Panasonic®

Installation Guide

DECT 6.0 Cell Station Unit (SIP)

Model No. KX-UDS124

Thank you for purchasing this Panasonic product.
Please read this manual carefully before using this product and save this manual for future use.

KX-UDS124: Software File Version 01.000 or later

Table of Contents

1 For Your Safety

To prevent personal injury and/or damage to property, be sure to observe the following safety precautions.

The following symbols classify and describe the level of hazard and injury caused when this unit is operated or handled improperly.

⚠ WARNING	This notice means that misuse could result in death or serious injury.
⚠ CAUTION	This notice means that misuse could result in injury or damage to property.

The following types of symbols are used to classify and describe the type of instructions to be observed.

🚫 This symbol is used to alert users to a specific operating procedure that must not be performed.

❗ This symbol is used to alert users to a specific operating procedure that must be followed in order to operate the unit safely.

⚠ WARNING

🚫

- Do not connect or disconnect the AC plug with wet hands.
- Do not touch the SIP-CS, AC adaptor, or AC adaptor cord during a lightning storm.
- Do not allow anything to rest on the AC adaptor cord or LAN cable. Do not locate the SIP-CS where the AC adaptor cord or LAN cable may be stepped on or tripped on.
- When installing or testing a SIP-CS with an external AC adaptor, the AC adaptor should be plugged into a wall outlet or floor-mounted AC outlet. Do not connect the AC adaptor to a ceiling-mounted AC outlet, as the weight of the adaptor may cause it to become disconnected.
- Make sure that you do not short the battery or cables.
- Never attempt to insert wires, pins, etc. into the vents or other holes of the SIP-CS.
- Do not splash water on the AC adaptor or the power cord, nor get them wet. Doing so can result in fire, electric shock, or injury. If they do get wet, immediately disconnect the AC adaptor and power cord, and contact an authorized service center.
- Do not touch the AC adaptor for extended periods of time. Doing so can lead to low-degree burns.
- Do not make power connections that exceed the ratings for the AC outlet or power equipment. If the power rating of a surge protector, etc. is exceeded, it can cause a fire due to heat buildup.
- Care should be taken so that objects do not fall onto, and liquids are not spilled into, the SIP-CS. Do not subject the SIP-CS to excessive smoke, dust, moisture, mechanical vibration, shock, or direct sunlight.
- Do not place heavy objects on top of the SIP-CS.
- Do not mount the SIP-CS in a manner other than that described in this manual.

- The SIP-CS must only be installed and serviced by qualified service personnel. The SIP-CS should be used as-is from the time of purchase; it should not be disassembled or modified. Disassembly or modification can cause a fire, electric shock, or damage to the SIP-CS.
- Make sure that the wall that the SIP-CS will be attached to is strong enough to support the SIP-CS (approx. 330 g [11.6 oz]). If not, it is necessary for the wall to be reinforced.
- Only use the wall-mounting equipment (screws, washers, wall mounting plate) included with the SIP-CS.
- When the SIP-CS is no longer in use, make sure to detach it from the wall.
- Disconnect the SIP-CS from the AC outlet, disconnect the LAN cable, and contact the dealer if:
    - The AC adaptor cord or AC plug becomes damaged or frayed.
    - The SIP-CS is exposed to rain, water, or any other liquid.
    - The SIP-CS is dropped or damaged.
    - Internal components are exposed due to damage.
    - The SIP-CS does not operate properly.
    - Performance deteriorates.
- Disconnect the SIP-CS from the AC outlet and disconnect the LAN cable if the SIP-CS emits smoke, an abnormal smell, or makes unusual noise. These conditions can cause fire or electric shock. Confirm that smoke has stopped and contact an authorized service center.
- Clean the AC plug periodically with a soft, dry cloth to remove dust and other debris.
- If using an AC adaptor, use the optional AC adaptor KX-A239 (PQLV206YB), KX-A239X(PQLV206YB).
- If damage to the SIP-CS exposes any internal parts, immediately disconnect the cable or cord. If the power is supplied from the network to the SIP-CS (Power-over-Ethernet), disconnect the Ethernet cables. Otherwise, disconnect the AC adaptor cord. Then return the SIP-CS to a service center.
- The SIP-CS should only be connected to a power supply of the type shown on the label on the SIP-CS.
- Completely insert the AC adaptor/power plug into the AC outlet. Failure to do so may cause electric shock and/or excessive heat resulting in a fire.

⚠ CAUTION

- Do not stretch or bend the cables. Also, do not allow anything to rest on the cables.
- Do not bundle cables that are connected to the SIP-CS with the AC power cords of machines located nearby.
- To prevent malfunction, deformity, overheating, rust, and discolouration, do not install or place equipment in the following types of locations:
    - Locations where air ventilation is poor.
    - Locations that may be exposed to sulphurous gas, such as near hot springs.
    - Near devices that emit heat, such as heaters.
    - Near devices that emit electromagnetic noise, such as radios or televisions.
    - Near devices that emit high-frequency noise, such as sewing machines or welders.
- The SIP-CS and the cables should never be placed near or over a radiator or other heat source.
- The SIP-CS should not be placed outdoors (use indoors).
- The SIP-CS should not be placed near high-voltage equipment.

• The SIP-CS should not be placed on a metal object.

• The SIP-CS should be kept free of dust, moisture, high temperature (more than 40 °C [104 °F]), low temperature (less than 0 °C [32 °F]), and vibration, and should not be exposed to direct sunlight.
• When driving the screws into the wall, be careful to avoid touching any metal laths, wire laths or metal plates in the wall.
• Use cables that are fire-resistant or fireproof.
• Make sure the cables are securely fastened to the wall.
• The AC adaptor is used as the main disconnect device. Ensure that the AC adaptor is located near the SIP-CS and is easily accessible.
• Disconnect the AC adaptor cord and all cables from the SIP-CS before cleaning. Clean the SIP-CS with a soft, dry cloth. Do not use liquid, aerosol cleaners, abrasive powders, or chemical agents to clean the SIP-CS.
• When left unused for a long period of time, disconnect the SIP-CS from the AC outlet. When the SIP-CS receives power from a PoE power supply, disconnect the LAN cable.
• **Medical**—consult the manufacturer of any personal medical devices, such as pacemakers, to determine if they are adequately shielded from external RF (radio frequency) energy. (The SIP-CS operates in the frequency range of 1920 MHz to 1930 MHz, and the output peak power level is less than 0.12 W.) Do not use the SIP-CS in health care facilities if any regulations posted in the area instruct you not to do so. Hospitals or health care facilities may be using equipment that could be sensitive to external RF (radio frequency) energy.
• To ensure the security of private conversations, only connect the SIP-CS to a secure network.
• To prevent unauthorized access, only connect the SIP-CS to a network that is properly managed.
• Make sure all personal computers that are connected to the SIP-CS employ up-to-date security measures.
• To avoid unauthorized access and possible abuse of your phone system, we strongly recommend:
  – Keeping the password secret.
  – Changing your password regularly.
  – Selecting a complex, random password that cannot be easily guessed.
• Maintain the distances listed in "Required Distances between Equipment" in the Installation Guide between equipment in order to prevent noise, interference or the disconnection of a conversation. (The distance may vary depending on the environment.)

Notice

SAFETY REQUIREMENTS
• Before connecting the SIP-CS, confirm that the SIP-CS supports the intended operating environment.
• If the SIP-CS does not operate properly, disconnect the AC adaptor cord and LAN cable, then connect again.
• The SIP-CS may not operate in the event of a power failure.
• Do not move the SIP-CS while it is in use.
• Satisfactory operation, interoperability, and compatibility cannot be guaranteed with all equipment connected to the SIP-CS, nor with all services provided by telecommunications providers over networks connected to the SIP-CS.

SECURITY REQUIREMENTS
• Privacy of communications may not be ensured when using the wireless systems.
• Keep a copy of all important data (such as your network information) before sending the machine for repair.

- The SIP-CS can store your private/confidential information. To protect your privacy/confidentiality, we recommend that you initialize the SIP-CS to erase all user data and restore the factory default settings before you dispose, transfer or return the SIP-CS.

Additional Information

F.C.C. AND INDUSTRY CANADA RELEVANT INFORMATION

CAUTION

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

Privacy of communications may not be ensured when using this unit.

Notice

FCC ID can be found on the back of this unit.

Note

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Some wireless telephones operate at frequencies that may cause interference to nearby TVs and VCRs. To minimize or prevent such interference, the base of the wireless telephone should not be placed near or on top of a TV or VCR. If interference is experienced, move the wireless telephone further away from the TV or VCR. This will often reduce, or eliminate, interference.

RF Exposure Warning:

This product complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment. To comply with FCC/IC RF exposure requirements, this product must be installed and operated in accordance with the provided instructions. The installed unit requires a minimum 20 cm (8 inches) of spacing between the antenna and a person's body (excluding hands, wrists and feet) during wireless modes of operation.
This transmitter must not be co-located or operated in conjunction with any other antennas or transmitters.

For Users in Canada Only

This Class B digital apparatus complies with Canadian ICES-003.

Note

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
Privacy of communications may not be ensured when using this telephone. Some wireless telephones operate at frequencies that may cause interference to nearby TVs and VCRs. To minimize or prevent such interference, the base of the wireless telephone should not be placed near, or on top of, a TV or VCR. If

interference is experienced, move the wireless telephone further away from the TV or VCR. This will often reduce, or eliminate, interference.

2 Overview

Outline

This document describes the installation, deployment, configuration of a SIP-based DECT system. In this system, SIP-based DECT Portable Stations are used together with SIP-CSs.

Related Documentation

Administrator Guide for KX-UDS124

Describes the programming and maintenance of the SIP-CS.

Please refer to the following web site for more information:
http://panasonic.net/pcc/support/sipphone

Terminology

Air Sync Group

Air Synchronisation Group. To obtain steady Air Synchronisation over a wide area, it is necessary to create Air Sync Groups.

Air Sync Master CS

Primary Clock Master of an Air Sync Group. Each Air Sync Group must have a unique Air Sync Master.

Air Sync Secondary Master CS

Secondary Clock Master of an Air Sync Group

DECT

Digital Enhanced Cordless Telecommunication

Handover

Allows you to move between CS coverage areas during a conversation without disrupting the call. This is only possible within the same Air Sync Group.

IPEI

International Portable Equipment Identity Decimal, 12-digit, globally unique identification code of PSs. Specified in ETSI EN 300 175-6.

Migration

Allows you to use the S-PS at another system (site) which was registered beforehand.

Primary CS

Primary CS for Air Synchronisation

Roaming

Allows you to move between coverage areas of SIP-CSs in other Air Sync Groups when the S-PS is idle.

S-PS

SIP-CS compatible Portable Station/Handset

Secondary CS

Secondary CS for Air Synchronisation

SIP-CS

SIP Cell Station

Super Master CS

Master CS of Air Sync Group 1. This CS manages configuration for the whole system.

Tree Survey

Procedure to obtain a steady Air Synchronisation tree.

System Overview

The SIP-CS can be connected to a SIP server via a LAN and supports S-PSs for making calls. The SIP-CS allows for easy and cost-saving installation using an existing IP network infrastructure. Air synchronisation technology is used for synchronising each SIP-CS.

The SIP-CS provides the following:
– Wireless systems using a converged voice and data network infrastructure.
– Wireless branch offices and wireless solutions by long distance installation on larger premises when located on the same network.
– Reliable wireless communication using DECT technology over an IP network.
– High quality voice communication.
– Easy maintenance using Air Download.

The following is an example of SIP-CS installation using an IP network.
To obtain steady Air Synchronisation, create two or more Air Sync Groups to cover a wide area, as shown below.

⚡ : Handover is working.

Roaming
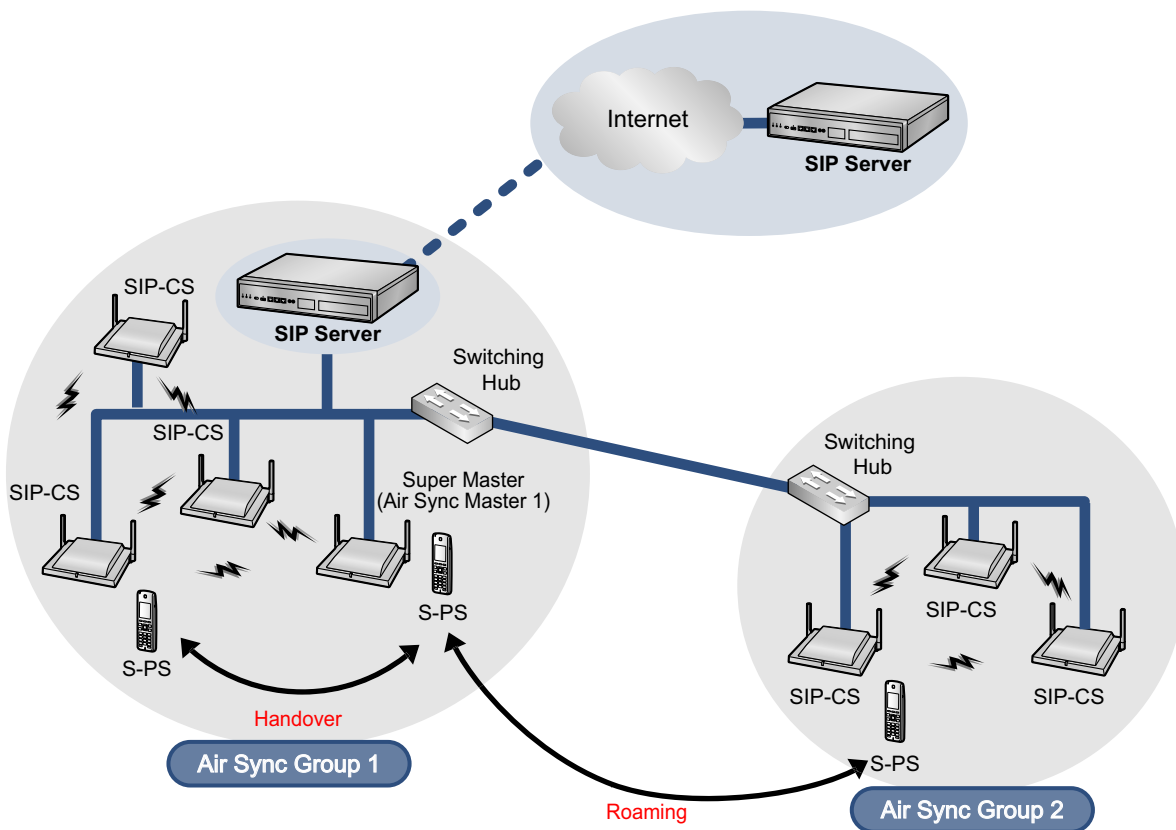
Note
- You can move between the coverage areas of SIP-CSs during a conversation, without disrupting the call. This is called "Handover" and is only possible within the same Air Sync Group. You cannot move between Air Sync Groups during a conversation. You can only move between Air Sync Groups when in idle status. This is called "Roaming".
- Each Air Sync Group requires an Air Sync Master CS.

- The system requires one Super Master CS to control the system as a whole. The Air Sync Master CS of Air Sync Group 1 becomes the Super Master CS.
- All SIP-CSs of the same model consist of the same hardware and same firmware, but each SIP-CS's role (Master/Slave) is decided by its settings.

Migration
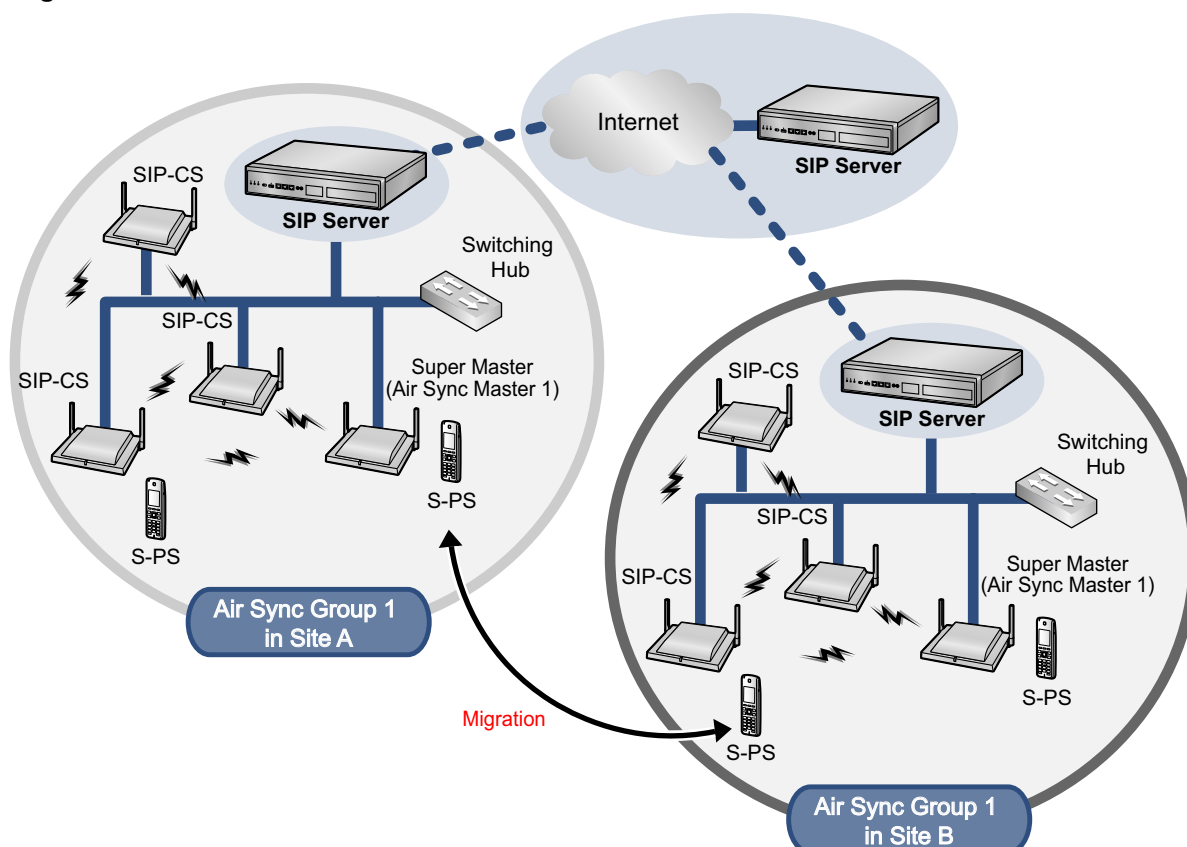
Note

- You can use a S-PS in other systems (sites), if you register it to each system beforehand. This is called "Migration". You can register up to 4 systems to a S-PS.
- A system at a different site connected by a dedicated line (such as an IP-VPN), which shares a Super Master CS, is considered part of the same system.

SIP Signalling and Media Stream Control Overview

Moving while in standby mode
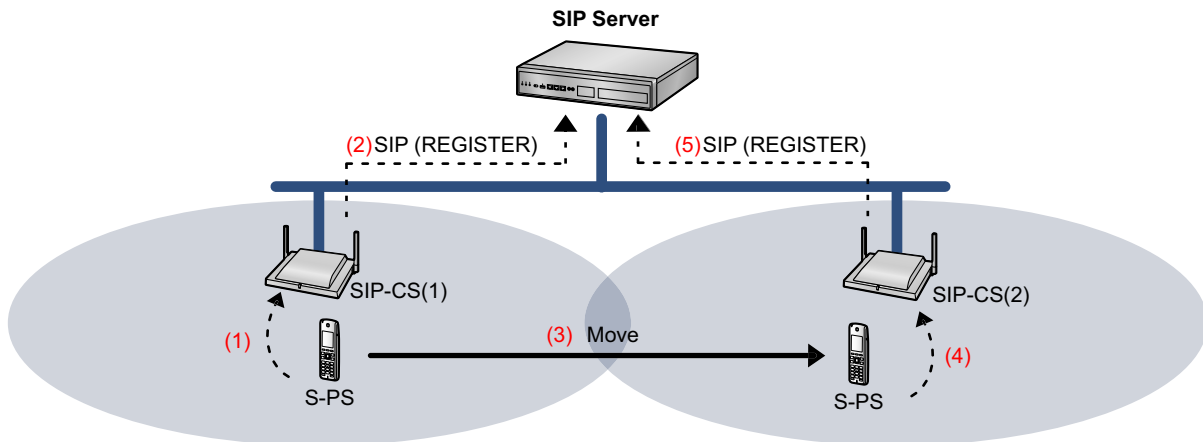
(1)   The S-PS requests Location Registration from SIP-CS(1).

(2)   SIP-CS(1) requests SIP Registration from the SIP server.

(3)   The S-PS moves from coverage area of SIP-CS(1) to the coverage area of SIP-CS(2).

(4)   The S-PS requests Location Registration from SIP-CS(2).

(5)   SIP-CS(2) requests SIP Registration from the SIP server.

SIP registration is executed each time the S-PS performs location registration while it is idle.

Moving while talking
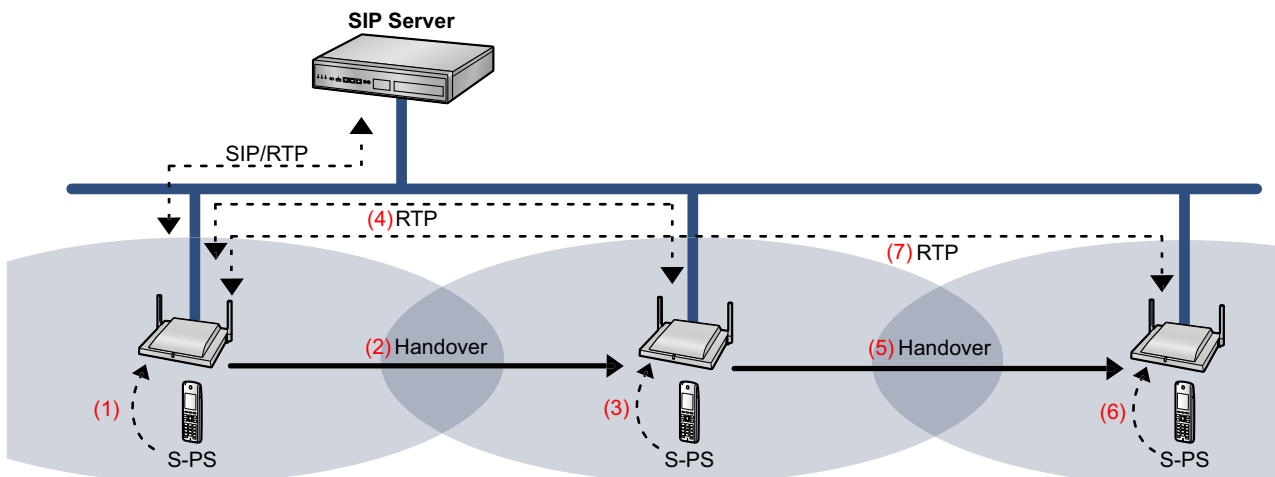
(1)   The S-PS requests Location Registration to SIP-CS(1), and then the S-PS starts the call.

(2)   The S-PS moves from the coverage area of SIP-CS(1) to the coverage area of SIP-CS(2).

(3)   The S-PS requests Location Registration to the SIP-CS(2).

(4)   RTP is transferred from SIP-CS(1) to SIP-CS(2).

(5)   The S-PS moves from the coverage area of SIP-CS(2) to the coverage area of SIP-CS(3).

(6)   The S-PS requests Location Registration to the SIP-CS(3).

(7)   RTP is transferred from SIP-CS(1) to SIP-CS(3).

SIP signalling and the media stream are sent between the SIP-CS currently in use and the SIP-CS that was being used when the call started.

System Configuration

The Air Sync Master CS of Air Sync Group 1 is the most important SIP-CS. It is called the Super Master CS. The Super Master CS has the following roles:
- Portal for all settings.
- Management of the synchronisation tree of all SIP-CSs.
- Distribution of configuration data via Web user interface programming or configuration file programming.
- Distribution of SIP-CS and S-PS firmware data to all SIP-CSs in the system.
- Distribution of imported phonebook data to all SIP-CSs in the system.

Air Synchronisation Group 1   **Air Synchronisation Group 2**   **Air Synchronisation Group n**

Super Master CS

Air Sync Master CS

Air Sync Master CS

Slave CS   Slave CS   Slave CS

Slave CS   Slave CS   Slave CS

Slave CS   Slave CS   Slave CS
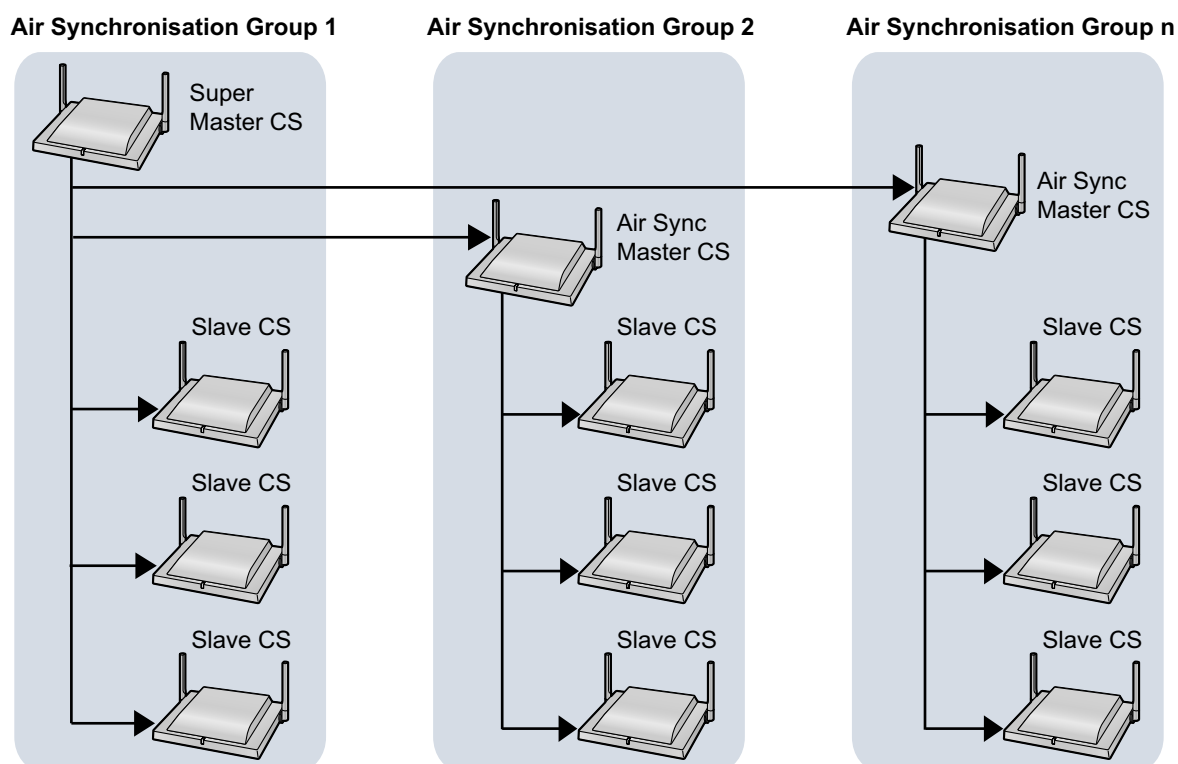
Data flow of SIP-CSs
1. The Super Master distributes data to each Air Sync Master.
2. Each Air Sync Master distributes the data to all Slave CSs in the Air Sync Group. Also, the Super Master distributes the data to all Slave CSs in Air Sync Group 1.

Note

- Data will be distributed until all Slave CSs in all Air Sync Groups receive the data.
- Data is distributed in the following situations:
  - When the Super Master CS is started.

– When **All Save** is performed through the Web user interface.
– When Timed forwarding update is set.
– When Timed phonebook importing is set.

System Specifications

Item	Maximum Number per System
S-PS	255
SIP-CS	128 (32 SIP-CSs per Air Sync Group)
Air Sync Group	8
Super Master CS	4

Note

A S-PS can be registered to up to 4 SIP-CS systems.

3 Installing the SIP Cell Stations

3.1 Overview of SIP Cell Stations

Names and Locations
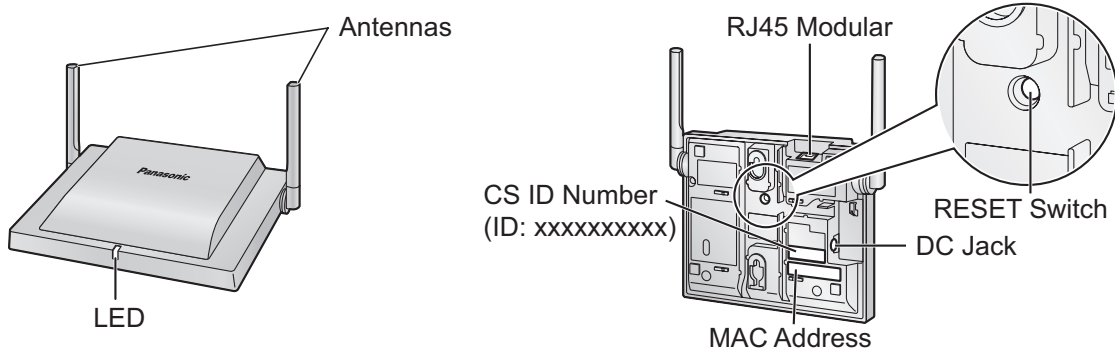
Unpacking

Unpack the box and check the items below:

SIP Cell Station	1
Wall Mounting Plate	1
Screws	2
Washers	2

LED Indications

SIP-CS State	Description
General Operation	• OFF: Power Off/SIP-CS Software downloading • Green ON: Stand-by (no active calls) • Slow Green Flashing: Talk (active calls) • Moderate Green Flashing: Busy[1] • Red ON: Fault • Slow Red Flashing: Out of Service/Starting up (data link establishment → Air Synchronisation) • Moderate Red Flashing: Starting up (power on → data link establishment) • Amber ON: Stand-by (unstable synchronisation [no active calls]) • Slow Amber Flashing: Talk (unstable synchronisation [active calls]) • Moderate Amber Flashing: Busy[1] (unstable synchronisation) **Note** LED flashing patterns are as follows: • Slow Flashing: 60 times per minute • Moderate Flashing: 120 times per minute

SIP-CS State	Description
Site Survey Mode	• Red and green alternate flashing: Site Survey Master mode • Green flashing: The site survey signal being received is good • Orange flashing: The site survey signal being received is not good • Red flashing: The site survey signal has been lost • Slow red flashing: No site survey signal (after receiving IP address) • Moderate red flashing: No site survey signal (before receiving IP address)

*1   All voice channels are occupied.

3.2 Connecting SIP Cell Stations

Connecting a SIP-CS to a LAN

Notice
- Connect the SIP-CSs to the LAN only after completing network settings. For details about network settings, see "Configuring Network Settings for Super Master CS" in "4.3 Site Survey".
- When connecting a SIP-CS to the LAN, connect it to a switching hub.

Note
- Use an Ethernet straight cable with an RJ45 connector to connect the SIP-CS to a switching hub. The cable should be a 10BASE-T/100BASE-TX CAT 5 (Category 5) or higher cable, and the diameter of the cable must be 6.5 mm or less.
- It is possible to connect the SIP-CS to the LAN while registering the SIP-CS to the SIP server.

1. Connect the cable to the SIP-CS.
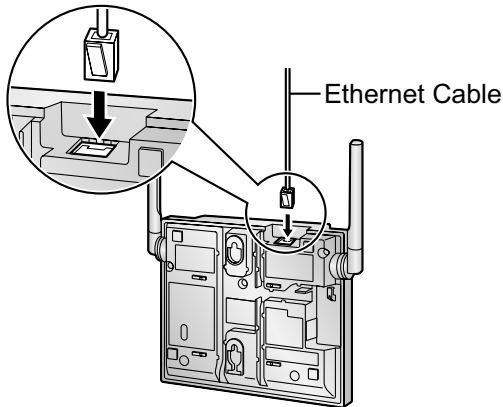
Ethernet Cable

2. Pass the cable through the groove of the SIP-CS in one of the following three ways.

❶ To a Switching Hub

❷ To a Switching Hub
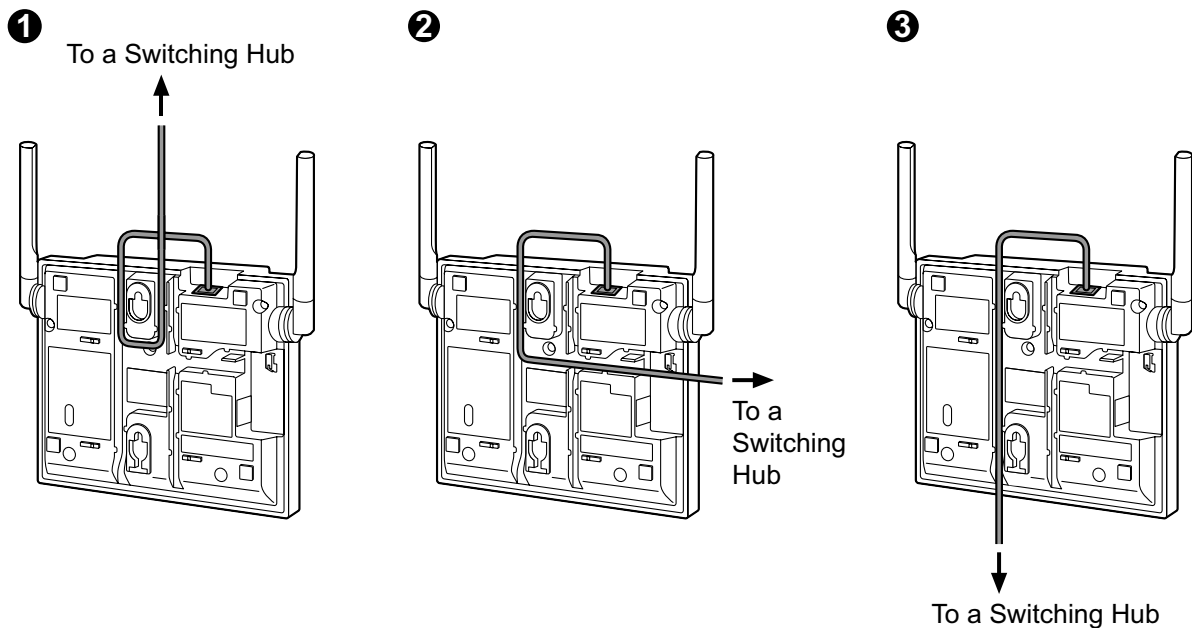
❸ To a Switching Hub

3. Connect the other end of the cable to the switching hub.

Connecting an AC Adaptor to a SIP-CS

SIP-CSs comply with the IEEE 802.3af Power-over-Ethernet (PoE) standard. If PoE is available on your network, these SIP-CSs can receive the necessary power supply from the network through the network cable. In this case, no AC adaptor is needed for the SIP-CSs.
However, if PoE is not available, you will need to connect an AC adaptor to the SIP-CS.

WARNING

When installing or testing a SIP-CS with an external AC adaptor, the AC adaptor should be plugged into a wall outlet or floor-mounted AC outlet. Do not connect the AC adaptor to a ceiling-mounted AC outlet, as the weight of the adaptor may cause it to become disconnected.

Note

Use only the optional AC adaptor KX-A239 (PQLV206YB) or KX-A239X (PQLV206YB) for the SIP-CS.

1. Connect the AC adaptor cord to the SIP-CS.
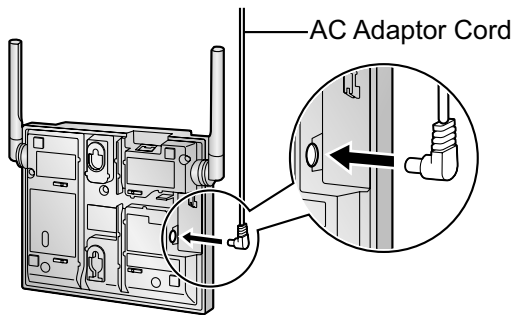
AC Adaptor Cord

2. Pass the cord through the groove of the SIP-CS in one of the following three ways.

❶ To AC Adaptor KX-A239

❷ To AC Adaptor KX-A239

❸ To AC Adaptor KX-A239
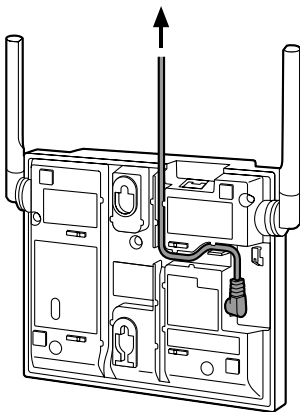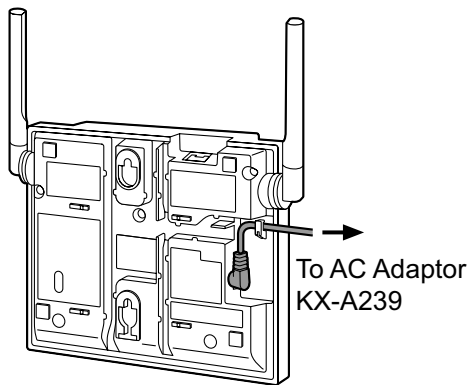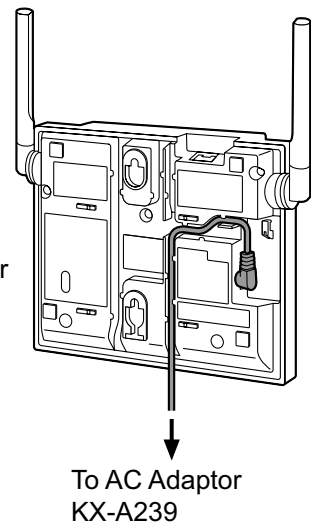
3. Connect the AC adaptor to an AC outlet.

3.3 Wall Mounting

Mounting

WARNING
- **Make sure that the wall that the CS will be attached to is strong enough to support the CS (approx. 330 g [11.6 oz]). If not, it is necessary for the wall to be reinforced.**
- **Only use the wall-mounting equipment (screws, washers, wall mounting plate) included with the CS.**
- **When the CS is no longer in use, make sure to detach it from the wall.**

CAUTION
- When driving the screws into the wall, be careful to avoid touching any metal laths, wire laths or metal plates in the wall.
- Do not stretch or bend the cables. Also, do not allow anything to rest on the cables.
- Use cables that are fire-resistant or fireproof.
- The CS and the cables should never be placed near or over a radiator or other heat source.
- Do not bundle cables that are connected to the CS with the AC power cords of machines located nearby.
- Make sure the cables are securely fastened to the wall.

1. Place the reference for wall mounting on the wall to mark the 2 screw positions.
2. Install the 2 screws and washers (included) into the wall.

   Note
   - Make sure that the screw heads are at the same distance from the wall.
   - Install the screws perpendicular to the wall.

3. Insert the upper and lower tabs of the wall mounting plate into the designated openings in the base unit.
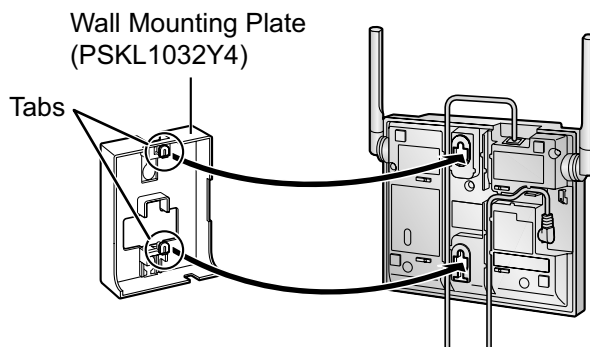
4. Slide the wall mounting plate in the direction of the arrow until it clicks.
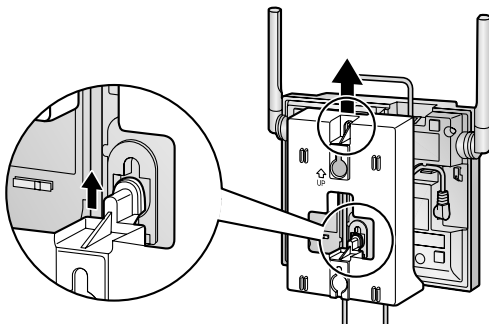
5. Hook the CS on the screw heads.
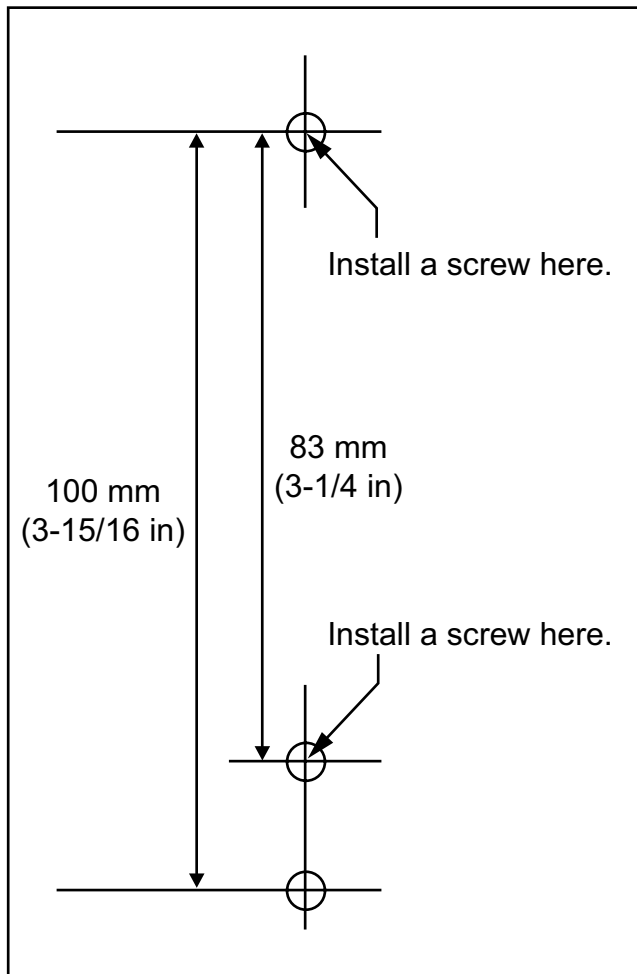
Washer

Drive the screw to this point.
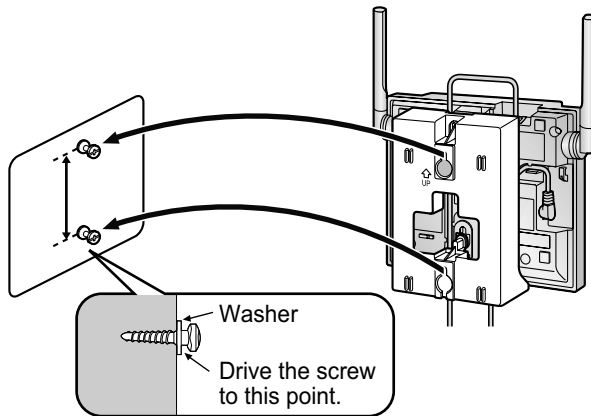
6. Place the antennas so that they are pointing in directions that are 90 degrees apart (for antenna diversity), as follows:

45º

90º

45º
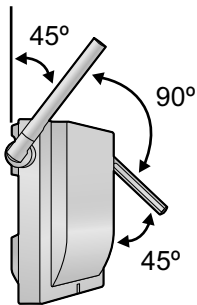
Reference for Wall Mounting

Please copy this page and use as a reference for wall mounting.

Install a screw here.

83 mm
(3-1/4 in)

100 mm
(3-15/16 in)

Install a screw here.

Note

Make sure to set the print size to correspond with the size of this page. If the dimension of the paper output still deviates slightly from the measurement indicated here, use the measurement indicated here.

3.4 Basic Network Configuration

Configuring Network Settings for Super Master CS

Recommended Environment

The Web user interface will operate correctly in the following environments:

Operating System	Microsoft® Windows® XP or Windows 7 (32 bit)
Web Browser	Windows Internet Explorer® 7 or Windows Internet Explorer 8

Password Security

CAUTION

To avoid unauthorised access and possible abuse of the PBX, we strongly recommend:

- – Keeping the password secret.
- – Changing your password regularly.
- – Selecting a complex, random password that cannot be easily guessed.

Logging in to the Web User Interface

1. Connect a PC to the SIP-CS intended to serve as the Super Master CS.
2. Start a Web browser on the PC.
3. Enter the default IP address of the SIP-CS in the browser's address bar.
   The default IP address and subnet mask are as follows:
   - • IP address: 192.168.0.241
   - • Subnet mask: 255.255.255.0
4. Log in to the SIP-CS as the administrator.

Note

The default ID and password for the administrator are as follows:
- • ID: admin
- • Password: adminpass

CAUTION

For security reasons, change the administrator password after logging in to the Web user interface for the first time.

Changing the Administrator Password

1. In the **System** tab, select **Administrator Password**.
2. Enter the default password in **Current Password**.
3. Enter a new password in **New Password**.
4. Enter the new password again in **Confirm New Password**.
5. Click **All Save**.
6. In the **Maintenance** tab, select **Restart**.
7. Click **Restart**.
   The new password will be saved and the SIP-CS will restart.

Assigning IP Address Information

The Super Master CS must have a static IP address. Follow the procedure below to configure static IP address information.

1. In the **Network** tab, select **Basic Network Settings**.
2. Enter the IP address of the Super Master CS in **Static IP Address**.
3. Enter the subnet mask in **Subnet Mask**.
4. Enter the IP address of the default gateway in **Default Gateway**.
5. Enter the IP address of the primary DNS server in **DNS1**.
6. Enter the IP address of an secondary DNS server in **DNS2**.
7. Click **Save**.

Configuring Air Synchronisation Settings

Follow the procedure below to change the SIP-CS status to **Master**.

1. In the **System** tab, select **Air Settings**.
2. In **CS Class**, select **Master**.
3. Enter the IP address of the Super Master CS in **IP Address**.

4. Click **Save**.
The SIP-CS will restart.
The SIP-CS is now set as the Super Master CS.

Connecting SIP-CSs to the LAN

Confirming the MAC Addresses of all the SIP-CSs

Before connecting the SIP-CSs to the LAN, confirm the MAC address of each SIP-CS.
The MAC address of each SIP-CS is required in a procedure described later. The MAC address is written on the rear side of each SIP-CS.

Connecting SIP-CSs to the LAN

1. Disconnect the Super Master CS from the PC.
2. Place the Super Master CS in its planned location, and then connect it to the LAN.
3. Place the other SIP-CSs in their planned locations, and then connect them to the LAN.
All the SIP-CSs (except Super Master CS) will automatically acquire their IP address from the DHCP server.

4 Deployment Procedure

The deployment procedure for establishing a wireless system is as follows.

4.1 Overview

1. Site Planning

Choose the optimal installation locations for SIP-CSs. Site planning requires careful preparation and thorough testing.

2. Site Survey

Confirm the signal condition of the planned location using two un-registered CSs and one S-PS.
When connecting the wireless system, use extreme care in conducting the site survey. Site surveys can be conducted using two KX-UDS124s. An incorrectly performed site survey can result in a poor service area, frequent noise, disconnection of calls, and synchronisation failure of SIP-CSs.

3. CS Registration

Register all SIP-CSs in the system which the Air Sync Master CS is controlling.

4. Tree Survey

Create the synchronisation hierarchy for each Air Sync Group to provide stable Air Synchronisation. There are 2 types of Tree Survey methods, as shown in the table below:

Tree Survey Type	Description	References
Web User Interface Programming	Installing the SIP-CS after conducting a Tree Survey by accessing the Web user interface from a PC connected to the same network. This method provides an easier but less accurate Tree Survey.	Refer to "Section 2 Web User Interface Programming" in the Administrator Guide.
CS Maintenance Tool Programming	Installing the SIP-CS after conducting a Tree Survey using the CS Maintenance Tool installed on a PC connected to the same network. This method provides a more accurate Tree Survey.	xxx

5. Configuration

Specify SIP server network informations, and SIP account information of extensions.

6. S-PS Registration

Register S-PSs to the Super Master CS.

7. S-PSs Area Check

Check the service area, sound quality, and handover operation under actual conditions.

4.2 Site Planning

In order to be able to move between coverage areas during a call (Handover), synchronisation between SIP-CSs is necessary. If synchronisation between SIP-CSs has not been configured, handover will fail. The source of synchronisation is called a Master CS and the target of synchronisation is called a Slave CS. An Air Synchronisation Group is created with the Master/Slave CSs on different levels. The source of synchronisation for each SIP-CS in an Air Synchronisation Group is called an Air Synchronisation Master CS.

The number of Master/Slave levels in an Air Synchronisation Group cannot exceed 8. To ensure that the number of levels does not exceed 8, locate the Air Synchronisation Master CS in the centre of the group. A greater number of levels can lead to instability in handover and Air Synchronisation.

The Master CS of Air Synchronisation Group 1 is called the Super Master CS and controls the whole system.
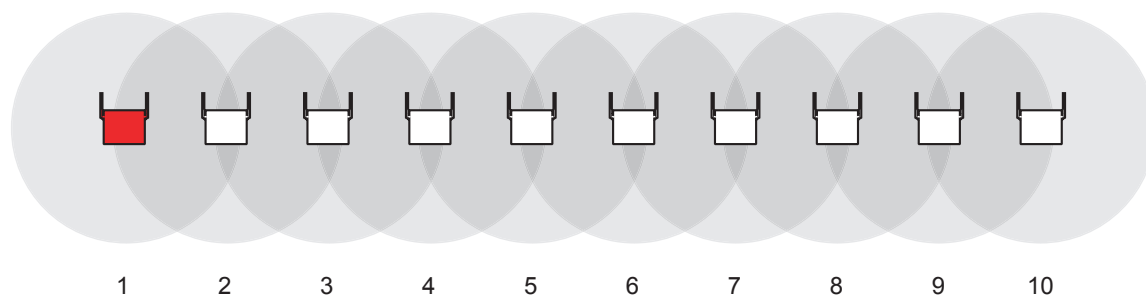
Good Example:

The Master CS is located in the centre of the installation site for each Air Sync Group.
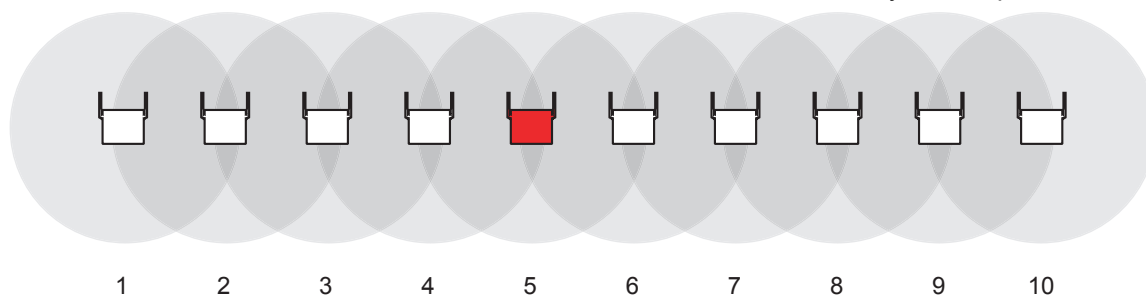
Number of Master/Slave level: 5

Bad Example:

The Master CS is **NOT** located in the centre of the installation site for each Air Sync Group. Therefore, the number of layers in the hierarchy exceeds 8.


Number of Master/Slave level: 10

Notice

- Choosing the best site for the SIP-CS requires careful planning and testing. The best location may not always be convenient for installation.
- It is necessary to locate SIP-CSs within synchronisation range of other SIP-CSs, however, locating SIP-CSs too close to each other can lead to interference and a reduction in the number of simultaneous calls. In a regular office, the average distance between SIP-CSs should be approximately 30 m.

However, since walls, metallic shelves, etc. can weaken signals, Air Synchronisation may not be as stable as planned. Conduct a site survey after installing the SIP-CSs, as described in the next chapter.

CS Coverage Area for Establishing Conversations

The example below shows the size of the area where one SIP-CS can provide service for S-PSs, if it is installed in an area with no obstacles.
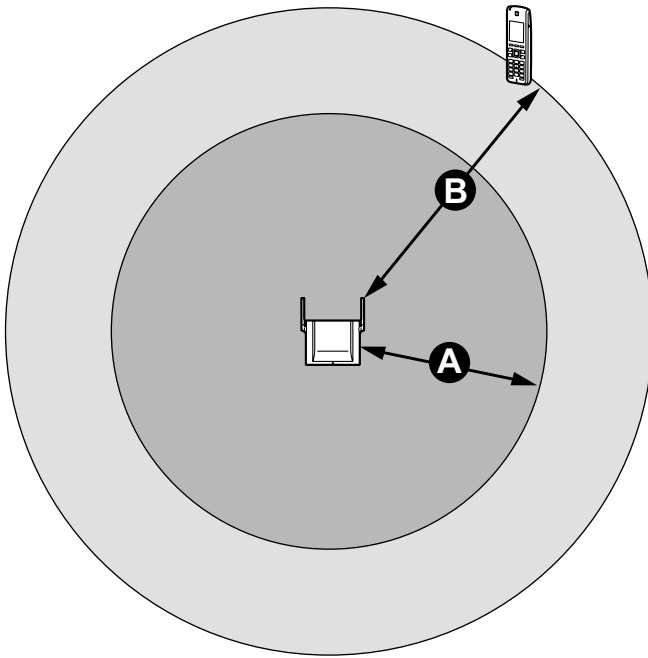
Area	Description
A	Air Synchronisation coverage area (Radius: About 1 m to 40 m)
B	S-PS coverage area (Radius: About 1 m to 50 m)

Understanding Radio Waves

Characteristics of Radio Waves

The transmission of radio waves and the SIP-CS coverage area depend on the structure and materials of the building.

Office equipment, such as computers and fax machines, can interfere with radio waves. Such equipment may create noise or interfere with the performance of the S-PS.

The illustration below shows the special transmitting patterns of radio waves.

1. Radio waves are reflected by objects made of materials such as metal.
2. Radio waves are diffracted by objects such as metallic columns.

3. Radio waves penetrate objects made of materials such as glass.
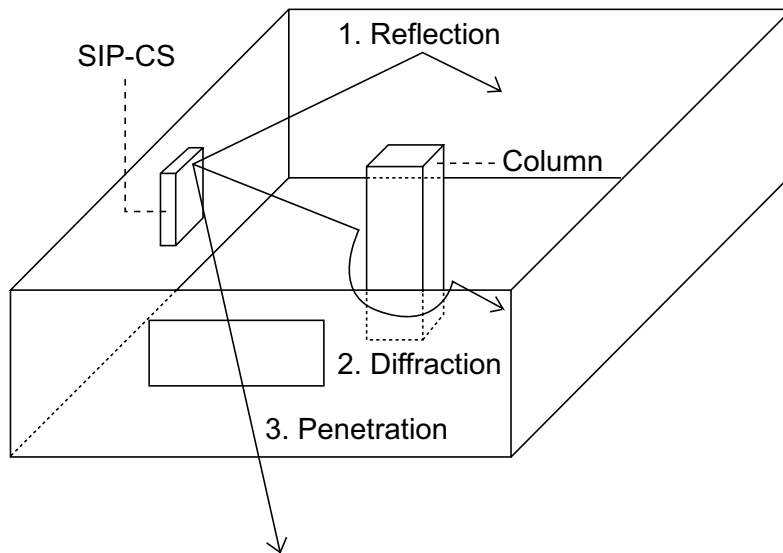
Relationships Between Radio Waves and Building Structure and Materials

• The SIP-CS coverage area is affected more by the building materials and their thickness than the number of obstacles.
• Radio waves tend to be reflected or diffracted by conductive objects and rarely penetrate them.
• Radio waves tend to penetrate insulated objects and are rarely reflected by them.
• Radio waves penetrate thin objects more than thick objects.
• The table below shows the transmission tendency of radio waves when they reach objects made from various materials.

Object	Material	Transmission Tendency
Wall	Concrete	The thicker they are, the less radio waves penetrate them.
	Ferroconcrete	Radio waves can penetrate them, but the more iron there is, the more radio waves are reflected.
Window	Glass	Radio waves usually penetrate them.
	Glass with wire net	Radio waves can penetrate them, but tend to be reflected.
	Glass covered with heat-resistant film	Radio waves are weakened considerably when they penetrate windows.
Floor	Ferroconcrete	Radio waves can penetrate them, but the more iron there is, the more radio waves are reflected.
Partition	Steel	Radio waves are reflected and rarely penetrate them.
	Plywood, Glass	Radio waves usually penetrate them.

Object	Material	Transmission Tendency
Column	Ferroconcrete	Radio waves can penetrate them, but the more iron there is, the more radio waves tend to be reflected or diffracted.
	Metal	Radio waves tend to be reflected or diffracted.
Cabinet	Steel	Radio waves are usually reflected or diffracted, and rarely penetrate them.
	Wood	Radio waves can penetrate them, but they are weakened.

General Installation

Obtain a map of the SIP-CS installation site, identify the service area required by the user on the map, and then plan the location of each SIP-CS.
It is recommended that you install the SIP-CS at a height of 2 m of more for less obstructions.

Follow the procedure below to perform site planning for general installation:
1. Decide where to install the first SIP-CS.
2. Install the second SIP-CS at a distance of about 30 m from the first SIP-CS. If you cannot maintain a distance of 30 m due to building limitations, install the second SIP-CS as far away as possible in the overlapping range of the Air Synchronisation coverage area.

   Notice

   Locate SIP-CSs so that places where most calls will be made are within the coverage area of as many SIP-CSs as possible.
3. When you have covered the necessary area, make the SIP-CS that is adjacent to most other SIP-CSs into the Air Sync Master CS.

SIP-CS(1)

Air Sync Master CS

SIP-CS(3)   SIP-CS(2)
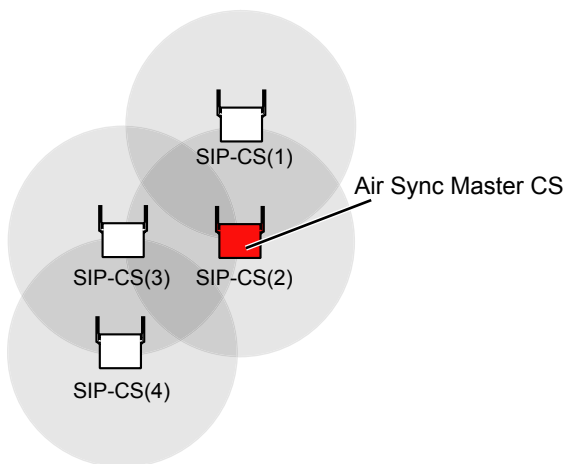
SIP-CS(4)

SIP-CS	Overlapping Coverage Area	Other SIP-CSs in the Coverage Area
SIP-CS(1)	SIP-CS(2) SIP-CS(3)	SIP-CS(2)

| SIP-CS	Overlapping Coverage Area	Other SIP-CSs in the Coverage Area
SIP-CS(2)	SIP-CS(1) SIP-CS(3) SIP-CS(4)	SIP-CS(1) SIP-CS(3)
SIP-CS(3)	SIP-CS(1) SIP-CS(2) SIP-CS(4)	SIP-CS(2) SIP-CS(4)
SIP-CS(4)	SIP-CS(2) SIP-CS(3)	SIP-CS(3)

SIP-CS(2) and SIP-CS(3) are adjacent to most other SIP-CSs.
Therefore, in this case choose SIP-CS(2) or SIP-CS(3) as the Air Sync Master CS.
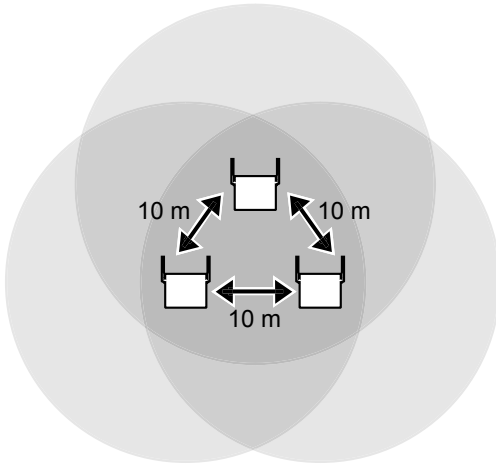
Adjoining Installation

When you want to make many simultaneous calls in a small area, locate SIP-CSs according to the table below.

Simultaneous Calls	Number of CSs	Distance between CSs
Up to 4	1	-
5 to 8	2	1 m
9 to 12	3	10 m
13 to 16	4	10 m
More than 17	Not Recommended	Not Recommended

Example 1
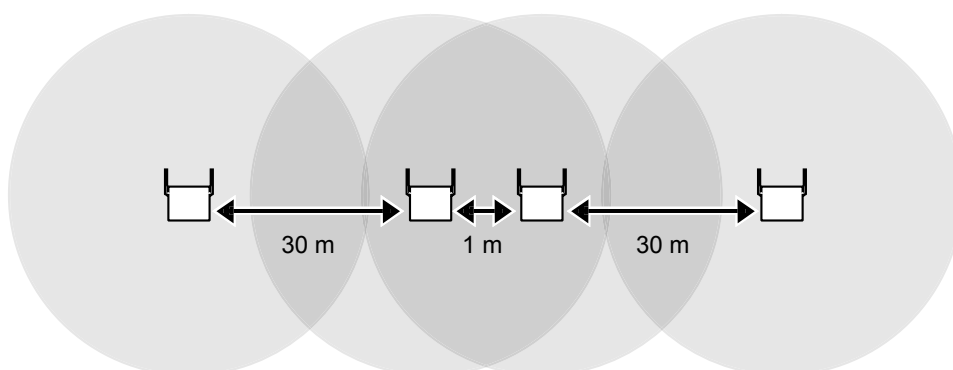
Example 2 (Vertical)

Example 3 (Vertical)
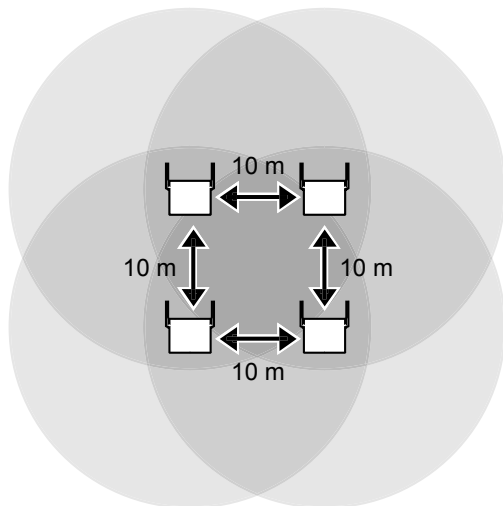
Notice

- It may not be possible to create an Air Sync Group that spans multiple floors, because the dividing ceilings may weaken the signal too much. In this case, locate a connecting SIP-CS in the staircase between each floor.
- When creating an Air Sync Group that spans multiple floors, make sure that you conduct a site survey on each floor.
- Make the SIP-CS that is adjacent to most other SIP-CSs (in all 3 dimensions) into the Master CS.

Air Synchronisation

Air synchronisation assigns classifications to SIP-CS and establishes connections based on those classifications. This creates a robust system where the whole system is not reliant upon one SIP-CS.

CS Coverage Area for Air Synchronisation between SIP-CSs

The example below shows the size of the area where one SIP-CS can synchronise with other SIP-CSs, if it is installed in an area with no obstacles.
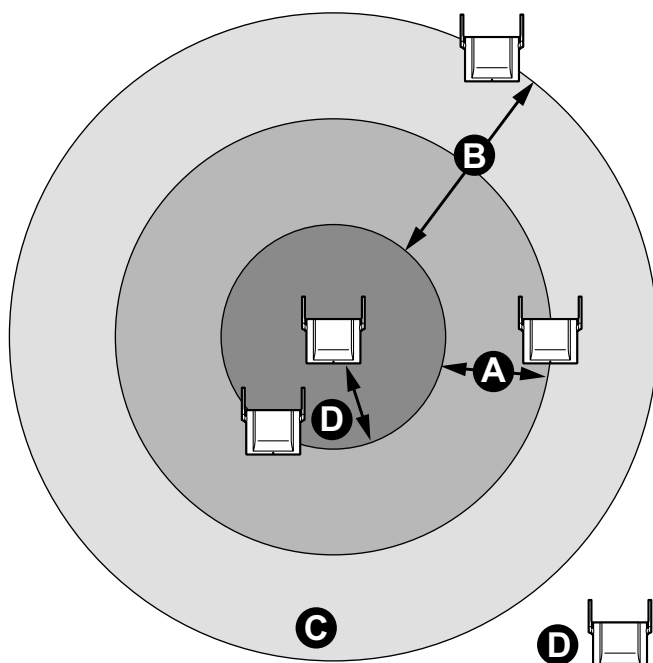
Area	Description
A	Good Coverage Area: Radio signal strength level is "Good" (20 m to 40 m). Good synchronisation quality can be maintained.
B	Coverage Area Radio signal strength level is "Bad" (about 20 m to 50 m).
C	Grey Zone: Conversation will be intermittent.
D	Out of Service: Too close (0 m to 1 m) or too far so that the radio signal is lost and the SIP-CSs cannot be synchronised.

Note

For air synchronisation radio signal strength details, refer to "Site Survey Mode" in "LED Indications" table found in "2 Overview".

4.3 Site Survey

Confirming SIP-CS Coverage Area for Air Synchronisation between SIP-CSs

Confirm the radio signal strength of the SIP-CS at each planned location. The SIP-CS's LED indicates the strength of the wireless connection.
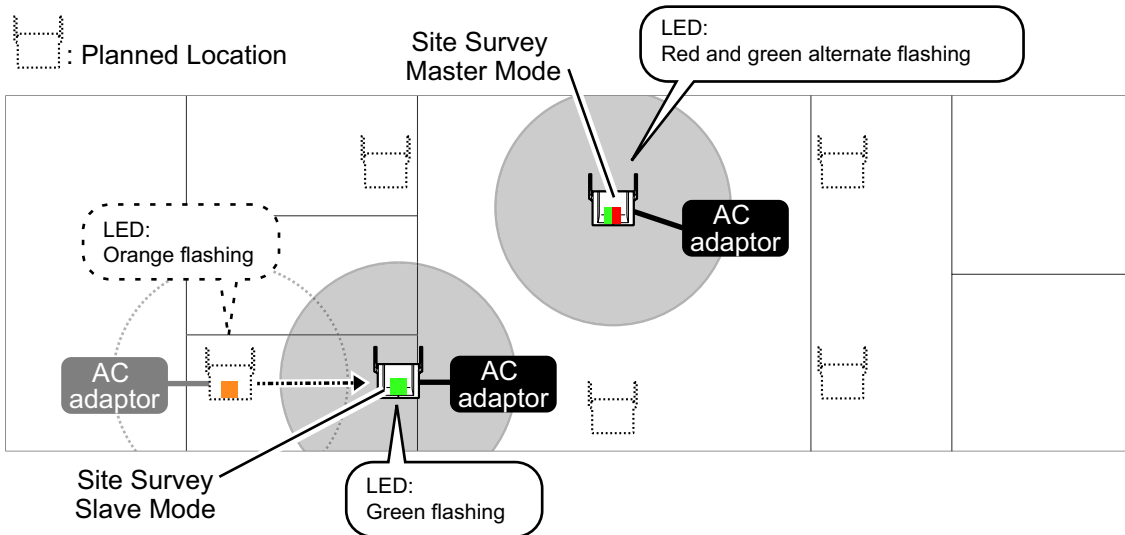
Confirming SIP-CS Coverage Area for Establishing Conversations

After confirming the SIP-CS coverage area for air synchronisation, confirm the speech quality. The speech quality will be shown on the S-PS's LCD.
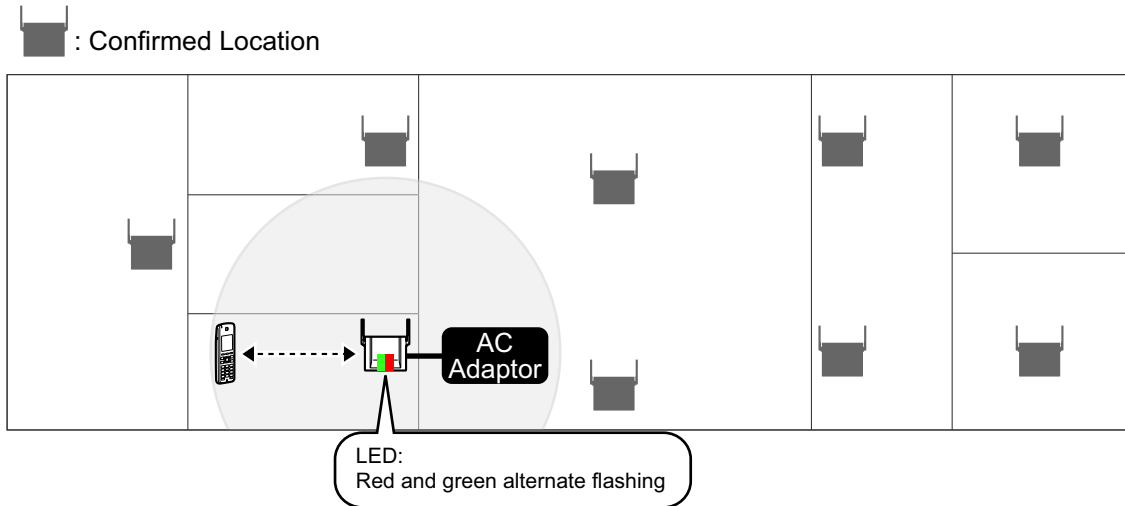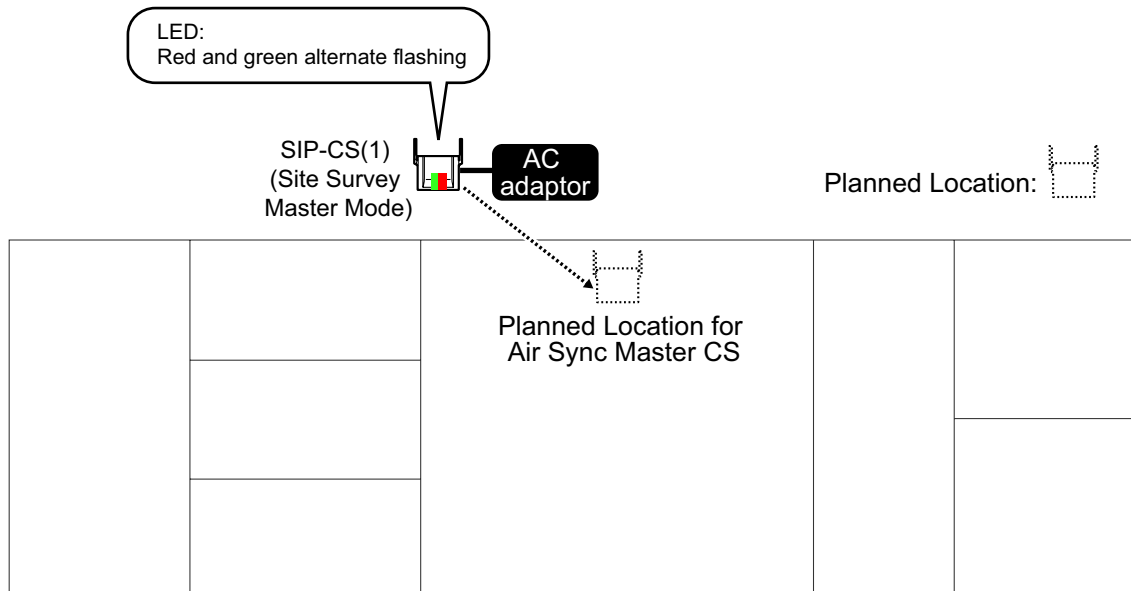

Site Survey for Air Synchronisation

After completing site planning, you can use 2 SIP-CSs to conduct the site survey to check radio signal strength. Then, if necessary, modify the location of the SIP-CSs accordingly. You can check the radio signal strength by the colour of the SIP-CS's LED.

Confirming the Coverage Area for Air Synchronisation between SIP-CSs

1. Supply power to the 2 SIP-CSs using AC adaptors.
2. Turn on SIP-CS(1) by holding the RESET switch.

3. Once SIP-CS(1) turns on, release the RESET switch, and then press the RESET switch again. SIP-CS(1) will enter Site Survey Master mode.
4. Turn on SIP-CS(2) normally. SIP-CS(2) will enter Site Survey Slave mode automatically when it receives a signal from SIP-CS(1).
5. Place SIP-CS(1) where the Air Sync Master CS is planned to be located.

LED:
Red and green alternate flashing

SIP-CS(1)
(Site Survey
Master Mode)

AC adaptor

Planned Location:

Planned Location for
Air Sync Master CS

6. Place SIP-CS(2) in the location planned for the SIP-CS closest to the Air Sync Master CS (currently SIP-CS[1]).

AC adaptor

SIP-CS(1)

LED:
Red flashing

AC adaptor

SIP-CS(2)
(Site Survey
Slave Mode)
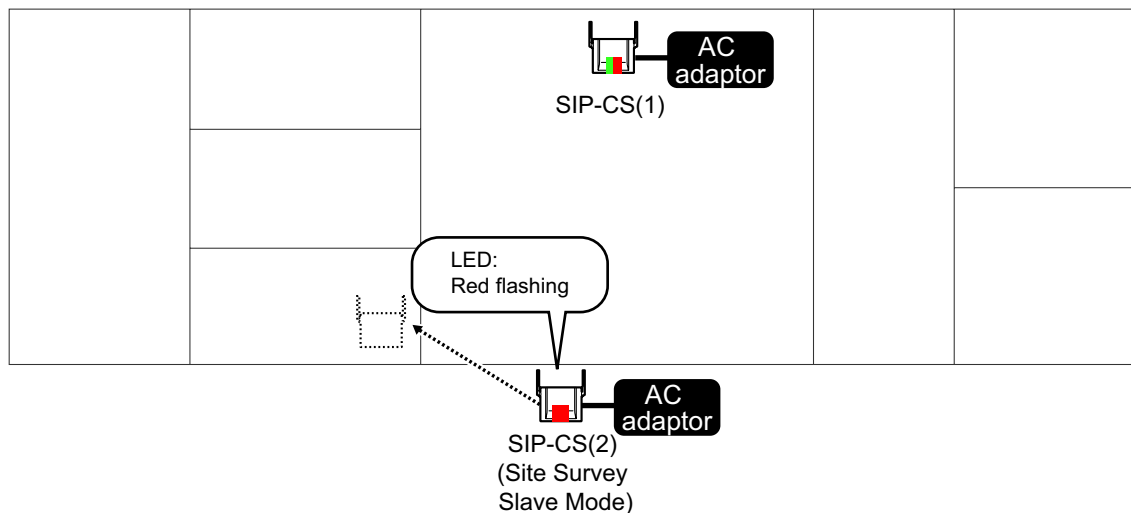
7. Confirm whether the LED of SIP-CS(2) is green.
   If it is not green, move SIP-CS(2) around to find a location where its LED turns green.

Note

- The LED indicates radio signal strength levels for air synchronisation. For details, refer to "CS Coverage Area for Establishing Conversations" in "4.2 Site Planning".

- For more details about the LED indications of the SIP-CS when in Site Survey mode, refer to "LED Indications" in "3 Installing the SIP Cell Stations".

AC adaptor

SIP-CS(1)

LED:
Orange flashing

AC adaptor

SIP-CS(2)

AC adaptor

SIP-CS(1)

LED:
Green flashing

AC adaptor
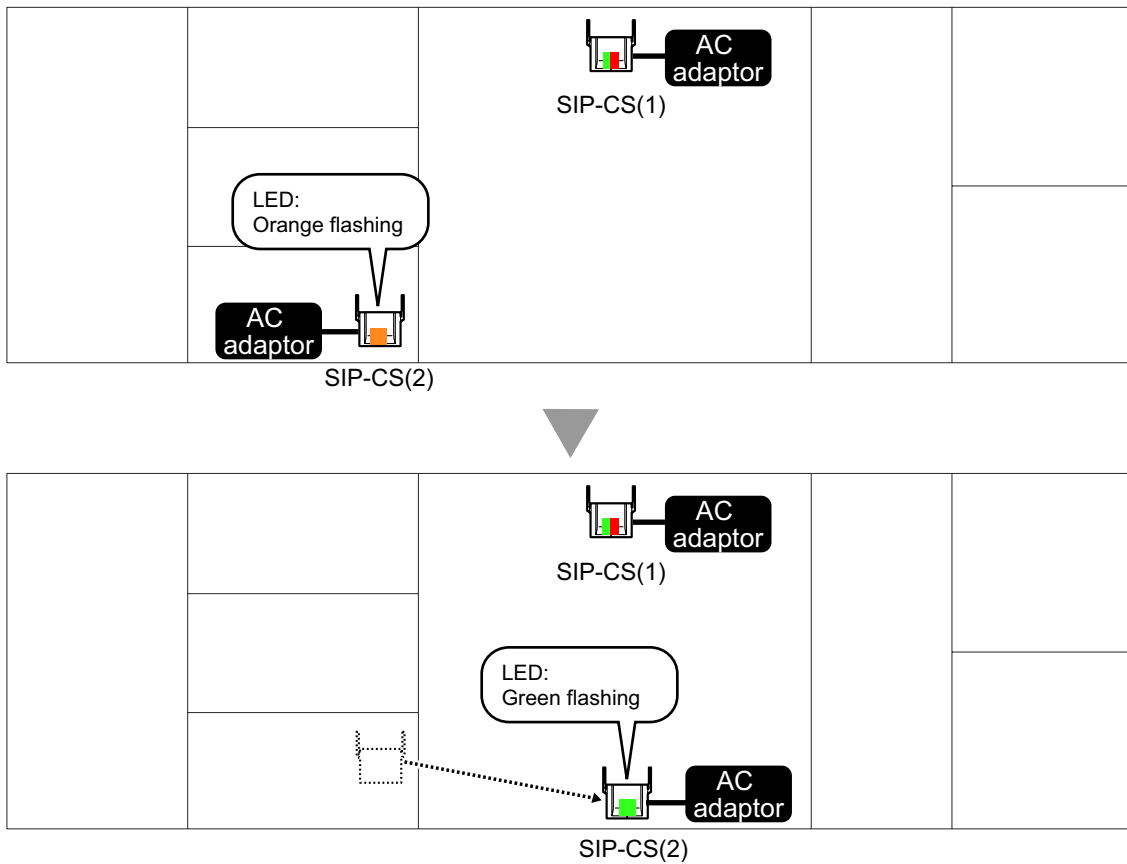
SIP-CS(2)

8. Place SIP-CS(1) where SIP-CS(2) was, and then place SIP-CS(2) in the location planned for the SIP-CS closest to current location of SIP-CS(1).

Confirmed Location:

AC adaptor

SIP-CS(1)

AC adaptor

LED:
Red flashing
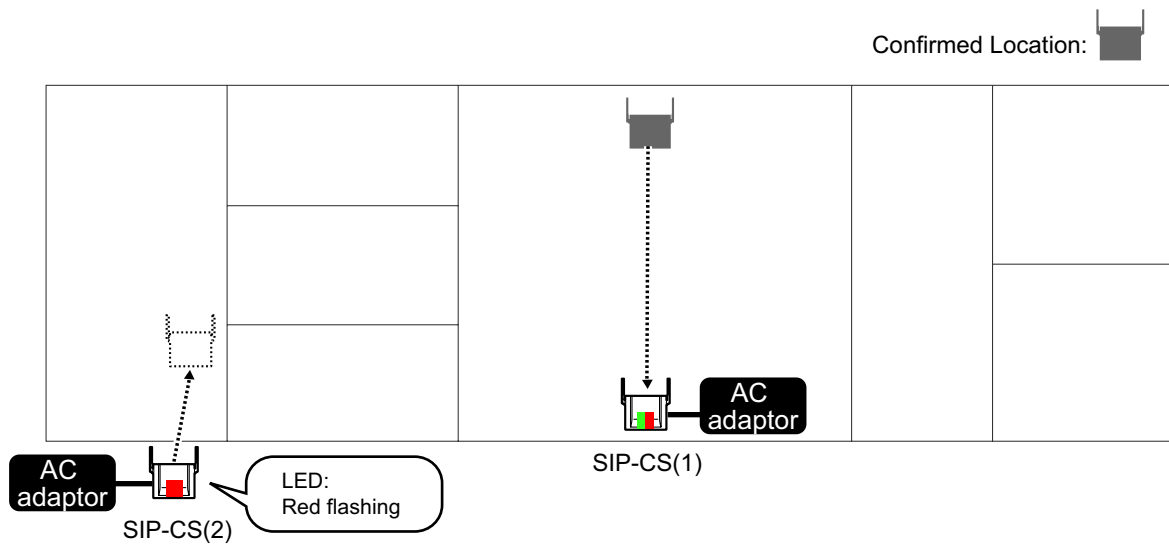
SIP-CS(2)

9. Confirm whether the LED of SIP-CS(2) is green. If it is not green, move SIP-CS(2) around to find a location where its LED turns green.
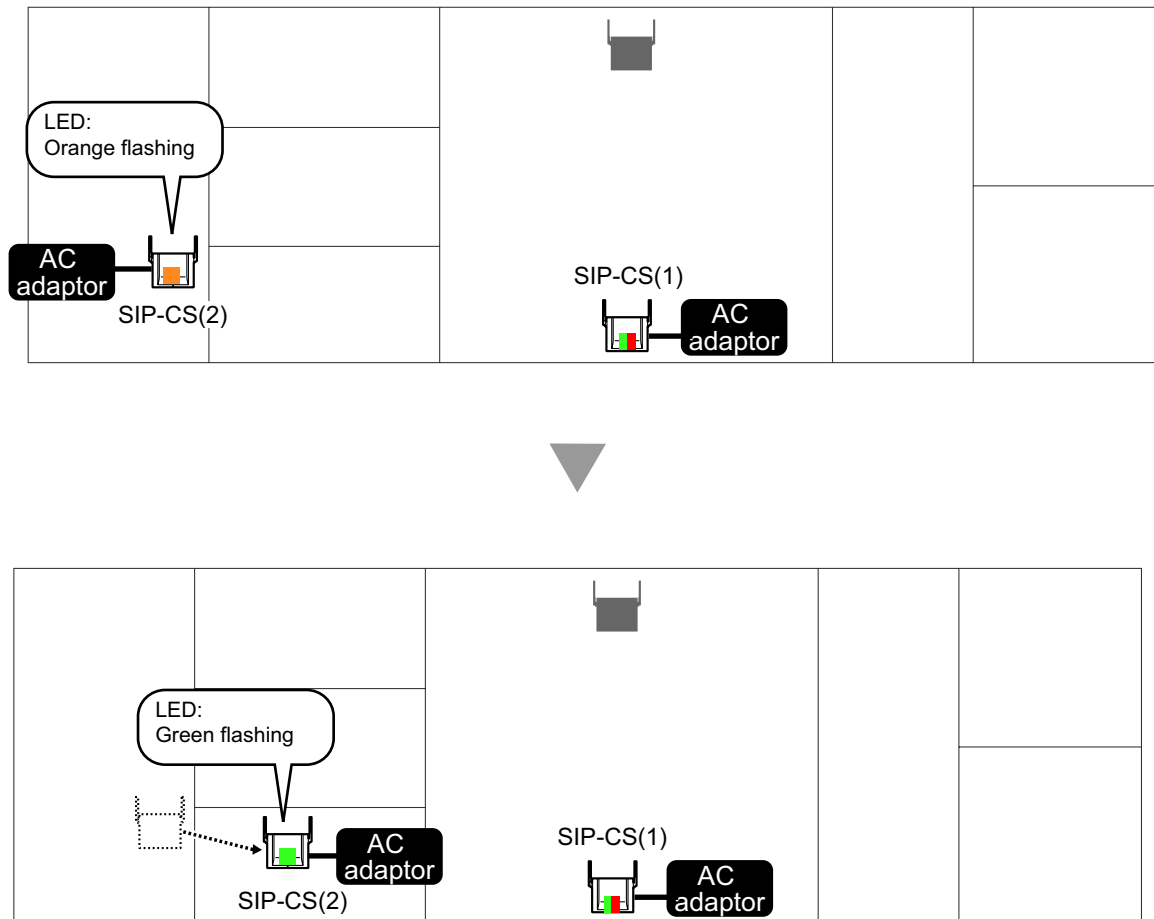
10. Repeat steps 8 to 9 for all other locations.

Site Survey for S-PS Service Area

Each S-PS has a CS Area Check mode that monitors the state of the radio link to the SIP-CS to check the S-PS service area for establishing conversations. In CS Area Check mode, the following are displayed on the S-PS with a refresh interval of 2 seconds: the SIP-CS ID of the SIP-CS to which the S-PS is connected, the radio strength level, and the Error Rate. For each confirmed SIP-CS location, set the S-PS to CS Area Check mode, and then place a SIP-CS at that location to measure the coverage area. Then, record the results on the map of the installation site. This site survey requires 1 S-PS and 1 SIP-CS.

Notice

> Conduct the site survey starting with the confirmed location for Air Sync Master CS, and then go to closest location next.

Before Site Survey for S-PS Service Area

Checking the SIP-CS ID Number
Check the SIP-CS ID number label attached to the SIP-CS.
The SIP-CS ID number is attached to the rear side of the SIP-CS.

Starting the S-PS in Maintenance Mode
The S-PS must be in Maintenance mode to conduct a site survey.
To enter Maintenance mode, follow the procedure below:

Note

> Before using an S-PS, the battery must be inserted and then charged for the specified amount of time. For details, refer to the documentation for the S-PS.

1. The S-PS should be in a powered off state. If the S-PS is turned on, turn it off by pressing and holding the POWER/CANCEL key.
2. Turn on the S-PS by pressing and holding the POWER/CANCEL key.

3. After turning on the S-PS, a blank screen will be displayed. At this time, press and hold the TALK/ SP-PHONE key for about 7 seconds, and then release the key.
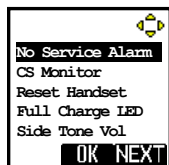   The S-PS will start in Maintenance mode.

   Note

   > When it takes more than 7 seconds to start Maintenance mode, follow the procedure below to return stand by screen:
   > a. Press the left soft key.
   > b. Press **[8]** → **[1]**.
   >   The Maintenance mode main menu will be displayed.

4. Press **OK**.

The Maintenance mode main menu will be displayed.

```
        ◁◇▷
No Service Alarm
CS Monitor
Reset Handset
Full Charge LED
Side Tone Vol
     OK NEXT
```

Site Survey for S-PS Service Area

1. Place a SIP-CS in the location confirmed for the Air Sync Master CS in the previous site survey.
2. Supply power to the SIP-CS using an AC adaptor.
3. Start the S-PS in Maintenance mode.
   (See "Starting the S-PS in Maintenance Mode", above.)
4. Select "**CS Area Check**" on the S-PS.
5. Press **OK** twice.
   The S-PS will be in CS Area Check mode and you will hear a tone.
6. Walk around the SIP-CS to confirm the SIP-CS's service area.
   If the radio strength level and Error Rate are at acceptable levels, you will continue hearing a tone from the S-PS and 2 lines on the LCD of the S-PS light green.

   Note

   If there is an area where you cannot hear a tone and the 2 lines of the LCD do not light green, relocate the SIP-CS.

7. After confirming the service area, press TALK/SP-PHONE key on the S-PS to stop the tone.
8. Relocate the SIP-CS to another location.
9. Walk around the SIP-CS to confirm the SIP-CS's service area.
10. Repeat steps 8 to 9 for all the locations so that the SIP-CSs will provide service for whole area.

Example:
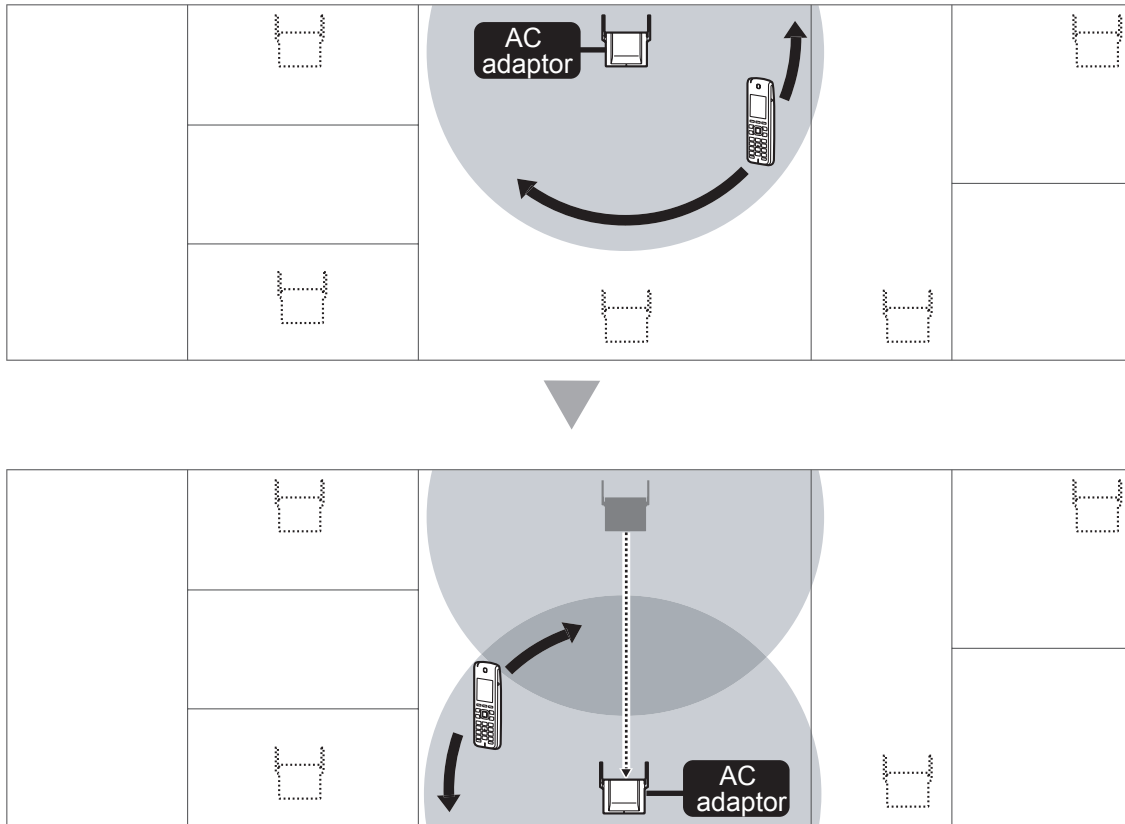
4.4 CS Registration
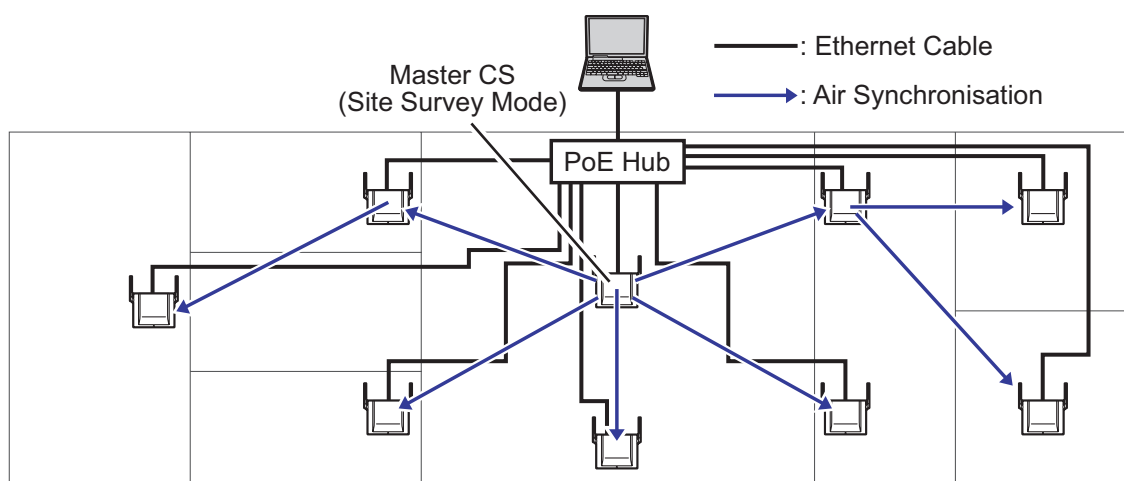
Notice
- Connect each SIP-CS in the Air Sync Group to the network and turn them on.
- During CS Registration, make sure that all unregistered SIP-CSs that are not in the Air Sync Group you are registering are turned off.

Confirming the MAC address of a SIP-CS

To register SIP-CSs to the Air Sync Master CS, the MAC address of each SIP-CS is required.
The MAC address is written on the rear side of each SIP-CS. Confirm the MAC address of each SIP-CS before registering it.

Before registering

For the Super Master CS
Provide a static IP address which can be used on your network.
For details, refer to "Assigning IP Address Information" in "3.4 Basic Network Configuration".
For Air Sync Master CSs other than Super Master CS
Set the IP address of the Super Master CS.

In Pre Sync procedure, all the SIP-CSs in Site Survey mode will be registered to the Air Sync Master CS.
Confirm that all the LEDs of the SIP-CSs are green. If any LED is not green, revise the location of the SIP-CSs.

Registering SIP-CSs to the Super Master CS

1. In the **System** tab, select **CS Management**.
2. Select **Air Sync Group**.
3. Click **Start CS Registration**.
   All the SIP-CSs on the LAN will be registered, and then displayed in **CS Registered List**.
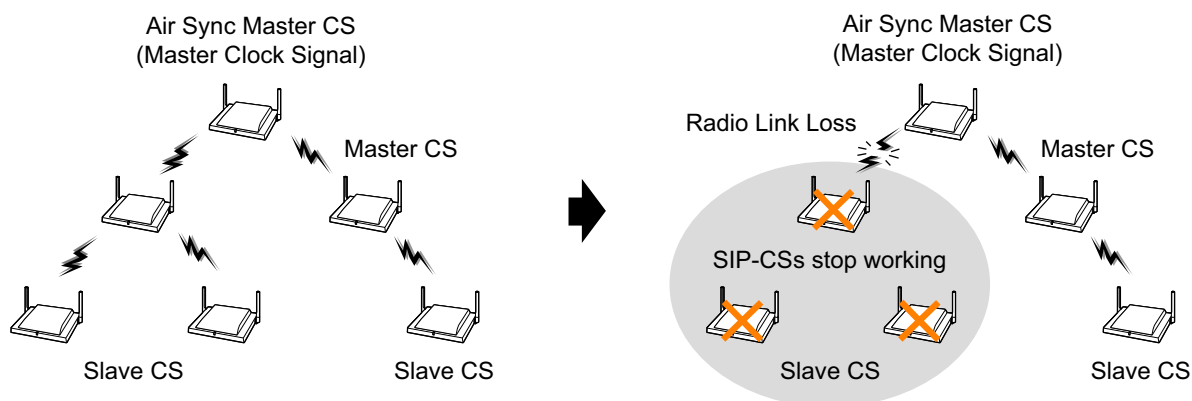
Notice

You cannot register the following SIP-CSs:
- SIP-CSs that are not turned on
- SIP-CSs that are not connected to the network
- SIP-CSs for which no IP address has been set
- SIP-CSs that cannot receive radio signals

4.5 Tree Survey

The Tree Survey creates the most suitable synchronisation tree automatically for SIP-CSs. You also can configure Air Sync Groups in this procedure.

The Tree Survey creates a Master/Slave tree structure with the Air Sync Master CS at the top and with stable air synchronisation. The procedure can be performed automatically by using either the Web user interface or the CS maintenance tool. The Tree Survey not only specifies the level for each SIP-CS, but also a primary and secondary synchronising CS from which the SIP-CS will receive its clock signal. The secondary synchronising CS is used as a backup so that if the primary synchronising CS fails the whole system will not be affected.

Preparing for Tree Survey

Follow the procedure below to put the SIP-CSs in Tree Survey mode.

1. In the **System** tab, select **Tree Survey**.
2. Confirm that all SIP-CSs status are "INS".
   If "FAULT" is displayed, there may be a problem with the network.
3. Click **Change to "OUS"** to change the SIP-CS status.
4. Click **OK**.
   The status of the SIP-CSs will change to OUS (Out of Service).

Conducting Tree Survey

Conduct the Tree Survey once all the SIP-CSs are OUS.
1. In the **System** tab, select **Tree Survey**.
2. Click **Start Tree Survey**.
3. After the Tree Survey has completed, click **Tree Image**.
   A connection diagram of the SIP-CSs is displayed.

Notice

If the Tree Survey will be conducted for 10 or more SIP-CSs, use the CS Maintenance Tool instead. For details, refer to the Administrator Guide.

Note

If necessary, you can relocate SIP-CSs and conduct the Tree Survey again.

Putting the SIP-CSs in Service

Follow the procedure below to put the SIP-CSs back in service.
1. In the **System** tab, select **Tree Survey**.
2. Click **Change to "INS"** to change the SIP-CS status.
3. Click **OK**.
   The status of the SIP-CSs will change to INS (In Service).

Applying the Tree Survey Results

Follow the procedure below to apply the parent-child settings from Tree Survey results to the registered SIP-CSs.
1. In the **System** tab, select **Tree Survey**.
2. Click **Apply**.
3. Click **OK**.

4.6 Configuration

Specify SIP server network information, an extension name, and extension number.

Specifying the SIP Server's Information

Follow the procedure below to specify the IP address and port number of the SIP server to which the Super Master CS is connected.

1. In the **VoIP** tab, select **SIP Settings**.
2. In **Phone Number**, enter the phone number of the SIP account.
3. In **Regist Server Address**, enter IP address of the SIP Registrar server.
4. In **Regist Server Port**, enter the port number of the SIP Registrar server that is set to communicate with the SIP-CS.
5. In **Proxy Server Address**, enter the IP address of the SIP Proxy server.
6. In **Proxy Server Port**, enter the port number of the SIP Proxy server that is set to communicate with the SIP-CS.
7. In **Authentication ID**, enter the Authentication ID of the SIP account.
8. In **Authentication Password**, enter the Authentication password of the SIP account.
9. Click **All Save**.

Specifying the Preferred Codec

Follow the procedure below to specify the codecs you want to use and their usage priorities.

1. In the **VoIP** tab, select **VoIP Settings**.
2. In **CODEC Preferences**, select a codec to use and specify its priority.
3. Click **All Save**.

4.7 PS Registration

This section shows how to register S-PS by using Web user interface.

Log in to the Web User Interface of the Super Master CS

Please refer to "Logging in to the Web User Interface" in "3.4 Basic Network Configuration" for entering Web user interface.

Registering Extension Numbers and Extension Names for S-PSs

Follow the procedure below to assign extension numbers and extension names to the S-PSs.
1. In the **System** tab, select **PS Registration**.
2. Enter an extension name in **PS Name**.
3. Seledt **Line1 SIP Setting** or **Line2 SIP Setting**.

> **Note**
>
> Some SIP servers allow only 1 extension number per telephone. For details, refer your SIP server's documentation.

4. Enter the **Phone Number**, and enter **Authentication ID** and **Authentication Password** if necessary.
5. Click **All Save**.
6. Repeat steps **2** to **5** for each S-PS.

Note

If the S-PS name is too long to display, the end of the name may not be displayed on the PS's standby screen.

Starting Registration Mode

After you have configured the S-PS name and SIP settings, follow the procedure below to register S-PSs.
1. In the **System** tab, select **PS Registration** → **Start PS Registration**.
2. Select the S-PSs to be registered in **Available PS**, and then click ☐ < ☐.To select all available S-PSs, click ☐ << ☐.
   To deselect S-PS(s), click ☐ > ☐ or ☐ >> ☐.
3. Click **Next**.
4. Click **OK** to confirm registration.

Registering S-PSs

After entering PS Registration mode, follow the procedure below to register each S-PS.
1. Turn on the S-PS.
2. Select **System Option**.
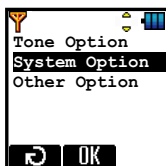
3. Enter the password.

4. Select **Register H/S**.

5. Select a base number. You can register four separate bases on your S-PS.

6. Hold down [OK] until "**Please wait...**" is displayed.
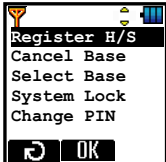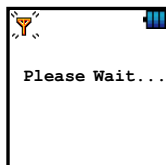
7. When registration has completed, "**Registered**" will be displayed.

Note

> You can register multiple S-PSs continuously and simultaneously. However, PS Registration mode will terminate if no registrations are detected within 2 minutes. All SIP-CSs controlled by the Super Master CS will enter PS Registration mode at the same time as the Super Master CS. You can register a S-PS to any of the SIP-CSs.

Checking Progress

You can check registration progress on the **PS Registration** screen.
If **Registering** is displayed on the left of the screen, you can check the registration status of each S-PS in the **Wireless Status** field.
If **Complete** is displayed on the left of the screen, all S-PSs that selected for registration were registered successfully.

Finishing Registration from S-PSs

After you have registered the S-PSs to the Air Sync Master CS, you must complete registration from each S-PS individually.

1. Make sure that the S-PS is not registered.

> **Note**
>
> For details, refer to the documentation for the S-PS.

2. Press `OK`.

"**HOLD DOWN OK TO REGISTER**" is displayed.

3. Hold down `OK` until "**Please wait...**" is displayed.

4. When registration has completed, you will hear a confirmation tone and "**Registered**" will be displayed.

Unregistering S-PSs

If you want to unregister a specified PS, follow the procedure below.

1. Click the **System** tab, click **PS Registration** – **Delete PS Registration**.

2. Select the S-PSs to be unregistered in **Available PS**, and then click `<`.
To select all available S-PSs, click `<<`. To deselect S-PS(s), click `>` or `>>`.

3. Click **Next**.

4. Click **OK** to confirm unregistration.

Unregistering a Base System from the S-PS

If the S-PS was outside the coverage area or was turned off when the above-mentioned unregistration procedure was performed, you must unregister the base system manually.

1. Select "**System Option**".
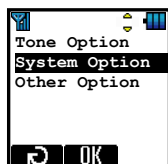
2. Enter the password.
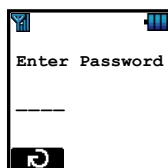
3. Select "**Cancel Base**".
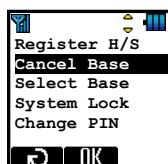
4. Select the base number for unregistration, and then press `OK`.

```
Cancel Base
Base 1
Base 2
Base 3
Base 4
      OK
```
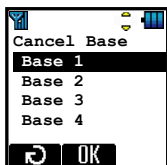
5. Press `OK`.

```
Delete?

Yes

      OK
```
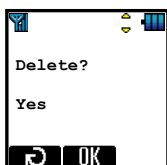
When Unregistration has completed, "**Deleted**" will be displayed.

```
    Deleted
```
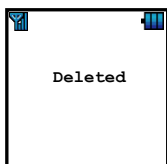
4.8 PS Area Check

In this section, you can check the service area, handover and voice quality using 2 registered S-PSs under actual conditions.

Entering S-PS Area Check mode

1. Start the S-PS in Maintenance mode.
    For details, see "Starting the S-PS in Maintenance Mode" in "4.3 Site Survey".
2. Select "`PS area check`".
3. Press `OK`.
4. Repeat the procedure from **1** to **3** for another S-PS.

Note

Both S-PSs must be in PS Area check mode.

Conducting S-PS Area Check

1. Call S-PS(2) from S-PS(1).
    S-PS(1) sends a tone signal to S-PS(2), and S-PS(2) returns the signal back to S-PS(1).
    You can hear a tone when this signal is received.
2. Set S-PS(2) close to the SIP-CS and move around the service area listening to the tone from S-PS(1)'s receiver to confirm voice quality and handover operation.
    The CS-ID and signal strength of the SIP-CS you are connected to and the target SIP-CS for Handover is displayed on the S-PS. When the signal strength is sufficiently strong, the CS-ID is displayed in green.


```
CSnnn-xx    yy%
    nnn : Current sync CS ID
     xx  : RSSI level
     yy : Error rate
```

Detected CS IDs and RSSI level are displayed.
If the RSSI level exceeds the threshold,
it is displayed with green shading.

Notice

When checking the PS area, ensure that at least one SIP-CS is displayed in green on the LCD of the handset within the service area.

5 Troubleshooting

Tree Survey Error Messages and Notices

When an error occurs during or after the Tree Survey, an error message or notice is displayed.

Messages displayed during the Tree Survey

Message	Probable Cause	Solution
The Tree Survey can not be executed because software shown below does not support the Tree Survey.	The selected SIP-CS uses an older software version not supported by the Tree Survey feature.	Please update the software to version 7.100 or later.
SIP-CS(s) will not function correctly because air synchronisation has not been established.	Location of the SIP-CS is not good.	Please move the SIP-CS(s) closer to the adjacent SIP-CS according to site planning. If you still have trouble, there may be interference from external wireless equipment. Please locate the source and eliminate it.
Connection error.	IP network environment and settings are incorrect.	Please check the network connection of the SIP-CS(s) and PC.
SIP-CS(s) will not function correctly because there is interference from external wireless equipment.	There may be interference with DECT radio waves.	Please locate the source of interference and eliminate it.

Messages displayed when the Tree Survey is complete

Message	Probable Cause	Solution
Notice Sync Slave CS does not have Secondary-CS.	One or more SIP-CSs could not have a Slave CS assigned for reasons such as avoiding the creation of a loop. However, this is not a problem.	Please move the SIP-CS(s) closer to the adjacent SIP-CS according to site planning. Loops may occur when SIP-CSs are assigned a Slave CS. In this case, please reconduct site planning.
ERROR!!! Parameter Error.	Monitoring of SIP-CSs failed.	Conduct the Tree Survey again.
ERROR!!! CS does not have Primary CS.	A SIP-CS is located far from the adjacent SIP-CS.	Please move the SIP-CS(s) closer to the adjacent SIP-CS according to site planning.
ERROR!!! Survey result contains more than 4 levels.	Air synchronisation hierarchy contains more than 4 levels.	Please recheck the design of your Tree Structure and relocate SIP-CS(s) to remove the unsupported level(s).

Message	Probable Cause	Solution
ERROR!!! IP-CS is too close.	SIP-CSs are located too close together. As a guideline, the maximum number of SIP-CSs in an area with a radio signal strength of "11" is 2.	Please relocate the SIP-CS(s). Refer to the guidelines for distance between SIP-CS(s) in "Required Distances between Equipment".

6 Appendix

SIP-CS Specification

Type	4 channel CS with wideband audio
Supported Audio	Wideband Narrowband
Radio Method	DECT
VoIP Signalling Protocol	SIP
IP Port Number Flexible Setting	Yes
Local Setting	Yes (through Web application)
Site Survey Mode	Yes (through Web application)
Initialisation	Yes (through Web application)
Maximum Simultaneous Calls	4
Power Supply	PoE (IEEE 802.3af) Optional AC adaptor (KX-A239 [PQLV206YB]/KX-A239X [PQLV206YB])
Codec	G.722 for Wideband (Used for LAN and broadband remote IP network) G.711 for Narrowband (Used for LAN and broadband remote IP network) G.729a for Narrowband (Used for narrowband remote IP network)
LAN Port	10 BASE-T 100 BASE-TX
VLAN	Yes (802.1Q)
IP Addressing	DHCP Static IP Address Setting
Software Upgrade	Yes
Built-in VPN	No
Weight	290 g
Size	(W) 190 mm × (H) 133.9 mm × (D) 39.3 mm

PS Specification

Items	KX-UDT111	KX-UDT121
Type	Standard	Slim & Light
Radio Technology		

Items	KX-UDT111	KX-UDT121
LCD	1.8 inch colour	1.8 inch colour
Bluetooth	No	Yes
Vibration	Yes	Yes
Battery	Ni-MH	Li-Ion
Number of Simultaneous Registered Systems	4	
Software Upgrade	Yes (Wireless Download)	

RF Specification

Item	Description
Radio Access Method	MultiCarrier TDMA-TDD
Frequency Band	1920 MHz to 1930 MHz
Number of Carriers	10
Carrier Spacing	1728 kHz
Transmission Output	Peak 250 mW

CAUTION
- The SIP-CS should be kept free of dust, moisture, high temperature (more than 40 °C), low temperature (less than 0 °C), and vibration, and should not be exposed to direct sunlight.
- The SIP-CS should not be placed outdoors (use indoors).
- The SIP-CS should not be placed near high-voltage equipment.
- The SIP-CS should not be placed on a metal object.

Compatible S-PSs

Item	Model No.
S-PS	• KX-UDT111 • KX-UDT121

Note
- For more details about S-PSs, refer to the documentation for your S-PS.

Required Distances between Equipment
CAUTION
Maintain the distances listed below between equipment in order to prevent noise, interference or the disconnection of a conversation. (The distance may vary depending on the environment.)

Equipment	Distance
CS and office equipment such as a computer, telex, fax machine, etc.	More than 2 m (6 ft 7 in)
CS and PS	More than 1 m (3 ft 3 in)
Each CS	More than 3 m (10 ft)
Each PS	More than 0.5 m (1 ft 8 in)
SIP server and CS	More than 2 m (6 ft 7 in)

Notice

If multiple SIP-CSs provide service in the same area, the phone connection may become noisy or the number of possible simultaneous calls with S-PSs may decrease due to interference between the SIP-CSs. The required distance between SIP-CSs may vary depending on the environment of the installation site and conditions in which the wireless system is used. Conduct a site survey to determine the appropriate distance.

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