

Hitachi Kokusai Electric Inc.

150Mbps High-speed Radio Link

SINELINK 24G

User's Manual

Please read ahead of the use.

Caution:

Changes or modifications not expressly approved by Hitachi Kokusai Electric Inc. could void the user's authority to operate the equipment.

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 his own expense.

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1. INTRODUCTION

This manual describes the use of SINELINK24G.

Please read this manual carefully before using the equipment.

1-1 Targets

This manual targets the engineer who has knowledge of LAN, TCP/IP, and a WWW browser at the business level.

1-2 Product summary

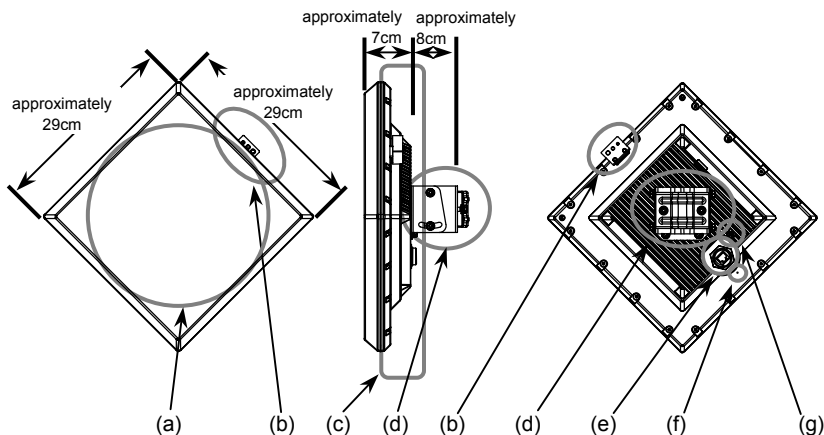
- * Using unlicensed 24GHz band, everybody can use SINELINK and install anywhere.
- * The through-put achieves 56Mbps for each uplink and downlink.
- * Wireless communication circuit enables high-speed data communication system in areas where wire circuit installation is not available, due to obstacles such as rivers, railroad, principal road, etc..

1-3 Features

- (1) 150Mbps high-speed transmission
 - 150Mbps radio transmission speed as optic fiber
 - Enough effective through-put to achieve transmission of moving image etc.
- (2) Unlicensed and uncrowded 24GHz band
 - Enough channels availability (8ch)
 - Dynamic frequency selection function (Avoid using interfered channel and enable the stable circuit quality)
 - No license required, you can use SINELINK if only the installation has been done.
- (3) High security
 - Data is scrambled
 - Unique and nonpublic radio protocol
 - * This secures important data
 - Pencil beam antenna (3.5 degrees or less)
 - * Narrow beam prevents unexpected receiver
- (4) Easy installation (Note 1)
 - Compact and light weight
 - * 29 x 29 x 7cm, Approx. 3kg (Antenna is contained)
 - Easy direction tuning by watching hole only
 - Compliant with IEEE802.3af
 - Parameter setting and status confirmation by PC Web style input only

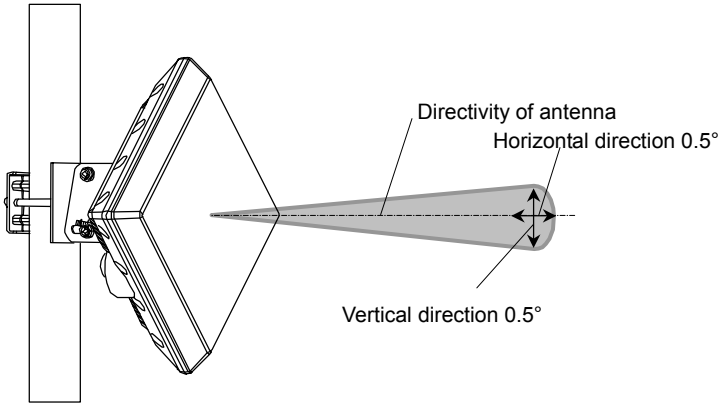
(Note 1) Communication cannot be performed under the condition that opposite product is unseeable.

1-7 Name and explanation of main body each part

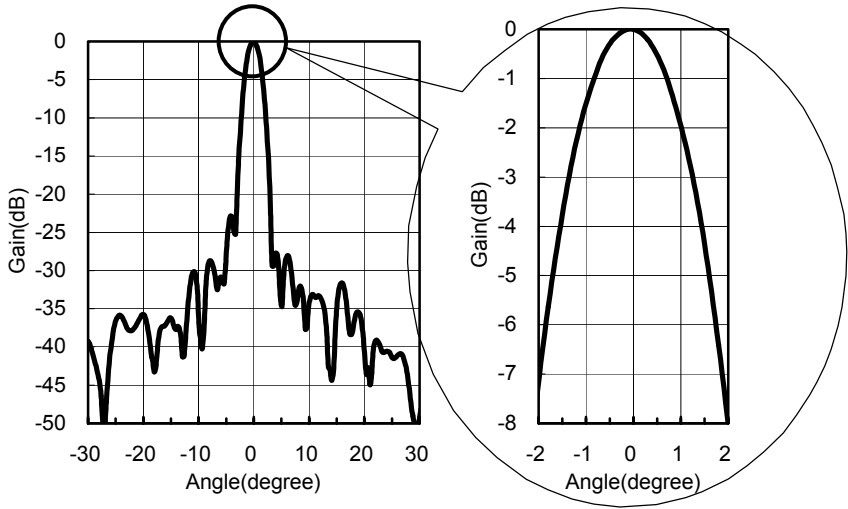


Name	explanation
(a) Antenna	The radio wave emits from the antenna side. The antenna side is turned to the opposing device for set up.
(b) Direction Adjustment Scope	By looking from the hole in scope, the direction of this antenna is adjusted.
(c) Heat radiation fin integrated back lid	It releases internal heat into air.
(d) Mount bracket	It fixes this device to pole. The diameter of a pole is 25 ~ 45mm.
(e) LAN connector	Connect LAN cable. At the outdoor installation, connect LAN cable with waterproofing cap.
(f) The atmospheric pressure adjustment hole	The atmospheric pressure in this product is adjusted.
(g) GND (FG) Terminal	Connect grounding wire.

1-8 Directivity of antenna



Antenna pattern

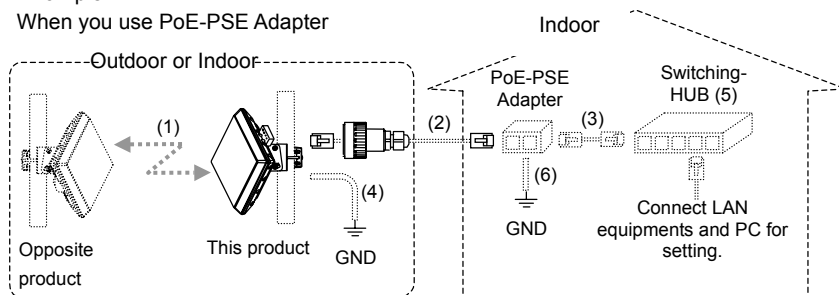


1-9 Connecting SINELINK24G

Connected composition example is shown below.

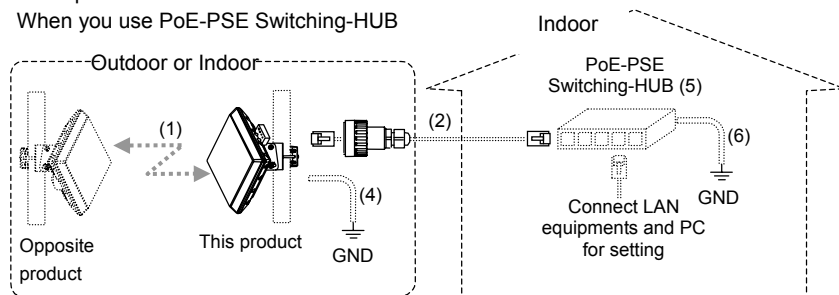
* Example1

When you use PoE-PSE Adapter



* Example2

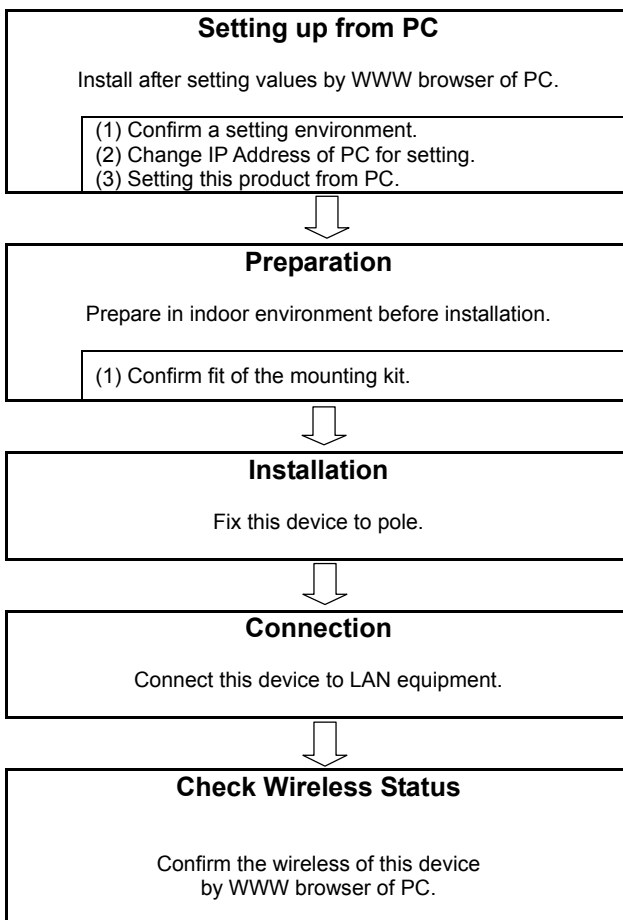
When you use PoE-PSE Switching-HUB



- (1) The communication distance between this product and opposite product is 5 ~ 2000m (recommendation).
- (2) This product connects with PoE-PSE. Maximum cable length that adds (2) to (3) is 100m. Please use the STP cable and the surge protective device when you connect outdoor with indoor.
- (3) PoE-PSE connects with Switching-HUB.
- (4) The terminal GND of SINELINK 24G must connect with grounding conductors.
- (5) Use the Switching-HUB corresponding to 100Mbps(full-duplex).
- (6) Ground it through PoE-PSE when you use the STP cable for (2).

2. Installation, Connection, Setting

2-1 Installation Flow



2-2 Setting up from PC

(1) Confirm a setting environment.

Please confirm the following content.

- PoE-PSE(Power over Ethernet - Power Sourcing Equipment)
 - * It is a state of feeding power to this product.
- LAN cable
 - * The length of the cable from this device to the switching HUB is within 100m in total.
 - * Straight cable for both LAN cables from this product to switching HUB.
(Switching HUB corresponding to Auto MDI/MDI-X can be connected also with cross-over cable.
- Switching HUB
 - * Support for 100BASE-TX (100Mbps full duplex)。
 - * Auto negotiation or 100Mbps(Full-Duplex) fixation for setting of connected port with this product.
 - * Connected port with this product is linked by 100Mbps full duplex.
 - * Connected port with PC is linked.
- PC for Setting
 - * OS: Microsoft Windows XP/2000 Professional
 - * WWW Browser: Microsoft Internet Explorer 6.0 SP1 or above.
When OS and WWW Browsers other than specification are used, this device might not work normally. Please use specified OS and a WWW browser.

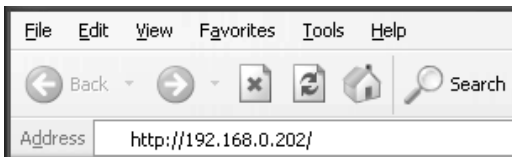
(2) Change IP Address of PC for setting.

- Change IP Address and Subnet Mask of PC for setting to the following values.
 - * IP Address: 192.168.0.1 ~ 192.168.0.254 (without 192.168.0.202)
 - * Subnet Mask: 255.255.255.0
- Factory Default of SINELINK 24G
 - * IP Address: 192.168.0.202
 - * Subnet Mask: 255.255.255.0

(3) Setting this device from PC.

Set this device by WWW browser so that the wireless may communicate with the opposite product.

- 1 To get to setting pages, browse to SINELINK 24G by entering the URL in the location bar of your browser.
The URL is **http://192.168.0.202/** (factory default).

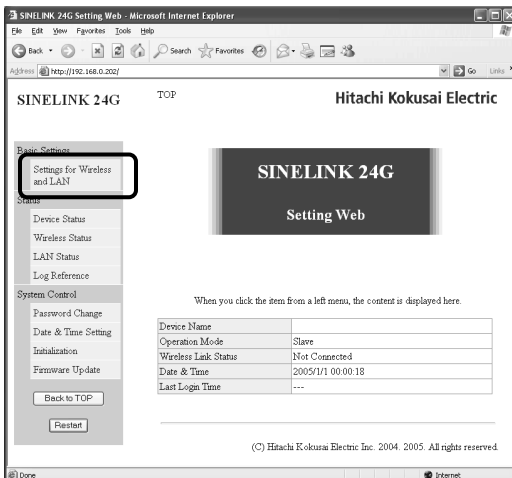


- 2 Enter **"administrator"** in the User Name field.

Do not enter anything in the Password field.
(factory default is none)
Please set it later.



- 3 Click **Settings for Wireless and LAN.**



4 Enter the following settings field.

Device Name

Enter this product name.
The field will accept alphanumeric string and has a maximum length of 20 characters.
Factory default is all space.

Operation Mode

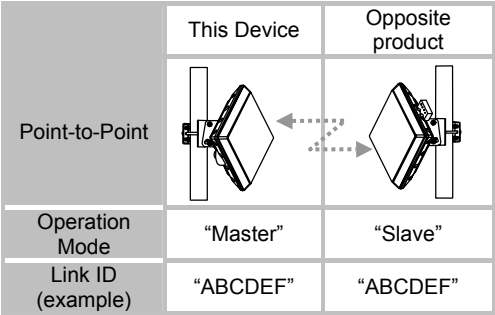
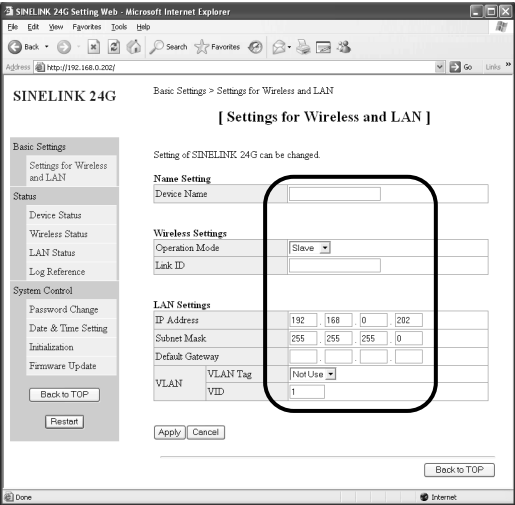
Select “Master” or “Slave”.
In a wireless communication with opposite product, it is necessary to set one of them “Master” and the other “Slave”.
Factory default is “Slave”.

Link ID

Enter the same Link-ID as the opposite product.
When you set Link ID different from the opposite product, it can not communicate.
The field will accept alphanumeric string and has a maximum length of 6 characters.
Factory default is none.

IP Address

Enter IP Address of this product.
The range of IP Address is from class A to class C.
Factory default is 192.168.0.202.



[To prevent interference]
Set link ID different in each pair of “Master” and “Slave”.

Enter the value matched to customer's LAN environment to “LAN Settings”.
When you set an wrong value, it is not possible to set it by a WWW browser.

4

Subnet Mask

Enter Subnet Mask.
The table on the right shows a range of Subnet Mask.
Factory default is 255.255.255.0.

IP Address Classes	Range of Subnet Mask
Class A	255.0.0.0 ~ 255.255.255.252
Class B	255.255.0.0 ~ 255.255.255.252
Class C	255.255.255.0 ~ 255.255.255.252

Default Gateway

Enter Default Gateway.
Factory default is none.

VLAN Tag

Select "Use" or "Not Use".
Factory default is "Not Use".

VID

Enter VID(VLAN ID).
The range is from "1. " to "4094".
Factory Default is "1".

5

Copy the content of settings each item to paper etc. and keep it.

The setting change and the operation situation cannot be referred to when IP Address and Password etc. of this device are forgotten.

6 Enter settings each item, and click "Apply" button.

The setting is changed, and this device does restart. It takes about 30 seconds until restart is completed.

※example

7 Change IP address of PC to the value that can be communicated with this device.

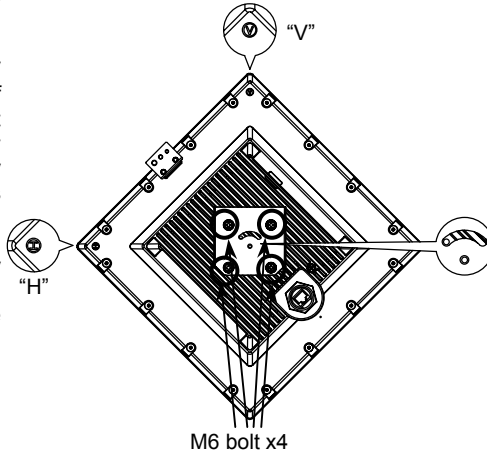
8 Confirm settings after this device restarts and pull out LAN cable from this device.

2-3 Preparation for installation.

(1) Confirm the fit of mounting bracket

- 1 Confirm the fit of the mounting bracket.

There are markings of V and H on the back of the Antenna. If you set the V upward (factory default), then vertically polarized wave is selected. Likewise, horizontally polarized wave is chosen by setting the H upward. Polarization of the wave must be the same with the opposite product. Unless, transmission can not be established.



On the following cases, set the marking H upward.

The same marking, H or V, has to be set upward between a pair of this products.

- * When you can see opposite product through the scope only when setting H upward due to obstacles.
- * No availability of channel in vertical polarization.
- * To avoid interference from the other pair of this products nearby.

To set the H upward, remove the four M6 bolts on the rear, then rotate the mounting kit 90 degrees counterclockwise. Finally fasten the four M6 bolts to a torque range of 5.59 to 6.66[N/m]. (57 to 68[kgf/cm])

2-4 Installation

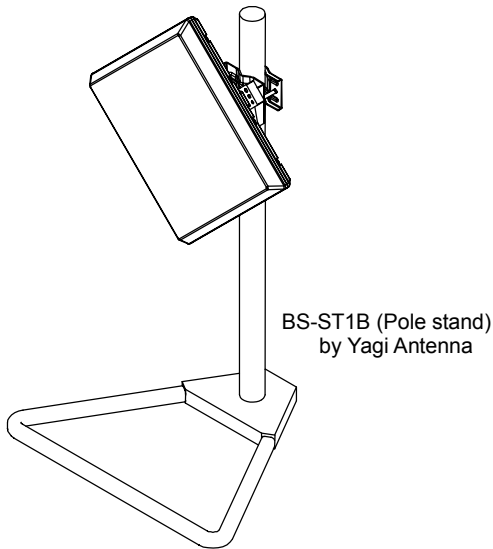
Fix this product to pole after completion of the preparation and the setting by WWW browser. Mounting kit corresponds to pole phi from 25 to 45mm.

In the followings, please do not install.

- * No line of sight between this products. No radio communication is established under such condition,
- * Where distance is variable between this products. Radio communication is disconnected when the distance varies.
- * Installation on automobile, crane and the equivalent. It might cause device failure.

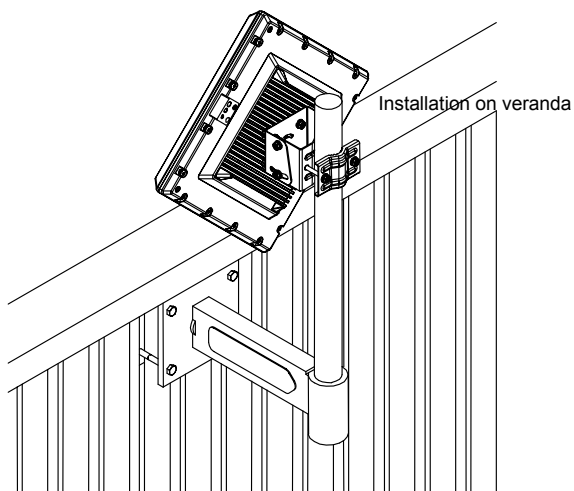
Indoor installation example

Fix this product to the BS pole stand as shown below when installation is made in doors.



Outdoor installation example

Fix this product to the pole designed for veranda, wall and roof top installation, depending on circumstances.



(1) Fixing to pole

- 1 Arrange pole for this product installation.

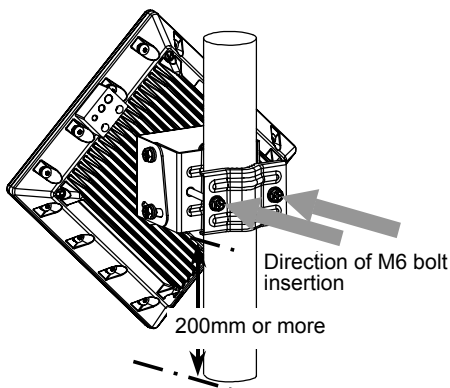
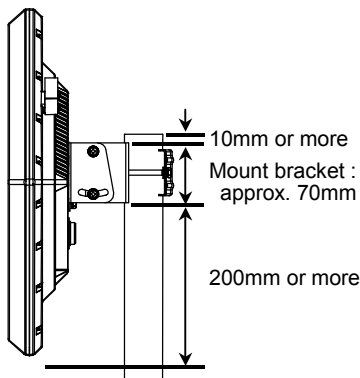
Pole phi is from 25 to 45mm. It is recommended that pole length less than 700mm for indoor and less than 400mm for outdoor installation. Confirm whether intensity of pole is enough for installation.

Confirm direction adjustment scope for availability after the installation. Pole is not applicable if it interrupt with line of sight to the scope.

- 2 Fasten mount kit to the pole with two M6 bolts temporarily.

Insert the bolts to the direction indicated by the arrow on the right. Fasten the bolts to the extent this product can hold it's position. For precision in direction adjustment, the scope better be at the position where you can look into with stable posture.

Pole has to have a length more than 200mm from the bottom end of the mount kit. If it is shorter than that, elevation angle for this product might not be sufficient for adjustment.



M6 bolt is attached with bolt cap or washer. Position of the bolt cap and washer is adjustable.

3

Scope

Look into the scope at a distance of 30cm.

Direction adjustment scope has several scopes with different diameter.

Find opposite product through the bigger scope, then adjust the sight of the opposite product to the center sight of the smaller scope.

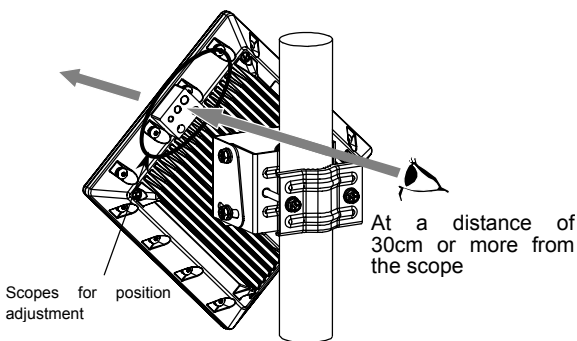
You can find two circles in the scope since hole of the opposite side from your view point is smaller, as shown on the right.

Look into the scope from the position where two circles become concentric.

By looking into the scope properly you can confirm the direction of the antenna.

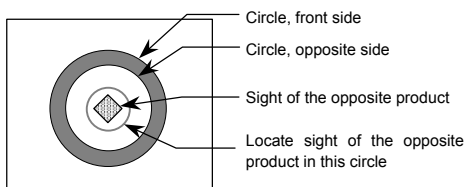
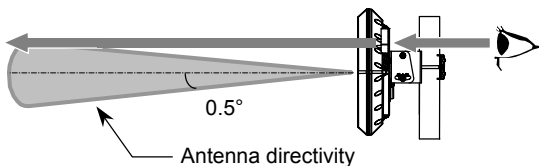
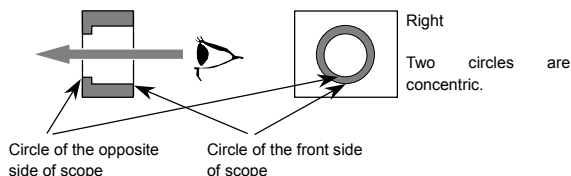
This product performs most stable when the opposed product is in the circular cone of 0.5 degrees which centers right angle from the antenna center, as shown on the right.

Adjust the sight of the opposed product, in the smaller scope, in a range of half radius circle in the opposite end circle.



Cross section diagram of the scope

Sight from your view point



4

Adjustment of
horizontal angle

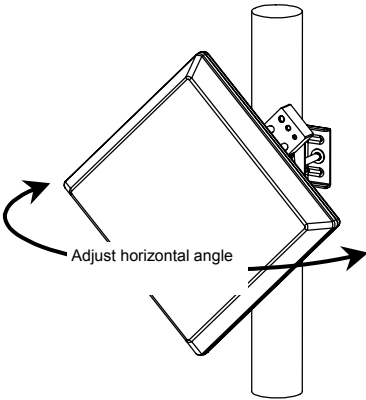
Adjust angle of direction to the opposite product by looking into the scope.

Adjust the sight of opposite product to the horizontal centre of the hole.



Vertical center is adjusted by accommodation of vertical angle.

Visual recognition become harder as longer the distance to opposite products. Horizontal angle is to be adjusted to the building of installation in such case.



5 **Adjustment of vertical angle**

Look into the adjusting scope correctly and find the proper angle by viewing the opposite product.

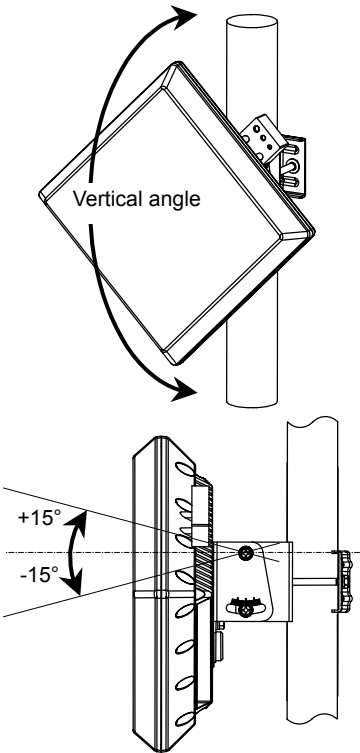
Vertical angle can be adjusted between the range of +/- 15 degrees. In case of 15 degrees, the relation between distance and height will be as follows;

Distance	Height (approx.)
50m	13.4m
100m	26.8m
500m	134m
1,000m	267.9m

The opposite product must be viewed at the center of the scope. (see below)

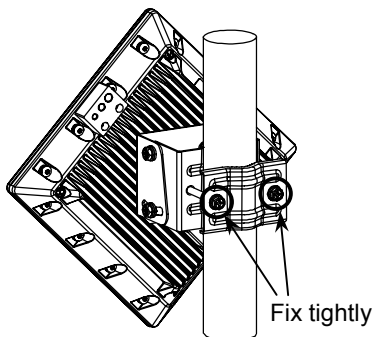


If the distance is very long and difficult to adjust, please adjust first with the building which the opposite product is settled.



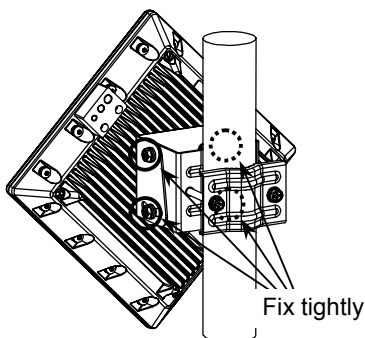
- 6 Next, fix the product with the fixing pole.

Certainly tight the M6 bolt, so that the Antenna would be stably fixed.

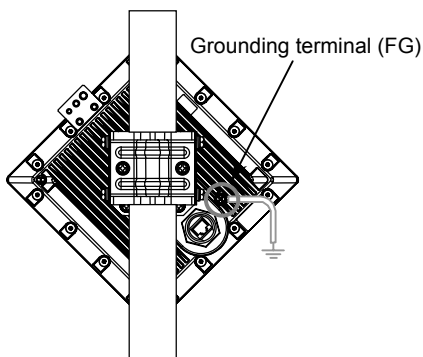


- 7 Next, tight the M6 bolt (4pcs.) to fix the vertical angle of the mounting plate.

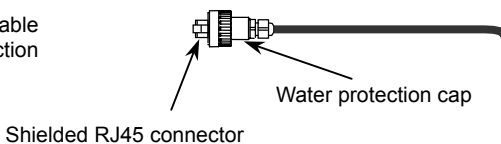
Fixing Torque of M6 bolt should be 2.36 to 2.74 [N/cm]
(24 to 28[kgf/cm])



- 8 Connect the Grounding cable with M5 screw.



- 9 Connect the LAN cable (with water protection cap/ refer to 2-3)

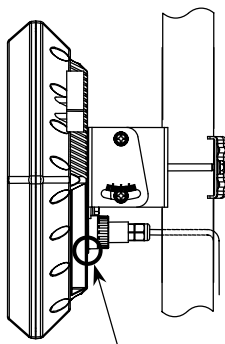


- 13 Check the LAN cable quality using Cable tester.

(Check points)

- = All 8 cable cores are connected straightly.
- = No communication problem at 100BASE-TX
- = Cable length should be less than 100m
- = Communication quality would not be changed in case RJ45 connector portion is touched slightly.

- 14 Screw in the water protection cap after connecting RJ45 connector to the product. Tight certainly the connector by hand. Fixing Torque should be 2.26[N/m](23 [kgf/cm]) (To the extent that O ring would be compressed)
Roll self-melting tape and vinyl tape on the water protection cap.



Fix the water protection cap and roll self-melting tape and vinyl tape on it.

Screw in, to the extent that O ring would be compressed

Wire the LAN cable to the extent that no stress would be add to connector portion.

- 15 Connect RJ45 connector to PoE apparatus.

Wire the LAN cable to the extent that no stress would be add to connector portion.

2-5 Connect to LAN equipments

This product complies with IEEE802.3af. It can be connected with LAN equipments, such as Switching HUB, through PoE supply apparatus. (Follow the instruction below)

LAN cable

=Distance to Switching HUB should be less than 100m.

=LAN cable should be straight cable.

(In case Switching HUB is "Auto MDI/MDI-X" applied, it can be connected with cross cable)

Switching HUB

=100BASE-TX(100Mbps, Full duplex)

NOTE: This product does not support 10Mbps or Semi duplex communication.

=Connection port setting should be "Auto Negotiation" or 100Mbps Fixed Full duplex.

*NOTE: This product does not have filtering function by MAC address, etc.

In case necessary, Filtering must be done at LAN equipments of Switching HUB side.

2-6 Confirm the RF status

RF status can be confirmed through WWW browser of the connected tool (PC)

Please refer to item 3-3(3) below.

If the "Distance" or "Rx level" does not show proper level, it might be possible that the Antenna direction is not settled properly, or any obstructs is blocking.

3. Use of this device

3-1 Power-On

Plugging the LAN cable into IEEE802.3af PoE-PSE enables SINELINK 24G to be powered on and start running.

The power output LED of PoE-PSE will light up.

3-2 Power-Off

To power off SINELINK 24G, unplug LAN cable plug from IEEE802.3af PoE-PSE.

3-3 Maintenance by WWW browser

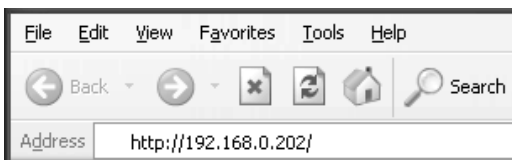
Settings and the status confirmation of this device are done by a WWW browser of your PC.

(1) Login maintenance page of this device.

1

Start WWW browser, and enter IP Address of this device. PC connects with this device.

Please confirm it to the person who set IP Address to this device when you do not know IP Address.



(example : Factory Default)

2

Enter User Name and Password.

- User Name is **"administrator"**
- Factory Default of password is none.

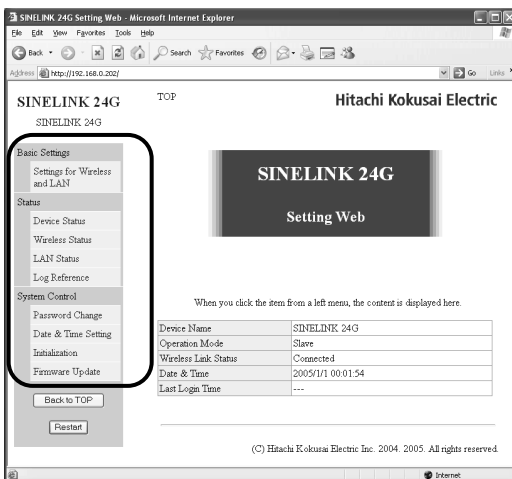


(example : Factory Default)

3

Top page is displayed.

When you click the item from a left menu, the content is displayed right page.



(example : Setting "SINELINK 24G" to Device Name)

(2) Displays Device Status

1 Click **Device Status**.
Device Status page is displayed.

Device Name

Device Name is displayed.

Firmware Version

Current firmware version is displayed.

MAC Address

MAC Address is displayed.

Serial Number

Serial Number of this device is displayed.

Date & Time

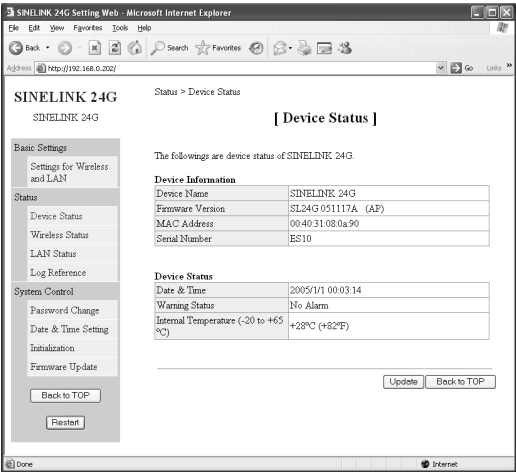
Date and time of this device is displayed.
The User needs to set "Date & Time" after Power OFF/ON.

Warning Status

Warning Status is displayed.

Internal Temperature

Internal Temperature is displayed.



(3) Displays Wireless Status.

1 Click **Wireless Status**.
Wireless Status page is displayed.

Operation Mode

Operation Mode is displayed.

Link Status

Link Status is displayed.

Air Data Rate

Air Data Rate is displayed.
This device does the adjustment modulation.
Air Data Rate dynamically changes into 50M/100M/50Mbps according to the situation.

Throughput

Throughput is displayed.
Throughput changes into 56M/38M/18Mbps (Full-Duplex) according to Air Data Rate.

Channel in-use

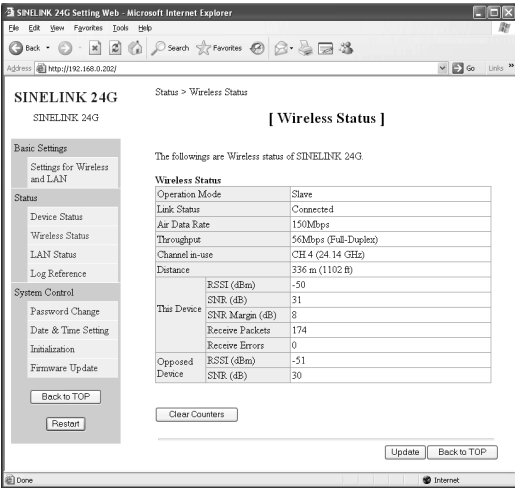
Channel in-use is displayed.

Distance

Distance in a wireless section with the opposed device is displayed.
Distance is displayed in 12m step.

RSSI

RSSI of this device or opposed device is displayed.



SNR

SNR(Signal to Noise Ratio) of this device or opposed device is displayed.

SNR Margin

SNR Margin is displayed.
Air Data Rate might down when this value is small.

Receive Packets

Receive Packets is displayed.

Receive Errors

Receive Errors is displayed.

Click "Clear Counters" button.
Receive Packets and Receive Errors is returned to 0.

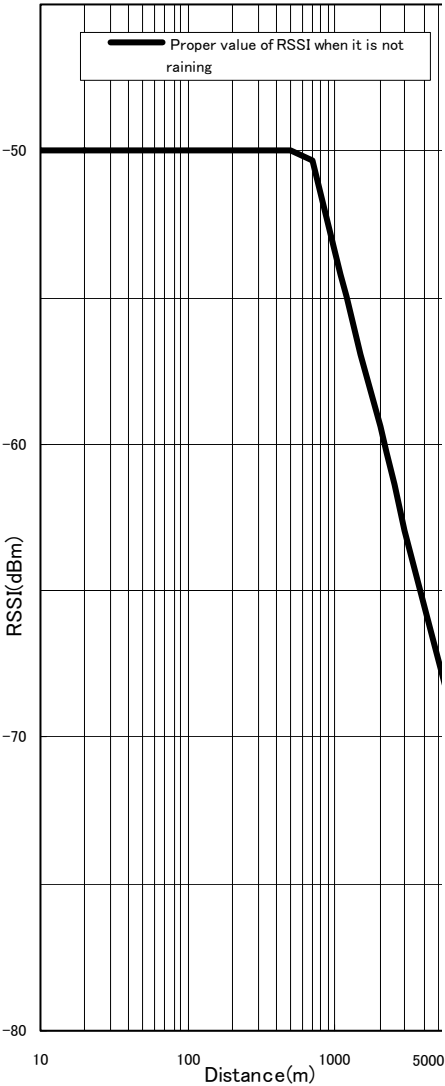
2 Proper value of RSSI

The graph of distance and RSSI (theory value) is shown right.

RSSI becomes about -50dBm by ATPC(Auto Power Control) in the short distance.

The direction of the antenna might shift when RSSI is lower than a proper value.

The graph of distance and RSSI (theory value)



(4) Displays LAN Status.

1 Click **LAN Status**.
LAN Status page is displayed.

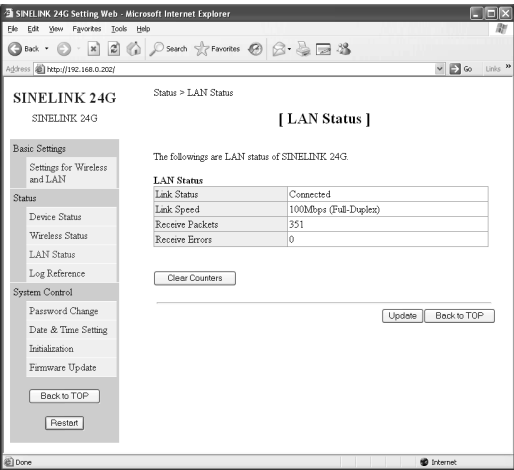
Link Status
Link Status is displayed.

Link Speed
Link Speed is displayed.

Receive Packets
Receive Packets is displayed.

Receive Errors
Receive Errors is displayed.

Click “Clear Counters” button.
Receive Packets and Receive Errors is returned to 0.



(5) Displays Device Log.

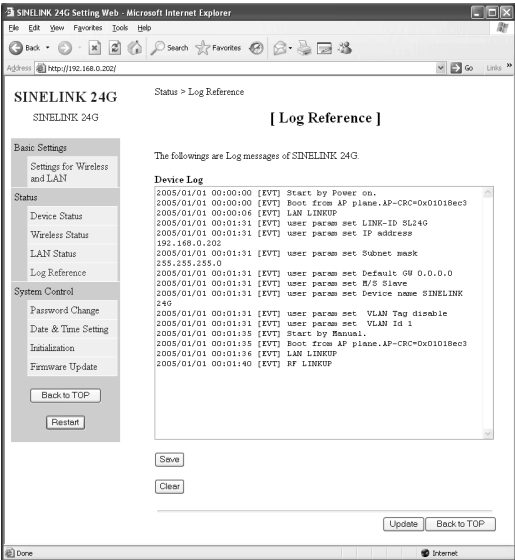
1 Click **Log Reference**.
Log Reference page is displayed.

Device Log
Device Log is displayed.

The latest 63 logs from power ON are displayed.

Click “Save” button.
Device Log can be saved to PC.

Click “Clear” button.
All Logs is cleared.



(6) Change password.

- 1 Click **Password Change**.
Password Change page is displayed.

Login Name

Login Name is displayed.

Login Name is administrator.

New Password**New Password (again)**

Enter New Password.
The field will accept alphanumeric string and has a maximum length of 16 characters.
Factory default is none.

SINELINK 24G Setting Web - Microsoft Internet Explorer

System Control > Password Change

[Password Change]

Login Password of SINELINK 24G can be changed.

Login Name	administrator
New Password	
New Password (again)	

Apply

Back to TOP

Restart

- 2 Enter new password, and click "Apply" button.
New Password becomes effective.

Copy new password to paper etc. and keep it.
The setting change and the operation situation cannot be referred when password of this device are forgotten.

SINELINK 24G Setting Web - Microsoft Internet Explorer

System Control > Password Change

[Password Change]

Login Password of SINELINK 24G can be changed.

Login Name	administrator
New Password	*****
New Password (again)	*****

Apply

Back to TOP

Restart

(7) Settings date and time.

- 1 Click **Date & Time Setting**.
Date & Time Setting page is displayed.

Date & Time

Date and time of this device is displayed.

The User needs to set "Date & Time" after Power OFF/ON.

New Date & Time

Enter new date and time.

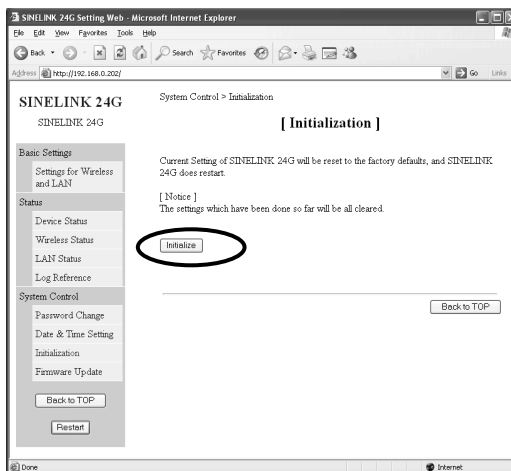
- 2 Enter new date and time, and click "Apply" button.

New date and time becomes effective.

(8) Initialize the setting.

- 1 Click Initialization.
Initialization page is displayed.

Current Setting of this device will be reset to factory defaults, and this device does restart. It takes about 30 seconds until restart is completed.



(9) Update firmware of this device.

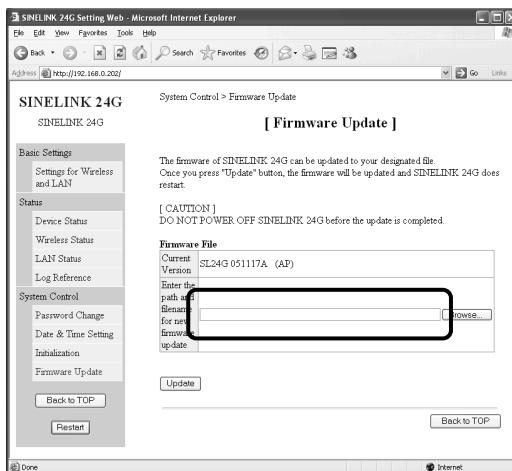
- 1 Click Firmware Update. Firmware Update page is displayed.

Current Version

Current Version is displayed.

Enter the path and filename for new firmware update

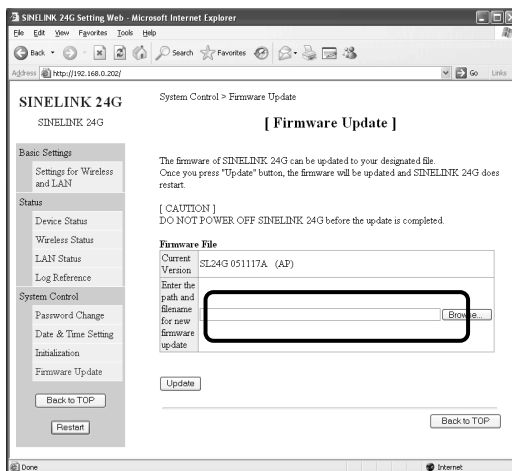
Enter the path and filename for new firmware update.



- 2 Enter path and filename, click "Update" button. PC starts to send the firmware file to this device.

Do not power off this device before the update is completed.

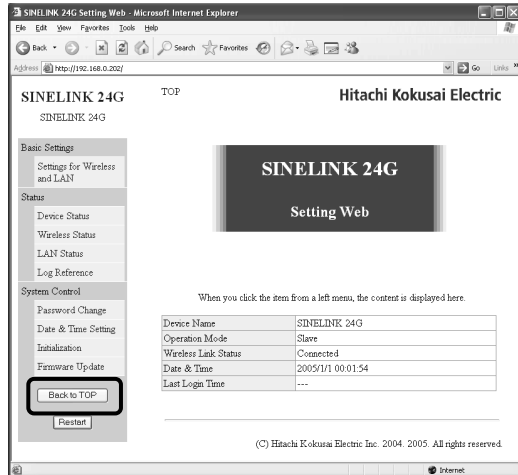
The firmware will be updated and this device does restart. It takes about 30 seconds until restart is completed.

**Attention in use**

Update firmware of this device at your own risk.

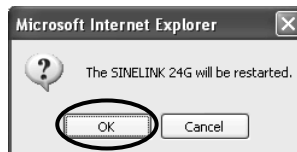
(10) Restart this device.

- 1 Click "Restart" button.



- 2 Click "OK" button.

It takes about 30 seconds until restart is completed.



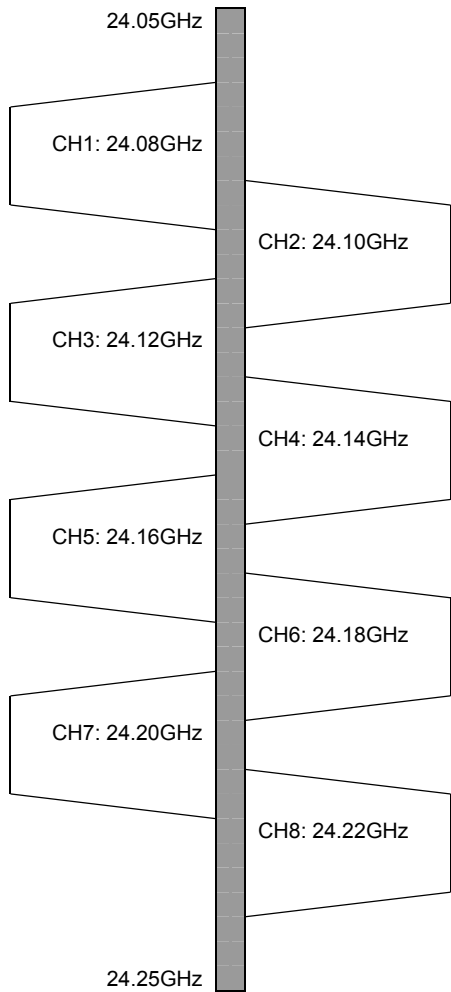
4. Appendix

4-1 Specification

Items	Specifications			Note
Applied regulations	FCC Part 15.249			
Frequency band	24.05 ~ 24.25GHz			
Number of available channels	8CH 24.08 ~ 24.22GHz (20MHz Step)			
Occupied bandwidth	28MHz			
Antenna	26cm-square(522 unit) planar antenna (All-in-one) Gain: 34dBi			Beam angle : 3 degrees or less Vertical/Horizontal polarization
Field Strength	128dBuV/m or less			Distance of Measurement : 3m
Duplex method	TDD			Tx : Rx =1 : 1
Tx power	-1dBm (Average Power)			
Air data rate, Distance	Air data rate (Mbps)	Modulation	Distance (km)	The adaptive control according to the line quality.
	150	64QAM	~ 1	
	100	16QAM	~ 1.5	
	50	QPSK	~ 2	
Throughput	Air data rate (Mbps)	Throughput (Up/Down link) (Mbps)		
	150	56 / 56		
	100	38 / 38		
	50	18 / 18		
Delay time (Average)	Air data rate (Mbps)	64Byte Packets (ms)	1522Byte Packets (ms)	In case that the load is below throughput.
	150	Approx. 0.7	Approx. 1.0	
	100	Approx. 0.7	Approx. 1.1	
	50	Approx. 0.8	Approx. 1.4	
Interference avoidance function	* Carrier sense * Dynamic frequency selection			
Automatic antenna power control	Performing optimization by monitoring receiving power at any time.			maximum control width is 40dB
Over input protection	Yes			

Items	Specifications	Note
Security	<ul style="list-style-type: none"> * Unique and nonpublic radio protocol * Scrambled data * Login password 	
Maintenance	<p>The following items can be controlled by PC based tool via LAN cable.</p> <ul style="list-style-type: none"> * Firmware update * Reboot * Link ID setting * Status and Log display * IP address setting 	IEEE802.1Q VLAN Tag for maintenance can be used.
Network interface	100BASE-TX	100Mbps, Full-Duplex
Packet length	64 ~ 1536 byte	
Power consumption	IEEE802.3af PD CLASS 0 conforming 12.95W or less	
Power supply	By overlapped DC "PoE (Power over Ethernet)". Cable length within 100m	
Size	Approx. 290(W)x290(D)x70(H) mm	Without mounting bracket
Weight	Approx. 3 kg	Without mounting bracket
Built-in clock accuracy	Error range is from 2 to 3 minute/month.	
Degree of protection	IP34	IEC 60529
Temperature range	-20 degrees C ~ +50 degrees C	
Humidity	Up to 95%	

4-2 RF channel allocation number



4-8 Factory Default

Settings				Factory Default	Memo
Settings for Wireless and LAN	Name Setting	Device Name		All space	
	Wireless Settings	Operation Mode		Slave	
		Link ID		(none)	
	LAN Settings	IP Address		192.168.0.202	
		Subnet Mask		255.255.255.0	
		Default Gateway		(none)	
		VLAN	VLAN Tag	Not Used	
			VID	1	
	Password Change				(none)