

# **Installation & Operation Manual**

## **For the GIR - 2005**



**Oct. 2005**

**DACOM**

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## I. GIR-2005 Overview

Globalstar using the LEO-satellites provides high quality communication services. But, the services are not available in the NLOS (Non Line-Of-Sight) environments such as indoors, tunnel and etc. GIR-2005 (Globalstar Indoor Repeater) can assist to provide the seamless Globalstar Services in the NLOS environments.

### 1. GIR-2005 Service Network

At the indoor environment where the LOS environment is not constructed between the satellite and the terminal, we can provide the Globalstar Service to the terminal that is located on the indoor by connecting the outdoor unit and external antenna for the link with the satellite, indoor unit and indoor Tx/Rx patch antennas for the link with the terminal.

### 2. GIR-2005 Overview

Place the GIR-2005 ODU (Outdoor Unit) and the external antenna on the building roof, and put IDU (Indoor Unit) and its patch antennas inside the building. These two units receive, amplify, and retransmit each downlink signal of the satellite and uplink signal of the terminal to expanded signal arrival area. Thus the service is possible in the interior.

Unlike a general ground mobile communication repeater, signal level of GIR-2005 received from the satellite is feeble differently and the fluctuation over time varies hourly. Therefore a high gain amplifier is necessary, but the possibility of oscillation may increase due to the high gain amplifier. To prevent the oscillation, the isolation between ODU and IDU antenna must be over 80dB.

### 3. GIR-2005 Configuration

GIR-2005 Repeater is composed with one Indoor Unit, one Outdoor Unit and Indoor Antenna Set(Tx/Rx Patch antennas).

※ External antenna do not comes with the package. Should purchase separately.

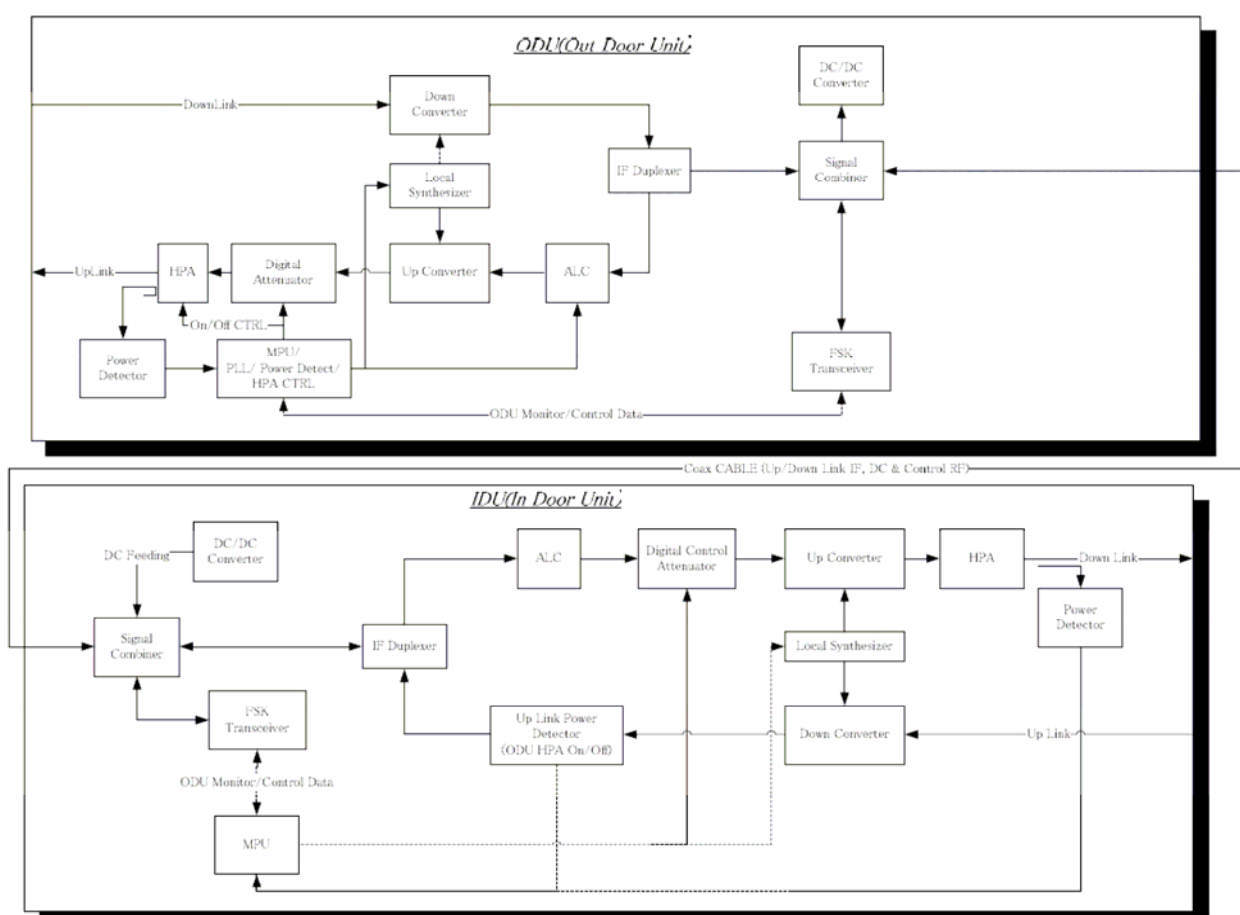


Figure 1-1 Block diagram of the GIR - 2005

## II. Preparation to install the GIR-2005

### 1. Safety

**1.1.** Before you begin, refer to the local Safety standard for the power source, grounding, and other safety information.

## 2. Environment

- 2.1. Verify if you have a correct operating environment.
- 2.2. The instrument operates properly in ambient temperatures from  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  and relative humidity from 5% to 95%.

## 3. GIR-2005 Dimensions

### 3.1. Indoor Unit

The following Figure 2-1 shows the dimensions of the Indoor Unit.

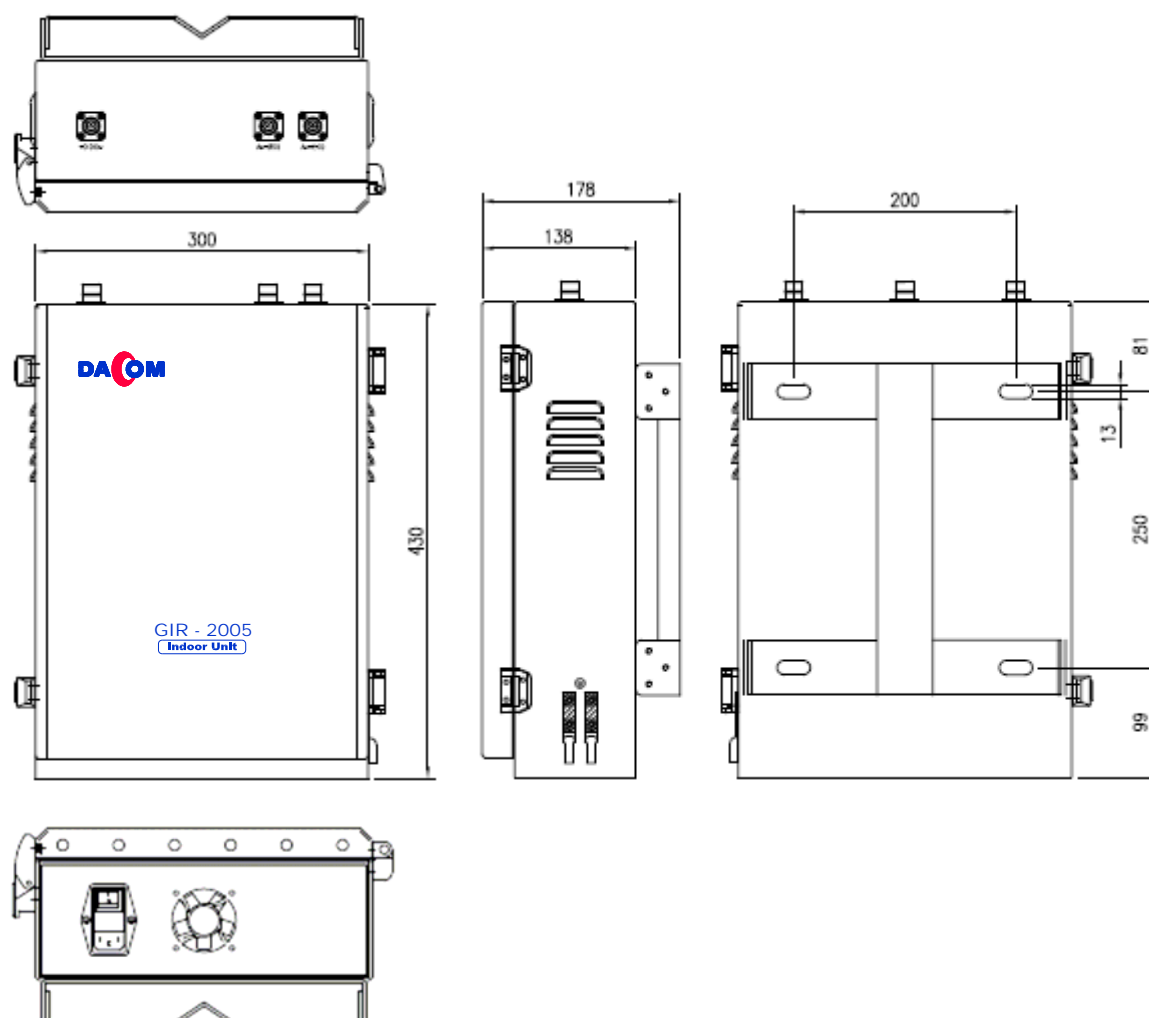


Figure 2-1 Dimensions of the Indoor Unit

### 3.2. Outdoor Unit

Refer to the Figure 2-2 for the dimensions of the Outdoor Unit.

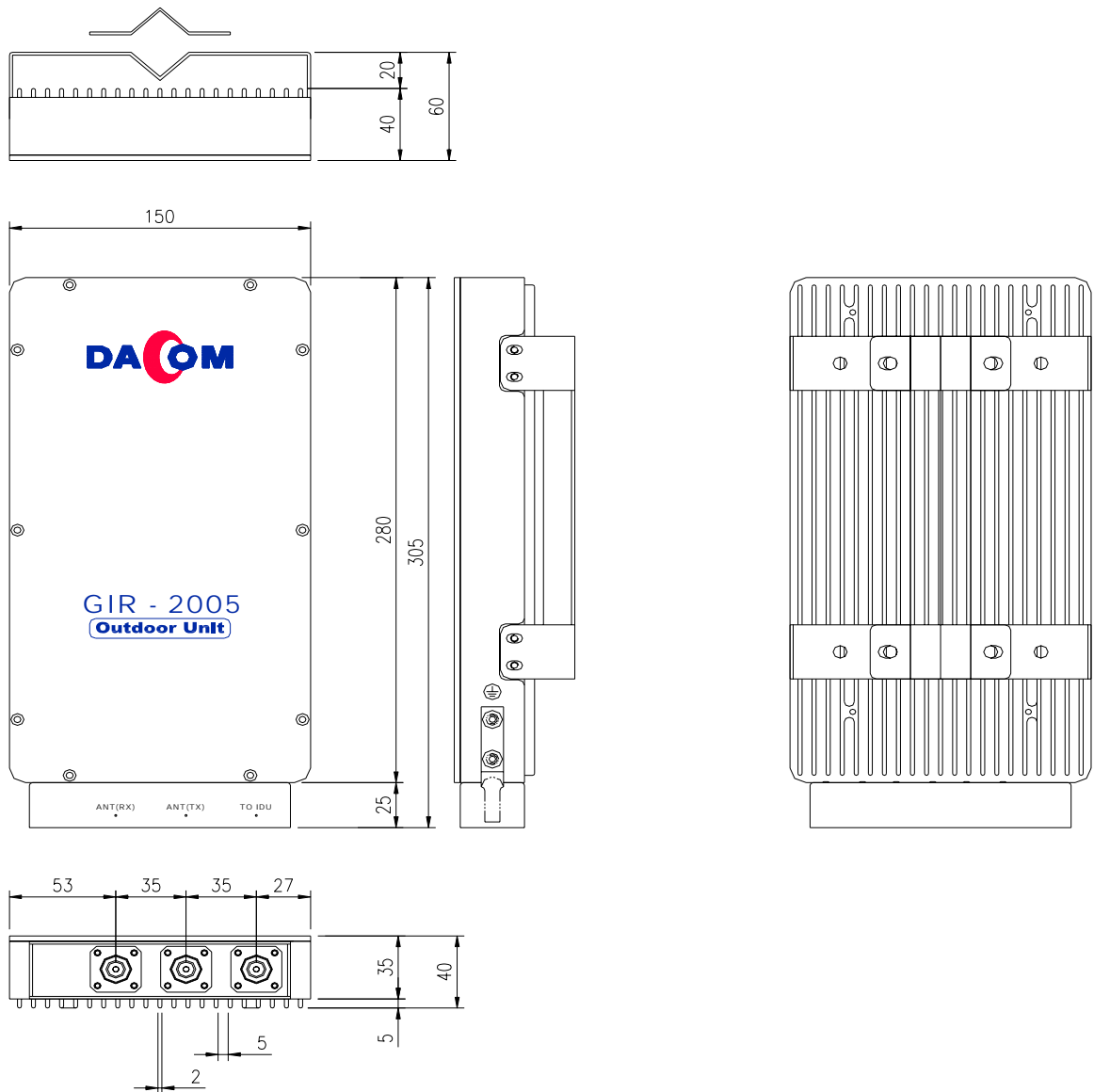


Figure 2-2 Dimensions of the Outdoor Unit

### III. GIR-2005 Installation

First turn off the power, and install IDU inside of building, and ODU outside of building where has clear visibility with no obstacle facing. “On top of the roof” is recommended place to put. After installing IDU and ODU, connect IDU and ODU with appropriate cable. Then turn on the power. Using control panel of IDU, set up the parameters of IDU & ODU to work properly. While doing this procedure, must take a note below for considerations of installation.

- To avoid oscillation, the indoor and outdoor antenna must be get 80dB of minimum Isolation.
- For the installation place of the repeater in indoors, secure the visibility range as possible, and separate from the outdoor antenna as far as possible.

Follow the instruction below to install IDU & ODU to the appropriate place.

#### 1. IDU (Indoor Unit) Installation

IDU can be placed on the supporting structure like a desk or installed on the interior wall. If choose to install on the wall, fallow instruction below. Then connect cables from each of TX, RX patch antennas to IDU as described in this manual. Please note that all the procedure must take while power is off.

##### 1.1 Fixing

At first, using the M12 Anchor bolts, install GIR-2005 Chassis bracket into the wall Bracket that is fixed to the wall in Figure 3-1. And then, using M4 bolt, assemble GIR-2005 with Chassis bracket and wall-bracket.

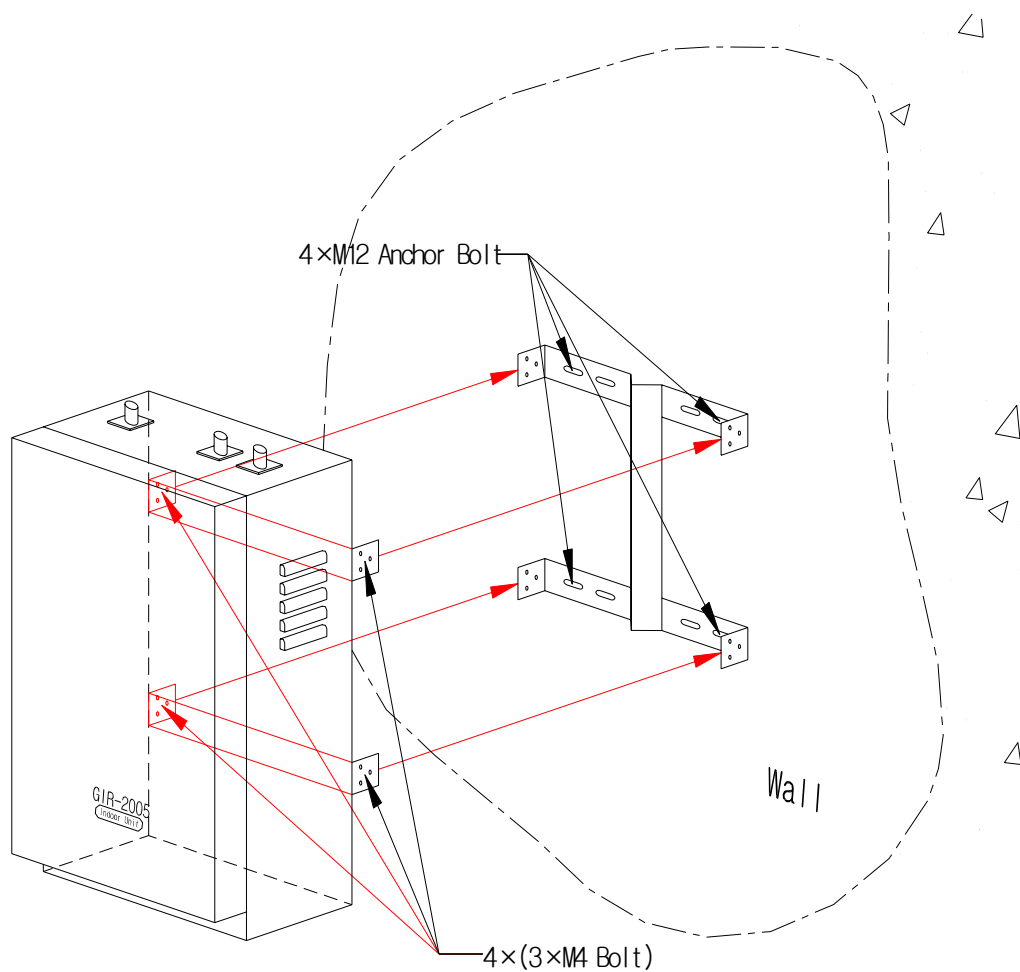


Fig. 3-1 Assemble Wall Bracket with GIR-2005 Chassis Bracket

## 1.2 Grounding

After GIR-2005 Indoor Unit is fixed to the wall, using 14 Square Cable put the ground post of GIR-2005 chassis to the earth where has good conductivity. Refer to the figure below.

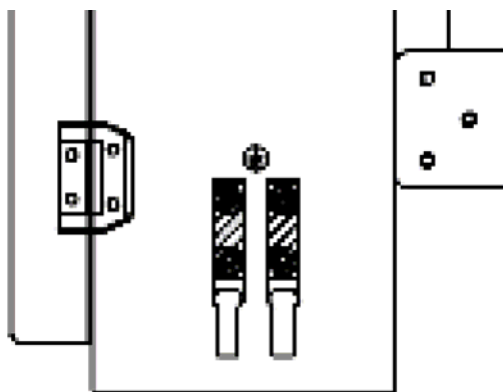


Fig. 3-2 GIR-2005 Grounding



### 1.3 Connecting Internal antenna with cables

Place GIR – 2005 indoor antenna close to the ceiling and far from the window of inside the building. Antenna direction is recommended to face to wall side not to window side to minimize coupling between Indoor and outdoor antenna. Install the each of indoor patch antennas at the right and left side of the Indoor Unit. Do not exceed 3 meter for the distance between IDU and indoor patch antenna each. Connect TX/RX cables from antenna to IDU.

## 2. ODU (Outdoor Unit) Installation

Place ODU outside of building with no visible obstacle in front of ODU. Follow the instruction below to install ODU on the proper place, install external antenna, and connect cables between antenna and ODU as well. Refer to the figure 3-3 below.



Fig. 3-3 GIR-2005 ODU Installation

## 2.1 Fixing

Outdoor Unit either can be installed to the wall or mast Pipe. If you select a wall to fix, do same as what you did with Indoor Unit. If you select a mast pipe to fix, first find the solid structure and fix the 20~30mm diameter pipe to it, and assemble ODU to the pipe using a wall and pipe bracket.

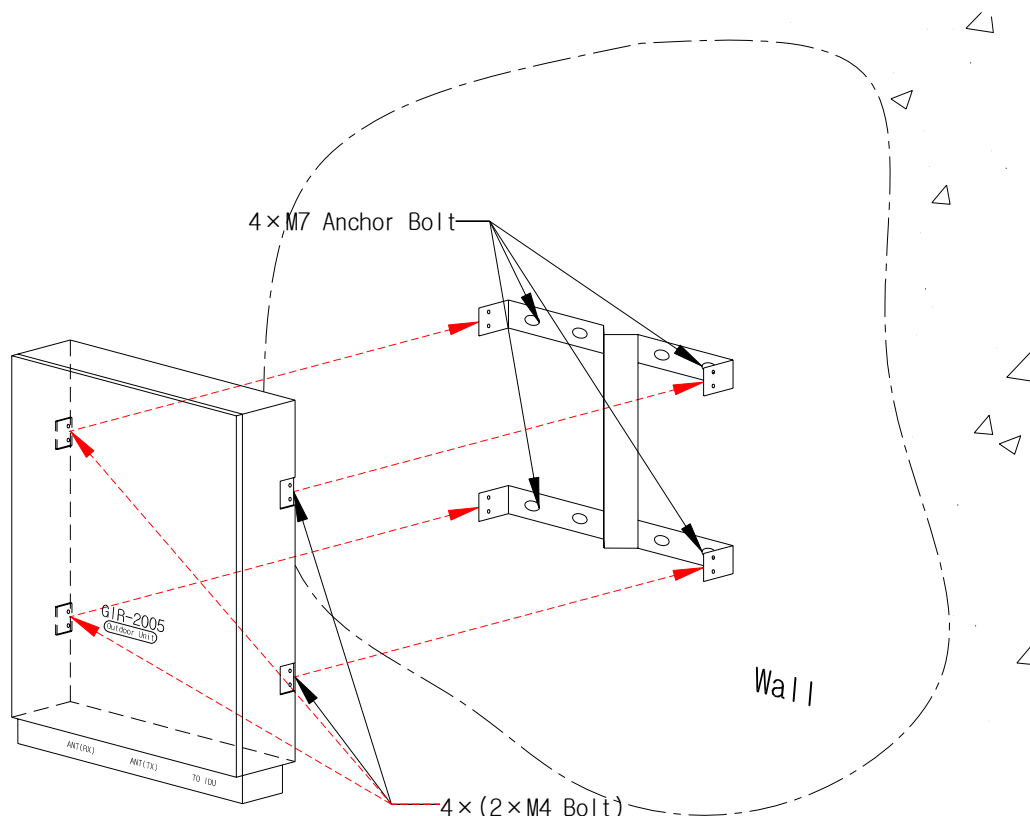


Fig 3-4 Outdoor Unit Fixing to the wall

## 2.2 Grounding

After GIR-2005 Outdoor Unit is fixed, should ground it using 14 Square Cable connected to the grounding post of GIR-2005 chassis and earth where has good connectivity.

## 2.3 Connecting Internal antenna with cables

Connect cables with TX/RX making to relevant place of ODU using specified cables like figure from each of TX RX patch antennas to IDU like figure 3-5. Please note that all the procedure must take while power is off.

### 3. Interconnection between ODU & IDU

With specified cables (thick black one), interconnect IDU and ODU while power is off.

Refer to the figure below for visual work details. (Basic connection: DMSC-400, 20m)



Figure 3-5 ODU connected to IDU & Internal Antenna using cables



Figure 3-6 IDU connected to ODU & External Antenna using cables

#### 4. IDU & ODU parameter setting

Now begin to set up the parameter of GIR-2005 using control panel inside of IDU.

Refer to the figure 3-7.



Fig 3-7 Control panel

After all the preparation finished, turn on the power of IDU and follow procedure of manual and begin the setting. As written in the user manual, place HPA MODE CTRL under AUTO mode in order to work proper way. Refer to the user manual for setting ATTN. Value, (IDU ATTN: below 20dB, ODU ATTN.: below 5dB). For more details and visual instruction, refer to the “IV GIR-2005 Basic operation”.

## IV. GIR-2005 Basic Operation

### 1. GIR-2005 Control Panel Overview

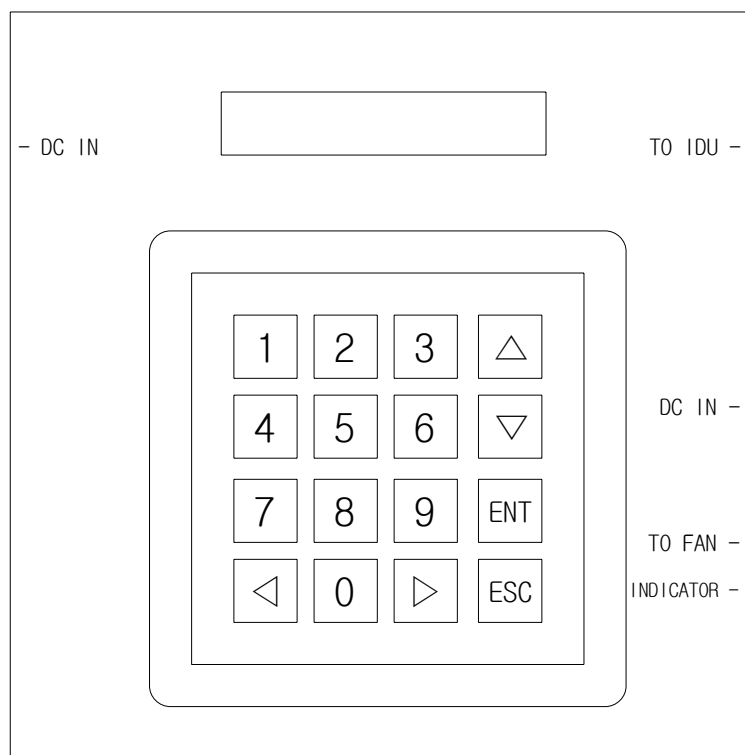


Fig 4-1 Control panel



[Enter Key] select menu or save the value setting



[ESC Key] Escape from menu or cancel the value



[Number Key] move in-between menu and change value(number)



[Up Key] move up among the menu or increase value



[Down Key] move down among the menu or decrease value



[Left Key] change initial value or move a cursor to left



[Right Key] change initial value or move a cursor to right

## 2. Operation Consideration

### 2. 1. TSSI Value

Shows signal value of IDU (Indoor Unit) and ODU(Outdoor Unit). Once menu comes up push [enter] key, and then can see TSSI Value.

### 2. 2. Attenuation Value

Adjust attenuation value of IDU, ODU

Initial setting of Attenuation Value:

- IDU 20dB
- ODU 10dB

### 2. 3. In order to get excellent outcome, should be installed properly, and may need to be adjusted upon the surrounding environment.

- If decrease, generating power will be increased and may be able to talk a long distance call, but possibility of oscillation will grow as well. Thus need to watch out oscillation when you set the value.
- Under a normal circumstance, 2~5dB for ODU 20dB for IDU are recommended.
  - ※ After adjustment of the Attenuation Value, [HPA Control Mode] must be set as "Auto" for call test.

### 2. 4. HPA Mode Control

There are On, Off, Auto 3 Modes.

- On : HPA is On / use for a test
- Off : HPA is Off
- Auto : HPA is On while line is busy(talking), otherwise Off
- ※ HPA is under ODU menu.

### 2. 5. HPA Off Delay Time

When you lose signals while you are talking or push the enter key, HPA can be off. The HPA off delay time can be adjusted

- Initial set Value is 20sec.
- ※ Remark: HPA is under menu of ODU.

### 2. 6. Fan Control

On, Off, Auto 3 submenus.

- On : working
- Off : not working



- Auto : when temperature reaches 30℃, automatically turns on.

※ Fan is under menu of IDU.

## 2. 7. Temperature Monitor

Can monitor inside temperature, and shows.

## 3. Menu Configuration & Operation

### 3. 1. Initialization

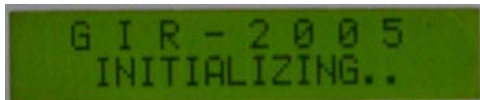
#### ■ Power ON



This is the initial screen when you turn on the power.

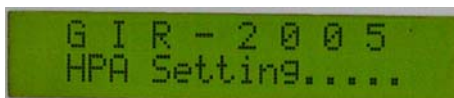
You can see a message like “Application Program Version is 2.0.”.

#### ■ System Booting



After 1.5sec, ‘initializing’ pops up in the screen up until the initialization completed.

#### ■ HPA Setting



HPA setting to adjust conditions of controller, IDU, and ODU begins.

#### ■ Menu











After initialization is completed, the first menu shows up.

### 3. 2. Menu selection

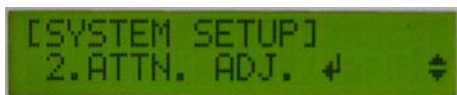
#### ■ Select TSSI Value Menu






- On the previous screen, push  key, and the first menu 1. TSSI Value will come up.  stands for the index number of each menu.  Shows there are other menu under .  shows you can move up and down using   keys. If there is no such sign comes up you may not move up and down further. Thus you can see there are sub-menu under it.

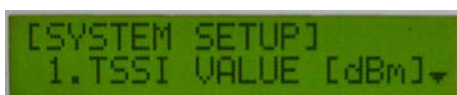
- Push  key escape from this menu and move to the upper one.


#### ■ Select Attenuation Adjustment Menu



Push  or  to select Attenuation Adjustment menu in the status of TSSI VALUE menu, and move to above screen.  at the very right end shows you can move either up and down.

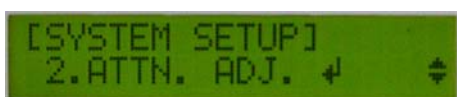
#### ■ TSSI Monitoring.



Push  key to see the value, and it is shown as below.



#### ■ Attenuator value setting.



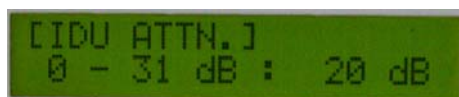
Push  key to select ATTN. ADJ. menu.



### ■ IDU Attenuator setting



will show up and Push **ENT**

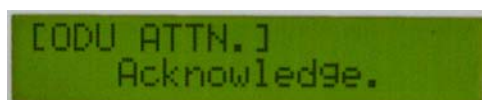


To change value setting push **ENT** and the first digit of **20 dB** will blink.

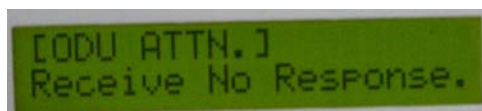
Push **◀ ▶** keys to move left and right where to change numbers.

Push **0** ~ **9** key or **▲ ▼** to increase/decrease number values.

Push **ENT** key to save the setting and blinking will stop. Also can hear a beep sound and 'Acknowledge' will appear when new setting is properly saved.



If new set up is failed, you can hear long beep sound and "Receive No Response" will appear, and blinking starts. In order to stop blinking push **ESC** and return to the initial setting.



### ■ ODU Attenuator setting



Enter ATTN. ADJ. Menu, and push **▼** or **2** to select ODU ATTN. And enter the menu. To change value and save, follow directions states above.

### ■ HPA Mode Setting.



In the status of ODU ATTN menu, push **▼** or **3** to move HPA MODE CTRL.

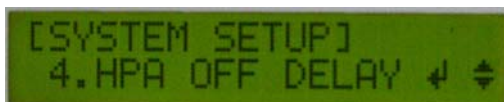
Push **ENT** to select it. Initial mode (On, Off, Auto) will appear.



[HPA MODE CTRL.]  
AUTO/ON/OFF : OFF


Use ◀ ▶ key to move cursors from right and left to choose the mode, and select a mode and push enter key again to save.

■ HPA Off Delay Setting.



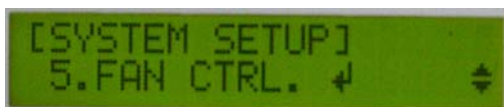
[SYSTEM SETUP]  
4.HPA OFF DELAY ↑ ↓

Push ▼ or 4 to move to HPA OFF DELAY sub-menu. Push ENT to select. Initial setting will appear. Move cursors from right to left to the point where you need to change numbers and enter numbers with number key, then enter key again to save.



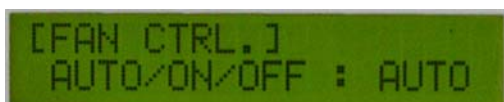
[HPA OFF DELAY]  
10 - 30 Sec. 20 Sec

■ Cooling Fan Setting.



[SYSTEM SETUP]  
5.FAN CTRL. ↑ ↓

Escape from previous screen, Push ▼ or 5 to move to 5. FAN CTRL and push ENT to select. Initial setting will appear.

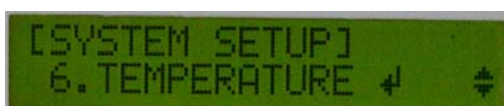


[FAN CTRL.]  
AUTO/ON/OFF : AUTO

Use ◀ ▶ key to move cursors from right and left to choose the mode, and select a mode and push enter key again to save.

- Under AUTO mode, if temperature goes down below 30°C, the fan stops working, stays in between 30~40°C, it works with medium speed, and over 40°C, its speed up with maximum speed.

■ Measuring Temperature.








[SYSTEM SETUP]  
6.TEMPERATURE ↑ ↓

Under the system setup menu, push  or  and push  to select. Inside temperature will appear. Can monitor temperature.



■ LCD Backlight setting.



Escape back to the previous screen, push  or , and then push  to select. Initial setting will appear. In order to change it move cursor using   key and push enter key to save.



■ Under AUTO mode, if time is out, automatically turn off Backlight.

## Quick Start Reference Guide

- 1) Set up the outdoor omni antenna at the high place that can guarantee LOS (Line of Site) between antenna and satellites.
- 2) Place The GIR-2005 Outdoor Unit at the wall or mast pipe and connect outdoor antenna.
- 3) Place the GIR-2005 Indoor Unit at the wall or just put it near from Indoor antenna and connect installed patch antennas at the wall that can broadly take a view of the indoor coverage area.
- 4) Connect the cable between Indoor unit and outdoor unit with interconnection cable.
- 5) Connect the attached power cable. (AC Input : 100 ~ 240 V)
- 6) To start the operation, press the POWER switch.
- 7) Adjust HPA control mode to AUTO.
- 8) Monitoring the RSSI value of the subscriber unit(e.g.: GSP-1600) at the opposite corner from the Indoor antennas. If reception is not good, decrease the IDU ATTN.

VALUE.

- 9) If reception is good enough, Increase the IDU ATTN VALUE until RSSI value indicate 80% or so of the full range. The smallest needed power will make the Repeater stable.
- 10) Try to make a call and monitor sound quality and whether sudden call drop or not
- 11) If sudden call drop happens, test and compare to other subscriber unit at the outdoor  
The same symptom happens, wait for several minute and test and monitor again
- 12) If outdoor condition is good, decrease the ODU ATTN. VALUE. The smallest needed power will make the Repeater stable.
- 13) Remember the ODU power is needed to adjust to trade off between maximum user number and stable operation of the Repeater.

**APPENDIX 1 . Components of the GIR-2005****◆ Pictures of GIR-2005**

IDU Ass'y	
IDU	Antenna & cables (connected to IDU)
	
ODU Ass'y	
ODU	Antenna & Cable (connect to ODU)



ODU-IDU Interconnection Cable



◆ Accessories of the GIR-2005

Items		Quantity	Remarks
IDU Ass'y	IDU	1Set	
	- Fixing Bracket	1EA	
	- Anchor Bolt(M12)	4EA	
	- Mast Bracket	2EA	
	- Bolt(M12)	4EA	
	Antenna Set	1Set	
	Antenna Cable	2EA	・ 3m
	Inter-connection Cable	1EA	・ 20m
	Power Cable	1EA	・ 1.5m
ODU Ass'y	ODU	1Set	
	- Fixing Bracket	1EA	
	- Anchor Bolt(M6)	4EA	
	- Mast Bracket	2EA	
	- Bolt(M6)	4EA	
	Antenna	1EA	・ Optional Antenna
	Antenna Cable	2EA	・ 3m

## APPENDIX 2. Specifications of the GIR-2005

### 1. IDU/ODU

ITEM		Specification	Remark
Frequency Band	Down Link	2485.5-2498.5MHz	
	Up Link	1611.5-1624.5MHz	
Band Flatness		2 dB 이내	Peak To Peak
Frequency Stability		$\pm 1$ ppm	
ALC Range	Down Link	35 dB	
	Up Link	35 dB	
Power Control Range	Down Link	31 dB/1 dB Step	$\pm 0.7$ dB
	Up Link	31 dB/1 dB Step	
Input Level	Down Link	Min. 100 dBm/Total	
	Up Link	Min. 65 dBm/Total	
Output Level	Down Link	Max. 10 dBm/Total	
	Up Link	Max. 30 dBm/Total	
VSWR		Min. 1.5 : 1	
Isolation		Min. 80 dB	
In/Output Conn. Type		N Female	
System Delay		Max. 5usec	
IN/OUT Impedence		50 Ohm	
NF		Up Link : 5 dB @ Max Gain Down Link : 2 dB @ Max Gain	
Oscillation Detection	Detection Method	Abnormal Power Detection	
	Control	Gain Control	
Spurious	+/- 885kHz (IDU)	-29 dBc	@ 0 dBm/1.25MHz RBW 30kHz
	+/- 1.98MHz (IDU)	-34 dBc	@ 0 dBm/1.25MHz RBW 30kHz
	+/- 885kHz (ODU)	-29 dBc	@ 0 dBm/1.25MHz RBW 30kHz
	+/- 1.98MHz (ODU)	-34 dBc	@ 0 dBm/1.25MHz RBW 30kHz



## 2. Outdoor Antenna

### 1.1 Electrical Specification

Item	TX	RX
FREQUENCY	(1610.0 ~ 1626.5)MHz	(2483.5 ~ 2500.0)MHz
RADIATION PATTERN	HEMISPHERICAL	
POLARIZATION	LHCP	LHCP
VSWR	<2.0:1	<2.0:1
GAIN(dBic)	Free Space	Free Space
@90°(Zenith, Top)	+ 2.30	+ 2.40
@10° Elevation	- 0.50	+ 1.50
@20° Elevation	+ 0.97	+ 2.20
@30° Elevation	+ 1.60	+ 2.50
@45° Elevation	+ 2.20	+ 2.30
@70° Elevation	+ 2.20	+ 2.50
AXIAL RATIO @ Zenith	2 dB	2 dB
3 dB BEAM WIDTH	160°	172°
POWER HANDLING	>30W	1 Watt
DC GROUNDING	YES (LIGHTNING PROTECTION)	
ISOLATION : PASSIVE	>54 dB @ Tx Band, and >37 dB @ Rx Band	
ACTIVE	>45 dB @ Tx Band	
FILTER REJ. : (824-894) MHz	> 70 dB	
(1610-1626.5) MHz	> 67 dB	
(3220-3253) MHz	> 29 dB	
(4830-4879.5) MHz	> 54dB	

### 1.2 LNA OPTION

LNA GAIN	N/A	(34 +/- 1) dB
LNA NOISE FIGURE	N/A	2.4 dB
LNA INPUT P1dB	N/A	> -13 dB
LNA VOLTAGE	N/A	(+2.5 to +30) Volts DC FROM Rx RF CON.
LNA DRAWING CURRENT	N/A	< 39 mA

### 3. Indoor Antenna

#### 3.1 SAT-1600-P4

Model	SAT-1600-P4		
Type	Microstrip Patch Type		
Characteristic	Electrical Char.	Frequency Range	1610.73 ~1625.49 MHz
		Polarization	Vertical
		Gain	≥ 4dBi
		Beam width	≥ H-Nominal 70°
			≥ V-Nominal 50°
		V. S. W. R	≤ 1 : 1.5
		Power Capability	≤ 5 Watt
		Impedance	50 Ω
	Physical Char.	Radiation Element Material	copper
		Dimension	165×171×41 mm
		Weight	0.7 Kg
		Input Connector	N-Female or Any other Type

#### 3.2 SAT-2500-P4

Model	SAT-2500-P4		
Type	Microstrip Patch Type		
Characteristic	Electrical Char.	Frequency Range	2484.39~ 2499.15MHz
		Polarization	Vertical
		Gain	≥ 4dBi
		Beam width	≥ H-Nominal 70°
			≥ V-Nominal 50°
		V. S. W. R	≤ 1 : 1.5
		Power Capability	≤ 5 Watt
		Impedance	50 Ω
	Physical Char.	Radiation Element Material	copper
		Dimension	165×171×41 mm
		Weight	0.7 Kg
		Input Connector	N-Female or Any other Type