

Clear Call

User Manual

Version 1.1

GSInstech Co., Ltd

Abbreviations

Abbreviation	Term Definition	Remark
AGC	Automatic Gain Control	
ALC	Automatic Level Control	
BTS	Base Transceiver Station	
CW	Continuous Wave (un-modulated signal)	
DFM	Digital Filter Module	
DL	Downlink The path covered from the BTS to the subscribers service area via the repeater	
FW	Firmware	
HPA	High Power Amplifier	
HW	Hardware	
LNA	Low Noise Amplifier	
LTE	Long Term Evolution	
MS	Mobile Station	
PSU	Power Supply Unit	
RF	Radio Frequency	
RFU	Radio Frequency Drive Unit	
SW	Software	
UL	Uplink The path covered from the subscribers service area to the BTS via the repeater	
VSWR	Voltage Standing Wave Ratio	

1. FCC Mandatory

1.1 FCC Warning States

1.1.1 FCC Part 15.21

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

1.1.2 FCC Part 15.105

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 his own expense.

1.1.3 FCC Part 15.19

This 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.

1.1.4 Antenna installation

Antennas must be installed in accordance with FCC requirement.

The height of the antenna above average terrain (HAAT) must not exceed limit in the following table.

FCC ID(s)	HAAT (m)	Max. Antenna again
U88CC-L13	71656.75	6 dBi
U88CC-I13	26460.60	6 dBi
U88CC-P18	26143.43	6 dBi
U88CC-A18	72828.84	6 dBi

1.1.5 Radiation Exposure Statement

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

20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. RF exposure will be addressed at time of installation and the use of higher gain antennas may require larger separation distances.

1.1.6 FCC Warning Labels

1) FCC Part

WARNING. This is **NOT** a **CONSUMER** device. It is designed for installation by **FCC LICENSEES** and **QUALIFIED INSTALLERS**. You **MUST** have an **FCC LICENSE** or express consent of an FCC Licensee to operate this device. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.

1.2 Prohibitions

- Use of unauthorized antennas, cables, and coupling devices not conform to ERP/EIRP and indoor-only restrictions is prohibited.
- Preclude indications that home/personal use be prohibited.

1.3 Installation Warning statement



WARNING

Provides information or instructions that the reader should follow in order to avoid personal injury or fatality



CAUTION

Provides information or instructions that the reader should follow in order to avoid a service failure or damage to the system



CHECK POINT

Provides the operator with checkpoint for stable system operation



NOTE

Indicates additional information as a reference



No use for the unauthorized device

When installing the system. Must check the devices that use is authorized.
This conditions apply antenna, cable, and if necessary



Circuit Breaker Installation in the Box for Overcurrent Protection

Must install the circuit breaker between the system and main AC source for separating.

Make sure to install the Circuit breaker on the place to operate easily Circuit breaker be able to operate up to 20A



Terminal, Conduit and Cable size

To install the conduit is according to NAE regulation, and Terminal size is according to NEC regulation

General Information

This document is primarily written for those who are new to Clear Call system and wish to tune up the equipment. The document is applicable to below products from GSINSTECH.
Model number: Clear Call.

1.4 Repeater Information (FCC)

Certification	Type	ID	Remarks
FCC	Industrial RF Repeater	U88CC-L13	700MHz
		U88CC-I13	800MHz
		U88CC-P18	1900MHz
		U88CC-A18	2100MHz

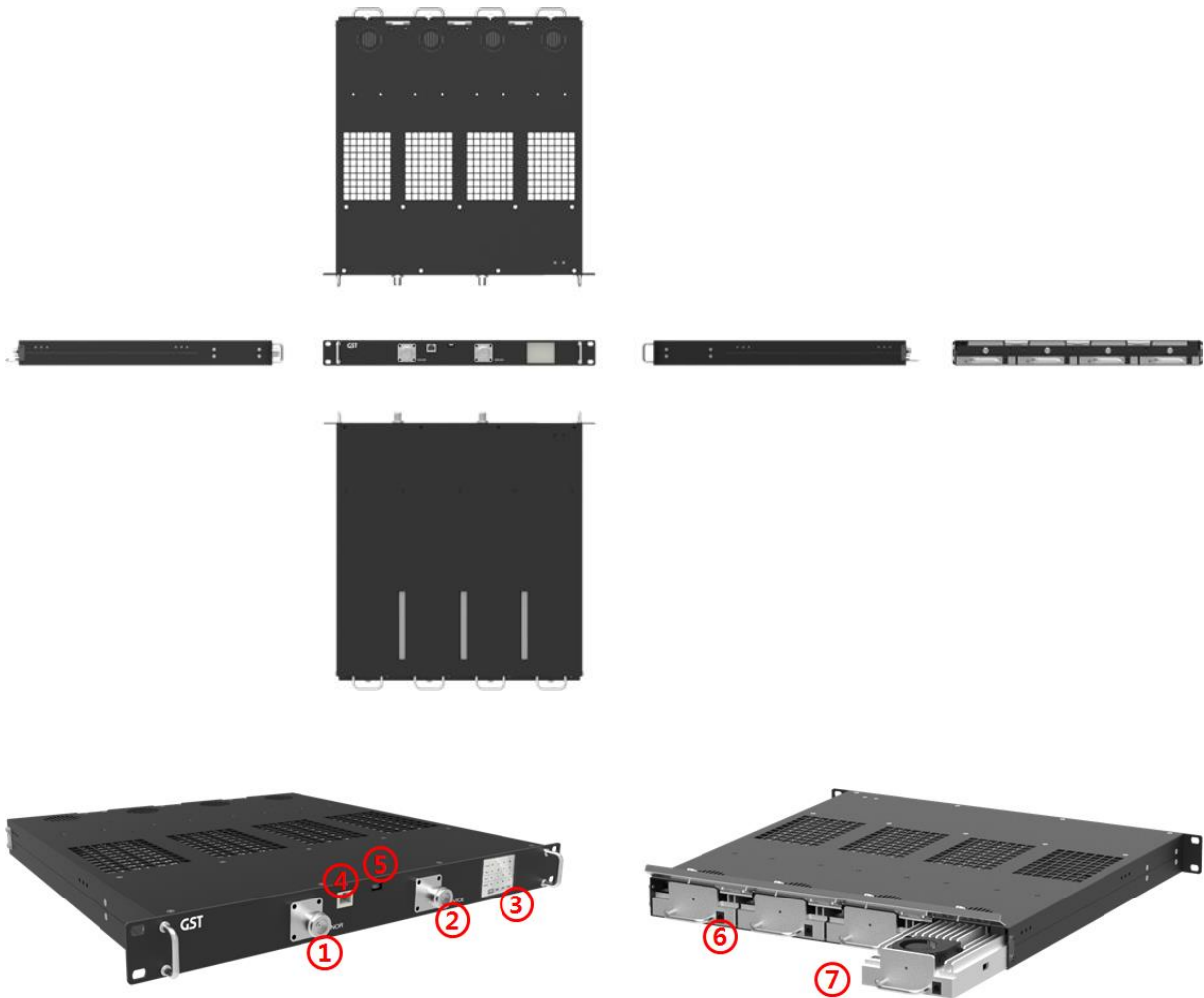
1.5 Purpose

Clear Call is a repeater, which has been designed to improve signals in blanket/shadow areas inside of buildings to transmit Provider's variety frequencies. User may choose filtering configuration according to the specific site circumstances. It supports 700MHz LTE, 800MHz iDEN, 850MHz Cellular, 1900MHz PCS and 2100MHz AWS frequency with one antenna port. The max output is 18dBm and coverage is up to 25,000 SQFT.

1.6 Advantages

- It provides selectable RF power levels for any wireless technology/band
- 19inch rack or wall mount available depending on the installation site
- Modular type for each frequency up to 4 modules
- Can select service band through RSSI
- Check and control the status of the repeater through front touch LCD
- FPGA digital filtering provides optimized RF performance
- Sub band filtering: It contains three non-contiguous high rejection digital filter
- Quad band channel filtering, real time oscillation detect & gain control

1.7 Appearance



No	Description	Function	Remarks
1	Donor ANT Port	Antenna port for communication with BTS	4.3-10 DIN
2	Service ANT Port	Antenna port for communication with terminal/UE	4.3-10 DIN
3	Touch LCD	Display of status and select of function	2.2inch TFT LCD
4	Ethernet Port	GUI connection port for checking the status and control	RJ-45
5	Debug Port	Communication port for developer	Micro USB
6	Power Supply Port	Power supply port for each module	DC-005 jack
7	RF Unit	RF service unit	Max 4 unit

2. Specifications

2.1 Frequency Allocation

Item		Specification	Remark
700MHz	Down Link	728MHz ~ 757MHz	Band 12 & 13
	Up Link	698MHz ~ 716MHz	Band 12
		776MHz ~ 787MHz	Band 13
800MHz	Down Link	862MHz ~ 894MHz	Band 26
	Up Link	817MHz ~ 849MHz	Band 26
1900MHz	Down Link	1930MHz ~ 1995MHz	Band 25
	Up Link	1850MHz ~ 1915MHz	Band 25
2100MHz	Down Link	2110MHz ~ 2155MHz	Band 4
	Up Link	1710MHz ~ 1755MHz	Band 4

2.2 Common Specifications

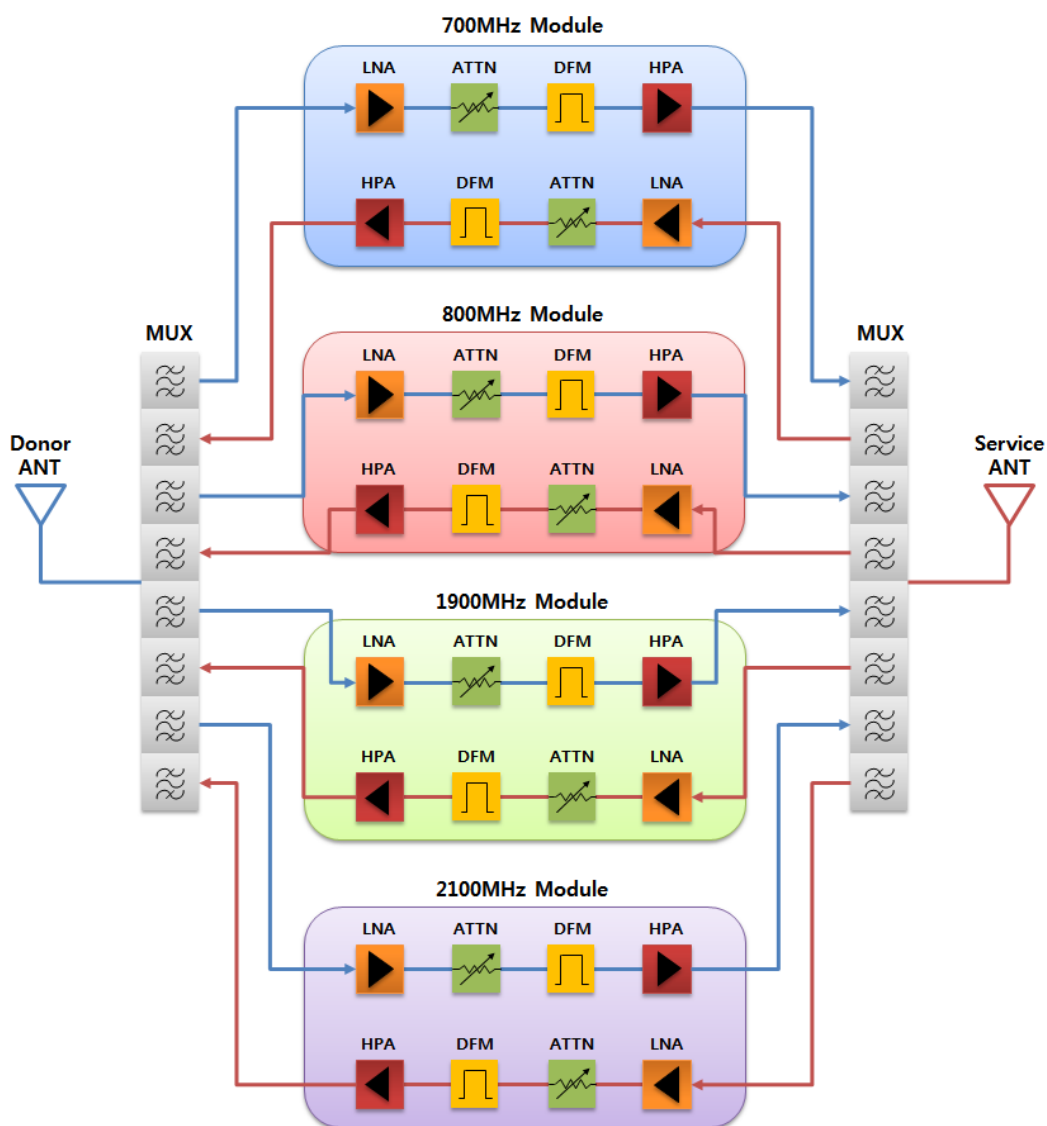
Item		Specification				Remark
Band		700MHz	800MHz	1900MHz	2100MHz	
Composite Power	DL	13dBm	13dBm	18dBm	18dBm	
	UL	18dBm	18dBm	18dBm	18dBm	
Gain	Range	75 ~ 45dB		80 ~ 50dB		
	Step	0.5dB				
	Accuracy	1dB				
Roll-Off		-50dBc @ ±750kHz				
Flatness	Single CH	≤ 4dB				
	Inter CH	≤ 5dB				
UL Noise Figure		≤ 7dB				@ Max Gain
Group Delay		≤ 5us				
Channel Select		Non-Contiguous 3Block				
In/Out Port VSWR		2.0 : 1				
Impedance		50Ω				

2.3 Mechanical Spec.

Item		Specification	Remark
RF Connector		DIN (4.3-10) Type Female	
AC-DC Adapter		Input : AC 90 ~ 264V, Output : DC 12V	
DC Power Connector		DC-005	
Size	Module	4.17 * 12.6 * 1.6inch (106 * 321 * 40.9mm)	

	Chassis	17.2 * 18.1 * 1.75inch (437 * 457.5 * 44.5mm)	
Weight	Module	< 2.98lbs (1.35Kg)	
	Chassis	< 19.84lbs (9Kg)	Included four modules
Operation Temperature		32 ~ 122°F (0 ~ 50°C)	
Humidity		0 ~ 80%	

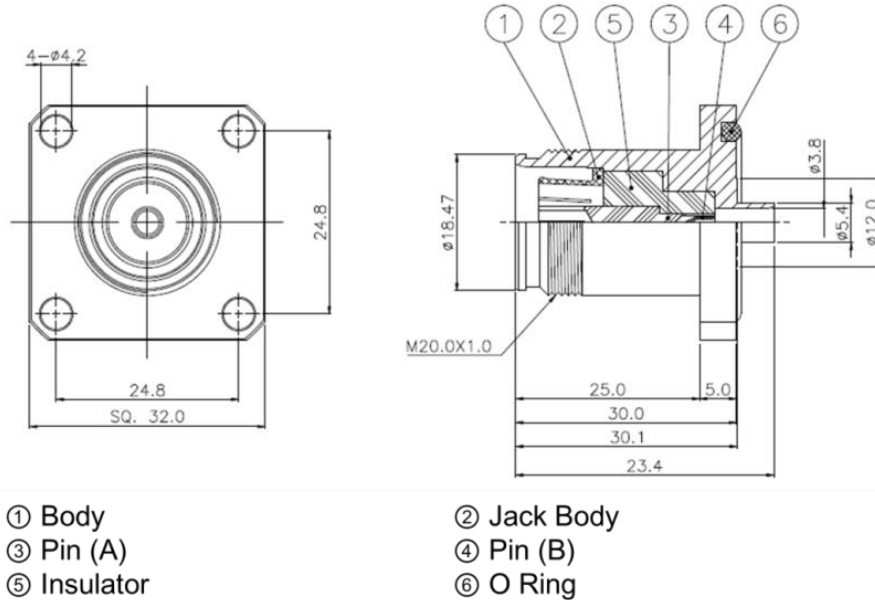
2.4 Block Diagram



3. Port and Connectors

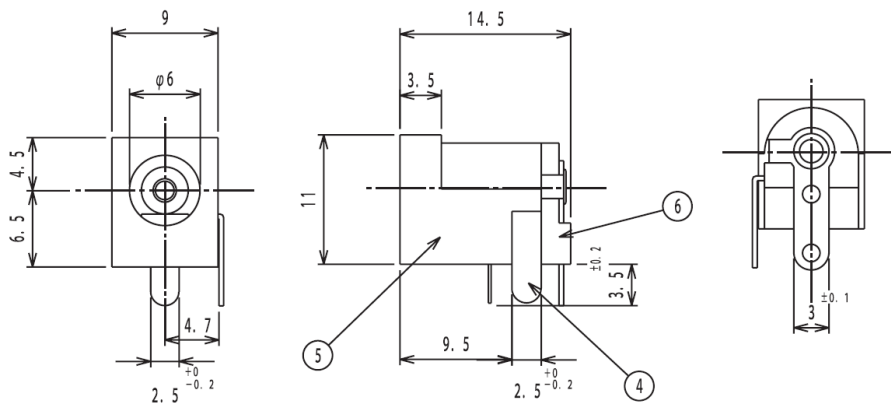
3.1 RF Connector

Clear Call adopts a Mini-DIN 4.3/10 connector. If the user wants to use an N type cable or connector, they need an adaptor.



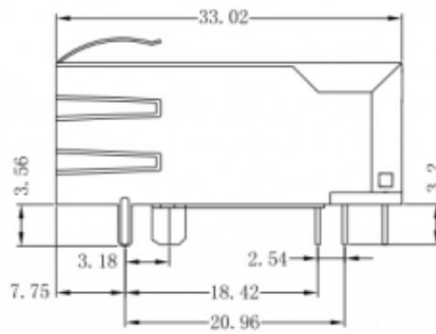
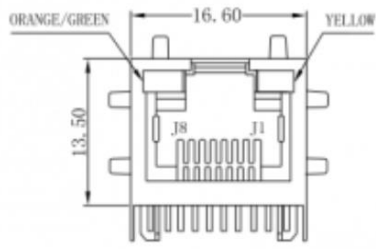
3.2 DC Power Connector

Clear Call uses only DC 12V. If the user uses other un-recommend input voltages, may be broken. The DC power connector of the Clear Call uses type-B. The outside diameter is 3.5mm and inside diameter is 1.35mm.



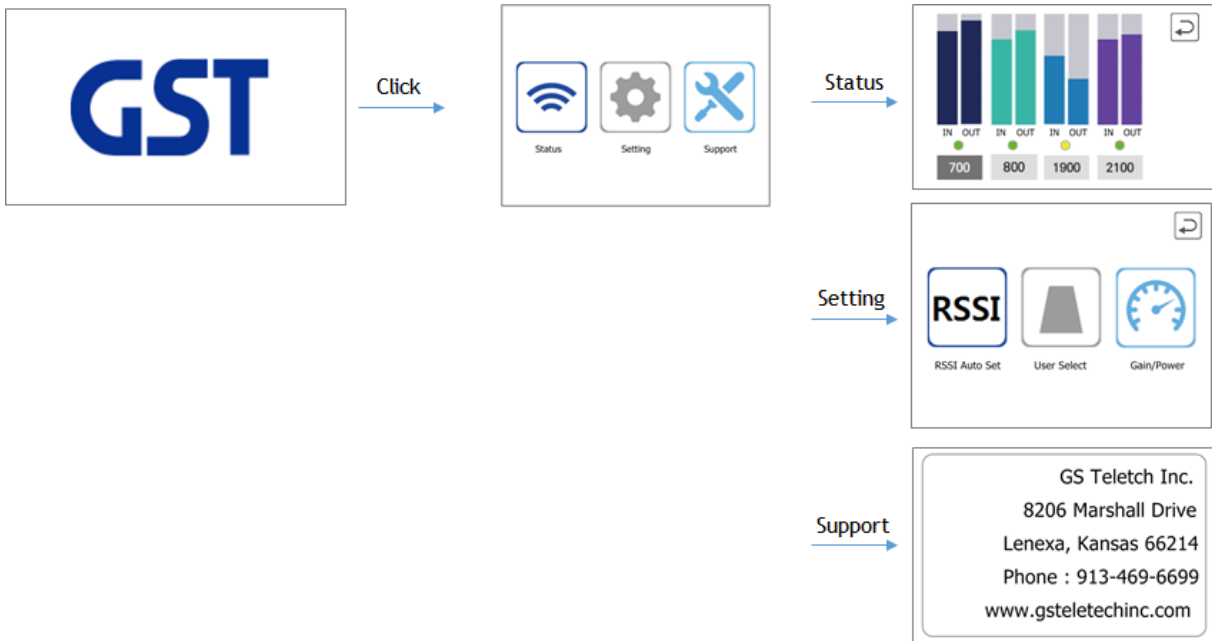
3.3 Ethernet Port

Clear Call can be connected to the SNMP via Ethernet, and the user can use the WEB UI to control and monitor in remote or local locations.



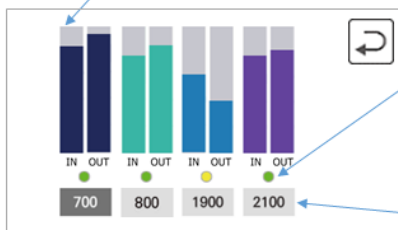
4. LCD Information

4.1 LCD Display Gate

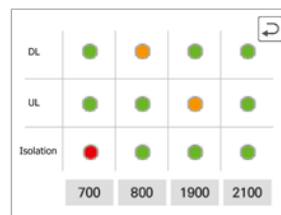


4.2 Status

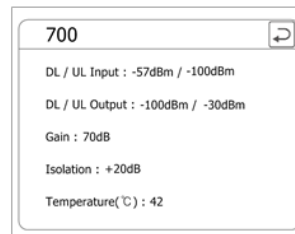
Displays the current In/Output level as % (in 1 % units)
(Displays the current output value in % for max/min output.)



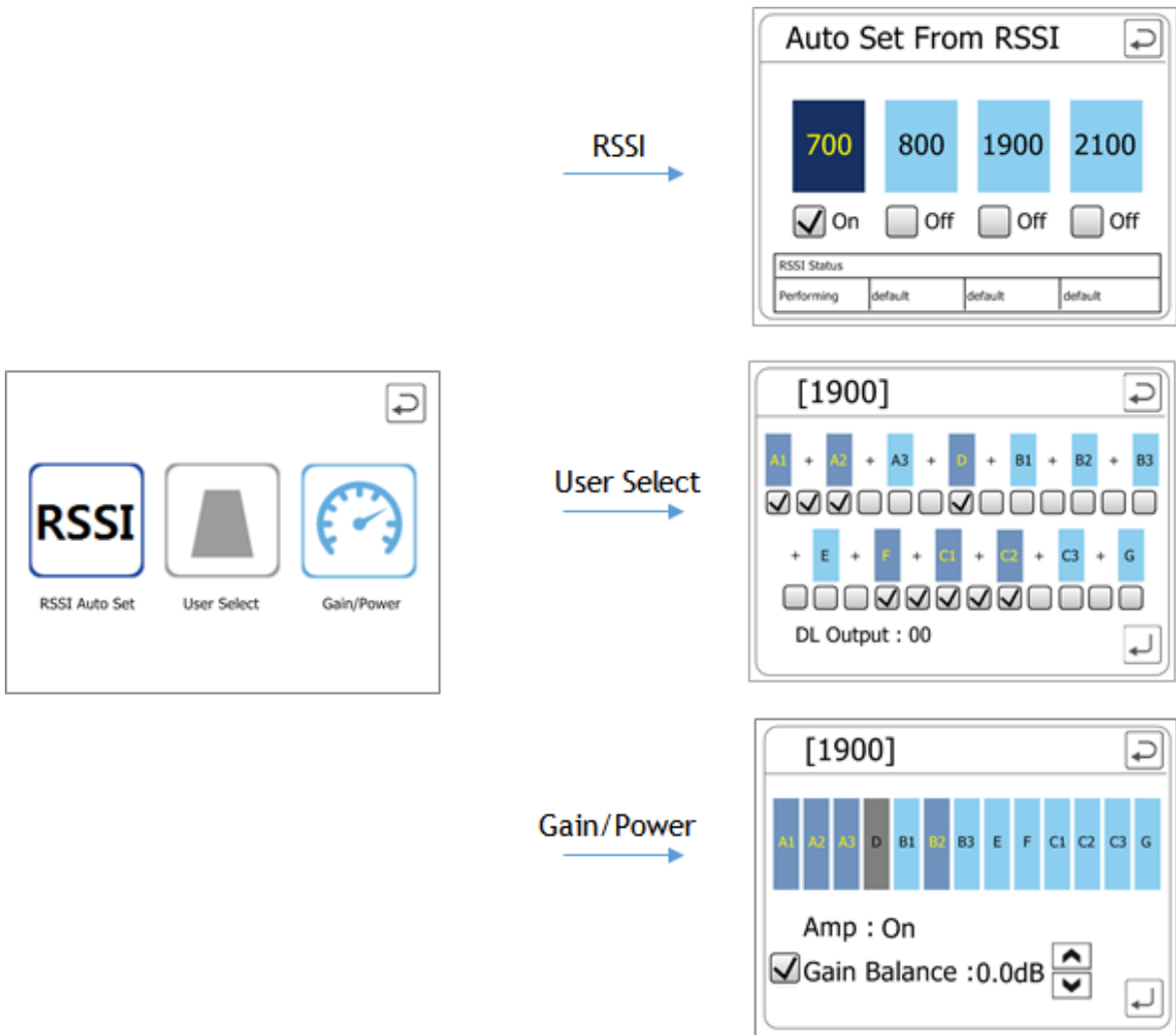
Show Current Alarm Status
Select LEDs to view the current alarm status for each service band.



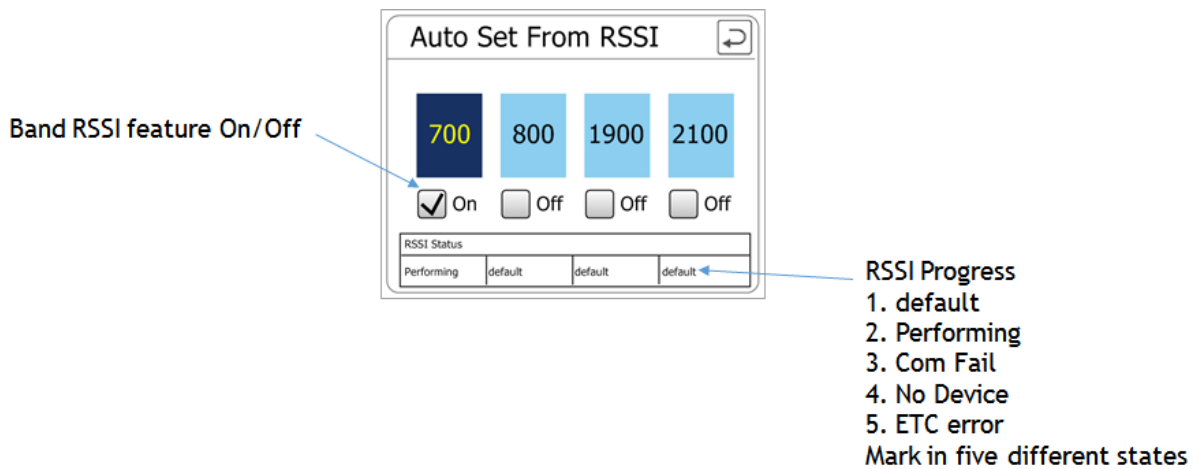
Service band selection enables detailed status



4.3 Setting

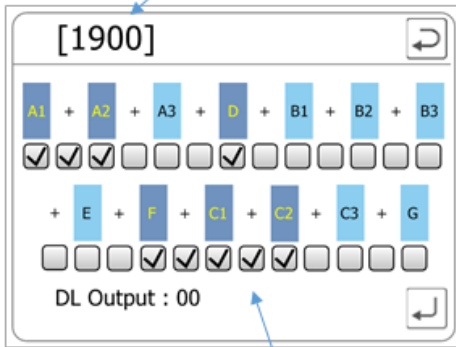


4.3.1 RSSI



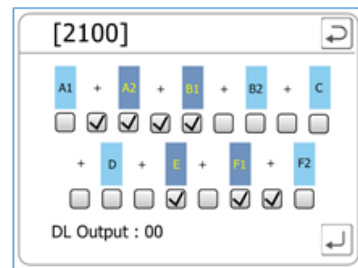
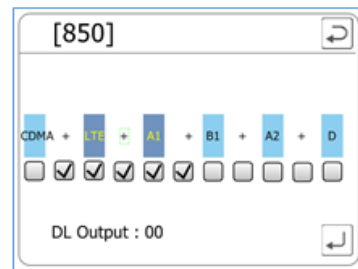
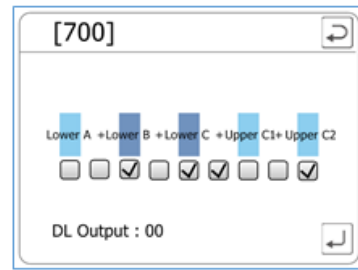
4.3.2 User Select

[Current select service band]
Change service when title click



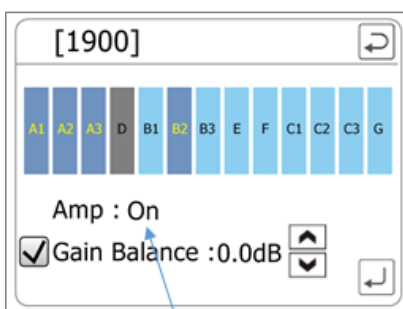
[Select use channel]
Select on selection/disable

Other service band examples

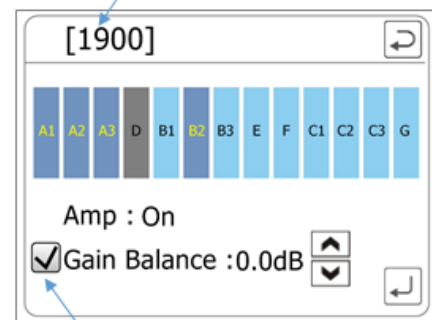


4.3.3 Gain/Power

[Current select service band]
Change service when title click



When you click Text
Amp On/Off Control



AGC ATT control on selection

4.4 Support

Shows addresses and contact numbers for a tech call if there is a problem with the equipment.



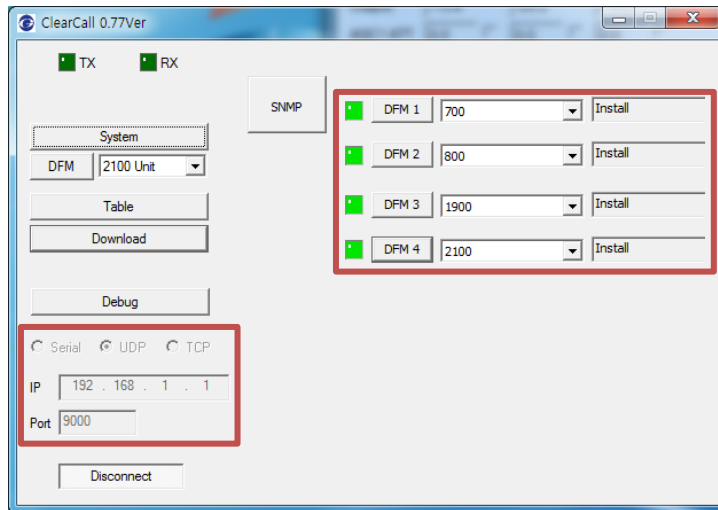
5. Graphic User Interface

5.1 Program Usage

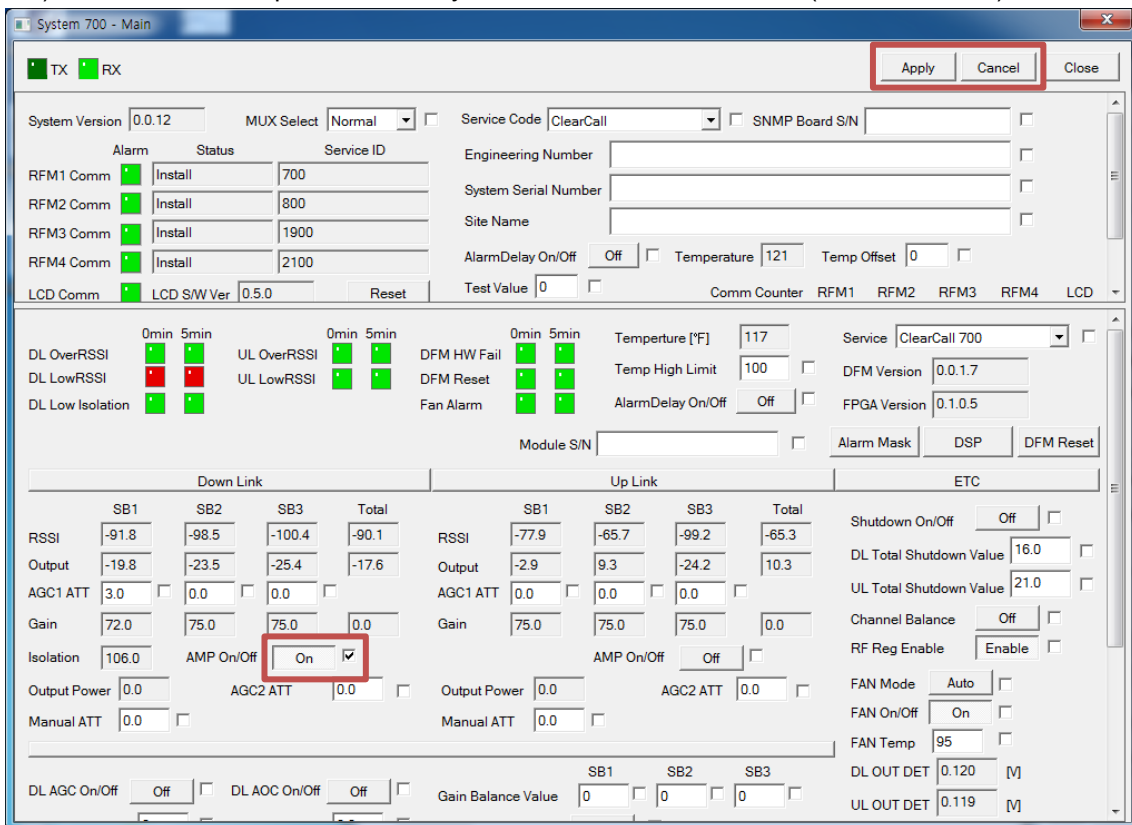
- 1) Connect your laptop to the repeater with a direct Ethernet cable.
- 2) Click the following icon to run the GUI program.



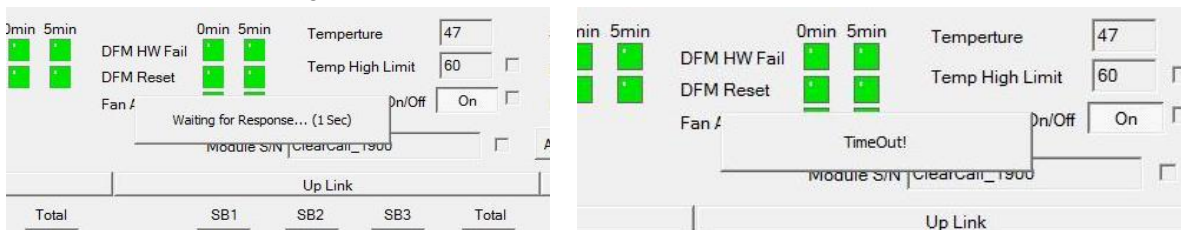
- 3) Connect to IP: 192.168.1.1, Port: 9000 with UDP communication.



- 4) Select a module per unit to verify that the module is mounted. (Install/Uninstall)



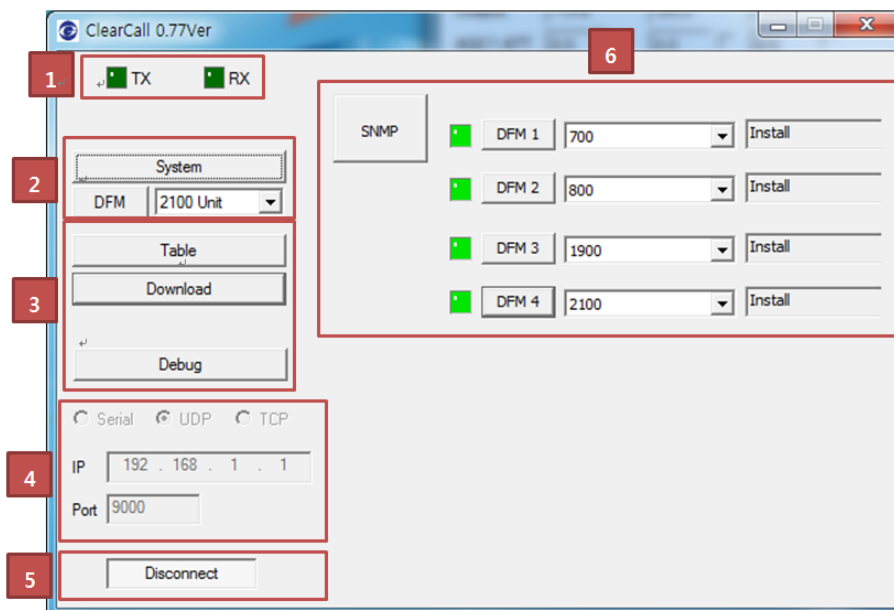
- 5) In case of control, press 'SET' to enter control mode.
- 6) Change what you want to control. To complete the change and send a control request, press 'Apply'.
- 7) The next item automatically displays the check box. You can cancel the control of the item by releasing the displayed check box. You can also cancel all controls by pressing 'Cancel'.
- 8) There is a response wait of 5 seconds. Only when the response is not in time, shows the 'Time Out' message.



- 9) After the control is finished, the status check is automatically performed again. At this point, it can be checked that the value is applied.

5.2 Start window

5.2.1 Start window

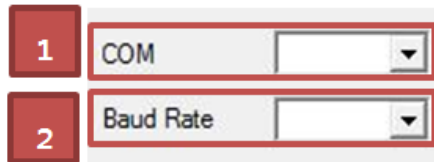


No.	Description
1	Data transfer/receiving status display
2	> System: System map open > DFM: DFM(Module) open the view/control window for Independent use
3	> Table: Table window open > Download: Download window open > Debug: Debug window open

4	Connection settings window. Serial/UDP/TCP can be one selected
5	Connect/Disconnect can be one selected
6	<p>System Map</p> <p>You can view simple information about each module in SNMP.</p> <p>> LED</p> <ul style="list-style-type: none"> - Green: Install - Red: Alarm - Yellow: Link Fail - Gray: Uninstall <p>> DFM 1 / 2 / 3 / 4: Open the view/control status window of SNMP and each DFM</p> <p>> 700 / 800 / 1900 / 2100: Module connected to the location</p> <p>> Install / Uninstall: Module fitted</p>

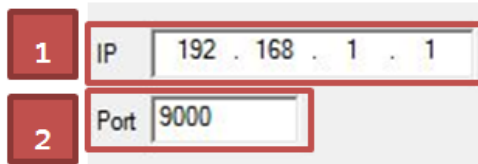
5.2.2 Communication Settings window

1) Serial



No.	Description
1	Serial COM port setting > refresh: COM port refresh
2	Serial communication speed setting Use 115,200 when connecting DFM alone

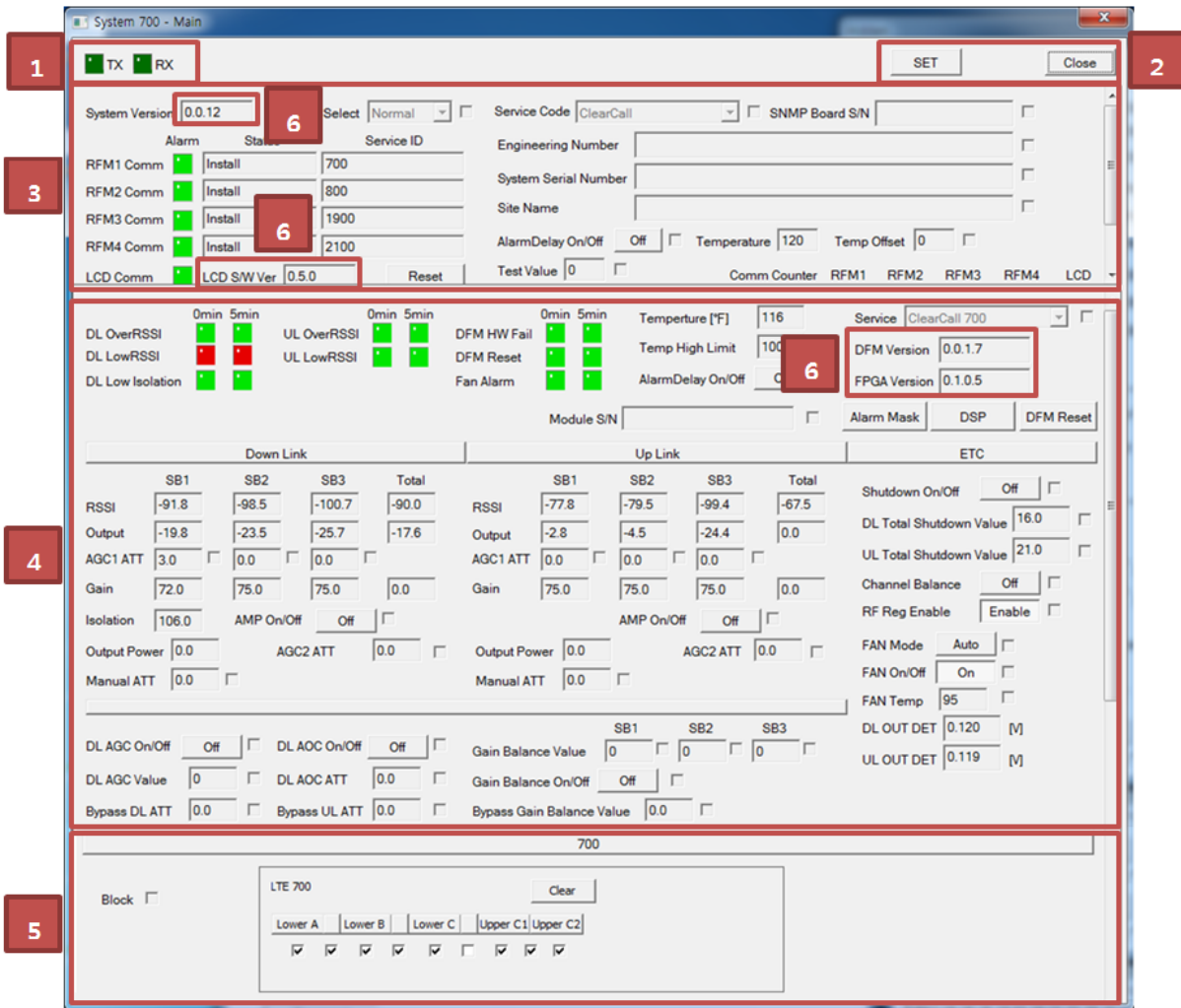
2) UDP/TCP



No.	Description
1	IP address setting
2	Port setting

5.3 System main window

5.3.1 Main window



No.	Description
1	Data transfer/receiving status display
2	> Control mode - SET/Apply: Enter control mode, run control - Cancel: Cancel control - Close: Close main window
3	SNMP main: SNMP information
4	DFM main: DFM information
5	Service band view/control. Located in its GUI for each module (707/800/1900/2100)
6	SNMP, LCD, DFM and FPGA version

5.3.2 SNMP window

System Version 0.0.6 MUX Select Normal Service Code ClearCall SNMP Board S/N

Alarm	Status	Service ID
RFM1 Comm	Install	700
RFM2 Comm	Install	800
RFM3 Comm	Install	1900
RFM4 Comm	Install	2100
LCD Comm	LCD SW Ver 0.1	

Engineering Number
System Serial Number
Site Name

AlarmDelay On/Off Off Temperature 47 Temp Offset 0

Test Value 0

Dry Contact 1 Off 2 Off 3 Off 4 Off 5 Off

Comm Counter

	RFM1	RFM2	RFM3	RFM4	LCD
TX	223	222	222	222	916
RX	223	222	222	222	916

No.	Description
1	SNMP reset
2	Communication counter. Increase by 1 each time the corresponding equipment communicates with SNMP

5.3.3 Alarm Mask window

AlarmMask

Alarm Mask

DL OverRSSI Normal

DL LowRSSI Normal

UL OverRSSI Normal

UL LowRSSI Normal

DL Low Isolation Normal

DFM HW Fail Normal

DFM Reset Normal

Fan Alarm Normal

No.	Description
1	Allow specific alarms to be masked

5.3.4 DSP window

DSP

DL	Filter Gain	UL	Filter Gain	RF2052
Input Gain 170		Input Gain 170		0x10 0x0077
Bank1 Filter 5.00 300		Bank1 Filter 5.00 300		0x11 0x0271
Bank1 NCO 62000 KHz		Bank1 NCO 27000 KHz		0x12 0x3009
Bank2 Filter 5.00 300		Bank2 Filter 5.00 300		0x13 0x0AD2
Bank2 NCO 72000 KHz		Bank2 NCO 37000 KHz		0x1C 0x0000
Bank3 Filter 5.00 300		Bank3 Filter 5.00 300		
Bank3 NCO 52000 KHz		Bank3 NCO 17000 KHz		
Output Gain 300		Output Gain 300		
Bypass DL Gain 0		Bypass UL Gain 0		
Bypass DL Filter 0		Bypass UL Filter 0		

Capture

No.	Description
1	Local frequency and gain of DSP. The default setting does not require the user to set it.

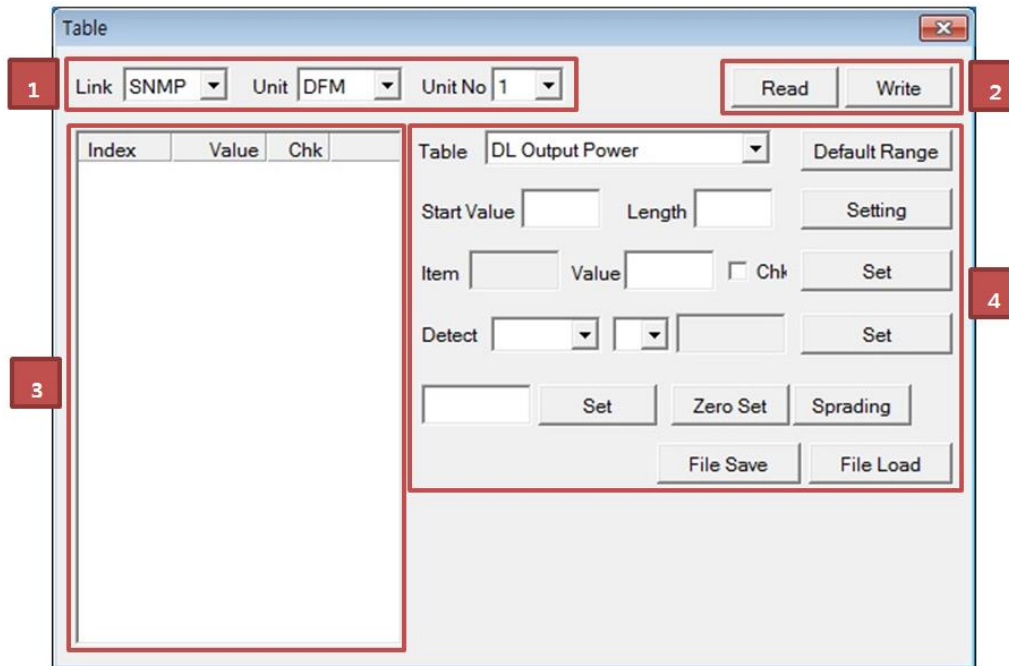
5.3.5 Hidden window

The screenshot shows the 'Hidden' configuration window with the following sections:

- Down Link / Up Link:** Parameters for RSSI, AGC1 ATT, Total Output, Total RSSI, and Isolation offsets for three service bands (SB1, SB2, SB3).
- Provider:** A dropdown menu set to 'undefine'.
- Shutdown Delay Value:** A text input field set to '255'.
- Temp Offset:** A text input field set to '0'.
- Total Shutdown Status:** A dropdown menu with a red box and number '1' pointing to it.
- Bypass On/Off:** A button set to 'Off'.
- SG On/Off:** A button set to 'Off'.
- Ship Default Setting:** A button with a red box and number '1' pointing to it.
- Service Band Information (700):**
 - Enable:** A checkbox.
 - BW [MHz]:** Text input fields for SB1 (16.250), SB2 (10.000), and SB3 (0.000).
 - CFreq [MHz]:** Text input fields for SB1 (737.000), SB2 (751.000), and SB3 (0.000).
 - EARFCN:** Text input fields for SB1 (0), SB2 (42949), and SB3 (42949).
- Band Setting On/Off:** A button set to 'Off'.
- Band Setting Mode:** A dropdown menu set to 'Auto'.
- Status:** A text input field.
- RSSI Limit:** A text input field set to '0.00'.
- RSSI:** Text input fields for Lo A, Lo B, Lo C, Up C1, and Up C2, all set to '0.0'.
- Block:** Text input fields for Lo A, Lo B, Lo C, Up C1, and Up C2.

No.	Description
1	Setting initialization
2	Service band information (Bandwidth, Center Frequency, EARFCN)
3	Service band auto setting Automatically set the service band by measuring the RSSI

5.4 Table



No.	Description
1	<p>Target Selection</p> <p>Select the destination for read/write table information</p> <ul style="list-style-type: none"> > Link: Destination associated with PC (SNMP/DFM) > Unit: What kind of read/write actual data > Unit No: Select target. Exists only in situations where multiple choices are available
2	<p>Commands to read/write table information</p> <ul style="list-style-type: none"> > Read: Request to read table data > Write: Request to read table data. Apply the table data change if you issue the command.
3	<p>Table information display window</p> <ul style="list-style-type: none"> > Index: Data display and target value > Value: Actual settings (V, dB) > Chk: Used by Sprading. Serve as a benchmark
4	<p>Table Setup Area</p> <ul style="list-style-type: none"> > Table: Select table type > Default Range: Set default range > Start Value: Set range start value > Length: Set range length > Setting: Apply range setting <p>The range is reduced from the starting value to a certain value (Step), and only a length is generated.</p>

- > Item: Selected item index value
- > Value: The selected item value. Can be changed
- > Chk: Selected Chk value. Can be changed
- > Set: Modify selected item

- > Detect: Ability to insert real detect values directly
 - First box: Display the corresponding index value. Optional
 - Second box: Increase in index value
 - Text box: print current detect value
 - Set: Enter the current detect value in the corresponding index.
Then move the index increments to select the next index.

- > Offset: The set value is added only to the total value
- > Zero Set: Set all value settings to zero
- > Sprading: To divide values evenly between items marked with two

- > File Save: Save the current table
- > File Load: Load table value from file

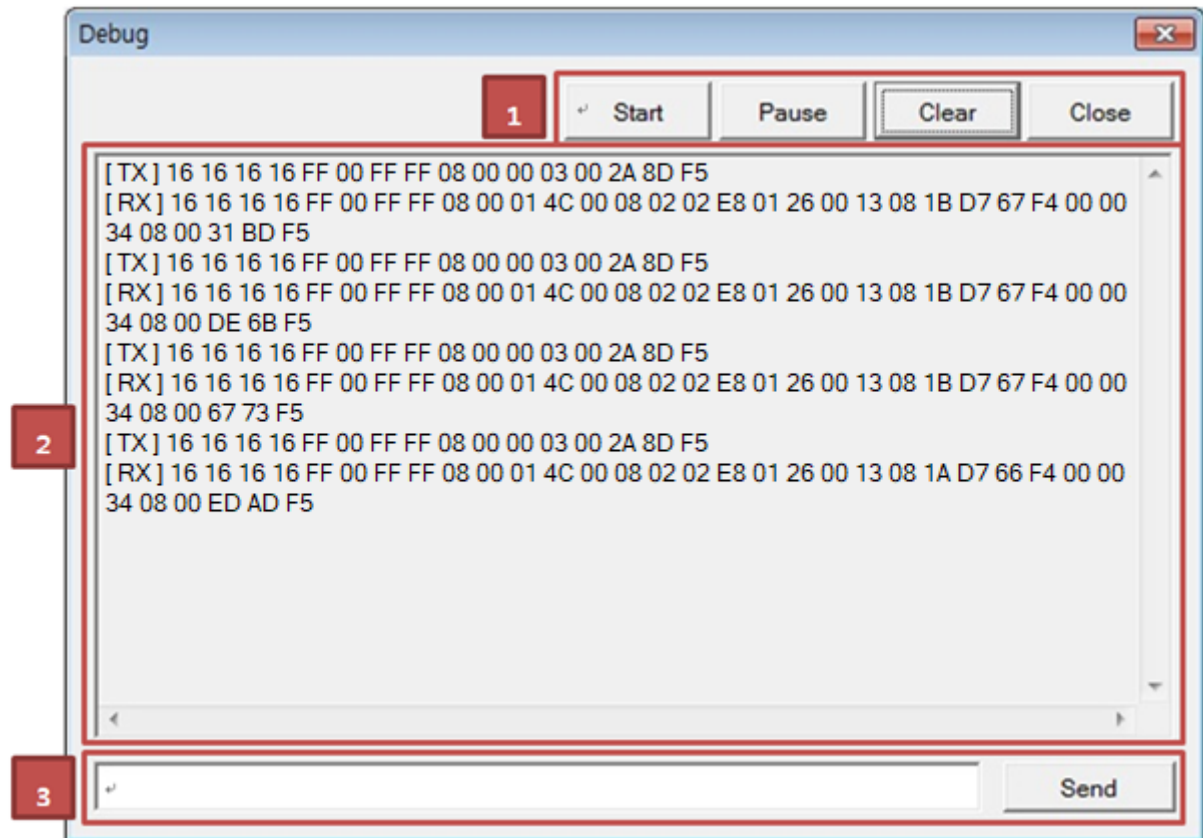
5.5 Download



No.	Description
1	Target Selection Select the destination for read/write table information > Link: Destination associated with PC (SNMP/DFM) > Unit: What kind of read/write actual data > Unit No: Select target. Exists only in situations where multiple choices are available - No1: 700, No2: 800, No3: 1900, No4: 2100
2	Download Start/End > Start: Download start. Activation occurs only when the file path is correct. > Close: Close the window. Stop downloading while the download is in progress

	<p>Download Settings and Information Display</p> <ul style="list-style-type: none"> > Target: Type of file to download (Application/FPGA) > File Path: Path where destination file is located. <ul style="list-style-type: none"> You can find it by typing directly or by selecting Open next to it. > File Frame: Number of frames divided by files
3	<ul style="list-style-type: none"> > Frame Size: Bytes per frame > File Size: File size > Total CRC : Total CRC of download file > Progress: Display current download progress > Frame: The frame number currently being transferred > Time: Download time

5.6 Debug



No.	Description
1	<p>Debug Control Panel</p> <ul style="list-style-type: none"> > Start: Start the automatic status check request > Pause: Stop automatic status check request > Clear: Clear record of data log window > Close: Close the window

2	Debug Log Panel Displays transfer/receiving data in real time
3	Debug Test Panel Receive data can be entered directly. No data is received which violates Clear Call protocol

6. Installation

6.1 Installation Accessories

No.	Picture	Item	Remark
1	A white rectangular patch antenna with a cable attached.	Donor Antenna (Patch)	4dBi / 6dBi (700M, 800M / 1900M, 2100M)
2	A white omni-directional antenna with a flared top.	Service Antenna (Omni)	2dBi / 4dBi (700M, 800M / 1900M, 2100M)
3	Two coiled antenna link cables.	Antenna Link Cable x 2	3D-FV 30ft
4	Two metal adapters for connecting mini DIN to N connectors.	4.3-10 mini DIN to N Adapter x 2	
5	An AC/DC power adapter with a power cord and a DC output cable.	AC/DC Adapter	12V DC/5A (For each Module)
6	A black lightning surge protector with gold-colored connectors and a label that reads 'REVEX COAXIAL LIGHTNING SURGE PROTECTOR H20'.	Lightning Surge Protector	6kV/3kA
7	A metal wall mounting kit consisting of a frame and mounting brackets.	Wall Mounting Kit	

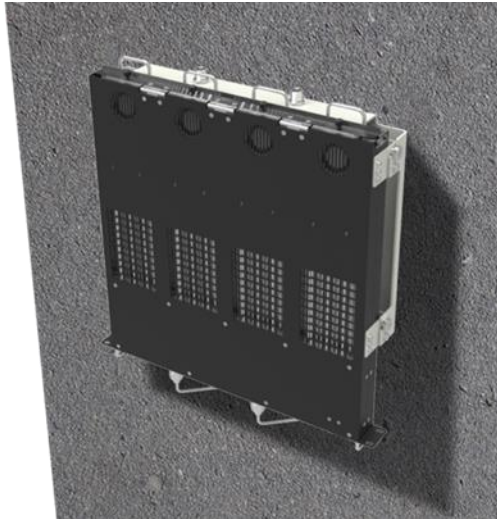
6.2 System Installation

Clear Call can be installed on 19inch racks or walls depending on the installation site.

6.2.1 Rack Mount



6.2.2 Wall Mount



6.3 Installation Precaution

6.3.1 Antenna

The antenna used in the Clear Call 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.

6.3.2 Isolation

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 is higher than 15dB above the gain of the system.

If isolation is not sufficiently ensured, the AOC function operates to reduce the gain to a level suitable for the ensured isolation.

6.3.3 Check points before turning on the Repeater

1) System Power Check

DC electrical power to the repeater should be 12V, input electricity only after power verification.

2) Input RF Signal Range

Optimal input RSSI into the repeater is -62dBm ~ -32dBm for all band. User should verify input condition of Donor ANT. If the input RSSI exceeds -32dBm, impose the using external attenuators should be used.

3) Isolation check between Donor/Service ANT

The system must need that 95dB(Gain+15dB) isolation is secured to use 80dB of the maximum profit of the system. User should check its condition before installation.

6.3.4 Open for Service

1) Check points before open:

① Verification of system installation status :

➤ Electricity, In/Out antennas, cable connection, and equipment mount status.

② Verification of system accessories :

➤ User should check all necessary accessories.

③ Check receipt signal level :

➤ Installer should check whether environmental conditions are in accordance with system specification to ensure that system operation will be optimized.

7. Troubleshooting

7.1 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, GST will simply replace the unit and conduct repairs at the appropriate facility.

7.1.1 Simple Troubleshooting Method

- 1) Check LED status at rear of module
 - Normal operation: Green LED on. Alarming: 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. **1-913-469-6699**.

7.1.2 Troubleshooting Guide Related to RF

Item	Check Point	Troubleshooting
Check before system operation	System input power range (DL/UL)	- Downlink: -62dBm ~ -32dBm - Uplink: -57dBm ~ -27dBm (@ 700MHz/800MHz) - Uplink: -62dBm ~ -32dBm (@ 1900MHz/2100MHz)
	System gain (DL/UL)	- 50dB ~ 80dB
	Output power (DL/UL)	- Downlink: 13dBm±2dB (@ 700MHz/800MHz) - Downlink: 18dBm±2dB (@ 1900MHz/2100MHz) - Uplink: 18dBm±2dB
	Check points before open for service	- Please check quantity of all accessories with specification before you set up - Fit cable length in accordance with field condition
Check after system operation	Check points after open for service	Check following status; - Verify that the antennas are securely mounted and pointed in the correct directions - Connection status between antennas and RF cable - Verify that the Repeater is securely mounted - Proper AC power status for AC/DC Adaptor - Coaxial cable (RF) construction status - Connectors and combiners connection status - Cable connection status against leakage of water
When repeater does not work properly	Check electricity cord connection status	- Re-Connection in power cable

	DL / UL over output alarm	<ul style="list-style-type: none"> - Make sure output power is operating normally - Please reset adaptor upon completing alarm troubleshooting
	Temperature alarm	Check following status; <ul style="list-style-type: none"> - Setting level of maximum temperature limit - Temperature offset is normal or not - Circumstances of temperature - Please reset adaptor upon completing alarm troubleshooting
	RF off	<ul style="list-style-type: none"> - Verify that the HPA's are on - Please reset adapter upon completing alarm troubleshooting
When output power is no longer problem	Technician should verify category of alarm at the LCD of front side.	<ul style="list-style-type: none"> - When red light on the shutdown LED, technician should troubleshoot the alarm via laptop

7.1.3 Troubleshooting Guide Related to SNMP

Symptom	Check Points	Troubleshooting
Link Fail	Communication problem	In case of Ethernet, verify IP addressing, DHCP function, and that cookies are deleted <ul style="list-style-type: none"> - verify that a direct Ethernet cable is being used

If technician thinks there is a serious problem, call after sales team for over-the-phone Technical support. **1-913-469-6699**.