



PS71090E 2W Public Safety Signal Booster

Users Guide

PRODUCT MANUAL

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1.877.844.4274

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Preface

This Preface includes the following:

- Purpose
- Scope
- Audience
- Document Organization
- References
- Document Conventions
- Safety Notices
- Technical Support
- Acronyms and Abbreviations
- Copyright and Trademark Acknowledgements

Purpose

This manual contains information and procedures for the operation of the Westell PS71090E Public Safety Signal Booster.

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.

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Document Organization

This manual includes the following chapters:

- **Chapter 1: General Information** – Outlines the document purpose and intended users, application, product registration, safety guidelines, disclaimer and FCC Part 90, FCC Warning Labels.
- **Chapter 2: Product Overview** – Provides product information, describes product features and lists accessories.
- **Chapter 3: Product Specification** – Provides tables containing RF, power, mechanical and environmental specifications. Also provides information about GUI items, alarm status and alarm relay.
- **Chapter 4: Product Appearance** – Provides physical specifications, photographs and information about the external and internal Signal Booster configuration.
- **Chapter 5: Installation Guidelines** – Lists guidelines for installing the Signal Booster and antennas.
- **Chapter 6: Software Installation** – Outlines the steps required to install the software.
- **Chapter 7: System Operation** – Describes product operation, including how to open the communication port and describes the functions in the Status and Control pages.
- **Appendix A: Important Product Information** – Provides the product registration number and internal power supply information.
- **Appendix B: Acronyms and Abbreviations** – A table of acronyms and abbreviations and definitions for each.

References

- FCC Part 90

Document Conventions

Table P-1 lists the conventions used throughout this document.

Table P-1: Document Conventions

Convention	Description
DANGER!	Description of 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!	Description of an imminent hazard that, if not avoided, may result in personal injury or serious equipment damage.
CAUTION	Description of a conditions or practice 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	Additional important information that the user must be aware of, but is not related to a hazard.
NOTE	Additional information that is beneficial for the user to know, but is not related to a hazard.
Bold	Bold text indicates an action or provides emphasis.
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.
>	Indicates a level in a menu. For example, Start>Programs prompts the user to click on Start, then locate and click Programs under the Start menu.

Safety Notices

This general safety information applies to both operating and service personnel. Specific warnings and cautions are located in other parts of this manual where they apply and may not appear in this summary. Failure to comply with these precautions or specific warnings elsewhere in the manual violates the safety standards of design, manufacture, and intended use of equipment.

Westell assumes no liability for the customer's or user's failure to comply with these requirements:

- **Explosive atmospheres** - To avoid explosion or fire, do not operate this product in the presence of flammable gases or fumes.
- **Lightning danger** - Do not install or make adjustments to this unit during an electrical storm.

WARNING!

Changes and Modifications not expressly approved by Westell can void your authority to operate this equipment under Federal Communications Commission's rules.

Technical Support

If you suspect a malfunction with this product or have a technical question, call your dealer or the Westell Support Line at: (603) 626-6677, Toll Free (USA) 1-877-844-4274, press option 2, and then option 1. Westell Support can also be reached via email at IBWsupport@westell.com.

Acronyms and Abbreviations

Refer to Appendix B for definitions of the acronyms and abbreviations used in this manual.

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The following products are referred to in this manual:

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1 General Information

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 **PS71090E** 2W Public Safety Signal Booster. 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.

1.2 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.

1.2.1 Product Registration Information

The serial number is located on the label on right-side of the enclosure. Record this number in Figure 1-1. Retain this manual, along with proof of purchase, to serve as a permanent record of your purchase.

MODEL NUMBER	SERIAL NUMBER	PURCHASE DATE
POINT OF SALE COMPANY		

Figure 1-1: Product Registration

1.3 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:

Grounding: This Signal Booster is designed to operate at 110VAC @ 1.02A maximum current and must always be operated with the ground wire properly connected.

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

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. Opening the chassis will void your warranty. If you suspect a malfunction with this product, call your dealer or Westell's technical support line at 1.877.844.4274.

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CAUTION

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

1.3.1 Important Safety Information

Antennas used for the purpose of radiating signals indoors are limited to a maximum gain of 3 dBi. 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 30 cm (~12 in) of any inside 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 30 cm (~12 in). A directional antenna having a maximum gain of 3.75 dBi is used, and precautions should be taken to prevent personnel from routinely passing through the main radiation beam at a distance closer than specified.

1.4 FCC Part 90 Signal Boosters

WARNING!

THIS IS A 90.219 CLASS B 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 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. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.

FCC Warning Labels

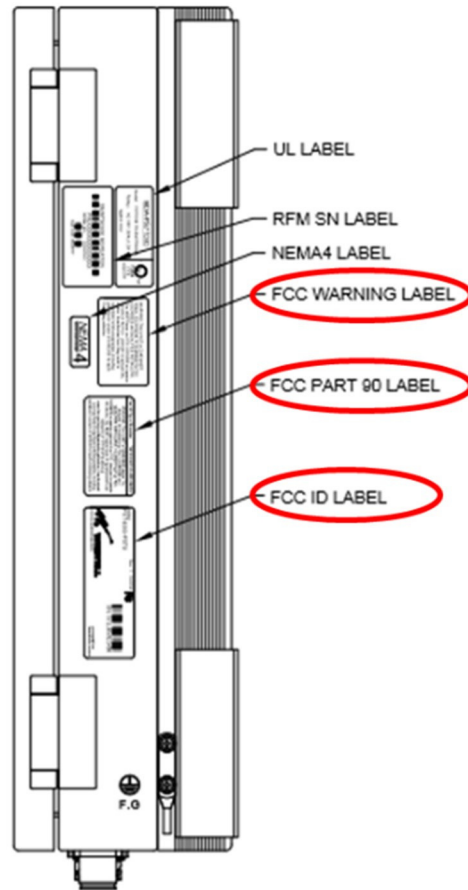
The following labels will appear on the PS71090E Signal Booster in accordance with the FCC:

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 the 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.

Part 90 Signal Boosters THIS IS A 90.219 CLASS B 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. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.

FCC Label Placement on the PS71090E:



Right-Side View

1.5 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

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2 Product Overview

2.1 Product Information

The PS71090E Signal Booster was developed for use in enclosed structures where signals from local public safety 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.

With a maximum total of 90 dB nominal gain on both the uplink and downlink, gain can be adjusted over a range from 60 dB to 90 dB in 1 dB steps.

The Signal Booster is controlled using a computer connected to the RJ45 Female Network Connector labeled 'GUI'. There are also LED indicators to indicate alarm status, OSC and power. Refer to Figure 4-1.

2.2 Product Features

- Easy installation
- Light and small
- Control using a Windows-based Graphical User Interface (GUI) and accessed by connecting a laptop or desktop computer to the 8P8C/RJ45 Female Network Connector labeled 'GUI'
- User gain control
- Automatic level control
- Automatic shutdown function
- Oscillation protection
- Overdrive protection
- Under/over voltage protection
- Fault protection
- Alarm notification
- SNMP

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- Persistent status and error information
- Battery Back-up Input

2.3 Included Accessories

Table 2-1 contains the items that are shipped with the PS71090E Public Safety Signal Booster. Table 2-1: Included Accessories

Quantity	Description
1	AC Power 14AWG Cable, 5 feet 10 inches
1	DC Power Cable, 5 feet 10 inches
1	Ethernet cable, 6 feet 1 inch
1	Alarm Relay 20AWG 20pin Cable, 4 feet 9 inches
1	USB Drive containing the User Manual and Software
5	Mounting Screws
5	Drywall Anchors
2	Cabinet Keys

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.

Table 2-2: Optional Accessories

Donor Antenna			
CSI-AY/746-896/11	Yagi, 11 dB, Public Safety 700/800 (746-896 MHz)		
Clearlink-APD/698-940/-153/15/4310f	Panel Donor Antenna, Low-Band, 698-960, High Isolation		
Server/Coverage Antenna			
ClearLink-O/698-2.7K/N	CS03-011-429		
ClearLink-D/698-2.7K/N	CS03-012-389		
Hybird Coupler	4.3-10 Type Connector	N-Type Connector	
3 dB	ClearLink-HC3/340-2.7K/N	ClearLink-HC3/340-2.7K/4310	
Power Tapper (Non-PIM Rated)	4.3-10 Type Connector	N-Type Connector	
6 dB	ClearLink-PT6/340-2.7K/4310	ClearLink-PT6/340-2.7K/N	
7 dB	ClearLink-PT7/340-2.7K/4310	ClearLink-PT7/340-2.7K/N	
8 dB	ClearLink-PT8/340-2.7K/4310	ClearLink-PT8/340-2.7K/N	
10 dB	ClearLink-PT10/340-2.7K/4310	ClearLink-PT10/340-2.7K/N	
13 dB	ClearLink-PT13/340-2.7K/4310	ClearLink-PT13/340-2.7K/N	
15 dB	ClearLink-PT15/340-2.7K/4310	ClearLink-PT15/340-2.7K/N	
20 dB	ClearLink-PT20/340-2.7K/4310	ClearLink-PT20/340-2.7K/N	
30 dB	ClearLink-PT30/340-2.7K/4310	ClearLink-PT30/340-2.7K/N	
Directional Coupler (Non-PIM Rated)	4.3-10 Type Connector	N-Type Connector	
5 dB	ClearLink-DC5/340-2.7K/4310	ClearLink-DC5/340-2.7K/N	
6 dB	ClearLink-DC6/340-2.7K/4310	ClearLink-DC6/340-2.7K/N	
10 dB	ClearLink-DC10/340-2.7K/4310	ClearLink-DC10/340-2.7K/N	
15 dB	ClearLink-DC15/340-2.7K/4310	ClearLink-DC15/340-2.7K/N	
20 dB	ClearLink-DC20/340-2.7K/4310	ClearLink-DC20/340-2.7K/N	
30 dB	ClearLink-DC30/340-2.7K/4310	ClearLink-DC30/340-2.7K/N	
Power Divider (Non-PIM Rated)	4.3-10 Type Connector	N-Type Connector	
2:1	CLEARLINK-SPD2/340-2.7K/4310	ClearLink-SPD2/340-2.7K/N	
3:1	ClearLink-SPD3/340-2.7K/4310	ClearLink-SPD3/340-2.7K/N	
4:1	ClearLink-SPD4/340-2.7K/4310	ClearLink-SPD4/340-2.7K/N	
Adapter			
4.3-10 (M) to N (F)	CS48-132-633		
Battery Back-up			
12/24 Hour Battery Back-up	PS-BBU-01		

3 Product Specification

3.1 RF Specifications

Table 3-1: RF Specifications

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Parameter		Uplink/Downlink	Specification	Remark
700 Frequency Range		UL	788~805MHz	Each band Independently Control by GUI,SNMP
		DL	758~775MHz	
800 Frequency Range		UL	806~809MHz Sub-Band1 806~816MHz Sub-Band2 806~824MHz Sub-Band3	
		DL	851~854MHz Sub-Band1 851~861MHz Sub-Band2 851~869MHz Sub-Band3	
RF technology		UL / DL	P25 + LTE	LTE : FirstNet™
Output Power	DL	700MHz +800MHz	+30dBm per Band	@ Dual Band Operate
		700MHz Only	+33dBm	@Sing Band Operate per Band
		800MHz Only	+33dBm	
	UL	UL 700MHz	+30dBm	Combine Power: 2W 700MHz + 800MHz
		UL 800MHz	+30dBm	
Gain		UL / DL	90dB(±1.0dB)	±1.5dB @Operating Temperature
Gain Adjustment Range		UL / DL	30dB±1dB	@1dB Step
Maximum Input No damage Power		UL / DL	10dBm	
AGC Range		UL / DL	25dB(±1dB)	
Noise Figure		UL	6.0dB Typ.	Max. Gain
VSWR		UL / DL	< 2:1	@S11 and S22
EVM (LTE)		UL / DL	5%	@ 16 QAM (RMS)
				@ 64 QAM (RMS)
Propagation Delay		UL / DL	4 μs Max	WESTELL.COM

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Gain Flatness	UL / DL	±1.5dB	±2dB @Operating Temperature
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3.2 Power Specification

Table 3-2: Power Specifications

Parameter	Specification	Note
Main Power Input Voltage	110V AC (88~264VAC)	Internal AC DC Power Supply
Battery (ACM-31 type)	Max. 2A	Battery full Charging within 48hours
	BATT : 24VDC	Battery Voltage
Power Consumption	100W Typical	

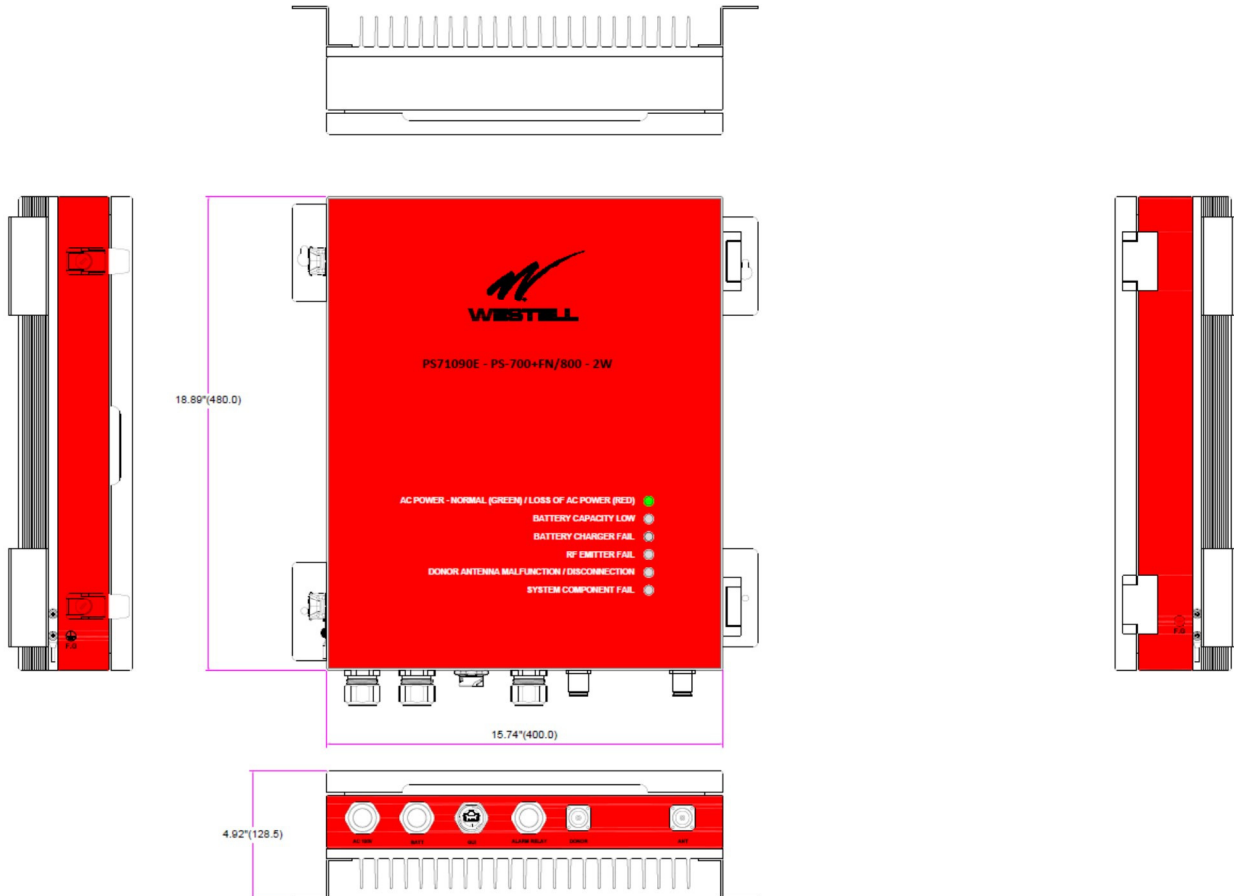
3.3 Mechanical Specification

Table 3-3: Mechanical Specifications

Parameter	Specification	Note
Size	15.7 x 18.9 x 5.0 in	L x H x D
Connectors	Donor/Coverage Antenna Ports: 4.3-10 (f)	Matting Male Connector Torque 3.7 ft.-lbs.
	AC Power In (M6110 Gland Connector)	Open Wire Terminal (Pig tail)
	DC (Battery) Power In (M6110 Gland Connector)	Open Wire Terminal (Pig tail)
	Frame Ground	Two-Lug Ground
	RJ-45 Ethernet-1 (10/100 Base-T)	GUI Interface
	RJ-45 Ethernet-2 (10/100 Base-T)	SNMP Interface
	M6110 Gland Connector, female	Alarm Relay Interface
Mounting Type	Wall-Mount with 4 holes	2 holes in each side
Enclosure Lock	Key Lock	Two-Key Lock
Heat Dissipation	Natural Convection	

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Finish	Red color Paint	RAL3001 Signal RED
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3.4 Environmental Specification

Table 3-4: Environmental Specifications

Parameter	Specification	Note
Operating Temperature	-30°C ~ +50°C (ambient)	-22F ~ +122F
Storage Temperature	-40° C ~ +60° C (ambient)	-40° F to +140° F
Operating Humidity	5% ~ 95%	
Environmental	IP-66, NEMA 4 Compliance	

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3.5 GUI Items

Table 3-5: GUI Items

Parameter	Specification	Note
UL/DL Output Readings	5dBm to 38dBm	Reads and displays the UL/DL output power
Alarm Readout Displays	PLL LD(Lock Detector), Isolation, AC Power, DL shutdown, Battery Charger Fail, Relay Status, Donor ANT VSWR / Malfunction Service ANT VSWR Manual Amp Off, Battery Capacity Low, UL HPA Fail, DL HPA Fail, UL Shutdown	Displays alarm status
UL/DL Shutdown Setting	23dBm to 36dBm	Use to set the peak power (shutdown level)
UL/DL Gain Setting / Attenuation	60dB to 90dB Gain 0dB to 30dB Attenuation.	Used to set the UL/DL system gain.
System Location Display	PS71090E PS-SMR700/800 Company, Address, City, State, Contact	Displays the Signal Booster name and information.
Control Send	All Control Page Settings	Used to save settings in the Control page.

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Isolation	Isolation Value, Isolation Max Gain Display	
VSWR	Adjustable from 1-30	
Quit	None	Closes the GUI page.

Refer to **Section 6 System Operation** for more information about the GUI.

3.6 Alarm Status

Table 3-6 Alarm Status

Alarm	GUI	Outside LED of the Repeater					
		AC Power	Battery Cap. Low	Battery Charger	RF Emitter	Donor ANT Disconnect	System Comp.
PLL LD	O	Green	x	x	x	x	Red
Isolation	O	Green	x	x	x	x	Red
DL Shutdown	O	Green	x	x	x	x	Red
UL Shutdown	O	Green	x	x	x	x	Red
AC Fail	O	Red	x	x	x	x	x
Service ANT VSWR	O	Green	x	x	x	Red	x
Donor ANT VSWR/Malfunction	O	Green	x	x	x	Red	x
Manual Amp Off	O	Green	x	x	Red	x	x
Battery Charger Fail	O	Green	x	Red	x	x	x
Battery Cap. Low	O	Green	Red	x	x	x	x

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DL HPA Fail	O	Green	x	x	Red	x	x
UL HPA Fail	O	Green	x	x	Red	x	x

3.7 Alarm Relay

Table 3-7 Alarm Relay

Alarm	Alarm of the Relay					
	Relay 1 (1,2,3)	Relay 2 (4,5,6)	Relay 3 (7,8,9)	Relay 4 (10,11,12)	Relay 5 (13,14,15)	Relay 6 (16,17,18)
AC Fail	O	X	X	X	X	X
Battery Cap. Low	X	O	X	X	X	X
Battery Charger Fail	X	X	O	X	X	X
Manual Amp Off	X	X	X	O	X	X
DL HPA FAIL	X	X	X	O	X	X
UL HPA FAIL	X	X	X	O	X	X
Isolation	X	X	X	X	X	O
PLL LD	X	X	X	X	X	O
DL Shutdown	X	X	X	X	X	O
UL Shutdown	X	X	X	X	X	O
Service ANT VSWR	X	X	X	X	O	X
Donor ANT VSWR/Malfunction	X	X	X	X	O	X

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Donor ANT Disconnection	X	X	X	X	O	X
-------------------------	---	---	---	---	---	---

Alarm#	18Pin # Description			Alarm Information	Relay Status
	NC	NO	CC		
Alarm1	1	2	3	AC POWER / LOSS OF AC POWER	Normal → NC+CC Alarm → NO+CC
Alarm2	4	5	6	BATTERY CAPACITY LOW Low Battery capacity at 70% reduction of operating capacity	
Alarm3	7	8	9	BATTERY CHARGER FAIL	
Alarm4	10	11	12	RF EMITTER FAIL	
Alarm5	13	14	15	DONOR ANT. Malfunction/DISCONNECTION	
Alarm6	16	17	18	SYSTEM COMPONENT FAIL	

NOTE

Either method in Table 3-7 would trigger the following alarms: Antenna Malfunction, PA Failure and Power Failure.

ALARM 1 : AC Power Fail (Pin 1,2,3)

ALARM 2 : Battery Capacity LOW (Pin 4,5,6)

ALARM 3 : Battery Charger Fail (Pin7,8,9)

ALARM 4 : RF Emitter Fail (Pin 10,11,12)

ALARM 5 : Donor Antenna Malfunction/Disconnection (Pin 13,14,15)

ALARM 6 : System Component Fail (Pin 16,17,18)

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4 Product Appearance

4.1 External Configuration

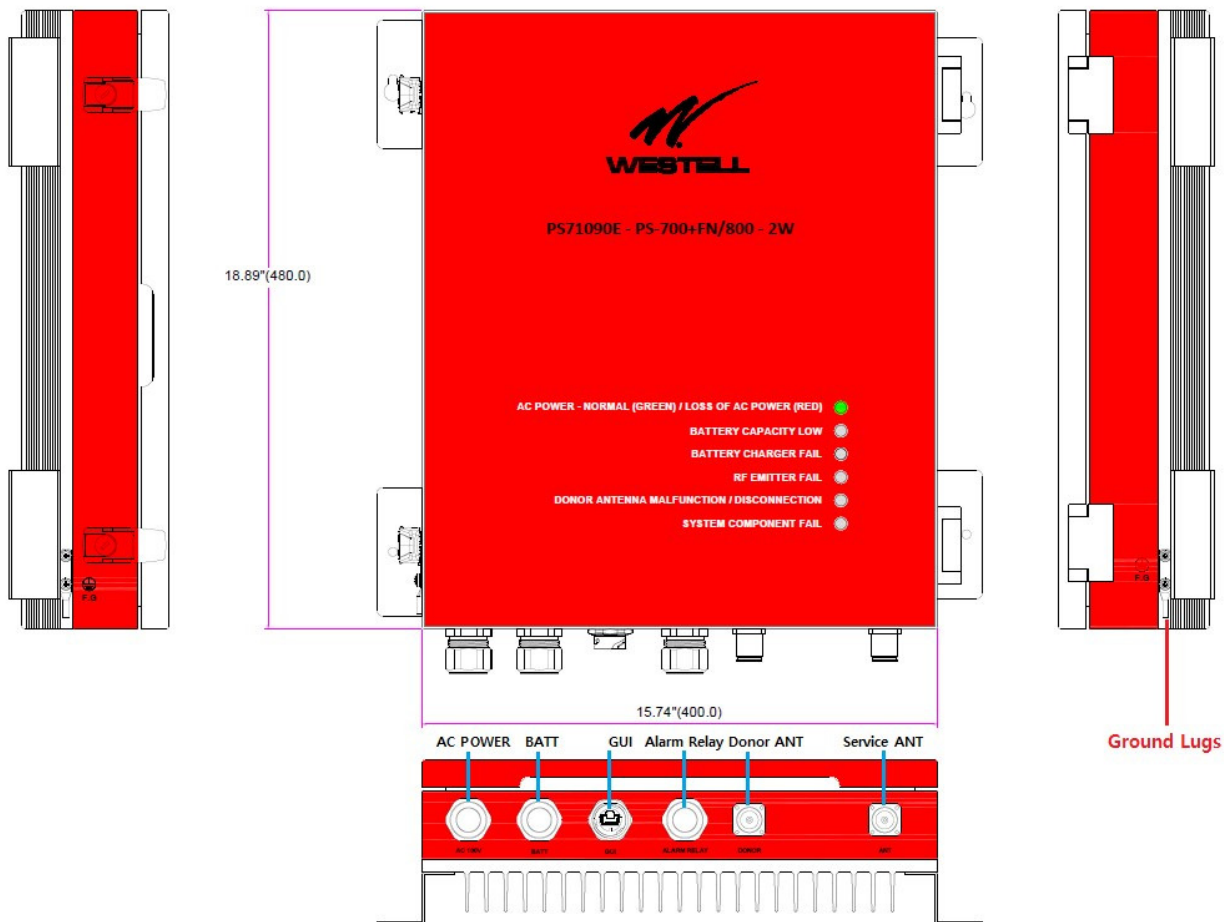


Figure 4-1: External Product Configuration

5 Installation Guidelines

5.1 Important Installation Guidelines

- The PS71090E Signal Booster is designed for indoor use only.
- The PS71090E Signal Booster 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 cause regenerative feedback in the system.

This feedback can cause the amplifier to emit a continuous signal at maximum amplitude, and, in some cases, interfere with normal operation of the donor site. Careful consideration of the layout and placement of the system is imperative to minimize this possibility and to minimize the amount of signal leaking from the building.

- Do not disassemble the Signal Booster.

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.
- 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.
- The PS71090E Signal Booster must be connected to ground for protection.
- We recommend that installers do not wear jewelry or metal accessories when installing this Signal Booster.
- Do not place cables or tools that may damage the Signal Booster in close proximity to it.
- Check the installation site for hazardous conditions such as water-covered floors or badly worn or damaged cables prior to installation.

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

CAUTION

- **Close proximity to the donor or server antennas with the Signal Booster in operation may expose users or installers to RF fields that exceed FCC limits for human exposure.**
- **Turn power to the Signal Booster off when connecting or disconnecting cables.**

5.2 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 channel 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 cell site location.

5.3 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 phones / radios, such as desks or dispatch areas. **Note: If the signal level from antenna at the UL service port is >-12dBm, add external attenuation to avoid shutdown alarm**

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- To determine the quantity and locations of indoor antennas, measure Received Signal Strength Indication (RSSI) using DM Tool software 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 two 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.

5.4 Mounting the Signal Booster

Follow the instructions in this section to mount the Signal Booster on a wall.

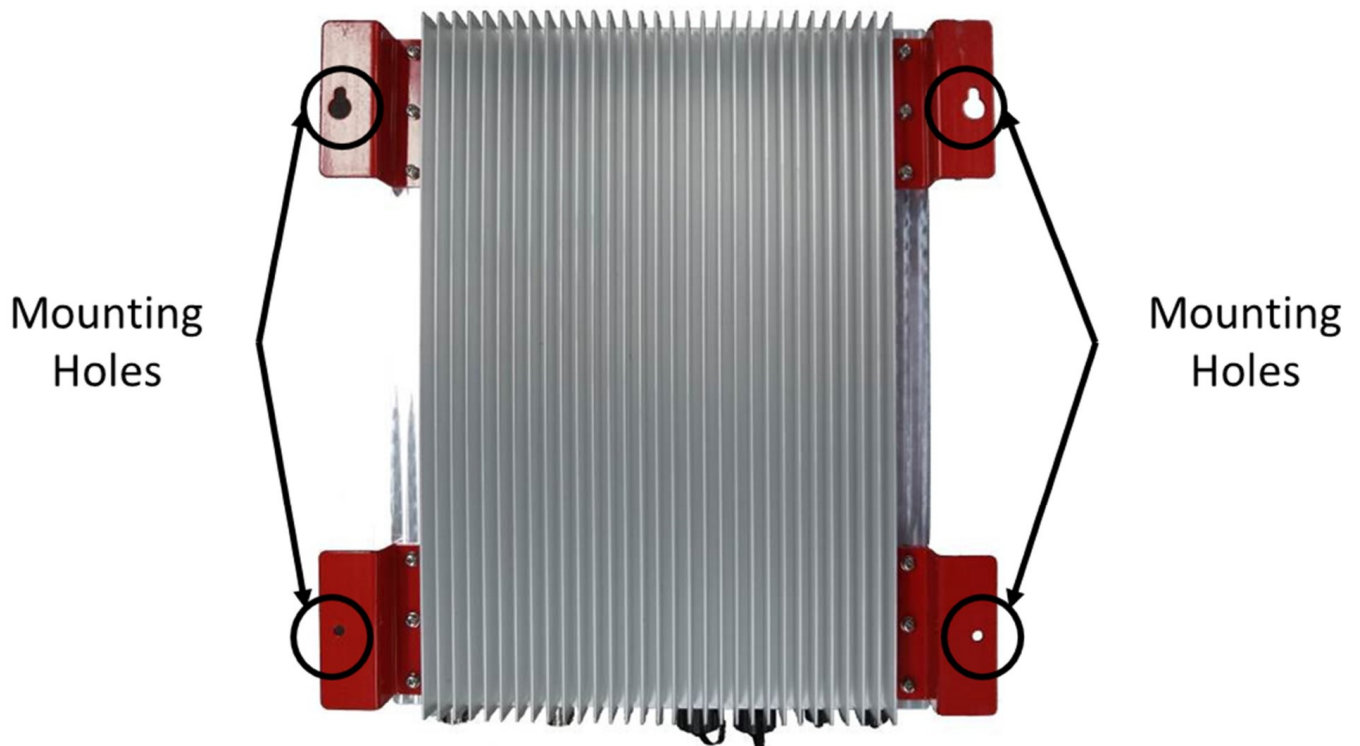


Figure 5-1: Signal Booster Mounting

1. Using the PS71090E as a template, mark the four (4) locations for the wall anchoring system screws.
2. Move the PS71090E unit and drill the mounting holes at the marks in the wall.

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Install a wall anchor in each of the four (4) drilled holes.

3. Install the top two (2) screws into the anchors, leaving enough room to slide the screws into the oblong holes of the top of the unit's mounting positions.
4. Once the Unit is hung on the top two (2) screws finish fastening the top screws.
5. Install the bottom two (2) screws into the anchors, fastening the Unit to the wall.

5.5 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.
- If cables and alignment are acceptable, and a problem persists, use a spectrum analyzer to examine the signal environment in which the unit is operating. The existence of strong adjacent channel signals within the frequency band(s) can cause the AGC to reduce the amplifier's gain or cause alarms. In some cases, additional filtering or attenuation may be required to reject these unwanted signals. In some instances, the donor antenna can be reoriented horizontally to place the interference source in an antenna pattern null.

5.6 Controlling the Signal Booster

Control and monitoring the Signal Booster requires that a properly configured computer with Westell PS71090E control software installed is connected via an Ethernet cable, such as the one shown in Figure 5-2A. Connect the Ethernet cable from the Network Interface port of a computer to the GUI port on the bottom end panel of the Signal Booster.



Figure 5-2A: Ethernet Cable

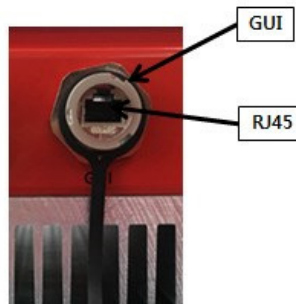


Figure 5-2B: Ethernet Connectors

5.7 Connecting to the Alarm Relay Panel

Use the provided Alarm Relay Serial Cable to connect the PS71090E Public Safety Signal Booster to the alarm relay panel. If the provided cable is not long enough for your system, you will need to build one.

1. Strip the outer serial cable insulation back to expose the inner conductors, Figure 5-3.
2. Strip back the insulation on the ends of each conductor. (Tin wires as needed.)

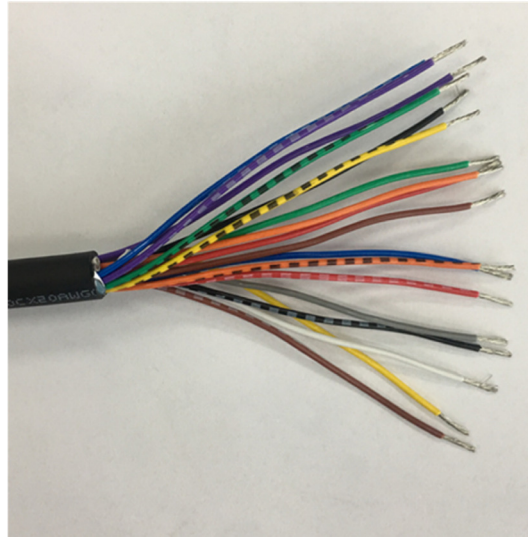


Figure 5-3: Stripped Alarm Wire

3. Remove the protective cover on the Alarm Relay 9 position D-Sub connector.



Figure 5-4: Alarm Relay 18-wire Gland Connector M6110

4. Connect the M6110 Gland connector at the serial cable to the Alarm Relay connector on the PS71090E, Figure 5-5. Be sure to fasten the connector screws securely.

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Figure 5-5: Alarm Relay Cable Connected to Signal Booster

5. Connect the stripped end of the serial cable to the alarm relay panel. Refer to Table 5-1 for connection information.

Table 5-1: Alarm Relay Connections

Alarm#	18Pin # Description			Alarm Information	Relay Status
	NC	NO	CC		
Alarm1	1	2	3	AC POWER / LOSS OF AC POWER	Normal → NC+CC Alarm → NO+CC
Alarm2	4	5	6	BATTERY CAPACITY LOW Low Battery capacity at 70% reduction of operating capacity	
Alarm3	7	8	9	BATTERY CHARGER FAIL	
Alarm4	10	11	12	RF EMITTER FAIL	
Alarm5	13	14	15	DONOR ANT. Malfunction/DISCONNECTION	
Alarm6	16	17	18	SYSTEM COMPONENT FAIL	

5.8 Connecting the Power Cable

Use the provided AC Power Cable to connect the PS71090E Public Safety Signal Booster to an AC power source.

1. Remove the M6110 Gland Connector Molded from the AC 110V power connector on the Signal Booster, Figure 5-6.

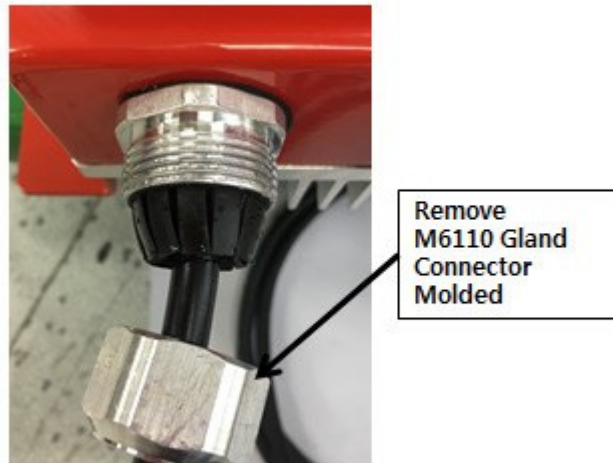


Figure 5-6: Remove the Power Connector Cap

2. Connect the power cable to the AC 110V power connector on the Signal Booster, Figure 5-7.

NOTE

The Signal Booster connector and the cable connector are keyed as shown in Figure 5-7.

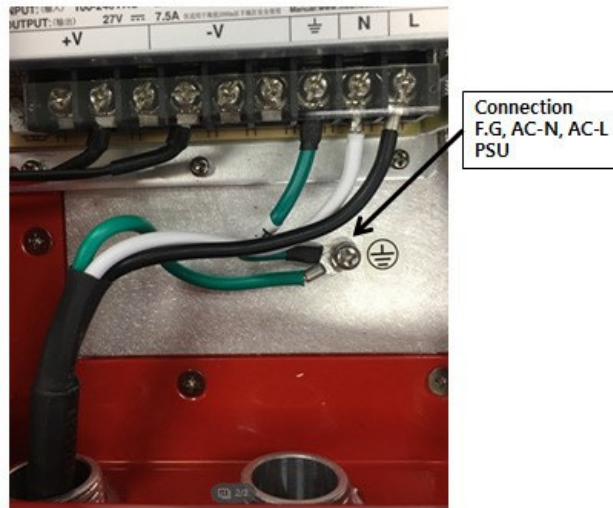


Figure 5-7: Connection AC Power Cable

3. Screw the connector on securely.

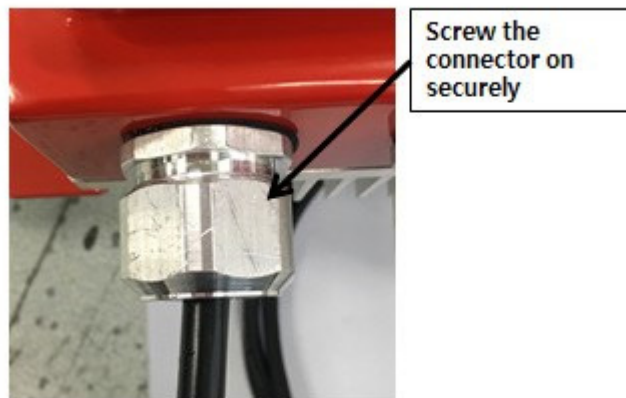


Figure 5-8: Power Cable Connected to Signal Booster

4. When the Signal Booster is properly set up and ready to have power applied, plug the other end into the 110VAC outlet.



Figure 5-9: Power Cable Connected to Signal Booster

5.9 Connecting the Battery Back-up Cable

Use the provided DC Power Cable to connect the PS71090E Public Safety Signal Booster to a 24-30VDC Battery Back-up / power source. (Pin A, White = positive, Pin B, Black = Negative)

Figure 5-10: Battery Cable Connected to Signal Booster

6 System Operation

6.1 Operating the Program

Access the PS71090E Public Safety Signal Booster using the provided **PS71090E PS-SMR 700/800** software through a LAN connection. The Signal Booster ships with the IP address **192.168.1.150** on the **GUI** port.

To connect directly to the Signal Booster from a laptop or PC with a crossover 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.

Open Control Panel\All Control Panel Items\Network Connections Choose appropriate Local area connection:

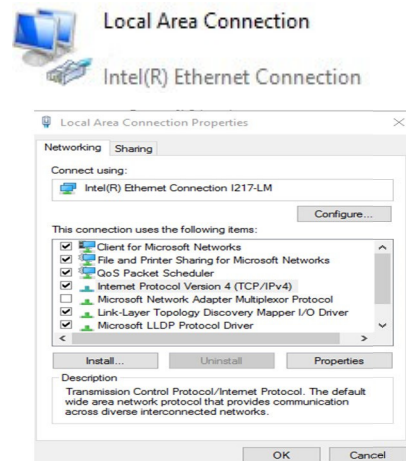


Figure 6.1: Network Connection Set-up

- 1) Select Use the following IP Address and enter the IP address 192.168.1.x, where 'x' is any number from 2 to 254, inclusive, other than 150.

e.g. Set Computer IP to 192.168.1.2

- 2) Ensure that the subnet mask is set to 255.255.255.0.

NOTE

Refer questions about these settings to your IT department.

- 3) Navigate to the Westell PS71090E directory- on the included USB drive and Unzip the 096001911-XX Westell PS71090E GUI Install vX.X.zip file content
- 4) Locate Setup application software file and double-click to install, as seen below.

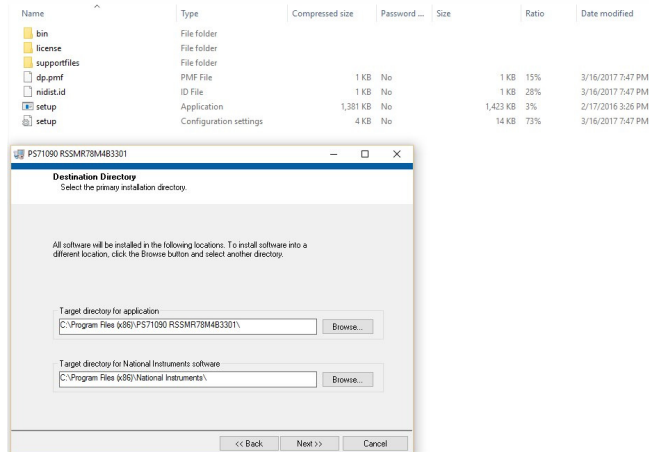


Figure 6.2: Destination Directory

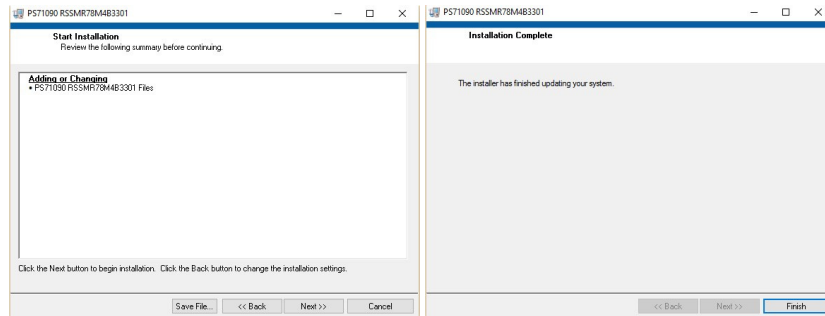
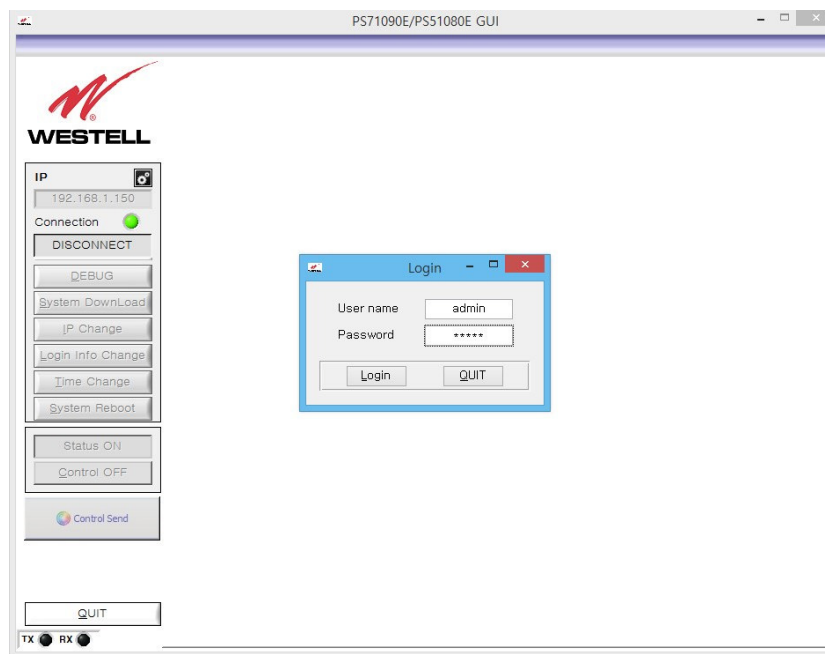


Figure 6.3: Software Installation

5) Click Next and Finish



(Default) User Name : admin
(Default) Password : admin

Figure 6.4: PS71090E/PS51080E GUI Log-In

Item	Description
1	IP Address Field (editable when Connect button is displayed)
2	Connect/Disconnect toggle button
3	TX/RX LED indicates the state of communication with the Signal Booster and GUI

6) Verify that the IP address in the upper left of the page is correct 192.168.1.150, if it is not, edit it in the IP Address field.

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- 7) Click the Connect button. The button label changes to Disconnect.

6.2 Status

Clicking the **Status** button in the menu on the left of the page changes the button text to **Status ON** and displays the Status Mode page, described in this section.

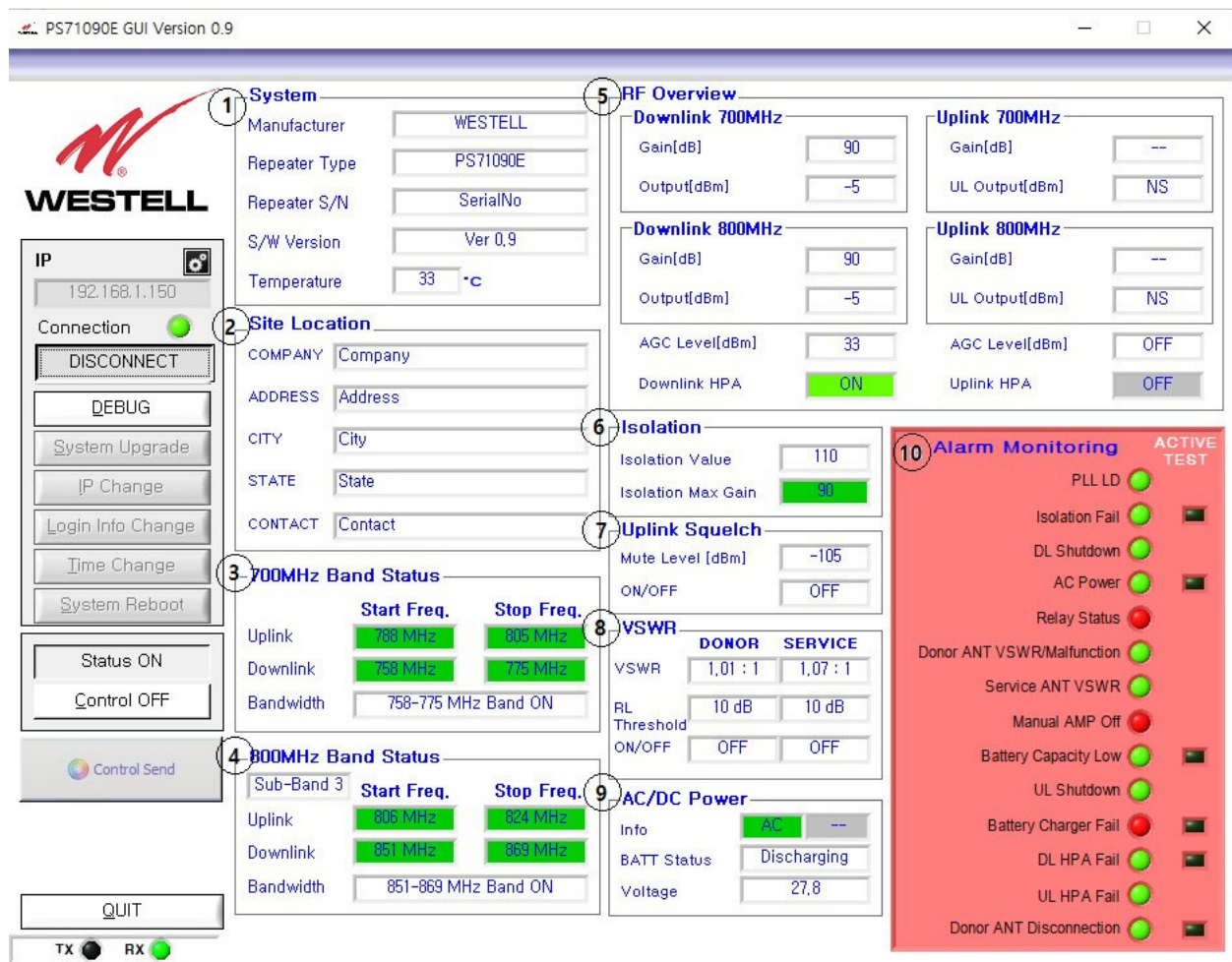


Figure 6-5: Status Mode Page

Item #	Section	
1	System	Not User-Configurable/Informational Only
	Manufacture	Displays the Signal Booster's manufacturer

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System Manufacturer: WESTELL Repeater Type: PS71090E Repeater S/N: 19RF11050001 S/W Version: Ver 0.9 Temperature: 33 °C	Signal Booster Type	Displays Signal Booster Model Number
	Signal Booster S/N	Displays Signal Booster Serial Number
	S/W Version	Displays firmware version of the control board
	Temperature	Displays internal temperature of the Signal Booster

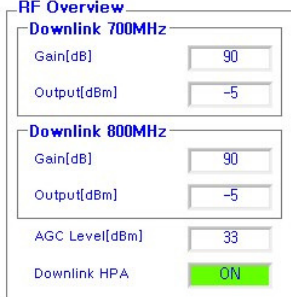
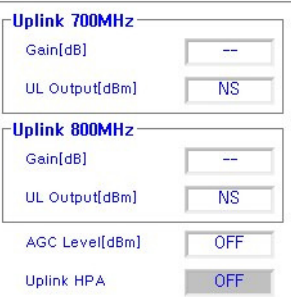
Item #	Section
2 Site Location COMPANY: Company ADDRESS: Address CITY: City STATE: State CONTACT: Contact	Site Location
	Company: Company information display
	Address: Address information display
	City: City information display
	State: State information display
	Contact: Contact information display
Item #	Section
3 700MHz Band Status Uplink: Start Freq. 768 MHz, Stop Freq. 805 MHz Downlink: 758 MHz, 775 MHz Bandwidth: 758-775 MHz Band ON	700 MHz Band Status
	Uplink
	Start Frequency: Displays 700 MHz uplink Start frequency
	Stop Frequency: Displays 700 MHz uplink Stop frequency
	Downlink
	Start Frequency: Displays 700 MHz downlink Start frequency
	Stop Frequency: Displays 700 MHz downlink Stop frequency
	Bandwidth: Allows Main-band to be set to Select
Item #	Section

4	800 MHz	
	Sub-band 1	
Sub-Band 1 Start Freq. Stop Freq. Uplink 806 MHz 809 MHz Downlink 851 MHz 854 MHz Bandwidth 851-854 MHz Band ON Sub-Band 2 Start Freq. Stop Freq. Uplink 806 MHz 816 MHz Downlink 851 MHz 861 MHz Bandwidth 851-861 MHz Band ON	Uplink	
	Start Frequency	Displays sub-band 1 uplink Start frequency
	Stop Frequency	Displays sub-band 1 uplink Stop frequency
	Downlink	
	Start Frequency	Displays the sub-band 1 downlink start frequency
	Stop Frequency	Displays sub-band 1 downlink Stop frequency
	800MHz Band	Allows sub-band 1 to be set to Select
	Sub-band 2	
	Uplink	
	Start Frequency	Displays sub-band 2 uplink Start frequency
	Stop Frequency	Displays sub-band 2 uplink Stop frequency
	Downlink	
	Start Frequency	Displays sub-band 2 downlink start frequency
	Stop Frequency	Displays sub-band 2 downlink Stop frequency
	800MHz Band	Allows sub-band 2 to be set to Select
	Sub-band 3	
	Uplink	
	Start Frequency	Displays sub-band 3 uplink Start frequency
	Stop Frequency	Displays sub-band 3 uplink Stop frequency
	Downlink	
	Start Frequency	Displays sub-band 3 downlink start frequency
	Stop Frequency	Displays sub-band 3 downlink Stop frequency
	800MHz Band	Allows sub-band 3 to be set to Select
Item #	Section	
	Stop Frequency	Displays sub-band 2 downlink Stop frequency
	800MHz Band	Allows sub-band 2 to be set to Select
	Sub-band 3	
	Uplink	
	Start Frequency	Displays sub-band 3 uplink Start frequency
	Stop Frequency	Displays sub-band 3 uplink Stop frequency
	Downlink	
	Start Frequency	Displays sub-band 3 downlink start frequency
	Stop Frequency	Displays sub-band 3 downlink Stop frequency
	800MHz Band	Allows sub-band 3 to be set to Select

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	Start Frequency	Displays sub-band 3 downlink Start frequency
	Stop Frequency	Displays sub-band 3 downlink Stop frequency
	800MHz Band	Allows sub-band 3 to be set to Select

Item #	Section	
5 RF Overview 	RF Overview	
	Gain [dB] (700 MHz)	Displays Downlink gain in the 700 MHz range
	700 MHz Output (dBm)	Displays Output value by 700 MHz Band
	Gain [dB] (800 MHz)	Displays Downlink gain in the 800 MHz range
	800 MHz Output (dBm)	Displays Output value by 800 MHz Band
	AGC Level [dBm]	Displays Downlink Automatic Gain Control Level setting value
	HPA	Downlink HPA On/Off
	Uplink	
	700MHz Gain (dB)	Displays Uplink gain in the 700 MHz range
	700MHz Output [dBm]	Displays status of the Uplink gain
	800MHz Gain (dB)	Sets the unit's maximum ALC output value
	800MHz Output [dBm]	Displays status of the Uplink gain
	AGC Level [dBm]	Displays Uplink Automatic Gain Control Level setting value
	HPA	Uplink HPA On/Off

Item #	Section	
6 Isolation Isolation Value110 Isolation Max Gain90	Isolation	
	Isolation Value	When power is on, an isolation check is performed and the values are displayed Isolation : 110 ~ 80 dB
	Isolation Max. Gain	The isolation checked can be display with Isolation maximum Gain.
Item #	Section	
7 Uplink Squelch Mute Level [dBm]-105 ON/OFFON	Uplink Squelch	
	Mute Level : Uplink muting threshold level display Range : -105 ~ -80dBm	
	ON/OFF : Squelch function On/Off Status	
Item #	Section	
8 VSWR DONOR SERVICE VSWR1.01 : 11.06 : 1 RL10 dB10 dB ThresholdONON	VSWR	
	VSWR : Donor / Service ANT. VSWR Display	
	Return loss Threshold : Return loss of VSWR threshold. Range : 0 ~ 30dB	
	ON/OFF : VSWR Check On/Off Status	
Item #	Section	
9	AC/DC	
	Info	AC or BATT Status Display
	Charge Status	Charge Status Display Charge / Discharge

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AC/DC Power Info AC -- BATT Status Discharging Voltage 27.8	Voltage	AD or DC Voltage Display 0.0 ~ 29.0
Item #	Section	
10 Alarm Monitoring ACTIVE TEST PLL LD Isolation Fail DL Shutdown AC Power Relay Status Donor ANT VSWR/Malfunction Service ANT VSWR Manual AMP Off Battery Capacity Low UL Shutdown Battery Charger Fail DL HPA Fail UL HPA Fail Donor ANT Disconnection	Alarm Monitoring Not User-Configurable/ Alarm Test and Alarm Informational Only. (GREEN = Normal; RED = Alarm)	
PLL LD	Local PLL Lock Detect Fail	
Isolation Fail	After Isolation Check , lack of Isolation and reduced gain	
DL Shutdown	PA protection Downlink HPA off	
AC Power	Loss of AC Power	
Relay Status	If any of six alarms are present	
Donor ANT VSWR/Malfunction	Donor ANT VSWR Check Fail/ Donor ANT Malfunction	

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Service ANT VSWR	Service Antenna VSWR Check Fail
Manual AMP Off	HPA Off (Downlink or Uplink HPA)
Battery Capacity Low	Low Battery capacity at 70% reduction
UL Shutdown	PA protection Uplink HPA off
Battery Charger Fail	Battery Disconnection or Battery No charging status
DL HPA Fail	Downlink HPA Upper/Lower Current Limit
UL HPA Fail	Uplink HPA Upper/Lower Current Limit
Donor ANT Disconnection	Donor ANT Disconnection Checked.

6.3 Control

Clicking the **Control** button in the menu on the left of the page changes the button text to

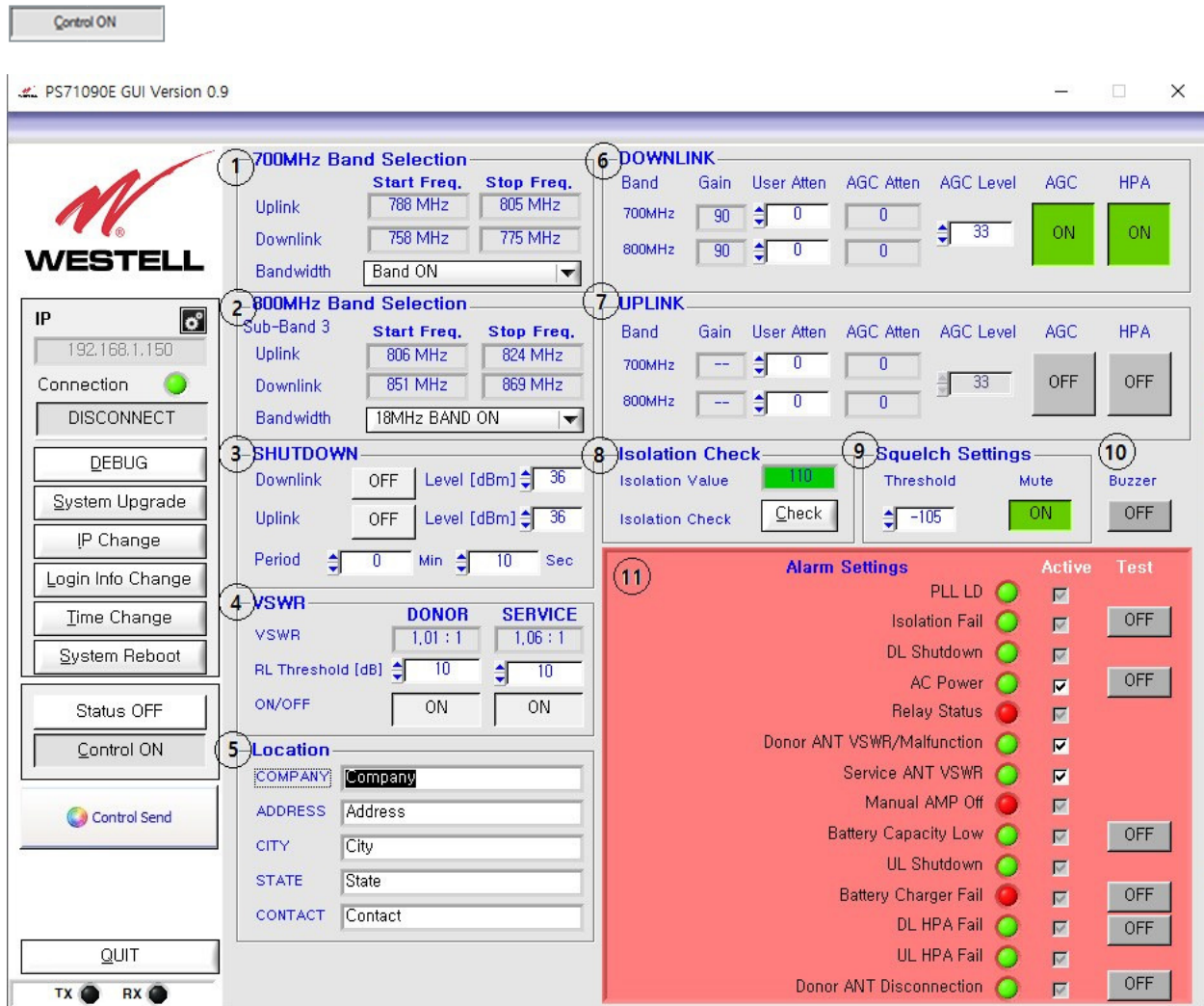


Figure 6-6: Control Mode Page
and displays the Control Mode page, described in this section.

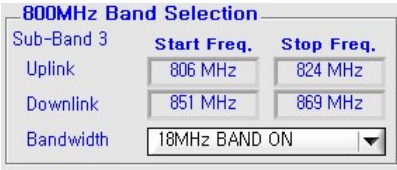
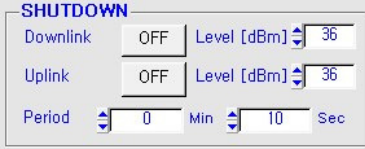
Item #	Section	
1	700MHz Band Selection	
	Uplink	Displays 700MHz uplink Start frequency
		Displays 700MHz uplink Stop frequency
	Downlink	Displays 700MHz downlink Start frequency
		Displays 700MHz downlink Stop frequency

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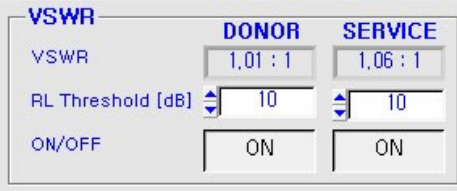
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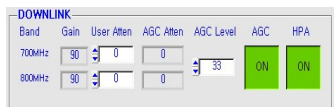
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	Bandwidth	Band ON / Band OFF (17MHz BW)
--	-----------	-------------------------------

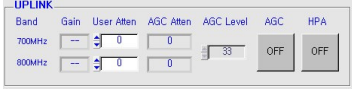
Item #	Section	
2 	800MHz Band Selection	
	Uplink	Displays 800MHz uplink Start frequency
		Displays 800MHz uplink Stop frequency
	Downlink	Displays 800MHz downlink Start frequency
		Displays 800MHz downlink Stop frequency
	Bandwidth	3MHz/10MHz/18MHz Band ON / Band OFF
Item #	Section	
3 	Shutdown Allows the shut-down level to be set	
	Downlink	
	Shutdown	Allows the downlink shutdown level to be set to ON or OFF.
	Level [dBm]	Allows the maximum shutdown level to be set between 23 and 36
	Uplink	
	Shutdown	Allows the uplink shut down level to be set to ON or OFF.
	Level [dBm]	Allows the maximum shutdown level to be set between 23 and 36
	Period	Allows the shutdown period to be set in minutes and seconds. (Default 10sec)
Item #	Section	
4	VSWR	
	VSWR	Donor/Service ANT. VSWR

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		Return Loss Threshold	Setting Return loss threshold of VSWR
		ON/OFF	VSWR Check On/Off
Item #	Section		
	Location		
	Company	Setting Company information	
	Address	Setting Address information	
	City	Setting City information	
	State	Setting State information	
	Contact	Setting Contact information	

Item #	Section	
	Downlink	
	Gain [dB] (700 MHz)	Displays downlink gain in the 700 MHz range
	User Atten (700 MHz)	Setting User attenuation value controlled by downlink in the 700 MHz band
	AGC Atten [dB] (700 MHz)	Displays attenuation value controlled by AGC in the 700 MHz band
	Gain [dB] (800 MHz)	Displays downlink gain in the 800 MHz range
	User Atten (800 MHz)	Setting User attenuation value controlled by downlink in the 800 MHz band
	AGC Atten [dB] (800 MHz)	Displays attenuation value controlled by AGC in the 800 MHz band
	AGC	Control Auto Level Control Function On/Off
	AGC Level [dBm]	Sets the unit's maximum ALC output value in the Downlink.

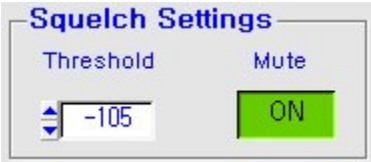
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	HPA	Sets Downlink HPA On/Off
Item #	Section	
7 	Uplink	
	Gain [dB] (700 MHz)	Displays uplink gain in the 700 MHz range
	User Atten (700 MHz)	Setting User attenuation value controlled by Uplink in the 700 MHz band
	AGC Atten [dB] (700 MHz)	Displays attenuation value controlled by AGC in the 700 MHz band
	Gain [dB] (800 MHz)	Displays Uplink gain in the 800 MHz range
	User Atten (800 MHz)	Setting User attenuation value controlled by Uplink in the 800 MHz band
	AGC Atten [dB] (800 MHz)	Displays attenuation value controlled by AGC in the 800 MHz band
	AGC	Control Auto Level Control Function On/Off
	AGC Level [dBm]	Sets the unit's maximum ALC output value in the Uplink.
	HPA	Sets Uplink HPA On/Off
Item #	Section	
8 	Isolation Check	
	Isolation Value	Displays Isolation value (110 ~ 80dB)
	Isolation Check	Isolation Check Manually

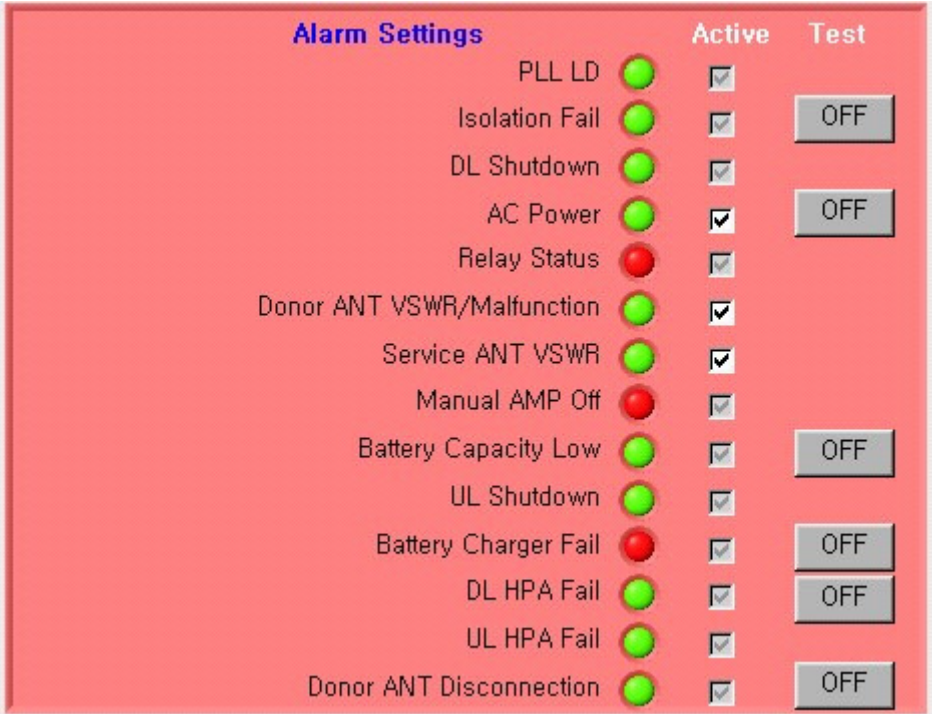
Item #	Section	
9	Squelch Settings	
	Threshold	Setting Mute Threshold level

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	Range : -105 ~ 80 dBm
Mute ON/OFF	Mute Check ON / OFF

Item #	Section
10 	Buzzer Enable/Disable Buzzer ON/OFF Buzzer ON / OFF (any alarm raised) Buzzer On-Off Period : 1sec Buzzer On / 9sec Buzzer Off (Every 10sec)

Item #	Section
11	Alarm Setting / Alarm Test
	
PLL LD	Local PLL Lock Detect Fail
Isolation Fail	After Isolation Check , lack of Isolation and reduced gain / Alarm Test On/Off
DL Shutdown	PA protection Downlink HPA off

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AC Power	Loss of AC Power/ Alarm Active/Inactive Checkbox, Alarm Test On/Off
Relay Status	If any of six alarms are present
Donor ANT VSWR/Malfunction	Donor ANT VSWR Check Fail/ Donor ANT Malfunction
Service ANT VSWR	Service Antenna VSWR Check Fail
Manual AMP Off	HPA Off (Downlink or Uplink HPA)
Battery Capacity Low	Low Battery capacity at 70% reduction / Alarm Test On/Off
UL Shutdown	PA protection Uplink HPA off
Battery Charger Fail	Battery Disconnection or Battery No charging status / Alarm Test On/Off
DL HPA Fail	Downlink HPA Upper/Lower Current Limit / Alarm Test On/Off
UL HPA Fail	Uplink HPA Upper/Lower Current Limit
Donor ANT Disconnection	Donor ANT Disconnection Checked. / Alarm Test On/Off
Alarm Test ON/OFF Button	Enable alarm testing via the software GUI. (On Period of 2 min.)

7 System Software Upgrade

7.1 Upgrading the System Software

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

1. Click the **Control** button to display the Control page.

2. Click  in the menu located on the left side of the Control page. The System Upgrade progress window, Figure 7-1, displays.

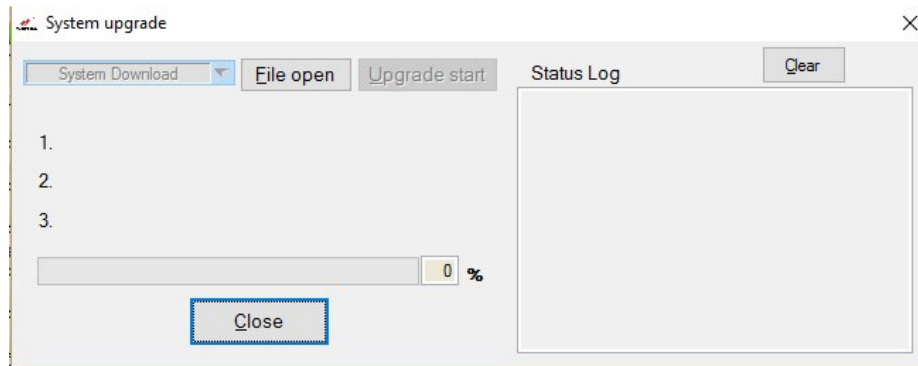
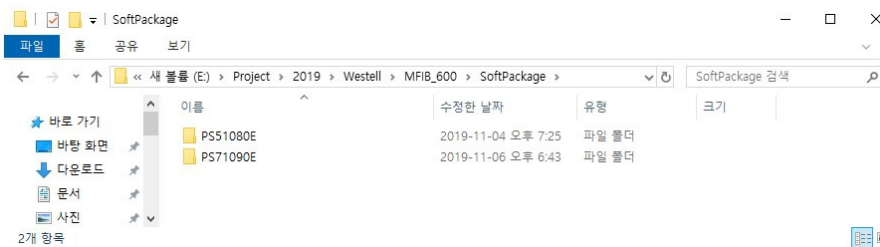
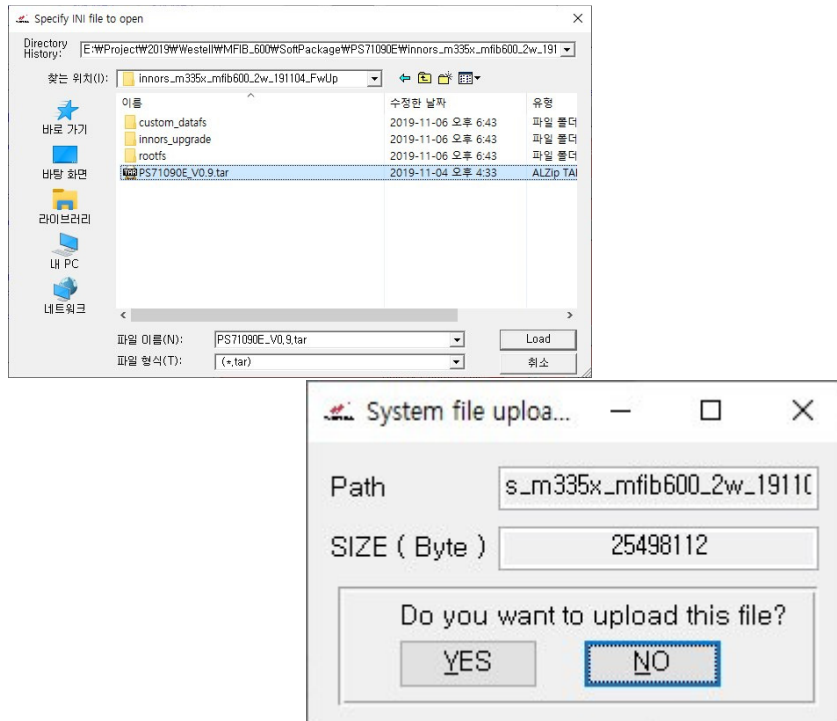


Figure 7-1: System Firmware Upgrade Progress Window File Open Tab

3. Click the **File Open** tab in the system Upgrade progress window to display it, Figure 7-1.
4. Navigate to PS71090E SW Upgrade folder



5. Select the File **PS71090E_VX.X.tar** and press load



6. Click  in the System file upload dialog window, system upgrade begins, as indicated by the progress bar in the system upgrade window.

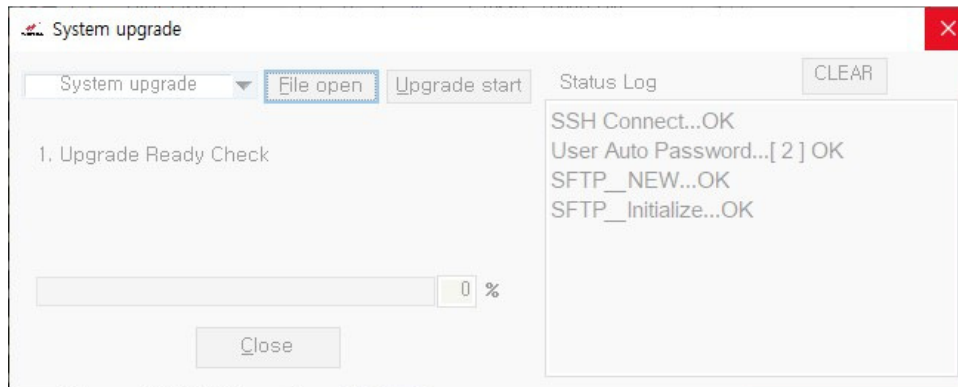


Figure 7-2: System Upgrade

7.2 IP Change

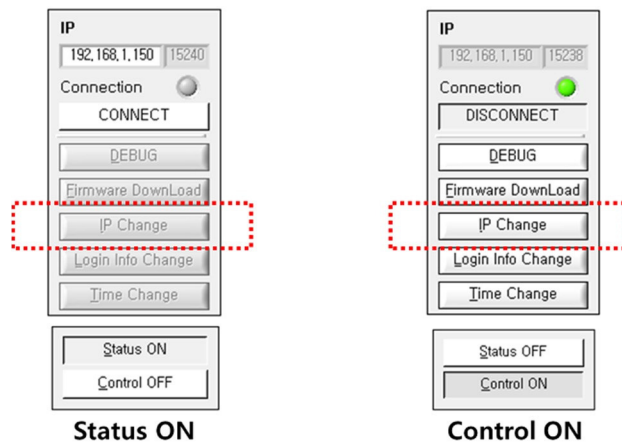
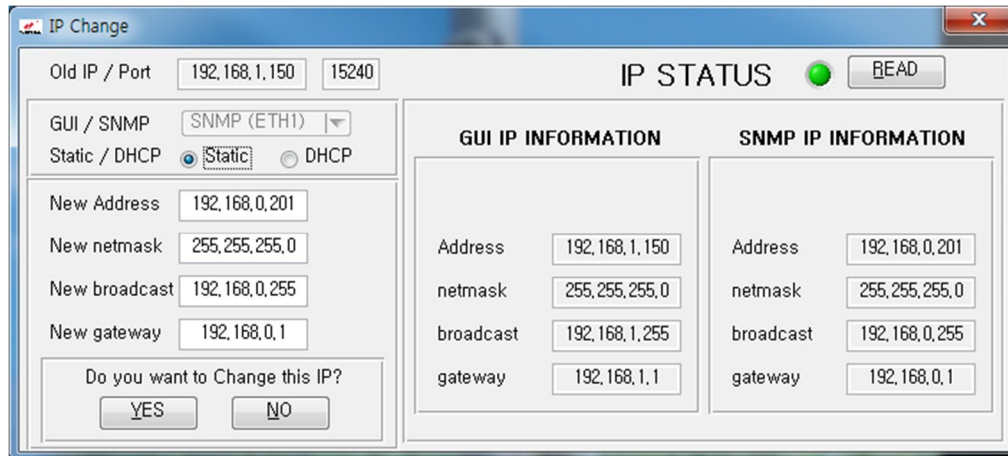


Figure 7-4: IP Settings

1. With Control ON, the IP Change button is activated.

7.2.1 IP Change Window



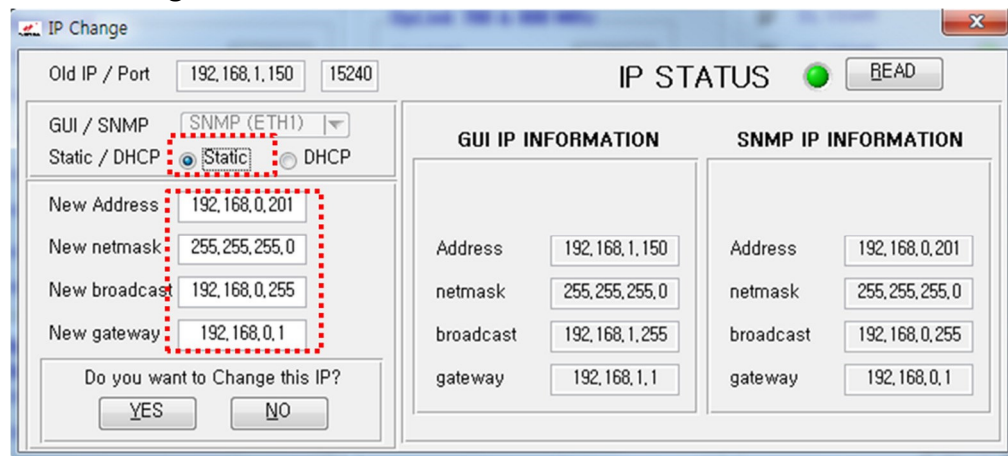
The IP Change window displays the following information:

- Old IP / Port:** 192.168.1.150 / 15240
- IP STATUS:** Green LED, READ button
- GUI / SNMP:** SNMP (ETH1)
- Static / DHCP:** Static (selected), DHCP
- New Address:** 192.168.0.201
- New netmask:** 255.255.255.0
- New broadcast:** 192.168.0.255
- New gateway:** 192.168.0.1
- Do you want to Change this IP?:** YES / NO buttons
- GUI IP INFORMATION:**
 - Address: 192.168.1.150
 - netmask: 255.255.255.0
 - broadcast: 192.168.1.255
 - gateway: 192.168.1.1
- SNMP IP INFORMATION:**
 - Address: 192.168.0.201
 - netmask: 255.255.255.0
 - broadcast: 192.168.0.255
 - gateway: 192.168.0.1

Figure 7-5: IP Change Window

1. Successful completion of IP Read, Status LED turns green and change icon is activated
2. When the IP Change Window is opened, the current status is displayed, Figure 7-10
 - a. Static IP can be set. (See 7.2.2)
 - b. DHCP IP can be set. (See 7.2.3)

7.2.2 Static IP Setting



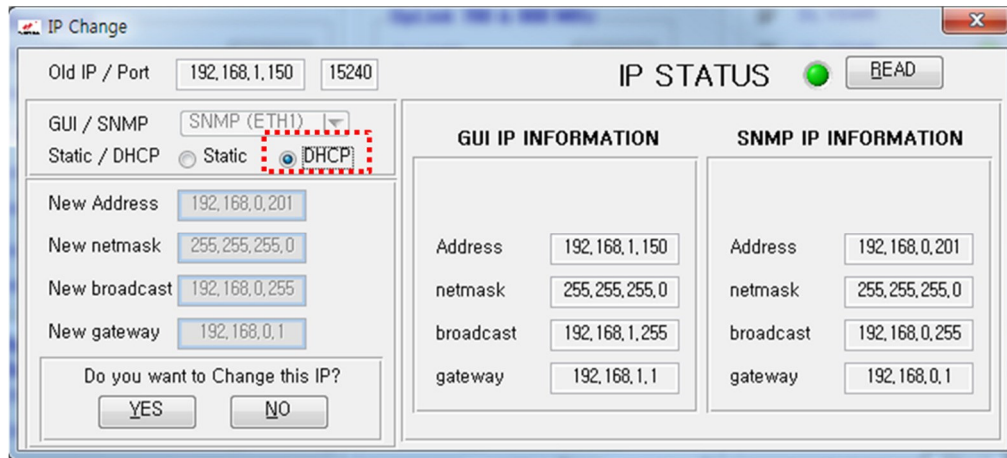
The IP Change window displays the following information:

- Old IP / Port:** 192.168.1.150 / 15240
- IP STATUS:** Green LED, READ button
- GUI / SNMP:** SNMP (ETH1)
- Static / DHCP:** Static (selected), DHCP
- New Address:** 192.168.0.201
- New netmask:** 255.255.255.0
- New broadcast:** 192.168.0.255
- New gateway:** 192.168.0.1
- Do you want to Change this IP?:** YES / NO buttons
- GUI IP INFORMATION:**
 - Address: 192.168.1.150
 - netmask: 255.255.255.0
 - broadcast: 192.168.1.255
 - gateway: 192.168.1.1
- SNMP IP INFORMATION:**
 - Address: 192.168.0.201
 - netmask: 255.255.255.0
 - broadcast: 192.168.0.255
 - gateway: 192.168.0.1

Figure 7-6: Static IP Setting

1. Please write the Address / netmask / broadcast / gateway
2. If have all information set, please press YES button.

7.2.3 DHCP IP Setting



IP Change

Old IP / Port: 192.168.1.150 15240

GUI / SNMP: SNMP (ETH1)

Static / DHCP: ☐ Static ☒ DHCP

New Address: 192.168.0.201

New netmask: 255.255.255.0

New broadcast: 192.168.0.255

New gateway: 192.168.0.1

Do you want to Change this IP?

YES NO

IP STATUS: ● READ

GUI IP INFORMATION		SNMP IP INFORMATION	
Address	192.168.1.150	Address	192.168.0.201
netmask	255.255.255.0	netmask	255.255.255.0
broadcast	192.168.1.255	broadcast	192.168.0.255
gateway	192.168.1.1	gateway	192.168.0.1

Figure 7-7: DHCP IP Setting

1. After DHCP select please click the YES button.

Appendix A Important Product Information

A.1 Registration Number

FCC – NVRPS71090E-PS78

A.2 UL

This product is UL Listed.

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Appendix B Acronyms and Abbreviations

Table B-1 contains the acronyms and abbreviations used in this manual, along with a definition for each one.

Table B-1: Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AC	Alternating Current
AGC	Automatic Gain Control
COM	Communications
dB	Decibels
dBc	Decibels relative to the carrier
dB _i	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	Federal Communications Commission
HPA	High-Powered Amplifier
IF SAW	Intermediate Frequency Surface Acoustic Wave
IP	Internet Protocol
LAN	Local Area Network
LED	Light Emitting Diode
MHz	Megahertz

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NMS	Network Management System
OSC	Oscillator
PLL LD	Phase-locked loop with lock detection
RF	Radio Frequency
RS-232C	Serial Communication Standard
UL	Uplink
UPS	Uninterruptable Power Supply
VAC	Volts Alternating Current (AC Voltage)
VSWR	Voltage Standing Wave Ratio