fcc.gov/signal-boosters/registration). Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.

### RSS-GEN, (6.8 Transmit antenna)

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.

(Max. peak gain: 17 dBi)

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 isotroperayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

(Max. peak gain: 17 dBi)

### RF Radiation Exposure

This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of **630 cm** between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. RF exposure will be addressed at time of installation and the use of higher gain antennas require larger separation distances.

L'antenne (ou les antennes) doit être installée de façon à maintenir à tout instant une distance minimum de au moins **630 cm** entre la source de radiation (l'antenne) et toute personne physique. Cet appareil ne doit pas être installé ou utilisé en conjonction avec une autre antenne ou émetteur.

## 2. INSTALLATION

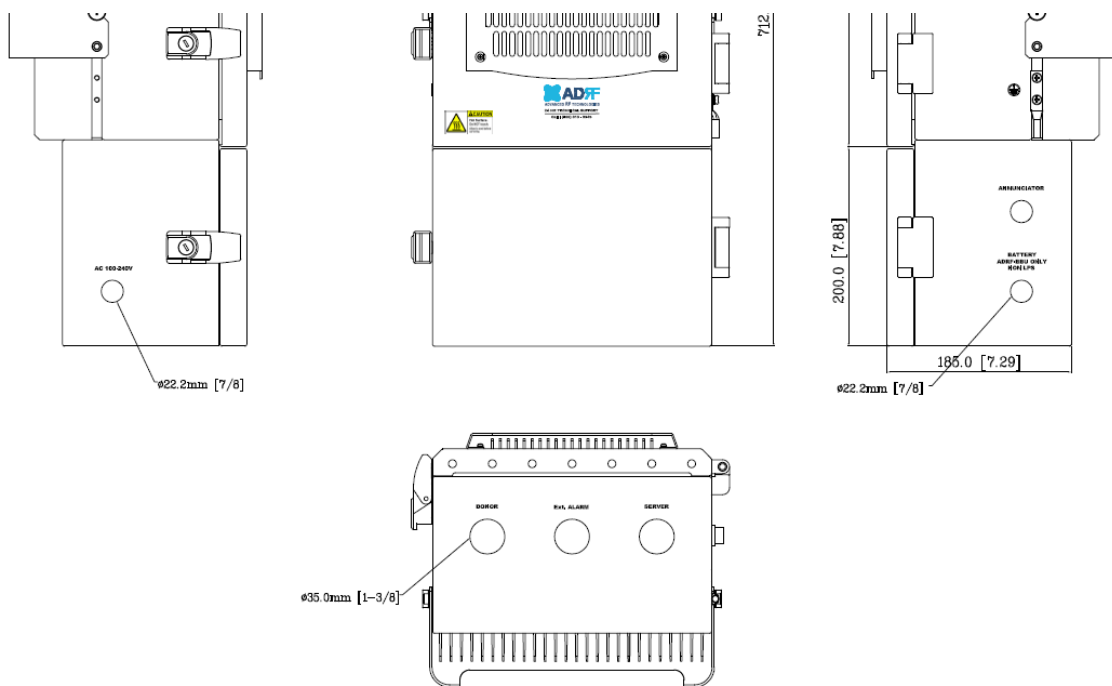
### 2.1 Wiring Compartment

The bottom of the PSR-78-9537-UA is a wiring compartment with pre-cut holes. These holes are designed to be used in conjunction with conduit hubs to prevent water ingress. A total of 6 pre-cut holes are available to use for the various cables that will be needed for the proper operation of the repeater.

To maintain UL 2524 Listed status, unused ports must be properly weather proofed.

**Table 2-1 Pre-cut hole size and labels**

Silkscreen Label	Location	Diameter
AC 100-240V	LEFT	22.2mm (7/8")
ANNUNCIATOR	RIGHT	22.2mm (7/8")
BATTERY ADRF-BBU ONLY NON LPS	RIGHT	22.2mm (7/8")
DONOR	BOTTOM	33.0mm (1-3/8")
Ext. ALARM	BOTTOM	33.0mm (1-3/8")
SERVER	BOTTOM	33.0mm (1-3/8")



**Figure 2-1 Wiring Compartment Cutout Holes**



## 2.2 Wire Terminals

Non-power limited cables such as the AC power line and the DC battery line shown below in red must be separated by  $\frac{1}{4}$ " from power limited cables such as the donor/server, ext. alarm, and annunciator lines shown below in black. To maintain the  $\frac{1}{4}$ " spacing, route the annunciator line above the server line as shown in the picture below.

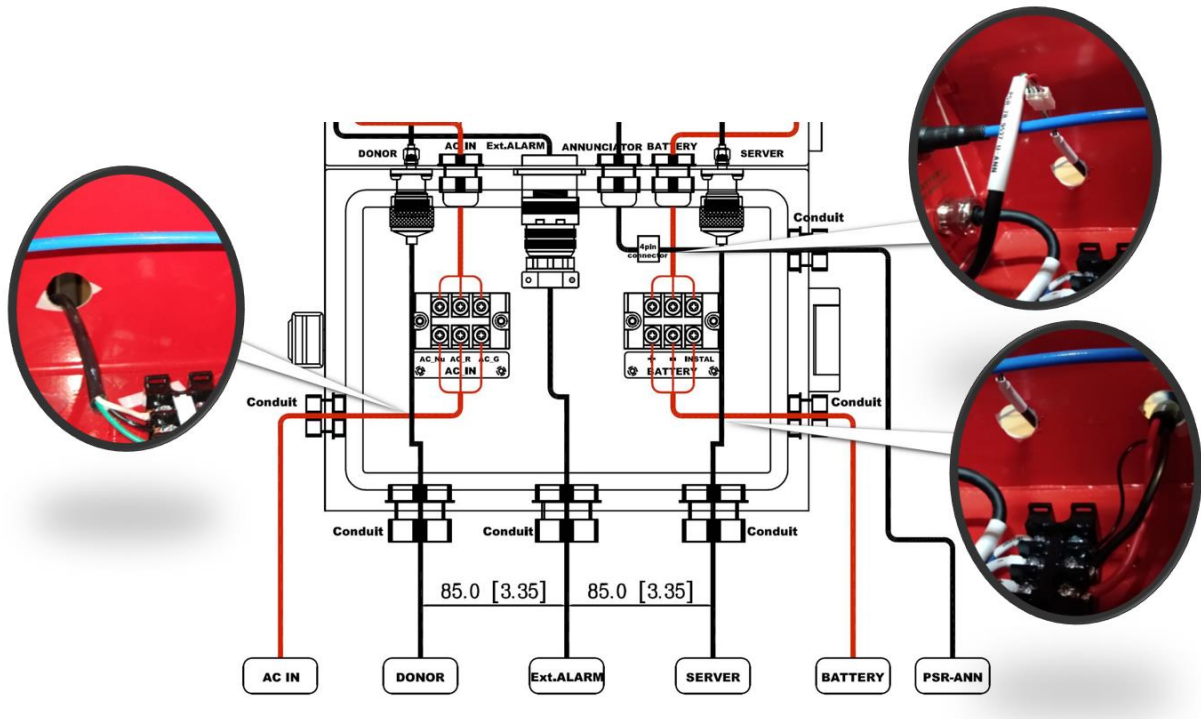


Figure 2-2 Terminal Wiring Diagram

### 2.2.1 AC 100-240V Terminal Block

The AC 100-240V Terminal Block is located on the left side of the wiring compartment. One side of the terminal block will be pre-wired and connected to the PSU and the chassis ground. The open terminals must be connected to an AC power source between 100-240V AC and secured in an electrical breaker box on its own circuit. The terminal block can support up to a cable gauge of 12AWG.

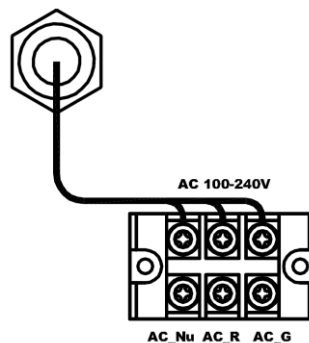


Figure 2-3 AC 100-240V Terminal Block

Table 2-2 Terminal Block Definition

Silkscreen Label	Line Type	Max Supported AWG
AC_NU	Neutral	12AWG
AC_R	Line or Hot	12AWG
AC_G	Ground	12AWG

### 3. OVERVIEW

#### 3.1 LED

PSR-78-9537-UA LED indicator lights are located on the inside of the repeater towards the bottom. Below the LED indicators is a button that is used to trigger the door open alarm.



Figure 3-1 LED Panel

Table 3-1 LED Specifications

POWER	DL	UL	ALARM
AC Fail	DL Signal Not Detected	UL Out-Band Overload	Power-Related Alarms
DC Fail	DL Signal Low Detected	UL Input Overload	RF DL Path Related Alarms
Battery Fail	DL RF Power	UL DSP Over Input	RF UL Path Related Alarms
Low Battery	DL Out-Band Overload	UL Over Input	Over Temperature
Battery Not Charge	DL Input Overload	UL Over Power	DSP Communication
Battery Not Connected	DL DSP Over Input	UL Return Power	Door Open
Over Current	DL Over Input	UL PLL Fail	System Halt
	DL Over Power		
	DL Return Power		
	DL PLL Fail		

LED Indicator	Specifications
Solid Green	Normal operation
Solid Yellow	Soft Fail alarm exists in the system
Solid Red	Hard Fail alarm exists in the system

#### 3.2 Host / Remote Switch

The Host/Remote Switch allows the user to switch the default Repeater IP, Subnet Mask, and Gateway of the Ethernet port of the repeater to an alternative setup. These settings can only be adjusted by logging into the repeater under HOST mode and configuring the settings under the Modem Box Setting section on the Install Page (section 7.4.5).

Once the settings are set, flipping the switch to the REMOTE position will reboot the repeater with the new alternate settings. *Please note that when the repeater is set to the REMOTE position, DHCP is disabled and the repeater will not automatically assign an IP address to any device that connects directly to the repeater.*

- Host IP: 192.168.63.1 (Fixed IP, unable to modify this IP address)
- Remote IP: 192.168.63.5 (Default IP, but can be modified in Host mode)

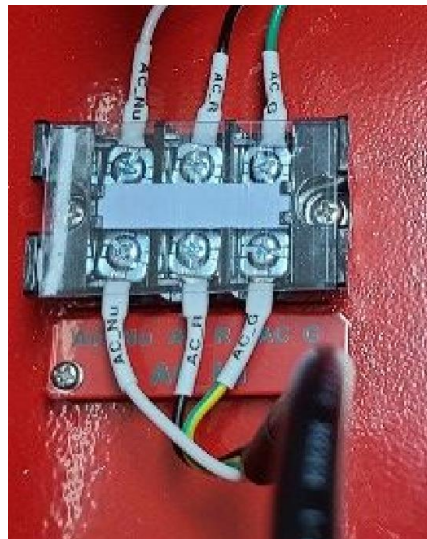


**Figure 3-2 Host/Remote Switch**

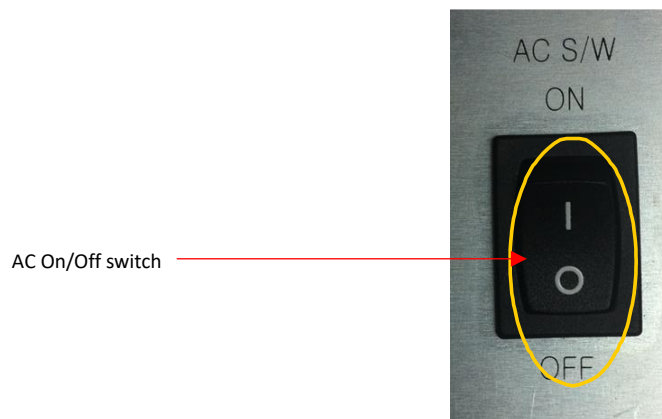
### 3.3 Cable Connection

#### 3.3.1 AC Power

The AC Terminal is located at the bottom of the wiring compartment on the opposite side of the wiring compartment door. The repeater has a free-voltage range input of 100-240V AC. The AC terminal box can support a max gauge of 12AWG and should be connected to the breaker box on its own circuit.



**Figure 3-1 AC Terminal**



**Figure 3-2 AC On/Off Switch**

The AC Power on/off switch is on the left-hand side of the PSU which is located inside of the repeater.

### 3.3.2 External Alarm



**Figure 3-3 External Alarm Port**

This port should be connected only to the fire alarm control panel.

**Table 3-1 External Alarm Port Pin Description**

Pin	Color	Pin Description (24 pins)	ADRF External Alarm Box Pin Description	Alarm Type
A	Black	Donor antenna malfunction_P	1-POS	Output
B	Black	Donor antenna malfunction_N	1-NEG	Output
C	Brown	Active RF device malfunction_P	2-POS	Output
D	Brown	Active RF device malfunction_N	2-NEG	Output
E	Red	Low battery capacity (70%)_P	3-POS	Output
F	Red	Low battery capacity (70%)_N	3-NEG	Output
G	Orange	System component malfunction_P	4-POS	Output
H	Orange	System component malfunction_N	4-NEG	Output
J	Yellow	Normal AC Power_P	5-POS	Output
K	Yellow	Normal AC Power_N	5-NEG	Output
L	Green	Loss of normal AC Power_P	6-POS	Output
M	Green	Loss of normal AC Power_N	6-NEG	Output
N	Blue	Battery charger failure_P	7-POS	Output
P	Blue	Battery charger failure_N	7-NEG	Output
Q	Purple	Summary Alarm_P	8-POS	Output
R	Purple	Summary Alarm_N	8-NEG	Output
S	Grey	Donor Antenna Disconnect_P	9-POS	Output
T	Grey	Donor Antenna Disconnect_N	9-NEG	Output
U	White	Oscillation Alarm_P	10-POS	Output
V	White	Oscillation Alarm_N	10-NEG	Output
W	Pink	ANN Disconnection_P	11-POS	Output
X	Pink	ANN Disconnection_N	11-NEG	Output
Y	Light Blue	N.C.	-	-

Z	Light Blue	N.C	-	-
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### 3.3.3 RF

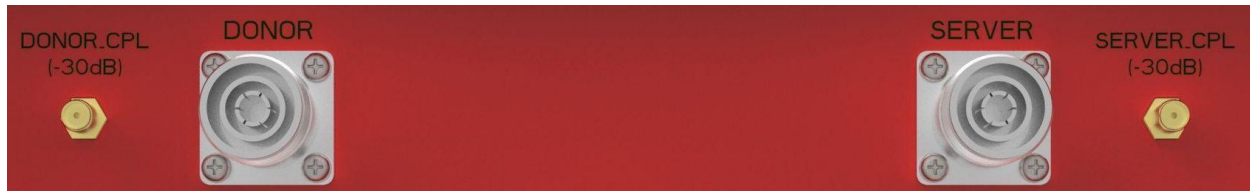


Figure 3-4 RF Ports

The RF connections are made via two 4.3-10 female connectors. The RF connector labeled “DONOR” must be connected to the antenna pointing towards the base station. The DONOR port can receive both 700 and 800MHz public safety signals. The RF connection labeled “SERVER” must be connected to the antenna facing the area to be covered by the BDA. The repeater has a single SERVER port that supports both 700 and 800MHz public safety signals.

The RF connections must be made using cables with an impedance of 50 ohms.

The separation between the antennas is necessary to prevent oscillation. Oscillation occurs when the signal entering the system continually re-enters, due to the lack of separation between the donor and server antennas. In other words, the signal is being fed back into the system. This creates a constant amplification of the same signal. As a result, the noise level rises above the signal level.

To prevent feedback, the donor and server antennas must be separated by an appropriate distance to provide sufficient isolation. Isolation is attained by separating antennas a sufficient distance so that the output of one antenna does not reach the input of the other. This distance is dependent on the gain of the repeater.

- **DONOR** – 4.3-10 female which is used to connect the donor antenna (700MHz + 800MHz PS)
- **DONOR\_CPL (30dB)** – SMA female 30 dB coupling port which is used to monitor the amplified UL signal
- **SERVER\_CPL (30dB)** – SMA female 30 dB coupling port which is used to monitor the amplified DL signal
- **SERVER** – 4.3-10 female which is used to connect the server antenna (700MHz + 800MHz PS)

### 3.3.4 Annunciator

The Annunciator port provided power and communication to the PSR-ANN annunciator box. The PSR-ANN annunciator box provides a summary status of the repeater via LED indicator lights and an audible alarm.

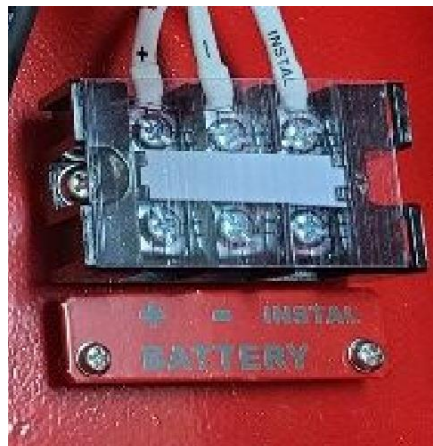
The default length of the cable that is provided to connect to the PSR-78-U to the PSR-ANN is 2m (6.5ft). Additional cable lengths at 10ft, 20ft, and 33ft are available. The maximum distance of the cable between the PSR-78-U repeater and the PSR-ANN annunciator is limited to 20m (66ft).



**Figure 3-5 Annunciator Port**

### 3.3.5 Battery Backup Terminal

This port connects to the ADRF-BBS/BBL-24 (24V battery backup unit) via a dedicated cable provided by the ADRF.



**Figure 3-6 Battery Backup Port (4-pin Female)**

When the ADRF-BBS/BBL-24 is connected to the repeater, the battery switch on the PSU must be switched to the ON position. This will enable the repeater to charge the ADRF-BBS/BBL-24 battery backup unit when AC power is present.



**Figure 3-7 Battery Switch**

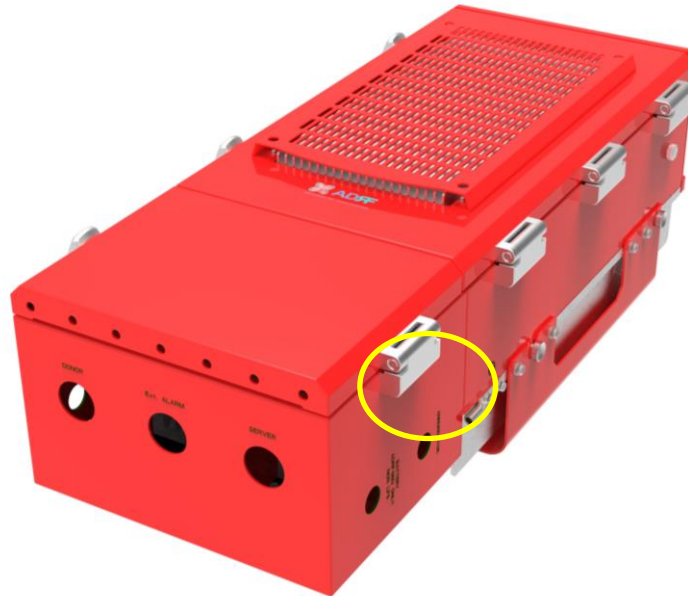
The PSR-78-9537-UA can be connected to an ADRF-BBS/BBL-24 to provide power during a power failure. If an ADRF-BBS/BBL-24 is utilized, connect it to the PSR-78-9537-UA via the external battery port.

**(WARNING: The circuit breaker switch on the ADRF-BBS/BBL-24 must be set to OFF before connecting it to the PSR-78-9537-UA to prevent damage to the repeater or the ADRF-BBS/BBL-24 and personal injury.)**

Note: Please contact ADRF Technical Support for assistance if you are unfamiliar with the installation procedure of the battery box.

### 3.3.6 Grounding

The grounding terminal is located at the lower right-hand side of the BDA. A grounding cable should be properly connected before powering on the equipment.



**Figure 3-8 Ground Cable Terminal**

Ground terminals located on the side of the repeater and can support a ground cable up to 1.25mm<sup>2</sup> (16AWG) in diameter and should be permanently connected to a grounding bar.



## 4. ALARMS

### 4.1 Message Board Alarms and Notifications

**Table 4-1 Message Board Alarms and Notifications**

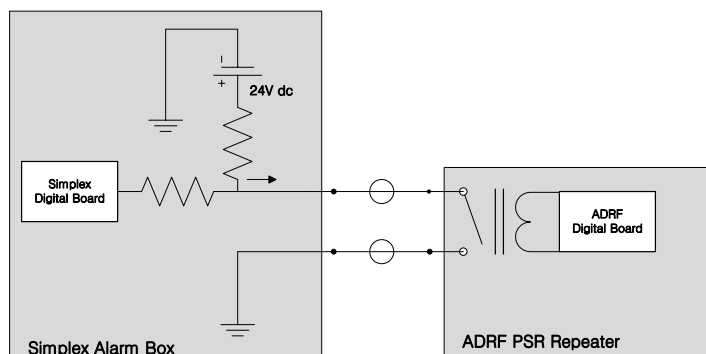
Alarm	Alarm Description	Trigger Condition
AC Fail	AC Input is outside of operating range	The power supply is not operating within specs. (4 seconds)
DC Fail	DC Output is outside of operating range	The power supply is not operating within specs. (4 seconds)
Temperature	The module is above/below the normal operating temperature	The module is above the normal operating temperature. (4 seconds) Over Temperature [Soft: 80~87 C, Hard: Above 87 C]
Current	PSU is providing more than the max current	The power supply is not operating within specs. (4 seconds) Over Current [Hard: Above 20A]
System Halt	The system is in a shutdown state due to a hard fail alarm	The system is in a shutdown state due to a hard fail alarm. (10 cycles)
DSP Fault	The system has detected an issue with the internal DSP	The system has detected an issue with the internal DSP chip. (Cannot communicate with DSP)
OSC	Oscillation detected	Oscillation detected.
DL Signal not detected	DL signal is below the specified level	DL signal is below the specified level. (default: -90dBm, 4 seconds)
DL Signal Low	DL signal is below the specified level	DL signal is below the specified level. (default: -85dBm, 4 seconds)
Input Overload	Incoming in-band DL or UL signal is too strong	Input signal is above the threshold. (4 seconds) (Soft: DL -5dBm/UL -5dBm, Hard: DL +5dBm/UL +5dBm)
Out of band Overload	Incoming out-band DL or UL signal is too strong	Out of band signal is above the threshold. (4 seconds) (Soft: DL -5dBm/UL -5dBm, Hard: DL +5dBm/UL +5dBm)
Synthesizer Lock Fail	There is an issue with the internal PLL	There is an issue with internal PLL. (4 seconds)
DL RF Power	Input + gain does not match the output level (above delta of 6 dB)	Input + gain does not match the output level. (default delta of 6 dB)
Overpower	The output level is above the max output levels	The output level is above the max output levels. AGC On case (Soft: AGC Level + 1~2dB, Hard: AGC Level + >2dB) AGC Off case (Soft: max output level + 1~2dB, Hard: max output level + >2dB)
VSWR	Power is being reflected back to the repeater	Power is being reflected back to the repeater. Threshold = output power - 8dB. For example, if the repeater is outputting 24dBm and detects 16dBm of return power, then the VSWR will be triggered. (Alarm will only trigger when the output power is 15dBm or greater)
Heartbeat	Heartbeat is sent out to the NOC	Heartbeat sent at set interval.
Reboot	Soft reboot performed	Reboot is performed from the Control tab.
Factory setting	Factory default settings restored	Factory setting is set from the Control tab.
Door	Door alarm set/clear	Door alarm set: Door open Door alarm clear: Door close



## 4.2 External Alarms

The PSR-78-9537-UA supports dry contact alarms and can be connected to a fire alarm control panel. The user can program the repeater to either create an open or closed circuit when an alarm is present in the system.

### 4.2.1 External Alarm Output interface



**Table 4-2 External Alarm**

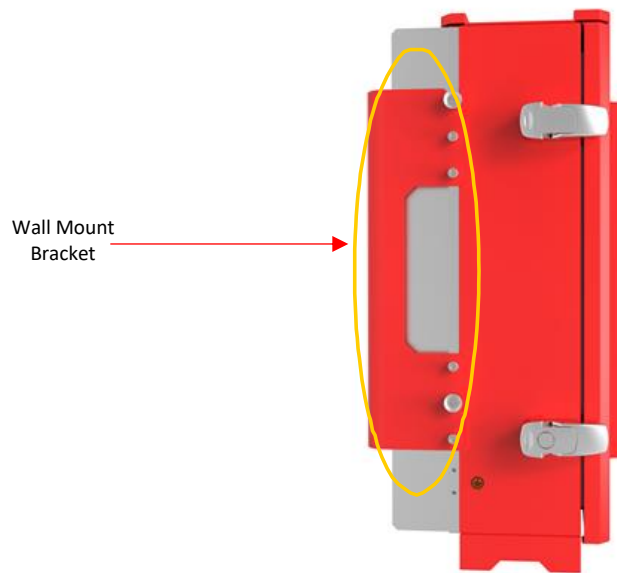
External Alarm Name	Set Condition	Likely Causes
Donor Antenna Malfunction	- UL Return Power Hard Fail	- Damaged Donor Antenna
Active RF Device Malfunction	- RF Power Soft Fail - DL Return Power Hard Fail - DL/UL Over Power Hard Fail - DL/UL Input Overload Hard Fail	- Degrading Amplifier - Open or Disconnected Server Port - Oscillation - Strong RF Input Signal
Low Battery Capacity (70% depleted)	- Low Battery Soft Fail	- Battery Depleted
System Component Malfunction	- Over Current Hard Fail - Over Temperature Hard Fail - DSP Hard Fail - Out-band Overload Hard Fail	- Faulty or Damaged PSU - Ambient Temperature - DSP Filter Fault - Strong RF Input Signal
Normal AC Power	- AC Normal Set - AC Fail Soft Clear	- Powered by AC Power - Powered by DC Power
Loss of Normal AC Power	- AC Fail Soft Set - AC Normal Clear	- Powered by DC Power - Powered by AC Power
Battery Charger Failure	- Battery Fail Soft Fail - Battery Not Connected Soft fail - Battery Not Charge Soft Fail	- Low Battery Charging Voltage - Battery Cable Disconnected - Degraded Batteries
Summary Alarm	- Any Active Alarm	- Any Active Alarm Present in the System
Donor Antenna Disconnect	- No DL Signal Detected	- Disconnected Donor Line
Oscillation Alarm	- Oscillation Hard Fail	- Gain Set Too High or Lack of Isolation
Annunciator Disconnect	- Annunciator Disconnect Hard Fail	- Disconnected PSR-ANN

## 5 INSTALLATION

### 5.1 Installation Procedures

#### 5.1.1 Wall Mount Procedure

- Verify that the PSR-78-9537-UA and mounting holes are in good condition
- Place the PSR-78-9537-UA mounting bracket template up against the wall and mark off mounting holes
- Drill the appropriate size holes and install the included wall anchors
- Remove the wall mount bracket from the repeater and bolt the wall mount bracket to the wall
- Place the repeater onto the wall mount bracket and secure the bracket to the repeater
- Connect the GND cable
- Connect the Antenna cables
- Connect the Power cable



**Figure 5-1 Wall Mount**

#### 5.1.2 PSR-ANN Annunciator Installation

The PSR-ANN annunciator box has been designed to either mount on top of the PSR-78-9537-UA repeater or can also be wall mounted separately. By default, the mounting bracket is configured to mount to the top of the repeater with the mounting bracket at the bottom of the PSR-ANN annunciator box. If individually wall mounting the PSR-ANN, then the bracket will need to be moved from the bottom of the box to the back of the box.

Once the PSR-ANN annunciator box has securely mounted, connect the included power/data cable from the side of the PSR-ANN box to the port labeled Annunciator on the PSR-78-9537-UA.

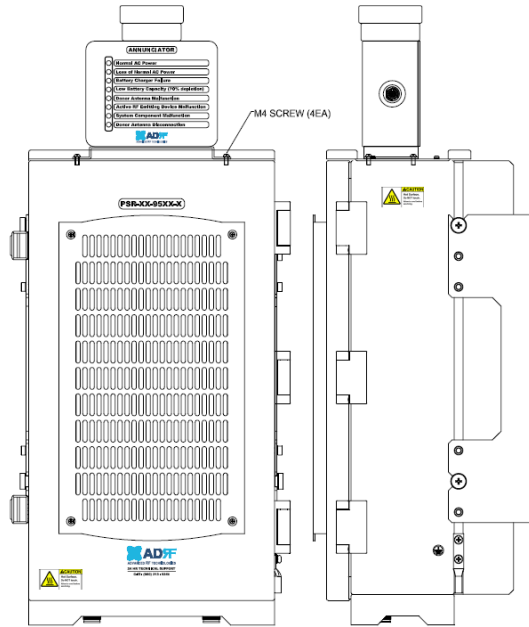


Figure 5-2 PSR-ANN Repeater Mount

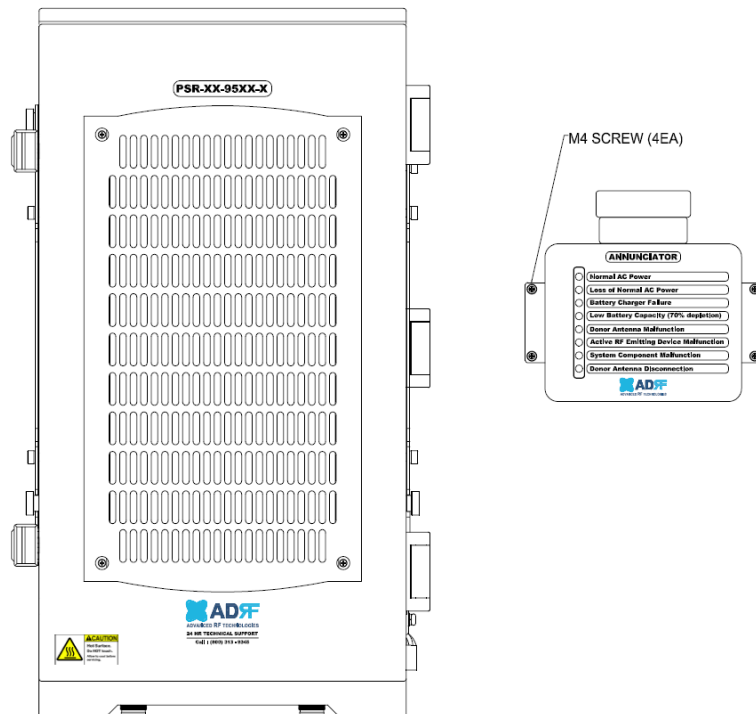
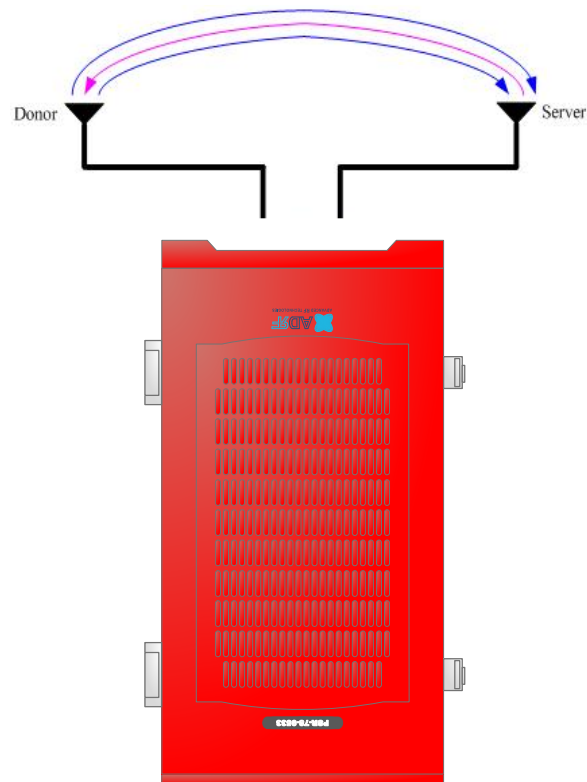


Figure 5-3 PSR-ANN Wall Mount

## 5.2 Antenna Separation/Isolation

The separation between the donor and server antennas is necessary to prevent oscillation. Oscillation occurs when the signal entering the system continually re-enters, due to the lack of separation between the donor and server antennas. In other words, the signal is being fed back into the system. This creates a constant amplification of the same signal. As a result, the noise level rises above the signal level.



**Figure 5-4 RF Repeater Oscillation**

To prevent feedback, the donor and server antennas must be separated by an appropriate distance to provide sufficient isolation. Isolation can be attained by separating antennas at a sufficient distance so that the output of one antenna does not reach the input of the other. This distance is dependent on the gain of the repeater.

Recommended isolation value is 15dB greater than the user-set gain of the repeater. For example, if the user-set gain of the repeater is 50dB, then isolation of 65dB or greater is required. In the same manner, to utilize the maximum gain of 95dB of the PSR-78-9537-UA, isolation of at least 110dB is required.



**WARNING.** This is **NOT** a **CONSUMER** device. It is designed for installation by **FCC LICENSEES** and **QUALIFIED INSTALLERS**. You **MUST** have an **FCC LICENSE** 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.

**DO NOT APPLY AC POWER TO THE BDA UNTIL CABLES ARE CONNECTED TO BOTH PORTS OF THE BDA AND THE ANTENNAS.**

1. To mount on a wall. Using appropriate screws and anchors attach the BDA to the wall at the four mounting holes.
2. Ensure that the isolation between the donor antenna and the serving antennas is at least 15 dB greater than the BDA gain.
3. Connect the cable from the donor antenna to the BDA connector labeled “DONOR” and the cable from the serving antennas to the BDA connector labeled “SERVER”.
4. Connect the AC power cord to the BDA and turn on the switch at the left of PSU.
5. Installation of the BDA is now complete. Adjust the gain controls to suit the specific signal environment through the GUI on your PC.

## 6. ADRF-BBL/BBS-U INSTALLATION

### 6.1 Installation Procedures

The ADRF-BBL/BBS-U battery backup unit houses two 12V batteries that are connected in series to have a nominal voltage of 24VDC. The battery charger is built into the PSU located inside of the PSR-78-9533/9537-U. When the system is being powered by AC, the PSU will charge the ADRF-BBL/BBS-U battery backup. When there is a loss of primary power (AC), then repeater will switch over to the secondary power (DC) provided by the battery backup. Once the primary power is restored, the PSR-78-9533/9537-U will switch back to operating with AC power and will resume charging the battery backup.

1. Verify that the repeater has been properly grounded.



2. Loosen each wheel lock by spinning the red dial to the left.



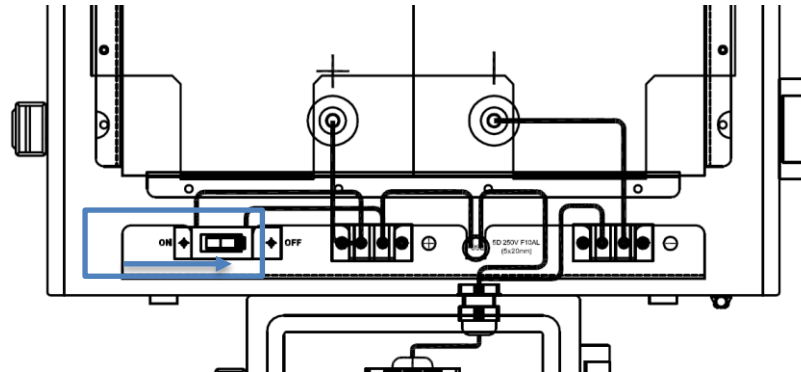
3. Move the ADRF-BBL-U-24 to the desired location and spin the red dial to the right to tighten wheel locks.

4. The brackets on the back of the ADRF-BBL/BBS-U unit can be used to secure to the wall **ONLY when it is stationed on the floor**. Due to the total weight of the ADRF-BBL/BBS-U w/ batteries, it CANNOT be wall mounted off the ground. The brackets are not designed to support the full weight of the ADRF-BBL/BBS-U when it is wall mounted without any additional support. If a wall mounting solution is needed, then an optional wall mount kit (ADRF-BBL/BBS-X-WMK) is available for purchase.

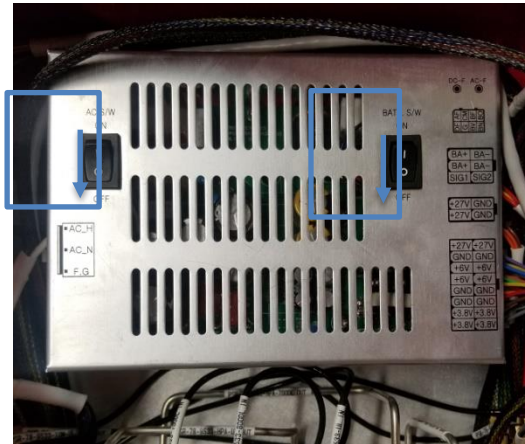


5. Use the included key to unlock the door latches to open the ADRF-BBL-U-24.

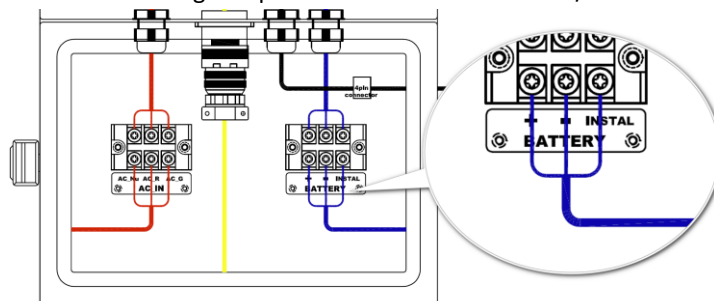
6. On the ADRF-BBL-U, set the power switch to the OFF position.



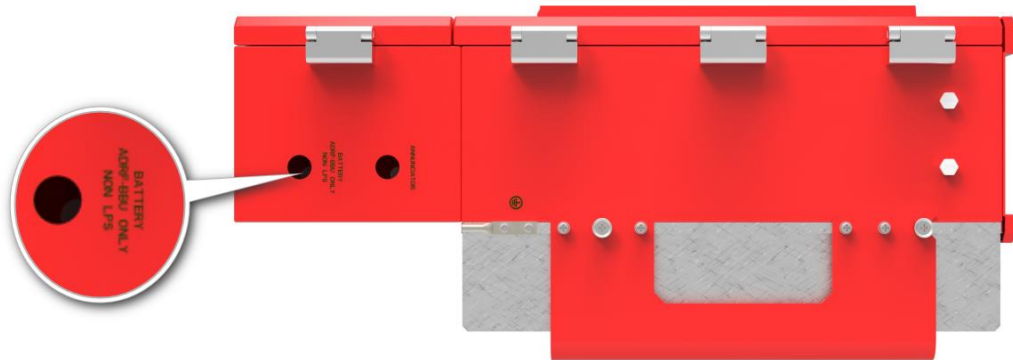
7. On the PSR-78-9533/9537-U, verify that both **AC** and **BATT** switches have been set to the OFF position.



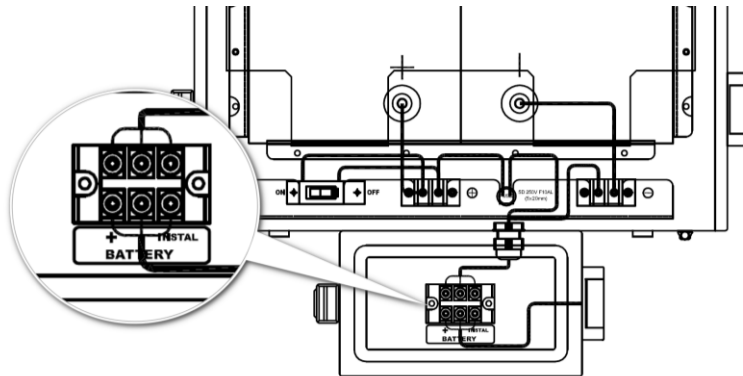
8. Use the provided battery backup cable from the ADRF-BBL-U and connect the wires to the terminal block located inside of the wiring compartment of the PSR-78-9533/9537-U.



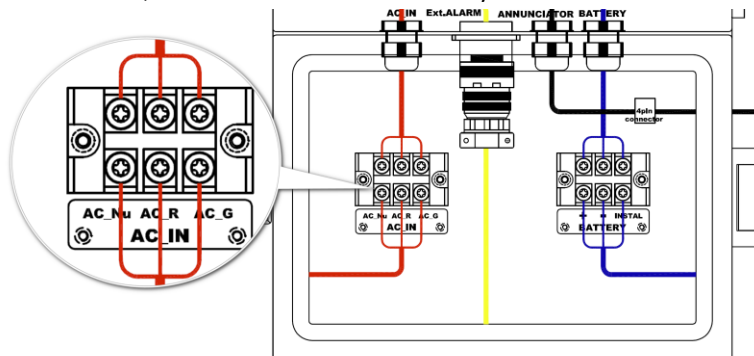
9. Install a conduit hub connector that can support 7/8" onto the PSR-78-9537-UA hole labeled BATTERY and snake the cable through the conduit.



10. Install a conduit hub connector that can support 7/8" onto the ADRF-BBL-U hole labeled BATTERY.
11. Open the wiring compartment of the ADRF-BBL-U and wire the battery cable to the terminal block.



12. On the PSR-78-9537-U, wire the AC terminal block to your dedicated circuit breaker







## 7. PSR-78-9537-U WEB-GUI SETUP INTRODUCTION

The Web-GUI allows the user to communicate with the repeater locally. To connect to the repeater locally, you will need a laptop with an Ethernet port and an RJ-45 crossover cable.

<b>NOTICE TO USERS, INSTALLERS, AUTHORITIES HAVING JURISDICTION, AND OTHER INVOLVED PARTIES</b>			
This product incorporates field-programmable software. In order for the product to comply with the requirements in the Standard for in-building 2-Way Emergency Radio Communication Enhancement Systems, UL 2524 certain programming features or options must be limited to specific values or not used at all as indicated below.			
<b>Program feature or option</b>	<b>Permitted in UL 2524? (Y/N)</b>	<b>Possible settings</b>	<b>Settings permitted in UL 2524</b>
Remote Power Switch	N	Enable/Disable	Disable
Battery Not Charge Check	Y	On/Off	On
Battery Check	Y	Check All/Except Installed/Check Off	Check All
Donor Antenna Malfunction Check Time	Y	0sec, 10sec, 45sec, 90sec, 3min, 6min, 15min, 30min, 1hour, 2hour, 4hour, 8hour, 12hour, 24hour, and 48hour	0sec, 10sec, 45sec, 90sec, 3min, 6min, 15min, 30min, 1hour, 2hour, 4hour, 8hour, 12hour, and 24hour

Please note that some selections of the Donor Antenna Malfunction Check Time setting could impact the compliance of the UL 2524 code. The selections available for this option are 0sec, 10sec, 45sec, 90sec, 3min, 6min, 15min, 30min, 1hour, 2hour, 4hour, 8hour, 12hour, 24hour, and 48hour. Selection of 24 hours or less will be required to remain compliant with UL 2524.

AAI Test

Alarm setting Status

☒ Closed
☐ Open

Donor Antenna Malfunction Check Time

0sec

☐ AAI Test On

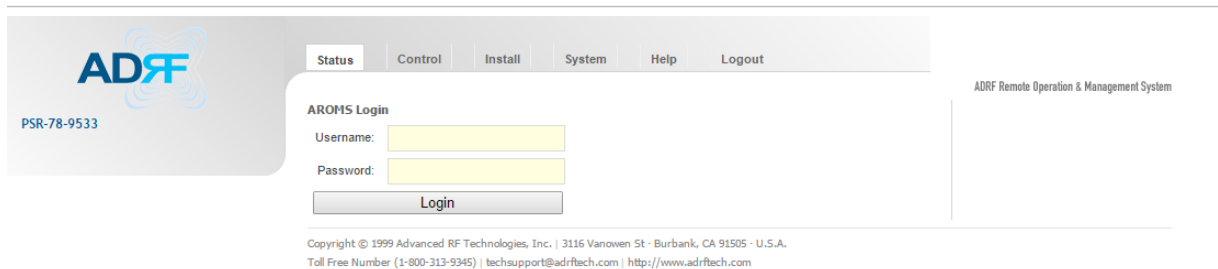
**Figure 7-1 Donor Antenna Malfunction Check Time**

## 7 PSR-78-9537-UA WEB-GUI SETUP

The Web-GUI allows the user to communicate with the repeater either locally or remotely. To connect to the repeater locally, you will need a laptop with an Ethernet port and an RJ-45 crossover cable. To connect to the repeater remotely, you will need to have an active internet connection via an external modem or LAN.

### 7.1 Repeater/PC Connection Using Web-GUI

- Verify that your Local Area Network Connection is set to **obtain an IP address automatically** under the Internet Protocol (TCP/IP) properties.
- If you are connecting to the unit remotely (use of a modem), then skip the step above.
  - Connect the RJ-45 crossover cable between the laptop's Ethernet port and the repeater's Ethernet port.
  - Launch either Internet Explorer or Google Chrome.
  - Type the following IP address into the address bar of the Internet Browser: <http://192.168.63.1>
- If you are connecting to the unit remotely, then type the IP address of the modem to connect to the unit
  - The following login screen will appear:
  -



The screenshot shows the ADRF PSR-78-9537-UA Web-GUI Login Page. The page has a header with the ADRF logo and the model number PSR-78-9533. Below the header is a navigation bar with tabs: Status, Control, Install, System, Help, and Logout. The main content area is titled 'AROMS Login' and contains two input fields for 'Username' and 'Password', followed by a 'Login' button. The footer contains copyright information for Advanced RF Technologies, Inc. and contact details.

**Figure 7-2 Login Page**

If you are not the Administrator, please type in your assigned username & password which you should have received from the Administrator.

The default username and password for the General User is **adrf** & **adrf**, respectively.

The default Administrator login is **admin** & **admin**, respectively.

## 7.2 Status Tab

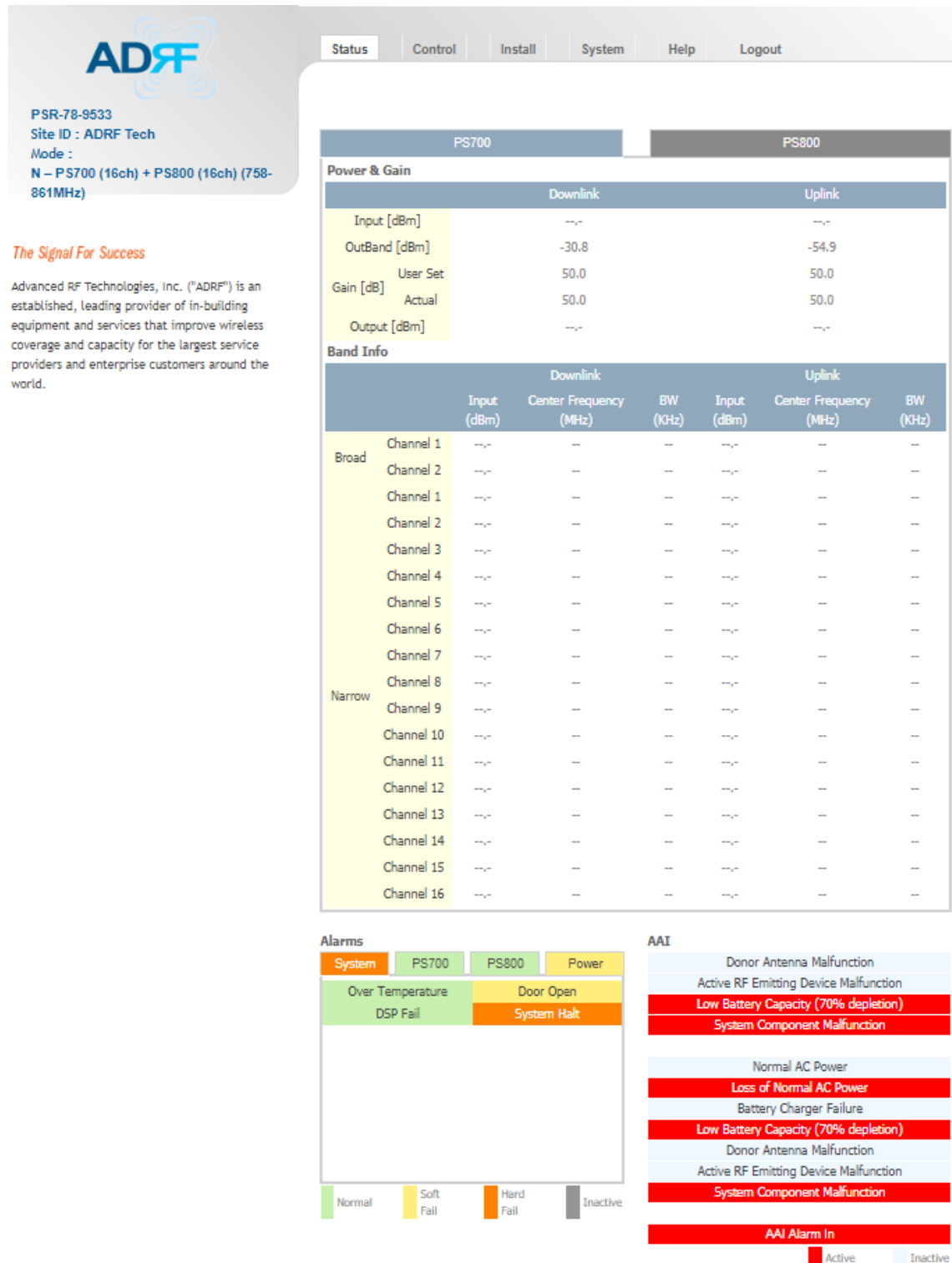


Figure 7-3 Status Tab

### 7.2.1 Band Info

The Band Info section displays frequency information along with the corresponding bandwidths that have been set from the Install tab. Input levels for each channel are also displayed in this section.

Band Info		Downlink			Uplink		
		Input (dBm)	Center Frequency (MHz)	BW (KHz)	Input (dBm)	Center Frequency (MHz)	BW (KHz)
Broad	Channel 1	--.	--.	--.	--.	--.	--.
	Channel 2	--.	--.	--.	--.	--.	--.
Narrow	Channel 1	--.	--.	--.	--.	--.	--.
	Channel 2	--.	--.	--.	--.	--.	--.
	Channel 3	--.	--.	--.	--.	--.	--.
	Channel 4	--.	--.	--.	--.	--.	--.
	Channel 5	--.	--.	--.	--.	--.	--.
	Channel 6	--.	--.	--.	--.	--.	--.
	Channel 7	--.	--.	--.	--.	--.	--.
	Channel 8	--.	--.	--.	--.	--.	--.
	Channel 9	--.	--.	--.	--.	--.	--.
	Channel 10	--.	--.	--.	--.	--.	--.
	Channel 11	--.	--.	--.	--.	--.	--.
	Channel 12	--.	--.	--.	--.	--.	--.
	Channel 13	--.	--.	--.	--.	--.	--.
	Channel 14	--.	--.	--.	--.	--.	--.
	Channel 15	--.	--.	--.	--.	--.	--.
	Channel 16	--.	--.	--.	--.	--.	--.

**Figure 7-4 Status Tab – Band Info Display**

### 7.2.2 Power & Gain

This section displays the Input, Gain, and Output for both downlink and uplink.

Power & Gain			
		Downlink	Uplink
Input [dBm]		--.	--.
OutBand [dBm]		--.	--.
Gain [dB]	User Set	50.0	50.0
	Actual	50.0	50.0
Output [dBm]		--.	--.

**Figure 7-1 Status Tab – Power & Gain Display**

- **Input [dBm]** – Displays the in-band Downlink/Uplink signal level. The system will display “--.” when the input level is < -90 dBm.
- **Outband [dBm]** – Displays the out-band composite power.
- **Gain [dB]**
  - User Set: Displays the amount of gain that the user set.
  - Actual: Displays the actual amount of gain that is currently in use.
- **Output [dB]** – Displays the Downlink/Uplink composite output power levels. The system will display “--.”, when the output level is < +5 dBm.

### 7.2.3 Alarms

This section displays the alarm status for System alarms, RF Alarms, and Power alarms. If an alarm is present in the system, then the color of the alarm tab will change according to the type of failure.

Alarms	Alarms	Alarms	Alarms																																																																																																																				
<table border="1"> <tr> <th>System</th><th>PS700</th><th>PS800</th><th>Power</th></tr> <tr> <td>Over Temperature</td><td></td><td>Door Open</td><td></td></tr> <tr> <td>DSP Fail</td><td></td><td>System Halt</td><td></td></tr> </table>	System	PS700	PS800	Power	Over Temperature		Door Open		DSP Fail		System Halt		<table border="1"> <tr> <th>System</th><th>PS700</th><th>PS800</th><th>Power</th></tr> <tr> <td>DL Signal Not detected</td><td>DL Signal Low</td><td></td><td></td></tr> <tr> <td>DL Oscillation Alarm</td><td>DL RF Power</td><td></td><td></td></tr> <tr> <td>DL Out of Band overload</td><td>UL Out of Band overload</td><td></td><td></td></tr> <tr> <td>DL DSP Input Overload</td><td>UL DSP Input Overload</td><td></td><td></td></tr> <tr> <td>DL Input Overload</td><td>UL Input Overload</td><td></td><td></td></tr> <tr> <td>DL Over Input</td><td>UL Over Input</td><td></td><td></td></tr> <tr> <td>DL Over Power</td><td>UL Over Power</td><td></td><td></td></tr> <tr> <td>DL Synthesizer Lock Fail</td><td>UL Synthesizer Lock Fail</td><td></td><td></td></tr> <tr> <td>DL VSWR</td><td>UL VSWR</td><td></td><td></td></tr> </table>	System	PS700	PS800	Power	DL Signal Not detected	DL Signal Low			DL Oscillation Alarm	DL RF Power			DL Out of Band overload	UL Out of Band overload			DL DSP Input Overload	UL DSP Input Overload			DL Input Overload	UL Input Overload			DL Over Input	UL Over Input			DL Over Power	UL Over Power			DL Synthesizer Lock Fail	UL Synthesizer Lock Fail			DL VSWR	UL VSWR			<table border="1"> <tr> <th>System</th><th>PS700</th><th>PS800</th><th>Power</th></tr> <tr> <td>DL Signal Not detected</td><td>DL Signal Low</td><td></td><td></td></tr> <tr> <td>DL Oscillation Alarm</td><td>DL RF Power</td><td></td><td></td></tr> <tr> <td>DL Out of Band overload</td><td>UL Out of Band overload</td><td></td><td></td></tr> <tr> <td>DL DSP Input Overload</td><td>UL DSP Input Overload</td><td></td><td></td></tr> <tr> <td>DL Input Overload</td><td>UL Input Overload</td><td></td><td></td></tr> <tr> <td>DL Over Input</td><td>UL Over Input</td><td></td><td></td></tr> <tr> <td>DL Over Power</td><td>UL Over Power</td><td></td><td></td></tr> <tr> <td>DL Synthesizer Lock Fail</td><td>UL Synthesizer Lock Fail</td><td></td><td></td></tr> <tr> <td>DL VSWR</td><td>UL VSWR</td><td></td><td></td></tr> </table>	System	PS700	PS800	Power	DL Signal Not detected	DL Signal Low			DL Oscillation Alarm	DL RF Power			DL Out of Band overload	UL Out of Band overload			DL DSP Input Overload	UL DSP Input Overload			DL Input Overload	UL Input Overload			DL Over Input	UL Over Input			DL Over Power	UL Over Power			DL Synthesizer Lock Fail	UL Synthesizer Lock Fail			DL VSWR	UL VSWR			<table border="1"> <tr> <th>System</th><th>PS700</th><th>PS800</th><th>Power</th></tr> <tr> <td></td><td></td><td></td><td>AC</td></tr> <tr> <td></td><td></td><td></td><td>Over Current</td></tr> <tr> <td></td><td></td><td></td><td>Battery Not Installed</td></tr> <tr> <td></td><td></td><td></td><td>Low Battery</td></tr> <tr> <td></td><td></td><td></td><td>Battery Not Charge</td></tr> </table>	System	PS700	PS800	Power				AC				Over Current				Battery Not Installed				Low Battery				Battery Not Charge
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DL Synthesizer Lock Fail	UL Synthesizer Lock Fail																																																																																																																						
DL VSWR	UL VSWR																																																																																																																						
System	PS700	PS800	Power																																																																																																																				
DL Signal Not detected	DL Signal Low																																																																																																																						
DL Oscillation Alarm	DL RF Power																																																																																																																						
DL Out of Band overload	UL Out of Band overload																																																																																																																						
DL DSP Input Overload	UL DSP Input Overload																																																																																																																						
DL Input Overload	UL Input Overload																																																																																																																						
DL Over Input	UL Over Input																																																																																																																						
DL Over Power	UL Over Power																																																																																																																						
DL Synthesizer Lock Fail	UL Synthesizer Lock Fail																																																																																																																						
DL VSWR	UL VSWR																																																																																																																						
System	PS700	PS800	Power																																																																																																																				
			AC																																																																																																																				
			Over Current																																																																																																																				
			Battery Not Installed																																																																																																																				
			Low Battery																																																																																																																				
			Battery Not Charge																																																																																																																				
<div>Normal</div> <div>Soft Fail</div> <div>Hard Fail</div> <div>Inactive</div>	<div>Normal</div> <div>Soft Fail</div> <div>Hard Fail</div> <div>Inactive</div>	<div>Normal</div> <div>Soft Fail</div> <div>Hard Fail</div> <div>Inactive</div>	<div>Normal</div> <div>Soft Fail</div> <div>Hard Fail</div> <div>Inactive</div>																																																																																																																				

Figure 7-2 Status Tab – Alarm Display

### 7.2.4 AAI

This section displays the AAI alarm status for each dry contact alarm. Red indicates that the dry contact alarm is active and light blue indicates the alarm is inactive. If the Remote Power Switch function is enabled, then the AAI Alarm In status will not be present from the AAI alarm status since this function is disabled when the Remote Power Switch is enabled.

AAI
Donor Antenna Malfunction
Active RF Emitting Device Malfunction
Low Battery Capacity (70% depletion)
System Component Malfunction
Normal AC Power
Loss of Normal AC Power
Battery Charger Failure
Low Battery Capacity (70% depletion)
Donor Antenna Malfunction
Active RF Emitting Device Malfunction
System Component Malfunction
AAI Alarm In
Active Inactive

Figure 7-3 Status Tab – AAI Alarm Display (Remote Power Switch Disabled)

AAI
Donor Antenna Malfunction
Active RF Emitting Device Malfunction
Low Battery Capacity (70% depletion)
System Component Malfunction
Normal AC Power
Loss of Normal AC Power
Battery Charger Failure
Low Battery Capacity (70% depletion)
Donor Antenna Malfunction
Active RF Emitting Device Malfunction
System Component Malfunction
Active Inactive

Figure 7-4 Status Tab – AAI Alarm Display (Remote Power Switch Enabled)

## 7.2.5 Repeater Info / Repeater Location / Technical Support / Installer Contact Info

**Information**

Serial Number	
Latitude	
Longitude	
Firmware	F2.0.F
Web GUI	F2.0.0

**Location**

**Description**


---

**Technical Support**

Phone: 1-800-313-9345  
E-mail: [techsupport@adrftech.com](mailto:techsupport@adrftech.com)

**Installer Contact Info**

Company:  
Installer:  
Phone:  
E-mail:

**Figure 7-5 Status Tab – Repeater Info / Repeater Location / Technical Support / Installer Contact Info**

- **Repeater Info:** Displays the serial number, latitude, longitude, firmware version, and Web-GUI version
- **Repeater Location:** Displays the address where the repeater is installed
- **Technical Support:** Displays ADRF's Technical Support contact information
- **Installer Contact Info:** Displays the installer's name, phone, and e-mail address

## 7.3 Control Tab

### General Settings

☒ ALC On
 ☐ PS 700 DL HPA On
 ☐ PS 800 DL HPA On
 ☐ PS 700+800 UL HPA On
 ☐ Remote Power Switch

Apply

### System

Reboot

Factory Set

PS700

### Manual Gain Control

DL Gain [dB] 50.0

UL Gain [dB] 50.0

DL ALC Level [dBm] 37.0

UL ALC Level [dBm] 30.0

DL ALC Offset Level [dB] 7.0

UL ALC Offset Level [dB] 7.0

DL /UL Gain Balance ON Off

Apply

### Battery Alarm Settings

Battery Check Check All

Battery Not Charge Check On

Apply

PS800

### Alarm Settings

DL Signal Low Level [dBm] -85.0

DL Signal Not Detect Level [dBm] -90.0

DL RF Power Level [dB] 6.0

DL Over Power Level [dBm] 37.0

UL Over Power Level [dBm] 30.0

Apply

### AAI Test

Alarm setting Status Closed Open

Donor Antenna Malfunction Check Time 3min

☐ AAI Test On

Fire Alarm

Donor Antenna Malfunction Normal

Active RF Emitting Device Malfunction Normal

Low Battery Capacity (70% depletion) Set

System Component Malfunction Set

System Monitoring

Normal AC Power Normal

Loss of Normal AC Power Set

Battery Charger Failure Set

Low Battery Capacity (70% depletion) Set

Donor Antenna Malfunction Normal

Active RF Emitting Device Malfunction Normal

System Component Malfunction Set

Apply

Figure 7-6 Control Tab



### 7.3.1 General Settings

The General Settings section allows the user to enable/disable amplifiers and the ALC routine.

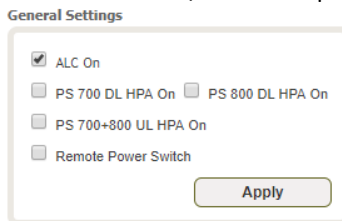


Figure 7-7 Control Tab – General Setting

- **ALC ON:** Enables or disables Automatic Level Control (ALC)
- **PSR 700 DL HPA On:** Enables or disables the Downlink High Power Amplifier (HPA) for 700MHz PS
- **PSR 800 DL HPA On:** Enables or disables the Downlink High Power Amplifier (HPA) for 800MHz PS
- **PSR 700+800 UL HPA On:** Enables or disables the Uplink High Power Amplifier (HPA) for 700+800MHz PS
- **Remote Power Switch:** Enables or disables the Remote Power Switch function

To enable/disable any of the settings, click on the checkbox and click the Apply button.

#### 7.3.1.1 Emergency Power Off Switch Support

The PSR-78-9537-UA now support the ability to connect an extern power switch to turn on/off the high power amplifier via our Alarm Input dry contact pins. This Emergency Power Off (EPO) function is an optional feature that is only active when the function is enabled. If the EPO function is enabled, the AAI dry contact input alarm pair will no longer function. This feature is available on firmware version 2.0.33 or higher and older repeaters can be updated using a field upgradeable firmware.

On the dry contact alarming cable, if the Alarm Input-1 & GND (light blue pair) is an open circuit, the DL and UL HPA will be turned on. If this pair is shorted together (closed circuit) then the DL and UL HPA will turn off. If needed, the cable length can be extended up to approximately 300 ft. using CAT6 Shielded Twisted Pair cable.



Figure 7-8 AAI Alarm Cable – Alarm Input

### 7.3.2 System

Under the System section, the user is able to perform a soft reboot on the repeater and also can restore factory default settings.



Figure 7-9 Control Tab – System

- **Reboot:** Performs a soft reboot of the repeater
- **Factory Set:** Restores all settings to factory defaults

### 7.3.3 Manual Gain Control

Figure 7-10 Control Tab – Manual Gain Control

- **DL/UL Gain:** Gain levels of the repeater can be specified here
- **DL/UL ALC Level:** Prevents the output power from exceeding the specified value
- **DL/UL Output ALC Offset:** If any ALC attenuation has been applied, the system will release this attenuation when the signal level drops by the specified level
- **DL /UL Gain Balance ON:** Allows the user to enable or disable the gain balance. When gain balance is enabled, the delta value between the downlink and uplink gains remain constant

### 7.3.4 Alarm Settings & Battery Alarm Settings

Figure 7-11 Control Tab – Alarm & Battery Alarm Settings

- **DL Signal Low Level:** Allows the user to specify how low the signal can be before triggering a “Downlink Signal Low” soft-fail alarm
- **DL Signal Not Detected Level:** Allows the user to specify how low the signal can be before triggering a “Downlink Signal Not Detected” soft-fail alarm
- **DL RF Power Level:** Allows the user to set a maximum deviation value for the downlink RF power before triggering a “DL RF Power Level” soft-fail alarm
  - For example, if the input signal is -50 dBm and the gain is set to 60 dB, the expected output power should be 10 dBm. If the Downlink RF Power alarm value is set to 6dB, then a soft-fail alarm will trigger if the output power falls below 4 dBm
- **DL Over Power Level:** DL Over Power Alarm will trigger when the DL output level exceeds this level
- **UL Over Power Level:** UL Over Power Alarm will trigger when the UL output level exceeds this level
- **Battery Check:**
  - Check All – All battery related alarms are checked which include Battery Fail, Battery Not Installed, Low Battery, and Battery Not Charge
  - Except Install – Only Battery Fail, Low Battery, and Battery Not Charge alarms are checked
  - Check Off – Does not perform any battery check
- **Battery Not Charge Check:**
  - On – Checks for the Battery Not Charge alarm
  - Off – Disables the check for the Battery Not Charge alarm

## 7.4 Install Tab

Status
Control
**Install**
System
Help
Logout

Technology

N - PS700 (16ch) + PS800 (16ch) (758-861MHz)

Apply

Band Selection

PS700
PS800

		Channel Center Frequency (MHz)	Bandwidth (KHz)	Downlink Gain (dB)	DSP Output Level (dBm)	Set	Downlink Freq (MHz)	
							Start	End
Broad	PS700	--	OFF	0.0	--	Apply	--	--
	PS800	--	OFF	0.0	--	Apply	--	--
Narrow	Ch. 1	--	OFF	0.0	--	Apply	--	--
	Ch. 2	--	OFF	0.0	--	Apply	--	--
	Ch. 3	--	OFF	0.0	--	Apply	--	--
	Ch. 4	--	OFF	0.0	--	Apply	--	--
	Ch. 5	--	OFF	0.0	--	Apply	--	--
	Ch. 6	--	OFF	0.0	--	Apply	--	--
	Ch. 7	--	OFF	0.0	--	Apply	--	--
	Ch. 8	--	OFF	0.0	--	Apply	--	--
	Ch. 9	--	OFF	0.0	--	Apply	--	--
	Ch. 10	--	OFF	0.0	--	Apply	--	--
	Ch. 11	--	OFF	0.0	--	Apply	--	--
	Ch. 12	--	OFF	0.0	--	Apply	--	--
	Ch. 13	--	OFF	0.0	--	Apply	--	--
	Ch. 14	--	OFF	0.0	--	Apply	--	--
	Ch. 15	--	OFF	0.0	--	Apply	--	--
	Ch. 16	--	OFF	0.0	--	Apply	--	--

Show Freq. Table

SNMP

Site ID

ADRF Tech

Description

ADRF Tech PSR-78 Serise

Apply

Modem Box Setting

Repeater IP

192.168.63.11

Subnet Mask

255.255.255.0

Gateway

192.168.63.254

Apply

Location

Latitude

N

+

00

Longitude

W

+

1

Apply

AAI Input

AAI Input 1

Apply

Figure 7-12 Install Tab

### 7.4.1 Technology

This section allows the user to set the repeater mode to either use PS700, PS800, or PS700+PS800.

**Technology**

N - PS700 (16ch) + PS800 (16ch) (758-861MHz) ▼

Apply

**Figure 7-13 Install Tab – Technology**

The following choices are available from the drop-down menu:

- N – PS700 (16ch) + PS800 (16ch) (758-861MHz)
- S1 – PS700 (12ch) + PS800 (20ch) (758-861MHz)
- S7 – PS700 (32ch) (758-775MHz)
- S8 – PS800 (32ch) (851-861MHz)

### 7.4.2 Band Selection

**Band Selection**

PS700						PS800		
		Channel Center Frequency (MHz)	Bandwidth (KHz)	Downlink Gain (dB)	DSP Output Level (dBm)	Set	Downlink Freq (MHz)	
							Start	End
Broad	PS700 ▼	--	OFF ▼	0.0 ▼	--	Apply	--	--
	PS700 ▼	--	OFF ▼	0.0 ▼	--	Apply	--	--
N a r r o w	Ch. 1	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 2	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 3	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 4	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 5	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 6	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 7	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 8	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 9	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 10	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 11	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 12	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 13	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 14	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 15	--	OFF ▼	0.0 ▼	--	Apply	--	--
	Ch. 16	--	OFF ▼	0.0 ▼	--	Apply	--	--

**Figure 7-14 Install Tab – Band Selection**

Band selection allows the user to specify the desired frequencies by inputting the center frequencies and selecting the bandwidths.

- **Channel Center Frequency:** The user can input the center frequency of the pass-band.
- **Bandwidth:** Allows the user to select the desired bandwidth for the passband. Choices for wideband frequencies include 3, 5, or 10 MHz. Narrowband choices include 6.25, 12.5, 25.0, 75.0 and 200 kHz. The required frequency spacing between channels is 4x the bandwidth from center to center. For example, if there are 2 channels each at 12.5KHz, then the required frequency spacing between these 2 channels will be 50KHz (measuring from center to center). If channel bandwidths are different between the 2 channels, then the required frequency spacing will be 4x the larger bandwidth.
- **Downlink Gain:** Minor gain adjustments can be performed on a per channel basis to equalize signal levels
- **Downlink Freq - Start:** Displays the start frequency of the pass-band once the band selection has been set
- **Downlink Freq - End:** Displays the end frequency of the pass-band once the band selection has been set

### 7.4.3 SNMP

The figure shows a web form titled "SNMP". It contains two input fields: "Site ID" and "Description". Below these fields is a button labeled "Apply".

Figure 7-15 Install Tab – SNMP

The SNMP section allows you to specify the Site ID and Description. The Site-ID is the code that is used to identify the repeater.

### 7.4.4 Location

This section allows the user to input the latitude and the longitude of the repeater.

The figure shows a web form titled "Location". It contains two input fields: "Latitude" and "Longitude". Each field has a dropdown menu for direction (N or S for Latitude, E or W for Longitude) and a plus sign. Below these fields is a button labeled "Apply".

Figure 7-16 Install Tab – Location

### 7.4.5 Modem Box Setting

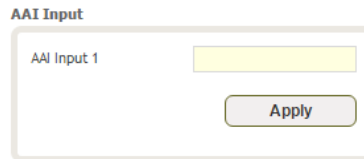
This section allows the user to specify alternative Repeater IP, Subnet Mask, and Gateway settings. These settings are enabled when the Host/Remote switch is set to the Remote position.

The figure shows a web form titled "Modem Box Setting". It contains three input fields: "Repeater IP", "Subnet Mask", and "Gateway". Below these fields is a button labeled "Apply".

Figure 7-17 Install Tab – Modem Box Setting

### 7.4.6 AAI Input

The PSR-78-9537-UA can accept a dry contact input alarms. The alarm can be labeled in this section. Once the alarm is labeled, it will show up in the system with the new custom names on the Status tab. This feature is only available if the Emergency Power Off switch function is not being utilized.



AAI Input

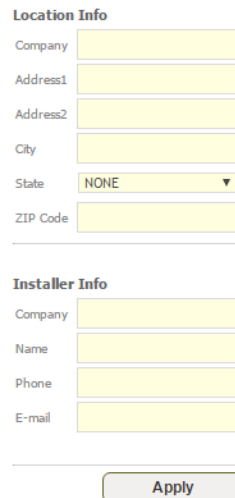
AAI Input 1

Apply

**Figure 7-18 Install Tab – AAI Input**

### 7.4.7 Location Info / Installer Info

This section allows the user to specify the address of the repeater and also the information of the installer.



**Location Info**

Company

Address1

Address2

City

State

ZIP Code

---

**Installer Info**

Company

Name

Phone

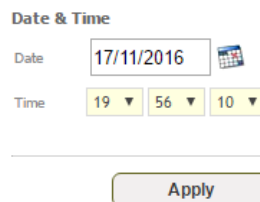
E-mail

Apply


**Figure7-19 Install Tab – Location Info / Installer Info**

### 7.4.8 Date & Time

This section allows the user to specify the current date and time.



**Date & Time**

Date  

Time

Apply

**Figure 7-20 Install Tab – Date & Time**

## 7.5 System

The System tab allows the user to perform firmware updates, upload closeout packages, view any changes to the system, backup existing configuration, add/remove user accounts, and change the login credentials of the Administrator.

### 7.5.1 System: Account

#### 7.5.1.1 System: Account – Account Management

The Account Management section allows the Administrator to delete any user accounts. Please note that the Account Management section is only available if you are logged into the system as the Administrator. To delete a user account, click on the Account Management link and under the Edit column, click on the delete button.

Account Management / [New account](#) / [Change Password](#)

No	User Name	Password	Status	Last Login	Edit
1	admin	admin	administrator	2007-01-01 00:03:42	-
2	adrf	adrf	user	1970-01-01 00:00:00	<a href="#">delete</a>
3	guest	guest	guest	1970-01-01 00:00:00	<a href="#">delete</a>

**Figure 7-21 System: Account – Account Management**

#### 7.5.1.2 System: Account – New Account

The New account section allows the Administrator to create a new user account. Please note that the New account section is only available if you are logged into the system as the Administrator. To create a new user account, click on the new account link, fill in the fields, and click Create.

[Account Management](#) / [New account](#) / [Change Password](#)

① User Name

② User Group
 

user

③ Password

④ Confirm password

Create

Cancel

**Figure7-22 System: Account – New Account**

#### 7.5.1.3 System: Account – Change Password

The Change Password section allows the current user who is logged into the system to change their login credentials.

[Account Management](#) / [New account](#) / [Change Password](#)

① User Name
 

admin

② New User Name

③ Confirm New User Name

④ Password

⑤ Confirm password

Please enter new password.

Apply

Cancel

**Figure 7-23 System: Account – Change Password**

## 7.5.2 System – SNMP

This section displays The SNMP section allows the user to define the parameters for SNMP v1, v2c, and v3. Community strings for v1/v2c can be specified from here and SNMP user account can be created/deleted from this section.

### SNMP V1 / V2

#### ADD SNMP

Version	Permission	Community	Command
v2c	read/write		add

#### Active SNMP

Version	Permission	Community	Command
v1	read/write	public	delete
v2c	read/write	public	delete

### SNMP V3

#### ADD SNMP

User ID	Permission	Auth Algorithm / Password	Privacy Algorithm	Command
	read/write	MD5	None	add

#### Active SNMP

User ID	Permission	Auth Algorithm / Password	Privacy Algorithm	Command
---------	------------	---------------------------	-------------------	---------

### SNMP Monitoring

#### SNMP V1 / V2

Enabled	Version	Permission	Community	Command
<input type="checkbox"/>	v1	read only		set

#### SNMP V3

Enabled	User ID	Permission	Auth Algorithm / Password	Privacy Algorithm	Command
<input type="checkbox"/>		read only	MD5	None	set

Figure 7-24 SNMP

## 7.5.3 System – Logs

This section displays system events that have taken place. The Log displays the time and date of when the event took place, and what changes were made to the system.

Seq	Date		Event	Description
80	2016-11-15	07:14:15	Broad Band Freq set	Broad Band Freq changed 0.0, Bandwidth Set to 0.0
79	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
78	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
77	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
76	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
75	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
74	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
73	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
72	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
71	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
70	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
69	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
68	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
67	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
66	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
65	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
64	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
63	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
62	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0
61	2016-11-15	07:14:15	700 Narrow Band Freq Set	700 Narrow Band Freq changed 0.0, Bandwidth Set to 0.0

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20  
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40  
41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60  
61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80  
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Figure 7-25 System: Logs



#### 7.5.4 System – Update

- To perform a firmware update, click on the Update tab and the following screen will appear.

**FW Update**

File Name  No file chosen

---

Click Upgrade to update the repeater firmware

**Figure 7-26 System: Update**

- Click on the Choose File button and locate the firmware file.
- Click on the Upgrade button to perform the firmware update.
- Once the firmware update is complete, the following popup message will appear:

115.95.237.70:8075 says:

Please wait a moment when repeater reboot.

**Figure 7-27 System: Update is Complete Popup Message**

#### 7.5.5 System – Backup / Restore

The Backup / Restore section allows the user to save the settings of the repeater. To perform the backup, click on the Backup button and you will be prompted to save the backup file. To restore the settings to the system, click on Choose File button, select the backup file, and click the Restore button.

**Settings Backup**

Click the Backup button to download a backup file.

**Settings Restore**

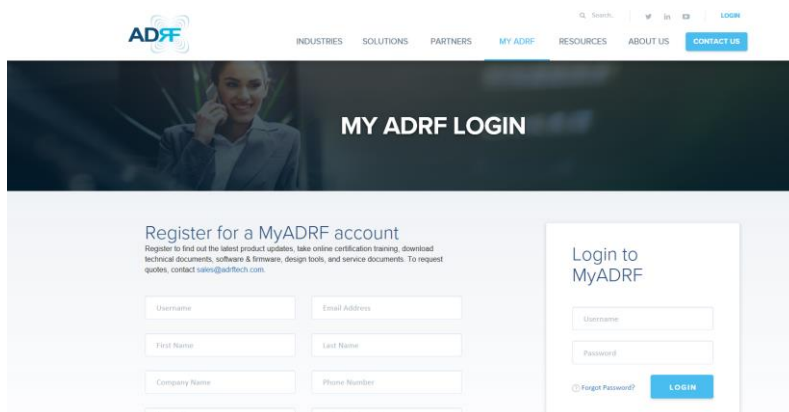
File Name  Backup\_0130 1356.tar

Click Restore to restore the system-setting

**Figure 7-28 System: Backup / Restore**

## 7.6 Help

If an internet connection is available, clicking on the Help Tab will redirect the user to our Technical Support page.



**Figure 7-29 Help**

## 7.7 Logout

Clicking the Logout button will log the current user off the system.

# 8. MAINTENANCE GUIDE FOR PSR-78-9533-U/9537-U REPEATER

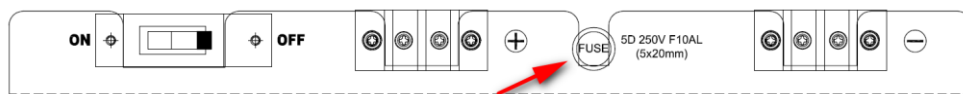
## 8.1 Periodic Inspection Checklist

### 1. Repeater

- Log into the ADRF unit and check for any alarms in the system
- Address any outstanding alarms
- Check for loose connections to the repeaters/remotes and antennas. If connections are loose, make sure that all connections are tightly fastened.
- Check that cables and connectors are in good condition.
- Ensure that the repeater/remote brackets are in good condition and that the repeater/remote is securely fastened.
- Verify that the repeater has 3" of clearance on all sides to ensure proper ventilation.

### 2. Battery Backup

- Open the ADRF-BBL-U/BBS-U enclosure and inspect the battery terminals for any corrosion buildup
- Turn the circuit breaker to the off position and unscrew the fuse holder to inspect the fuse
  - A spare fuse is included with the purchase of the ADRF-BBL-U and can be used to replace the fuse if needed



### c. If the terminals need to be cleaned:

- Set the ADRF-BBL-U/BBS-U breaker switch to the OFF position
- Disconnect the battery backup cable from the repeater
- Carefully disconnect battery terminals and clean the terminal with a battery terminal cleaner
- Wait for terminals to fully dry
- Reconnect the battery terminals and set the breaker switch to the ON position

- d. The lifespan of the batteries will vary based on the number of outages, however we approximate that with an average of 4 outages a year, the batteries should last approximately 2-3 years

## **8.2 Preventive Measures for Optimal Operation**

### **8.2.1 Recommendations**

- Perform the *Periodic Inspection Checklist* on a semi-annually basis.

### **8.2.2 Precautions**

- Do not operate the repeater with the antennas in extremely close proximity to one another as this may cause damage to the repeater.
- Do not change the parameters unless instructed to do so by an authorized supervisor.
- Do not move the repeater unless instructed to do so by an authorized supervisor.
- Do not detach any cables to the repeater unless repair of respective components is necessary.

## **9. WARRANTY AND REPAIR POLICY**

### **9.1 General Warranty**

The PSR-78-9537-UA carries a Standard Warranty period of two (2) years unless indicated otherwise on the package or in the acknowledgment of the purchase order.

### **9.2 Limitations of Warranty**

Your exclusive remedy for any defective product is limited to the repair or replacement of the defective product. Advanced RF Technologies, Inc. may elect which remedy or combination of remedies to provide in its sole discretion. Advanced RF Technologies, Inc. shall have a reasonable time after determining that a defective product exists to repair or replace the problem unit. Advanced RF Technologies, Inc. warranty applies to repaired or replaced products for the balance of the applicable period of the original warranty or ninety days from the date of shipment of a repaired or replaced product, whichever is longer.

### **9.3 Limitation of Damages**

The liability for any defective product shall in no event exceed the purchase price for the defective product.

### **9.4 No Consequential Damages**

Advanced RF Technologies, Inc. has no liability for general, consequential, incidental or special damages.

### **9.5 Additional Limitation on Warranty**

Advanced RF Technologies, Inc. standard warranty does not cover products which have been received improperly packaged, altered, or physically damaged. For example, broken warranty seal, labels exhibiting tampering, physically abused enclosure, broken pins on connectors, any modifications made without Advanced RF Technologies, Inc. authorization, will void all warranty.

### **9.6 Return Material Authorization (RMA)**

No product may be returned directly to Advanced RF Technologies, Inc. without first getting approval from Advanced RF Technologies, Inc. If it is determined that the product may be defective, you will be given an RMA number and instructions on how to return the product. An unauthorized return, i.e., one for which an RMA number has not been issued will be returned to you at your expense. Authorized returns are to be shipped to the address on the RMA in an approved shipping container. You will be given our courier information. It is suggested that the original box and packaging materials should be kept if an occasion arises where a defective product needs to be shipped back to Advanced RF Technologies, Inc. To request an RMA, please call (800) 313-9345 or send an email to [techsupport@adrfttech.com](mailto:techsupport@adrfttech.com).

## 10. SPECIFICATIONS

### 10.1 Electrical Specifications

**Table 10-1 Electrical Specifications (PSR Series)**

Parameters		Specifications		Remark
		DL	UL	
Frequency Range (MHz)	FirstNet + PS 700	769 - 775MHz(For FCC) (768-769MHzGuard band) 768 – 775 MHz (For ISSED)	799 - 805 MHz(For FCC) (798- 799MHz Guard band) 798 - 805 MHz (For ISSED)	APCO 25
	PS 800	851 - 861	806 - 816	APCO 25
Composite Output Power (PSR-78-9537-UA)	PS 700	37 dBm	30 dBm	
	PS 800	37 dBm	30 dBm	
	PS 700 + PS 800	40 dBm	30 dBm	
System Gain (dB)		95	95	
Filter selection		Narrow band		
Simultaneous Filter Support numbers	Narrow (KHz)	6.25 ~75 (6.25 x n , n= 1~12)		
Spurious		3GPP Rule Compliant		
Passband Ripple		±2 dB		
ALC Dynamic Range		≥ 60dB		
Gain Dynamic Range		45dB		
Channel Setting Resolution		0.025 KHz		
Noise Figure @ Max. gain		≤5dB		
System Group Delay	Broad Band	<6us		
	Narrow Band	<126us@6.25KHz BW, <67us@12.5KHz BW, <36us@25KHz BW, <18us@75KHz BW, <10us@200KHz BW		
Power Supply		100 -240 VAC, 60 Hz (Free Voltage)		Optional battery backup
Power Consumption (PSR-78-9537-UA / 9537)		< 150 W / < 222 W		
Max RF Input Power without overdrive		-20dBm		
No damage Max Input Power		+10 dBm		
Impedance		50 Ω		
VSWR		< 1.5 : 1		
Dry Contacts		NFPA 1221 2016 Code Compliant		
Remote Alarming / Network Management		Dry Contacts, Web-GUI, SNMP, (External Wireless Modem Required)		
Humidity		5% - 95% RH Condensed		
Operating at Ambient Temperature		-40°F to +140°F (-40°C to +60°C)		

### 10.2 Mechanical Specifications

**Table 10-2 Mechanical Specifications**

PSR-78-9537-UA	Specifications	Comments
Dimensions W x D x H	12.0 x 11.9 x 21.3 in (w/o mounting bracket)	
Weight	64 lbs (w/o mounting bracket)	
RF Connector	4.3-10 (Female)	
Weather Resistances	IP66	

### 10.3 Power Specifications

**Table 10-3 Power Specifications**

Parameters	Specifications	Comments
Repeater Rating	<ul style="list-style-type: none"> <li>PSR-78-9537-UA: 100 – 240 VAC, 50/60 Hz, 3.04-1.28A or 24VDC, 8.04A (Battery Port Only)</li> </ul>	
Annunciator Rating	28VDC Nominal, 108.3mA	
AC Supply Protection	Fuse & Circuit Protector	T6.3L250V
Ground	External Threaded Stud	
Battery Type	Valve Regulated, Sealed Lead Acid Rechargeable Battery	
Battery Model	ADRF-BBL-U-24: Tempest TR120-12 ADRF-BBS-U-24: Tempest TR45-12	
Battery Capacity	TR120-12: 120Ah TR45-12: 48Ah	
Maximum Current Charge	3A	
Dry Contact Relay Rating (resistive)	<ul style="list-style-type: none"> <li>Max switching voltage: 30V DC</li> <li>Max switching current: 5A</li> <li>Min switching capacity: 10mA, 5V DC</li> </ul>	

### 10.4 ADRF-BBS-U-24 / ADRF-BBL-U-24 Runtime Calculations

PSR-78-9533-UA w/ ADRF-BBL/BBS-U-24 Battery Runtime Calculations

PSR-78-9537-UA (Dual Band) w/  
(1) ADRF-BBL-U-24

**Repeater**

- DC Power Consumption (W) – 198.62
- DC Voltage (V) – 24.02
- DC Current Draw (A) – 8.269

**(1) Battery Backup**

- Battery Capacity (Ah) – 120

**Calculations**

- Runtime (h) = Battery Capacity (Ah) / Current Draw (A)
- Runtime (h) = 120Ah / 8.269A
- Runtime (h) = 14.51h

**10.5 Warranty & Certificates**

**Table 10-4 Warranty & Certificates**

Parameters	Specifications	Comments
MTBF	> 100,000 Hours	Ambient
Compliance	UL60950	
Warranty	2 Years	

## 11. ANICAL DRAWING

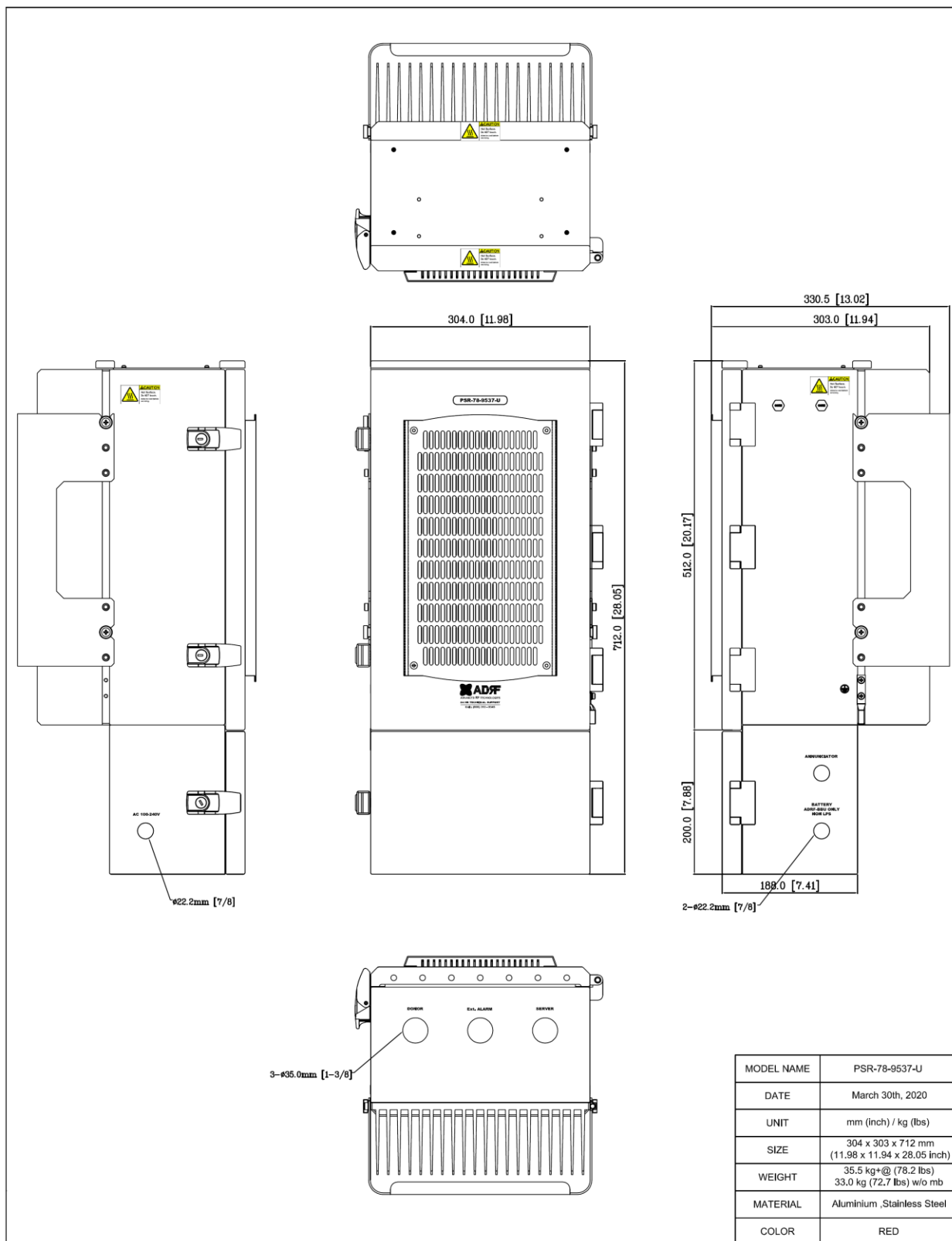


Figure 11-1 PSR-78-9537-U Mechanical Drawing

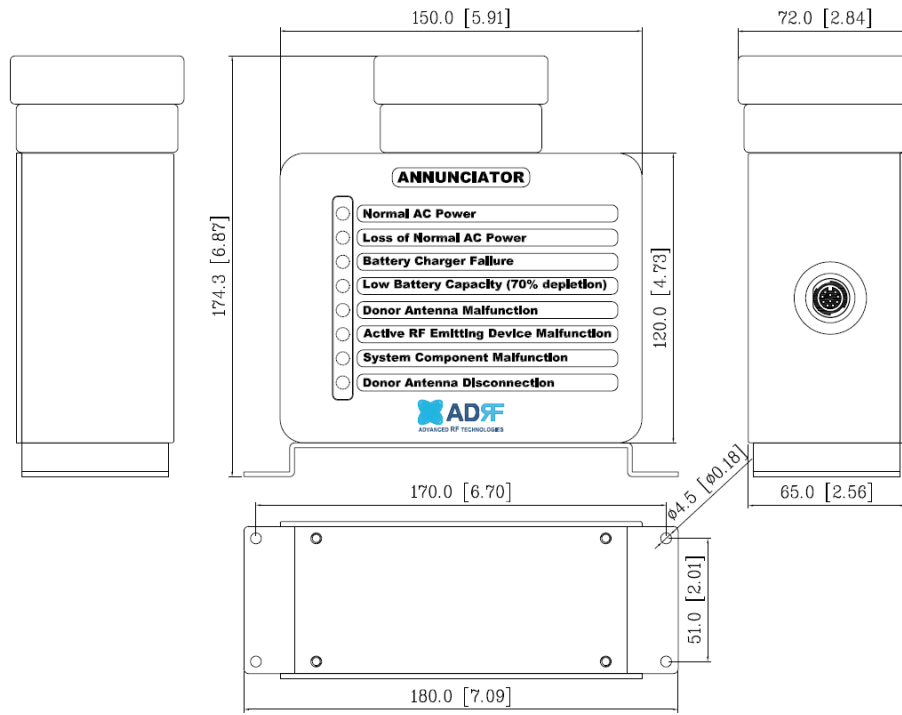
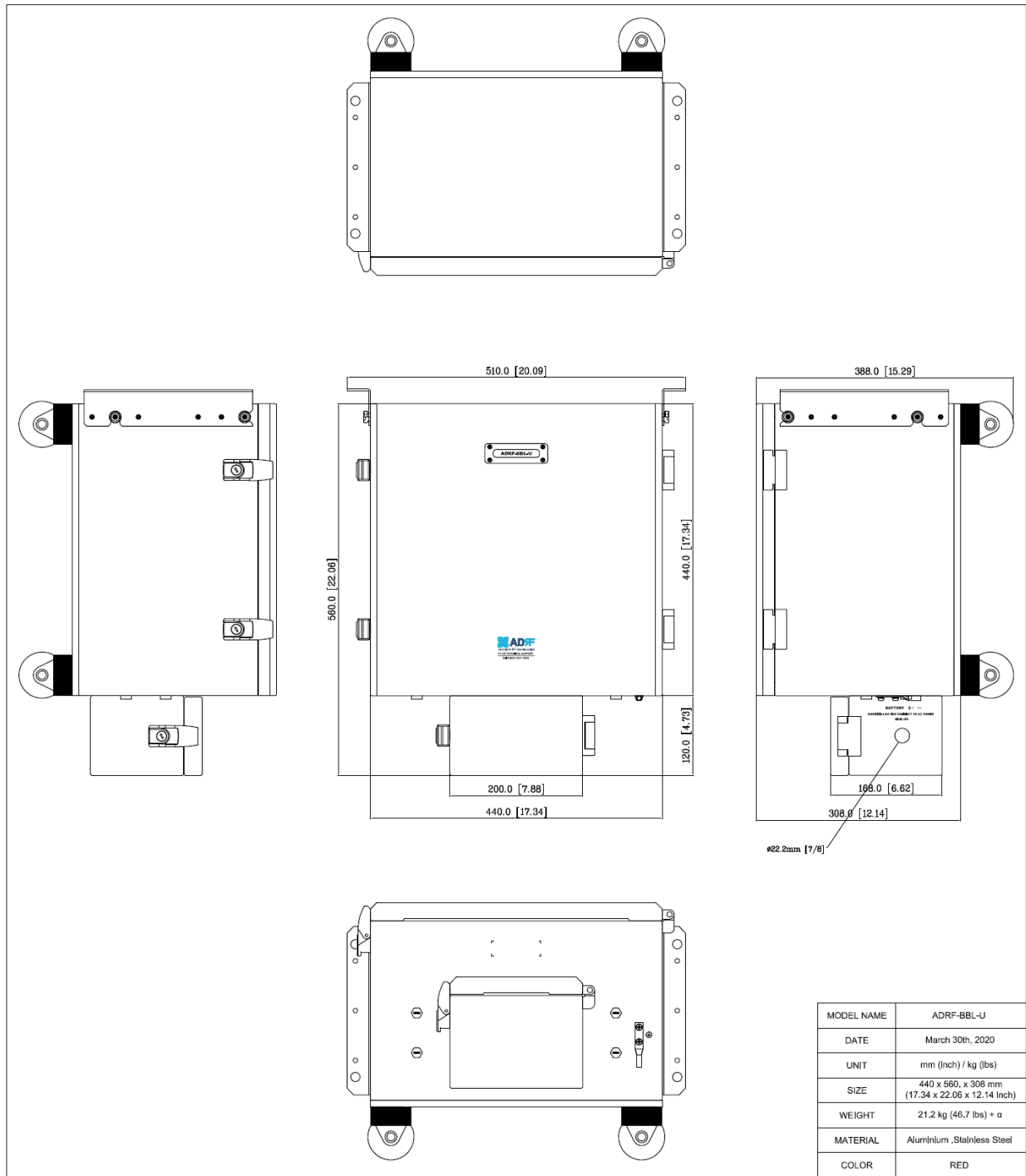
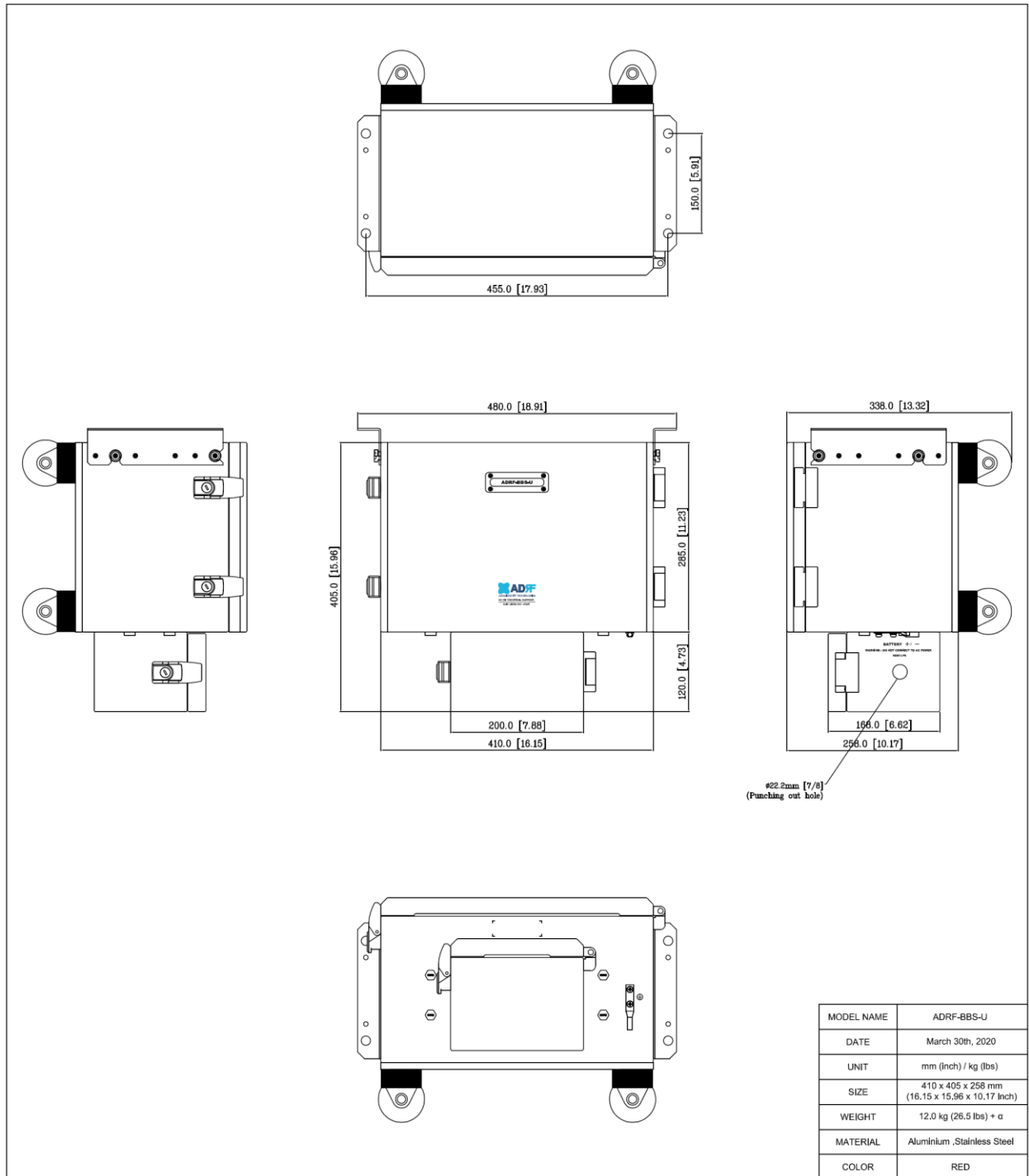


Figure 11-2 PSR-ANN Annunciator Mechanical Drawing





**Figure 11-3 ADRF-BBL-U Mechanical Drawing**



**Figure 11-4 ADRF-BBS-U Mechanical Drawing**

## 12. APPENDIX

### 12.1 Shutdown Retry Logic

The function of the built-in shutdown routine is to protect the repeater from any further damage from a hard-fail that the system may be experiencing.

Within 5 seconds of a hard-fail alarm being detected, the repeater will start the shutdown routine. The repeater will shut down by powering off the HPAs (high-powered amplifiers) for 30 seconds.

After 30 seconds have elapsed, the repeater will power on the HPAs and check to see if the hard-fail alarm still exists. If the hard-fail alarm still exists, then the repeater will shut down for 1 minute (double the time of the previous shutdown time).

After 1 minute has elapsed, the repeater will power on the HPAs and check to see if the hard-fail alarm still exists. If the hard-fail alarm still exists, then the repeater will shut down for 2 minutes (double the time of the previous shutdown time).

The shutdown routine will repeat itself a total of 10 times. If the hard-fail alarm still exists after the 10th retry, then the repeater will turn off its HPAs permanently until a reset is performed or factory set is executed.