

# **User Manual**

**Version 1.0**

# Revision History

| Rev No. | Change Notification | Date       | Remarks |
|---------|---------------------|------------|---------|
| V1.0    | Draft               | 2024.07.26 |         |
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## **1. FCC and ISED Mandatory**

### **1.1 FCC Warning States**

#### **1.1.1 FCC Part 15.19 Warning**

The device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

#### **1.1.2 FCC Booster Warning Label**

##### **1) 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](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.

#### **1.1.3 FCC Booster Warning Statements**

Use of unauthorized antennas, cables, and/or coupling devices not conforming with ERP/EIRP and/or indoor-only restrictions is prohibited.

Home/ personal use are prohibited.

Only 50 ohm rated antennas, cables and passive equipment shall be used with this remote. Any equipment attached to this device not meeting this standard may cause degradation and unwanted signals in the bi-directional system. All components connected to this device must operate in the frequency range of this device.

#### 1.1.4 FCC Part 15 Class A

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

#### 1.1.5 RF Radiation Exposure

This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of UL: 90cm, DL: 100cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. RF exposure will be addressed at time of installation and the use of higher gain antennas require larger separation distances.

(DL: Pannel antenna Max. peak gain: 8 dBi, UL: LDPA antenna Max. peak gain: 9 dBi)

### 1.2 ISED Warning states

#### 1.2.1 ISED Warning Label

WARNING: This is NOT a CONSUMER device. It is designed for installation by an installer approved by an ISED licensee. You MUST have an ISED LICENCE or the express consent of an ISED licensee to operate this device.

AVERTISSEMENT: Ce n'est PAS un appareil de consommation. Il est conçu pour être installé par un installateur approuvé par un titulaire de licence d'ISD. Vous DEVEZ avoir une LICENCE d'ISDE ou le consentement exprès d'un titulaire de licence d'ISDE pour utiliser cet appareil.

#### 1.2.2 RF Radiation Exposure

This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of UL: 90cm, DL: 100cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. RF exposure will be addressed at time of installation and the use of higher gain antennas require larger separation distances.

(DL: Pannel antenna Max. peak gain: 8 dBi, UL: LDPA antenna Max. peak gain: 9 dBi)

L'antenne (ou les antennes) doit être installée de façon à maintenir à tout instant une distance minimum de au moins UL: 90cm, DL: 100cm entre la source de radiation (l'antenne) et toute personne physique. Cet appareil ne doit pas être installé ou utilisé en conjonction avec une autre antenne ou émetteur.

(DL: Pannel antenna Max. peak gain: 8 dBi, UL: LDPA antenna Max. peak gain: 9 dBi)

*Information in this document is subject to change without notice.*

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## 2. General Information

This document is primarily written for those who are new to 700/800 0.5W BDA system and wish to tune up the equipment. The document is applicable to below products from DKK.

### 2.1 Repeater Information (FCC & ISED ID)

| CERTIFICATION | TYPE | ID                 | NOTES |
|---------------|------|--------------------|-------|
| FCC           | B9A  | 2BKJD-IT109B016-UA |       |
|               | B9B  | 2BKJD-IT109B016-UB |       |
| ISED          | B9A  | 32982-IT109B016CA  |       |
|               | B9B  | 32982-IT109B016CB  |       |

### 2.2 Purpose

700/800 0.5W BDA is a system that generally supports public safety wireless services indoors, and is necessary for first aid workers and firefighters to communicate with each other in emergencies and normal situations.

700/800 0.5W BDA is a digital repeater that supports 700MHz band and 800MHz band. Bandwidth varies based on FPGA, and up to 32 channels can be selectively serviced through software through digital filter.

### 2.3 Advantages

- 700MHz/800MHz Dual Band
- 32 Channels Class B Filter per Band
- LED for Status Check
- Automatic Gain Control
- DL/UL Squelch
- Oscillation Detection
- Isolation Check
- Auto Shutdown
- Donor antenna malfunction and donor antenna disconnect
- Support Web GUI and SNMP v3.0

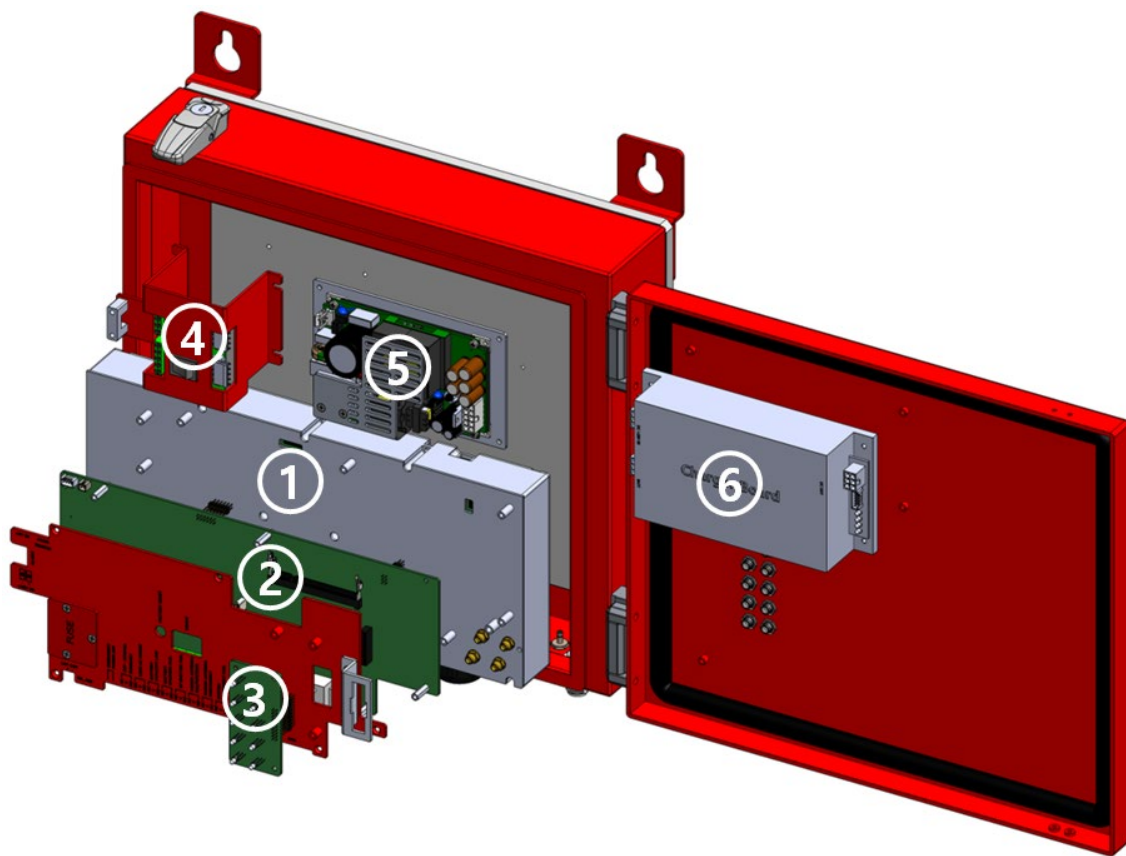
## 2.4 Exterior



| No. | PARAMETER            | DESCRIPTION                   | NOTES                                       |
|-----|----------------------|-------------------------------|---------------------------------------------|
| 1   | DONOR                | Donor antenna port            | N-type                                      |
| 2   | SERVICE              | Service antenna port          | N-type                                      |
| 3   | TX CPL               | UL output coupling port       | SMA                                         |
| 4   | RX CPL               | DL output coupling port       | SMA                                         |
| 5   | 110-220VAC & BATTERY | AC power and battery DC power | Liquid Tight<br>Conduit Fittings (3/4 inch) |

|   |             |                                                           |                                          |
|---|-------------|-----------------------------------------------------------|------------------------------------------|
| 6 | ANNUNCIATOR | Provide power and alarm signaling to a remote annunciator | Liquid Tight Conduit Fittings (1/2 inch) |
| 7 | ALARM RELAY | Provide wired connection to alarm                         | Liquid Tight Conduit Fittings (1/2 inch) |
| 8 | GUI         | Communications with a network                             | RJ-45                                    |

## 2.5 Interior



| No. | PARAMETER           | DESCRIPTION                                               | NOTES                             |
|-----|---------------------|-----------------------------------------------------------|-----------------------------------|
| 1   | RFM & DTU           | RF board, digital board and PAMs are built in             | Top: RF board<br>Bottom: DTU, PAM |
| 2   | WEB GUI/ALARM Board | Web GUI and alarm functionality integrated into one board |                                   |
| 3   | LED                 | Display of system and alarm state                         | 9 LEDs                            |
| 4   | Power Switch Board  | AC power ON/OFF                                           |                                   |
| 5   | PSU                 | AC/DC converter                                           |                                   |
| 6   | Charger Module      | Provides battery charging and DC power                    |                                   |

### 3. Specifications

#### 3.1 Frequency Range

| SERVICE BAND    | DOWNLINK [MHz] |        |      | UPLINK [MHz] |        |      |
|-----------------|----------------|--------|------|--------------|--------|------|
|                 | LOW            | CENTER | High | LOW          | CENTER | High |
| 700MHz (US)     | 769            | 772    | 775  | 799          | 802    | 805  |
| 700MHz (CANADA) | 768            | 772    | 776  | 798          | 802    | 806  |
| 800MHz (US)     | 851            | 856    | 861  | 806          | 815    | 816  |
| 800MHz (CANADA) | 866            | 867.5  | 869  | 821          | 822.5  | 824  |

#### 3.2 RF Specifications

| PARAMETER                            |         | DOWNLINK                                             | UPLINK         |
|--------------------------------------|---------|------------------------------------------------------|----------------|
| Output Power                         | 700MHz  | 27dBm                                                | 24dBm          |
|                                      | 800MHz  | 27dBm                                                | 24dBm          |
| Input Dynamic Range                  |         | -63dBm ~ -3dBm                                       | -56dBm ~ +4dBm |
| Gain Range                           |         | 30dB ~ 90dB                                          | 20dB ~ 80dB    |
| Gain Adjustment Range per CH         |         | 30dB/1.0dB steps                                     |                |
| Gain Adjust Accuracy                 |         | ±1dB                                                 |                |
| Input AGC Dynamic Range              |         | 60dB                                                 |                |
| Max RF Input Power without Overdrive |         | -10dBm                                               | -10dBm         |
| Max RF Input Power without Damage    |         | 0dBm                                                 | +10dBm         |
| Noise figure                         |         | 6dB Max @ Max Gain                                   |                |
| Pass Band Ripple                     |         | 3dB peak to peak                                     |                |
| Number of Channel Filter             | Class B | 32 Channel                                           |                |
| Filter Bandwidth                     | Class B | 100kHz, 150kHz, 250kHz                               |                |
| Delay                                | Class B | < 16.5us @ 100kHz                                    |                |
|                                      |         | < 16.5us @ 150kHz                                    |                |
|                                      |         | < 16.5us @ 250kHz                                    |                |
| Roll Off                             | Class B | ≥ 60dBc @ Fc±260kHz (BW 100kHz)                      |                |
|                                      |         | ≥ 60dBc @ Fc±285kHz (BW 150kHz)                      |                |
|                                      |         | ≥ 60dBc @ Fc±335kHz (BW 250kHz)                      |                |
| EVM                                  |         | ≤ 4.0% @ P25 phase 1 and phase 2 modulation          |                |
| UL Squelch Threshold                 |         | -90~-50dBm @ Per Class B Channel must have a disable |                |

|                          |                                                 |
|--------------------------|-------------------------------------------------|
| VSWR                     | $\leq 1.5:1$                                    |
| Spurious                 | $\leq -13\text{dBm}$ (FCC Title 47 Part 90.219) |
| Characteristic Impedance | $50\Omega$                                      |

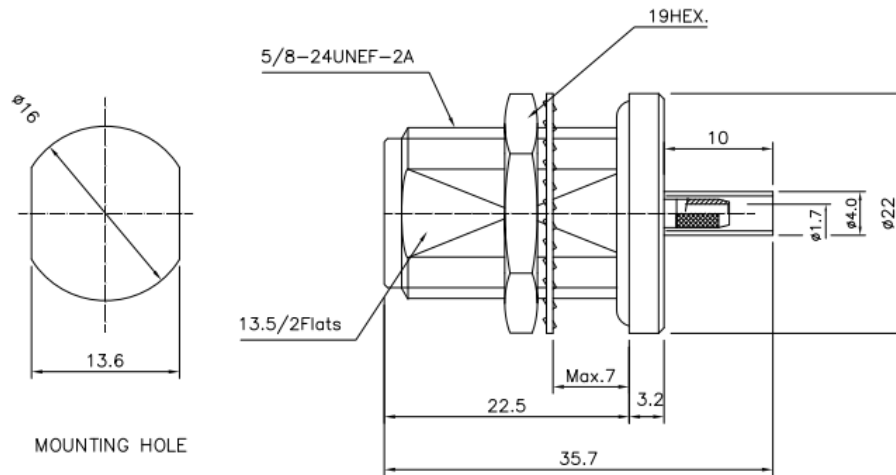
### 3.3 Mechanical Specifications

| PARAMETER              | DESCRIPTION                    | NOTES |
|------------------------|--------------------------------|-------|
| Dimensions (H x W x D) | 380 x 330 x 143mm              |       |
| Weight                 | $\leq 15.5\text{kg}$           |       |
| Operating Voltage      | 110VAC, 50/60Hz                |       |
| Power Consumption      | $\leq 75\text{W}$              |       |
| Operating Temperature  | $-30 \sim +50^{\circ}\text{C}$ |       |
| Operating Humidity     | $\leq 95\%$                    |       |
| Enclosure Cooling      | Convection                     |       |
| Enclosure Class        | IP65 / NEMA 4X                 |       |

## 4. Integrated Enclosure Interfaces

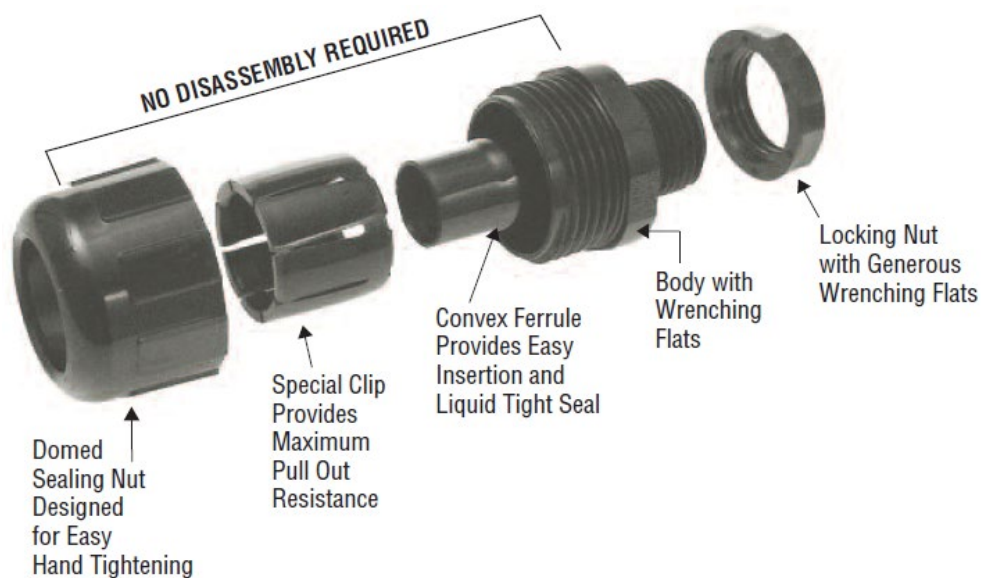
### 4.1 DONOR & SERVICE Connector

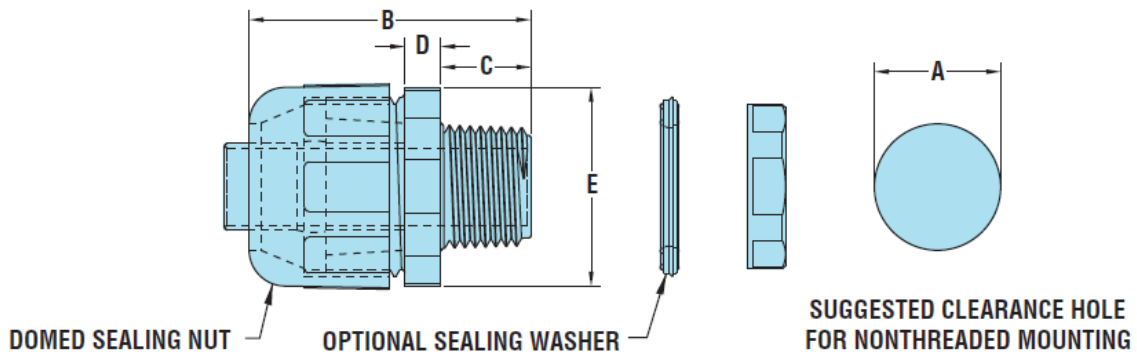
700/800 0.5W BDA adopts an N-type female connector. If the user wants to use a 4.3-10 Mini DIN cable or connector, they need an adapter.



### 4.2 110-220VAC & BATTERY Feedthrough

Feedthrough to provide AC power and battery DC power to BDA. That uses 3/4 inch liquid tight conduit fittings.





| FITS<br>CONDUIT/<br>TUBING<br>TRADE<br>SIZE | PART NO. |      | DESCRIPTION  | THREAD<br>SIZE | PART DIMENSIONS<br>BODY AND SEALING UNIT |      |                     |      |                  |      |                       |           |      |      |
|---------------------------------------------|----------|------|--------------|----------------|------------------------------------------|------|---------------------|------|------------------|------|-----------------------|-----------|------|------|
|                                             | Black    | Gray |              |                | A                                        |      | B                   |      | C                |      | D                     |           | E    |      |
|                                             |          |      |              |                | Clearance<br>Hole                        |      | Max. O.A.<br>Length |      | Thread<br>Length |      | Wrenching<br>Nut Thk. | Flat Size |      |      |
|                                             |          |      |              |                |                                          |      |                     |      |                  |      |                       |           | in.  | mm.  |
| 1/4                                         | 8398     | -    | HFC 1/4-PG7* | PG7            | .492                                     | 12,5 | 1.13                | 28,7 | .45              | 11,4 | .21                   | 5,3       | 1.00 | 25,4 |
| 3/8                                         | 8400     | 8401 | HFC 3/8      | 1/2" NPT       | .875                                     | 22,2 | 1.96                | 49,8 | .63              | 16,0 | .25                   | 6,3       | 1.33 | 33,7 |
| 1/2                                         | 8402     | 8403 | HFC 1/2      |                | **                                       |      |                     |      |                  |      |                       |           |      |      |
| 3/4                                         | 8404     | 8405 | HFC 3/4      | 3/4" NPT       | 1.109                                    | 28,1 | 2.04                | 52,8 | .63              | 16,0 | .25                   | 6,3       | 1.56 | 39,6 |
| 1                                           | 8406     | 8407 | HFC 1        | 1" NPT         | 1.375                                    | 34,9 | 2.25                | 57,2 | .78              | 19,8 | .25                   | 6,3       | 1.81 | 46,0 |
| 1-1/4                                       | 8638     | 8639 | HFC 1-1/4 †  | 1-1/4" NPT     | 1.734                                    | 44,0 | 2.07                | 52,6 | .69              | 17,4 | .25                   | 6,3       | 2.15 | 54,6 |
| 1-1/2                                       | 8640     | 8641 | HFC 1-1/2 †  | 1-1/2" NPT     | 1.984                                    | 50,4 | 2.28                | 57,9 | .78              | 19,8 | .28                   | 7,0       | 2.40 | 61,0 |
| 2                                           | 8642     | 8643 | HFC 2 †      | 2" NPT         | 2.469                                    | 62,7 | 2.26                | 66,0 | .85              | 21,6 | .31                   | 7,9       | 2.98 | 75,6 |

### 4.3 ANNUNCIATOR Feedthrough

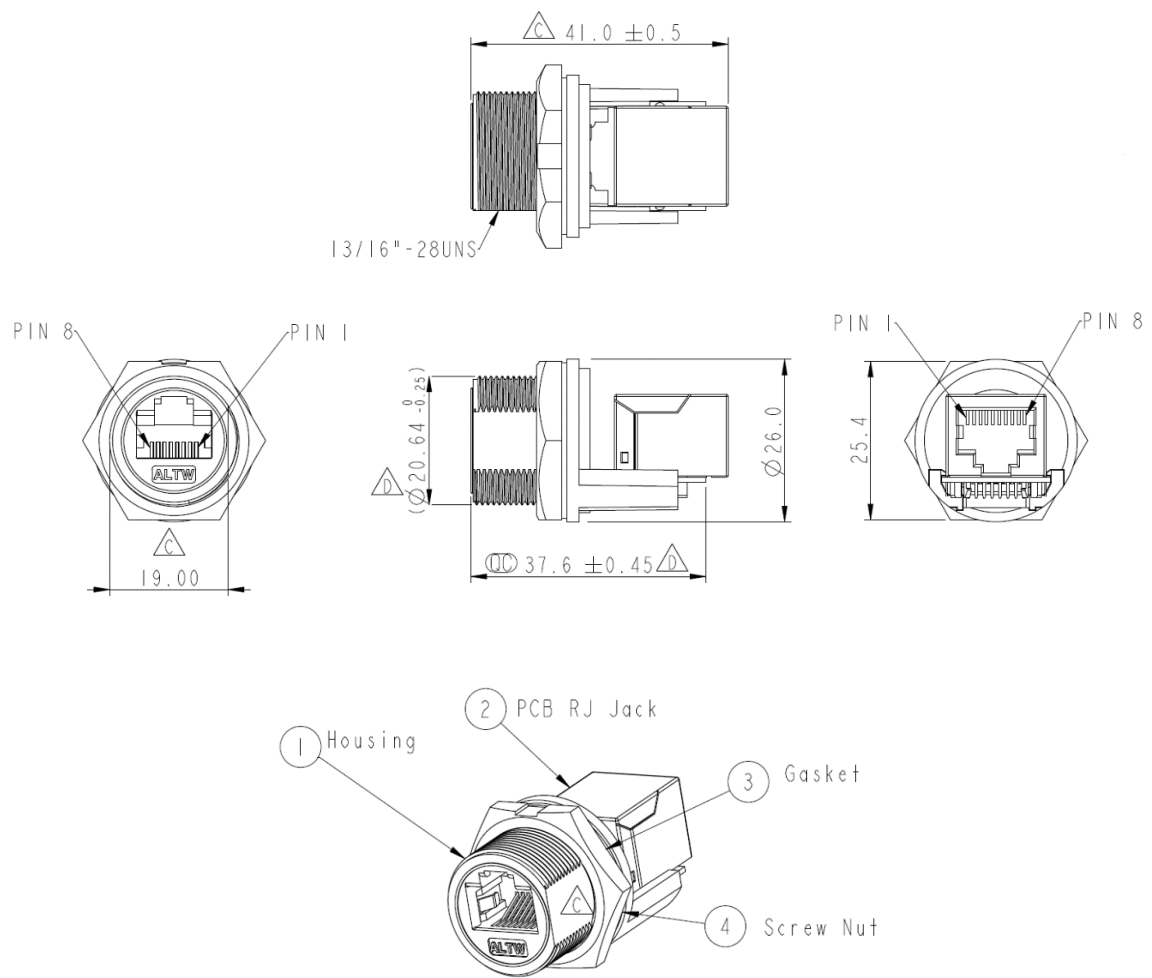
Feedthrough to provide power and alarm signaling to a remote annunciator. That uses 1/2 inch liquid tight conduit fittings.

### 4.4 ALARM RELAY Feedthrough

Feedthrough to provide wired connection to one status signal and 7 UL2524 required alarms. That uses 1/2 inch liquid tight conduit fittings.

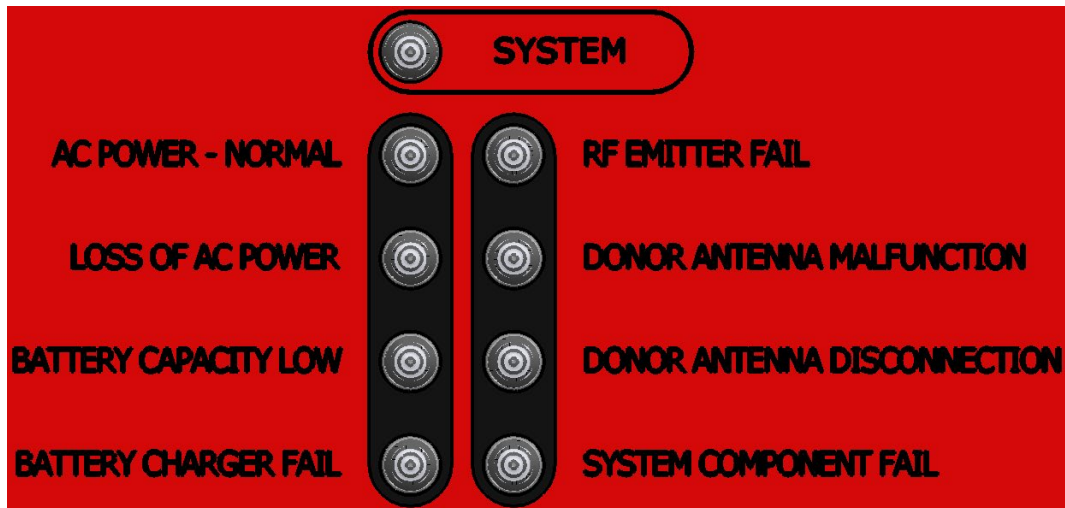
### 4.5 GUI Connector

Ethernet connector port for communications with a network. User can use the Web GUI to control and monitor the BDA in remote or local locations.



## 5. LED Indicators

The BDA has 1 system LED and 8 alarm LEDs that visibly display system status and UL2524 alarms.



### 5.1 SYSTEM LED

The SYSTEM LED is a tricolor LED - GREEN, YELLOW, RED

| LED COLOR | STATE                                         |
|-----------|-----------------------------------------------|
| GREEN     | SYSTEM NORMAL - POWER ON                      |
| YELLOW    | ANY ALARM DETECTED - SYSTEM OPERATIONAL       |
| RED       | ANY ALARM DETECTED - SYSTEM NOT OPERATIONAL   |
| GREEN     | ALARM RELAY INTERFACE ALARM ACTIVE BUT MASKED |
| OFF       | NO DC POWER PRESENT                           |

### 5.2 ANNUNCIATOR LEDs

There are 8 LEDs which colors are defined as follows:

| LED COLOR | STATE                                      |
|-----------|--------------------------------------------|
| GREEN     | AC POWER NORMAL                            |
| RED       | LOSS OF AC POWER                           |
| RED       | BATTERY CAPACITY LOW                       |
| RED       | BATTERY CHARGER FAIL                       |
| RED       | RF EMITTER FAIL<br>- DL 700 Amplifier Fail |

|     |                                                                                                                                                                                                                                    |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | <ul style="list-style-type: none"> <li>- DL 800 Amplifier Fail</li> <li>- UL 700 Amplifier Fail</li> <li>- Over Temperature</li> <li>- Donor Antenna Disconnection</li> <li>- Oscillation Detection - Service Affecting</li> </ul> |
| RED | DONOR ANTENNA MALFUNCTION                                                                                                                                                                                                          |
| RED | DONOR ANTENNA MALFUNCTION                                                                                                                                                                                                          |
| RED | SYSTEM COMPONENT FAIL <ul style="list-style-type: none"> <li>- Over Temperature</li> <li>- Oscillation Detection - Reduced Gain</li> <li>- Oscillation Detection - Service Affecting</li> </ul>                                    |

## **6. Installation Guide**

### **6.1 Environment**

#### **6.1.1 Antenna**

The antenna used in the BDA must be certified or an antenna with equivalent specifications. The company shall not bear any liability for any problems arising from the use of an uncertified antenna.

The donor antenna must be mounted outside the building with the strongest cell signals. Mount the donor antenna as high as possible facing towards the desired location of the cell tower and facing the opposite direction of the expected location of the service antenna.

The server antenna must be mounted.

#### **6.1.2 Isolation Check and Gain Setting**

If the system wants to operate in the max gain state, the system requires sufficient isolation between the donor and service antennas. The system recommends isolation be higher than 20dB above the gain of the system. If isolation is not sufficiently ensured, the Isolation Check function operates to reduce the gain to a level suitable for the ensured isolation.

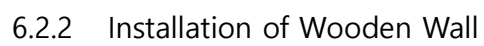
### **6.2 Mounting the BDA**

Choose a location for the BDA, preferably away from excessive heat, direct sunlight, moisture and is free from high temperatures.

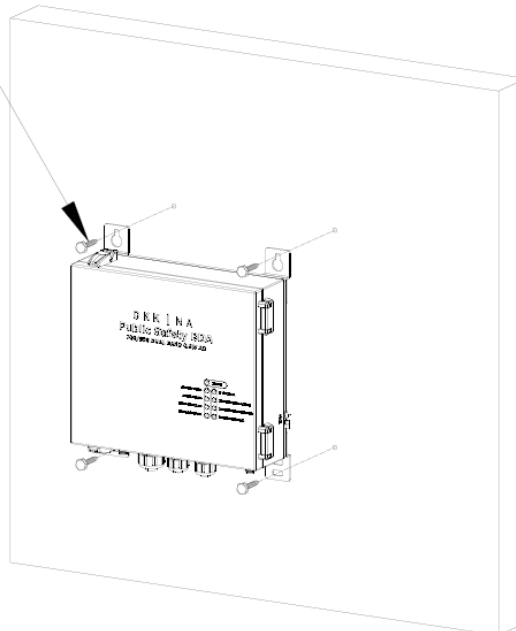
#### **6.2.1 Installation of Concrete Wall**

The following illustration is an example of a concrete wall installation.

### 3/8" Nut & Washer



5/16" Hex Lag Screw



## 7. Web GUI Configuration

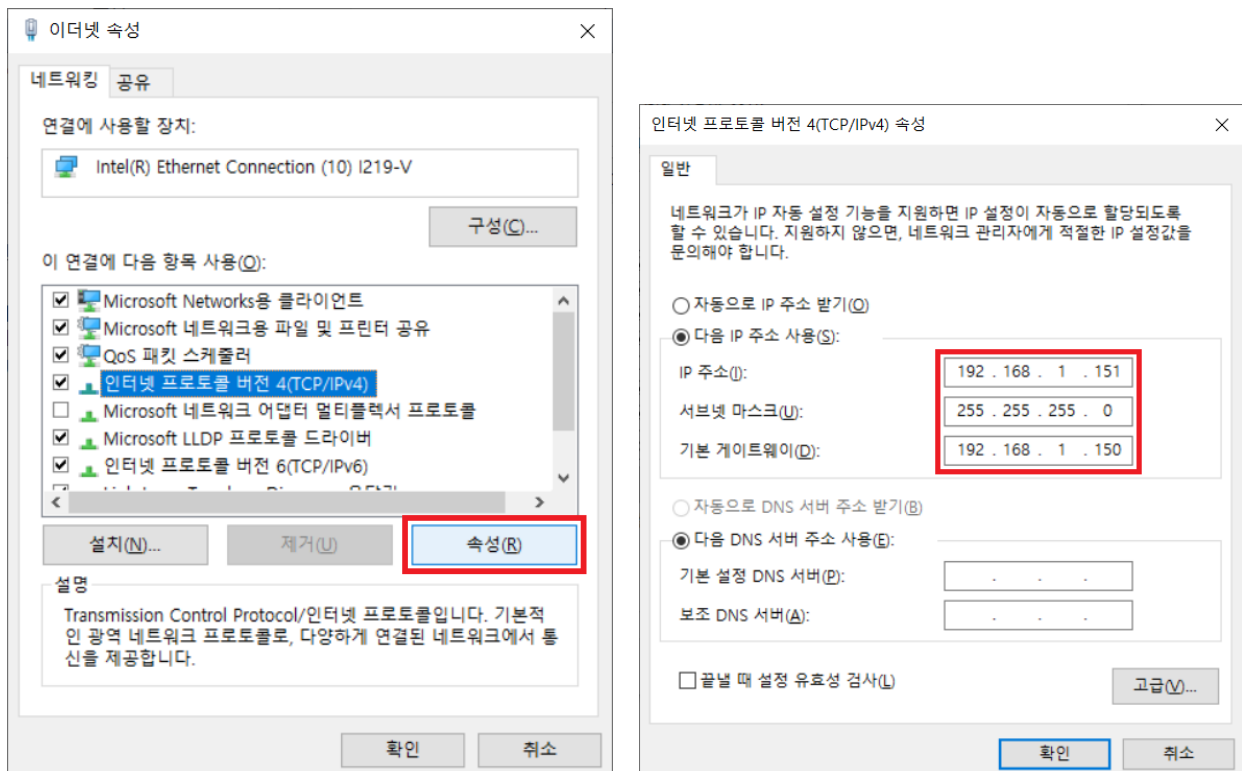
### 7.1 Web GUI Overview

Supports Web GUI pages through the ethernet interface.

### 7.2 Laptop Configuration for Connect to the Repeater

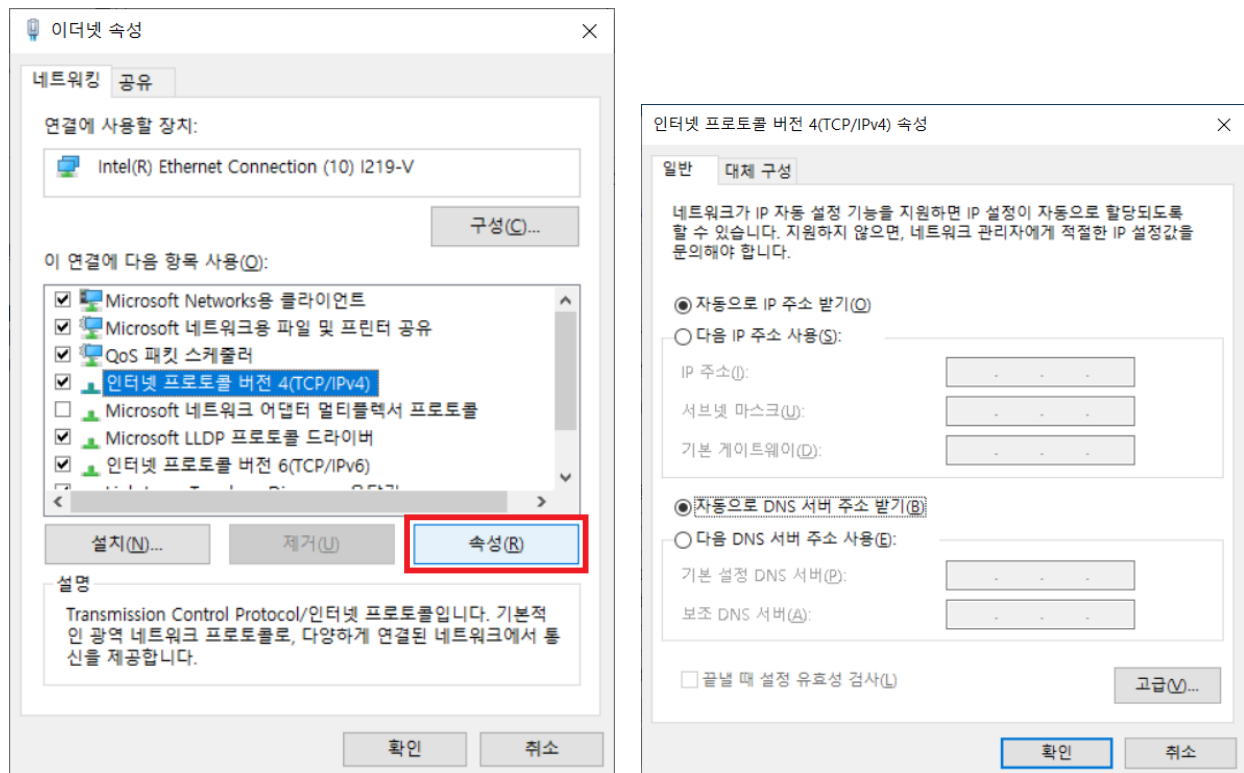
Connect the ethernet cable to the GUI port at the bottom of the repeater or the LOCAL\_GUI port inside the repeater.

#### 7.2.1 GUI Port Connect



- 1) Select 'Internet Protocol Version 4(TCP/IPv4)' in the Ethernet Properties window and click Properties.
- 2) Enter the IP address (192.168.1.151), the subnet mask (255.255.255.0), and the default gateway (192.168.1.150) as shown in the figure above, and then click OK.

## 7.2.2 NMS Port Connect



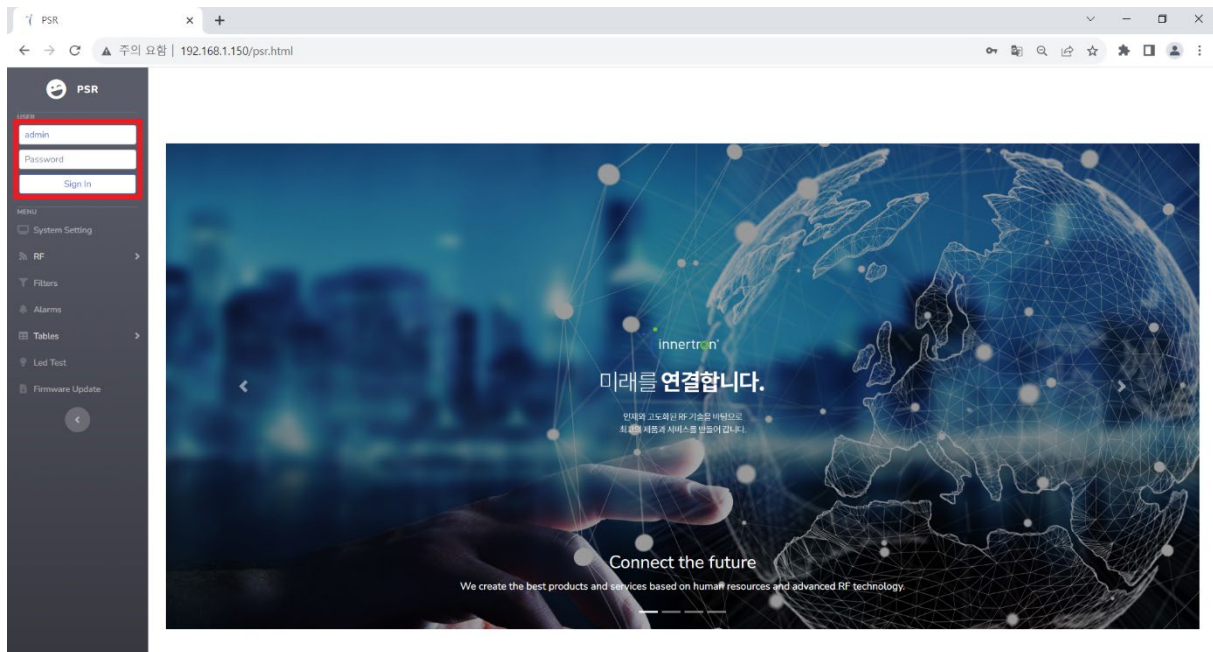
- 1) Select 'Internet Protocol Version 4(TCP/IPv4)' in the Ethernet Properties window and click Properties.
- 2) Select 'Obtain IP address automatically.'
- 3) Select 'Obtain DNS server address automatically and click OK.

## 7.3 Web GUI Connect and Sign In

- 1) Enter '192.168.1.150/psr.html' in the Internet address window to access the Web GUI.

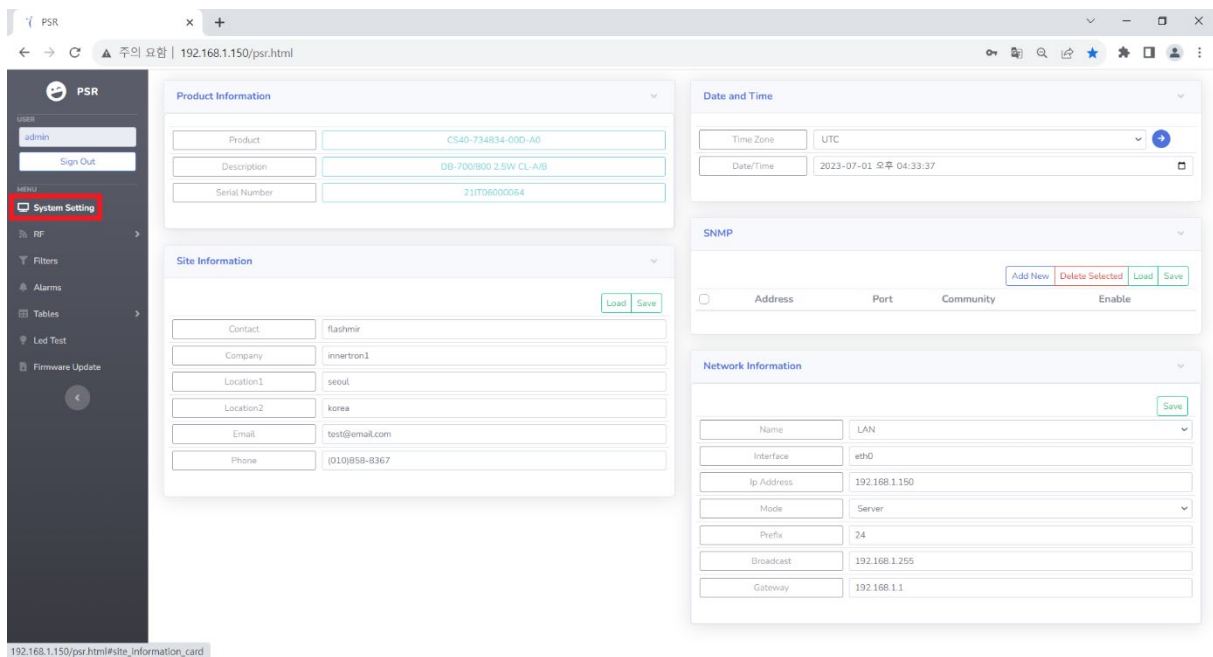


- 2) On the Web GUI screen, type "admin" in ID and P/W and click Sign In button.



## 7.4 System Setting Screen

- 1) Can check the system information(Product, Site, Network, etc) on the system setting screen.



## 7.5 RF Configuration / General / Operation Screen

1) Can change the RF setting of the repeater on this screen.

The screenshot displays the PSR web interface for RF Configuration. The sidebar menu on the left includes 'System Setting', 'RF Configuration' (highlighted), 'RF General', 'RF Operation', 'Filters', 'Alarms', 'Tables', 'Led Test', and 'Firmware Update'. The main content area is divided into two panels: '700MHz Configuration' and '800MHz Configuration'. Each panel contains a table of settings for various RF parameters, including Gain, Input AGC, Output AGC, Squelch, Output Alt AGC, Oscillation, Donor Antenna Level, and Isolation. Below these are calibration settings for Frequency Offset, Malfunction Offset, Isolation Offset, DNC Atten Offset, Input Offset, and Output Offset. The '700MHz Configuration' panel shows settings for 700MHz, while the '800MHz Configuration' panel shows settings for 800MHz. The '700MHz Calibration' panel shows settings for 700MHz, and the '800MHz Calibration' panel shows settings for 800MHz.

The screenshot displays the PSR web interface for RF Configuration. The sidebar menu on the left includes 'System Setting', 'RF Configuration' (highlighted), 'RF General', 'RF Operation', 'Filters', 'Alarms', 'Tables', 'Led Test', and 'Firmware Update'. The main content area is divided into three panels: 'RF Module Enable/Disable', 'RF Temperature Alarm Configuration', and 'RF Configuration Export/Import'. The 'RF Module Enable/Disable' panel shows a table of modules and their enable/disable status. The 'RF Temperature Alarm Configuration' panel shows settings for RFM Temperature, HPA Temperature, and Alarm Threshold. The 'RF Configuration Export/Import' panel shows buttons for Export and Import.

**Attenuator**

| Group | Index | Value | Put  |
|-------|-------|-------|------|
| DL700 | 1     | 0.0   | dB + |
|       | 2     | 0.0   | dB + |
|       | 3     | 30.0  | dB + |
|       | 4     | 30.0  | dB + |
| DL800 | 1     | 0.0   | dB + |
|       | 2     | 0.0   | dB + |
|       | 3     | 30.0  | dB + |
|       | 4     | 30.0  | dB + |
| UL700 | 1     | 0.0   | dB + |
|       | 2     | 0.0   | dB + |
|       | 3     | 30.0  | dB + |
|       | 4     | 30.0  | dB + |
| UL800 | 1     | 0.0   | dB + |
|       | 2     | 0.0   | dB + |
|       | 3     | 30.0  | dB + |
|       | 4     | 30.0  | dB + |

**ADC**

| Path       | Name        | Value      | Power      |
|------------|-------------|------------|------------|
| DL 700     | HPA Reverse | 0.000 Volt | 0.0 dBm    |
|            | HPA Forward | 0.001 Volt | 0.0 dBm    |
|            | Antenna In  | 0.707 Volt | -110.0 dBm |
| DL 800     | HPA Reverse | 0.001 Volt | 0.0 dBm    |
|            | HPA Forward | 0.001 Volt | 0.0 dBm    |
|            | Antenna In  | 1.026 Volt | -110.0 dBm |
| UL 700/800 | HPA Reverse | 0.000 Volt | 0.0 dBm    |
|            | HPA Forward | 0.000 Volt | 0.0 dBm    |

**FPGA**

| Path  | Name      | Raw Value  | Power Value |
|-------|-----------|------------|-------------|
| PS700 | DL Input  | -49.7 dBm  | -103.1 dBm  |
|       | DL Output | -100.0 dBm | -100.0 dBm  |
|       | UL Input  | -54.1 dBm  | -99.1 dBm   |
|       | UL Output | -100.0 dBm | -100.0 dBm  |
| PS800 | DL Input  | -45.5 dBm  | -98.3 dBm   |
|       | DL Output | -45.6 dBm  | -98.3 dBm   |
|       | UL Input  | -51.2 dBm  | -103.2 dBm  |
|       | UL Output | -51.4 dBm  | -49.4 dBm   |

**DAC**

| Path   | Name        | Pin | Ch | Value | Put    |
|--------|-------------|-----|----|-------|--------|
| DL 700 | Main 1 Bias | 4   | 1  | 0.00  | Volt + |
|        | Main 2 Bias | 5   | 3  | 0.00  | Volt + |
| DL 800 | Main 1 Bias | 6   | 5  | 0.00  | Volt + |
|        | Main 2 Bias | 7   | 7  | 0.00  | Volt + |

## 7.6 Filter Screen

- 1) Can set the frequency and bandwidth of the digital filter on the filter screen.

PSR

192.168.1.150/psr.html

PSR

admin

Sign Out

MENU

System Setting

RF

RF Configuration

RF General

RF Operation

**Filters**

Alarms

Tables

Led Test

Firmware Update

700 Filters Configuration

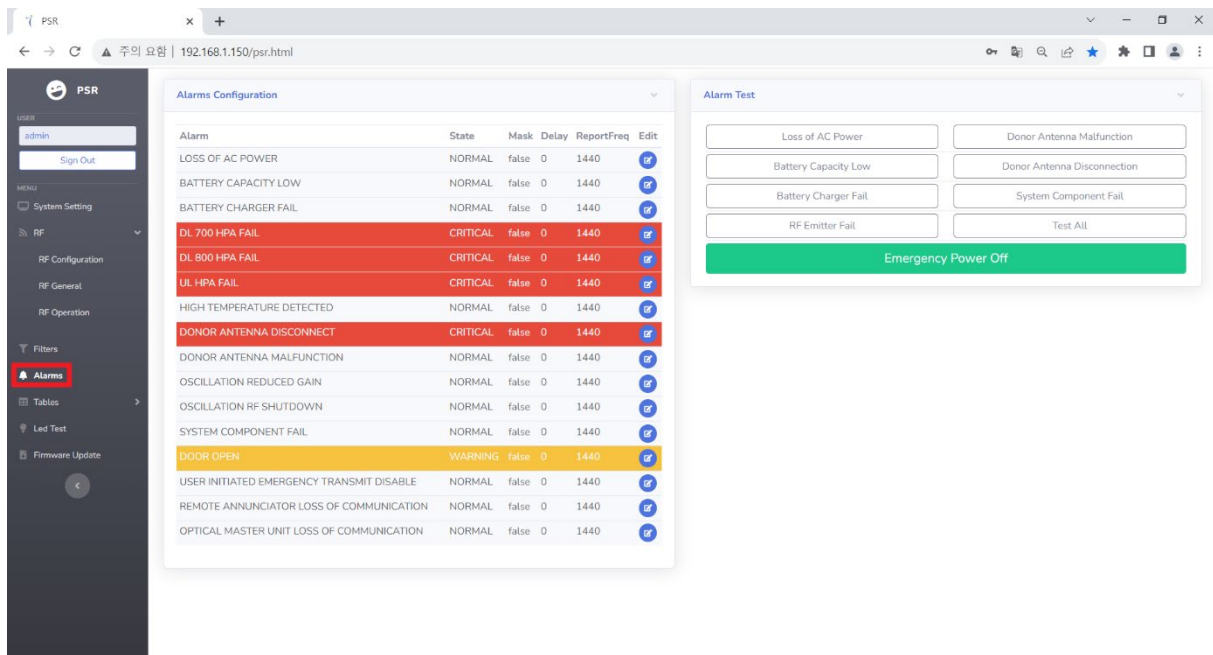
| CH | CF     |        | BW  | ATT |    | PWR |     | EN  | ED  |
|----|--------|--------|-----|-----|----|-----|-----|-----|-----|
|    | DL     | UL     |     | DL  | UL | DL  | UL  |     |     |
| 0  | 767M   | 797M   | 10M | 0   | 0  | N/A | N/A | OFF | OFF |
| 1  | 772M   | 802M   | 25K | 0   | 0  | N/A | N/A | ON  | OFF |
| 2  | 769.7M | 799.7M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 3  | 769.9M | 799.9M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 4  | 770.1M | 800.1M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 5  | 770.3M | 800.3M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 6  | 770.5M | 800.5M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 7  | 770.7M | 800.7M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 8  | 770.9M | 800.9M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 9  | 771.1M | 801.1M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 10 | 771.3M | 801.3M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 11 | 771.5M | 801.5M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 12 | 771.7M | 801.7M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 13 | 771.9M | 801.9M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 14 | 772.1M | 802.1M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 15 | 772.3M | 802.3M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 16 | 772.5M | 802.5M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 17 | 772.7M | 802.7M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 18 | 772.9M | 802.9M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 19 | 773.1M | 803.1M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 20 | 773.3M | 803.3M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 21 | 773.5M | 803.5M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 22 | 773.7M | 803.7M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 23 | 773.9M | 803.9M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 24 | 774.1M | 804.1M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 25 | 774.3M | 804.3M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 26 | 774.5M | 804.5M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 27 | 774.7M | 804.7M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 28 | 774.9M | 804.9M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 29 | 775.1M | 805.1M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 30 | 775.3M | 805.3M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 31 | 775.5M | 805.5M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 32 | 775.7M | 805.7M | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 33 | 767M   | 797M   | 10M | 0   | 0  | N/A | N/A | OFF | OFF |
| 34 | 767M   | 797M   | 1M  | 0   | 0  | N/A | N/A | OFF | OFF |
| 35 | 767M   | 797M   | 1M  | 0   | 0  | N/A | N/A | OFF | OFF |
| 36 | 767M   | 797M   | 1M  | 0   | 0  | N/A | N/A | OFF | OFF |

800 Filters Configuration

| CH | CF      |         | BW  | ATT |    | PWR |     | EN  | ED  |
|----|---------|---------|-----|-----|----|-----|-----|-----|-----|
|    | DL      | UL      |     | DL  | UL | DL  | UL  |     |     |
| 1  | 851.21M | 806.21M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 2  | 851.78M | 806.78M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 3  | 852.35M | 807.35M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 4  | 852.92M | 807.92M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 5  | 853.49M | 808.49M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 6  | 854.06M | 809.06M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 7  | 854.63M | 809.63M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 8  | 855.2M  | 810.2M  | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 9  | 855.77M | 810.77M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 10 | 856.34M | 811.34M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 11 | 856.91M | 811.91M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 12 | 857.48M | 812.48M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 13 | 858.05M | 813.05M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 14 | 858.62M | 813.62M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 15 | 859.19M | 814.19M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 16 | 859.76M | 814.76M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 17 | 860M    | 815M    | 25K | 0   | 0  | N/A | N/A | OFF | OFF |
| 18 | 860.9M  | 815.9M  | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 19 | 861.47M | 816.47M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 20 | 862.04M | 817.04M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 21 | 862.61M | 817.61M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 22 | 863.18M | 818.18M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 23 | 863.75M | 818.75M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 24 | 864.32M | 819.32M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 25 | 864.89M | 819.89M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 26 | 865.46M | 820.46M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 27 | 866.03M | 821.03M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 28 | 866.6M  | 821.6M  | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 29 | 867.17M | 822.17M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 30 | 867.74M | 822.74M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 31 | 868.31M | 823.31M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 32 | 868.88M | 823.88M | 75K | 0   | 0  | N/A | N/A | OFF | OFF |
| 33 | 860M    | 815M    | 18M | 0   | 0  | N/A | N/A | OFF | OFF |
| 34 | 860M    | 815M    | 2M  | 0   | 0  | N/A | N/A | OFF | OFF |
| 35 | 860M    | 815M    | 1M  | 0   | 0  | N/A | N/A | OFF | OFF |
| 36 | 860M    | 815M    | 3M  | 0   | 0  | N/A | N/A | OFF | OFF |

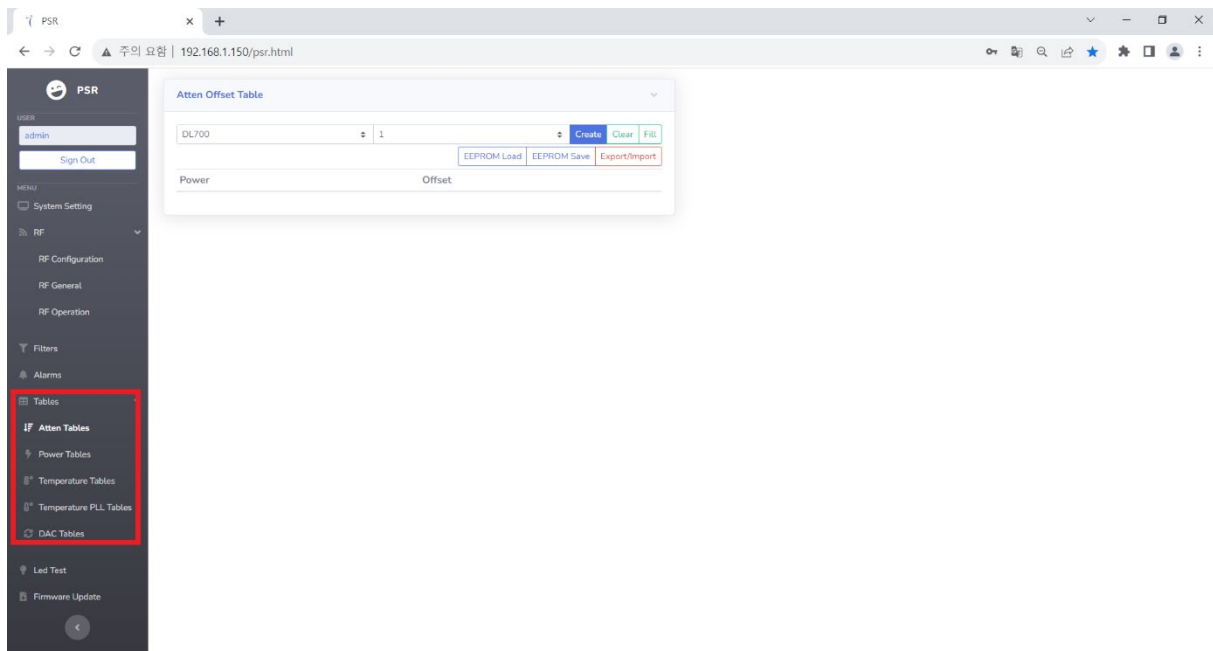
## 7.7 Alarm Screen

- 1) As a screen for checking the alarm state of the repeater, alarm mask may be set and alarm test may be performed.
- 2) The alarm state of the repeater may be checked in an alarm color.
  - Yellow: Any alarm detected but system operation
  - Red: Any alarm detected and system not operation



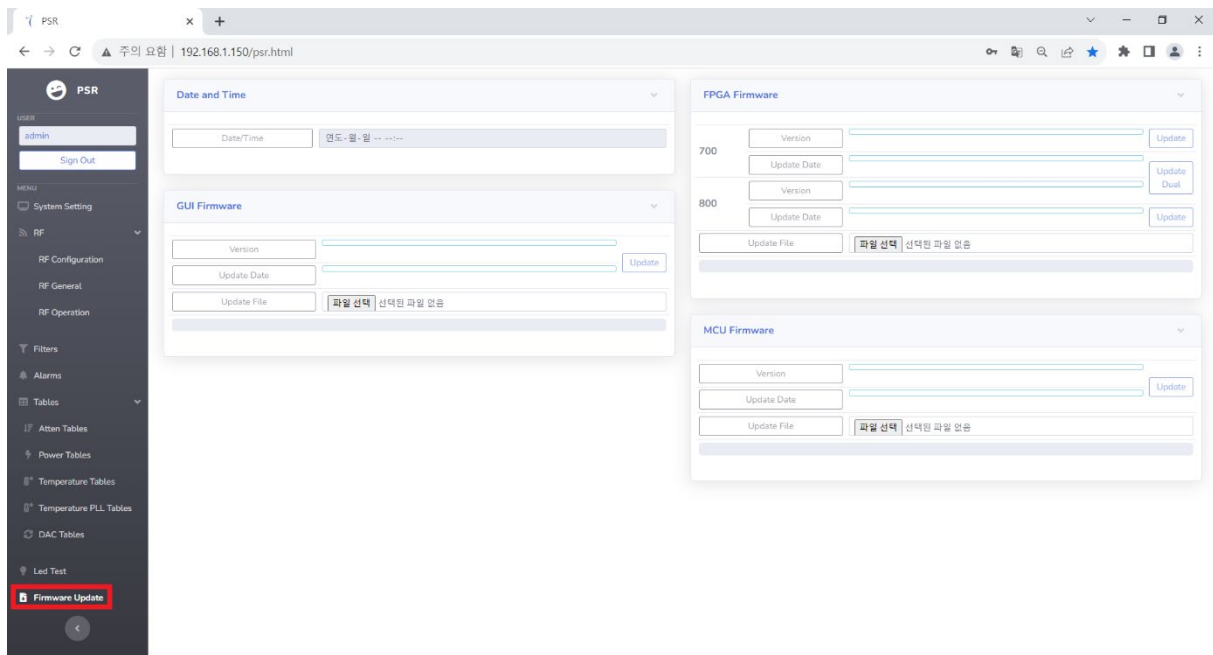
## 7.8 Table Screen

- 1) Can set various tables(Atten, Power, Temperature, Temperature PLL, DAC) on the table screen.



## 7.9 Firmware Update Screen

- 1) Can download the GUI, FPGA and MCU file on the firmware update screen.



## 8. Troubleshooting

In case of abnormal operation, technician should diagnose abnormality via remote access or directly connecting to repeater using Ethernet cable. If technician is required to conduct repairs due to major alarm, repeater should first be powered off, and then technician should prepare the proper measurement equipment before trying to fix the problem. In most cases of major repairs, DKK will simply replace the unit and conduct repairs at the appropriate facility.

### 8.1.1 Simple Troubleshooting Method

- 1) Verify SYSTEM LED State.
  - System normal : Green LED on
  - Any alarm detected - system operational : Yellow LED on
  - Any alarm detected - system not operational : Red LED on
- 2) Technician should check external and internal connectors to ensure that all connections are tightly secure. These connectors should be cleaned regularly.
- 3) If technician thinks there is a serious problem, call after sales team for over-the-phone technical support. 82-32-816-1456.

### 8.1.2 Troubleshooting Guide Related to System Operation

| PARAMETER                     | CHECK POINT                         | TROUBLESHOOTING                                                                                                                                                                                                                                                                                      |
|-------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Check Before System Operation | System Input Power                  | - Downlink : -63dBm ~ -3dBm<br>- Uplink : -56dBm ~ +4dBm                                                                                                                                                                                                                                             |
|                               | System Gain                         | - Downlink : 90dB $\pm$ 1.5dB<br>- Uplink : 80dB $\pm$ 1.5dB                                                                                                                                                                                                                                         |
|                               | System Output Power                 | - Downlink : 27dBm $\pm$ 1.5dB<br>- Uplink : 24dBm $\pm$ 1.5dB                                                                                                                                                                                                                                       |
| Check After System Operation  | Check Points After Open For Service | - Verify that the antennas are securely mounted and pointed in the correct directions.<br>- Connection status between antennas and RF cable.<br>- Verify that the BDA is securely mounted.<br>- DC voltage.<br>- Grounding status of electrical circuit.<br>- Coaxial cable(RF) construction status. |

### 8.1.3 Troubleshooting Guide Related to Alarm State

| GUI ALARM                       | FRONT PANEL LED                | BDA ACTION                        | TROUBLESHOOTING                                                                                              |
|---------------------------------|--------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------|
| NA                              | AC POWER -<br>NORMAL           | SHUTDOWN                          | - Check power cable connection.                                                                              |
| LOSS OF AC<br>POWER             | LOSS OF AC<br>POWER            | NONE                              | - NA                                                                                                         |
| BATTERY CAPACITY<br>LOW         | BATTERY CAPACITY<br>LOW        | NONE                              | - NA                                                                                                         |
| BATTERY CHARGER<br>FAIL         | BATTERY CHARGER<br>FAIL        | NONE                              | - NA                                                                                                         |
| DL 700 HPA FAIL                 | RF EMITTER FAIL                | 700 DL RF<br>SHUTDOWN             | - Check HPA is off.<br>- Check BDA is shutdown condition.                                                    |
| DL 800 HPA FAIL                 | RF EMITTER FAIL                | 800 DL RF<br>SHUTDOWN             | - Check HPA is off.<br>- Check BDA is shutdown condition.                                                    |
| UL HPA FAIL                     | RF EMITTER FAIL                | 700 & 800<br>UL+DL RF<br>SHUTDOWN | - Check HPA is off.<br>- Check BDA is shutdown condition.                                                    |
| HIGH<br>TEMPERATURE<br>DETECTED | SYSTEM<br>COMPONENT FAIL       | 700 & 800<br>RF SHUTDOWN          | - Check maximum temperature setting.<br>- Check ambient temperature.                                         |
|                                 | RF EMITTER FAIL                |                                   |                                                                                                              |
| DONOR ANTENNA<br>DISCONNECT     | DONOR ANTENNA<br>DISCONNECTION | NONE                              | - Check antenna installation direction.<br>- Check donor antenna and RF cable<br>connection status.          |
|                                 | RF EMITTER FAIL                |                                   |                                                                                                              |
| DONOR ANTENNA<br>MALFUNCTION    | DONOR ANTENNA<br>MALFUNCTION   | NONE                              | - Check donor antenna installation<br>direction.<br>- Check donor antenna and RF cable<br>connection status. |
| OSCILLATION<br>REDUCED GAIN     | SYSTEM<br>COMPONENT FAIL       | NONE                              | - Check the direction of the donor<br>antenna and the service antenna.                                       |
| OSCILLATION RF<br>SHUTDOWN      | SYSTEM<br>COMPONENT FAIL       | 700 & 800<br>RF SHUTDOWN          | - Check the direction of the donor<br>antenna and the service antenna.                                       |
|                                 | RF EMITTER FAIL                |                                   |                                                                                                              |
| DOOR OPEN                       | NA                             | NONE                              | - Check the door                                                                                             |

#### 8.1.4 Troubleshooting Guide Related to NMS

| SYMPTOM   | CHECK POINT           | TROUBLESHOOTING                                                              |
|-----------|-----------------------|------------------------------------------------------------------------------|
| Link Fail | Communication Problem | - Re-connection in ethernet cable.<br>- Verify IP address and DHCP function. |

#### 8.1.5 Replaceable Batteries

- ✓ Risk of explosion if battery is replaced by an incorrect type.
- ✓ Dispose of used batteries according to the instructions.
- ✓ Replace only with the same or equivalent type.