



1-BOX™

# Installation and Operating Manual

1-BOX-PS7W/PS8W-33/33-90-N

Dual Band Public Safety BDA w/GUI Control,  
Internal Annunciator and Battery Back-up Unit



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## DOCUMENT HISTORY

| <i>Description</i>      | <i>Revision</i> | <i>Date Issued</i>               |
|-------------------------|-----------------|----------------------------------|
| <i>Original Version</i> | <i>01</i>       | November 11 <sup>th</sup> , 2024 |
|                         |                 |                                  |

## 1-BOX™ OVERVIEW

The 1-BOX™ unit consists of 3 main sections: BDA, Annunciator, and BBU.

The BDA assembly extends the coverage area of radio communications in buildings and RF shielded environments. The unit features low noise figure and wide dynamic range. It is based on a duplexed path configuration with sharp out of band attenuation allowing improved isolation between the receiving and transmitting paths. The unit includes two RF connectors, BASE and MOBILE, and is duplexed to transmit and receive via both ports.

The on-board annunciator complies with NFPA 1221, NFPA 1225 and IFC 2024 and provides visual and dry contact alarm status as listed on the annunciator panel. 1-BOX™ can support up to 4 external annunciators at distances of up to 1,000 feet via an RJ-45 port.

The Battery Back-up Unit (BBU) provides 12 hours of back-up power in the event of AC power failure.

## 1-BOX™ FEATURES

A Built-in Battery Back-Up Unit (BBU) provides 12 hours of operation during AC mains power outage.

Built-in annunciator panel on the 1-BOX™ door displays the current NFPA alarm conditions.

Capability to add up to four external annunciator panels.

A Graphic User Interface (GUI) allows remote monitoring and control from any WIFI-enabled device. This includes gain adjustment, input level monitor, alarm notifications/alerts and manual remote shutdown.

## FCC NOTE

This is a Class B device. The product has been tested and found to comply with the Booster requirements per FCC 47 CFR Part 90.219.

Caution, the use of unauthorized antennas, cables, and/or coupling devices not conforming with ERP/EIRP and/or indoor-only restrictions (refer to KDB 935210 D02 Signal Boosters Certification v04r03, V. PART 90 SIGNAL BOOSTER SPECIFIC REQUIREMENTS) may violate FCC regulations and may be subject to a fine.

## RF EXPOSURE WARNING

To satisfy the FCC RF exposure requirements, the BDA/antenna installation must comply with the following:

The outdoor antenna (Yagi type or similar directional antenna) must be installed to provide a minimum separation distance of 0.506 meters (50.6 cm) between the antenna and persons within the area. (This assumes a typical antenna with gain of [10.1 dBi, VSWR  $\leq$  1.5:1,  $Z_o$ = 50 ohms, and a cable attenuation of between 1-10 dB).

The indoor antenna (Omni directional) must be installed to provide a minimum separation distance of 0.2 meters (20 cm) between the antenna and persons within the area. (This assumes a typical wide-beam type antenna with gain of 0-2 dBi, VSWR  $\leq$  2:1,  $Z_o$ = 50 ohms, and a cable attenuation of between 1-10 dB)

## WARNING SYMBOLS

### BEFORE USE

Review this manual and ensure that all conditions are compatible with the amplifier's specifications as presented in the following pages. Safe operation may be impaired if this equipment is not used as intended.

### GENERAL DESCRIPTION

This symbol is marked in the manual and denotes important safety operation instructions.

Please read carefully before continuing.

This equipment is suitable for a wide variety of scientific, industrial, laboratory and communication applications where high levels of electromagnetic Radio Frequency (RF) energy are required. Therefore, the output of the amplifier must be terminated to an appropriate load, such as a high-power attenuator, dummy load, or antenna. The user must ensure that radiated energy does not violate regulatory levels of electromagnetic interference.



### PROTECTIVE GROUND

This symbol is marked on the equipment and denotes protective ground terminal. This amplifier includes a protective ground terminal. The equipment should not be used if this protection is impaired.



### HAZARDOUS LINE AND RF VOLTAGES

This symbol is marked on the equipment where dangerous voltages are present. Use extreme caution. Both RF input and output connectors should be terminated prior to the application of the external AC source. Otherwise, contact with the RF output center pin can be dangerous. Place the amplifier in the OFF position prior to connecting and disconnecting RF output load.



### ELECTROSTATIC DISCHARGE (ESD)

This symbol is marked on the equipment where ESD sensitive devices are present. Do not handle without the proper protection.



### CAUTION

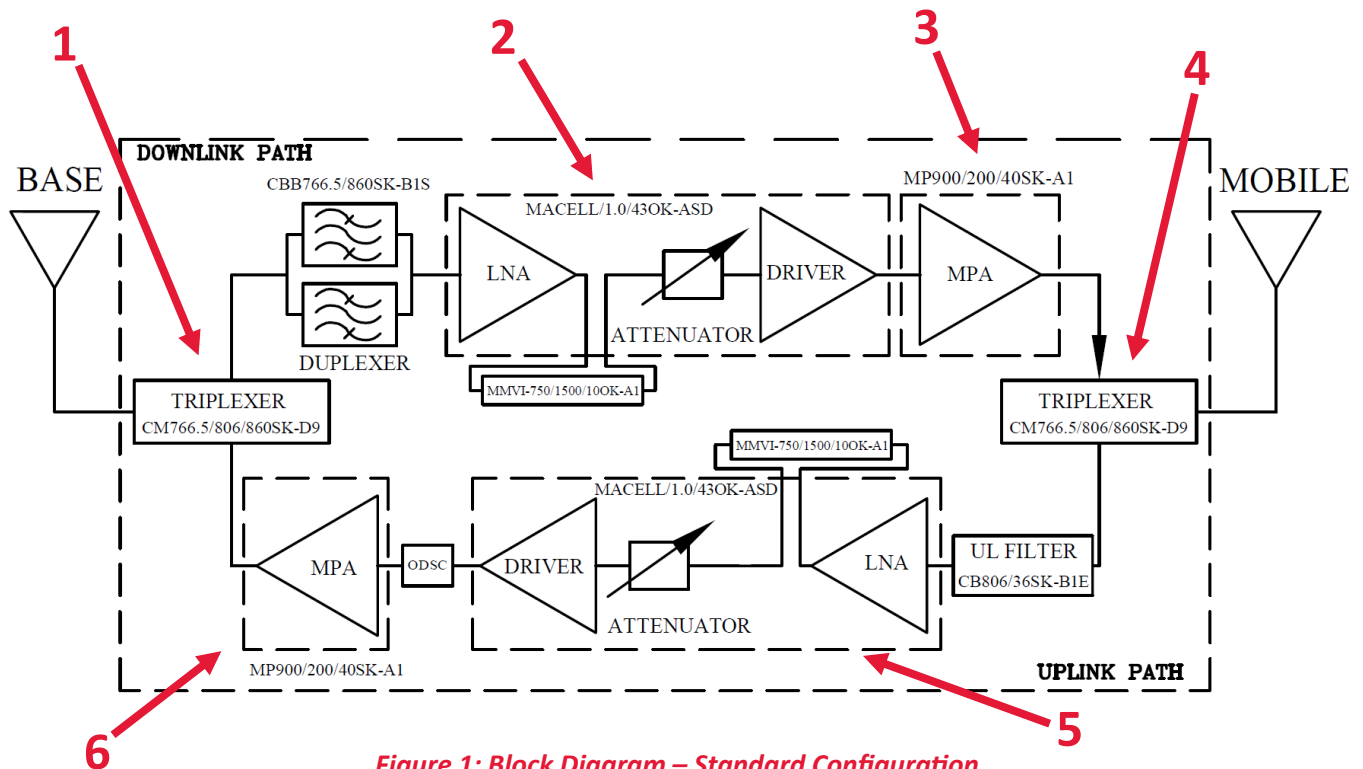
This symbol is marked on the manual and denotes a condition that may cause damage to the Amplifier if procedure is not correctly performed. Do not proceed until the indicated conditions are met.



### MAINTENANCE

Maintenance, repair and calibration must be performed by qualified personnel only. Contact with the internal amplifier components may be dangerous even when the equipment is in the OFF position.

## BLOCK DIAGRAM DESCRIPTION



**Figure 1: Block Diagram – Standard Configuration  
1-BOX-PS7W/PS8W-33/33-90-N**

1. Base Tri/Duplexer – isolates the Uplink and Downlink frequency paths on the “**BASE**” port. Features low bandpass insertion loss and high selectivity.
2. Downlink Pre-amp - is a low noise amplifier that drives the Downlink MPA and offers 32dB Gain.
3. Downlink MPA or Medium Power Amplifier, provides the remaining gain and output power required in the system’s downlink path.
4. Mobile Tri/Duplexer - isolates the Uplink and Downlink frequency paths on the “**MOBILE**” port. Features low bandpass insertion loss and high selectivity Uplink.
5. Uplink Pre-amp - is a low noise amplifier that drives the Uplink MPA and offers 32dB Gain.
6. Uplink MPA or Medium Power Amplifier, provides the remaining gain and output power required in the system’s uplink path.

### Refer to Figure 1 for the following:

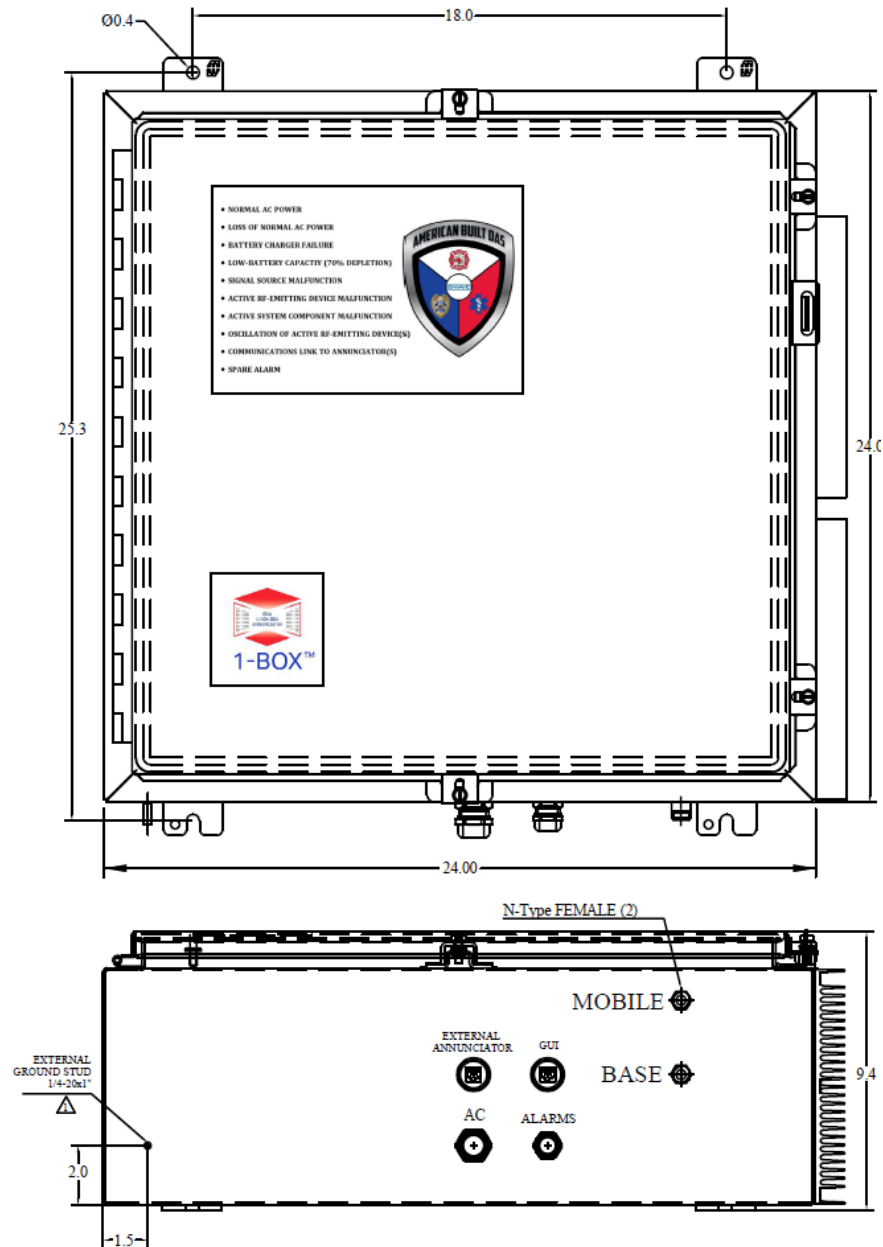
The BDA Downlink path receives RF signals from the base station, amplifies and transmits them to the subscriber. The BDA Uplink path receives RF signals from the subscriber, amplifies and transmits them to the base station.

The diplexers isolate the paths and route each signal to the proper amplification path. Using coaxial cable, the “**BASE**” RF connector is routed to the “**DONOR ANTENNA**” (typically roof-top mounted) and the “**MOBILE**” RF connector is routed to the Distributed Antenna System (“**DAS**”), also known as the “**SUBSCRIBER ANTENNA.**”

## MECHANICAL SPECIFICATIONS

| Specification         | Typical Values                     |
|-----------------------|------------------------------------|
| Enclosure Dimensions  | 24" W x 24" H x 8" D               |
| Enclosure Type        | NEMA 4X                            |
| RF Connectors         | N-Type Female                      |
| Mounting Type         | Wall Mount                         |
| Weight                | 75 lbs. (Typ.) including batteries |
| Operating Temperature | -20°C to +55°C                     |
| Finish                | Epoxy RED                          |

**Table 1: 1-BOX™ Mechanical Specifications**



## RF SPECIFICATIONS

| Specification                                                | Typical Values                |
|--------------------------------------------------------------|-------------------------------|
| Downlink Frequency Range                                     | 758 - 775 MHz / 851 – 869 MHz |
| Uplink Frequency Range                                       | 788 – 824 MHz                 |
| Pass band Gain @ min attenuation                             | 90 dB (Typ.)                  |
| Maximum RF Input Signal Level                                | -45 dBm                       |
| Variable Step Attenuator Range                               | 0-30 dB in 1 dB steps         |
| Noise Figure @+25° C (max gain)                              | 5.0 dB                        |
| Composite Output Power Uplink                                | +33 dBm                       |
| Composite Output Power Downlink                              | +33 dBm                       |
| 3rd Order Intercept point Uplink<br>@ 2 tones +30 dBm each   | +51 dBm                       |
| 3rd Order Intercept point Downlink<br>@ 2 tones +30 dBm each | +51 dBm                       |
| Isolation between Up/Down Link                               | 110 dB (Min.)                 |
| Input/ Output Impedance                                      | 50 $\Omega$                   |
| VSWR (Input/Output)                                          | 1.5: 1 (Max)                  |

**Table 2: 1-BOX™ RF Specifications**

## POWER REQUIREMENTS

| Specification | Typical Values             |
|---------------|----------------------------|
| AC Input      | 90-305 VAC, 47-63 Hz       |
| AC Current    | 2.8 A @ 115V, 1.4 A @ 230V |

**Table 3: AC Requirements**

## LiFePO<sub>4</sub> BATTERY SPECIFICATIONS

| Specification            | Typical Values                           |
|--------------------------|------------------------------------------|
| Voltage                  | 25.6V (2x12.8V in series)                |
| Maximum Charging Voltage | 29.2V (2x14.6V in series)                |
| Standard Charge Current  | 6A                                       |
| Rated Capacity           | 30AH (minimum 12 hours of back-up power) |
| Weight                   | 13.68 lbs. (6.84x2)                      |
| Size                     | 7.29(H) x 5.83(W) x 29.5(D) EACH         |

**Table 4: Battery Specifications**

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

## MOUNTING & INSTALLATION GUIDELINES

This unit should be installed by qualified personnel. Use appropriate mounting equipment and tools:

**Step 1:** Drill two holes 18" apart on the wall/plywood to align with the lower mounting feet. Bolts installed in these positions is where the lower mounting feet will rest.

**Step 2:** Using the mounting feet, place 1-BOX™ on top of the two bolts installed in Step 1.

**Step 3:** Drill two holes 18" apart to align with the upper mounting feet. Install bolts in these positions to secure 1-BOX™ to the wall.

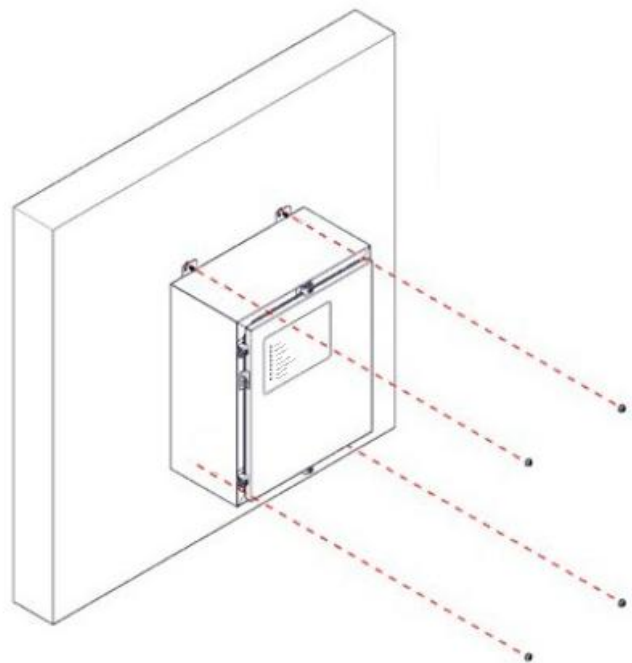
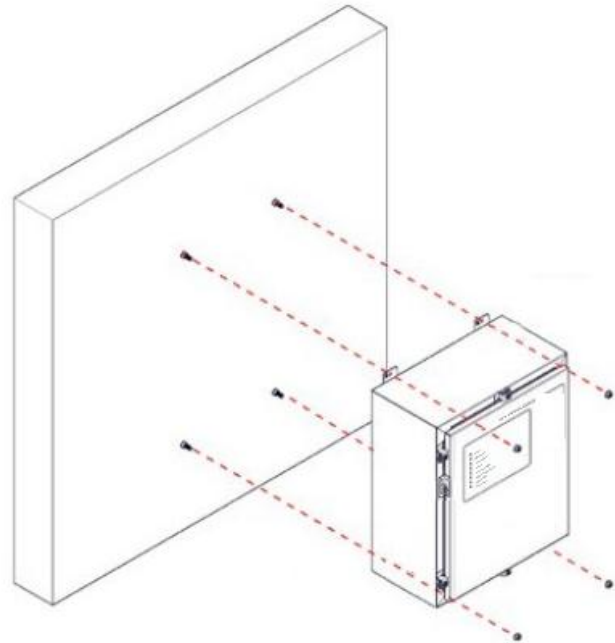


*Indoor BDAs are designed to operate in an indoor environment within a typical operating temperature range of -20°C to +55°C, with normal airflow on heat dissipation surfaces of the systems.*

*Indoor BDAs are NOT designed for outdoor applications where the ambient temperature is outside the recommended range or inside an additional enclosure. This will prevent normal airflow on heat dissipation surfaces of the systems, damaging Amplifiers, and the Main Power Supply.*



*Indoor BDAs are NOT designed for use with unstable power sources, i.e.: generators. Should these units fail due to conditions not within specified parameters, the warranty will void.*



**Figure 3: 1-BOX™ Mounting**

## BDA PORTS & CONNECTORS

The RF connections are made via two type “N” female connectors. The RF connector labeled “**BASE**” must be connected to the antenna pointing towards the base station. The RF connection labeled “**MOBILE**” must be connected to the antenna facing the area to be covered by the BDA. The RF connections must be made through cables with characteristic impedance of 50 ohms.

The isolation between the base station antenna and the mobile antenna should be at least **20 dB higher than the BDA gain**. Isolation less than this value can cause gain ripple across the band. Isolation equal to or less than the BDA gain will give rise to oscillations which will saturate the amplifiers and cause damage to the BDA.

| Port | Label                | Function                                                                                                                                           |
|------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | EXTERNAL ANNUNCIATOR | RJ-45 for data connection of up to 4 external annunciators via Cat-6 (daisy-chain up to 1000-ft away).                                             |
| 2    | GUI                  | RJ-45 for connection of PC for GUI monitoring and control (see GUI instructions on Pages 13-19).                                                   |
| 3    | MOBILE               | Type N female for connection to the subscriber Distributed Antenna System (DAS) via coaxial cable.                                                 |
| 4    | BASE                 | Type N female for connection to the Donor antenna via coaxial cable.                                                                               |
| 5    | ALARMS               | A liquid-tight cord grip for 5-10 mm (0.197-0.393”) diameter cords, enables sealed entry of installer wiring to the 10 sets of alarm dry contacts. |
| 6    | AC POWER             | A liquid-tight conduit fitting, ½” trade size, for flexible non-metallic conduit enables sealed entry of AC mains wiring into 1-BOX™.              |
| 7    | GROUND               | External ground stud ¼-20                                                                                                                          |

**Table 5: 1-BOX™ Panel Ports**



**Figure 4: 1-BOX™ Ports – Standard Configuration**



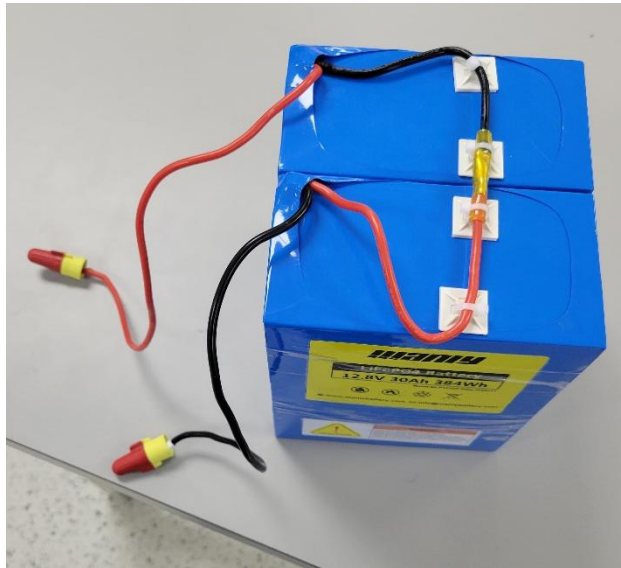
To maintain the UL Type 4 Rating the liquid cord grip and conduit connectors must be properly tightened and secured or plugged if unused. The RJ-45 connections should be made using the factory supplied mating connector shells or capped if unused.

## BATTERY INSTALLATION

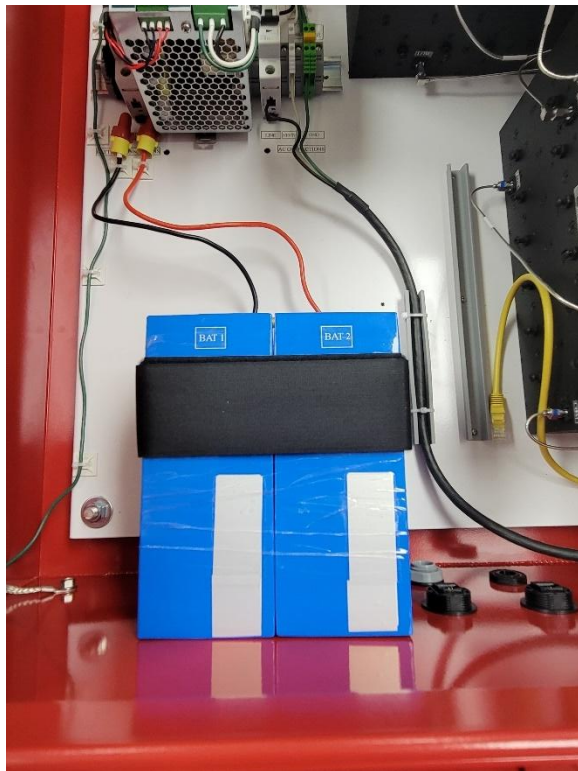


**DO NOT APPLY A.C. POWER TO THE BDA UNTIL THE BATTERIES ARE INSTALLED AND CONNECTED FOR SAFETY. ENSURE CIRCUIT BREAKERS ARE IN OFF POSITION.**

Two 12.8V LiFePO<sub>4</sub> back-up batteries supplied from the factory connected in series [Figure 5] are provided for a minimum of 12 hours operation during AC Power failure.



*Figure 5: Batteries as supplied from G-WAVE*



*Figure 6: Batteries Secured with Velcro strap*

The batteries are shipped attached together and labeled “BAT1” and “BAT2”. A Velcro strap affixed to the backplate in 1-BOX™ provides a means of securing the batteries inside the unit [Figure 6] while resting on the bottom surface. Once the batteries are secured follow the wiring instruction in the “DC Power Connections” section which follows.

## AC & DC POWER CONNECTIONS



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



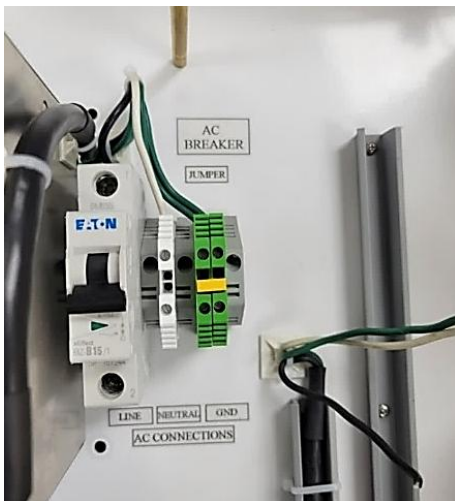
REFER TO FIGURES 7-10 WIRING DIAGRAM FOR THE FOLLOWING INSTRUCTIONS. BE SURE BOTH THE BATTERY DISCONNECT BREAKER AND THE AC DISCONNECT BREAKER ARE IN THEIR “OFF” POSITIONS BEFORE CONNECTING THE AC WIRING AND BATTERY PACK. NOTE “OFF” IS WHEN THE LEVER OF THE CIRCUIT BREAKER IS IN THE DOWNWARD POINTING POSITION AND A **GREEN** INDICATOR SHOWS IN THE TRIANGULAR WINDOW ON THE LOWER FRONT FACE OF THE BREAKER, INDICATING A DE-ENERGIZED, “SAFE” CONDITION.

### AC CONNECTIONS:

(PLEASE NOTE THAT 1-BOX™ RUNS ON AC MAINS VOLTAGE BETWEEN 90VAC and 305VAC, AUTO-RANGING).

A conduit fitting is supplied on 1-BOX™ to facilitate protected entry of AC mains wiring into the unit. Connect the three AC power wires from a dedicated AC power mains branch circuit to the 3 AC connection positions on the DIN RAIL to the right side of the UPS/Battery Charging Unit, under the label marked “AC BREAKER” as follows:

- A. Connect the GREEN (GROUND) lead to the far-right GREEN position marked “GND.”
- B. Connect the WHITE (NEUTRAL) lead to the central WHITE position marked “NEUTRAL.”
- C. Connect the BLACK (HOT) lead to circuit breaker position marked “LINE.”



**Figure 7: AC Connections (Pre-Wiring)**



**Figure 8: AC Connections (Post-Wiring)**

## BATTERY CONNECTIONS:

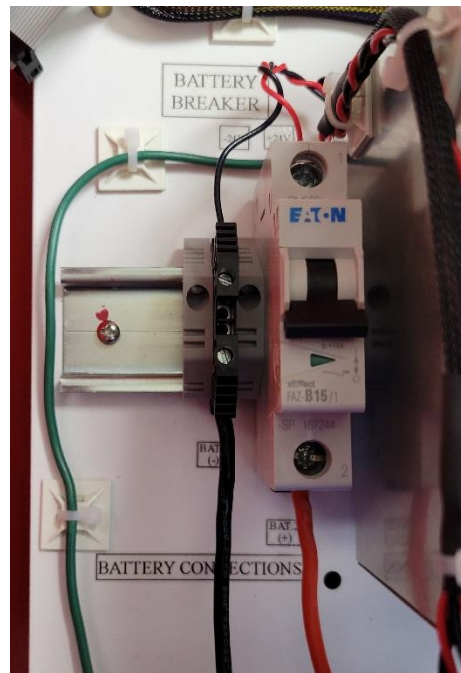
CONNECT THE INSTALLED BATTERIES ACCORDING TO THE WIRING INSTRUCTIONS BELOW. THERE ARE ONLY TWO INTERNAL BATTERY CONNECTIONS TO 1-BOX™ REQUIRED.

A UPS/Battery Charging unit maintains a 24 VOLT DC output to the unit and automatically switches to battery backup mode upon removal of the AC mains voltage. See unit specifications for the available duration of battery backup.

- Locate “**BATTERY BREAKER**” to the left of the UPS/Battery Charging Unit.
- Connect the **RED (POSITIVE)** lead of BATTERY 2 to the Battery Breaker marked “**BAT2 (+)**” to the left of the UPS/Battery Charging Unit on the DIN RAIL.
- Connect the **BLACK (NEGATIVE)** lead of BATTERY 1 to the black position marked “**BAT1 (-)**” to the left of the Battery Breaker.



**Figure 9: Battery Connections (Pre-Wiring)**



**Figure 10: Battery Connections (Post-Wiring)**

Ensure all connections are made per the above instructions and in accordance with the wiring photos in this manual. Installation of the BDA is now complete. To adjust the gain controls to suit the specific signal environment, refer to the next section (Operation) of the manual.



For the following section please ensure all RF ports are terminated in 50 ohms or connected to the antenna system prior to turning 1-BOX™ on.

TO BEGIN THE COMMISSIONING PROCESS THE AC AND DC BREAKER NEED TO BE ON THEIR “ON” POSITIONS AND THE GREEN BACKLIT DC POWER SWITCH IN ITS “ON” POSITION.

**Figure 11: DC Power Switch**



#### D. 1-BOX™ COMMISSIONING & GUI OPERATION

##### Overview

1-BOX™ provides Ethernet connectivity that allows access to a web-based user interface for communicating with the control board, checking system status, and making gain adjustments. Communications will require connecting your laptop computer to the RJ-45 port labeled “GUI”. Figure 12 shows the RJ-45 Port. Please use the RJ-45 mating shell provided with the unit’s accessories to ensure UL compliant ingress protection. Simply insert the Ethernet cable plug into the mating connector.



Figure 12: RJ-45

##### GUI Port



Ensure that the isolation between the donor antenna and the service antenna is at least **20 dB greater than the BDA gain**. Ensure donor input signal does **NOT exceed -45 dBm**. (Use the higher of the Uplink and Downlink gains reported on the BDA test data sheet). Connect the cable from the donor antenna to the BDA connector labeled “**BASE**” and the cable from the service/subscriber (DAS) antennas to the BDA connector labeled “**MOBILE**.”

##### DHCP Login

1-BOX™ units are shipped with DHCP IP assignment. You may change this to Static IP later; we will go over this in the “**Network**” section. Once 1-BOX™ is connected to the laptop via Ethernet cable, open a web browser and type [gwavebda.local:8080] in the URL. Once the page is loaded, you will be prompted to input the generic username and password.

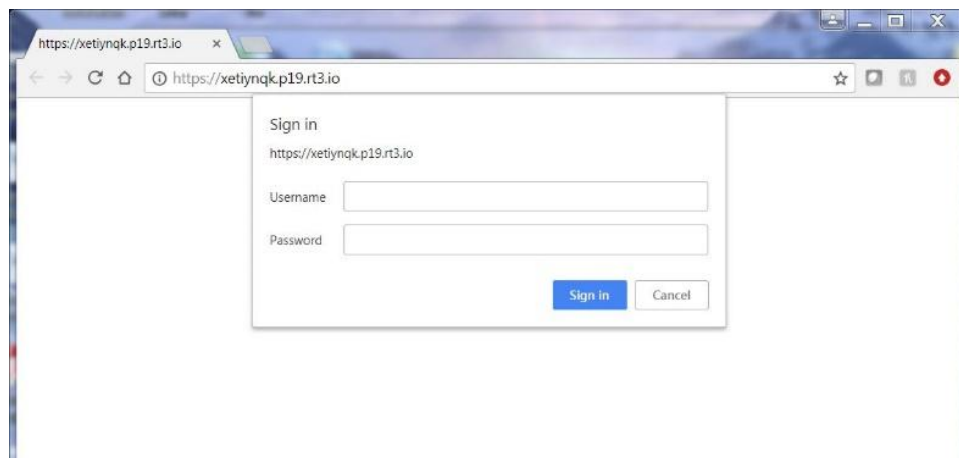
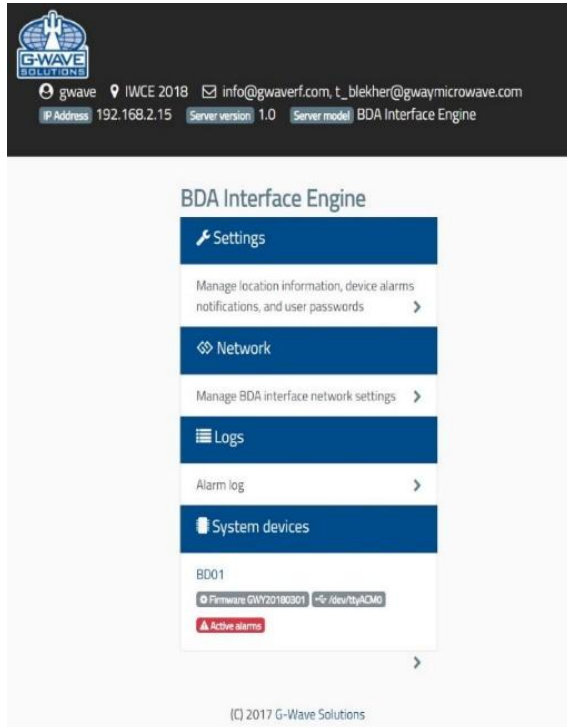


Figure 13: GUI URL Login Page

Web browser URL address: gwavebda.local:8080  
Generic Username is: gwave  
Generic Password is: gwave  
You may set a new password in the next step.



**Figure 14: GUI “Home” page**

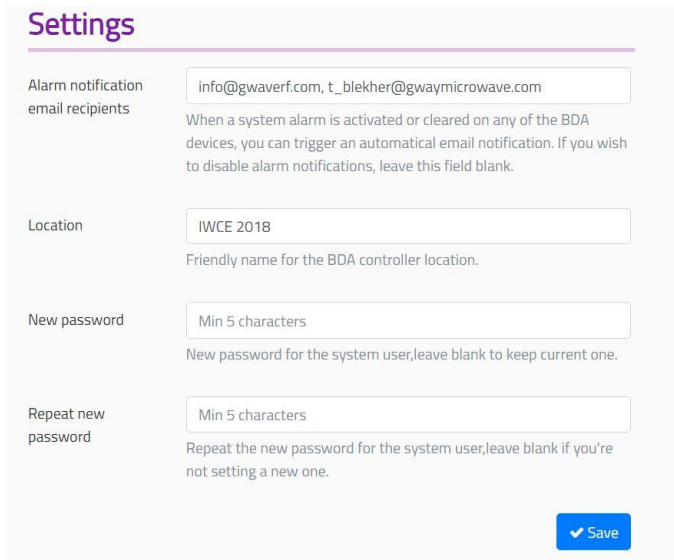
### GUI Settings

Once loaded, [Figure 15] you may adjust the alarm notification contact e-mail address(es) (for multiple e-mail addresses, please use a comma and space before entering a secondary or tertiary e-mail address), location of install (can be an address or a project name) as well as, set a new login password, username will always remain “gwave”.

Once all settings have been adjusted, click **[Save]**. To return to the Home Screen, click the green “Home” icon in the upper left-hand corner, under the G-Wave logo.

Once logged into the web-user interface, you will have access to a list of sub-menus, we will refer to this page as “Home” [Figure 14] including: “Settings”, “Network”, “Logs” and “System Devices”. The top of the page displays the system summary, including **Location**, **IP Address**, and **primary e-mail contact(s)**, which we will adjust first.

First, we will modify the settings. Click on the Sub-Menu icon labeled “Settings.”



**Figure 15: GUI Settings**

Note: Should you ever forget your password, please contact G-Wave’s Technical Support at 201-343-6388 to request a temporary password.

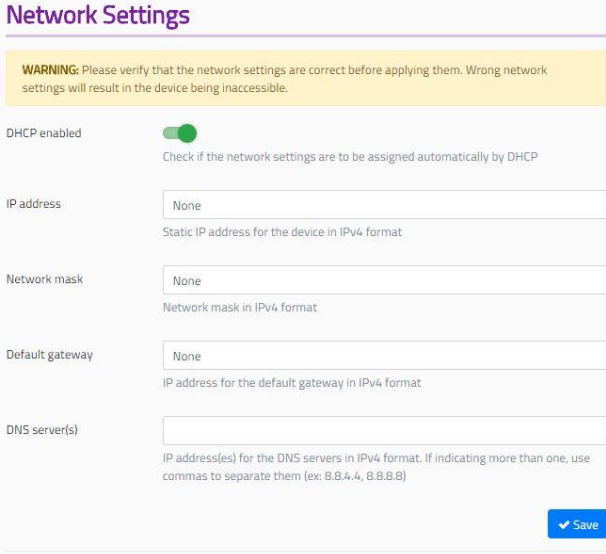
Next, we will address the Network Settings. Click on the sub-menu icon labeled “Network” on the Home Screen.

## Network Settings

Once loaded [Figure 16], you may switch from DHCP to Static IP. To do so, click the green toggle next to DHCP, to switch it to off, the toggle will be grey when Static IP is enabled. You may now assign an IP address, Network Mask, Default Gateway, and DNS Server. Please contact the LAN administrator for this information.

When finished, click save and return to the Home Page. The 1-BOX™ will then auto-reboot. Do not interrupt the reboot process. You will then need to re-login to the unit, see Appendix A to match compatibility with PC. Otherwise, if, once you save settings, you then connect to the network, you may login remotely, see remote login instructions.

Please see **Appendix A** for instructions on how to change your laptop settings to match the GUI settings for static IP, to enable local login next time you connect your laptop to the signal 1-BOX™. No changes on your laptop are required for remote login.

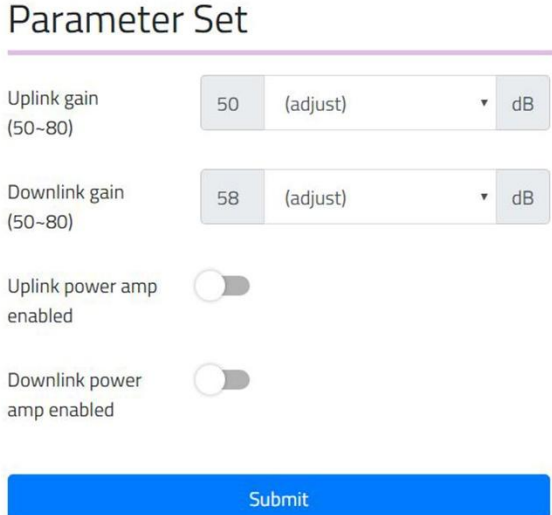


**Figure 16: GUI Network Settings**

## System Adjustments

Next, we will commission the BDA for signal enhancement. With the Donor Antenna connected to the BASE port and the coax linked to the distributed antenna system connected to the Mobile Port, you may access the “**System Devices**” from the Home Page.

On the System Devices page, you will have access to all information regarding the 1-BOX™, status, alarms as well as access to adjustments. On the left side of the page, you will see a section labeled “**Parameter Set.**” [Figure 17] Here, you can adjust system gain and enable/disable the amplifiers as needed.



**Figure 17: GUI Parameter**

## Adjust Gain/Monitor Composite Output Power

G-Wave GUI enables a user to adjust power levels whilst viewing the results. The Parameter Set Section, under Uplink and Downlink Gain, offers a drop-down menu with options: “Add 1 dB Gain” “Add 5 dB Gain” “Add 10 dB Gain” “Reduce 1 dB Gain” “Reduce 5 dB Gain” “Reduce 10 dB Gain”. After selecting one of the above adjustments, select **[Submit]** to apply the changes.

| Status                           |                                    |                        |                          |
|----------------------------------|------------------------------------|------------------------|--------------------------|
| Uplink Output Composite RF Power | Downlink Output Composite RF Power | Uplink Input RF Power  | Downlink Input RF Power  |
| Below Range dBm                  | Below Range dBm                    | Below Range dBm        | -41.08 dBm               |
| Uplink Power Amp Current         | Downlink Power Amp Current         | Uplink Pre-Amp Current | Downlink Pre-Amp Current |
| 24 mA                            | 20 mA                              | 135 mA                 | 126 mA                   |
| Uplink Power Amp Enabled         | Downlink Power Amp Enabled         |                        |                          |
| NO                               | NO                                 |                        |                          |

**Figure 18: GUI Status**

In the **[Status Section]**, on the same page, you will see the status of the composite output power for both the Uplink and Downlink Paths. [Figure 18]. These are labeled “Uplink Input RF Power” and “Downlink Input RF Power” \*Note, most G-Wave standard 1-BOX™ feature a maximum input signal level of -45 dBm. Output power is determined by the input power to the unit, plus the system gain. Should the input power exceed the maximum, you will receive an alarm notification, see Figure 20 and alarm descriptions.

Each BDA features an established ALC (Automatic Level Control), limiting the maximum output power the amplifier can produce. When adjusting the gain settings, in the event you reach ALC limitation, you will see a notification [Figure 19]. When the indicator displays “**OFF**,” you have not reached the maximum output power capacity of the amplifier. If it indicates “**ON**,” you have reached the maximum output of 1-BOX™ and gain should be reduced by 1-2 dB, until the indicator says “**OFF**”. It is not recommended to operate the BDA beyond the ALC threshold.

| ✓ This device is in good health. |              |
|----------------------------------|--------------|
| ALC                              |              |
| ALC Uplink                       | ALC Downlink |
| OFF                              | OFF          |

**Figure 19: ALC (Automatic Level Control)**

## Alarms

Alarm conditions [Figure 20] will indicate “**ON**” when triggered and issue an e-mail alert notification. Below is a brief description of each alarm condition. Alarm indicators displaying on your GUI will correlate to the listed conditions.

**Uplink Power Amp Failure:** Uplink Power Amplifier Failure, factory repair required.

**Downlink Power Amp Failure:** Downlink Power Amplifier Failure, factory repair required.

**Low DC Voltage:** This is an indicator that 1-BOX™ internal DC voltage is lower than the normal operating level. This alarm is an indication that there is damage to the battery back-up unit or low battery.

**Donor Antenna Failure:** This feature includes the donor antenna failure alarm. When that alarm is triggered, it will display on the GUI. This alarm will also disable the power amplifiers on both Uplink and Downlink paths which will be indicated in the **[Status]** section.

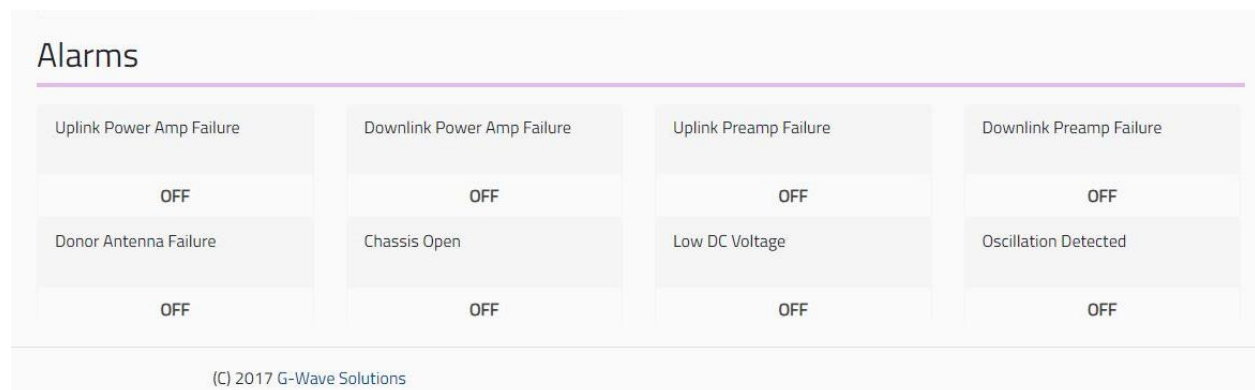
## Alarms Continued

**Chassis Open:** 1-BOX™ enclosures, enable a user to open and close the chassis door. If the chassis door is open, it will trigger an alarm.

**Oscillation Detected:** The GUI will provide an alarm if oscillation has been detected. This alarm will also disable the power amplifiers on both Uplink and Downlink paths which will be indicated in the [Status] section.

**Max Uplink Input Power Signal Exceeded:** Typically, the maximum input signal level to the 1-BOX™ is -45 dBm unless customized otherwise. To avoid damage to the pre-amplifier, it is crucial not to overdrive 1-BOX™. This indicator will alert you when you're on the threshold prior to causing damage.

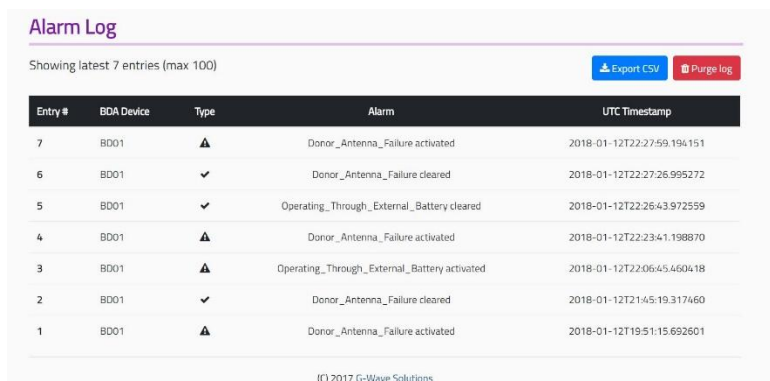
**Max Downlink Input Power Signal Exceeded:** Typically, the maximum input signal level to the 1-BOX™ is -45 dBm unless customized otherwise. To avoid damage to the pre-amplifier, it is crucial not to overdrive 1-BOX™. This indicator will alert you when you're on the threshold prior to causing damage.



**Figure 20: GUI Settings**

## Logs

G-Wave's GUI stores a record of all reported alarm conditions. As alarm statuses are triggered and cleared, the information is time stamped in the log. Access this log through the Home Page. Click "Logs" [Figure 21]. You may download a CSV file to retain a copy of the logs by selecting "Export CSV" and you may clear a log by clicking the red icon, "Purge Log."



**Figure 21: GUI Alarm Log**

### Remote Monitoring the BDA via GUI

Once 1-BOX™ is commissioned, you may disconnect your laptop. 1-BOX™ must then be connected to the Local Area Network to enable remote monitoring. Next, please reset the BDA by turning the power off and then on again. From this point forward, whenever switching the connection from the local area network directly to your laptop or vice versa 1-BOX™ will need to be reset. Once connected to the LAN with external web access, a user may remotely log in to this unit by using their web browser on any Wi-Fi enabled device. For



remote monitoring access please contact G-Wave Sales at (844) MYGWAVE (694-9283) and our team will assist and provide the purchase plans associated with remote monitoring. Please have the 1-BOX™ SKU Number, Serial Number, and access to your e-mail when you call as you will have to confirm your e-mail address to finish setting up your account. Once you have remote monitoring access your device will be visible remotely. You will be prompted to enter a username and password.

Username is: gwave

Password is: gwave (unless you changed the password during the commissioning process)

### G-WAVE Maintenance and Support

Should you have any questions during the set-up or remote login process, please do not hesitate to contact us, we are happy to assist.

G-Wave does offer a maintenance program. Should you choose to purchase this program, G-Wave engineers will be able to access your 1-BOX™ remotely and assist in any troubleshoot support available via remote login. G-Wave engineers will be able to diagnose failure, recommend a plan of action (in case an RMA does need to be issued to repair hardware), or remotely resolve an issue. For more information about G-Wave's maintenance program, please inquire via [info@gwaverf.com](mailto:info@gwaverf.com).



## Appendix A

### Static IP

Should you require a static IP connection, you will need to change the Local Area Connection Properties on your laptop to directly connect with your laptop in the future.

If using Windows, access the Network and Sharing Center under the Control Panel. **[Figure A]**

Access the Local Area Connection Status and Select Properties. **[Figure B]**

Click Internet Protocol Version 4 (TCP/IPv4). **[Figure C]**

Select: "Use the following IP address." **[Figure D]**

The IP address, Subnet Mask and Gateway you set in this step MUST match the IP address you input in the GUI at time of commissioning when switching off DHCP, except for the last digit in the IP address.

### For Example:

#### BDA GUI Settings:

IP: 192.168.0.1

MASK: 255.0.0.0

GATEWAY: 192.168.0.2

DNS: 192.168.0.2

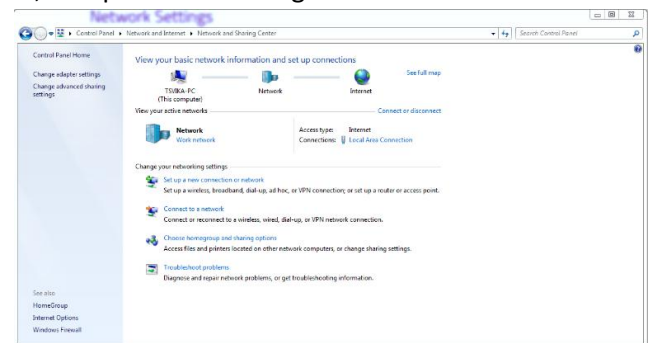
#### PC Settings:

IP: 192.168.0.2

MASK: 255.0.0.0

GATEWAY: 192.168.0.2

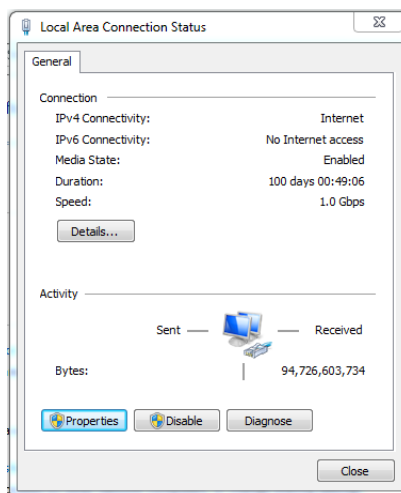
DNS: 192.168.0.2



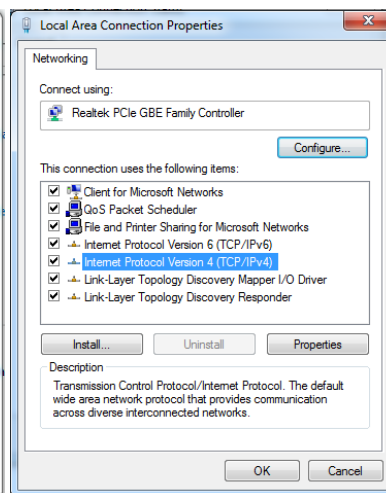
**Figure A: Network Settings**

Save settings by clicking **[OK]**. Your PC/ Laptop settings are now set.

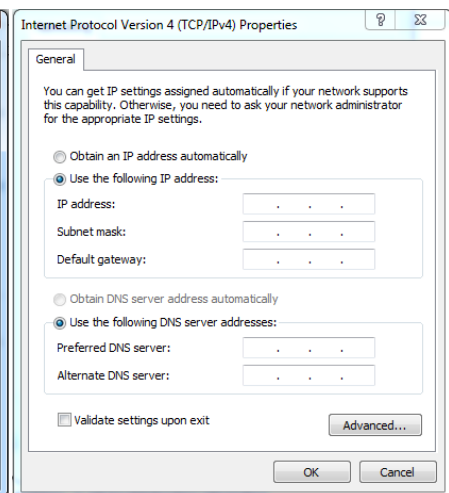
Next time you connect to the BDA locally, you will be able to access the GUI by opening a web browser and typing the IP address you set, followed by **[ :8080 ]** (or selected port). For example: 192.168.0.1:8080, login page should then load.



**Figure B**



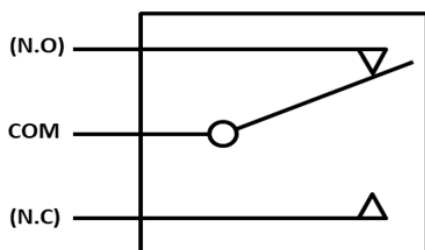
**Figure C**



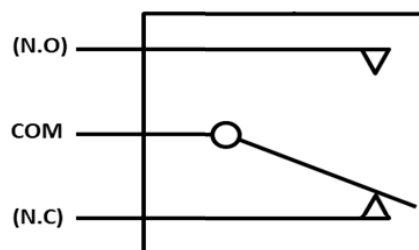
**Figure D**

## 1-BOX™ ALARM CONDITIONS

Annunciator dry contact (relay) outputs, labeled J1 through J10, are provided via 10 connectors located on the edge of the annunciator board [Figure 24]. Figures 22 & 23 below show the alarm and non-alarm conditions.



**Figure 22: Alarm Condition**

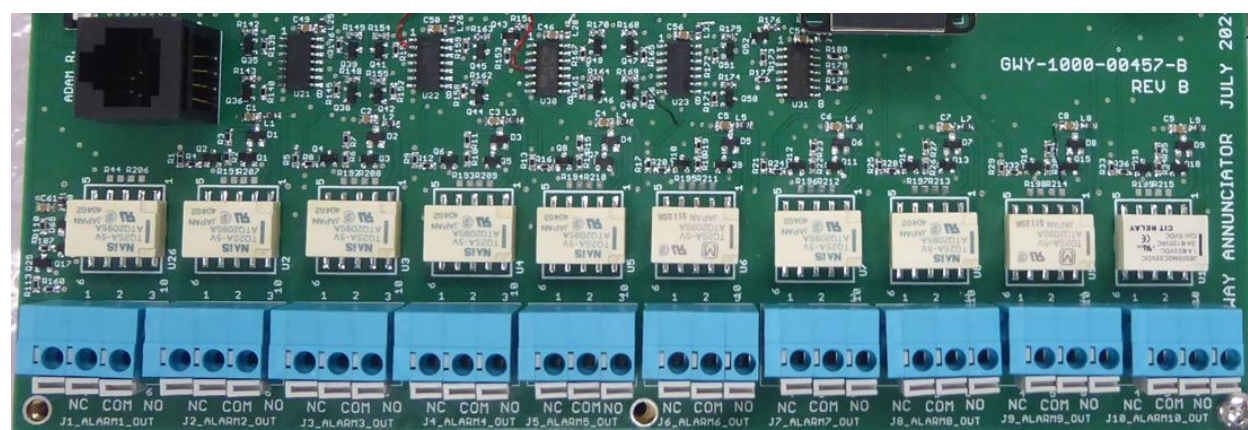


**Figure 23: Non-Alarm Condition**

These conditions are also shown by the 10 LED lights on the annunciator front panel to the left of the descriptive text for each condition.

| Alarm Reported                              | Normal Operation LED | Active Alarm LED | Dry Contact Connector |
|---------------------------------------------|----------------------|------------------|-----------------------|
| Normal AC Power                             | ●                    | OFF              | J1                    |
| Loss of Normal AC Power                     | OFF                  | ●                | J2                    |
| Battery Charger Failure                     | ●                    | ●                | J3                    |
| Low-Battery Capacity (70% Depletion)        | ●                    | ●                | J4                    |
| Signal Source Malfunction                   | ●                    | ●                | J5                    |
| Active RF-Emitting Device Malfunction       | ●                    | ●                | J6                    |
| Active System Component Malfunction         | ●                    | ●                | J7                    |
| Oscillation of Active RF-Emitting Device(s) | ●                    | ●                | J8                    |
| Communications Link to Annunciator(s)       | ●                    | ●                | J9                    |
| Spare Alarm                                 | ●                    | ●                | J10                   |

**Table 6: 1-BOX™ Annunciator dry contact alarms and LED Conditions**



**Figure 24: Annunciator Dry Contact Connector for Alarming**

## DIAGNOSTICS GUIDE

The BDA provides long-term, care-free operation and requires no periodic maintenance. There are no user-serviceable components inside the BDA. This section covers potential problems that may be related to the installation or operating environment.

**A. GAIN REDUCTION:** Potential causes – Bad RF cables and RF connections to antennas, damaged antennas.

**B. EXCESSIVE INTERMODULATION OR SPURIOUS:** Potential causes – Amplifier oscillation caused by insufficient isolation. The isolation between two antennas can be calculated by the equation:

$$\text{Isolation} = 92.5 + 20 \log (F \times D) - G_t - G_r$$

Where:

F = frequency (GHz)       $G_t$  = transmit antenna gain (in the direction of the receive antenna)  
D = separation (Km)       $G_r$  = receive antenna gain (in the direction of the transmit antenna)

For example, at the SMR frequencies, the antenna isolation at 100 m separation is about 71 dB for omnidirectional antennas (0 dB gain). To increase isolation, the antennas should have higher directivity and must point away from each other.

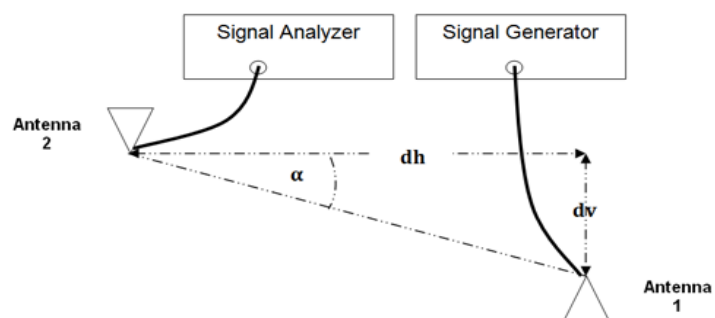
**C. OCCASIONAL DROP-OUT OF SPECIFIC CHANNELS:** Potential causes – One channel with very strong power dominates the RF output of the amplifier. This can be corrected by proper distribution of the server antenna system.

## ANTENNA SEPARATION

BDA oscillation is caused by low isolation (antenna separation) between donor antenna and service antennas. The recommended isolation between those antennas is 20 dB above the system gain. The amount of isolation that can be achieved between antennas depends on several factors, such as the physical vertical and horizontal separation (distance between the antennas), polarization, radiation pattern of the antennas, the medium between the antennas, antenna gain etc.

Antenna isolation can most accurately be determined through on-site measurements. Antenna isolation measurement configuration is illustrated in Figure 25, where two spatially separated antennas (service antenna #1 and donor antenna #2) are connected to a signal generator and signal analyzer.

A signal at center frequency is generated by the signal generator sent to the input of antenna 1; the output of the signal at antenna 2 is measured and recorded by the signal analyzer. By calibrating for the cable loss, the difference of signal power level at the output of antenna 2 and that at the antenna 1 input is the antenna isolation.



**Figure 25**

## TECHNICAL SUPPORT

For any technical information, product installation instructions, deployment or technical support please contact G-WAVE. Our technical support team can assist with troubleshooting and diagnostics. If you need to request an RMA, please contact the toll-free number or e-mail below for support.

[TechSupport@GWaveRF.com](mailto:TechSupport@GWaveRF.com)

[RMA@GWaveRF.com](mailto:RMA@GWaveRF.com)

Tel: (201) 343-6388 Ext. 2



# 1-BOX™



G-WAVE offers Installer/Design training and certification. For any sales or other assistance please contact the e-mail below for support.

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