

# ICS Repeater for Sprint Equipment Manual (IRES-1900US20-20 CG-Prototype)

Airpoint Co., Ltd.

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# 1 Safety Notices

This document contains safety notices in accordance with appropriate standards.

Any installation, adjustment, maintenance and repair of the equipment must only be carried out by trained, authorized personnel. At all times, personnel must comply with any safety notices and instructions.

Specific hazards are indicated by symbol labels on or near the affected parts of the equipment. The labels conform to international standards, are triangular in shape, and are colored black on a yellow background. An informative text label may accompany the symbol label.

 <b>Warning</b>	
 水ぬれ禁止	<b>Avoid water immersion from the external interfaces</b> Water immersion from the external interfaces may cause damage to equipment

 <b>Attention</b>	
 高温注意	<b>Do not install where it is likely to contain heat.</b> Equipment must be placed where the airflow is good as it generates heat in operation.
 やけど注意	<b>Do not use bare hands</b> Use working gloves to avoid burn injuries.

 <b>Attention</b>	
 重量物	<b>Heavy goods</b> The equipment weighs about 20kg. Dropping it can cause injury.

Any Booster or Repeater system will generate radio (RF) signals and continuously emit RF energy. In order to avoid prolonged exposure to the antennas, Airport Co., LTD recommends maintaining a 300cm minimum separation distance from the antenna while the system is operating.

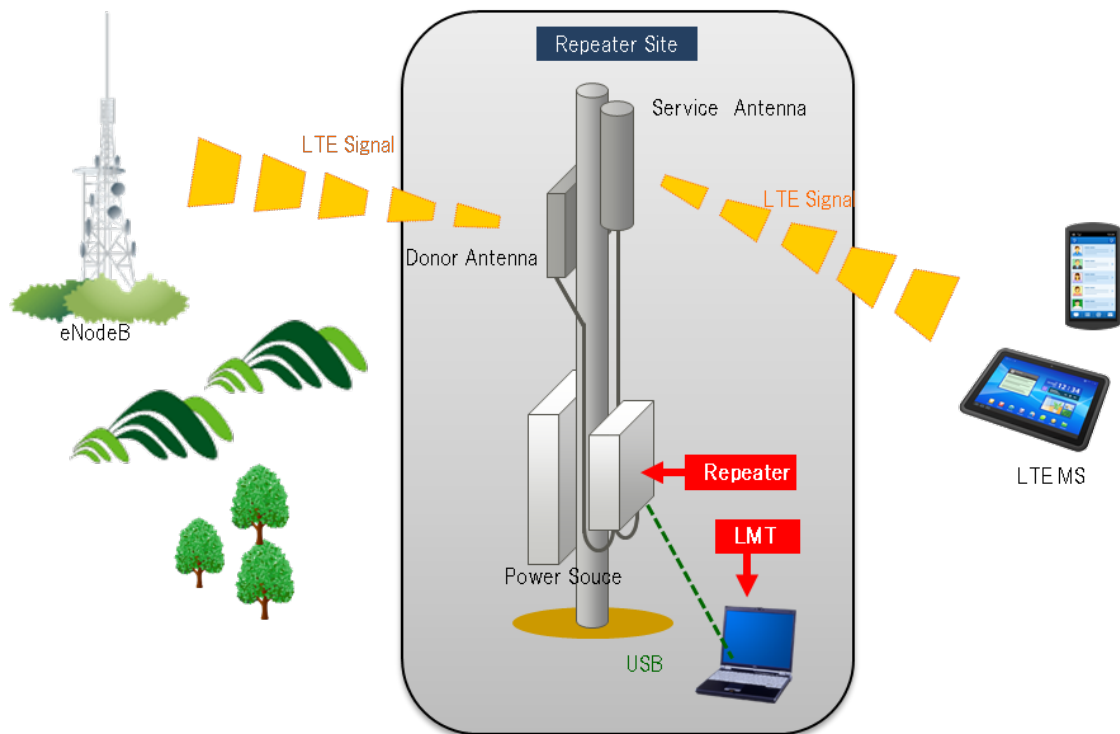
## 2 Introduction

The ICS (Interference Cancelling System) repeater has been designed to meet the needs of Network Operators wanting to maximize operational performance while enjoying the cost saving benefits of an effective, integrated, Repeater and eNodeB strategy.

The ICS repeater improves signal quality by eliminating problems such as weak and unstable receive and transmit signals. Customers will enjoy better signal quality, easier access and more stable links.

Using innovative interference cancelling technology, antenna isolation can be improved between 20 dB (depending on model) when multi-path feedback signals are present.

Following figure describes ICS repeater system configuration.



**Figure 1 System Configuration**

### 3 Material List

The following table describes material list of ICS repeater.

**Table 1 Material List**

Item	Pcs	Remarks
ICS Repeater	1	
Repeater Bracket	1	Include Bolts(12 pcs)
Connector for External Alarm	1	5 P Waterproofing
LMT Software	—	(CD-ROM)
USB Driver for LMT Software	—	(CD-ROM)
	—	



## 4 Functional Description

### 4.1 Block Diagram

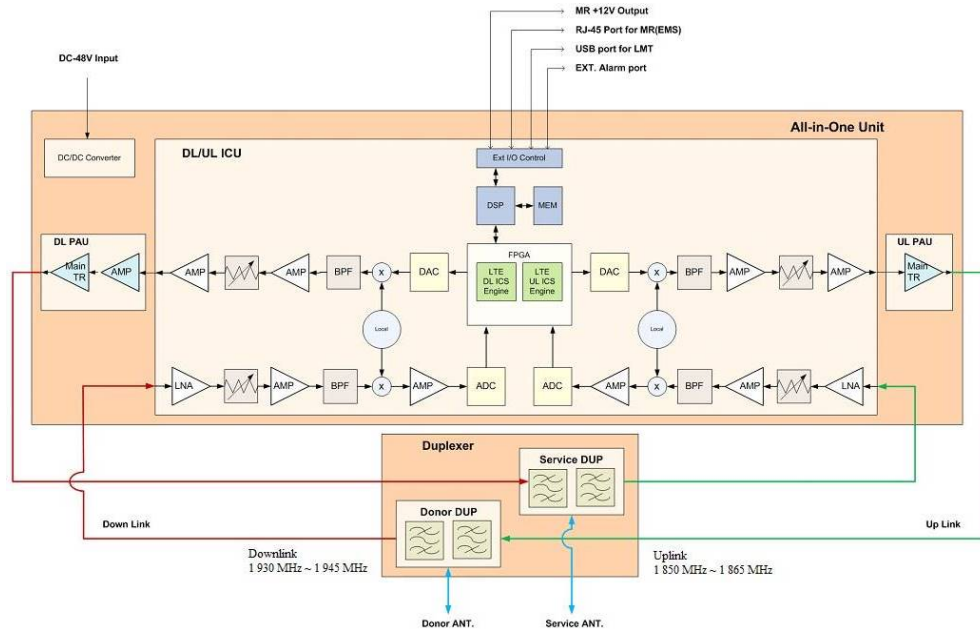


Figure 2 Block Diagram

### 4.2 Functions

#### (1) All in One Unit (AiO Unit)

AiO Unit has following functions.

- ◆ DL/UL ICS function
  - This function is applied in order for the ICS algorithm which consists of FPGA/DSP to predict and remove the feedback signal between a donor and a service port.
- ◆ DL/UL Power Amplifier function
  - This function applies to amplify DL/UL RF signal.
- ◆ Remote Control function
  - This function is used to monitor and control LMT.
- ◆ DC-DC Converter
  - This function is used to convert DC power input (-48 VDC) into internal power source.

#### (2) Duplexer

The duplexer is used to isolate the uplink from the downlink, that is, to separate the transmitting path from the receiving path.

## 5 System Specifications

### 5.1 Mechanical Specifications

**Table 2 Mechanical Specifications**

Parameter		Specification
Dimensions	Width	342 [mm] $\pm$ 2 [mm] (Without protrusion)
	Depth	165 [mm] $\pm$ 3 [mm] (Without bracket)
	Heights	435 [mm] $\pm$ 2 [mm] (Without protrusion)
Wight (without brancet)		Under 20 [kg]
Power Source	Input Voltage	DC -48 [V] $\pm$ 15 [%]
	Power Consumption	Less than 200 [W]

## 5.2 Electrical Specifications

**Table 3 Electrical Specifications**

Parameter	Downlink	Uplink	Remarks
Frequency	1 975 [MHz] ~ 1 995 [MHz]	1 895 [MHz] ~ 1 915 [MHz]	
Carrier	CDMA-2000 1X, 1X EV-DO(Rcv.A), LTE		
Max. Output Power	20 [W] ( +43 [dBm])	1 [W] (+30 [dBm])	
Input Power Range	-80 [dBm]/Total ~ -20 [dBm]/Total	~ -33 [dBm]/Total	
Max. Gain	100 [dB]	100 [dB]	
Gain Range	40 [dB] (60 ~ 100 [dB])	40 [dB] (60 ~ 100 [dB])	
Gain Control Step °	1 [dB] Step		
EVM (Rho)	8 [%] [LTE], 0.975 [CDMA]		3GPP TS 36.106
Max. Input Power	-20 [dBm]	-33 [dBm]	
V.S.W.R	Less than 1.5		
RF Impedance	50 [Ω]		
System Delay	Min. 3.0 [μs] [LTE], Min. 8.0 [μs] [CDMA]		
Power Density	0.903 mW/cm <sup>2</sup> (Downlink/LTE 5 MHz)		
Noise Figure	Less than 15 [dB] ( in 25 °C)	Less than 5 [dB] (in 25 °C)	@ maximum gain
Cancel Window size	6.0 [μs]		
Static Feedback Cancellation Capacity	Max. : -20 [dB] (Direct Feedback)		

## 5.3 Environmental Specifications

**Table 4 Environmental Specifications**

Parameter			Specification
Temperature and Humidity. ※No Condensation	Operational	Temperature	-30 [°C] ~ +50 [°C]
		Humidity	5 [%] ~ 95 [%RH]
	Storage	Temperature	-30 [°C] ~ +60 [°C]
		Humidity	5 [%] ~ 95 [%RH]
Cooling system			Natural air cooling
Ingress Protection			IPX5

## 6 System Description

### 6.1 Equipment Outline

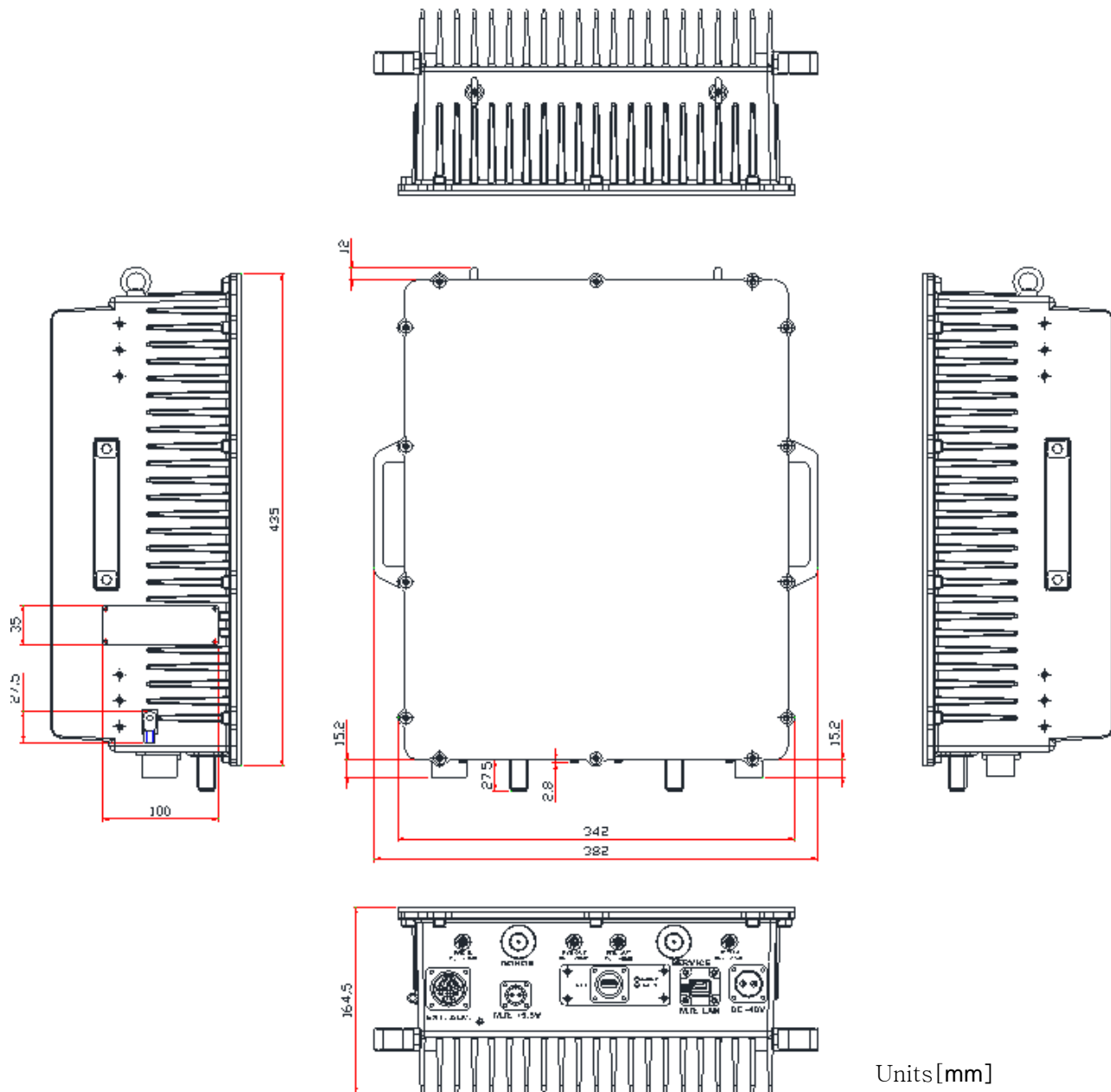


Figure 3 Equipment Outline

## 6.2 Repeater Bracket Outline

The following figure shows repeater bracket.

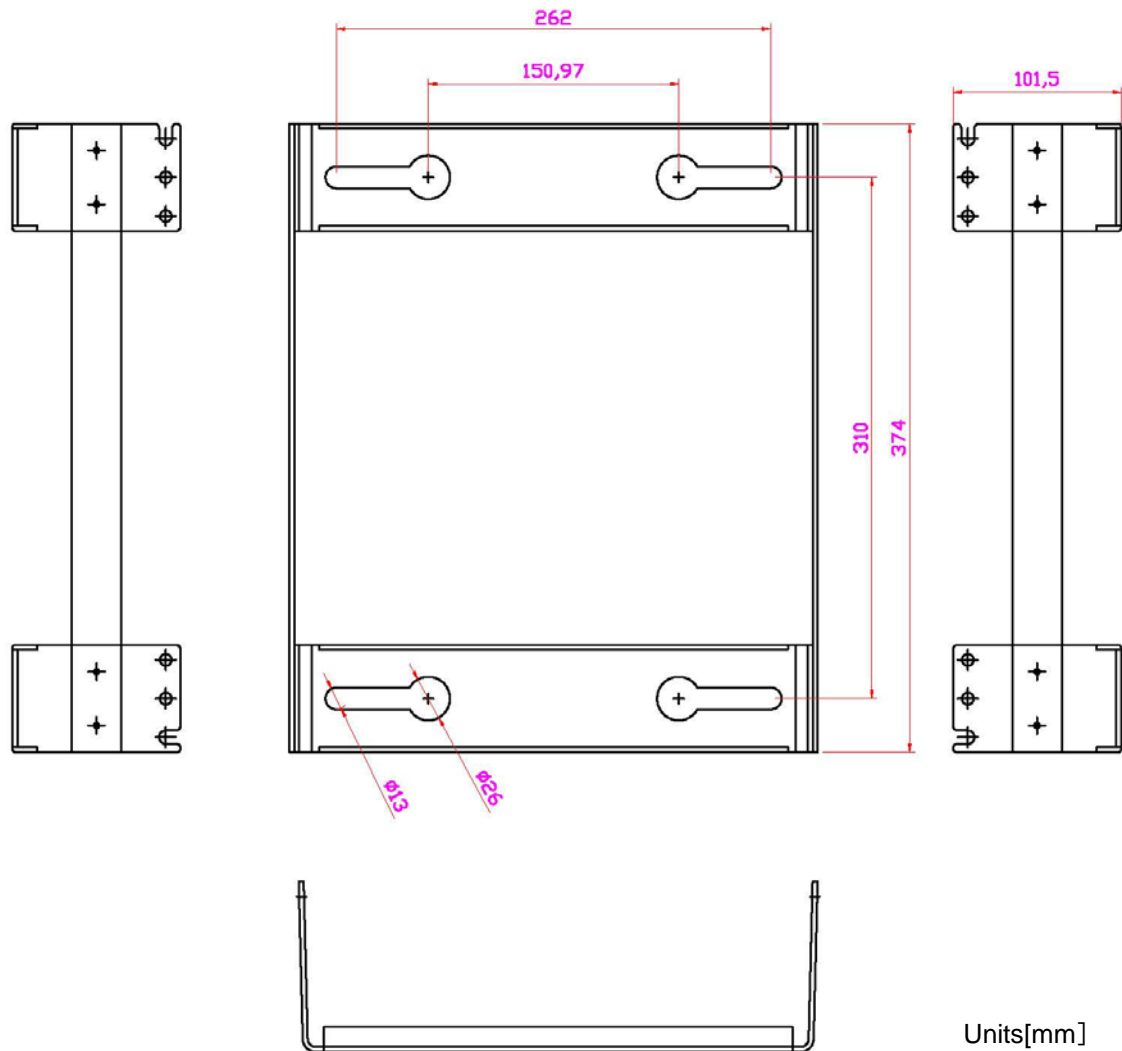


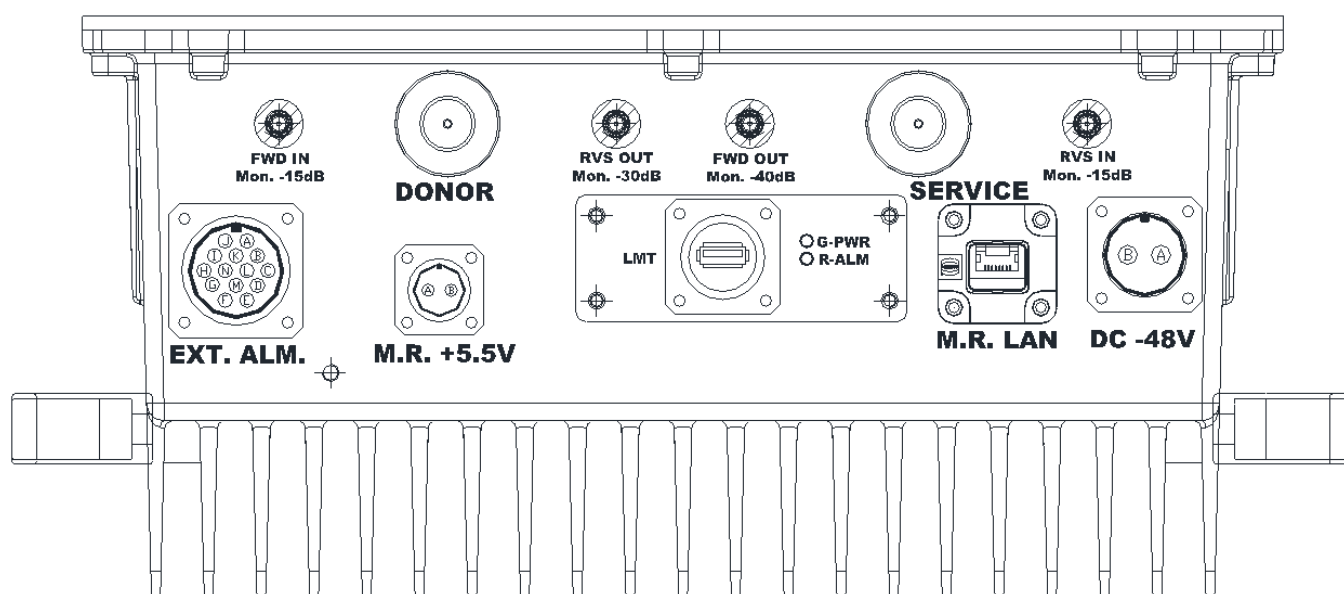
Figure 4 Repeater Bracket Outline

## 6.3 Interfaces

### 6.3.1 Interface Description

**Table 5 Interfaces**

No.	Interface	Port	Remarks
1	Donor Antenna Port	DIN7/16(J)	TRX
2	Service Antenna Port	DIN7/16(J)	TRX
3	DC Power Port	Waterproof 5P Connector	DC -48V (See )
4	External Alarm Port	Waterproof Connector	(See )
5	Monitor Port of Donor Antenna Port	SMA(J)	IN Coupling Loss: 20 dB $\pm$ 2 dB OUT Coupling Loss: 30 dB $\pm$ 2dB
6	Monitor Port of Service Antenna Port	SMA(J)	IN Coupling Loss: 20 dB $\pm$ 2 dB OUT Coupling Loss: 40 dB $\pm$ 2 dB
7	LMT port	USB (B Type)	PC's Port: USB(A type)
8	LED Indication	LED	PWR ALARM

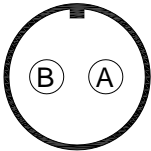


**Figure 5 Interfaces Description**

## 6.3.2 Connector Description

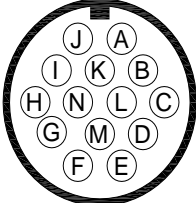
### (1) DC Power Port

Table 6 DC Power Port

Connector (Repeater Side)	Pin Assign	
	A	-48 VDC INPUT
	B	GND

### (2) External Alarm Port Connector

Table 7 External Alarm Connector

Connector (Repeater Side)	Pin Assign	
	A	Ext. Alarm #1
	C	Ext. Alarm #2
	E	Ext. Alarm #3
	G	Ext. Alarm #4
	I	Ext. Alarm #5
	B,D,F,H,H	GND (COM )



## 7 Functions

### 7.1 ICS Function

The ICS repeater possesses ICS function which can predict and cancel the feedback signal between donor and service antenna.

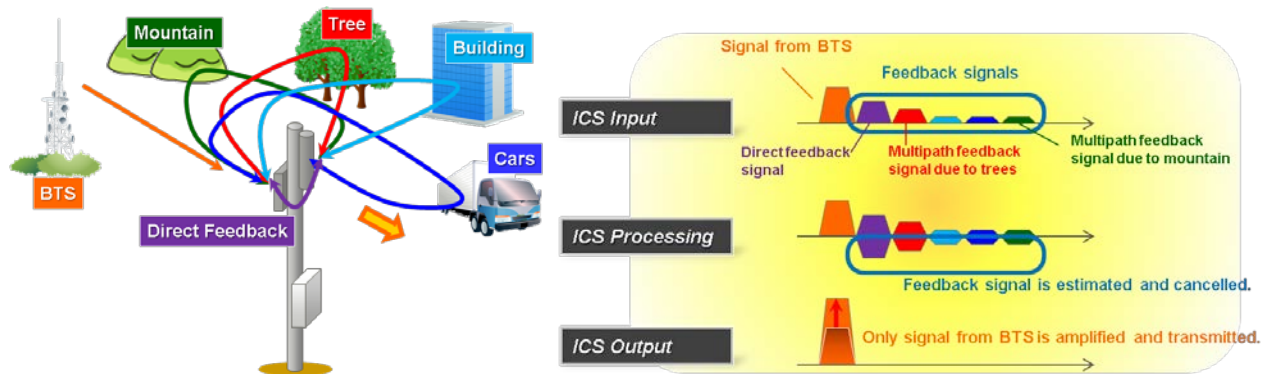


Figure 6 ICS Function

#### 7.1.1 Gain Setting Mode

The repeater has three type of gain setting mode. The gain setting for down link and uplink can be set separately.

The gain setting can be done without repeater service down.

##### (1) Gain Mode

The output power is depending on the Gain Set value of gain. (60 [dB] ~ 100 [dB])

##### (2) Pilot Mode

This mode is used to ensure consistent output power. This output power is determined by the Pilot Target Power setting. Output power will remain at this power regardless of variations in input power. 【DL Only】

##### (3) Balance Mode

The mode to set balance value of the uplink output signal level compared to downlink gain. 【UL Only】 The mode which attaches, interlocks and can adjust arbitrary level differences automatically to Downlink Gain.

(Range: 0 ~ -10 [dB])

Ex.1) Downlink Gain setting : Gain mode 80 [dB], Balance Value -5 [dB]

⇒ Uplink Gain : 75 [dB] (When Downlink gain set another value, uplink gain will be changed automatically.)

Ex.2) Gain setting : Pilot Mode, During receive is changing 70 ~ 75, Balance value +5 [dB]  
 ⇒Uplink Gain : 75 ~ 80 [dB] (Uplink gain will be changed by downlink gain changing)

## 7.1.2 Pilot AGC Function

The repeater has Pilot AGC (Auto Gain Control) function which detect reference signal from eNodeB and control gain to stabilize pilot output power. may not change by change of input power.

Pilot AGC function reference signal from e-Node B in LTE, uses RS (Reference Signal)

Following figure shows Pilot AGC image

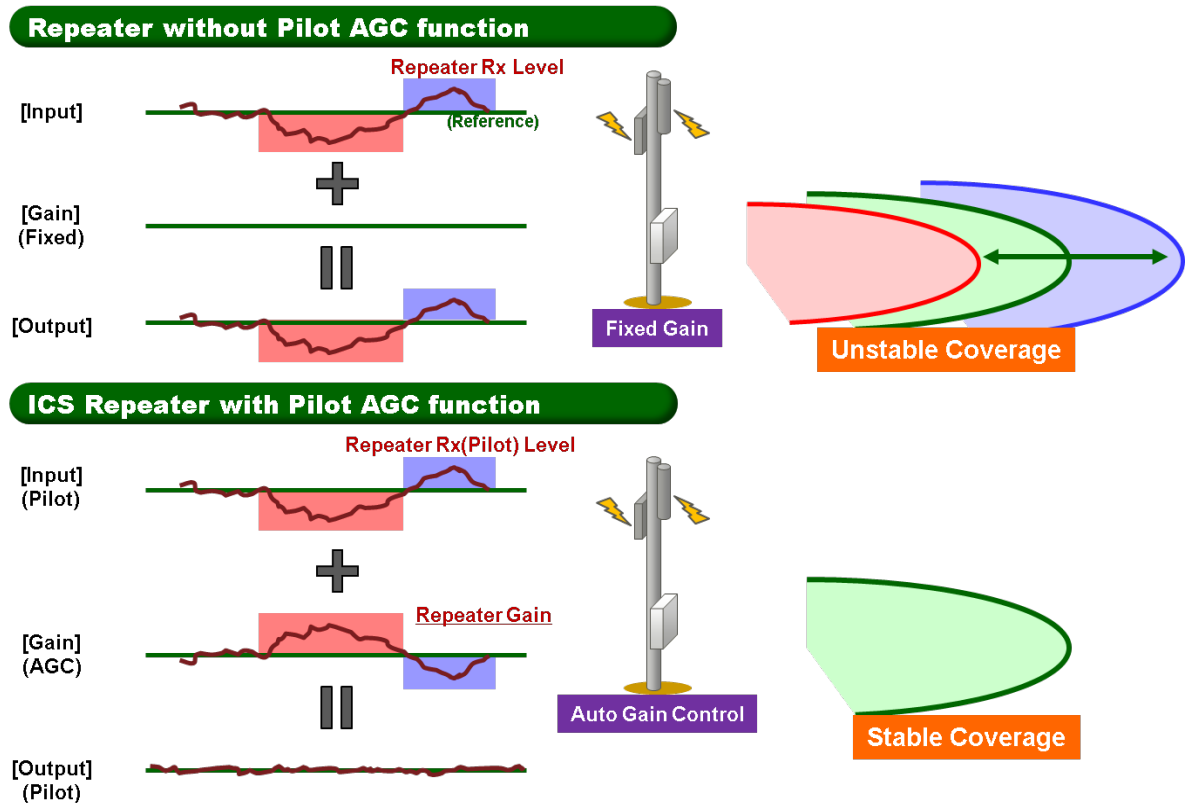


Figure 7 Pilot AGC Image

### 7.1.3 ALC/AUTO Shutdown/Excessive Input Protection (TBD)

The repeater has ALC (Automatic Level Control) function. If specified input level is exceeded, the automatic control of the attenuator in equipment is carried out, and an output level is kept constant. Even if it exceeds a maximum input level, repeater is keeping ALC by "Excessive Input protection" function while excessive input protection range

Excessive input protection range is provided keeping maximum output power and avoid immediate shutdown by excessive input. When the repeater detects input which exceeds excessive input protection range, auto shutdown is carried out immediately.

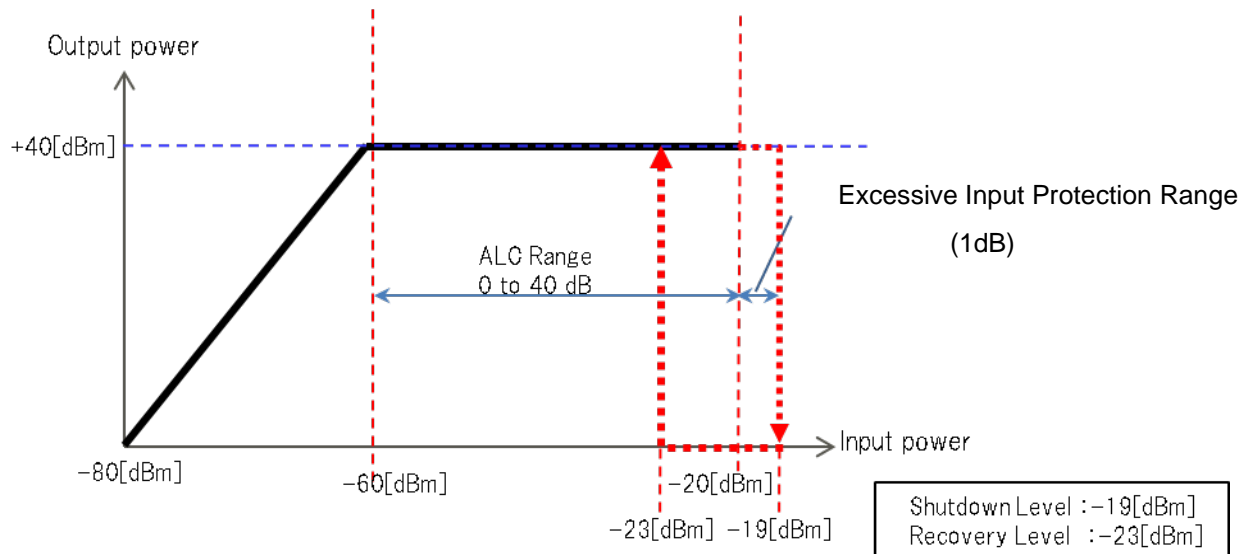


Figure 8 DL ALC/Auto Shutdown/Excessive Input Protection Image @gain 100 dB

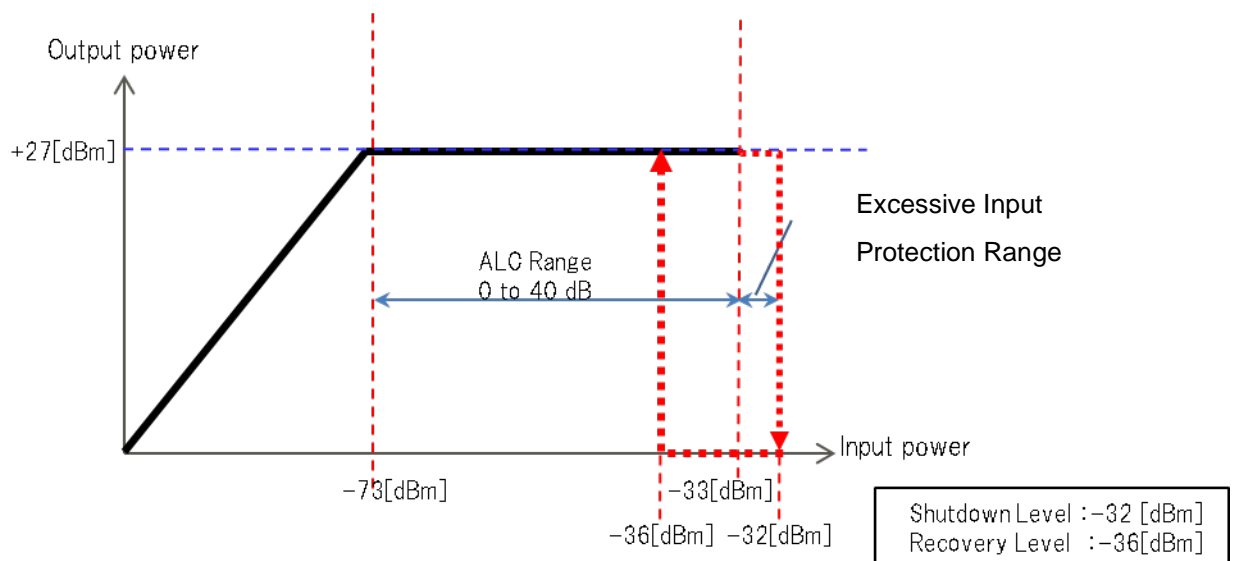


Figure 9 UL ALC/Auto Shutdown/Excessive Input Protection Image @gain 100 dB

## 7.2 Monitor and Control Function

The repeater can be monitored and controlled by LMT (Local Maintenance Terminal). LMT is based on Windows software (Windows XP/VISTA/7) and LMT is connected to the repeater by USB cable. Items of Monitor, control and alarm are shown in the Appendix C.

## 7.3 External Alarm Indication Function

The repeater has contact interface for external alarm and status can be monitored by LMT. Connector description and pin assignment are shown in table 7.

## 8 Software Setup (TBD)

### 8.1 LMT Installation

The LMT software in the CD-ROM which is attached to the repeater is required to install the Repeater LMT software. Ensure the file is available on your PC and you have at least 10MB of free space.

1. To begin installation, select and run the “XXX.exe” file.
2. Select the directory for the LMT software to be installed. Click on the [Change] button if you wish to select another directory.
3. After the installation directory has been selected, click the [install] button to begin installation.
4. During the installation, the progress bar indicates the installation process.
5. When the installation is complete, the “installShield Wizard Completed” message will appear. Click [ Finish] to complete the installation process.
6. Two executable files will be saved in the selected directory.
  - “XXX.exe”
  - “unint.exe”

These files can be accessed from the Start manu.

7. The LMT software can be uninstalled by running the unint.exe file.

### 8.2 Main Window

After installing the LMT software and establishing connection with the repeater, run the XXX.exe file to start the LMT. A main window will be displayed as shown in the following figure.

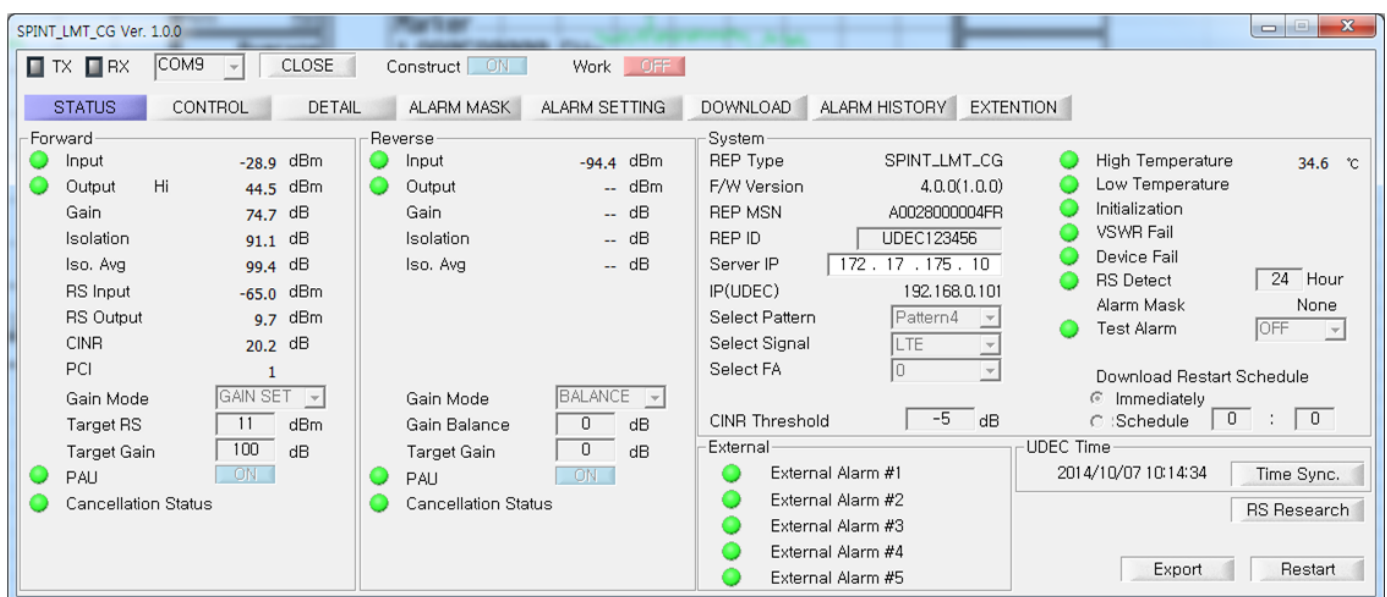


Figure 10 Main Window

The main window showss the following information :

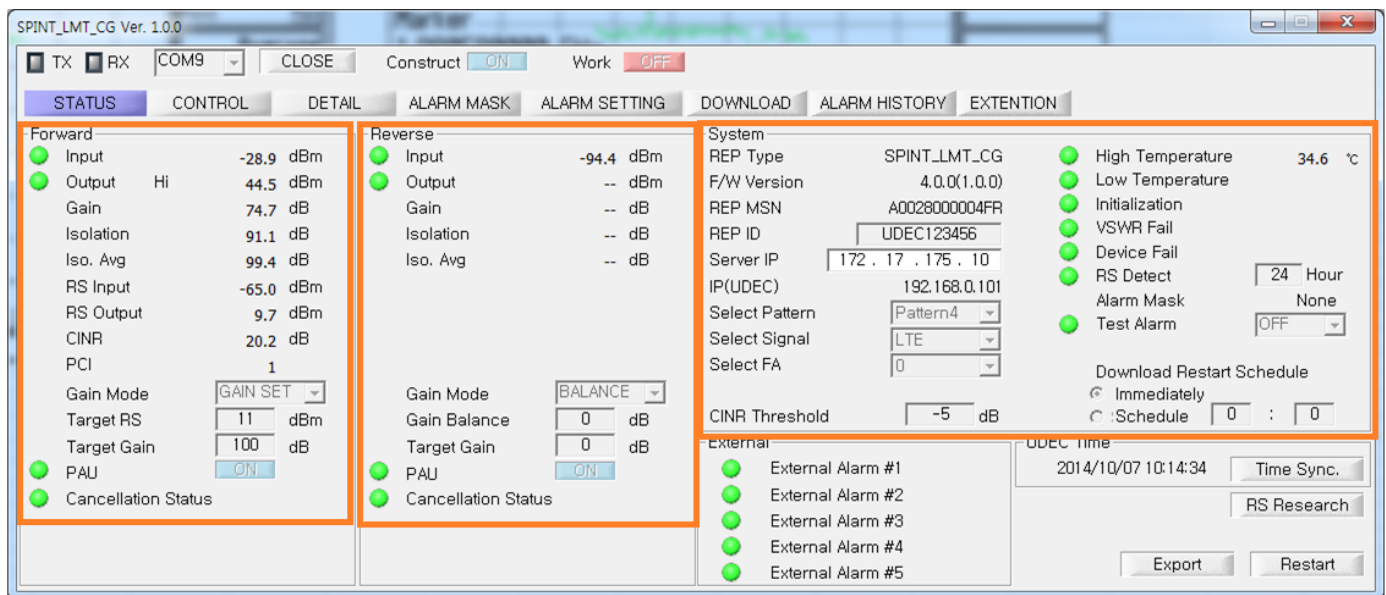
- Downlink
- Uplink.
- Sytem

Select the COM port of the PC to be used for the LMT.

To change the COM port, click the [CLOSE] button, select a desired port number then click the [OPEN] button to establish connection.

Click the [EXIT] button to quit the program.

## 8.3 Real Time Status Window



**Figure 11 Main Window**

**Table 8 Downlink Window Parameter**

No.	Items		Description	Remarks
1	Power	Input	Displays the level of Input power to Donor ANT.	Displays the Downlink and Uplink each
		Output	Displays the level of Output power from Service ANT.	
2	Gain	Gain	Displays the current Gain of Repeater	
3	Isolation	Iso	Displays the isolation between the Donor ANT. and Service ANT.	

## 8.4 Downlink Window

Forward

<input checked="" type="radio"/>	Input		-28.9 dBm
<input checked="" type="radio"/>	Output	Hi	44.5 dBm
	Gain		74.7 dB
	Isolation		91.1 dB
	Iso. Avg		99.4 dB
	RS Input		-65.0 dBm
	RS Output		9.7 dBm
	CINR		20.2 dB
	PCI		1
	Gain Mode	GAIN SET ▾	
	Target RS	11	dBm
	Target Gain	100	dB
<input checked="" type="radio"/>	PAU	ON	
<input checked="" type="radio"/>	Cancellation Status		

**Figure 12 Downlink Window**

**Table 9 Downlink Window Parameter**

Items	Description	Remarks
Gain Mode	Set possible to "GAIN SET" or "AGC MODE"	
Gain	Displays the current Gain of Downlink	
Target RS (Pilot)	Set possible to Reference Signal Target Value	
PAU	Set possible to Downlink RF Power ON/OFF	
RS(Pilot) Input Power	Displays the current Reference Signal Input Power level of Downlink	
RS(Pilot) Output Power	Displays the current Reference Signal Output Power level of Downlink	
High Input	Displays the High Input Alarm	
High Output	Displays the High Output Alarm	
Avg. Isolation	Displays the isolation between the Donor ANT. and Service ANT.	Average in 1 second
PCI	Displays the current Cell ID	
CINR	Displays the current Signal to Noise Ratio	

## 8.5 Uplink Window

The screenshot shows the 'Uplink Window' interface. At the top, there is a section titled 'Reverse' with a minus sign. Below this, there are several status indicators (green circles) and labels: 'Input' with a value of '-94.4 dBm', 'Output' with '-- dBm', 'Gain' with '-- dB', 'Isolation' with '-- dB', and 'Iso. Avg' with '-- dB'. Below these, there is a 'Gain Mode' dropdown menu set to 'BALANCE'. Underneath, 'Gain Balance' and 'Target Gain' are both set to '0 dB'. At the bottom, there are two more status indicators: 'PAU' (set to 'ON') and 'Cancellation Status'.

**Figure 13 Uplink Window**

**Table 10 Uplink Window Parameter**

Items	Description	Remarks
Gain Mode	Set possible to "GAIN SET" or "BALANCE"	
Gain	Displays the current Gain of Uplink	
Gain Balance	Set possible the Uplink Gain compare to Downlink Gain	
PAU	Set possible to Uplink RF Power ON/OFF	
High Input	Displays the High Input Alarm	
High Output	Displays the High Output Alarm	



## 8.6 System Window

System			
REP Type	SPINT_LMT_CG		High Temperature 34.6 °C
F/W Version	4.0.0(1.0.0)		Low Temperature
REP MSN	A0028000004FR		Initialization
REP ID	UDEC123456		VSWR Fail
Server IP	172 . 17 . 175 . 10		Device Fail
IP(UDEC)	192.168.0.101		RS Detect 24 Hour
Select Pattern	Pattern4		Alarm Mask None
Select Signal	LTE		Test Alarm OFF
Select FA	0		
CINR Threshold	-5 dB	Download Restart Schedule	
		<input checked="" type="radio"/> Immediately <input type="radio"/> Schedule 0 : 0	

Figure 14 System Window

Table 11 System Window Parameter

Items	Description	Remarks
REP Type	Displays the current Repeater Type	
F/W Version	Displays the current Firmware Version	
REP MSN	Displays the current System Serial Number	
REP ID	Displays the current Repeater Time	
Server IP	Set possible to synchronize the Repeater Time , When the Repeater connect to the PC	
IP(REP)	Displays a kind of current Input Channel	Fixed Value(F1)
System Temperature	Displays the current Repeater Temperature	
Initialization	Displays the Alarm of RF Shutdown	
High Temperature	Displays the Alarm of High Temperature	Upper 75 °C
Low Temperature	Displays the Alarm of Low Temperature	Under -30 °C
Device Fail	Displays the Alarm of Device Fail	Hardware Malfunction
RS Detect	Displays the Alarm of Pilot Detection Fail	
Test ALM	Displays the Alarm of DL VSWR Fail	Output Power : Upper + 30 dBm Return loss : Under 3 dB
Select Pattern	Set possible to select the FA & Carrier	
Select Signal	Set possible to detect the Carrier	

## 8.7 LMT Setting

For the LMT setting, follow the steps below.

**CONTROL → Change Setting → SET → Yes → OK → STATUS**

### 8.7.1 Downlink Target Gain Setting

For the Gain setting, follow the steps below.

1. Click [CONTROL] button
2. To change a Downlink target Gain (Min. Value : 60dB, Max. Value : 100dB)
3. Click [SET] button
4. Click [Yes] button
5. Click [OK] button
6. Click [STATUS] button

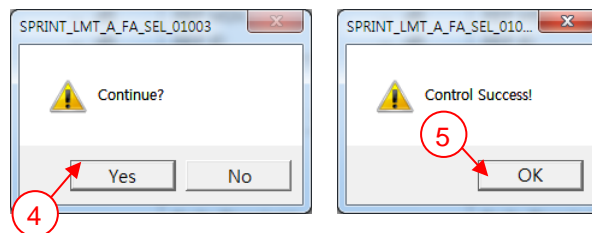
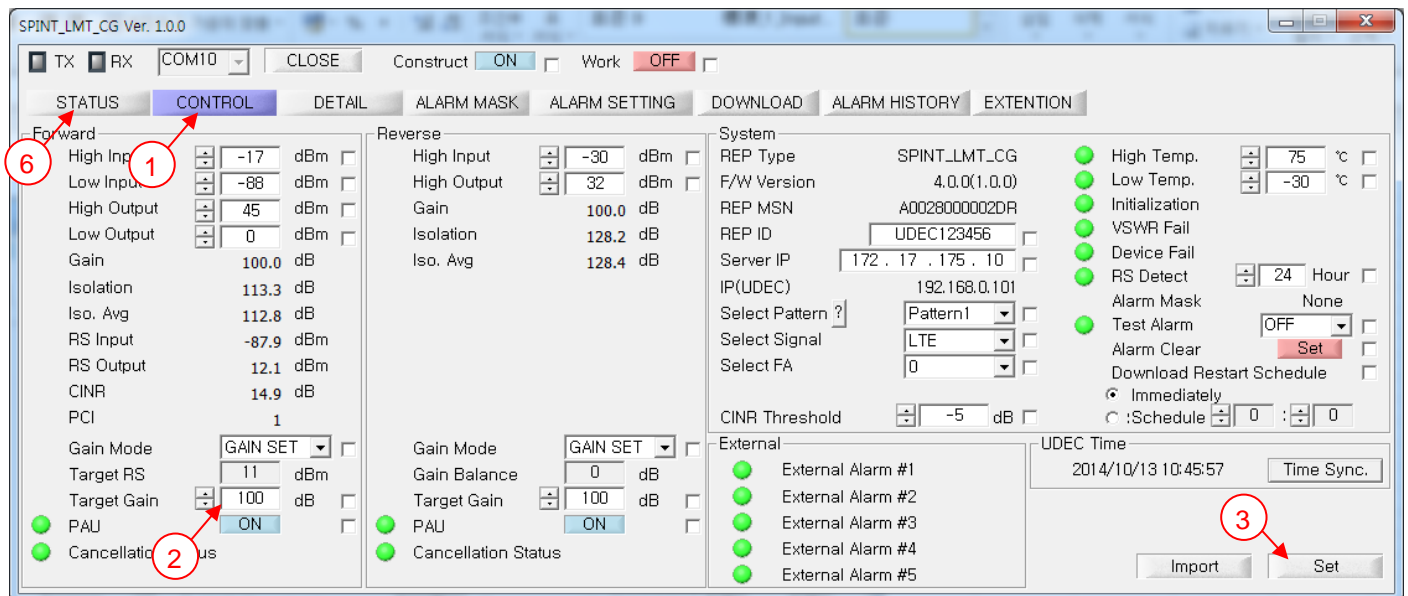


Figure 15 Control Window (Downlink Target Gain Setting)

### 8.7.2 Uplink Target Gain Setting

For the Gain setting, follow the steps below.

1. Click [CONTROL] button
2. To change a Uplink target Gain (Min. Value : 60dB, Max. Value : 100dB)
3. Click [SET] button

4. Click [Yes] button
5. Click [OK] button
6. Click [STATUS] button

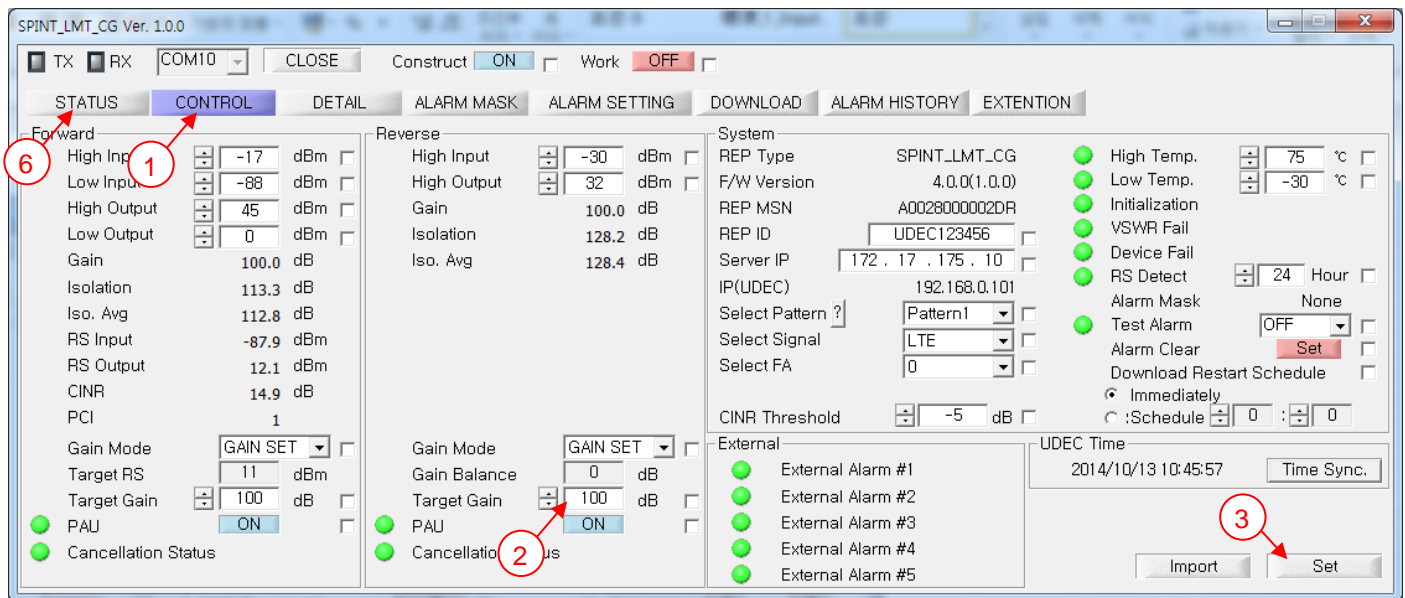


Figure 16 Control Window (Uplink Target Gain Setting)

### 8.7.3 Downlink Gain Mode Setting

For the Gain Mode setting, follow the steps below.

1. Click [CONTROL] button
2. To change a Downlink Gain Mode (GAIN SET or AGC)
3. Click [SET] button
4. Click [Yes] button
5. Click [OK] button
6. Click [STATUS] button

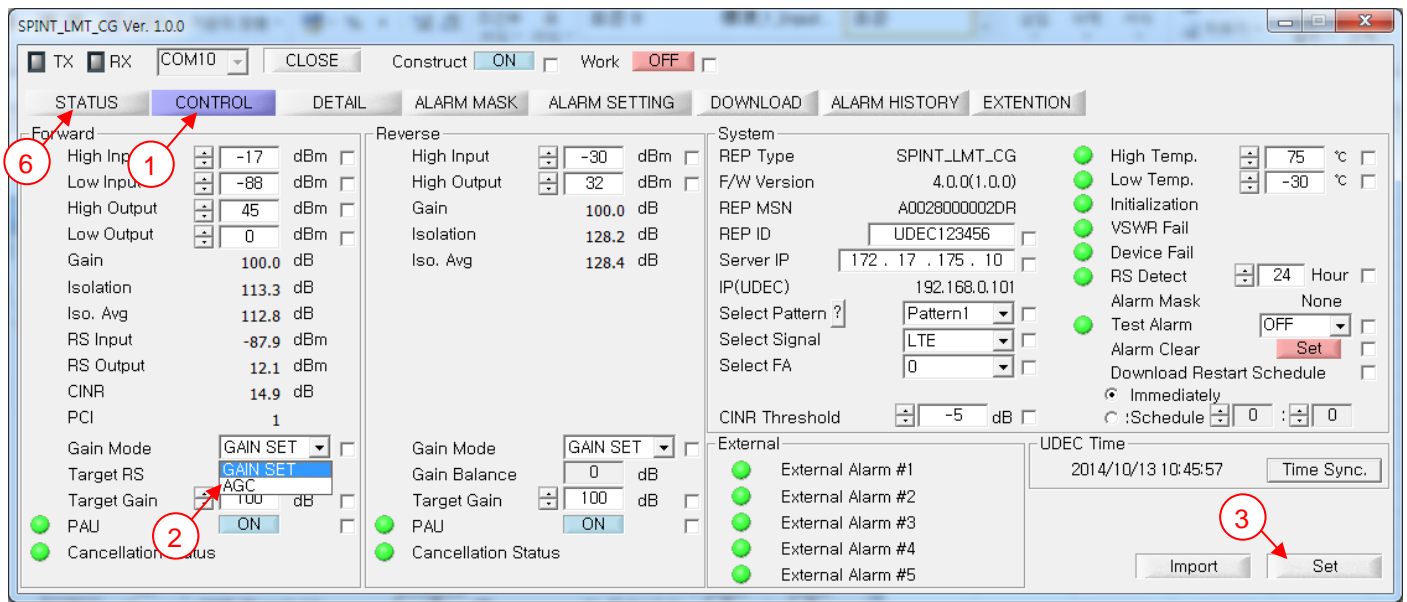


Figure 17 Control Window (Downlink Gain Mode Setting)

## 8.7.4 Uplink Gain Mode Setting

For the Gain Mode setting, follow the steps below.

1. Click [CONTROL] button
2. To change a Uplink Gain Mode (GAIN SET or BALANCE)
3. Click [SET] button
4. Click [Yes] button
5. Click [OK] button
6. Click [STATUS] button

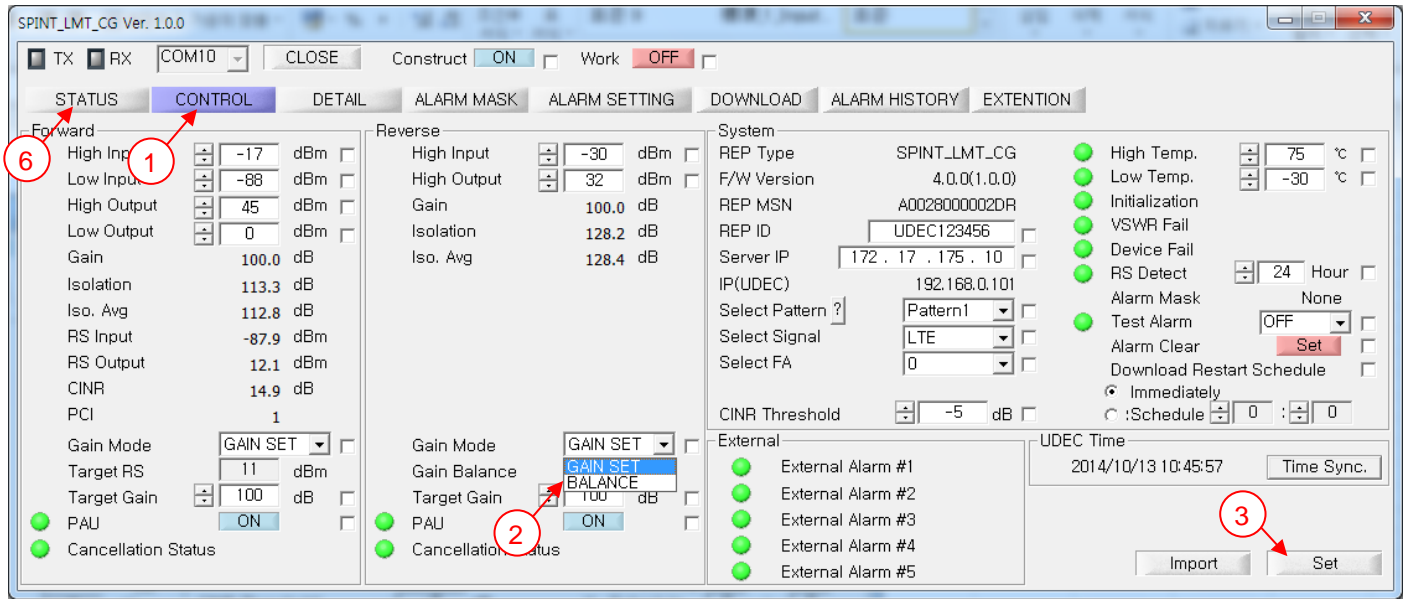


Figure 18 Control Window (Uplink Gain Mode Setting)

## 8.7.5 Signal Select Pattern Setting

The following figure shows signal select pattern(CDMA, LTE5MHz, LTE10MHz, LTE15MHz) of repeater.



Figure 19 Signal Select Pattern

For the signal select pattern setting, follow the steps below.

1. Click [CONTROL] button
2. To change a Select Pattern (Pattern1 ~ Pattern15)
3. Click [SET] button
4. Click [Yes] button
5. Click [OK] button
6. Click [STATUS] button

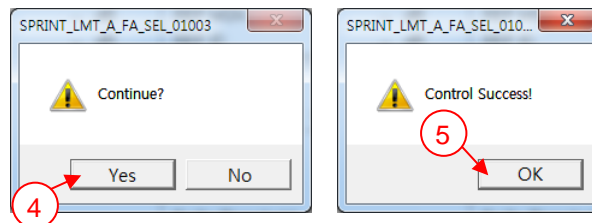
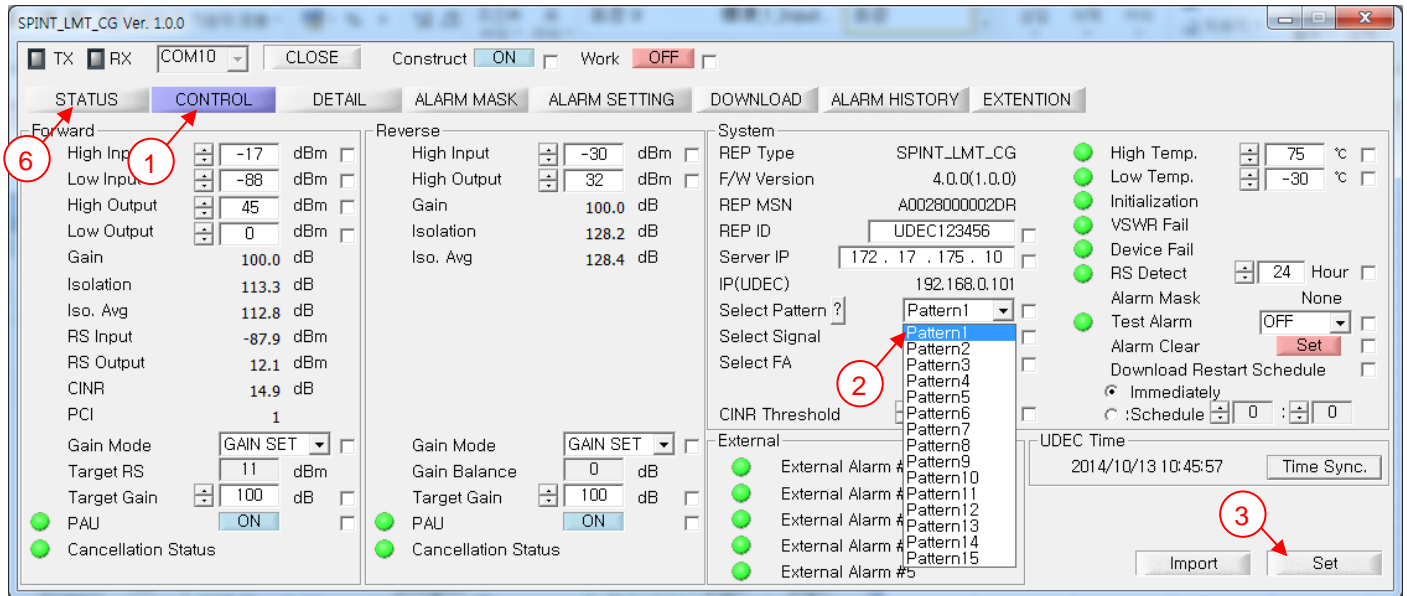


Figure 20 Control Window (Signal Select Pattern Setting)

## 9 Reference Document

### 8. 3GPP Specifications

- 3GPP TS36.106 「E-UTRA FDD repeater radio transmission and reception」

### 9. FCC Specifications

- FCC Part 24

### 10. UL Specifications

- UL 60950-1
- UL 60950-22

## 10 Operation Instruction

### 10.1 External interfaces

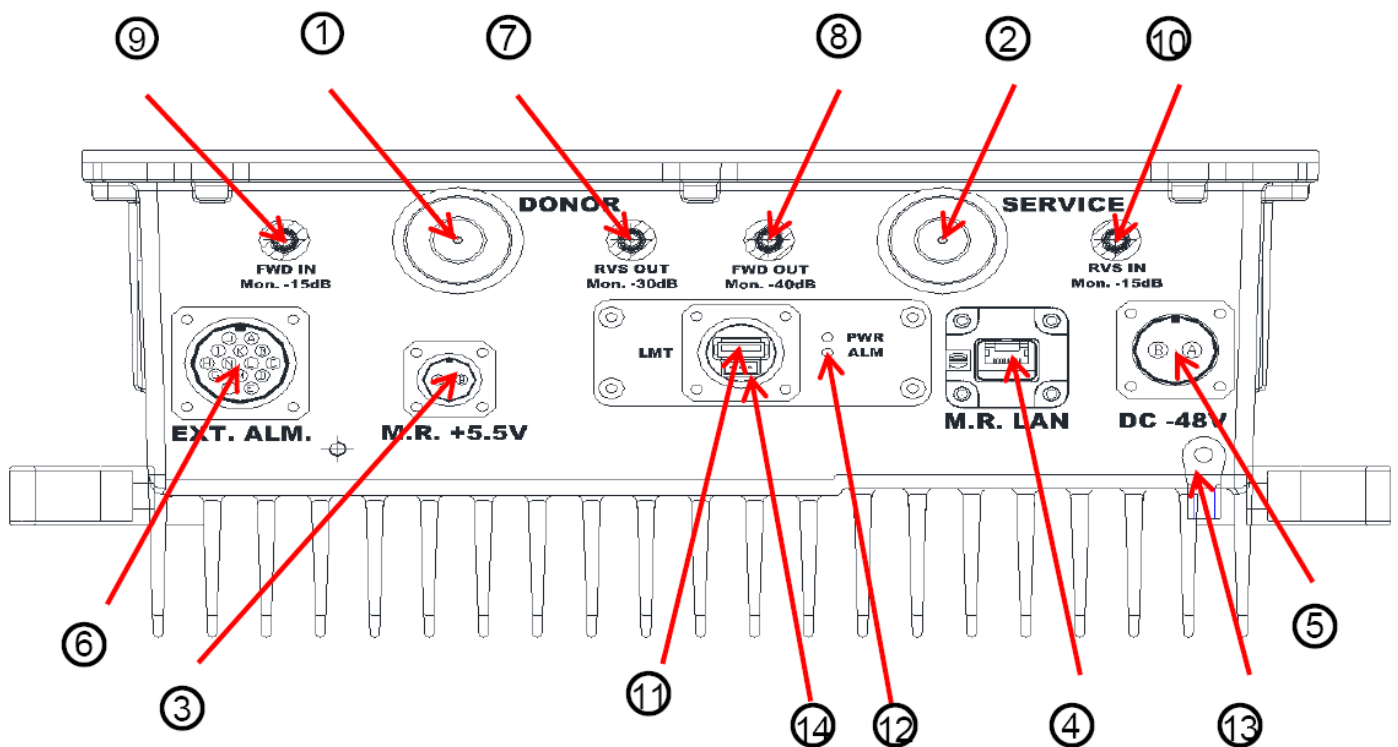
 <b>Warning</b>	
 水ぬれ禁止	<b>Avoid water immersion from the external interfaces</b> Water immersion from the external interfaces may cause damage to equipment

**Table 12 External interface list**

No.	インタフェース名	ポート種類	数	備考
①	Port for Antenna facing donor station	7/16DIN-J	1	TRX
②	Port for Antenna facing service area	7/16DIN-J	1	TRX
③	Power feeding port for mobile router	Waterproof type 2Pconnector	1	Output: DC+5.5V Connector model: MS3102A10SL-4P compliant
④	LAN port for mobile router	Waterproof type RJ-45connector	1	IEEE802.3 compliant Connector model : 09455450031
⑤	DC power input port	Waterproof type 2P connector	1	Input: DC—48V Connector model : MS3102A16-13P compliant
⑥	External equipment alarm intake port	Waterproof type 14P connector	5contact points	Connector model : MS3102A20-27P compliant
⑦	Monitor port (For transmitting signal to donor antenna)	SMA-J	1	Coupling loss: 30dB (±2dB)
⑧	Monitor port (For transmitting signal to service antenna)	SMA-J	1	Coupling loss: 40dB (±2dB)
⑨	Monitor port (For receiving signal from donor antenna)	SMA-J	1	Coupling loss: 15dB (±2dB)
⑩	Monitor port (For receiving signal from service antenna)	SMA-J	1	Coupling loss: 15dB (±2dB)
⑪	Local maintenance port (For LMT connection)	Waterproof type USB (A terminal)	1	PC side—USB(A terminal) Connector model : MS3105-16S compliant USB driver for Windows is provided (OS is Windows XP, 7, 8.1)
⑫	Equipment status monitoring LED	LED	2	PWR ON, ALARM status monitor
⑬	F.G. terminal	round crimp terminal	1	-
⑭	Debug port	3pin	1	Manufacturer maintenance port



Figure 21 Interface layout drawing



- External devices( Feeder Cable, Antennas, Coupling Device etc. ) are not provided by Manufacturer(Airpoint).  
Please refer to the Table1. Material List for the items provided by Manufacturer.

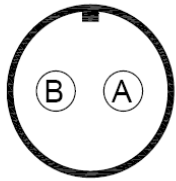
## 10.1.1 Connector Type

Connector type, pin assignment (equipment side) of equipment external interface is shown below.

(Excluding RF connector)

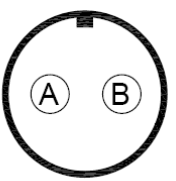
### ① DC Power Input Port

Table 13 DC Power Input Port

Shape (Equipment Side)	Pin Assignment	
	A	-48V DC INPUT
	B	GND

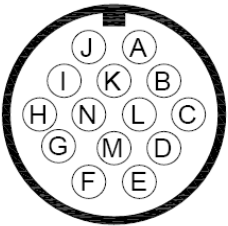
### ② Power Feeding Port for Mobile Router

Table 14 Power Feeding Port for Mobile Router

Shape (Equipment Side)	Pin Assignment	
	A	+5.5V DC OUTPUT
	B	GND

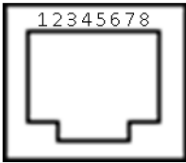
### ③ External Equipment Alarm Intake Port

Table 15 External Equipment Alarm Intake Port

Shape (Equipment Side)	Pin Assignment			
	A	External alarm #1	B	GND
	C	External alarm #2	D	GND
	E	External alarm #3	F	GND
	G	External alarm #4	H	GND
	I	External alarm #5	J	GND
	K	(Unused)	L	(Unused)
	M	(Unused)	N	(Unused)

#### ④ LAN Port for Mobile Router

**Table 16 LAN Port for Mobile Router**

Shape (Equipment Side)	Pin Assignment	
	1	Tx Positive Signal
	2	Tx Negative Signal
	3	Rx Positive Signal
	4	N.C.
	5	N.C.
	6	Rx Negative Signal
	7	N.C.
	8	N.C.

### 10.1.2 Equipment Status Indicators (LED)

Equipment status indicators (LED) are described below.

**Table 17 Equipment status indicators LED**

LED	LED indication	Power	RF	ALARM
PWR	Green	ON	ON	なし
	Green (Blinking)	ON	OFF	なし
ALM	Red	ON	ON/OFF	あり

Red indicates existence of any alarm

## 10.1.3 Connections and Conditions

Figure 22 External Interface Connection Diagram

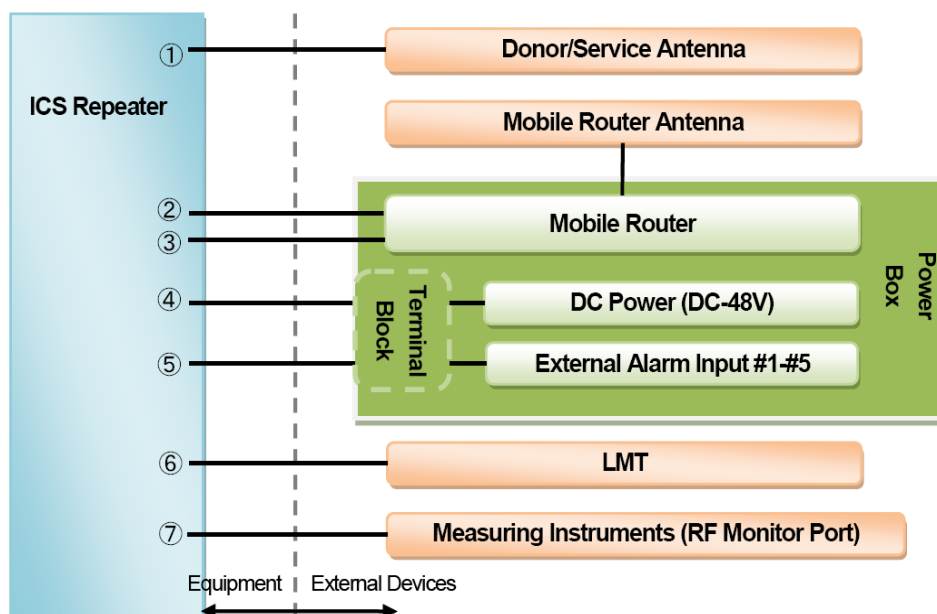





Table 18 External Interface Connection Conditions

No.	Type	ICS Repeater	Cables	External Devices
	RF	—	RF Cable <Feeder Cable Conditions> Input/output impedance: 50[Ω], V.S.W.R: 1.5 or less	
	LAN	—	• LAN Cable (Category 5 or higher)* • Cable Diameter...φ10[mm] or less	—
①	Power	• Output Voltage: DC+5.5[V]±0.5[V]	• Cable Diameter: Core... φ1.6[mm] or less Cable... φ3~6[mm] • Voltage Drop: Within the tolerable input range	[Mobile Router] • Input Voltage: DC+5.5[V] Supported
②	Power	• Input Voltage: DC-48[V]±15[%]	• Cable Diameter: Core...φ 3.5[mm] or less Cable...φ 5~11[mm] • Voltage Drop: Within the tolerable input range	• Output Voltage: DC-48[V]
③	Contact Points	• Applied Voltage: DC+3.3[V] • Outflowing Current: 3mA (Normally Open)	• Cable Diameter: Core... φ1.6[mm] or less Cable... φ7~15[mm]	• Contact Rating: DC+30[V] or less 0.3[A] or less • Sending Signal: Successive make
④	USB	—	USB Cable (A terminal at both ends)	USB-A terminal
⑤	RF	—	RF Cable <Feeder Cable Conditions> input / output impedance: 50[Ω], V.S.W.R: 1.5 or less	

- Please make sure that the cable type, cabling, ducting etc. are suitable for the operational environment.

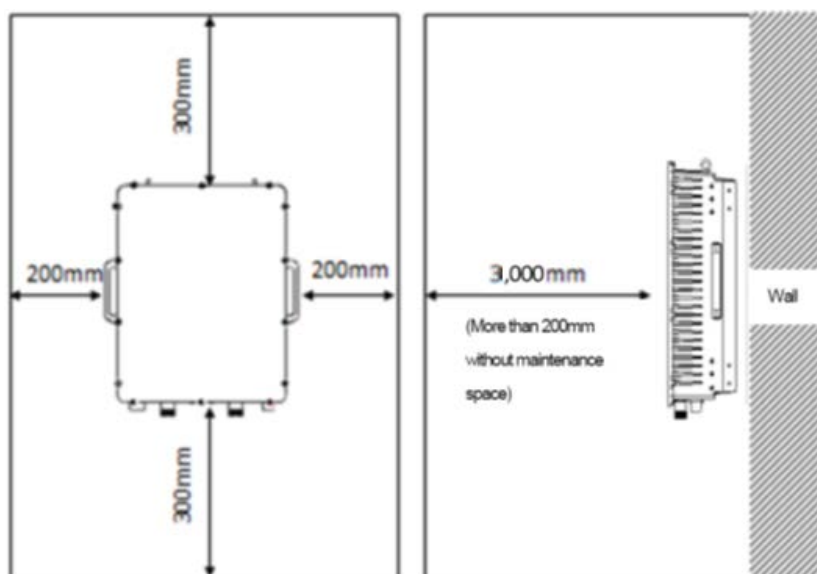
## 10.2 Operation Area (Performance Guaranteed)

 <b>Attention</b>	
 高温注意	<p>Do not install where it is likely to contain heat.</p> <p>Equipment must be placed where the airflow is good as it generates heat in operation.</p>
 やけど注意	<p>Do not use bare hands</p> <p>Use working gloves to avoid burn injuries.</p>

Please install the repeater as shown in Figure 21 below, so that operation environment can be maintained.

- Front space : more than 3,000 mm (more than 200mm without maintenance space)
- Space above and below : more than 300 mm
- Right and left space : more than 200 mm

**Figure 23 Example of repeater installation Setup**



## 10.3 Installation

 <b>Attention</b>	
 重量物	<b>Heavy goods</b> The equipment weighs about 20kg. Dropping it can cause injury.

Install the bracket with its right way up. For the right direction of the bracket, please refer to Figures below.

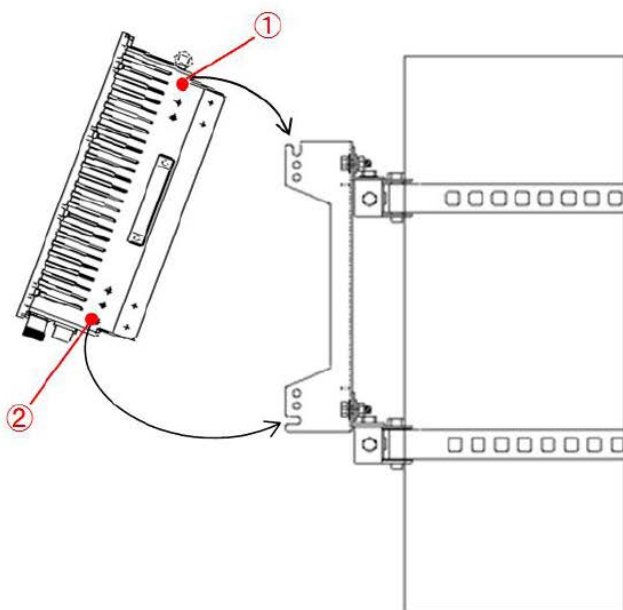
After the bracket is installed, hang the ICS Repeater onto the dent at the top of the bracket with its upper bolt (1). Please mind the free space between the ICS Repeater and the bracket.

And then, fit in the bolt (2) of the ICS Repeater into the dent at the lower part of the bracket.

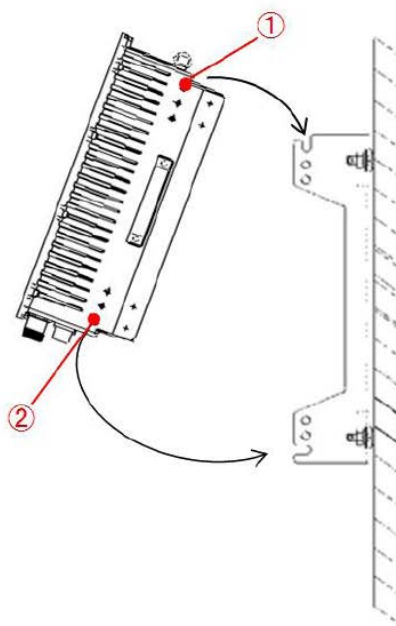
Put the remaining bolts in place and tighten them using a hex wrench (M6).

When using a suspender, make sure to use the two eyebolts that are equipped with the ICS Repeater.

**Figure 24 Example of installation on a column**



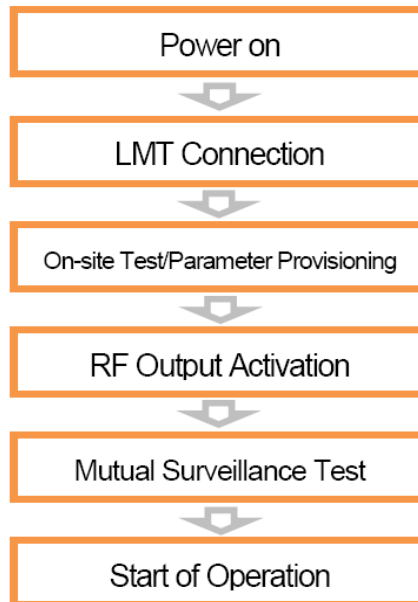
**Figure 25 Example of installation on the wall**



## 10.4 Turn-up Procedure

The following shows turn-up procedure after completion of installation:

**Figure 26 Turn-up Procedure**



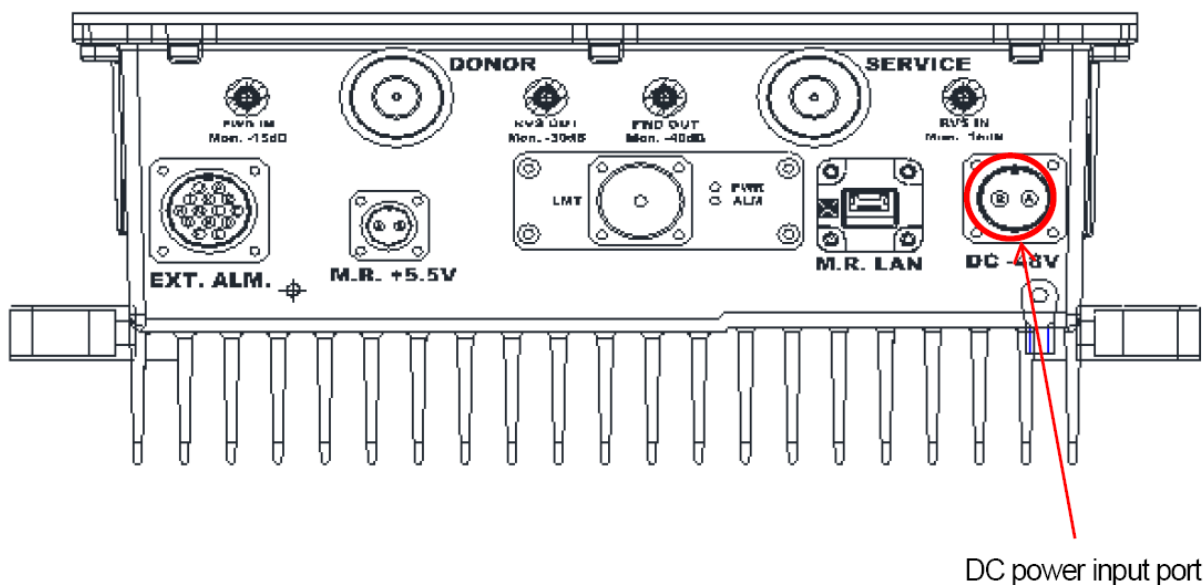
### 10.4.1 Power-up

Plug in the input power connector to the DC -48V input port as shown in Figure 25 below.

Then, turn on the breaker switches for the ICS Repeaters in the power box (auxiliary equipment).

Note that the equipment itself does not have its own power switch.

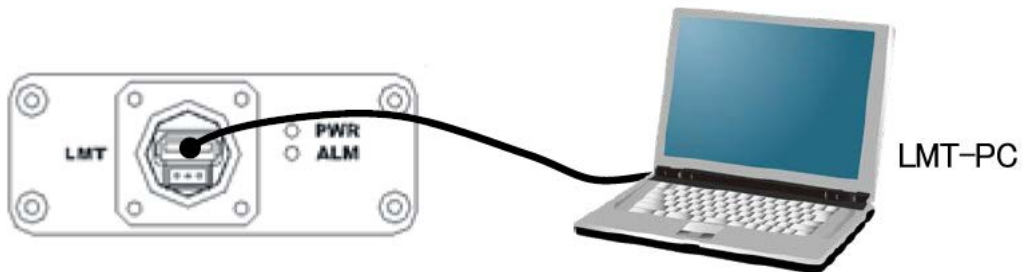
**Figure 27 Equipment External Interface**



## 10.4.2 LMT connection

Connect your LMT-PC to the local maintenance port on the external equipment interface as shown in Figure 26, using an A-A type USB cable. Then, boot the LMT on the LMT-PC.

Figure 28 Local Maintenance Port



## 10.4.3 On-site test/Parameter provisioning

An on-site test is conducted using the LMT on the LMT-PC.

Please provision the parameters by entering the results of an on-site test in the Downlink, Uplink, and System fields, shown below in the LMT parameter provisioning window.

Figure 29 LMT Parameter Provisioning Window

**SPRINT\_LMT\_A Ver. 1.0.0**

TX RX COM13 OPEN Construc ON Work OFF

**Operation Flag Section**

**Down Link Section**

Downlink

- Input 0 dBm
- Output 0 dBm
- Gain 0 dB
- Isolation 0 dB
- Iso. Avg 0 dB
- Pilot Input 0 dBm
- Pilot Output 0 dBm
- Ec/Io 0 dB
- Gain Mode GAIN SET
- Target RS 14 dBm
- Target Gain 60 dB
- PAU OFF
- Cancellation Status

**Up Link Section**

Uplink

- Input 0 dBm
- Output 0 dBm
- Gain 0 dB
- Isolation 0 dB
- Iso. Avg 0 dB
- Pilot Input 0 dBm
- Pilot Output 0 dBm
- Ec/Io 0 dB
- Gain Mode BALANCE
- Gain Balance 60 dB
- Target Gain -5 dB
- PAU OFF
- Cancellation Status

**System Section**

System

- REP Type SPRINT\_LMT\_A
- F/W Version 1.0.0(1.0.0)
- REP MSN 2MFAAN999999R
- REP ID SPRINT1234
- Server IP 172.17.175.10
- REP IP 192.168.0.2
- Select Pattern1
- Select CDMA
- Select FA 0
- Ec/Io Threshold -5 dB
- High Temperature 0 °C
- Low Temperature
- Initialization
- VSWR Fail
- Device Fail
- RS Detect 24 Hour
- Alarm Mask None
- Test Alarm OFF
- Download Restart Schedule
- Immediately
- Schedule 0 : 0
- Repeater Time 2008/11/19 11:10:00
- Time Sync.
- RS Research
- Export
- Restart

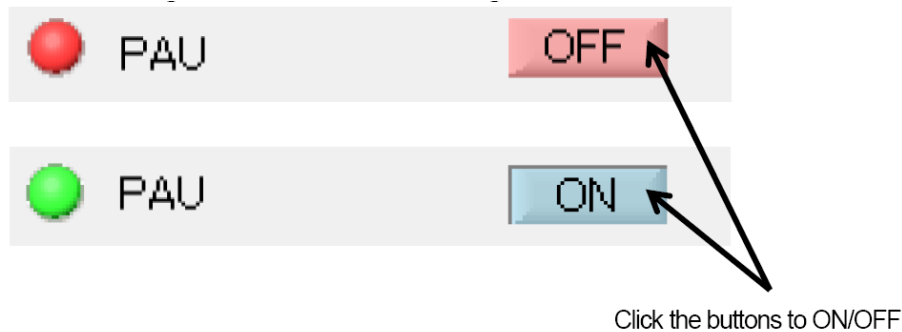


### 10.4.4 RF Output Activation

In the Downlink and Uplink fields on the LMT parameter provisioning window in Figure 28, set the PAU to "ON" respectively by clicking the ON/OFF button, and then, press the [Set] button to turn on the RF outputs in the directions of Downlink and Uplink respectively.

Note that this operation must be conducted by a qualified engineer as the radio wave starts emitting by this operation.

Figure 30 LMT PAU Provisioning Window



### 10.4.5 Mutual Surveillance Test

After confirming there are no alarms on the LMT's status display window, please check if the equipment surveillance is normally performed through communicating with the person in charge of surveillance at the operation center (on the EMS side)

For example: pseudo alarm reports for external alarms, confirmation of release, etc.

### 10.4.6 Start of Operations

If there are any other tests requested by the customer, such should be performed based on given procedures.

When successfully completed, the ICS Repeater is under operations. Before leaving the site, make sure to change the installation flag in the Work Flag field to "OFF."

## 10.5 Contact Information

If you have any questions about operating, please feel free to contact us.

Airpoint Co., Ltd. Radio Signal Processing Tem

Tel : 82-42-484-5460

Fax : 82-42-485-5460

E-mail : rahnwoo@airpoint.co.kr

**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.