ProtectLink
VHF-UHF Bi-Directional Amplifier

Installation and Users Guide

PRODUCT MANUAL

NOTICE TO USERS, INSTALLERS, AUTHORITIES HAVING JURISDICTION, AND OTHER INVOLVED PARTIES

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.

Program feature or option	Permitted in UL 2524? (Y/N)	Possible settings	Settings permitted in UL 2524
ALARM TEST screen **DISABLE AUDIBLE HORN** option	N	DISABLE and ENABLE	ENABLE

Product Registration Form

Westell recommends retaining a permanent record of your purchase with the following product information and proof of purchase. Refer to 1.3 Product Registration Information on page 1-2.

MODEL NUMBER	SERIAL NUMBER	PURCHASE DATE

POINT OF SALE COMPANY

Table of Contents

TABLE OF CONTENTS

List of Figures

Preface

About this Preface

This preface includes the following information about this ProtectLink VHF-UHF Bi-Directional Amplifier Users Guide.

Guide to this Preface

Document Purpose, Scope, Audience, and References

Purpose

This manual contains information and procedures for the operation of the Westell's ProtectLink VHF and UHF band Bi-Directional Amplifier.

Changes that occur after the publishing date may be incorporated by a complete manual revision or as additions.

Scope

Reference this manual when there is a need to add enhanced signal capability to a new or existing system, to monitor a system, make maintenance adjustments, or address alarms.

Audience

This manual is intended for installers and users who are familiar with similar types of equipment.

References

- UL 2524 Firmware 3.2
- FCC Part 90

Document Conventions

Table 1 describes the text conventions used in this document.

Table 1   Document Conventions

Convention	Meaning
⚡ DANGER:	Danger messages describe an imminent hazard that, if not avoided, may result in severe personal injury or death. Before you work on equipment, be aware of the hazards involved with electrical and RF circuitry and be familiar with standard practices for preventing accidents.
⚡ WARNING:	Warning messages describe an imminent hazard that, if not avoided, may result in severe personal injury or serious equipment damage.
⚠ CAUTION:	Caution messages describe conditions or practices that could cause damage to equipment or property. Communicates information that is crucial to preventing loss of data or damage to hardware or software, and actions that could result in equipment failure.
Important:	Important messages contain must-have information essential to the completion of a task, unrelated to a hazard.
Note: ✎	Note messages emphasize or supplement important points of the main text. Notes provide beneficial information unrelated to hazards.
Tip:	Tip messages provide information that assists users in operating equipment more effectively.
Menus and Menu Commands	This style indicates menu and menu commands. A right arrow (>) separates the menus from the submenus or menu commands. The right arrow also indicates the order in which you should click the menus, submenus, and menu commands.
Dialog Boxes, Tabs, Fields, Check Boxes, Command Buttons	This bold style indicates GUI features, dialog boxes, tabs, fields, check boxes, and command buttons.
KEYS	Uppercase body text indicates keys on a keyboard, such as the TAB or ENTER keys. Keys used in combination are connected with a plus symbol (+).

1-800-377-8766

Table 1   Document Conventions (Continued)

Bold text indicates an action or provides emphasis.	**Labels**	Designates physical components on Westell products such as jumpers, switches, and cable connectors.
	Click	Instructs the user to press the primary (typically left) mouse button while the pointer is over the specified location.
	Right-click	Instructs the user to press the secondary (typically right) mouse button while the pointer is over the specified location.
	Double-click	Instructs the user to press the primary (typically left) mouse button twice, rapidly, while the pointer is over the specified location.
	Select	Instructs the user to perform a selection on the screen by clicking an active object.
	Enter	Instructs the user to type text using the keyboard.

Customer Assistance

Pre-sales Support

Westell offers pre-sales technical support from 9 a.m. to 5 p.m. Eastern time, Monday - Friday. Representatives are standing by to assist with customer account information and product ordering and answer questions regarding Westell products and solutions.

Phone number: 800-377-8766, option 1

Before you call or email

Before you contact Westell for assistance, please have the following information available:

- ●The versions of hardware and software you are currently running
- ●What happened and what you were doing when the problem occurred
- ●How you tried to solve the problem

Email Technical Support

Email support is available. To contact Technical Support, send email to:

support@westell.com

Telephone Technical Support

Telephone technical support is available to Westell customers or partners who have not been able to resolve their technical issue by using our online services.

Phone number: 800-377-8766, option 2, then option 3

Normal Business Hours: 8:30 a.m. to 6 p.m. Eastern time Monday through Friday

Product Documentation

You can also access and view the most current versions of Westell product documentation on our Web site at:

http://www.westell.com

WESTELL

1-800-377-8766

General Information

This chapter provides general information about your Westell ProtectLink VHF-UHF Bi-Directional Amplifier.

Guide to this Chapter

CHAPTER 1

1.1 Document Purpose and Intended Users

The purpose of this document is to provide a step-by-step procedure to help experienced technicians or engineers install and commission an in-building Passive Wireless Distributed Antenna System (DAS) using Westell's ProtectLink VHF-UHF Bi-Directional Amplifier. Follow the instructions in this guide to minimize risks associated with modifying a live system and preclude service interruptions. This document assumes the technician or engineer understands the basic principles and functionality involved with an RF Signal Booster and in-building wireless systems. This guide has been written to address the practical concerns of the installer.

Note: In this and other sections, the ProtectLink VHF-UHF Bi-Directional Amplifier is also referred to as the ProtectLink BDA or the Signal Booster.

1.2 Product Application

Use this guide whenever there is a need to add enhanced signal capability to an existing system or when a Signal Booster is included in a new installation.

1.3 Product Registration Information

Westell recommends retaining a permanent record of your purchase with product information and proof of purchase. Complete the Product Registration Form inside the front cover page of this document.

The ProtectLink BDA model and serial numbers are on the Westell labels on the right side of the enclosure (see Figure 1-1 on page 1-7). Record these numbers on the Product Registration Form. Retain this information, along with proof of purchase, to serve as a permanent record of your purchase.

1-800-377-8766

1.4 Safety Guidelines

The general safety information in this guideline applies to both operations and service personnel. Specific warnings and cautions are located in the applicable manual sections, but may not appear in this summary. Failure to comply with these precautions or specific warnings elsewhere in the manual violates safety standards of design, manufacture, and intended use of equipment. Westell assumes no liability for the customer's failure to comply with these requirements:

⚠️

CAUTION: Grounding

This Signal Booster is designed to operate at 100-240V~, 50/60Hz, 2.0A power and must always be operated with the ground wire properly connected. The ground wire must be at least 14 AWG and must be connected to the building ground.

⚠️

CAUTION: Explosive atmospheres

To avoid explosion or fire, do not operate this product in the presence of flammable gases or fumes.

⚡

WARNING: Lightning danger

Do not install or adjust this unit during an electrical storm.

No user-serviceable parts are inside the unit. Hazardous voltages are present when the cover is removed. Removing the internal protective covers will void your warranty. If you suspect a malfunction with this product, call your dealer or Westell's technical support line at 1-800-377-8766.

⚠️

CAUTION: Turn the signal booster off when connecting or disconnecting cables or replacing fuses.

External Ethernet Port

⚡

WARNING: The RJ45 Ethernet port on the external surface of the enclosure is for maintenance use only. This port cannot be used as a permanent connector.

Remote Annunciator Location

The remote annunciator unit is for installation in

WESTELL

1-800-377-8766

- a locked room such as a fire control room
- a locked enclosure, or
- an equivalent enclosure that requires a tool to open.

UL2524 Alarm Silencing Limit

Permanent alarm silencing via the web interface is not permitted for installations requiring full compliance with UL 2524. Refer to the NOTICE TO USERS, INSTALLERS, AUTHORITIES HAVING JURISDICTION, AND OTHER INVOLVED PARTIES inside the front cover.
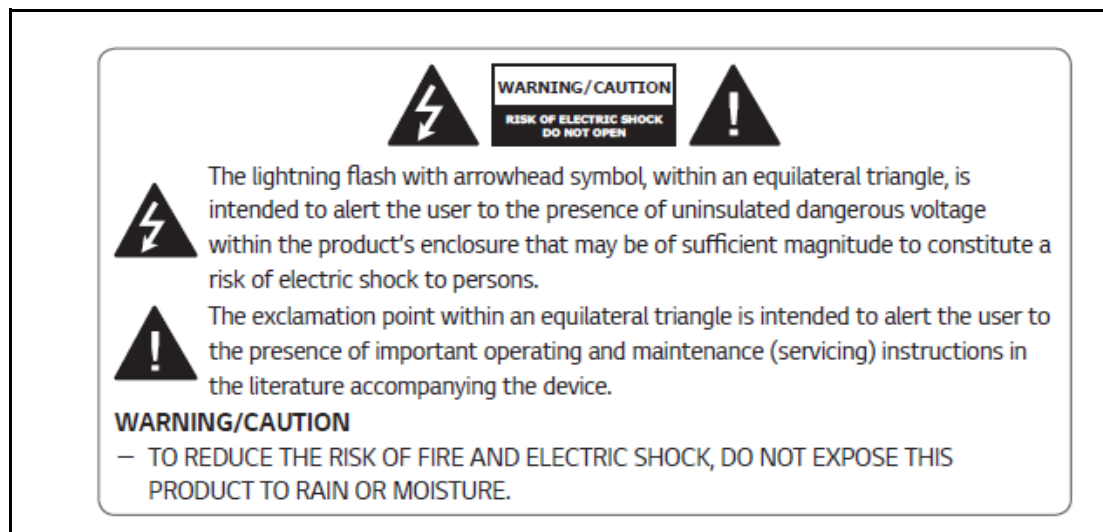
Battery Safety

⚠️
CAUTION: Do not wear conductive jewelry or use conductive tools while cleaning and working near battery terminals.

Replacement Fuses

As stated in , replace fuses F1 and F2 only with fuses specified in .

1.5 Important Antenna Safety Information

Antennas used for the purpose of radiating signals indoors are limited to a maximum gain of 7 dBi for VHF and 3 dBi for UHF. Each antenna must be positioned to observe minimum separation requirements from all users and bystanders.

The following guidelines must be used when considering separation distances:

- Indoor antennas must be placed so that under normal conditions, personnel cannot come within:
  - 60 cm (~24 in) of any indoor VHF antenna, or
  - 80 cm (~32 in) of any indoor UHF antenna.

  Adhering to this minimum separation will ensure that the employee or bystander cannot exceed RF exposures beyond the maximum permissible limit as defined by FCC Regulations section 1.1310 Limits for general population/uncontrolled exposure.

- Outdoor antenna must be positioned so that under normal conditions, personnel cannot approach closer than 120 cm (~4 ft.). If a directional antenna having a maximum gain of 11 dBi is used, precautions should be taken to prevent personnel from routinely passing through the main radiation beam at a distance closer than specified.

1-800-377-8766

1.6 FCC Part 90 Signal Boosters Warnings

Class B Device Warning

⚠

WARNING: THIS IS A 90.219 CLASS B CAPABLE DEVICE

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 License to operate this device. When commissioned with filters wider than 75KHz you must register class B signal boosters (as defined in 47 CFR 90.219) online at https://signalboosters.fcc.gov/signal-boosters/. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation.

FCC Contact Information

Federal Communications Commission
445 12th Street SW
Washington DC 20554

Phone 1-888-225-5322
TTY: 1-888-835-5322
Fax: 1-866-418-0232

FCC Labels

Refer to FCC Warning Labels on page 1-8.

1.7 Product Labels

FCC and Product Label Placement

Figure 1-1 is a right side view of the ProtectLink showing placement of FCC and Product labels.
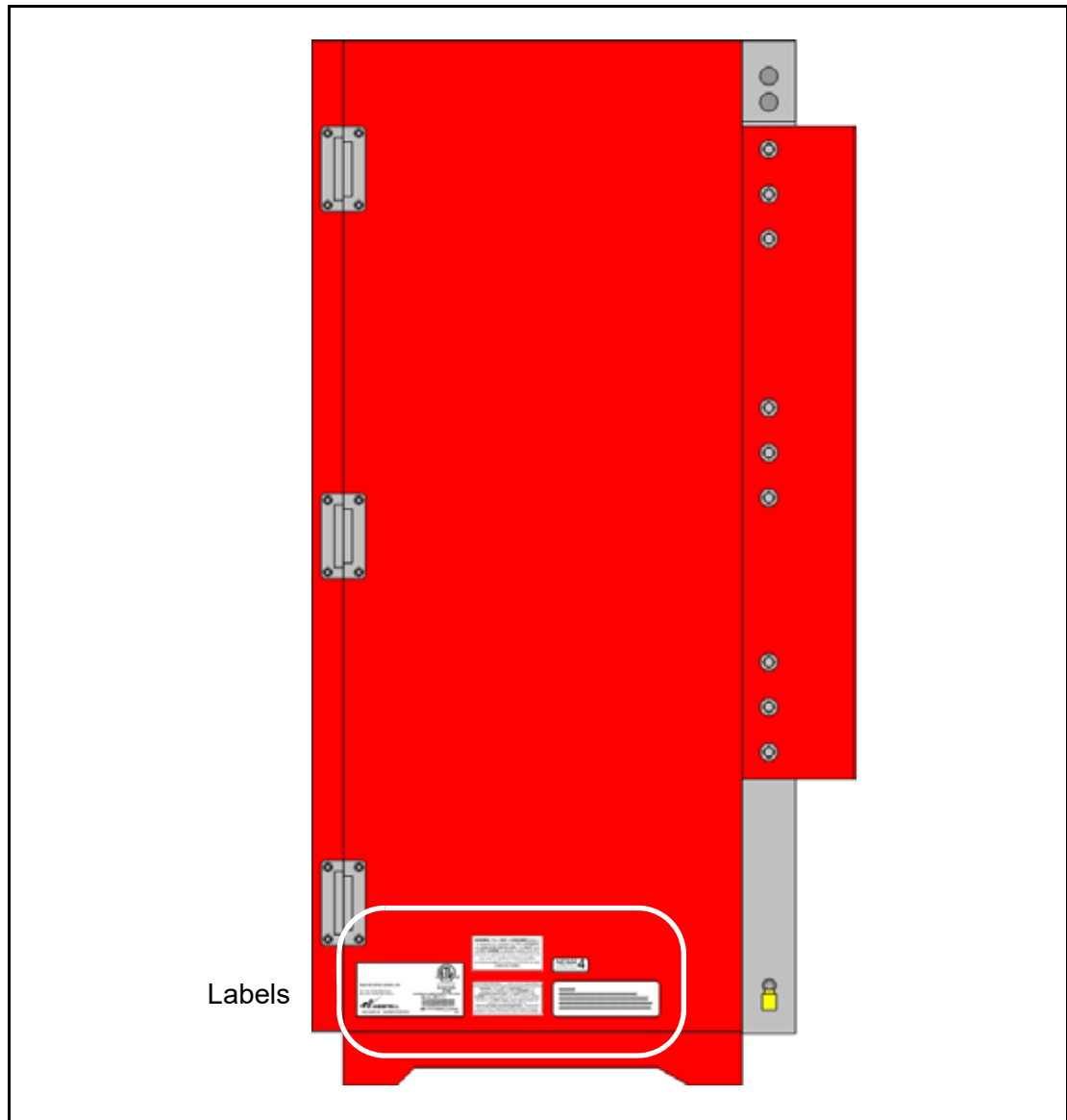
Figure 1-1   FCC and Product labels on right side of ProtectLink BDA

1-800-377-8766

FCC Warning Labels

In accordance with FCC requirements, the labels shown in Figure 1-2 below are affixed to the ProtectLink VHF-UHF Bi-Directional Amplifier, as shown in Figure 1-1 on page 1-7.
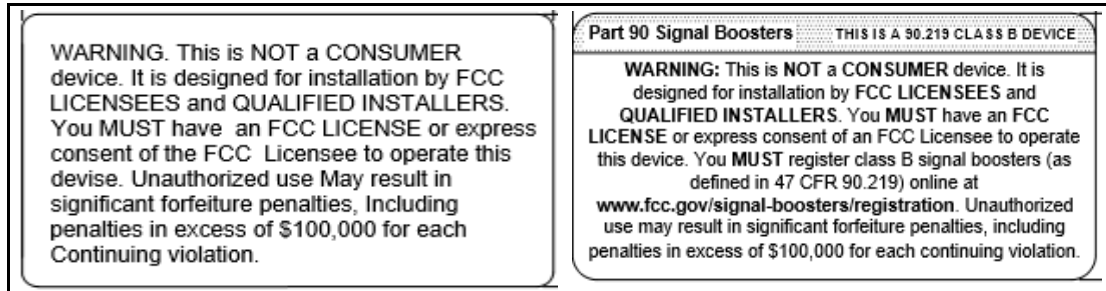
Figure 1-2   FCC warning labels on signal booster

Product Labels

Product labels similar to those shown in Figure 1-3 and Figure 1-4 below are affixed to the ProtectLink VHF-UHF Bi-Directional Amplifier as shown in Figure 1-1 on page 1-7.

Figure 1-3   ProtectLink VHF-UHF Bi-Directional Amplifier labels for UHF model

Figure 1-4   ProtectLink VHF-UHF Bi-Directional Amplifier labels for VHF model

1-800-377-8766

This label includes the BDA's electrical rating (100-240VAC, 50/60 Hz, 2.0A). Other information on the product label is described in Table 1-1 below:

Table 1-1   BDA Product Label information

Item #	Description
1	Model number
2	Product description
3	Product revision number
4	Date of manufacture (MM/YYYY)
5	Product Serial Number
6	Bar Code for Product Serial Number
7	ETL Control Number

A product label similar to that shown in Figure 1-5 below is affixed to the ProtectLink VHF-UHF Bi-Directional Amplifier remote annunciator as shown in Figure 1-1 on page 1-7.

Figure 1-5   BDA Remote Annunciator product label

This label includes the remote annunciator's electrical rating (28VDC, 25mA).

Fuse Labels

The fuse warning label below is affixed to the BDA cover (door):

1-800-377-8766

The fuse warning label below is affixed to the internal fuse cover plate (see Figure 3-3 on page 3-11):

Danger:
Replace with 5x20mm 2.5A
fuses only.
Remplacez uniquement par
un fusibles 5x20 mm 2,5 A

Product Overview

This chapter provides an overview of the Westell ProtectLink VHF-UHF Bi-Directional Amplifier.

Guide to this Chapter

CHAPTER 2

2.1 Product Information

The ProtectLink VHF-UHF Bi-Directional Amplifier was developed for use in enclosed structures where signals from local towers to operate mobile units is poor or unavailable. Adequate signal strength must be available outside the structure as a prerequisite to achieving in-building coverage. The device is connected to an external antenna, normally located on a roof, and to one or more internal antennas placed strategically throughout the area where wireless service is desired.

The external antenna is typically directional, such as a Yagi or Panel antenna. Internal antennas are typically omnidirectional, although various other types may be used, depending on the coverage application. The Signal Booster amplifies both the uplink (mobile to base) and downlink (base to mobile) signals, thus facilitating communications to and from the intended wireless infrastructure.

The downlink and uplink paths support maximum gains of up to 85 dB. Gain can be adjusted in 1 dB steps, from 55 (default) to 85 dB DL/UL.

The ProtectLink BDA has two RJ45 Ethernet ports, an external port labeled GUI for local configuration and an internal port labeled NMS for the persistent network connection.There are also LED indicators on the bottom of the enclosure to indicate power and status alarms. Refer to LED Status Indicators on page 3-10.

2.2 Product Features

Features of the ProtectLink VHF-UHF Bi-Directional Amplifier include:

- Easy installation
- Control using a web browser and accessed by connecting a laptop or desktop computer to the 8P8C/RJ45 Connector labeled 'GUI' on the bottom panel of the ProtectLink BDA.
- Automatic gain control
- Intelligent Oscillation Management
- Overdrive protection
- Under/over voltage protection
- Fault protection
- Low power consumption
- Redundant power supplies - operates on 120VAC or 24VDC
- Built-in battery backup and alarming
- SNMP
- Web based GUI
- Built-in Annunciator data connection
- UHF and VHF bands
- Available in duplex and 4 port models
- Duplex models include internal duplexer on both VHF and UHF bands
- Dry contacts for fire panel connections
- NEMA4 conduit glands
- 16 filters per band for class A units)
- 4 filters per band for class B
- Adjustable gain per filter
- Uplink and downlink squelch per filter
- Digital and analog modulation
- Dual status donor antenna monitoring
- Mandatory isolation test prior to commissioning
- Internal EPO connection

2.3 Included Accessories

Table 2-1 contains the items that are shipped with the ProtectLink VHF-UHF Bi-Directional Amplifier.

Table 2-1   Included Accessories

Quantity	Description
1	AC Power 3 Wire Up to 16 AWG, Length: 6 ft
9	Mounting screws/anchors
2	Cabinet Keys
1	Accessory kit (cordgrips, conduit fittings)

2.4 Optional Accessories

A complete line of accessories is available from Westell. Check with your Westell distributor for any additional items needed. Some products that are suitable for most in-building needs are listed in .

Table 2-2   Optional Accessories

SKU	Model #	Description	
Antennas			
CS03--025-840	Ant-DY-450G11/N(f)	Yagi, 11 dB, UHF Band (406-512 MHz)	
CS03-024-836	Ant-AY-136-174/6.5-7.5-N(f)	Yagi, 7dBi, VHF band (136-174 MHz)	
Power Tappers			
CS05-522-614	VHF-PT3/138-960/N(f)	3dB Power Tapper, Public Safety grade, 200W, N connectors (138-960 MHz)	
CS05-523-614	VHF-PT5/138-960/N(f)	5dB Power Tapper, Public Safety grade, 200W, N connectors (138-960 MHz)	
CS05-524-614	VHF-PT6/138-960/N(f)	6dB Power Tapper, Public Safety grade, 200W, N connectors (138-960 MHz)	
CS05-525-614	VHF-PT7/138-960/N(f)	7dB Power Tapper, Public Safety grade, 200W, N connectors (138-960 MHz)	
CS05-526-614	VHF-PT8/138-960/N(f)	8dB Power Tapper, Public Safety grade, 200W, N connectors (138-960 MHz)	
CS05-527-614	VHF-PT10/138-960/N(f)	10dB Power Tapper, Public Safety grade, 200W, N connectors (138-960 MHz)	
CS05-528-614	VHF-PT13/138-960/N(f)	13dB Power Tapper, Public Safety grade, 200W, N connectors (138-960 MHz)	
CS05-529-614	VHF-PT15/138-960/N(f)	15dB Power Tapper, Public Safety grade, 200W, N connectors (138-960 MHz)	
CS05-530-614	VHF-PT20/138-960/N(f)	20dB Power Tapper, Public Safety grade, 200W, N connectors (138-960 MHz)	
CS05-531-614	VHF-PT30/138-960/N(f)	30dB Power Tapper, Public Safety grade, 200W, N connectors (138-960 MHz)	
Power Dividers			
CS04-500-629	VHF-SPD2/138-960/N(f)	2-Way Power Divider, Public Safety grade, 300W, N connectors (138-960 MHz)	
CV04-501-629	VHF-SPD3/138-960/N(f)	3-Way Power Divider, Public Safety grade, 300W, N connectors (138-960 MHz)	
CV04-502-629	VHF-SPD4/138-960/N(f)	4-Way Power Divider, Public Safety grade, 300W, N connectors (138-960 MHz)	

WESTELL

1-800-377-8766

Table 2-2   Optional Accessories

SKU	Model #	Description	
Battery Cabinet and Batteries			
CS19-BBC-003	PS-BBC-003	12/24 Hour battery cabinet with fittings to support ProtectLinkClass A/B and PS Enhanced series class B BDAs	
CS19-PYL12V45FS	CS19-PYL12V45FS	12VDC, 45 AH Battery for BBC-003 (2 required)	
CS19-PYL12V100FT	CS19-PYL12V100FT	12VDC, 100AH Battery for BBC-003 (2 required)	
CS19-PYL12V160FT	CS19-PYL12V160FT	12VDC, 160AH Battery for BBC-003 (2 required)	
Remote Annunciator			
CS40-ANNUNC	CS40-ANNUNC	Remote Annunciator panel for single ProtectLink Series BDAs	

Specifications and Product Appearance

This chapter provides technical specifications and an external drawing of your Westell ProtectLink VHF-UHF Bi-Directional Amplifier.

Guide to this Chapter

CHAPTER 3

WESTELL.COM

3.1 RF Specifications

Table 3-1 lists RF specifications for the ProtectLink VHF-UHF Bi-Directional Amplifier.

Table 3-1   RF Specifications

Item	Parameter	Description	Unit	Notes
1	VHF Freq. Band	150-174	MHz	
2	UHF Freq. Band	450-512	MHz	
3	Number of DL Class A Filters per Band	16		
4	Number of UL Class A Filters per Band	16		
5	Class A Channelized Filter BW	12.5, 25, 50, 75	kHz	Default 75 kHz with minimum group delay
6	Class A Filter Rejections		dB	Δ**f** – is rejection from BAND EDGE Δf tolerance +/- 5kHz
	12.5 kHz @ Δf >30 kHz	>55		
	25 kHz @ Δf >50 kHz	>55		
	50 kHz @ Δf >105 kHz	>55		
	75 kHz @ Δf >210 kHz	>55		
6.2	VHF Class B Filter Rejections		dB	Δ**f** – is rejection from BAND EDGE Δf tolerance +/- 5kHz
	2 MHz @ Δf >1 MHz	>60		
	3.5 MHz @ Δf >1 MHz	>60		
	5 MHz @ Δf >1 MHz	>60		
	24 MHz @ Δf >1 MHz	>60		
6.4	UHF Class B Filter Rejection		dB	Δ**f** – is rejection from BAND EDGE Δf tolerance +/- 5kHz
	0.70 MHz @ Δf >1 MHz	>60		
	2 MHz @ Δf >1 MHz	>60		
	3.75 MHz @ Δf >1 MHz	>60		
	5 MHz @ Δf >1 MHz	>60		

Table 3-1   RF Specifications

Item	Parameter	Description	Unit	Notes
7	Class A System Group Delay for each filter		uS	TOTAL DL group delay between DONOR and SERVICE ports.
	12.5 kHz	<60		Will not meet P25 phase 1 or 2 requirements
	25 kHz	<36		P25 phase 1 compliant
	50 kHz	<25		P25 phase 1 compliant
	75 kHz	<15		P25 phase 1 & 2 compliant

1-800-377-8766

Table 3-1   RF Specifications

Item	Parameter	Description	Unit	Notes
7.2	Class B System Group Delay		uS	TOTAL DL group delay between DONOR and SERVICE ports.
	VHF and UHF Class B filters	<6		
	VHF and UHF Wideband Mode	<6		
8	System Gain DL	85	dB	Without duplexer/filters
9	System Gain UL	85	dB	Without duplexer/filters
10	UL and DL Composite Gain Adjustment	30	dB	1 dB steps
11	UL and DL Attenuation per Filter	30	dB	1 dB steps - Attenuation (aka Gain) adjustment
12	AGC Range	60	dB	Consists of 30dB available from composite gain control and 30 dB available from individual filter attenuation control
13	VHF Composite RF Power	30	dBm	Prior to duplexer/filter
14	UHF Composite RF Power	37	dBm	Prior to duplexer/filter

1-800-377-8766

3.2 Power and Fuse Specifications

Table 3-2 lists power specifications for the ProtectLink VHF-UHF Bi-Directional Amplifier.

Table 3-2   Power Specifications

Parameter	Specification
Main Power Input Voltage	120-240 VAC, 50/60 Hz, 2.0 A
AC Power Consumption	170 W Max.
Battery Charger Output	27.8 VDC
DC Input Range	24-30 VDC
DC Power Consumption (dual band)	130 Watts max. (5.3 Amps)
DC Power Consumption (single band)	90 Watts max. (3.7 Amps)
DC input from batteries (UHF)	81 Watts
Max. AH battery capacity	160AH
Max. battery standby operating time with two 160AH batteries	24 hours

Replacement Fuses

The BDA fuses F1 and F2 should be replaced only with 5x20mm 2.5A fuses, such as Littelfuse 0234 series part 2.5P. See 5.10 Fuse Replacement on page 5-31.

1-800-377-8766

3.3 Mechanical Specifications

Table 3-3 lists mechanical specifications for the ProtectLink VHF-UHF Bi-Directional Amplifier.

Table 3-3   Mechanical Specifications

Parameter	Specification	Notes
Size	29.5 x 20 x 13.8 in.	W x H x D
Weight (approx.)	79.5 lbs. (36.1 kg)	BDA cabinet without filters
Connectors	Donor/Coverage Antenna Ports: N	
	AC Power In (8402 Gland Connector)	Open Wire Terminal
	DC (Battery) Power In (8402 Gland Connector)	Open Wire Terminal
	Accessory (8404 Gland Connector)	NMS Network Connection
	Alarm Relay (8404 Gland Connector)	Alarm Relay Interface
	Annunciator (8404 Gland Connector)	Remote Annunciator Interface
	RJ-45 Ethernet-1 (10/100 Base-T)	GUI Interface
	Frame Ground	Two-Lug Ground
Mounting Type	Wall Mount with 10 holes	5 holes in each side
Enclosure Lock	Key lock	Two-key lock
Heat Dissipation	Natural Convection	
Finish	Red paint	RAL3001 Signal RED

3.4 Environmental Specifications

Table 3-4 lists environmental specifications for the ProtectLink VHF-UHF Bi-Directional Amplifier.

Table 3-4   Environmental Specifications

Parameter	Specification	Notes
Operating Temperature	0°C ~ +49°C (ambient)	32°F ~ +120°F
Storage Temperature	-40°C ~ +60°C (ambient)	-40°F to +140°F
Operating Humidity	5% ~ 95%	
Environmental	IP-67, NEMA 4 Compliance	

1-800-377-8766

3.5 Trouble Status

Table 3-5 lists Alarm States reported by the ProtectLink VHF-UHF Bi-Directional Amplifier.

Table 3-5   Trouble Status

Alarm State	Severity	Relay Alarm	GUI / SNMP Alarm	Description
Loss of AC power, Operating on Battery	Warning	LOSS OF AC POWER	LOSS OF AC POWER	AC Power lost and BDA is operating on battery power
Donor Antenna Disconnected	Critical	DONOR ANTENNA DISCONNECT	DONOR ANTENNA DISCONNECT	No RF input on donor port - Donor antenna disconnection suspected
Donor Antenna Malfunction	Warning	DONOR ANTENNA MALFUNCTION	DONOR ANTENNA MALFUNCTION	RF input at donor port below threshold - Antenna alignment change suspected
Uncorrectable Oscillation Detected	Critical	SYSTEM COMPONENT FAIL	SYSTEM COMPONENT FAIL	Uncorrectable oscillation detected that a reduction in gain could not resolve, causing RF shutdown
		RF EMITTER FAIL	OSCILLATION RF SHUTDOWN	
Oscillation Detected	Warning	SYSTEM COMPONENT FAIL	OSCILLATION REDUCED GAIN	Oscillation detected - BDA operating at reduced gain
Over Temperature	Warning	NONE	HIGH TEMPERATURE DETECTED	BDA internal temperature over threshold
UL/DL Amplifier Failure	Critical	RF EMITTER FAIL	DL 700 HPA FAIL	Uplink and/or downlink amplifier has been shut down
			DL 800 HPA FAIL	
			UL HPA FAIL	
Loss of Annunciator Communications	Warning	SYSTEM COMPONENT FAIL	REMOTE ANNUNCIATOR LOSS OF COMMUNICATIONS	BDA lost communications with the remote annunciator
Battery Capacity Low	Warning	BATTERY CAPACITY LOW	BATTERY CAPACITY LOW	Battery capacity under 30%
Battery Charger Failure	Critical	BATTERY CHARGER FAIL	BATTERY CHARGER FAIL	Failure of battery charger in BDA
Door Open	Warning	NONE	DOOR OPEN	Front panel door is open
Emergency Power Off Enabled	Warning	RF EMITTER FAIL	USER INITIATED EMERGENCY POWER OFF	Emergency power off (EPO) button has been enabled at fire control room

1-800-377-8766

3.6 Product Appearance

Figure 3-1 shows the external configuration of your ProtectLink BDA.

TOP VIEW

13.8 in.
(350.5 mm)

LEFT SIDE VIEW

FRONT VIEW

RIGHT SIDE VIEW

TOP

29.5 in. (749.3 mm)

REAR   FRONT

BOTTOM

FRONT   REAR

20 in. (508 mm)

REAR VIEW
(reduced scale)
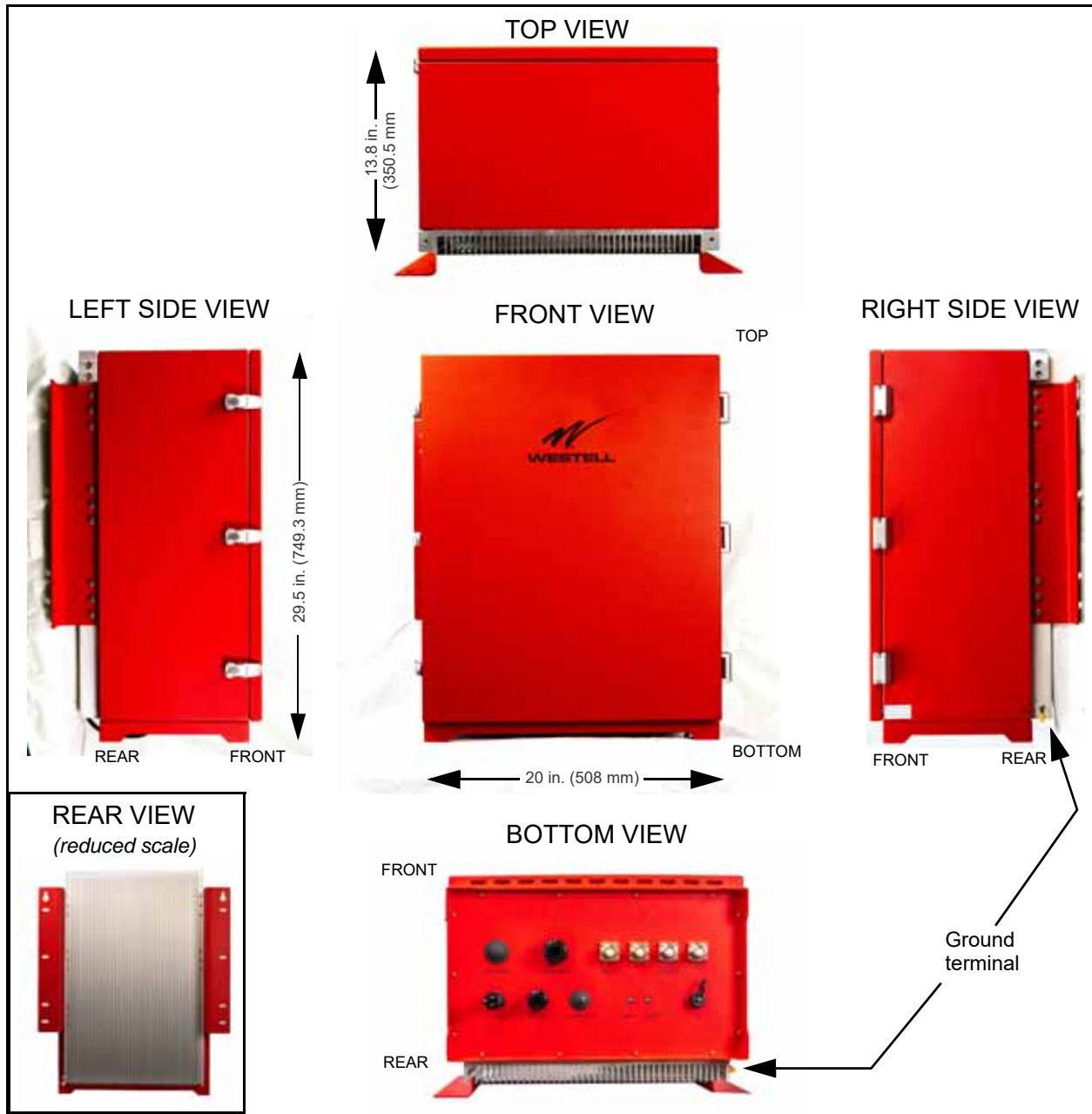
BOTTOM VIEW

FRONT

Ground
terminal

REAR

Figure 3-1   External configuration of the VHF-UHF Bi-Directional Amplifier

1-800-377-8766

LED Status Indicators

On the bottom exterior of the BDA are two LED indicators. The Power indicator will glow green when unit is powered on. The Status indicator will glow green for normal operation (Normal Standby), yellow for non-critical trouble alarms, and red for critical trouble alarms. See the bottom view of the VHF-UHF Bi-Directional Amplifier in Figure 3-2.
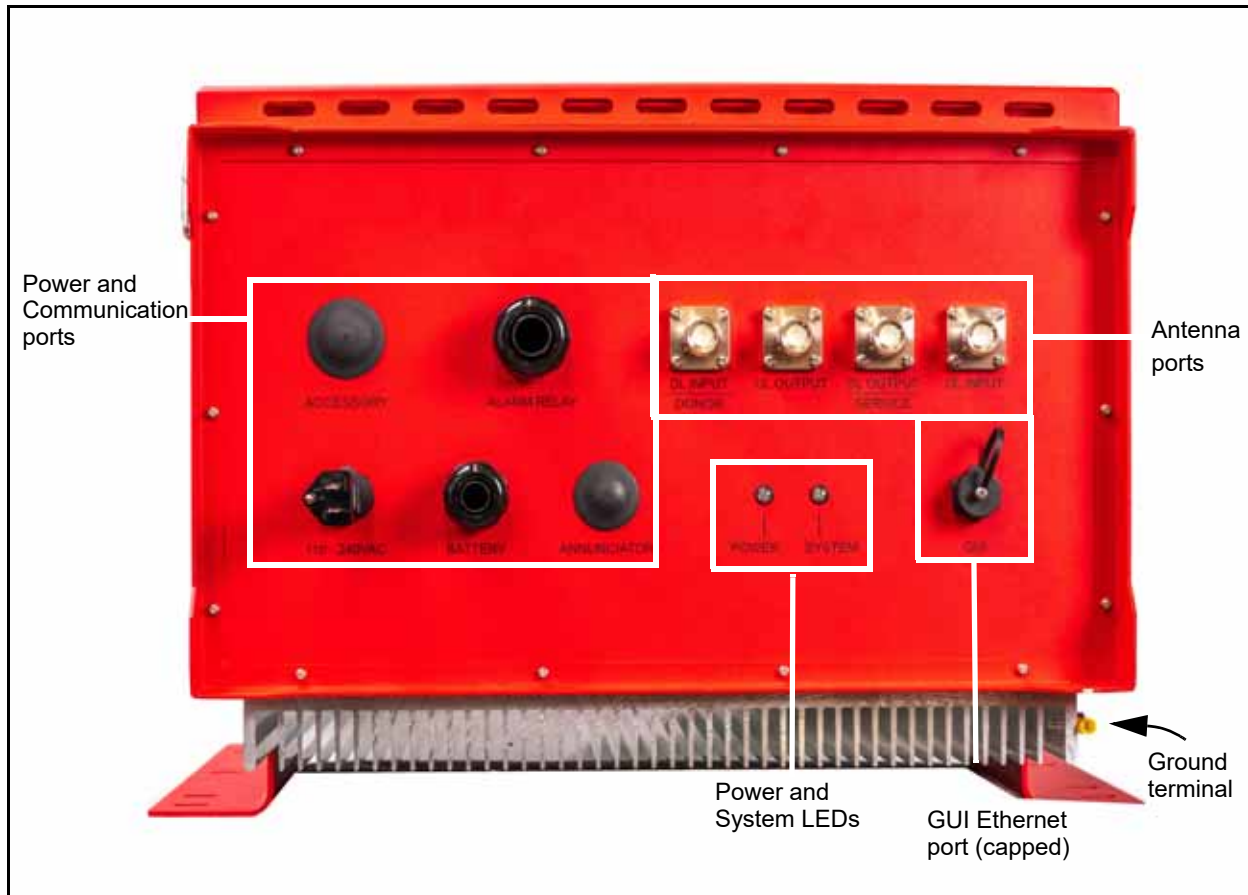

Figure 3-2   Bottom views of the VHF-UHF Bi-Directional Amplifier

Bottom Panel Feedthroughs and Connectors

On the bottom of the ProtectLink BDA are all the connections and cable feedthroughs, each labeled clearly. Watertight conduit fittings or hole plugs come preinstalled. The accessory kit provided includes additional conduit fittings and watertight cordgrips if the installer wishes to use a different style of feedthrough. See 4.4 Determining cable entry selection on page 4-6 for additional information.

Label Placement

Label placement on the VHF-UHF Bi-Directional Amplifier is shown in .

On/Off Switch

AC Power Connections

Battery Connections

Remote Annunciator RJ45 Port

Alarm Connections

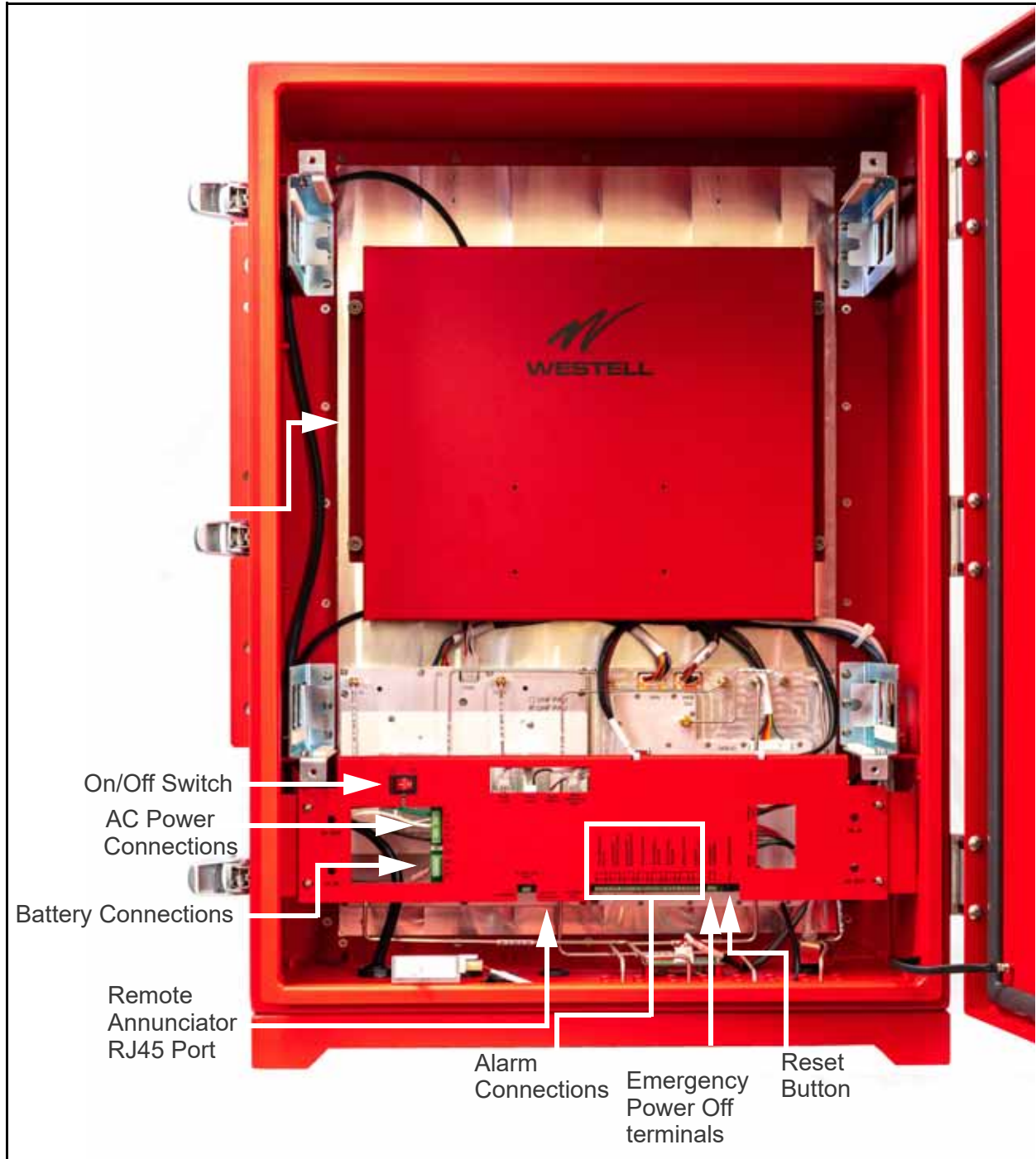Emergency Power Off terminals

Reset Button

Figure 3-3   View of the open ProtectLink BDA cabinet

Installation Guidelines

This chapter provides installation guidelines for your Westell ProtectLink VHF-UHF Bi-Directional Amplifier.

Guide to this Chapter

CHAPTER 4

4.1 Important Installation Guidelines

The ProtectLink VHF-UHF Bi-Directional Amplifier is designed for indoor use only.

The ProtectLink BDA must be installed in a vertical orientation (i.e. Connectors on the bottom of the unit).

Inadequate isolation between the outside and inside antennas may reduce the maximum available gain. Careful consideration of the layout and placement of the system is needed to minimize this possibility and to minimize the amount of signal leaking from the building.

Do not disassemble the Signal Booster.

Important: The remote annunciator unit is for installation in

   * a locked room such as a fire control room,

   * a locked enclosure, or

   * an equivalent enclosure that requires a tool to open.

DANGER: Refer to the 1.3 Safety Guidelines section for proper antenna selection and installation. To avoid serious injury, death and/or damage to the Signal Booster, do not install donor or server antennas near overhead power lines or high power components. Allow enough distance so that falling antennas would not come in contact with those components.

DANGER: Electric shock may occur if the Signal Booster is installed in close proximity to water.

WARNING: Amplifier or handset damage may occur if a handset is connected directly to the Signal Booster or to the coax that leads to the Signal Booster.

WARNING: The Signal Booster must be connected to ground for protection.

WARNING: We recommend that installers do not wear jewelry or metal accessories when installing this Signal Booster.

WARNING: Do not place cables or tools that may damage the Signal Booster in close proximity to it.

WARNING: Check the installation site for hazardous conditions such as water-covered floors or badly worn or damaged cables prior to installation.

WARNING: Lifespan and performance of the Signal Booster may be reduced if the unit is operating outside its nominal temperature range.

CAUTION: When the Signal Booster is in operation, RF fields in close proximity to the Signal Booster or donor or service antennas may exceed FCC limits for human exposure.

CAUTION: Turn power to the Signal Booster off when connecting or disconnecting cables.

CAUTION: Be careful as there is a very high voltage inside Signal Booster. Keys are required to open Signal Booster, but the keys must be kept by the administrator who manages the product.

4.2 Donor Antenna Installation Guidelines

- Accurately determine the azimuth to the donor site. Obtain the donor site information and approval from the service provider/carrier.

- Ensure that the radiation path to the donor site is unobstructed.

- Mount the donor antenna at or toward the edge of the roof, in the direction of the donor site. Avoid having the RF signal from the donor pass above the location(s) of the service antennas. Normally, the service antennas are installed behind and below the donor antenna, as viewed from above. This approach helps avoid interference and feedback to and from the service antennas.

- Normally, mounting the donor antenna higher will allow a less obstructed path to the donor site. However, in high traffic metro areas, avoid mounting the donor antenna higher than necessary, as the quality of the donor signal may become less stable and it is more likely to encounter adjacent filter interference.

- When possible, shield the rear of a donor antenna by locating it so that any HVAC units and/or penthouse structures are behind the antenna, relative to the donor site location.

4.3 Indoor Antenna Installation Guidelines

- Use omnidirectional antennas (see section 2.4. Optional Accessories) indoors and locate them centrally with respect to the intended coverage area to minimize signal leakage to the outside. Only use directional antennas indoors in special cases when higher gain and directionality would be helpful and RF exposure limits will not be exceeded.

- To avoid Signal Booster uplink overload and gain limiting, mount the indoor antennas away from areas where mobile subscribers frequently use their radios, fire alarm control rooms, or dispatch areas.

Note: If the signal level from antenna at the UL service port is >-12dBm, add external attenuation to avoid shutdown alarm.

- To determine the quantity and locations of indoor antennas, measure Received Signal Strength Indication (RSSI) to determine areas of weak signals. These are the approximate areas where indoor antennas may be needed.

- Be aware that the signal from an indoor antenna, in most cases, can be expected to penetrate approximately four standard sheet rock walls to reach users. If the signal must travel through more than two walls, or if the walls are made of materials other than sheet rock, it may be necessary to split the available signal and add more antennas.

WESTELL

1-800-377-8766

4.4 Determining cable entry selection

Prior to mounting the ProtectLink BDA on the wall, you'll need to determine what type of cable entries will be used.

Provided with each ProtectLink BDA are both watertight conduit fittings and NEMA4 rated cordgrips. For a cleaner installation, conduit is preferred, and those fittings come preinstalled on the BDA. UL2524 Installations require the use of the conduit fittings. If you wish to use the cordgrips for any cable feed-throughs, change out those fittings prior to mounting on the wall.

The Alarm Relay and Accessory feed-throughs (shown in <u>Figure 3-2 on page 3-10</u>) utilize non-metallic flexible 3/4" conduit. AC, DC and Annunciator feed-throughs use 1/2" non-metallic flexible conduit. Westell's CS19-BBC-003 battery cabinet is supplied with conduit fittings, so at a minimum you may wish to keep the DC cable as conduit.

4.5 Mounting and Grounding the ProtectLink BDA

Follow the instructions in this section to mount the ProtectLink BDA on a wall.
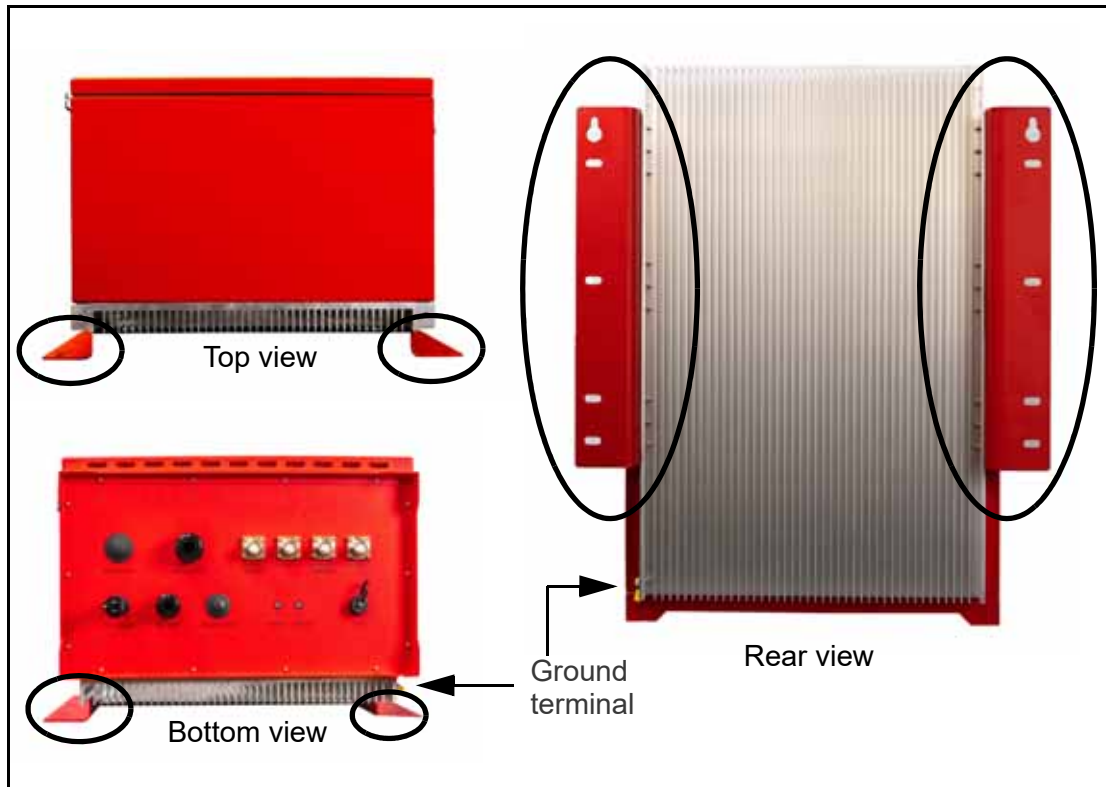

Figure 4-1   Signal Booster Mounting brackets (circled)

1. Using the ProtectLink BDA as a template, mark the eight (8) locations for the wall anchoring system screws (four per mounting bracket). See Figure 4-1.

2. Move the ProtectLink BDA and drill the mounting holes at the marks in the wall.

3. Install a wall anchor (8mm x100mm) in each of the eight (8) drilled holes.

4. Install the top two screws into the anchors, leaving enough room to slide the screws into the keyholes near the top of each mounting bracket.

5. Once the Unit is hung on the top two screws, finish fastening the top screws.

6. Install the rest of the screws into the anchors, fastening the Unit to the wall.

7. Use 16 AWG or greater wire to connect the ground terminal shown in Figure 4-1 above to a reliable earth ground.

4.6 Connecting the Antennas

The ProtectLink BDA's antenna ports are on the bottom of the cabinet. Figure 4-2 below shows the ports on a 4-port version. Other models have two ports (DL Input and UL Input).

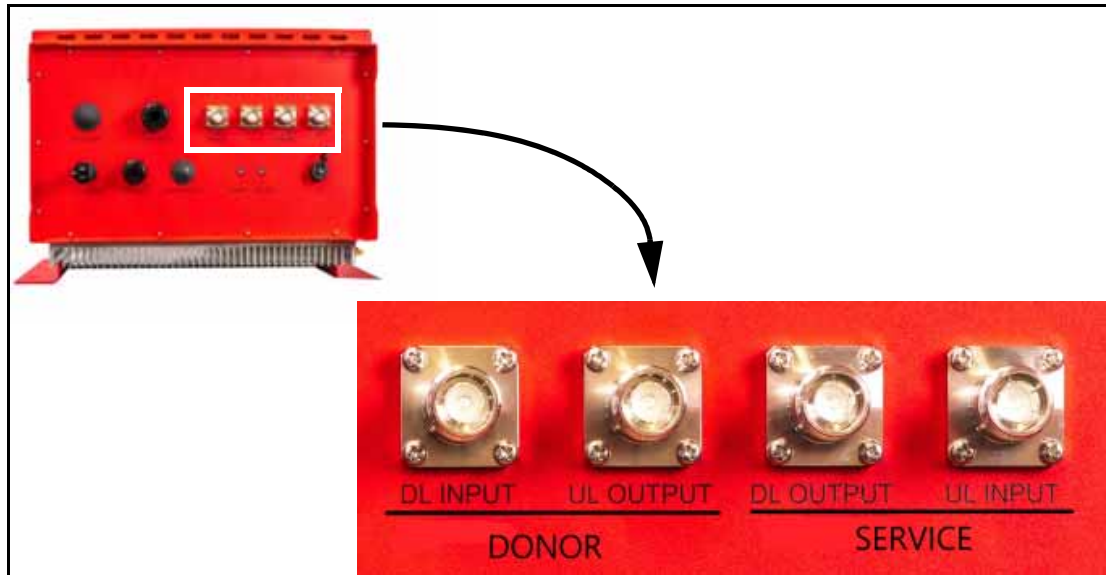Figure 4-2   Antenna ports on a 4-port model

Antenna port connections are listed in Table 4-1 below.

Table 4-1   Antenna Port Connections

Model	Port	Connects to
4-Port Models	DONOR DL INPUT	Rooftop donor antenna (receives incoming signals from donor site)
	DONOR DL OUTPUT	Rooftop antenna (sends outgoing signal to donor site)
	SERVICE DL OUTPUT	Indoor antenna network (transmits DL signal inside building)
	SERVICE DL INPUT	Indoor antenna network (receives UL signals inside building)
2-Port Models	DONOR	Rooftop donor antenna
	SERVICE	Indoor antenna network

1-800-377-8766

4.7 Verifying the Physical System Setup

- Check all cables for shorts and opens. Verify that there are no cables with loose or poor connections. RF leakage could cause oscillation to occur under some conditions.

- If the rooftop antenna (donor antenna) is directional, check it for proper alignment along the calculated compass heading. Typically, the directional antenna would be aimed at the same site that your handset uses, but that may not always be the case.

1-800-377-8766

4.8 Controlling the VHF-UHF Bi-Directional Amplifier

Controlling and monitoring the Signal Booster requires that a properly configured computer with a web browser is connected via an Ethernet cable, such as the one shown in Figure 4-3.

During installation or maintenance, the Network Interface port of a computer can temporarily be connected to the external GUI port on the bottom of the Signal Booster.

Figure 4-3   Ethernet Cable

RJ45 Cable Port

GUI
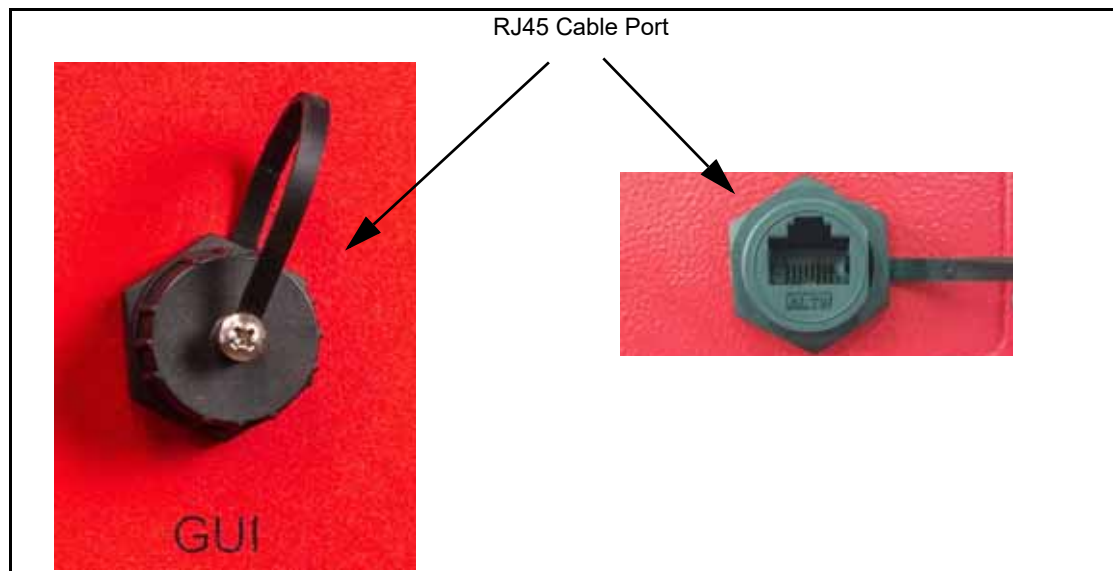
Figure 4-4   GUI port for Ethernet connection

⚠ **WARNING:** The RJ45 Ethernet port on the external surface of the enclosure is for maintenance use only. This port cannot be used as a permanent connector.

4.9 Connecting the Emergency Power Off Button

Connections 1 & 2 next to the alarm connections allow for a remote Emergency Power Off (EPO) switch to disable all RF functions of the ProtectLink BDA. See Figure 4-5 below.
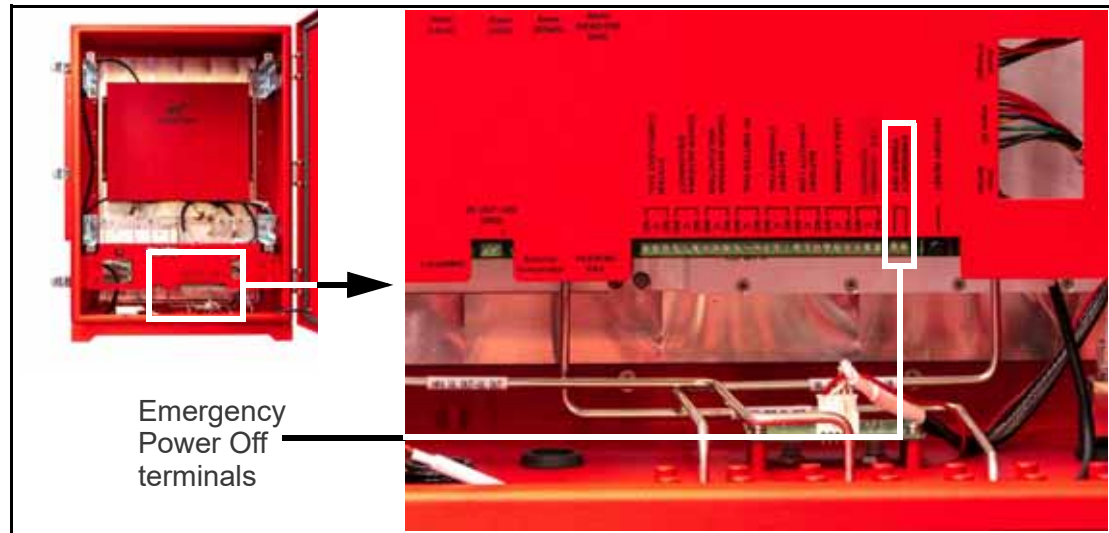

Figure 4-5   Emergency Power Off connections

Use a mushroom type EPO button available from electrical suppliers. The button may be a SPST type switch that is normally open and upon pressing closes the contacts. A 2 wire circuit between the EPO switch and terminals 1 & 2 will need to be provided by the installer.

4.10 Connecting to the Alarm Relay Panel

Use an industry standard multi-conductor alarm cable between 22 and 14 gauge to connect the Westell VHF-UHF Bi-Directional Amplifier to an external alarm relay panel.

1. Strip the outer serial cable insulation back to expose the inner conductors, as shown in Figure 4-6.

2. Strip back the insulation on the ends of each conductor. (Tin wires as needed.)

Figure 4-6   Stripped alarm wire

3. If using the provided conduit fittings, feed alarm cable through the watertight conduit and terminate in an electrical junction box. If using the provided watertight cordgrips, remove the conduit fitting from the bottom of the BDA chassis and replace with the suitably sized cordgrip fitting.

Figure 4-7   Conduit fittings and plugged cable ports

4. Connect the serial cable wire pairs to the Alarm Relay terminals on the BDA shown in Figure 4-8. Be sure to fasten the connector screws securely. Refer to Table 4-2 below for connection information.
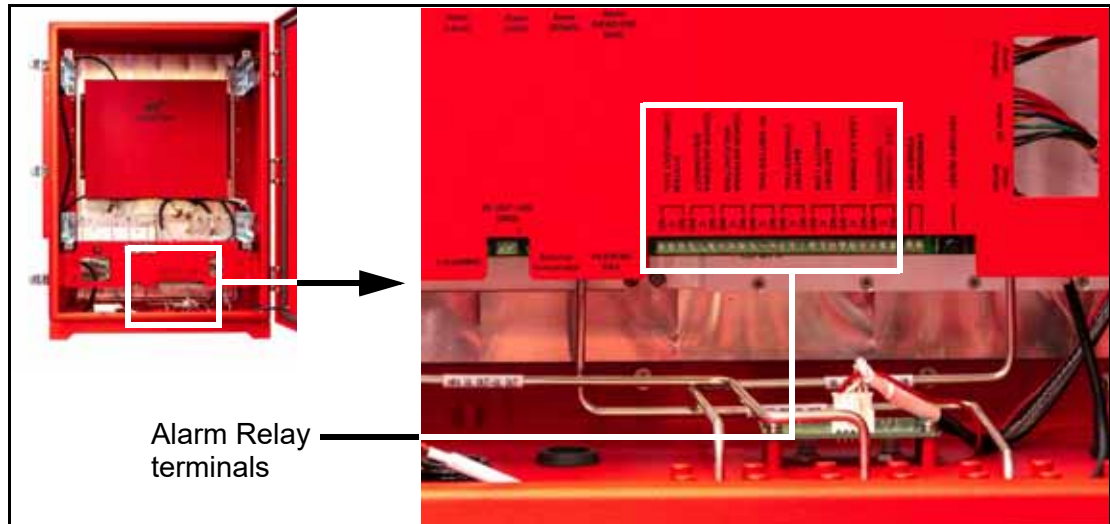

Alarm Relay terminals

Figure 4-8   BDA Alarm Relay terminals

5. Connect the stripped end of the serial cable to the alarm relay panel. Refer to Table 4-2 below for connection information.

Table 4-2   Alarm Connections

Alarm #	Description			Alarm Information
	NC	NO	CC	
EPO	1, 2			EMERGENCY POWER OFF
Alarm1	3	4	5	OFF-NORMAL SUMMARY
Alarm2	6	7	8	LOSS AC POWER
Alarm3	9	10	11	BATTERY CAPACITY LOW
Alarm4	12	13	14	BATTERY CHARGER FAIL
Alarm5	15	16	17	RF EMITTER FAIL
Alarm6	18	19	20	DONOR ANTENNA MALFUNCTION
Alarm7	21	22	23	DONOR ANTENNA DISCONNECT
Alarm8	24	25	26	SYSTEM COMPONENT FAIL

4.11 Connecting the Power Cable

Use the provided AC power cable to connect the ProtectLink VHF-UHF Bi-Directional Amplifier to an AC power source. Follow these steps:

1. The ProtectLink BDA has a 1/2" conduit fitting preinstalled in the 100-240VAC port and the AC cord exiting that fitting. You may need to disconnect the AC cord from the terminal fittings in the BDA to route through 1/2" conduit or replace the conduit fitting with the cordgrip feed-through. See Figure 4-9.

AC power cord (preinstalled)

Figure 4-9   Bottom ports with conduit fittings

2. Connect the power cable wires to the AC 100~240V power connector terminals on the Signal Booster as shown in Figure 4-10.

Connections:

Ground (Green)

AC Neutral (White)

AC Hot (Black)
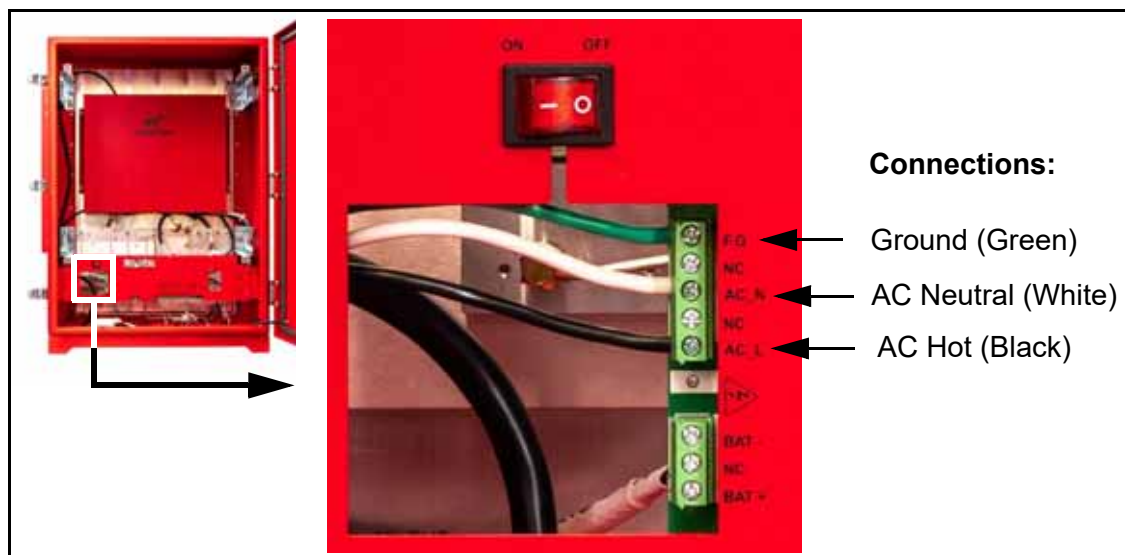
Figure 4-10   AC Power Connections

3. Screw the connector on securely.

4. When the Signal Booster is properly set up and ready to have power applied, plug the other end into the Cabinet 100~240 VAC.

4.12 Connecting the Battery Cable

Using Westell CS19-BBC-003 Battery Cabinet

Westell's CS19-BBC-003 Battery Cabinet comes with 72" + and - leads which connect to the signal booster's battery terminals as shown in Figure 4-11 below. Refer to CS19-BBC-003 installation instructions.

Connect - battery lead

Connect + battery lead
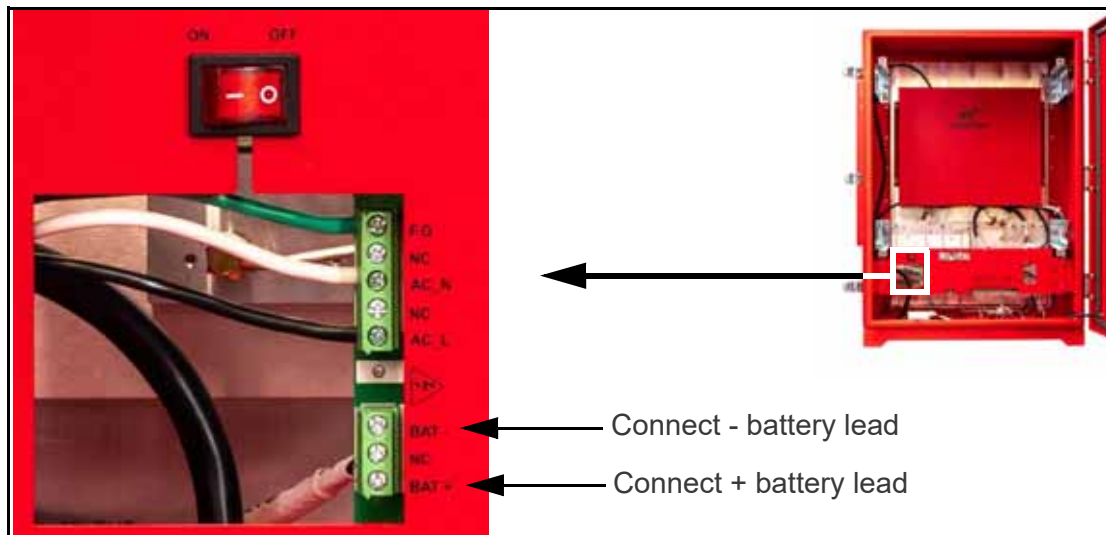
Figure 4-11   Battery cable connections to signal booster

Using Other Battery Solutions

If using alternate battery solution simply connect a 24VDC lead acid battery source to the positive and negative battery terminals shown in Figure 4-11. Be sure to add over-current protection on the positive lead.

4.13 Battery Specifications

Table 4-3 lists specifications for batteries Westell recommends to provide backup power to the ProtectLink VHF-UHF Bi-Directional Amplifier.

Table 4-3   Battery Specifications

Battery Kit >>	CS19-PYL12V45FS	CS19-PYL12V100FT	CS19-PYL12V160FT
Battery Type	Sealed maintenance free lead acid battery		
Capacity - 8HR rate	45 Ah	100 Ah	160 Ah
Dimensions	11" x 7.8" x 4"	20" x 9.3" x 4.2"	21.9" x 11" x 4.9"
Quantity needed	2	2	2

See Table 2-2 on page 2-5 for battery ordering information.

160AH 24VDC batteries will provide over 24 hours of backup time including 20% derate factor for aging with the system fully configured at maximum RF power.

Other Battery Maintenance Considerations

CAUTION: Do not wear conductive jewelry or use conductive tools while cleaning and working near battery terminals.

● Batteries should be marked with their installation date upon installation.

● The recommended batteries require no maintenance, but should be inspected in accordance with an NFPA 72 maintenance schedule for signs of damage including leakage, cracks, corrosion, or bloating.

● Batteries should be replaced in pairs on a schedule in accordance with local and state codes.

WESTELL
1-800-377-8766

4.14 Connecting the Remote Annunciator

Important: The remote annunciator must be installed in a secure location such as:

- a locked room such as a fire control room
- a locked enclosure
- an equivalent enclosure that requires a tool to open

The Remote Annunciator connects to the BDA with a standard Ethernet cable housed in conduit meeting specified standards. Follow these steps:

1. Install the annunciator base on a wall-mounted junction box at the desired visible location.

2. Install standard Ethernet cable in conduit between the annunciator and the BDA.

3. Connect the Ethernet cable to the RJ45 ports inside the BDA and the annunciator. See Figure 4-12. Remove factory installed plugs from RJ45 ports as necessary.

Remote Annunciator RJ45 Port
(rear side of housing)

BDA Remote
Annunciator
RJ45 port
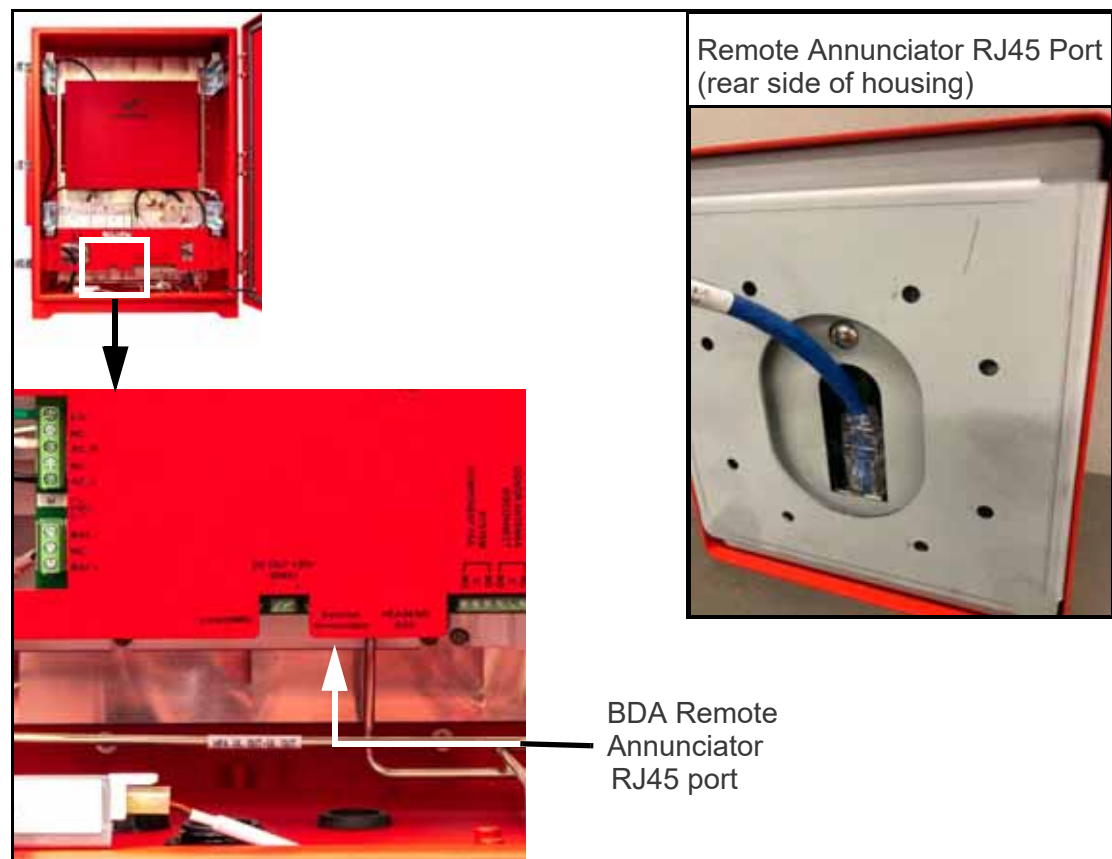
Figure 4-12   Connections to the Remote Annunciator

System Operation

This chapter covers your Westell ProtectLink VHF-UHF Bi-Directional Amplifier's key system operating features.

Guide to this Chapter

CHAPTER 5

5.1 Controls Inside the ProtectLink BDA

Within the ProtectLink BDA on the control board are two user accessible controls, the ON/OFF power switch and a reset button. These and other interior features are shown in Figure 5-1 below.
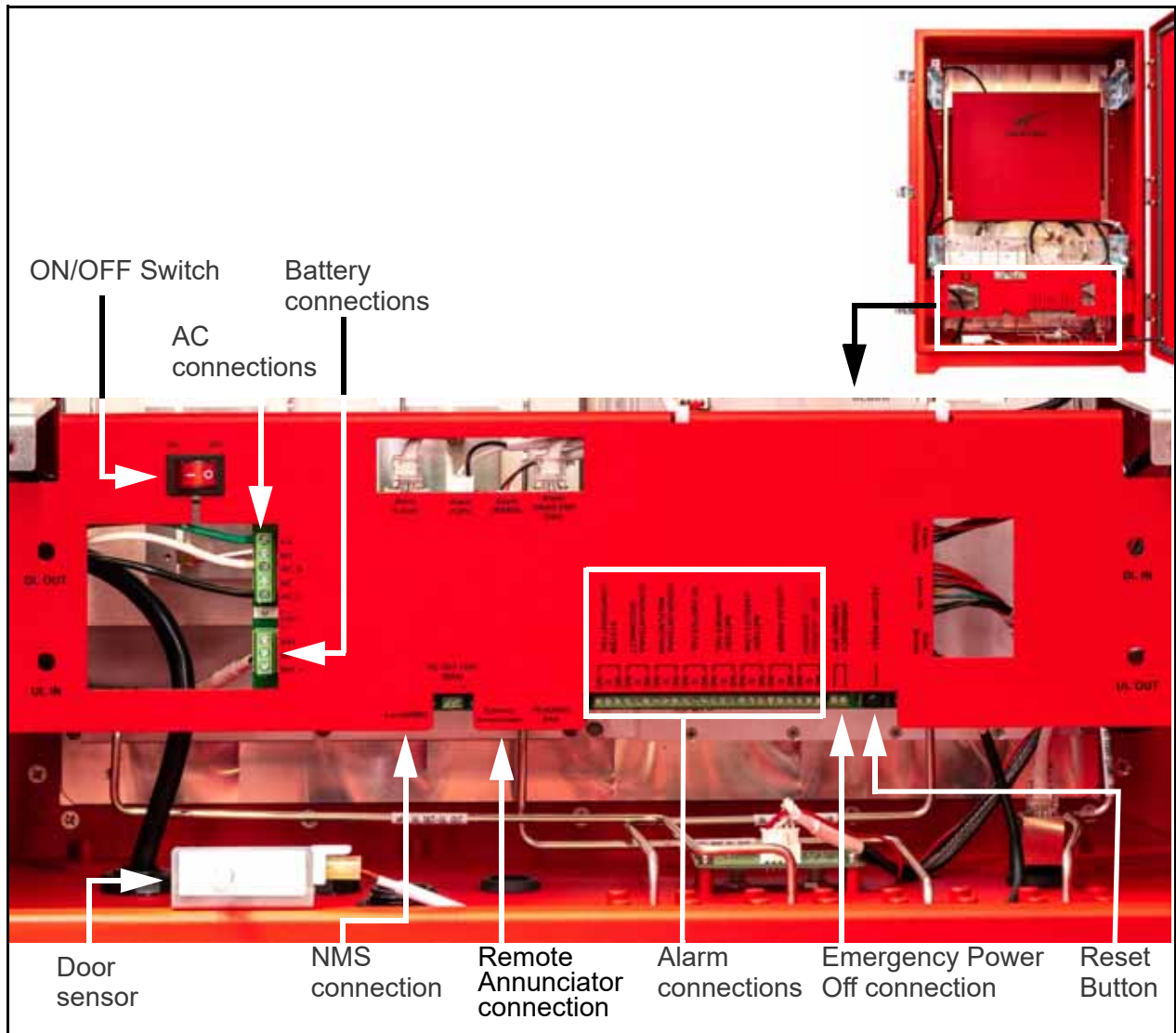
Figure 5-1   ProtectLink BDA interior features

ON/OFF Switch

The red ON/OFF switch above the AC power connections near the top left of the control panel connects and disconnects the AC power source to the ProtectLink BDA.

1-800-377-8766

Factory Reset / Alarm Mute Button

The reset button on the lower right of the control panel has 3 distinct functions:

- A momentary press will temporarily disable the audible annunciator in the BDA and on the remote annunciator if one is installed. After 24 hours, the audible alarms will be re-enabled.
- A press lasting 3-8 seconds will reboot the BDA. All settings will remain. This is similar to powering the unit off and then back on.
- A press of 10 or more seconds will reset the BDA to factory defaults. This is a way to wipe the BDA of all settings and start over.

5.2 Accessing the ProtectLink BDA GUI

Access the ProtectLink BDA using web browser software on your computer through a LAN connection. A Google Chrome browser optimizes the GUI without formatting issues that can be noticeable with other browsers. The BDA ships with the IP address **192.168.1.150** on the **GUI** port.

To connect directly to the BDA from a laptop or PC with a CAT-5E cable or over a LAN, change the TCP/IP settings on your computer to enable a connection to a host that has a static IP. Follow these steps:

1. Open your computer's Control Panel or Settings and navigate to All Control Panel Items and then to Network Connections (or Network and Sharing Center).

2. Choose an appropriate Local area connection. For example:
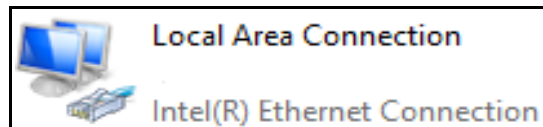
Properties windows will appear to make network connection settings as shown in Figure 5-2 below.
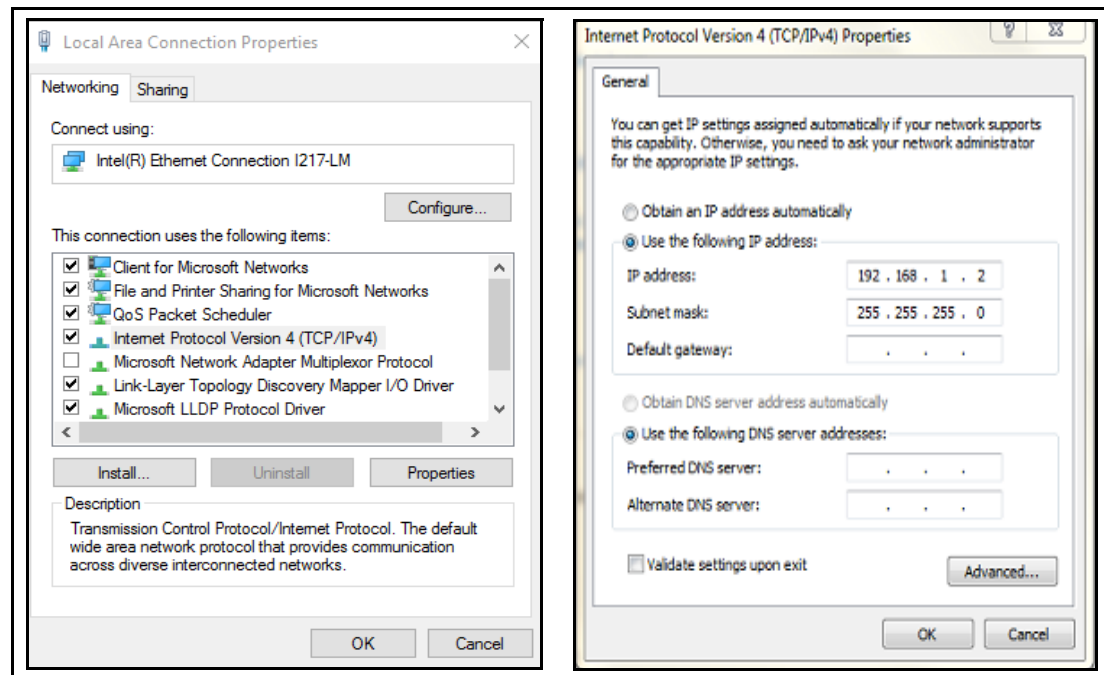
Figure 5-2   Network Connection Set-up

1-800-377-8766

3. Select **Use the following IP address** and enter IP address 192.168.1.x, where "x" is any number from 2 to 254, inclusive, other than 150 (*for example: 192.168.1.2*).

4. Ensure that the subnet mask is set to 255.255.255.0

    Note: Refer questions about these settings to your IT department.

Once the above LAN settings are configured, open a browser (Westell recommends Chrome) and enter the signal booster's default IP address. The Sign in screen appears as shown in Figure 5-3 below.

Figure 5-3   Sign In screen

Sign in the first time with the default user name **admin** and default password **admin**. The System Status screen will appear as shown in Figure 5-4.

Idle Timeouts and Lost Connections

● If the GUI is left inactive for 30 minutes (no keystrokes or mouse activity), the user automatically will be signed out and the Sign In screen will reappear.

● If the network connection is lost for 5 minutes, an alert will appear, the user automatically will be signed out, and the Sign In screen will reappear.

Changing passwords

Users can change their passwords while signed out of the ProtectLink BDA GUI by checking the **Change** checkbox to the right of the **Password** field. As shown at right, new fields appear to enter and confirm a new password.

1-800-377-8766

5.3 Web GUI System Status Display

When you sign in, the System Status window (also called the Main Menu) is displayed as shown in Figure 5-4 below. Key features numbered in Figure 5-4 are described in Table 5-1. Current Alarms are color coded as described in Table 5-2 on page 5-9.
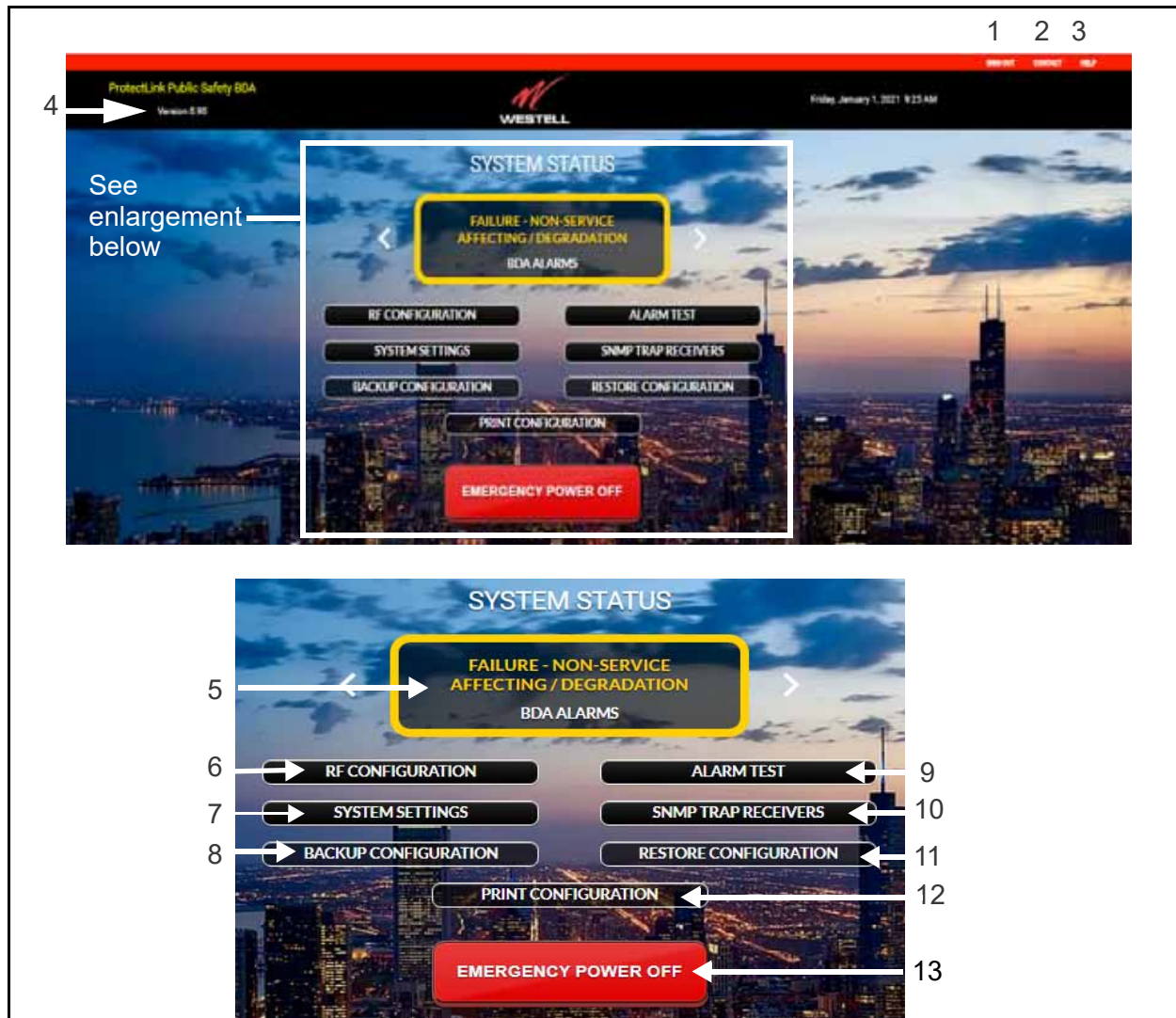
Figure 5-4   Web GUI System Status Screen

Tip: Use the zoom control on your internet browser to enlarge this and other Web GUI displays on your screen as needed.

Table 5-1   System Status page features

Feature	Description
1	Sign out button. Click to sign out.

Table 5-1   System Status page features

Feature	Description
2	Contact button. See CONTACT and HELP Links below.
3	Help button. See CONTACT and HELP Links below.
4	Software version number.
5	System Status indicator and Alarm Page button. Shows rolled up alarm status. Click to open Alarm Page. See 5.4 BDA Alarms Page on page 5-9.
6	RF Configuration. Click to open RF Configuration settings page. See 5.5 RF Configuration on page 5-15.
7	System Settings. Click to open the System Setting page. See 5.6 System Settings Page on page 5-21.
8	Backup Configuration. Click to open the Backup Configuration popup window to save configuration settings. See Backup Configuration on page 5-25.
9	Alarm Tests button. Click to test any or all alarms. See 5.9 Alarm Tests on page 5-29.
10	SNMP Trap Receivers button. Click to add, edit, or delete SNMP Trap Receivers. See 5.8 SNMP Trap Receivers on page 5-26.
11	Restore Configuration button. Click to open the Restore Configuration popup to select and restore a previous configuration. See Restore Configuration on page 5-25.
12	Print Configuration button. Click to open the Print Configuration popup to export all current configuration and measured values using HTML or CSV format. See Print Configuration on page 5-25.
13	Emergency Power Off button. See 4.9 Connecting the Emergency Power Off Button on page 4-11.

CONTACT and HELP Links

CONTACT and **HELP** links are at the top right of the screen header. As shown in Figure 5-5 below, click either of these links to open a popup with a QR code. The user can then scan or click the QR code to open a new browser tab with Westell contact information or the online user guide.

WESTELL

1-800-377-8766
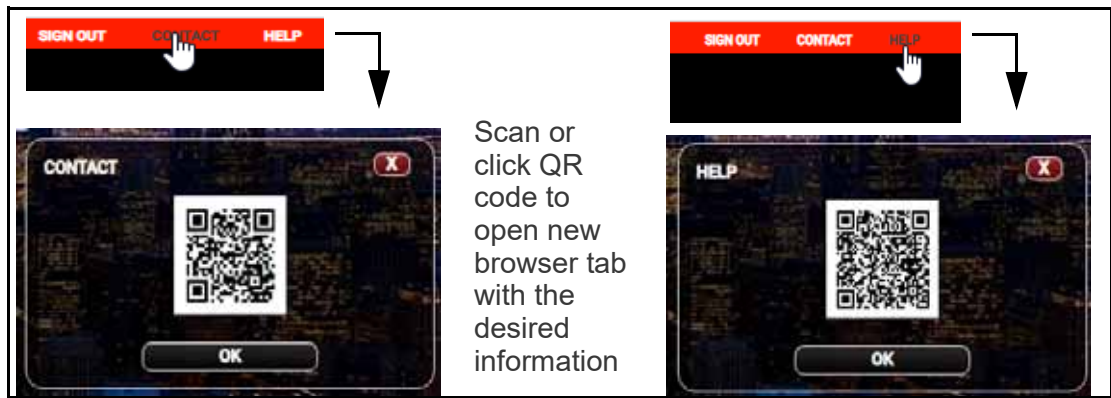
Figure 5-5 **CONTACT** and **HELP** popups with QR codes

5.4 BDA Alarms Page

The BDA Alarm Page is shown in Figure 5-6 below.

Figure 5-6   Alarm Page

As shown in Table 5-2, the color outlining each alarm indicator reflects current alarm severity or masking.

Table 5-2   Alarm Indicator Colors

Color	Alarm Severity	
Green	Normal	BATTERY CHARGER
Yellow	System Degradation Alarm	DOOR OPEN
Red	Critical Alarm	
White	Alarm is masked	DOOR OPEN

Click an alarm indicator once to display a popup revealing a more detailed alarm description and/or indicators for multiple alarm sources, as shown in Figure 5-7. Double-click an alarm indicator to also reveal **Mask**, **Delay**, and **Frequency** settings as shown in Figure 5-8.
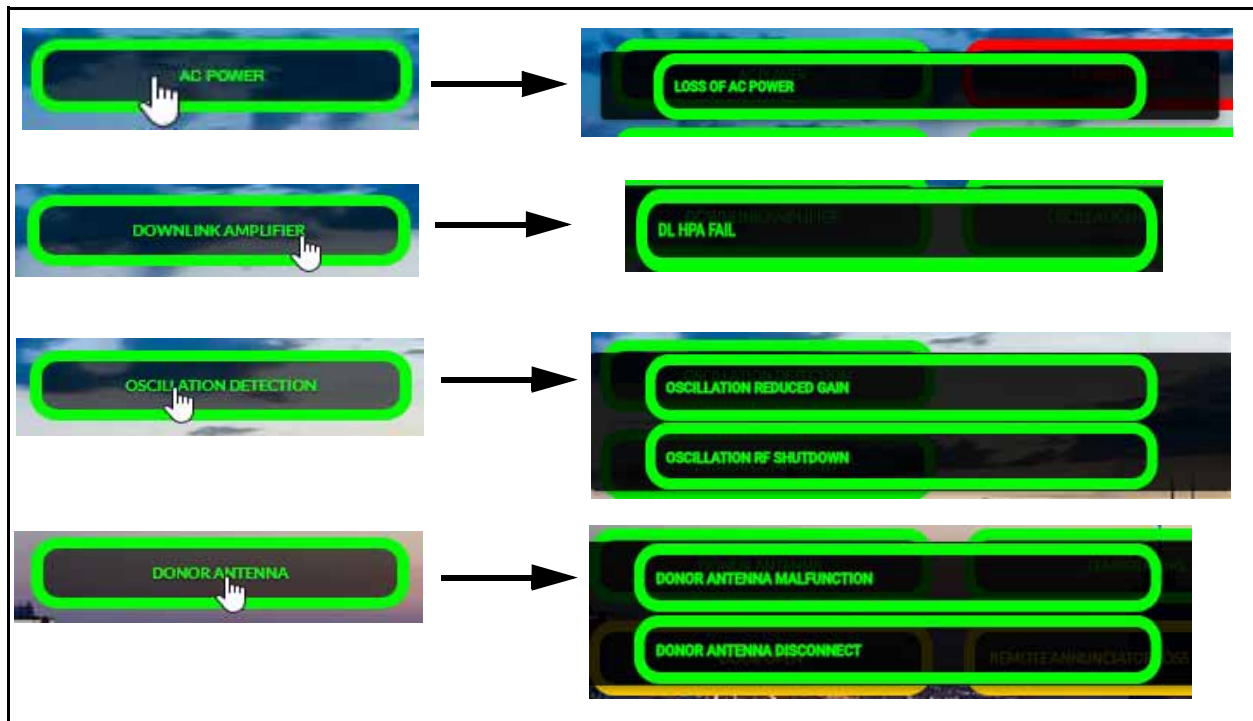
Figure 5-7   Popups revealing more alarm detail and/or multiple alarm sources

Either double-click an alarm indicator shown in Figure 5-6 or click a popup indicator as shown in Figure 5-7 to reveal that alarm source's **Mask**, **Delay**, and **Frequency** settings appear as shown in Figure 5-8 below. The second click reveals the settings.

Figure 5-8   Second click reveals alarm settings

Click once anywhere else on the BDA Alarms page to close a popup display.

Once the user has opened an alarm's popup display with the alarm settings and then closed it, a single click will reopen it until the user navigates away from the BDA Alarms page.

Details about each alarm indicator appears in Table 5-3.

Table 5-3   Alarm Indicators

Alarm Display	Description
AC POWER	Loss of AC Power
BATTERY CAPACITY	Low battery capacity at 70% reduction
BATTERY CHARGER	Battery Disconnection or Battery Not Charging status
EMERGENCY POWER OFF	Emergency Power Off has been activated externally
DOWNLINK AMPLIFIER	Downlink high power amplifier shutdown
UPLINK AMPLIFIER	Uplink high power amplifier shutdown
DONOR ANTENNA	Donor ANT Disconnection/VSWR Fail/ Malfunction
DOOR OPEN	Door status check
OSCILLATION DETECTION	Oscillations detected, gain reduced
SYSTEM COMPONENT	Unspecified system component failure not identified by another alarm
TEMPERATURE	Temperature is outside the set temperature range
REMOTE ANNUNCIATOR LOSS OF COMMUNICATION	Annunciator loss of communication

WESTELL

1-800-377-8766

Editing Alarms

Click the **EDIT ALARMS** button to change the configurations of any alarm. The **ALARM CONFIGURATION** popup will appear as shown at right. This popup must be active to edit any of the alarm configuration settings.
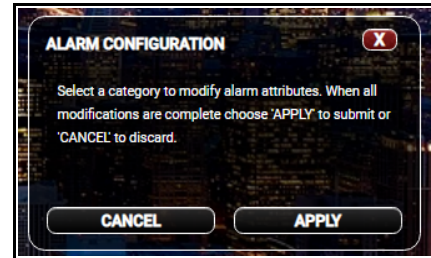
Tip: Click and drag this and similar popups anywhere on the screen as needed.

As shown in Figure 5-9 below, the user can now configure the **Mask** checkbox and slide controls to set the **Alarm Delay** and **Frequency** of SNMP traps sent.
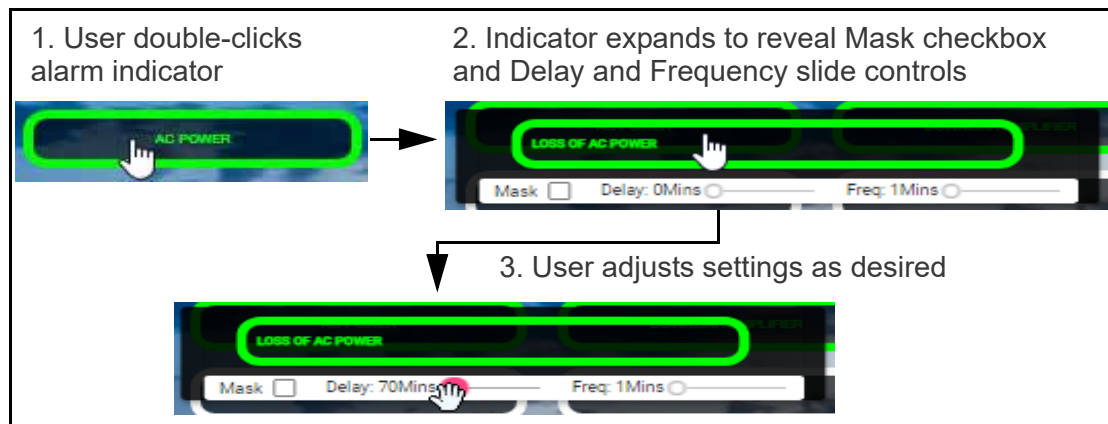
Figure 5-9   Accessing alarm configuration tools

To edit an alarm, follow these steps:

1.   Click the **EDIT ALARMS** button to open the **ALARM CONFIGURATION** popup.

2.   Double-click on the first alarm you want to edit. Activate the tools to adjust settings as shown in Figure 5-9.

3.   To mask (disable) the alarm, check the **Mask** checkbox. The alarm will not activate audible or visual annunciators while masked.

⚠
CAUTION: Permanent alarm silencing via the web interface is not permitted for installations requiring full compliance to UL 2524.

4.   To set a time delay before an alarm is reported, adjust the **Delay** setting to the desired delay (minutes).

5.   To set the frequency with which the alarm will send SNMP traps, adjust the **Freq.** setting (minutes).

6. Select the next alarm to be edited and repeat the above steps. Repeat this for every alarm to be edited.

7. When edits are complete, click the **APPLY** button in the **ALARM CONFIGURATION** popup. The popup will close with the configured alarm settings in effect.

Masking All Alarms

The user can mask all alarms at once by clicking the **MASK ALL ALARMS** button. The **MASK ALL CONFIGURATION** display will appear, as shown at right. Click **MASK** to mask all alarms; the BDA Alarms page will update with all indicators masked, as shown in Figure 5-10 below.
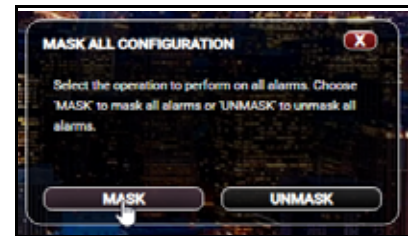
Figure 5-10   BDA Alarms page with all alarms masked

Notes: Any alarms masked with the **MASK ALL ALARMS** function can be unmasked individually as needed by using the **EDIT ALARMS** configuration.

✎   The **MASK ALL ALARMS** and **UNMASK ALL ALARMS** functions apply to all alarms regardless of whether individual alarms are masked or unmasked.

Alarm History Page

The **Alarm History** button at the bottom of the Alarms page opens the **Alarm History** page, shown in Figure 5-11.

Figure 5-11   Alarm History page

Each time an alarm changes severity, the Alarm History page logs the date and time, the alarm, and the event severity. The most recent alarms appear at the top of the display. Buttons at lower right let the user set the number of rows displayed per page and scroll through multiple pages.

Click the **CLEAR ALARM HISTORY** button to empty the alarm log.

Click the **EXPORT ALARM HISTORY** button beneath the log to download an Excel spreadsheet with the current alarm log. The spreadsheet name includes the date it was downloaded (e.g. "Alarm History03-03-2021").

Click the **BACK** button at the bottom of the page to return to the BDA Alarms page.

Returning to Main Menu

To return to the System Status page from the BDA Alarms page, click the **MAIN MENU** button at the bottom of the page.

5.5 RF Configuration

The RF Configuration page allows the installer to configure all RF settings in the BDA such as gain, squelch thresholds, and individual filters. Clicking the **RF CONFIGURATION** button on the System Status page opens the RF Configuration window shown in Figure 5-12 below. Features of the Band Settings are detailed in below. Features of the Filter Settings are detailed in Filter Settings on page 5-18.

Figure 5-12   RF Configuration window

In models equipped with the wideband Mode (see Mode selection in Table 5-4 on page 5-17), the RF Configuration display has no filter settings when wideband mode is displayed. See Figure 5-13 below.

Figure 5-13   RF Configuration window with Mode wideband selected

Isolation Test

Prior to editing any filters, the installer must first run an isolation test to verify there is adequate isolation between the donor and service antennas. To initiate an isolation test, click the **ISOLATION TEST** button at upper right (see Figure 5-14). A dialog will open showing progress and, within a few seconds, a message that the test succeeded and the maximum safe gain level. Do not exceed this gain level when commissioning the BDA without first making adjustments to the donor or service antenna system to increase the isolation. The most recent isolation test value appears to the right of the **ISOLATION TEST** button.
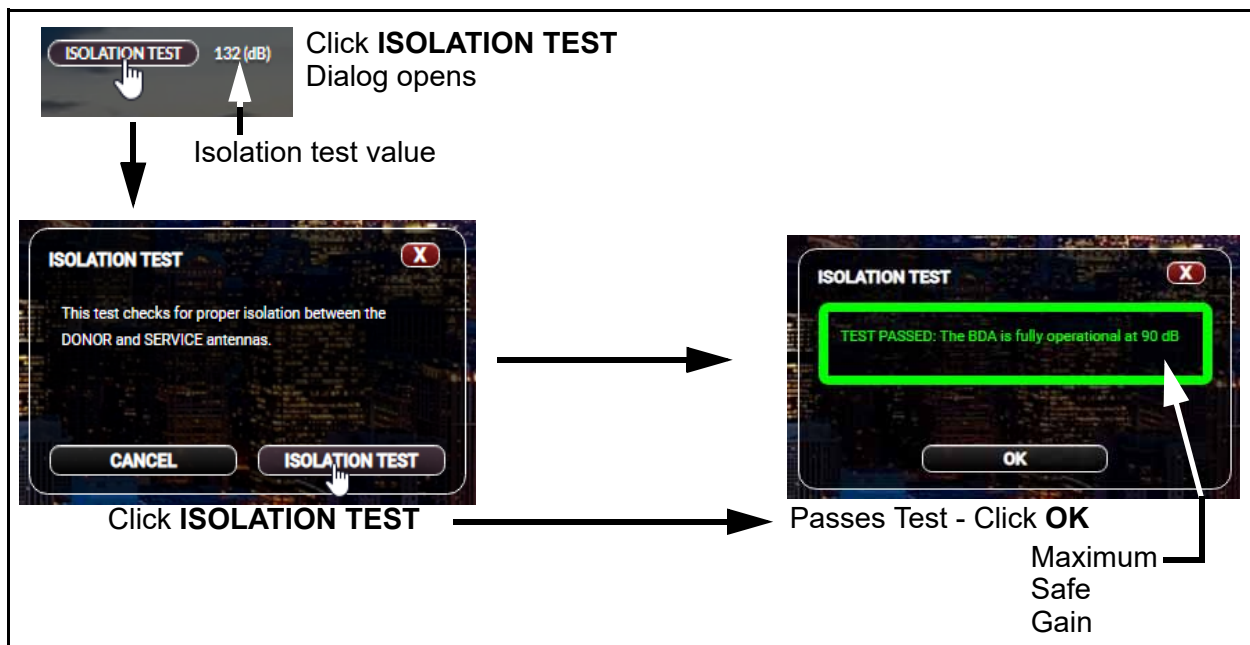
Figure 5-14   Conducting an isolation test

Click OK to close the **ISOLATION TEST** dialog.

Click **ISOLATION TEST** at any time to retest the isolation.

Editing RF Configuration

When the user clicks the **EDIT RF CONFIGURATION** button at bottom, the **RF CONFIGURATION** popup appears as shown at right and the settings open for editing as shown in Figure 5-15 below.
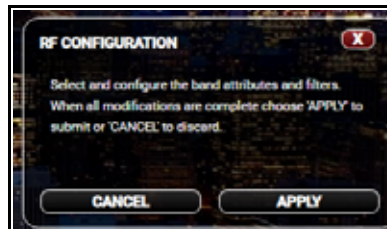
Figure 5-15   RF Configuration page open for editing

RF Configuration Page Features

Two rows of band settings are displayed in the upper part of the RF Configuration page, as shown in Figure 5-16 and detailed in Table 5-4.
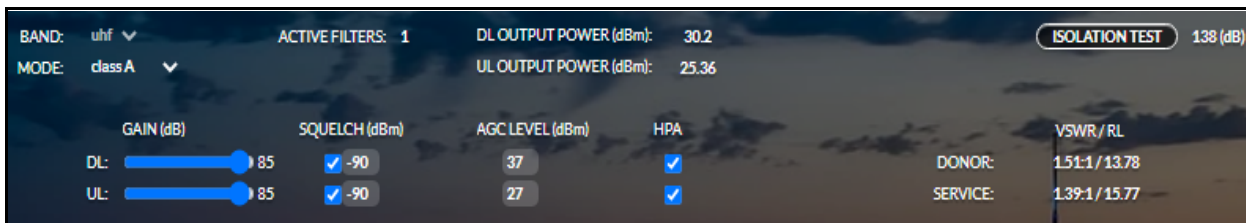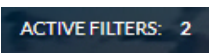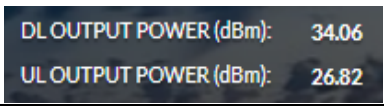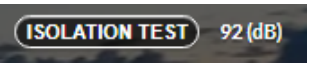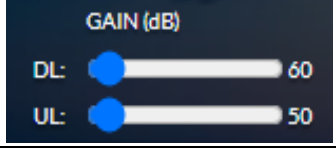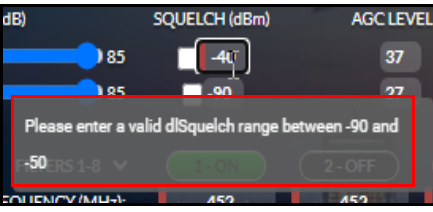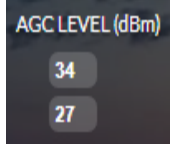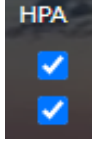
Figure 5-16   Band Displays and Settings on RF Configuration Page

Table 5-4   RF Configuration Page band display and settings features

Feature Image	Description
	Mode -- Select class A (class A models only), class B, or wideband (bypasses DSL; no filter settings are shown)

1-800-377-8766

Table 5-4   RF Configuration Page band display and settings features

Feature Image	Description
ACTIVE FILTERS: 2	# Filters -- Displays number of filters that are turned on
DL OUTPUT POWER (dBm): 34.06 UL OUTPUT POWER (dBm): 26.82	Output Power -- Displays DL and UL output power in dBm
ISOLATION TEST 92 (dB)	Refer to Isolation Test on page 5-16.
GAIN (dB) DL: 60 UL: 50	Gain - Drag the slide controls to set DL and UL Gain. Max Gain: 85 dB DL, 85 dB UL.
SQUELCH (dBm) -90 -90 SQUELCH (dBm) -60 -90 SQUELCH (dBm) ✓ -60 ✓ -90	Squelch - Displays DL (top) and UL Squelch settings. Adjustable from-90 to -50 dBm (DL and UL). Click in a value field to edit the setting. Check the checkbox to activate Squelch.
Note: When the user hovers over settings open for editing, a help message appears including the permissible range of entry values, as shown at right.	dB) SQUELCH (dBm) AGC LEVEL 85 -4 37 85 -90 27 Please enter a valid dlSquelch range between -90 and -50 1 - ON 2 - OFF FREQUENCY (MHz) 452 452
AGC LEVEL (dBm) 34 27	AGC LEVEL - Displays the maximum RF power output of the DL (top) and UL amplifiers. Adjustable from +37 dBm to +4 dBm on the downlink and +27 to -3 dB on the uplink. Click in a value field to edit the value.
HPA ✓ ✓	HPA - Displays DL (top) and UL HPA checkboxes. Uncheck the box to deactivate the high powered amplifiers.

Filter Settings

The Filter settings are below the band settings, as shown in Figure 5-17. Band settings opened for editing appear in Figure 5-18. See Table 5-5 on page 5-19 for feature details.
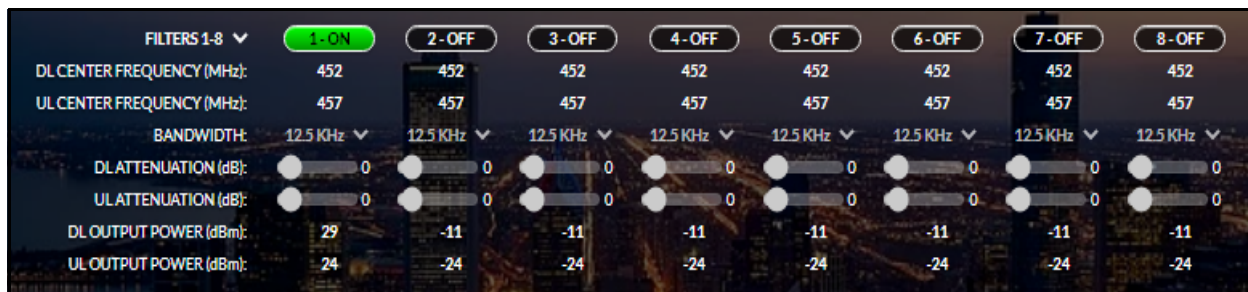
Figure 5-17   Filter settings display on RF Configuration page.

To edit filter settings, click the **EDIT RF CONFIGURATION** button at the bottom of the page to open the **RF CONFIGURATION** popup, shown at right. The filter settings open for editing as shown in Figure 5-18. When editing is complete, click **APPLY**.
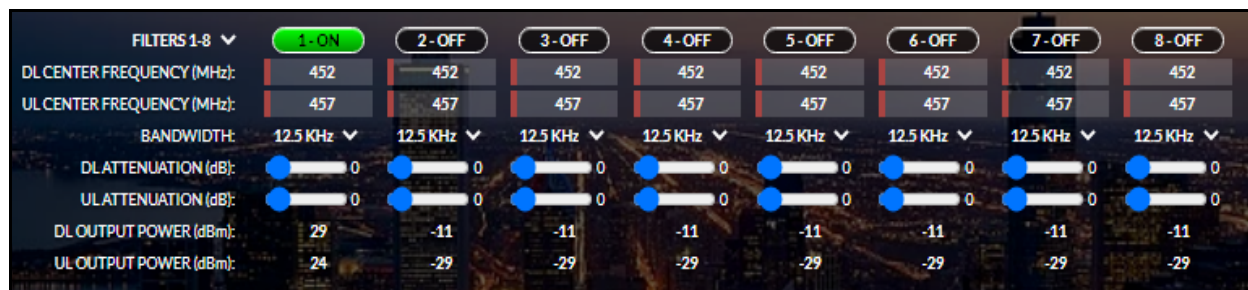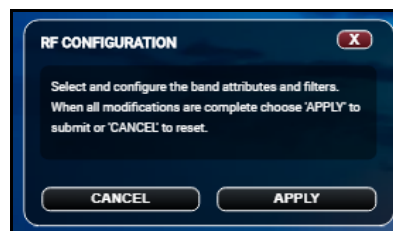

Figure 5-18   Filter settings open for editing

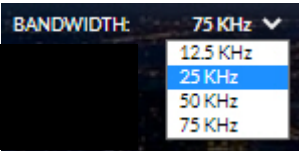Table 5-5   RF Configuration page filter settings
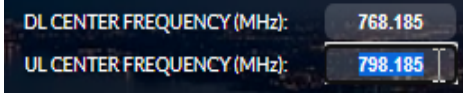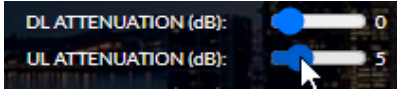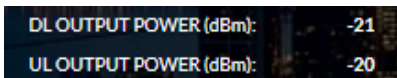
Feature	Description
	Filter range selector - Click to select: • In uhf band class a mode (pictured at left), filters 1-8 and 9-16. • In uhf band class b mode, filters 1-4. • In vhf band ... 🖉
	Filter enable button - In edit mode, click to toggle ON / OFF. Displays green when on, black when off.

Table 5-5   RF Configuration page filter settings

Feature	Description

DL CENTER FREQUENCY (MHz): 768.185 **UL CENTER FREQUENCY (MHz):** 798.185	DL and UL Center Frequencies (MHz) - In edit mode, click to edit values. When entering either the DL or UL frequency, depending on the model*, the other setting might automatically be entered with an appropriate offset:
	● UHF Duplex, 4-Port Duplex, or Dual Window Duplex models:
	   ● 450-470 MHz: +5 UL from DL
	   ● 470-512 MHz: +3 UL from DL
	● VHF/UHF Switched Simplex models: UL and DL settings are automatically duplicated
	● VHF Duplex and 4-Port Simplex models: UL and DL Center Frequencies are independent
	   * *See the product description under SYSTEM INFORMATION on the SYSTEM SETTINGS page.*

BANDWIDTH: 75 KHz ∨ 12.5 KHz / 25 KHz / 50 KHz / 75 KHz	Filter Bandwidth - In edit mode, select between available bandwidths. Available bandwidths vary by band, class, and/or filter. **Note:** The narrower the filter, the greater the group delay and possible impact on P25 digital transmissions.
DL ATTENUATION (dB): 0 **UL ATTENUATION (dB):** 5	DL and UL Attenuation - In edit mode, click and drag slide tool to set value (dB). This attenuation applies to this filter only, and typically is used to balance incoming RF signals.
DL OUTPUT POWER (dBm): -21 **UL OUTPUT POWER (dBm):** -20	DL and UL Output Power - Displays RF output power (dBm) for individual filters.

Click the **MAIN MENU** button at the bottom of the RF Configuration page to return to the System Status page.

5.6 System Settings Page

The System Settings page allows the installer to add the company name and contact information, set network IP addresses, set system time, load firmware upgrades, load product upgrade keys, and reset to factory defaults. This page also displays product model number, product description, serial number, uptime timer, and firmware version.

Click the **SYSTEM SETTINGS** button on the System Status page to open the **SYSTEM SETTINGS** page, shown in <u>Figure 5-19</u> below.

Figure 5-19   System Settings page

To edit settings, click the **EDIT SYSTEM SETTINGS** button at the bottom of the page. As shown in below, the EDIT SYSTEM SETTINGS dialog appears and editable **SITE INFORMATION** fields are highlighted. **NMS CONNECTION** static mode IP settings will appear open for editing when the user changes the **MODE** from DHCP to static.

Figure 5-20   System Settings page opened for editing
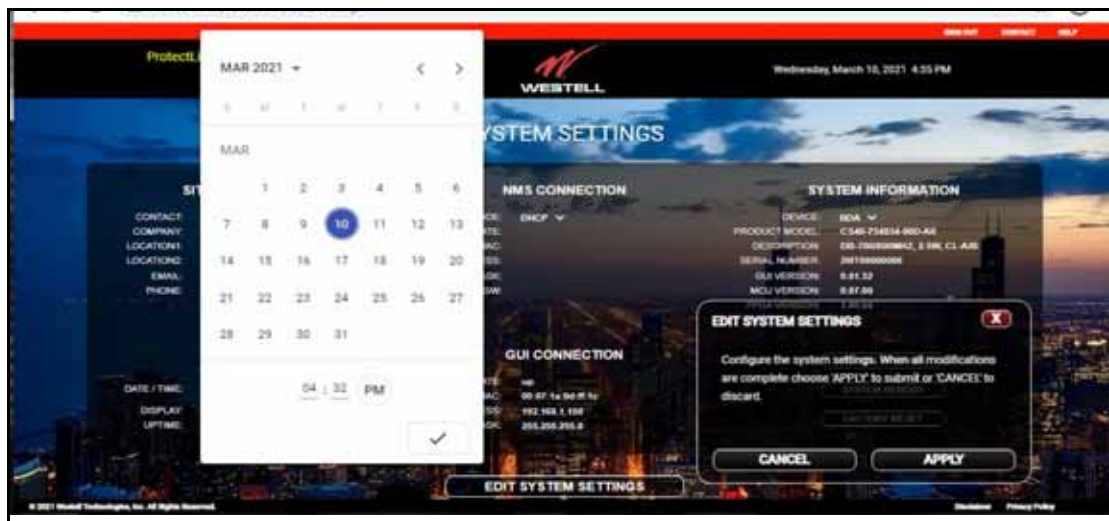
Figure 5-21   Date picker popup for setting date and time

Table 5-6   System Settings Page features
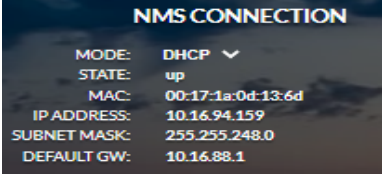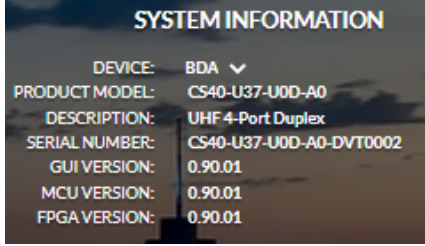
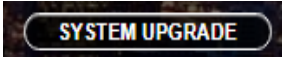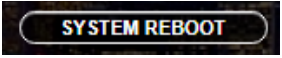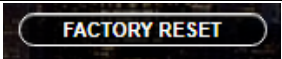| Feature	Description
SITE INFORMATION CONTACT: Westell Manager COMPANY: Westell Technologies LOCATION1: 750 North Commons Drive LOCATION2: Aurora, IL EMAIL: admin@westell.com PHONE: 123-123-1234	Site Information fields - In edit mode, click in each row to add or edit: • the site **CONTACT** (person or position), • **COMPANY** • **LOCATION1** (street address • **LOCATION2** (City, State) • **EMAIL** (Contact's email address) • **PHONE** (Contact's phone number)
SYSTEM TIME DATE / TIME: 3/10/2021, 16:34:03 DISPLAY: 12H UPTIME: 5 days 2 hours 12 minutes 15 seconds	System Time fields - • **DATE/TIME** - Displays M (or MM) /DD/YYYY, HH:MM:SS with the HH in 24-hour format. To edit, either type directly in the DATE/TIME display or click the calendar icon to open the date picker popup as shown in . Add minutes and seconds in place of 00:00 to advance the clock by a specified period. The clock display stops while in edit mode. • **DISPLAY** - This sets the format of the time display at upper right. In edit mode, select 12H (12 hour) or 24H (24 hour) using dropdown tool. • **UPTIME** - Displays cumulative system uptime.
NMS CONNECTION MODE: DHCP STATE: up MAC: 00:17:1a:0d:13:6d IP ADDRESS: 10.16.94.159 SUBNET MASK: 255.255.248.0 DEFAULT GW: 10.16.88.1	NMS Connection fields - • **MODE**: In edit mode, use dropdown tool to select **DCHP** or **static**. This selection determines the other fields displayed, as shown at left. Only static mode settings are editable. • **STATE**: Displays connection state (up or down). • **MAC**: The signal booster's MAC address. • **IP ADDRESS**: NMS connection IP address • **SUBNET MASK**: NMS connection subnet mask • **DEFAULT GW**: Default gateway IP address •

WESTELL
1-800-377-8766

Table 5-6   System Settings Page features

Feature	Description
GUI CONNECTION STATE: up MAC: 00:17:1a:0d:13:6c IP ADDRESS: 192.168.1.150 SUBNET MASK: 255.255.255.0	GUI Connection fields - ● **STATE** - up or down ● **MAC** - The signal booster's MAC address ● **IP ADDRESS** - Static IP address of GUI port, preset to 192.168.1.150. ● **SUBNET MASK** - GUI connection subnet mask
SYSTEM INFORMATION DEVICE: BDA ⌄ PRODUCT MODEL: CS40-U37-U0D-A0 DESCRIPTION: UHF 4-Port Duplex SERIAL NUMBER: CS40-U37-U0D-A0-DVT0002 GUI VERSION: 0.90.01 MCU VERSION: 0.90.01 FPGA VERSION: 0.90.01	System Information fields - ● **PRODUCT MODEL** ● **DESCRIPTION**, including UHF or VHF service. ● **SERIAL NUMBER** ● **GUI VERSION** ● **MCU VERSION** ● **FPGA VERSION**
SYSTEM UPGRADE	System Upgrade button- See 6.1 Upgrading the System Software on page 6-2.
SYSTEM REBOOT	System Reboot button - See 6.2 System Reboot and Factory Reset on page 6-3.
FACTORY RESET	Factory Reset button - See 6.2 System Reboot and Factory Reset on page 6-3.

Click the **MAIN MENU** button at the bottom of the page to return to the System Status page.

5.7 Backup, Restore, and Print Configuration Tools

Backup configuration is used to either create a backup copy of the ProtectLink BDA being installed or to create a template for additional BDAs to be easily programmed. It will create a file on your computer that includes all the RF and system settings with the exception of site information and network connection, which will remain at their default values.

As shown in Figure 5-4 on page 5-6, System Status page features include the **BACKUP CONFIGURATION**, **RESTORE CONFIGURATION**, and **PRINT CONFIGURATION** buttons
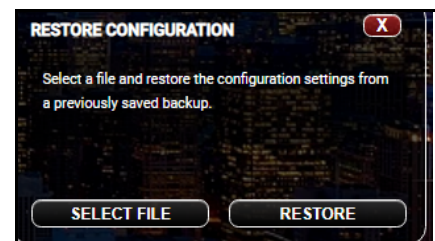
Backup Configuration

To save the current signal booster configurations as the backup configuration, click the **BACKUP CONFIGURATION** button. The **BACKUP CONFIGURATION** popup shown at right appears, with the note explaining that this will save all configuration settings excluding network connection and site information data. Click **SAVE.**
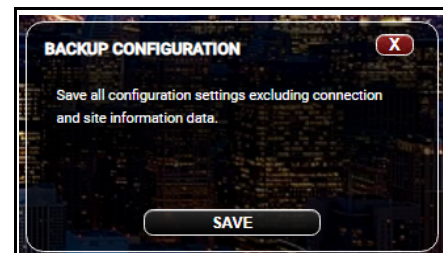

Restore Configuration

To restore a previous configuration, click the **RESTORE CONFIGURATION** button. The **RESTORE CONFIGURATION** popup shown at right appears. Click **SELECT FILE**, the navigate to the file with the desired configuration and select it. Then click **RESTORE**.

Print Configuration

To export a report with all current configuration data and measured values, click PRINT CONFIGURATION. The PRINT CONFIGURATION popup shown at right appears. Click one of the buttons to select your desired report format. The HTML report is formatted for print when opened in a web browser.

WESTELL

1-800-377-8766
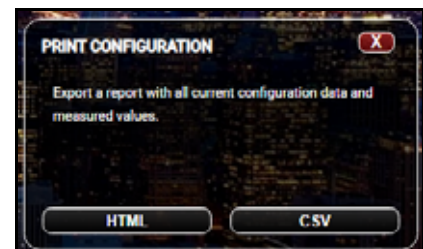
5.8 SNMP Trap Receivers

As shown in <u>Figure 5-4 on page 5-6</u>, System Status page features include the **SNMP TRAP RECEIVERS** button. Click that button to open the **SNMP TRAP RECEIVERS** page pictured in <u>Figure 5-22</u> below.
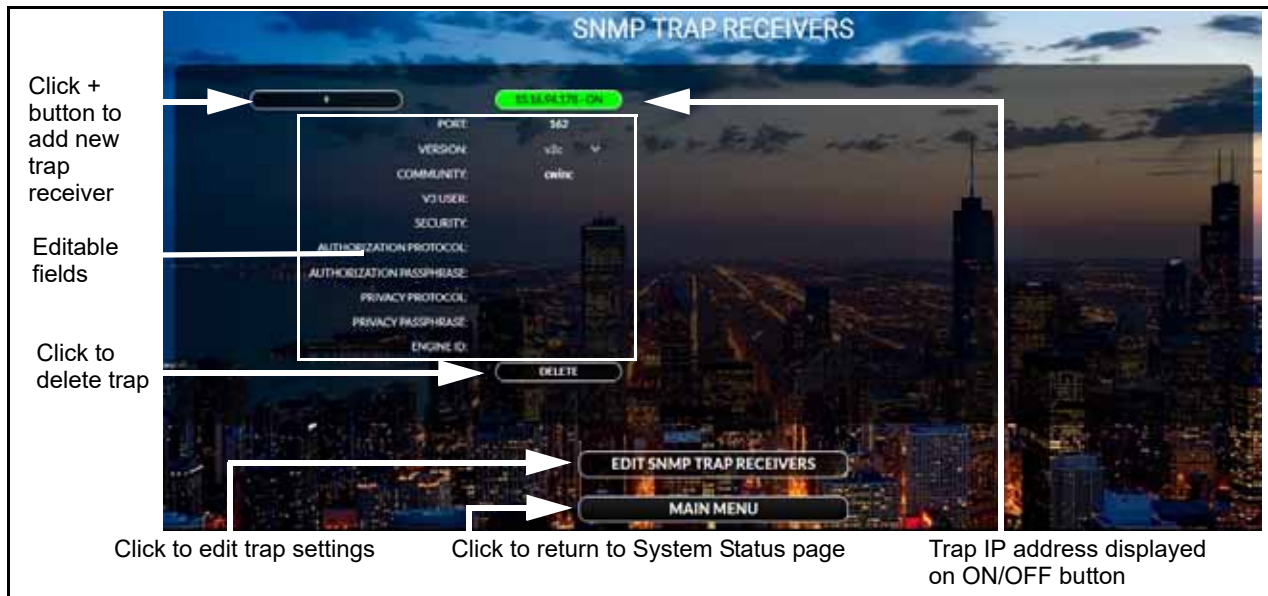

Figure 5-22   SNMP Trap Receivers page

Click the ⬤━━━━━━+━━━━━━⬤ button at upper left to add a new SNMP trap receiver. The **ADD SNMP TRAP RECEIVER** popup shown in <u>Figure 5-23</u> appears. Add the trap IP address in the **HOST** field and the community in the **COMMUNITY** field, then click **ADD**. The display refreshes showing the new trap as shown in <u>Figure 5-23</u>. The new trap is turned ON upon creation.
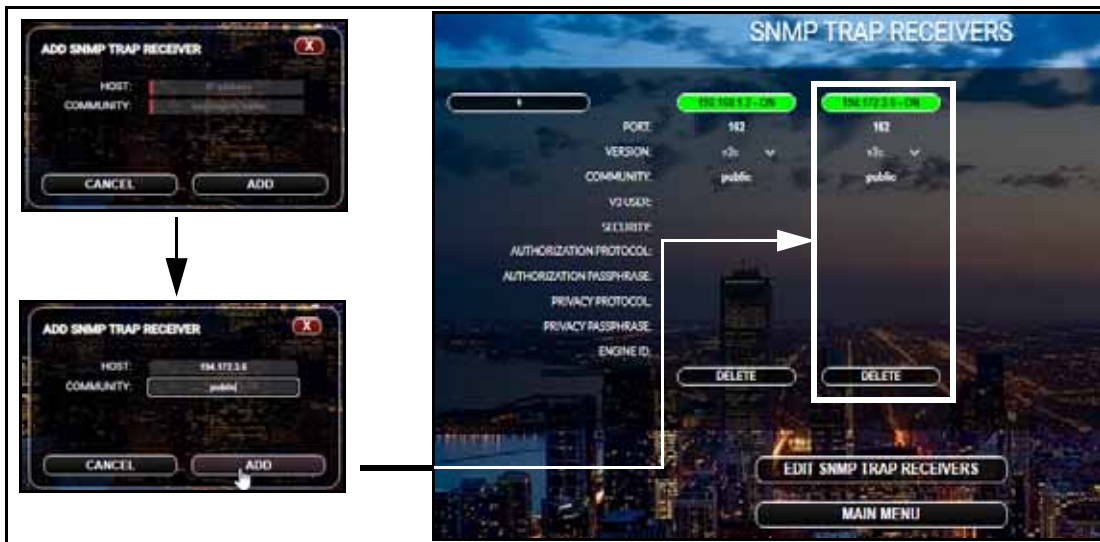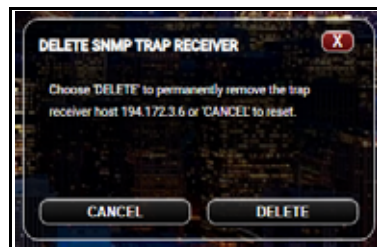
Figure 5-23   Adding new SNMP trap receiver

To delete an SNMP trap receiver, click the **DELETE** button below the trap display. The **DELETE SNMP TRAP RECEIVER** popup window appears as shown at right. Click **DELETE** to confirm the deletion. The **SNMP TRAP RECEIVERS** page refreshes and the just-deleted receiver is no longer shown.

Click the **EDIT SNMP TRAP RECEIVERS** button at the bottom of the page to open the page for editing. Highlights will appear over editable fields, and the **SNMP TRAP RECEIVERS** popup will appear as shown in below.

Figure 5-24   SNMP Trap Receivers page opened for editing

1-800-377-8766

With the page open for editing, the user can:

- Click the top button to toggle the receiver ON-OFF or OFF-ON. The button appears green when the unit is on and turns dark gray when off. The button also says whether the receiver is on or off.
- Edit the Port number
- Edit the **VERSION** using the drop-down menu. Version v2c is used by default. If the user changes the version to v3, additional fields open for configuration.

The user must click **APPLY** in the **SNMP TRAP RECEIVERS** popup for the changes to be applied. When the user clicks **APPLY**, the page refreshes and the changes are applied.

5.9 Alarm Tests

Click the **ALARM TEST** button on the System Status page to open the ALARM TEST page shown in <u>Figure 5-25</u> below.



Figure 5-25   Alarm Test window

To disable or enable the audible horn inside the BDA, click the **CONFIGURE AUDIBLE HORN** button. The **CONFIGURE AUDIBLE HORN** dialog opens as shown at right, with toggle buttons to DISABLE or ENABLE the BDA horn. Disabling the horn will silence the audible alarm in the BDA enclosure.Click **APPLY** to activate the configuration.
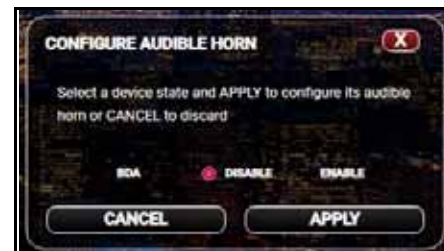
⚠️
CAUTION: Permanent alarm silencing via the web interface is not permitted for installations requiring full compliance to UL 2524.

Select (or deselect) the device(s) to be tested (e.g. the BDA) with the drop-down menu in the center of the page.

Click any individual alarm button to test that alarm. The alarm relay will activate and the remote annunciator audio alarm will sound unless disabled, and that alarm's LED should illuminate on the annunciator. A popup similar to that at right
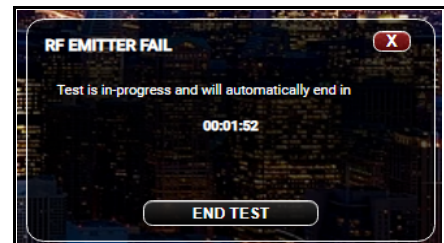
will appear with a timer showing when the test will end. The user can click the **END TEST** button to halt the test at any time.

Click the **TEST ALL** button to test all of the alarms in sequence. The test will proceed through all alarms one at a time at 5 second intervals.

5.10 Fuse Replacement

As shown in <u>Figure 3-3 on page 3-11</u>, inside the BDA above the On/Off switch is a cover secured with four screws with the label at right. Beneath this cover are fuses F1, which powers the Remote Annunciator, and F2, which powers the head end DAS optical master unit.

Danger:
Replace with 5x20mm 2.5A fuses only.
Remplacez uniquement par un fusibles 5x20 mm 2,5 A

To replace fuses, follow these steps:

1. Disconnect power to the BDA.

2. Unscrew the four screws securing the fuse cover plate and remove the plate.

3. Remove and replace the blown fuse(s). Use 5x20mm 2.5A fuses only, such as Littelfuse 0234 series part 2.5P.

    ⚠️
    WARNING: Only use the specified replacement fuses.

4. Secure the cover plate back in place before restoring power to the BDA.

1-800-377-8766

System Software Upgrade

This chapter provides software upgrade information for your Westell VHF-UHF Bi-Directional Amplifier.

## Guide to this Chapter

6.1 Upgrading the System Software

Follow the instructions in this section to upgrade to a newer version of system software.

1. On the System Settings page (Figure 5-19 on page 5-21), click the **SYSTEM UPGRADE** button.

2. The **SYSTEM UPGRADE** popup shown at right appears. Click **SELECT FILE**. A file explorer window will open.

3. Select the file provided by Westell for the desired system firmware and/or software license upgrade. Click **Open**. The **SYSTEM UPGRADE** popup refreshes showing the name of the selected file.
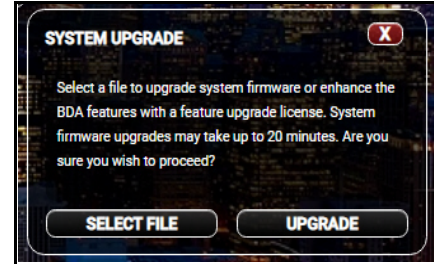
4. Click the **UPGRADE** button. The upgrade will commence. A series of color-coded status messages such as those at right will appear as the upgrade proceeds, saying "SYSTEM UPGRADE has started status is uploading," then "SYSTEM UPGRADE is in-progress, you will be redirected automatically," and finally "SYSTEM UPGRADE has succeeded status is idle" appearing in green. If the upgrade fails, "SYSTEM UPGRADE has failed status is idle" appears in red.
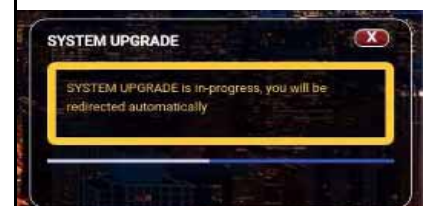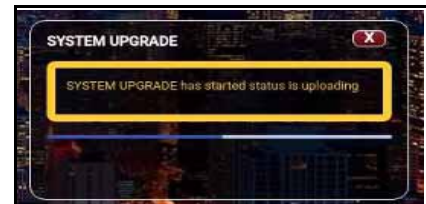
   Note: The time necessary for an upgrade varies from less than one minute to up to 30 minutes, depending on the system firmware and/or software license upgrade(s) being undertaken. Upgrades to the FPGA software require 20 minutes or more. The yellow "status is pending" message remains throughout the installation of uploaded software.

5. When the message "SYSTEM UPGRADE has succeeded status is idle" appears in green as shown at right, click **OK**.

6. You will be logged out of the BDA. Log back in. The upgrade is complete.
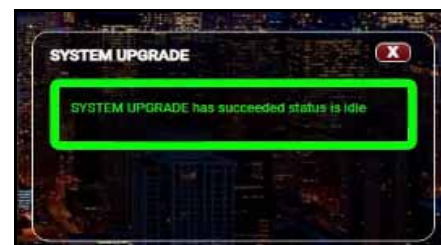
6.2 System Reboot and Factory Reset

Rebooting the System

Click the **SYSTEM REBOOT** button to undertake a system reboot. The **SYSTEM REBOOT** popup will appear as shown at right. If the system includes multiple devices which can be rebooted, the user must select the desired device with the selection menu. Click **SYSTEM REBOOT** to proceed with the reboot.
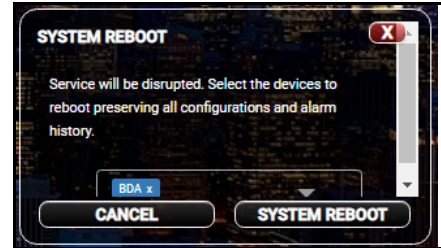
When the BDA is rebooted, service will be disrupted during the reboot, but all configurations and alarm history will be preserved.

Factory Reset

Click the **FACTORY RESET** button to reset the system to factory defaults. The FACTORY RESET popup will appear as shown at right. Click FACTORY RESET to undertake the reset.
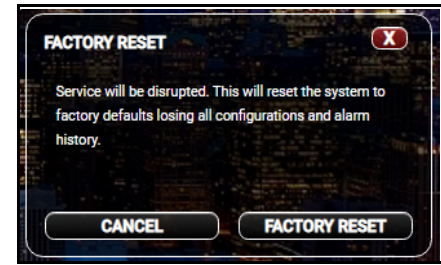
⚠️
CAUTION: BDA service will be disrupted when a factory reset is undertaken, and all configuration and alarm history will be lost.

1-800-377-8766

Important Product Information

This appendix includes important information about your ProtectLink VHF-UHF Bi-Directional Amplifier.

Guide to this Appendix

A.1 Important Product Information

A.1.1 Registration Number

Your ProtectLink VHF-UHF Bi-Directional Amplifier Registration Number is located on a label on the right side of the cabinet, as shown in Figure 1-1 on page 1-7. See 1.3 Product Registration Information on page 1-2.

A.1.2 NRTL

This product is NRTL listed.

A.1.3 Configuration List

The table below lists variants of the Westell VHF-UHF Bi-Directional Amplifier.

Part Number	Band	Class	Description	Power
CS40-V30-V1D-A0	VHF	A/B	4-port, 24MHz WB	1W
CS40-V30-V3D-A0	VHF	A/B	With duplexer, 1.5MHz GB, 3.5 MHz PB	1W
CS40-V30-SMD-A0	VHF	A/B	2-port Simplex operation	1W
CS40-U37-U4D-A0	UHF	A/B	1.5MHx GB	5W
CS40-U37-U4D-A0	UHF	A/B	With dual window duplexer, 1.5MHz GB, 3.5 MHz PB	5W
CS40-U37-U0D-A0	UHF	A/B	4-port 62MHz WB	5W

Acronyms and Abbreviations

This chapter provides information on acronyms and abbreviations used in this document.

Guide to this Appendix

WESTELL.COM

B.1 Acronyms and Abbreviations

Table B-1 below defines acronyms and abbreviations that appear in this document.

Table B-1   Acronyms and Abbreviations

Acronym or Abbreviation	Defnintion
AC	Alternating Current
AGC	Automatic Gain Control
COM	Communications
dB	Decibels
dBi	Decibels relative to isotropic
dBm	The power ratio in decibels (dB) of the measured power referenced to one milliwatt (mW)
DC	Direct Current
DL	Downlink
FCC	(U.S.) Federal Communications Commission
HPA	High-powered Amplifier
IP	Internet Protocol
LAN	Local Area Network
LED	Light Emitting Diode
MHz	Megahertz
NMS	Network Management System
OSC	Oscillation
RF	Radio Frequency
RS232C	Serial Communications Standard
UL	Uplink
VAC	Volts Alternating Current (AC Voltage)
VSWR	Voltage Standing Wave Ratio