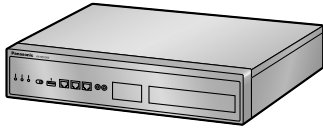# Panasonic®

Installation Manual

Pure IP-PBX

Model No. KX-NS1000

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

KX-NS1000: PCMPR Software File Version 001.10000 or later

System Components

System Components Table

Category	Model No.	Description
Main Unit	KX-NS1000	Main Unit
Activation Key Codes[1]	KX-NSE101	Activation Key for Mobile Extension for 1 User (1 Mobile User)
	KX-NSE105	Activation Key for Mobile Extension for 5 Users (5 Mobile Users)
	KX-NSE110	Activation Key for Mobile Extension for 10 Users (10 Mobile Users)
	KX-NSE120	Activation Key for Mobile Extension for 20 Users (20 Mobile Users)
	KX-NSM005	Up to 50 IP Phone Capacity Activation Key (Up to 50 IP Phone)
	KX-NSM010	Up to 100 IP Phone Capacity Activation Key (Up to 100 IP Phone)
	KX-NSM030	Up to 300 IP Phone Capacity Activation Key (Up to 300 IP Phone)
	KX-NSM099	Up to System Limit IP Phone Capacity Activation Key (System MAX IP Phone)
	KX-NSM102	2-Channel IP Trunk Activation Key (2 IP Trunk)
	KX-NSM104	4-Channel IP Trunk Activation Key (4 IP Trunk)
	KX-NSM108	8-Channel IP Trunk Activation Key (8 IP Trunk)
	KX-NSM116	16-Channel IP Trunk Activation Key (16 IP Trunk)
	KX-NSM201	1-Channel IP Softphone/IP Proprietary Telephone Activation Key (1 IPSoftphone/IP PT)
	KX-NSM205	5-Channel IP Softphone/IP Proprietary Telephone Activation Key (5 IPSoftphone/IP PT)
	KX-NSM210	10-Channel IP Softphone/IP Proprietary Telephone Activation Key (10 IPSoftphone/IP PT)
	KX-NSM220	20-Channel IP Softphone/IP Proprietary Telephone Activation Key (20 IPSoftphone/IP PT)
	KX-NSM501	1-Channel IP Proprietary Telephone Activation Key (1 IP PT)
	KX-NSM505	5-Channel IP Proprietary Telephone Activation Key (5 IP PT)
	KX-NSM510	10-Channel IP Proprietary Telephone Activation Key (10 IP PT)
	KX-NSM520	20-Channel IP Proprietary Telephone Activation Key (20 IP PT)

Category	Model No.	Description
	KX-NSM701	1-Channel SIP Extension Activation Key (1 SIP Extension)
	KX-NSM705	5-Channel SIP Extension Activation Key (5 SIP Extension)
	KX-NSM710	10-Channel SIP Extension Activation Key (10 SIP Extension)
	KX-NSM720	20-Channel SIP Extension Activation Key (20 SIP Extension)
	KX-NSN001	Activation Key for One-look Network (One-look Network)
	KX-NSN002	Activation Key for QSIG Network (QSIG Network)
	KX-NSP001	Standard Activation Key Package (E-mail/Two-way Recording) for 1 User (Std. Pkg 1 User)
	KX-NSP005	Standard Activation Key Package (E-mail/Two-way Recording) for 5 Users (Std. Pkg 5 Users)
	KX-NSP010	Standard Activation Key Package (E-mail/Two-way Recording) for 10 Users (Std. Pkg 10 Users)
	KX-NSP020	Standard Activation Key Package (E-mail/Two-way Recording) for 20 Users (Std. Pkg 20 Users)
	KX-NSP101	Advanced Activation Key Package (E-mail/Two-way Recording/Mobile/CA Pro) for 1 User (Adv. Pkg 1 User)
	KX-NSP105	Advanced Activation Key Package (E-mail/Two-way Recording/Mobile/CA Pro) for 5 Users (Adv. Pkg 5 Users)
	KX-NSP110	Advanced Activation Key Package (E-mail/Two-way Recording/Mobile/CA Pro) for 10 Users (Adv. Pkg 10 Users)
	KX-NSP120	Advanced Activation Key Package (E-mail/Two-way Recording/Mobile/CA Pro) for 20 Users (Adv. Pkg 20 Users)
	KX-NSP201	Mobile Activation Key Package (E-mail/Mobile) for 1 User (Mobile Pkg 1 User)
	KX-NSP205	Mobile Activation Key Package (E-mail/Mobile) for 5 Users (Mobile Pkg 5 Users)
	KX-NSP210	Mobile Activation Key Package (E-mail/Mobile) for 10 Users (Mobile Pkg 10 Users)
	KX-NSP220	Mobile Activation Key Package (E-mail/Mobile) for 20 Users (Mobile Pkg 20 Users)
	KX-NSU001	Activation Key for Recording Time Expansion (REC Time Expansion)
	KX-NSU002	Activation Key for Two-way Recording Control (Two-way REC Control)

Category	Model No.	Description
	KX-NSU003	Activation Key for Message Backup (Message Backup)
	KX-NSU102	2-Channel Unified Messaging Activation Key (2 UM Port)
	KX-NSU104	4-Channel Unified Messaging Activation Key (4 UM Port)
	KX-NSU201	Activation Key for Unified Messaging E-mail Notification for 1 User (UM/E-mail 1 User)
	KX-NSU205	Activation Key for Unified Messaging E-mail Notification for 5 Users (UM/E-mail 5 Users)
	KX-NSU210	Activation Key for Unified Messaging E-mail Notification for 10 Users (UM/E-mail 10 Users)
	KX-NSU220	Activation Key for Unified Messaging E-mail Notification for 20 Users (UM/E-mail 20 Users)
	KX-NSU299	Activation Key for Unified Messaging E-mail Notification for All Users (UM/E-mail All Users)
	KX-NSU301	Activation Key for Two-way Recording for 1 User (2way REC 1 User)
	KX-NSU305	Activation Key for Two-way Recording for 5 Users (2way REC 5 Users)
	KX-NSU310	Activation Key for Two-way Recording for 10 Users (2way REC 10 Users)
	KX-NSU320	Activation Key for Two-way Recording for 20 Users (2way REC 20 Users)
	KX-NSU399	Activation Key for Two-way Recording for All Users (2way REC All Users)
	KX-NSA010	Activation Key for CA Thin Client Server Connection (CA Thin Client)
	KX-NSA020	Activation Key for Multiple CSTA Connection (CSTA Multiplexer)
	KX-NSA201	Activation Key for CA PRO for 1 User (CA Pro 1 user)
	KX-NSA205	Activation Key for CA PRO for 5 Users (CA Pro 5 users)
	KX-NSA210	Activation Key for CA PRO for 10 Users (CA Pro 10 users)
	KX-NSA240	Activation Key for CA PRO for 40 Users (CA Pro 40 users)
	KX-NSA249	Activation Key for CA PRO for 128 Users (CA Pro 128 users)
	KX-NSA301	Activation Key for CA ACD Monitor for 1 ICD Supervisor (CA Supervisor)
	KX-NSA401	Activation Key for CA Operator Console (CA Console)

Category	Model No.	Description
	KX-NSA901	Activation Key for CA Network Plug-in for 1 User (CA Network 1 user)
	KX-NSA905	Activation Key for CA Network Plug-in for 5 Users (CA Network 5 users)
	KX-NSA910	Activation Key for CA Network Plug-in for 10 Users (CA Network 10 users)
	KX-NSA940	Activation Key for CA Network Plug-in for 40 Users (CA Network 40 users)
	KX-NSA949	Activation Key for CA Network Plug-in for 128 Users (CA Network 128 users)
	KX-NSF101	Activation Key for CTI interface (CTI interface)
Physical Cards		
FAX Card Slot	KX-NS0106	FAX Interface Card (FAX)
DSP Card Slot	KX-NS0110	VoIP DSP Card (S Type) (DSP S)
	KX-NS0111	VoIP DSP Card (M Type) (DSP M)
	KX-NS0112	VoIP DSP Card (L Type) (DSP L)
Storage Memory Card Slot	KX-NS0135	Storage Memory (S Type) (Storage Memory S)
	KX-NS0136	Storage Memory (M Type) (Storage Memory M)
	KX-NS0137	Storage Memory (L Type) (Storage Memory L)
Free Slot	KX-NS0180	2-Port Analogue Trunk / 2-Port SLT Card (SLC2/LCOT2)
	KX-NS0280	4-Port BRI / 2-Port SLT Card (SLC2/BRI4)
	KX-NS0290CE	PRI30 / 2-Port SLT Card (SLC2/PRI30)
	KX-NS0290	PRI23 / 2-Port SLT Card (SLC2/PRI23)
Doorphone Slot	KX-NS0161	Doorphone Interface Card (DOORPHONE)

[*1] Note that the types of activation keys are subject to change without notice. For CA activation keys, refer to the documentation for CA.

Equipment Compatibility

The PBX supports the following equipment:

Cell Stations
DECT
• DECT 8-Channel IP Cell Station Unit Using a V-IPCS4 Card for DECT Portable Station (KX-NCP0158CE)
DECT 6.0
• DECT 6.0 8-Channel IP Cell Station Unit Using a V-IPCS4 Card for DECT 6.0 Portable Station (KX-NCP0158)

Doorphones
- Doorphone (KX-T30865, KX-T7765)

Telephones
Panasonic Proprietary Telephones
- IP proprietary telephones (e.g., KX-NT300 series)
- IP softphones (e.g., KX-NCS8100)
- Portable stations (e.g., KX-TCA364, KX-WT115)

SIP Phones
- KX-UT series SIP phones
- IP conferencing phones (e.g., KX-NT700)
- Third party SIP phones (SIP hardphones/SIP softphones)

Other
- Single line telephones

Note
- For the equipment (e.g., Add-on Key Module, USB Module, Headset) that can be connected to a particular telephone, refer to the telephone's manual.
- For other equipment that can be connected to the PBX, refer to "2.1.2 System Connection Diagram".
- The PBX does not support the following Panasonic proprietary telephones:
  - Analogue proprietary telephones
  - Digital proprietary telephones
  - DSS consoles
  - KX-NT136 IP proprietary telephone
  - KX-NT400 IP proprietary telephone
  - KX-HGT100 SIP telephone

Notice

- This PBX supports SIP extensions. However, some PBX features may not be available depending on the type of telephone.
- Under power failure conditions, the connected telephones may not operate. Please ensure that a separate telephone, not dependent on local power, is available for emergency use.
- Prior to connection of this product, please verify that the intended operating environment is supported. Satisfactory performance cannot be guaranteed for the following:
  - interoperability and compatibility with all devices and systems connected to this product
  - proper operation and compatibility with services provided by telecommunications companies over connected networks

Note
- Some optional hardware, software, and features are not available in some countries/areas. Please consult your certified Panasonic dealer for more information.
- In this manual, the suffix of each model number (e.g., KX-NS1000**NE**) is omitted unless necessary.

List of Abbreviations

- CA → Communication Assistant
- IP-PT → IP Proprietary Telephone
- PS → Portable Station
- SIP Extension → Extensions of the PBX which use Session Initiation Protocol for communication.
- SLT → Single Line Telephone

Introduction

This Installation Manual is designed to serve as an overall technical reference for the Panasonic Pure IP-PBX, KX-NS1000. It provides instructions for installing the hardware, and programming the PBX using Web Maintenance Console.

The Structure of this Manual

This manual contains the following sections:

Section 1 Safety Precautions
Provides important information intended to prevent personal injury and property damage.

Section 2 System Outline
Provides general information on the PBX, including the system capacity and specifications.

Section 3 Information about the Activation Keys
Provides information on activation keys, including how to obtain activation keys.

Section 4 Installation
Describes the procedures to install the PBX. Detailed instructions for planning the installation site, optional service cards, and cabling of peripheral equipment are provided. Further information on system expansion and peripheral equipment installation is included.

Section 5 Programming with Web Maintenance Console
Describes the installation procedure, structure, and functions of the Web Maintenance Console for programming IP telephones and the PBX. Further information on programming the PBX for use with SIP trunks and a VoIP network is included.

Section 6 Troubleshooting
Provides information on the PBX and telephone troubleshooting.

Section 7 Appendix
Provides information on using the PBX with a VoIP network, the ports used by the PBX, and PBX Region Suffix Codes and Areas.

About the Other Manuals

Along with this Installation Manual, the following manuals are available:

Feature Guide
Describes all basic, optional and programmable features of the PBX.

PC Programming Manual
Provides step-by-step instructions for performing system programming using a PC.

User Manual
Provides operating instructions for end users using IP-PTs, SIP phones, SLTs, or PSs.

About the software version of your PBX

The contents of this manual apply to PBXs with a certain software version, as indicated on the cover of this manual. To confirm the software version of your PBX, see "How do I confirm the software version of the PBX or installed cards?" in "2.3 Frequently Asked Questions (FAQ)" of the PC Programming Manual.

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Table of Contents

Section 1

Safety Precautions

This section provides important information intended to prevent personal injury and property damage.

1.1 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

For All Telephone Equipment

🚫

- Do not install the product in any other way than described in relevant manuals.
- Do not install the product in a place exposed to rain or moisture, or a place where water, oil, or other liquids can drip or splash onto on the product. Such conditions can lead to fire or electric shock, and may impair the performance of the product.
- Do not install the system in the following locations:
  a. Areas where shocks or vibrations are frequent or strong. Such activity may lead to the product falling over and causing injury, or may impair the product's performance.
  b. Areas with high amounts of dust. High amounts of dust can lead to fire or electric shock, and impair the performance of the product.
- Do not place the product on an unstable or uneven surface. If the product were to fall over, it may cause injury or damage to the product.
- Do not supply power to a combination of devices that exceeds the total rated capacity of the wall outlets or extension cables used. If outlets, power strips, extension cords, etc. are used in a manner that exceeds their rated capacity, they emit large amounts of heat, which could cause a fire.

❗

- The product must only be installed and serviced by qualified service personnel. The product 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 product.
- Follow all warnings and instructions marked on the product.
- Products that require a power source should only be connected to the type of electrical power supply specified on the product label. If you are not sure of the type of power supply to your home, consult your dealer or local power company.
- For safety purposes some products are equipped with an earthed plug. If you do not have an earthed outlet, please have one installed. Do not bypass this safety feature by tampering with the plug.
- When installing telephone wiring, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons, including the following:
  a. Never install telephone wiring during a lightning storm.
  b. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
  c. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
  d. Use caution when installing or modifying telephone lines.
  e. Anti-static precautions should be taken during installation.
- Unplug the product from the wall outlet and have it serviced by qualified service personnel in the following cases:
  a. When the power supply cord or plug is damaged or frayed.
  b. If liquid has been spilled into the product.
  c. If the product has been exposed to rain or water.

    d. If the product does not operate according to the operating instructions. Adjust only the controls that are explained in the operating instructions. Improper adjustment of other controls may result in damage and may require service by a qualified technician to restore the product to normal operation.

    e. If the product has been dropped or the cabinet has been damaged.

    f. If product performance deteriorates.

For the PBX

- Do not insert objects of any kind into this product, as they may touch dangerous voltage points or short out parts that could result in a fire or electric shock.
- Do not pull, bend, rest objects on, or chafe the power cord and plug. Damage to the power cord or plug can cause fire or electric shock.
- Do not attempt to repair the power cord or plug. If the power cord or plug is damaged or frayed, contact an authorised Panasonic Factory Service Centre for a replacement.

- When mounting the PBX on a 19-inch rack, only use the 19-inch rack mounting equipment (attachment bracket, screws) included with the PBX.
- If damage to the unit exposes any internal parts, disconnect the power supply cord immediately and return the unit to your dealer.
- To prevent fires, electric shock, injury, or damage to the product, be sure to follow these guidelines when performing any wiring or cabling:
  - **a.** Before performing any wiring or cabling, unplug the product's power cord from the outlet. After completing all wiring and cabling, plug the power cord back into the outlet.
  - **b.** When laying cables, do not bundle the product's power cord with the power cords of other devices.
  - **c.** Do not place any objects on top of the cables connected to the PBX.
  - **d.** When running cables along the floor, use protectors to prevent the cables from being stepped on.
  - **e.** Do not run any cables under carpeting.
- Unplug this unit from the AC outlet if it 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 authorised Panasonic Factory Service Centre.
- Make sure that the wall that the unit will be attached to is strong enough to support approximately 4 times the weight of the unit. If not, it is necessary for the wall to be reinforced.
- When mounting the PBX on a wall, only use the wall-mounting equipment (anchor plugs, screws, metal brackets) included with the PBX and the wall mounting kit.
- The earthing wire of the AC cable has an effect against external noise and lightning strikes, but it may not be enough to protect the PBX and to ensure electromagnetic compatibility. A permanent connection between earth and the earth terminal of the PBX must be made.
- Proper earthing (connection to earth) is very important to reduce the risk to the user of electrocution or to protect the PBX from the bad effects of external noise in the case of a lightning strike. (See "4.2.4 Frame Earth Connection".)
- Plug the power cord firmly into an AC outlet. Otherwise, it can cause fire or electric shock.
- Be careful not to drop any components. Dropping components may damage them or cause an injury.
- Make sure that the AC outlet is properly earthed, then securely connect the 3-pin AC plug including the earthed pin.
- A lithium battery is used in the mother board. There is a risk of explosion if the battery is replaced with the incorrect type. Dispose of used batteries according to the manufacturer's instructions.

⚠	**CAUTION**

For All Telephone Equipment

🛈

- The product should be kept free of dust, moisture, high temperature (more than 40 °C) and vibration, and should not be exposed to direct sunlight.
- Unplug the product from the wall outlet before cleaning. Wipe the product with a soft cloth. Do not clean with abrasive powders or with chemical agents such as benzene or thinner. Do not use liquid cleaners or aerosol cleaners.

For the PBX

🚫

- Do not install the system in the following locations:
    a. In direct sunlight and hot, cold, or humid places. (Temperature range: 0 °C to 40 °C)
    b. Areas where sulphuric gases may be present, such as near thermal springs.
    c. Near devices that generate high frequencies, such as sewing machines or electric welders.
- Do not block the openings of the PBX. Allow space of at least 20 cm above and 10 cm at the sides of the PBX.
- When the PBX is mounted on a 19-inch rack, do not block the openings of the PBX. Allow space of at least 10 cm around the PBX's fan.
- When installing or removing the Storage Memory Card, do not put pressure on any parts of the mother board. Doing so may result in damage to the PBX.
- When installing or removing the optional service cards, do not put pressure on any parts of the mother board. Doing so may result in damage to the PBX.
- The Storage Memory Card contains software for all the processes of the PBX and all the customer data. Therefore, do not allow unauthorised access to prevent data leakage.
- Once you have started the PBX, if you unplug the PBX, do not initialise it again as described in "System Initialisation Procedure". Otherwise, your programmed data will be cleared. To restart the PBX, refer to "6.1.5 Restarting the PBX".

🛈

- Before touching the product (PBX, cards, etc.), discharge static electricity by touching ground or wearing an earthing strap. Failure to do so may cause the PBX to malfunction due to static electricity.
- When relocating the equipment, first disconnect the telecom connection before disconnecting the power connection. When the unit is installed in the new location, reconnect the power first, and then reconnect the telecom connection.
- The power supply cord is used as the main disconnect device. Ensure that the AC outlet is located near the equipment and is easily accessible.
- The hook clip poses a choking hazard. Keep the hook clip out of reach of children.
- Slots and openings in the front, back and bottom of the cabinet are provided for ventilation; to protect it from overheating, these openings must not be blocked or covered. The openings should never be blocked

by placing the product on a bed, sofa, rug, or other similar surface while in use. The product should never be placed near or over a radiator or other heat source. This product should not be placed in a sealed environment unless proper ventilation is provided.

- Make sure that the surface behind the PBX is flat and free of obstacles, so that the openings on the back of the PBX will not be blocked.
- Make sure that the surface behind the PBX is not made of wood.
- When this product is no longer in use, make sure to detach it from the rack or wall.
- Use only the AC power cord included with the PBX.
- When the PBX is mounted on a 19-inch rack, make sure that the installation of the unit does not cause the temperature of the rack to exceed its limit.
- Make sure to install all necessary optional service cards in the PBX before performing the wall mounting procedure. If it is necessary to install or remove a card, make sure to detach the PBX from the wall before installing or removing the card.
- When driving the screws into the wall, be careful to avoid touching any metal laths, wire laths or plates in the wall.
- When placing the PBX onto the wall, make sure that the arrows on the metal brackets are pointing upward. If the arrows are not pointing upward, the PBX may fall, resulting in injury.
- When opening the top cover, the power switch must be turned off.
- For safety reasons, close the top cover and tighten the screws before operating the PBX.
- If the PBX is not installed properly using the securing correct methods, the PBX may fall causing serious damage.
- When the PBX is placed on a desktop, make sure that the PBX is placed as indicated in "4.2.10 Placing the PBX on a Desktop". Do not place it on its side or upside down.
- Performing surge protection is essential. Make sure to follow the instructions in "4.2.12 Surge Protector Installation".
- It is strongly recommended to use SSL encrypted communication when the PC is accessing the PBX via the Internet. To use SSL encryption, routers must have a port set up for https communication.
- To prevent data leakage, render the Storage Memory Card physically unusable before disposal.
- Avoid using the same AC outlet for computers and other office equipment, as noise generated by such equipment may hamper system performance or interrupt the system.
- Unplug the system from its power source when wiring, and plug the system back in only after all wiring is completed.
- Trunks should be installed with surge protectors. For details, refer to "4.2.12 Surge Protector Installation".
- When installing or removing the Storage Memory Card, the power switch must be turned off.
- When installing or removing the optional service cards, the power switch must be turned off.
- For earthing wire, green-and-yellow insulation is required, and the cross-sectional area of the conductor must be more than 0.75 mm^2 or 18 AWG.
- When connecting a SLC2/BRI4, SLC2/PRI30 or SLC2/PRI23 card to the trunk, connect through an NT1; do not connect to the U interface of the trunk directly.
- PRI ports of SLC2/PRI30 and SLC2/PRI23 cards are SELV ports and should only be connected to SELV services.
- The MOH port and Pager port are SELV ports and should only be connected to approved SELV devices, or in Australia, via a Line Isolation Unit with a Telecommunications Compliance Label.
- To protect the system, keep the following in mind:
  - **a.** Make sure that both connector cases (frame ground) of the RS-232C cross cable (shielded cable) are conductive. If they are not conductive, make sure that both connector cases of the cable are firmly connected.
  - **b.** If this is not possible, connect the frame of the PBX to the frame of the PC/Printer using an earthing wire in order to prevent difference in the electrical potentials.

<u>**Notice**</u>

For All Telephone Equipment
- Read and understand all instructions.

For the PBX
- Keep the unit away from heating appliances and devices that generate electrical noise such as fluorescent lamps, motors and televisions. These noise sources can interfere with the performance of the PBX.
- If you are having problems making calls to outside destinations, follow this procedure to test the trunks:
    a. Disconnect the PBX from all trunks.
    b. Connect known working SLTs to those trunks.
    c. Make a call to an external destination using those SLTs.
    If a call cannot be carried out correctly, there may be a problem with the trunk that the SLT is connected to. Contact your telephone company.
    If all SLTs operate properly, there may be a problem with your PBX. Do not reconnect the PBX to the trunks until it has been serviced by an authorised Panasonic Factory Service Centre.

1.2 Important Safety Instructions

When using your telephone equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons, including the following:

- Do not use the product near water, for example, near a bathtub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool.
- Avoid using wired telephones during an electrical storm. There is a remote risk of electric shock from lightning.
- Do not use a telephone in the vicinity of a gas leak to report the leak.
- Rack Mount Instructions—The following or similar rack-mount instructions are included with the installation instructions:
  a. Elevated Operating Ambient—If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.
  b. Reliable Earthing—Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g., use of power strips).

SAVE THESE INSTRUCTIONS

1.3 Precautions

For users in the United Kingdom

FOR YOUR SAFETY, PLEASE READ THE FOLLOWING TEXT CAREFULLY.

This appliance is supplied with a moulded three-pin mains plug for your safety and convenience. Should the fuse need to be replaced, please ensure that the replacement fuse is of the same rating and that it is approved by ASTA or BSI to BS1362.

Check for the ASTA mark ⬨ or the BSI mark ♡ on the body of the fuse.

If the plug contains a removable fuse cover, you must ensure that it is refitted when the fuse is replaced. If you lose the fuse cover, the plug must not be used until a replacement cover is obtained. A replacement fuse cover can be purchased from your local Panasonic dealer.

IF THE FITTED MOULDED PLUG IS UNSUITABLE FOR THE AC OUTLET IN YOUR PREMISES, THEN THE FUSE SHOULD BE REMOVED AND THE PLUG CUT OFF AND DISPOSED OF SAFELY. THERE IS A DANGER OF SEVERE ELECTRICAL SHOCK IF THE CUT-OFF PLUG IS INSERTED INTO ANY 13 AMP SOCKET.

If a new plug is to be fitted, please observe the wiring code as shown below. If in any doubt, please consult a qualified electrician.

WARNING

This appliance must be earthed.

IMPORTANT: The wires in the mains lead are coloured as follows:
Green-and-yellow: Earth
Blue: Neutral
Brown: Live
As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows.
The wire that is coloured GREEN-AND-YELLOW must be connected to the terminal in the plug that is marked with the letter E or by the safety earth symbol ⏚ or coloured GREEN or GREEN-AND-YELLOW.
The wire that is coloured BLUE must be connected to the terminal that is marked with the letter N or coloured BLACK.
The wire that is coloured BROWN must be connected to the terminal that is marked with the letter L or coloured RED.
How to replace the fuse: Open the fuse compartment with a screwdriver and replace the fuse and fuse cover.
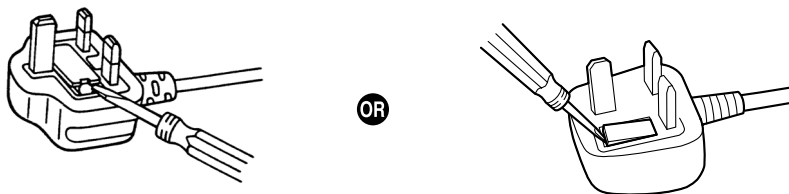
The equipment must be connected to direct extension lines, and a payphone should not be connected as an extension.

999 and 112 can be dialled on the apparatus after accessing the Exchange line for the purpose of making outgoing calls to the BT emergency services.

During dialling, this apparatus may tinkle the bells of other telephones using the same line. This is not a fault and we advise you not to call the Fault Repair Service.

For users in the European Union only

Information for Users on Collection and Disposal of Old Equipment and used Batteries
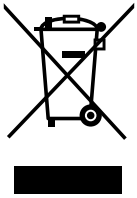
These symbols on the products, packaging, and/or accompanying documents mean that used electrical and electronic products and batteries should not be mixed with general household waste.
For proper treatment, recovery and recycling of old products and used batteries, please take them to applicable collection points, in accordance with your national legislation and the Directives 2002/96/EC and 2006/66/EC.
By disposing of these products and batteries correctly, you will help to save valuable resources and prevent any potential negative effects on human health and the environment which could otherwise arise from inappropriate waste handling.
For more information about collection and recycling of old products and batteries, please contact your local municipality, your waste disposal service or the point of sale where you purchased the items.
Penalties may be applicable for incorrect disposal of this waste, in accordance with national legislation.

For business users in the European Union
If you wish to discard electrical and electronic equipment, please contact your dealer or supplier for further information.

Information on Disposal in other Countries outside the European Union
These symbols are only valid in the European Union. If you wish to discard these items, please contact your local authorities or dealer and ask for the correct method of disposal.
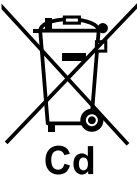
Note for the battery symbol (bottom two symbol examples):
This symbol might be used in combination with a chemical symbol. In this case it complies with the requirement set by the Directive for the chemical involved.

Cd

For users in Germany only

- Machine Noise Information Ordinance, 3rd GPSGV: The highest sound pressure level is 70 dB (A) or less according to EN ISO 7779.
- This equipment is not for use at video display work stations according to BildscharbV.

For users in Finland, Norway and Sweden only

- This equipment is intended for installation in restricted access locations where only authorised personnel may gain access through the use of a special tool, lock and key or other means of security.

For users in New Zealand only

- This equipment shall not be set to make automatic calls to the Telecom '111' Emergency Service.
- The grant of a Telepermit for any item of terminal equipment indicates only that Telecom has accepted that the item complies with minimum conditions for connection to its network. It indicates no endorsement of the product by Telecom, nor does it provide any sort of warranty. Above all, it provides no assurance

that any item will work correctly in all respects with another item of Telepermitted equipment of a different make or model, nor does it imply that any product is compatible with all of Telecom's network services.

- This equipment is not capable, under all operating conditions, of correct operation at the higher speeds for which it is designed. Telecom will accept no responsibility should difficulties arise in such circumstances.
- Some parameters required for compliance with Telecom's Telepermit requirements are dependent on the equipment (PBX) associated with this modem. In order to operate within the limits for compliance with Telecom's Specifications, the associated PBX equipment shall be set to ensure that modem calls are answered between 3 and 30 seconds of receipt of ringing.
- Using the toll services of a company other than Telecom:
  If the PBX is set up to use the toll services of a company other than Telecom, the telephone numbers dialled from the Caller Display listings within the PBX will be directed through the toll services of the other company because the telephone numbers include the toll access digit and area code digit. A toll charge may be incurred. Please check with the toll carrier concerned.
- APPLICABLE ONLY TO TELECOM CUSTOMERS WHO HAVE AUTOMATIC ACCESS TO OTHER CARRIERS FOR TOLL CALLS
  When calling back a number from the Caller ID list, all numbers prefixed with "0 + AREA CODE" will be automatically forwarded to your toll carrier. This includes numbers in your local calling area. The zero + area code should either be removed when calling back local numbers, or check with your toll carrier that a charge will not be levied.
- All persons using this device for recording telephone conversations shall comply with New Zealand law. This requires that at least one party to the conversation is to be aware that it is being recorded. In addition, the principles enumerated in the Privacy Act 1993 shall be complied with in respect to the nature of the personal information collected, the purpose for its collection, how it is used, and what is disclosed to any other party.
- The SLT ports are not specifically designed for 3-wire-connected equipment. 3-wire-connected equipment might not respond to incoming ringing when attached to these ports.

For users in Australia only

- No External TRC Terminal is provided due to an Internal Link between PE and TRC.

For users in Taiwan only

- Lithium batteries can be found in the circuit boards of the mother board and optional service cards of the PBX.

Notice

Regarding removing or replacing a battery in the circuit board, consult your dealer.

Note

- When disposing of any of the above products, all batteries must be removed. Follow the applicable laws, regulations, and guidelines in your country/area regarding disposal of batteries.
- When replacing a battery, use only the same battery type, or an equivalent recommended by the battery manufacturer.

廢電池請回收

1.4 Data Security

In order to use the PBX safely and correctly, the Security Requirements below must be observed. Failure to do so may result in:
- Loss, leakage, falsification or theft of user information.
- Illegal use of the PBX by a third party.
- Interference or suspension of service caused by a third party.

What is User Information?

User Information is defined as:
1. Information stored on the Storage Memory Card:
   System data, error data and activation key files.
2. Information sent from the PBX to a PC or a USB memory device:
   System data, sound files for MOH (Music on Hold) and OGM (Outgoing Messages), and activation key files.

Requirements

1. The Storage Memory Card contains software for all the processes of the PBX and all the customer data. Therefore, do not allow unauthorised access to prevent data leakage.
2. Always make backups of data stored on the Storage Memory Card and/or perform regular system data backups to a USB memory device.
   For details about making backups of data stored on the Storage Memory Card, refer to "7.2.2 Utility—File —File Transfer PBX to PC" in the PC Programming Manual.
   For details about backing up the system data to a USB memory device, refer to "6.1 Tool—System Data Backup to USB" in the PC Programming Manual.
3. To prevent illegal access from the Internet, activate a Firewall.
4. To avoid unauthorised access and possible abuse of the PBX, we strongly recommend:
   a. Keeping the password secret.
   b. Selecting a complex, random password that cannot be easily guessed.
   c. Changing your password regularly.
5. Perform the following when sending the PBX for repair or handing it over to a third party.
   a. Make a backup of data stored on the Storage Memory Card.
   b. Using a formatter, format the Storage Memory Card so that information cannot be retrieved from it.
6. To prevent data leakage, render the Storage Memory Card physically unusable before disposal.
7. When user information is sent from the PBX to a PC or a USB memory device, the confidentiality of that information becomes the responsibility of the customer. Before disposing of the PC or the USB memory device, ensure that data cannot be retrieved from it by formatting the hard disk and/or rendering it physically unusable.

Section 2
System Outline

This section provides general information on the PBX, including the system capacity and specifications.

2.1 Basic System Construction

2.1.1 System Configurations

Main Unit

The main unit contains a mother board for controlling PBX functions.
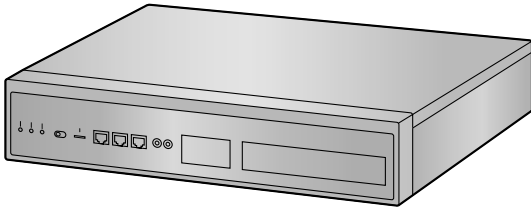
Stand-alone System

A single KX-NS1000 PBX can be used as a stand-alone system. A single KX-NS1000 used as a stand-alone system controls all terminals, trunks, and applications.

One-Look Network with NS-Net[1]

Multiple KX-NS1000 PBXs can be connected as a distributed networked system using a private IP network. The networked system is called a One-look network and it can contain up to 16 KX-NS1000 PBXs. In a One-look network, one PBX serves as the Master unit, which controls the other PBXs, known as Slave units. The Slave units share setup information and resources controlled by the Master unit. A One-look network is useful when the network will consist only of KX-NS1000 PBXs and a private IP network is feasible. A considerable amount of setup is done automatically by the PBXs, so setup and maintenance is much simpler than other type of networks, such as a TIE line network. All units can be programmed from one location. Resource sharing allows users to interact as if they were all connected to one PBX, which eliminates the need to manage information such as PBX access codes.

For details about programming the One-look network, refer to "5.5 Programming a One-look Network".
For details about using a One-look network, refer to "4.2 One-look Networking" in Feature Guide.

[1]   NS-Net is a network protocol only used for Panasonic products.
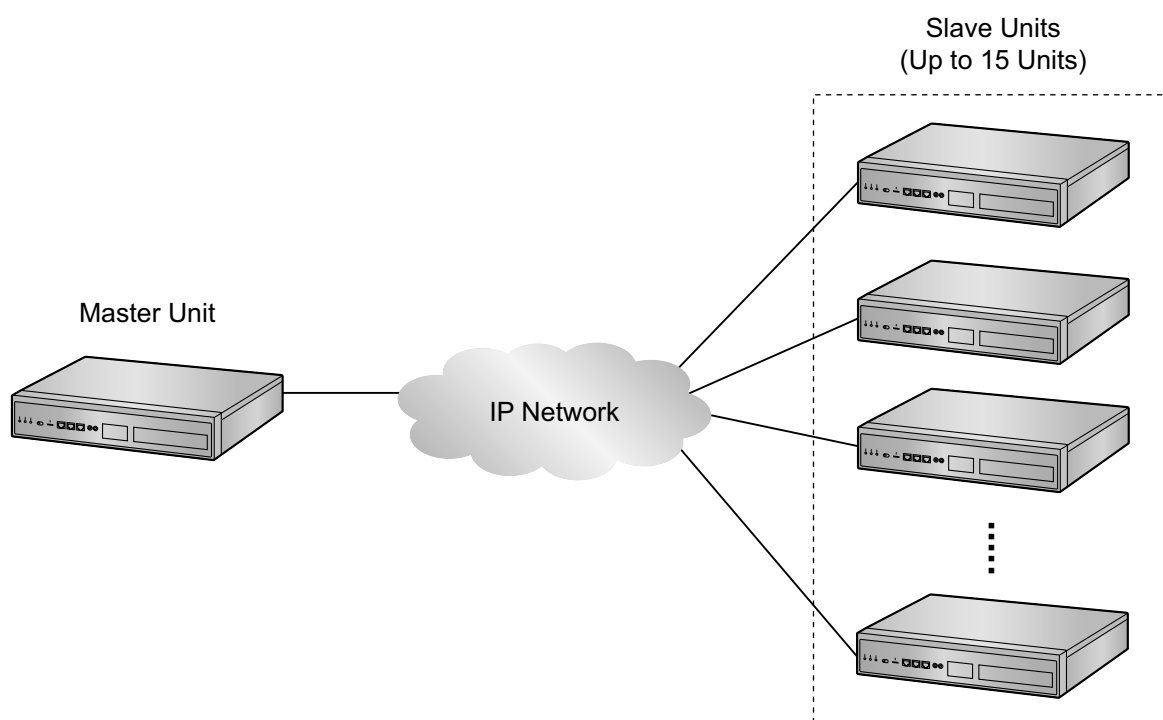
H.323 QSIG network

If the network will include non-KX-NS1000 PBXs (e.g., KX-TDE200, KX-NCP500), then an H.323 QSIG network is necessary.

An H.323 QSIG network is preferable if strict resource separation between sites is necessary. Although it is possible to reserve certain resources for certain extension users in a One-look network, the default is to share resources. On the other hand, in a QSIG network, resources are not available to extension users of other PBXs without explicit programming.

Programming and configuring an H.323 QSIG network is much more complex than a One-look network.

It is also possible to connect a One-look network to other PBXs via QSIG. In an H.323 QSIG network, the One-look network appears as one PBX. The Master unit represents the One-look network.

For details about programming the H.323 QSIG network, refer to "5.6 Programming a H.323 QSIG Network".

For details about H.323 QSIG network, refer to "4.2.2 Network Type Comparison" in the Feature Guide.

2.1.2 System Connection Diagram
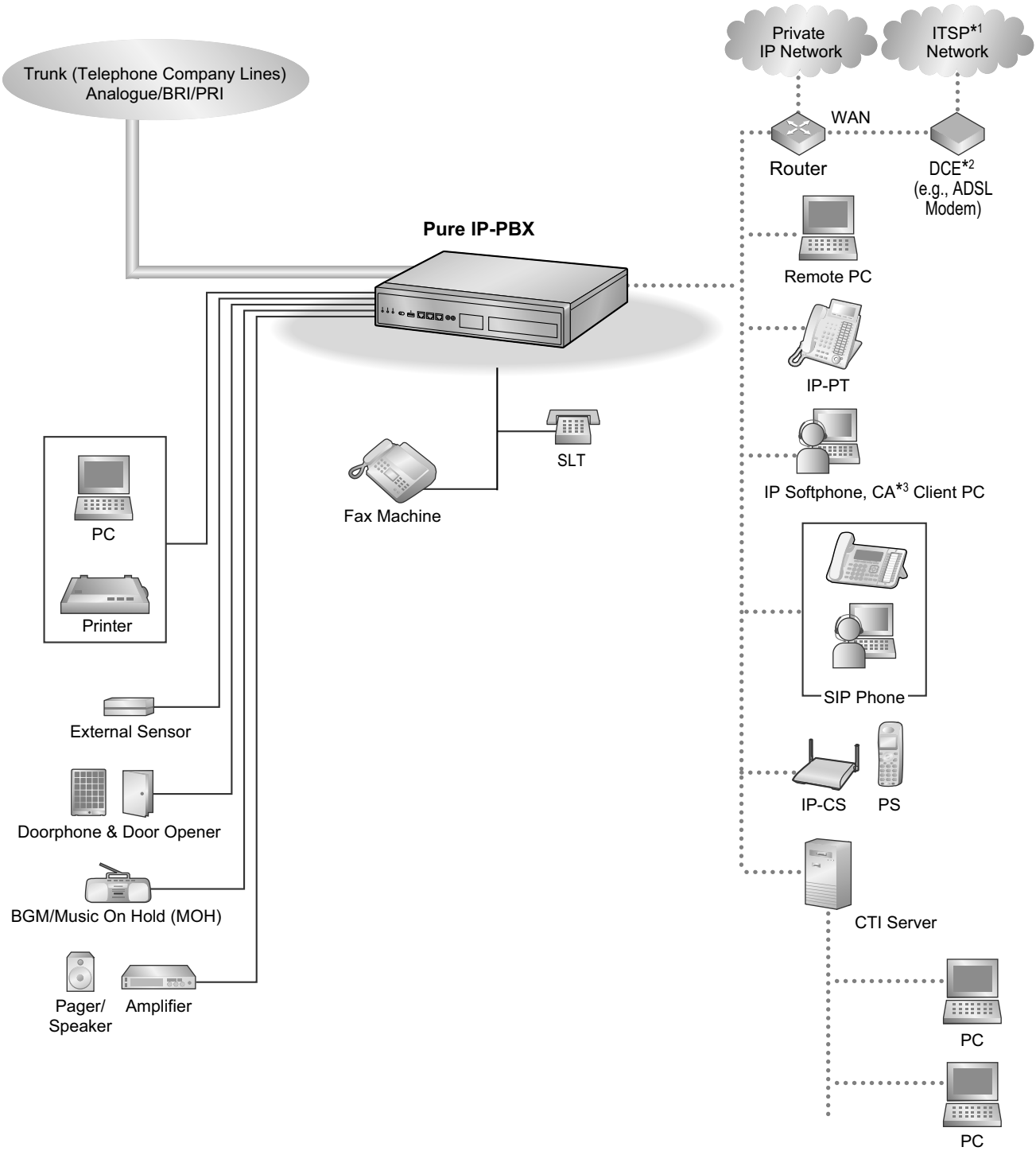
*1   ITSP: Internet Telephony Service Provider
*2   DCE: Data Circuit Terminating Equipment
*3   CA: Communication Assistant

Analogue Trunk

Telephone Company

SLC2/LCOT2 (KX-NS0180)

SLT   Fax Machine

ISDN BRI Line (Digital Trunk)

SLC2/BRI4 (KX-NS0280)

SLT   Fax Machine

ISDN PRI Line (Digital Trunk)

SLC2/PRI30 (KX-NS0290CE)

SLC2/PRI23 (KX-NS0290)

SLT   Fax Machine

USB Memory Device

DOORPHONE (KX-NS0161)

Doorphone & Door Opener   External Sensor

Uninterruptible Power Supply (UPS)

FAX (KX-NS0106)

Station Message Detail Recording (SMDR)

Storage Memory (Installed by default)

Storage Memory S (KX-NS0135)

DSP S (KX-NS0110)

Storage Memory M (KX-NS0136)

DSP M (KX-NS0111)

Radio

DSP L (KX-NS0112)

Amplifier   Pager/Speaker

Storage Memory L (KX-NS0137)

SIP Phone   IP-CS   PS

PC

Virtual Slot

V-IPCS4   V-IPEXT32

LAN

Private IP Network   Router

V-IPGW16   V-SIPEXT32

WAN

V-SIPGW16   V-UTEXT32

IP-PT   IP Softphone, CA Client PC   PC   CTI Server

ITSP Network   DCE (e.g., ADSL Modem)   Router

Mountable Equipment

2.2 Optional Equipment

2.2.1 Optional Equipment

Model No.	Model Name	Description
KX-NS0106	FAX Interface Card (FAX)	1-channel fax server. To be mounted on the mother board.
KX-NS0110	VoIP DSP Card (S Type) (DSP S)	A DSP card is a digital signal processor card with DSP resources that can be used for VoIP calls, conferences, the Unified Messaging feature, and the DISA/OGM feature. The DSP cards are compliant with ITU-T G.729A and G.711 codec methods.
KX-NS0111	VoIP DSP Card (M Type) (DSP M)	Depending on the amount of your DSP resource needs, DSP S, DSP M, or DSP L cards can be installed. The number of resources provided by each type of DSP card is as follows: • DSP S card: 63 • DSP M card: 127 • DSP L card: 254
KX-NS0112	VoIP DSP Card (L Type) (DSP L)	Up to 2 DSP cards can be installed on the mother board. To operate the PBX, at least one DSP S, DSP M, or DSP L card must be installed in one of the DSP card slots.
KX-NS0135	Storage Memory (S Type) (Storage Memory S)	Storage Memory with maximum of 200 hours Voice Mail recording time.
KX-NS0136	Storage Memory (M Type) (Storage Memory M)	Storage Memory with maximum of 450 hours Voice Mail recording time.
KX-NS0137	Storage Memory (L Type) (Storage Memory L)	Storage Memory with maximum of 1000 hours Voice Mail recording time.
KX-NS0161	Doorphone Interface Card (DOORPHONE)	1-port doorphone card for 1 doorphone, 1 door opener, and 1 external sensor.
KX-NS0180	2-Port Analogue Trunk / 2-Port SLT Card (SLC2/LCOT2)	A combination card including: • 2 analogue trunk ports with Caller ID (FSK/FSK with Call Waiting Caller ID [Visual Caller ID]/DTMF). One port is a power failure transfer (PFT) port. • 2 extension ports with Caller ID (FSK) for SLTs.
KX-NS0280	4-Port BRI / 2-Port SLT Card (SLC2/BRI4)	A combination card including: • 4 ISDN Basic Rate Interface ports. • 2 extension ports with Caller ID (FSK) for SLTs. EURO-ISDN/ETSI compliant.

Model No.	Model Name	Description
KX-NS0290CE	PRI30 / 2-Port SLT Card (SLC2/PRI30)	A combination card including: • 1 ISDN Primary Rate Interface port (30B channels). • 2 extension ports with Caller ID (FSK) for SLTs. EURO-ISDN/ETSI compliant.
KX-NS0290	PRI23 / 2-Port SLT Card (SLC2/PRI23)	A combination card including: • 1 ISDN Primary Rate Interface port (23B channels). • 2 extension ports with Caller ID (FSK) for SLTs. NI (North American standard ISDN protocol) compliant.

Note

For the maximum number of optional service cards that can be installed in the PBX, refer to "2.3.3 System Capacity".

2.3 Specifications

2.3.1 General Description

Main CPU		650 MHz Dual Core	
Power Input		100 V AC to 130 V AC: 0.95 A/200 V AC to 240 V AC: 0.6 A; 50 Hz/60 Hz	
Power Consumption (when fully mounted)		50 W (240 V: 132 VA, 200 V: 120 VA, 130 V: 104 VA, 100 V: 95 VA)	
External Backup Battery		External battery port is not supported. Support UPS: USB2.0: 1 port (Connector: Type A)	
Memory Backup Duration		7 years	
Dialling	**Trunk**	Dial Pulse (DP) 10 pps, 20 pps Tone (DTMF) Dialling with Caller ID (FSK/DTMF) 1600 Ω Maximum	
	Extension	Dial Pulse (DP) 10 pps, 20 pps Tone (DTMF) Dialling with Caller ID (FSK/DTMF) SLC1 port supports PFT in combination with the LCOT1 port connected to an analogue trunk.	
Mode Conversion		DP-DTMF, DTMF-DP	
Ring Frequency		20 Hz/25 Hz (selectable)	
Operating Environment	**Temperature**	0 °C to 40 °C	
	Humidity	10 % to 90 % (non-condensing)	
Conference Call Trunk		From 24 × 3-party conference call to 9 × 8-party conference call	
Music on Hold (MOH)		1 port (Level Control: -31.5 dB to +31.5 dB per 0.5 dB) MOH: Selectable Internal/External Music Source port	
External Paging		1 port (Volume Control: -15.5 dB to +15.5 dB per 0.5 dB)	
Serial Interface Port	**RS-232C**	1 (maximum 115.2 kbps)	
RJ45 Port	**MNT Port**	1 (for PC connection)	10BASE-T/100BASE-TX/ 1000BASE-T (Auto MDI/ MDI-X)
	LAN Port	1 (for LAN connection)	
	WAN Port[1]	1 (for WAN connection)	
Extension Connection Cable		SLT	1-pair wire (T, R)
Air-cooling method		FAN	
Dimension		430 mm (W) × 88 mm (H) × 340 mm (D)	
Weight (when fully mounted)		Under 5.1 kg	

[1] The WAN Port is not used with PCMPR Software Version 001.10000.

2.3.2 Characteristics

Terminal Equipment Loop Limit	• SLT: 600 Ω including set • Doorphone: 20 Ω
Minimum Leakage Resistance	15 000 Ω minimum
Maximum Number of Extension Instruments per Line	1 for SLT
Ring Voltage	75 Vrms at 20 Hz/25 Hz depending on the Ringing Load
Trunk Loop Limit	1600 Ω maximum
Hookswitch Flash/Recall Timing Range	24 ms to 2032 ms
Door Opener Current Limit	24 V DC/30 V AC, 1 A maximum
External Sensor Current Limit	Power to the external sensor is provided from the DOORPHONE card and must be grounded through the DOORPHONE card. For the connection diagram, refer to "4.6.1 DOORPHONE Card (KX-NS0161)". The PBX detects input from the sensor when the signal is under 100 Ω.
Paging Terminal Impedance	600 Ω
MOH (Music on Hold) Terminal Impedance	10 000 Ω

2.3.3 System Capacity

Type and Maximum Number of Slots

The PBX supports the following type and number of slots.

Slot Type		Maximum Number	
		Stand-alone System	**One-look Network**
Physical Slot	FAX Card Slot	1	16
	Storage Memory Card Slot	1	16
	DSP Card Slot	2	32
	Free Slot	1	16
	Doorphone Slot	1	16
Virtual Slot	Virtual Trunk Card	16	16
	Virtual Extension Card	20	32
	Virtual IP-CS Card	16	32
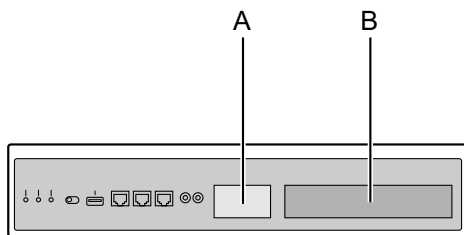
Front View   **Inside View (The top cover is removed.)**
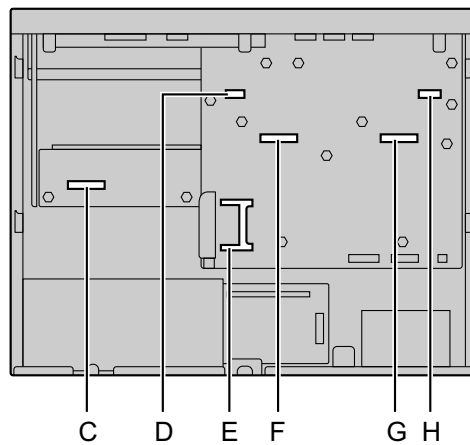
A. Front cover plate for the Doorphone Slot
B. Front cover plate for the Free Slot
C. Free Slot
D. Doorphone Slot
E. Storage Memory Card Slot
F. DSP Card Slot 2
G. DSP Card Slot 1
H. FAX Card Slot

Virtual Slots of the Mother Board

Example:

V-SIPGW16	V-IPGW16	V-IPEXT32	V-SIPEXT32	V-IPCS4	V-UTEXT32

1
2

Virtual Slots

Mother Board
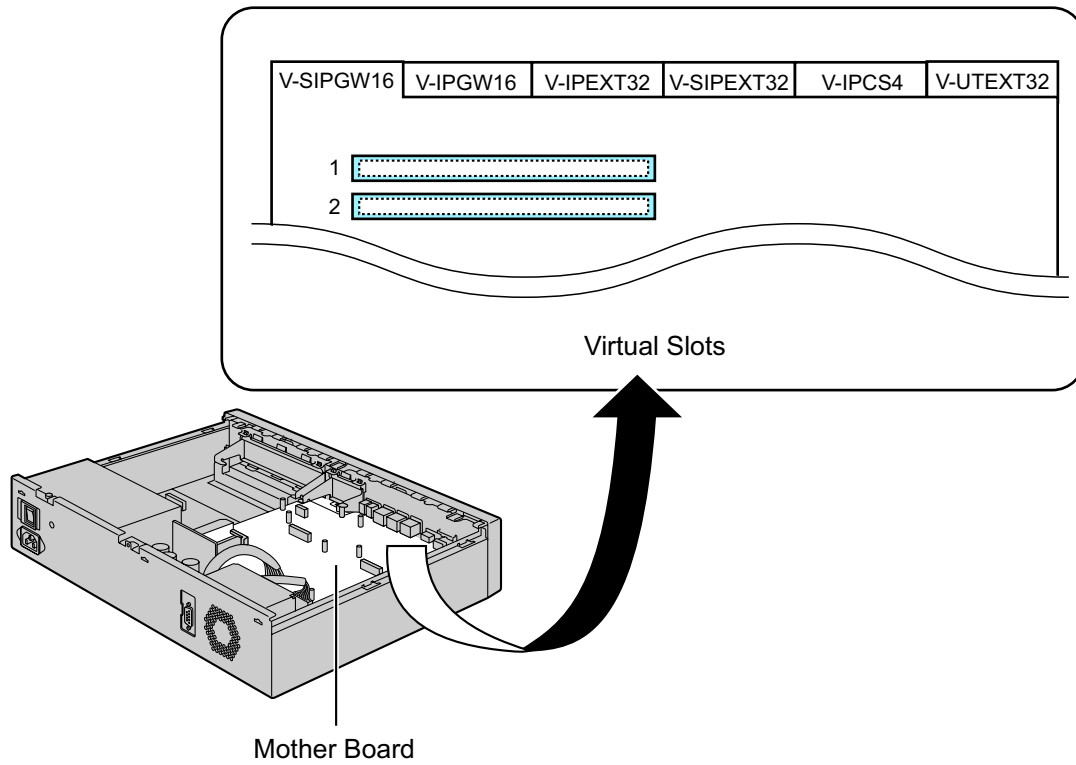
Maximum Optional Service Cards

The following number of cards can be installed in the Physical Slots or Virtual Slots of the PBX.

Note
- Any card that exceeds the capacity of the PBX will be ignored.
- When the PBX starts up with an invalid configuration, some cards will be ignored.

Cards Installed in Physical Slots

Card Type	Maximum Number	
	Stand-alone System	**One-look Network**
Free Slot	1	16
SLC2/LCOT2	1	16
SLC2/BRI4		
SLC2/PRI30		
SLC2/PRI23		
Doorphone Slot	1	16
DOORPHONE	1	16
DSP Card Slot	2	32
DSP S	2	32
DSP M		
DSP L		
FAX Card Slot	1	16
FAX	1	16
Storage Memory Card Slot	1	16
Storage Memory S	1	16
Storage Memory M		
Storage Memory L		

Cards Installed in Virtual Slots

Card Type	Maximum Number	
	Stand-alone System	**One-look Network**
Virtual Trunk Card	16	16
V-IPGW16	3	6
V-SIPGW16	16	16
Virtual Extension Card	20	32
V-IPEXT32	4	32
V-SIPEXT32	20	
V-UTEXT32		
Virtual IP-CS Card	16	32
V-IPCS4	16	32

Maximum Trunks and Extensions

The PBX supports the following number of trunks and extensions.

Type	Stand-alone System	One-look Network
Total Number of Trunks	256	600
Trunk (Virtual Trunk Card)	256	256
H.323 Trunks	48	96
SIP Trunks	256	256
Trunk (Physical Trunk Card)	30	480
Total Number of Extensions	640	1000[1]

Type	Stand-alone System	One-look Network
Extension (Virtual Extension Card)	640	1000
IP-PT and IP Softphone	128	1000
SIP Phone	640	1000
Extension (Physical Extension Card)	2	32

[*1] The maximum number of extension ports is 640 per PBX, and the maximum number of Unified Messaging ports is 24 per PBX. When 24 ports for Unified Messaging are fully activated on the Master unit, the maximum number of extension ports will be less than 640. One Unified Messaging port is equal to 10 extension ports. Therefore, when all Unified Messaging ports are activated, only up to 400 extensions are available. This condition does not apply for Slave units.

DSP Resources

DSP cards provide digital signal processor (DSP) reference resources, and the PBX uses the resources to perform various PBX operations. The following illustration shows the concept of DSP resource usage. More

complex situations may necessitate additional resources, and in some cases fewer resources may be necessary.

⎯ : Required DSP Resources
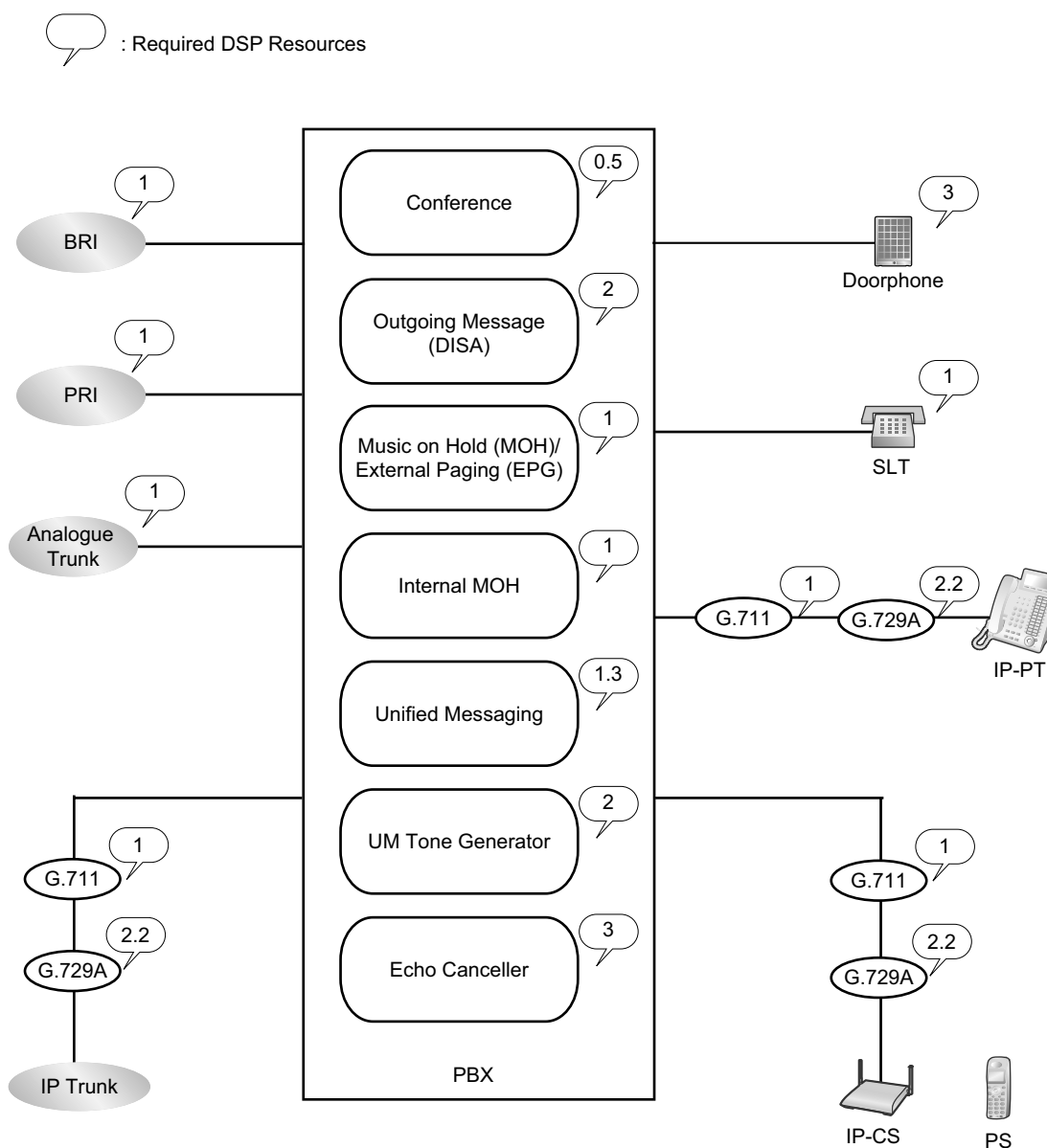
Required DSP Resources Assessment

The maximum number of simultaneous calls, operations and features using IP protocols is determined by the DSP card installed in the PBX. According to the number of resources required, you can install up to 2 DSP cards.
To decide how much resources are required for the PBX, the DSP Resource Advisor can be useful.

Note

- Calls cannot be made or received when all of the DSP resources are being used.
- The number of required resources must not exceed the DSP resources installed to the PBX.
- For details about the DSP Resource Advisor, refer to "9.32.1.1 PBX Configuration—Configuration—DSP Resource—Setting—DSP Resource Advisor" in the PC Programming Manual.
- For information about installing DSP cards, refer to "4.3.3 DSP S Card (KX-NS0110), DSP M Card (KX-NS0111), DSP L Card (KX-NS0112)".

DSP Resource Reservation

DSP resources can be reserved for certain operations to avoid lack of resources for particular operations. When the PBXs are connected in a One-look network, you can specify how many resources to allocate to each branch.
The following examples show cases of allocating and reserving DSP resources.

Note

For details about reserving DSP resources, refer to "5.4.4.1 DSP Resource Reservation" and "5.4.4.2 DSP Resource Advisor" in the Feature Guide, and "9.32.1.1 PBX Configuration—Configuration—DSP Resource—Setting—DSP Resource Advisor" in the PC Programming Manual.

Example

In this example, the DSP M (127 DSP resources) is installed and resources are reserved for the following operations:

- 40 VoIP (G.711) calls
- 10 Conference trunks
- 8 Unified Messaging (includes 3 Two-way recording operations)
- 10 OGM operations
- UM Tone (Fixed)

Reserved Resources
$(40 \times 1) + (10 \times 0.5) + (8 \times 1.3) + (10 \times 2) + 2$
=77.4

Free Resources
= 127 - 77.4
= 49.6

Maximum Terminal Equipment

The following shows the number of each terminal equipment type supported by the PBX.

Terminal Equipment Type		Stand-alone System	One-look Network
Telephone		640	1000
	SLT	2	32
	IP-PT[1]	128	1000
	SIP Phone	640	1000
IP-CS (8-channel)		64	128
PS		512	512
Doorphone		1	16
Door Opener		1	16
External Sensor		1	16

[1]   KX-NT300 series and KX-NT265 (software version 2.00 or later only).

Note for KX-NT265 IP-PT users

The supported card varies depending on the software version of your KX-NT265 IP-PT. To confirm the version, follow the procedure below:

While starting up

PROGRAM ▶ ▽ ▶ SP-PHONE ▶ ▽ ▶ SP-PHONE ▶ "AP Version". ▶▶

Select "Maintenance".   Select "Version display".

▶▶ SP-PHONE ▶ Software version is displayed.

To exit the programming mode

▶ HOLD ▶ HOLD ▶ HOLD ▶ HOLD
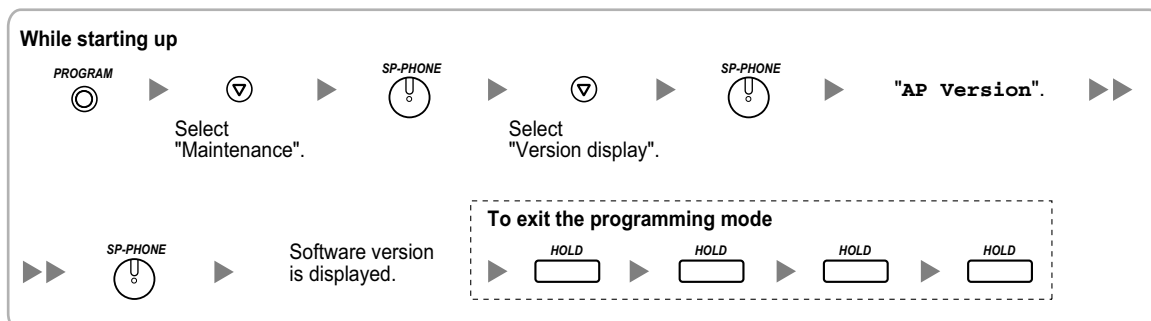
2.3.3 System Capacity

Section 3

Information about the Activation Keys

This section provides information on activation keys, including how to obtain activation keys.

3.1 Information about the Activation Keys

To use IP trunks and IP telephones on a private IP network using the mother board or to upgrade the software for enhanced features, you need the appropriate activation keys.
Activation keys are provided via the mother board and the optional activation key files.

3.1.1 Type and Maximum Number of Activation Keys

The PBX supports the following type and number of activation keys. The preinstalled activation keys on the mother board are shown with "[ ]".
When the number of preinstalled activation keys is not enough for the desired configuration or when you wish to use enhanced features, additional activation keys in the form of activation key files can be installed using Web Maintenance Console.
When the PBX is connected in a One-look network, activation keys should be installed on the appropriate PBX as shown in the tables below.

Note

- Store the downloaded activation key files in your PC or a memory device. They can then be reinstalled when changing the Storage Memory Card or in an emergency situation.
- For information about how to obtain the additional activation keys, refer to "3.1.2 Activation Key Code and Key Management System".
- For information about how to install the activation key files using Web Maintenance Console, refer to "5.4.4 Installing Additional Activation Keys".

IP Trunks

Model No.	Activation Key Type	Description	Maximum IP Trunks	
			Stand-alone System	One-look Network
KX-NSM102	2 IP Trunk	Allows the use of 2 IP trunks (H.323/SIP).	256 IP trunks (H.323/SIP)[*1][*2][*3]	
KX-NSM104	4 IP Trunk	Allows the use of 4 IP trunks (H.323/SIP).		
KX-NSM108	8 IP Trunk	Allows the use of 8 IP trunks (H.323/SIP).		
KX-NSM116	16 IP Trunk	Allows the use of 16 IP trunks (H.323/SIP).		

[*1] You need to set the number of installed activation keys to be used for H.323 trunks through system programming. By default, all installed activation keys will be used for SIP trunks.
[*2] For stand-alone system, the maximum number of IP trunks for H.323 is 48.
[*3] For One-look Network, the maximum number of IP trunks for H.323 is 96.

Installation in One-look Network System

Activation Keys		Master Unit	Slave Unit
KX-NSM102	2 IP Trunk		
KX-NSM104	4 IP Trunk	✓	✓
KX-NSM108	8 IP Trunk		
KX-NSM116	16 IP Trunk		

IP Telephone Capacity

Note

- Up to 30 IP-PTs/IP softphones/KX-UT series SIP phones/third party SIP phones can be used without needing any of the following IP telephone capacity activation keys.
- Activation keys for IP telephone capacity are not cumulative; the maximum overall capacity is determined by the highest-numbered installed activation key.

Model No.	Activation Key Type	Description	Maximum Capacity of IP Phones	
			Stand-alone System	**One-look Network**
KX-NSM005	Up to 50 IP Phone	Allows the use of between 31 and 50 IP-PTs/IP softphones/KX-UT series SIP phones/third party SIP phones.	Capacity for 50 IP-PTs/IP softphones/KX-UT series SIP phones/third party SIP phones	
KX-NSM010	Up to 100 IP Phone	Allows the use of between 31 and 100 IP-PTs/IP softphones/KX-UT series SIP phones/third party SIP phones.	Capacity for 100 IP-PTs/IP softphones/KX-UT series SIP phones/third party SIP phones	
KX-NSM030	Up to 300 IP Phone	Allows the use of between 31 and 300 IP-PTs/IP softphones/KX-UT series SIP phones/third party SIP phones.	Capacity for 300 IP-PTs/IP softphones/KX-UT series SIP phones/third party SIP phones	
KX-NSM099	System MAX IP Phone	Allows the use of between 31 and the system limit for IP-PTs/IP softphones/KX-UT series SIP phones/third party SIP phones.	Capacity for 640 IP-PTs/IP softphones/KX-UT series SIP phones/third party SIP phones	Capacity for 1000 IP-PTs/IP softphones/KX-UT series SIP phones/third party SIP phones

Installation in One-look Network System

Activation Keys		Master Unit	Slave Unit
KX-NSM005	Up to 50 IP Phone		
KX-NSM010	Up to 100 IP Phone	✓	✓
KX-NSM030	Up to 300 IP Phone		
KX-NSM099	System MAX IP Phone		

IP Telephone

Model No.	Activation Key Type	Description	Maximum IP Telephones	
			Stand-alone System	One-look Network
KX-NSM201	1 IPSoftphone/IP PT	Allows the use of 1 IP-PT/IP softphone/KX-UT series SIP phone.	640 IP-PTs/ IP softphones/ KX-UT series SIP phones[1]	1000 IP-PTs/ IP softphones/ KX-UT series SIP phones[1]
KX-NSM205	5 IPSoftphone/IP PT	Allows the use of 5 IP-PTs/IP softphones/KX-UT series SIP phones.		
KX-NSM210	10 IPSoftphone/IP PT	Allows the use of 10 IP-PTs/IP softphones/KX-UT series SIP phones.		
KX-NSM220	20 IPSoftphone/IP PT	Allows the use of 20 IP-PTs/IP softphones/KX-UT series SIP phones.		
KX-NSM501	1 IP PT	Allows the use of 1 IP-PT/KX-UT series SIP phone.	640 IP-PTs/ KX-UT series SIP phones [8 IP-PTs/ KX-UT series SIP phones]	1000 IP-PTs/ KX-UT series SIP phones [256 IP-PTs/ KX-UT series SIP phones]
KX-NSM505	5 IP PT	Allows the use of 5 IP-PTs/ KX-UT series SIP phones.		
KX-NSM510	10 IP PT	Allows the use of 10 IP-PTs/ KX-UT series SIP phones.		
KX-NSM520	20 IP PT	Allows the use of 20 IP-PTs/ KX-UT series SIP phones.		

Model No.	Activation Key Type	Description	Maximum IP Telephones	
			Stand-alone System	One-look Network
KX-NSM701	1 SIP Extension	Allows the use of 1 IP Conferencing Phone/third party SIP phone.	640 IP Conferencing Phones/third party SIP phones	1000 IP Conferencing Phones/third party SIP phones
KX-NSM705	5 SIP Extension	Allows the use of 5 IP Conferencing Phones/third party SIP phones.		
KX-NSM710	10 SIP Extension	Allows the use of 10 IP Conferencing Phones/third party SIP phones.		
KX-NSM720	20 SIP Extension	Allows the use of 20 IP Conferencing Phones/third party SIP phones.		

[1] You can set how many IP softphones can be used with the installed activation keys through system programming. By default, only IP softphones can be used with the installed activation keys.

Installation in One-look Network System

Activation Keys		Master Unit	Slave Unit
KX-NSM201	1 IPSoftphone/IP PT	✓	✓
KX-NSM205	5 IPSoftphone/IP PT		
KX-NSM210	10 IPSoftphone/IP PT		
KX-NSM220	20 IPSoftphone/IP PT		
KX-NSM501	1 IP PT	✓	✓
KX-NSM505	5 IP PT		
KX-NSM510	10 IP PT		
KX-NSM520	20 IP PT		
KX-NSM701	1 SIP Extension	✓	✓
KX-NSM705	5 SIP Extension		
KX-NSM710	10 SIP Extension		
KX-NSM720	20 SIP Extension		

Networking

Model No.	Activation Key Type	Description	Maximum Activation Keys	
			Stand-alone System	One-look Network
KX-NSN001	One-look Network	Allows the use of multi-site connections using One-look network feature.	-	16 activation keys[1]
KX-NSN002	QSIG Network	Allows the use of enhanced QSIG network features (NDSS, Centralised Voice Mail, etc.).	1 activation key	

[1]   This activation key must be installed to each PBX in the One-look network.

Installation in One-look Network System

Activation Keys		Master Unit	Slave Unit
KX-NSN001	One-look Network	✔	✔
KX-NSN002	QSIG Network	✔	-

Unified Messaging System (Features)

Model No.	Activation Key Type	Description	Maximum Activation Keys	
			Stand-alone System	One-look Network
KX-NSU001	REC Time Expansion	Allows the use of 15 hours of recording time for Unified Messaging. This activation key works only for the Storage Memory Card provided with the PBX. Recording time can be increased further by upgrading the Storage Memory Card. For details, refer to "4.3.2 Storage Memory Card (installed by default), Storage Memory S Card (KX-NS0135), Storage Memory M Card (KX-NS0136), Storage Memory L Card (KX-NS0137)".	1 activation key	16 activation keys[1]
KX-NSU002	Two-way REC Control	Allows a manager/administrator to use the Automatic Two-way Recording feature to record other users.	1 activation key	16 activation keys[1]
KX-NSU003	Message Backup	Allows the automatic backup of messages.	1 activation key	16 activation keys[1]

[1]   Activation keys must be installed to the site where the Unified Messaging mailboxes are located.

Installation in One-look Network System

Activation Keys		Master Unit	Slave Unit
KX-NSU001	REC Time Expansion	✓	✓
KX-NSU002	Two-way REC Control	✓	✓
KX-NSU003	Message Backup	✓	✓

Unified Messaging System (Unified Messaging Ports)

Model No.	Activation Key Type	Description	Maximum Unified Messaging Ports	
			Stand-alone System	One-look Network
KX-NSU102	2 UM Port	Allows the use of 2 Unified Messaging ports.	24 Unified Messaging ports[1] [2 Unified Messaging ports]	384 Unified Messaging ports[1] [32 Unified Messaging ports]
KX-NSU104	4 UM Port	Allows the use of 4 Unified Messaging ports.		

[1]   Activation keys must be installed to the site where the Unified Messaging mailboxes are located.

Installation in One-look Network System

Activation Keys		Master Unit	Slave Unit
KX-NSU102	2 UM Port	✓	✓
KX-NSU104	4 UM Port		

Unified Messaging System (Mailbox)

Model No.	Activation Key Type	Description	Maximum Mailboxes	
			Stand-alone System	One-look Network
KX-NSU201	UM/E-mail 1 User[1]	Allows the use of an e-mail (IMAP4) client and e-mail notification (voice/fax messages) for 1 user.	1024 mailboxes	16 384 mailboxes
KX-NSU205	UM/E-mail 5 Users[1]	Allows the use of an e-mail (IMAP4) client and e-mail notification (voice/fax messages) for 5 users.		
KX-NSU210	UM/E-mail 10 Users[1]	Allows the use of an e-mail (IMAP4) client and e-mail notification (voice/fax messages) for 10 users.		
KX-NSU220	UM/E-mail 20 Users[1]	Allows the use of an e-mail (IMAP4) client and e-mail notification (voice/fax messages) for 20 users.		
KX-NSU299	UM/E-mail All Users[1]	Allows the use of an e-mail (IMAP4) client and e-mail notification (voice/fax messages) up to the system's limit.		

[1]   Activation keys must be installed to the site where the Unified Messaging mailboxes are located.

Installation in One-look Network System

Activation Keys		Master Unit	Slave Unit
KX-NSU201	UM/E-mail 1 User		
KX-NSU205	UM/E-mail 5 Users		
KX-NSU210	UM/E-mail 10 Users	✓	✓
KX-NSU220	UM/E-mail 20 Users		
KX-NSU299	UM/E-mail All Users		

Unified Messaging System (Two-way Recording/Two-way Transfer Users)

Model No.	Activation Key Type	Description	Maximum Users	
			Stand-alone System	One-look Network
KX-NSU301	2way REC 1 User	Allows the use of Two-way Recording/Two-way Transfer for 1 user.	640 users	1000 users
KX-NSU305	2way REC 5 Users	Allows the use of Two-way Recording/Two-way Transfer for 5 users.		
KX-NSU310	2way REC 10 Users	Allows the use of Two-way Recording/Two-way Transfer for 10 users.		
KX-NSU320	2way REC 20 Users	Allows the use of Two-way Recording/Two-way Transfer for 20 users.		
KX-NSU399	2way REC All Users	Allows the use of Two-way Recording/Two-way Transfer up to the system's limit.		

Installation in One-look Network System

Activation Keys		Master Unit	Slave Unit
KX-NSU301	2way REC 1 User	✓	-
KX-NSU305	2way REC 5 Users		
KX-NSU310	2way REC 10 Users		
KX-NSU320	2way REC 20 Users		
KX-NSU399	2way REC All Users		

Cellular Phone Extension

Model No.	Activation Key Type	Description	Maximum Cellular Phone Extensions	
			Stand-alone System	One-look Network
KX-NSE101	1 Mobile User	Allows the use of 1 cellular phone extension.	1152 cellular phone extensions	
KX-NSE105	5 Mobile Users	Allows the use of 5 cellular phone extensions.		
KX-NSE110	10 Mobile Users	Allows the use of 10 cellular phone extensions.		
KX-NSE120	20 Mobile Users	Allows the use of 20 cellular phone extensions.		

Installation in One-look Network System

Activation Keys		Master Unit	Slave Unit
KX-NSE101	1 Mobile User		
KX-NSE105	5 Mobile Users		
KX-NSE110	10 Mobile Users	✓	-
KX-NSE120	20 Mobile Users		

Communication Assistant (CA) User

Model No.	Activation Key Type	Description	Maximum Activation Keys	
			Stand-alone System	One-look Network
KX-NSA010	CA Thin Client	Allows the use of CA Client in a thin-client environment.	1	
KX-NSA020	CSTA Multiplexer	Allows the use of CSTA Multiplexer.	4	
KX-NSA201	CA Pro 1 user	Allows the use of CA Client Pro for 1 user.[1]	240 users without CA server (Max. 1022 Users with CA server)	
KX-NSA205	CA Pro 5 users	Allows the use of CA Client Pro for 5 users.[1]		
KX-NSA210	CA Pro 10 users	Allows the use of CA Client Pro for 10 users.[1]		
KX-NSA240	CA Pro 40 users	Allows the use of CA Client Pro for 40 users.[1]		
KX-NSA249	CA Pro 128 users	Allows the use of CA Client Pro for 128 users.[1]		
KX-NSA301	CA Supervisor	Allows the use of CA Client Supervisor for 1 user.		
KX-NSA401	CA Console	Allows the use of CA Client Operator Console for 1 user.		
KX-NSA901	CA Network 1 user	Allows the use of CA Server network features for 1 user.		
KX-NSA905	CA Network 5 users	Allows the use of CA Server network features for 5 users.		
KX-NSA910	CA Network 10 users	Allows the use of CA Server network features for 10 users.		
KX-NSA940	CA Network 40 users	Allows the use of CA Server network features for 40 users.		
KX-NSA949	CA Network 128 users	Allows the use of CA Server network features for 128 users.		

[1] A maximum of 1022 CA users can be registered. However, CA Server is necessary to register more than 240 CA users.

Installation in One-look Network System

Activation Keys		Master Unit	Slave Unit
KX-NSA010	CA Thin Client	✓	-
KX-NSA020	CSTA Multiplexer		
KX-NSA201	CA Pro 1 user		
KX-NSA205	CA Pro 5 users		
KX-NSA210	CA Pro 10 users		
KX-NSA240	CA Pro 40 users		
KX-NSA249	CA Pro 128 users		
KX-NSA301	CA Supervisor		
KX-NSA401	CA Console		
KX-NSA901	CA Network 1 user		
KX-NSA905	CA Network 5 users		
KX-NSA910	CA Network 10 users		
KX-NSA940	CA Network 40 users		
KX-NSA949	CA Network 128 users		

CTI Licence

Model No.	Activation Key Type	Description	Maximum Activation Keys	
			Stand-alone System	One-look Network
KX-NSF101	CTI interface	Allows the use of the 3rd Party CTI interface.	1	

Installation in One-look Network System

Activation Keys		Master Unit	Slave Unit
KX-NSF101	CTI interface	✓	-

Packaged Activation Keys

These packaged activation keys include multiple activation keys. Installing one packaged activation key allows you to install multiple activation key features at once.
For details of each feature, refer to relevant section of this manual:

- E-mail (IMAP4) client and e-mail notification (voice/fax messages)
  → Unified Messaging System (Mailbox)
- Two-way Recording/Two-way Transfer
  → Unified Messaging System (Two-way Recording/Two-way Transfer Users)
- Cellular phone extension
  → Cellular Phone Extension

- CA Client Pro
  $\rightarrow$ Communication Assistant (CA) User

Model No.	Activation Key Type	Description
KX-NSP001	Std. Pkg 1 User	Allows the use of the following activation key features for 1 user: • E-mail (IMAP4) client and e-mail notification (voice/fax messages) • Two-way Recording/Two-way Transfer
KX-NSP005	Std. Pkg 5 Users	Allows the use of the following activation key features for 5 users: • E-mail (IMAP4) client and e-mail notification (voice/fax messages) • Two-way Recording/Two-way Transfer
KX-NSP010	Std. Pkg 10 Users	Allows the use of the following activation key features for 10 users: • E-mail (IMAP4) client and e-mail notification (voice/fax messages) • Two-way Recording/Two-way Transfer
KX-NSP020	Std. Pkg 20 Users	Allows the use of the following activation key features for 20 users: • E-mail (IMAP4) client and e-mail notification (voice/fax messages) • Two-way Recording/Two-way Transfer
KX-NSP101	Adv. Pkg 1 User	Allows the use of the following activation key features for 1 user: • E-mail (IMAP4) client and e-mail notification (voice/fax messages) • Two-way Recording/Two-way Transfer • Cellular phone extension • CA Client Pro
KX-NSP105	Adv. Pkg 5 Users	Allows the use of the following activation key features for 5 users: • E-mail (IMAP4) client and e-mail notification (voice/fax messages) • Two-way Recording/Two-way Transfer • Cellular phone extension • CA Client Pro
KX-NSP110	Adv. Pkg 10 Users	Allows the use of the following activation key features for 10 users: • E-mail (IMAP4) client and e-mail notification (voice/fax messages) • Two-way Recording/Two-way Transfer • Cellular phone extension • CA Client Pro
KX-NSP120	Adv. Pkg 20 Users	Allows the use of the following activation key features for 20 users: • E-mail (IMAP4) client and e-mail notification (voice/fax messages) • Two-way Recording/Two-way Transfer • Cellular phone extension • CA Client Pro
KX-NSP201	Mobile Pkg 1 User	Allows the use of the following activation key features for 1 user: • E-mail (IMAP4) client and e-mail notification (voice/fax messages) • Cellular phone extension

Model No.	Activation Key Type	Description
KX-NSP205	Mobile Pkg 5 Users	Allows the use of the following activation key features for 5 users: • E-mail (IMAP4) client and e-mail notification (voice/fax messages) • Cellular phone extension
KX-NSP210	Mobile Pkg 10 Users	Allows the use of the following activation key features for 10 users: • E-mail (IMAP4) client and e-mail notification (voice/fax messages) • Cellular phone extension
KX-NSP220	Mobile Pkg 20 Users	Allows the use of the following activation key features for 20 users: • E-mail (IMAP4) client and e-mail notification (voice/fax messages) • Cellular phone extension

Preinstalled Activation Keys in the Mother Board

Preinstalled activation keys with no expiration date

The following type and number of activation keys are preinstalled on the mother board.

Activation Key	Activated Features
IP Phone Capacity (ch)	Capacity for up to 30 IP-PTs/IP softphones/ KX-UT series SIP phones/third party SIP phones
CA Basic-Express	1022 users
IP Proprietary Telephone (ch)	8 IP-PTs/KX-UT series SIP phones
UM Port (ch)	2 Unified Messaging ports

Example: Preinstalled Activation Keys in the Mother Board

Preinstalled activation keys for free trial

The following activation keys are preinstalled on the mother board for the 60-days free trial. They will expire 60 days after pressing the **Activate Pre-installed Activation key** button to begin the free trial.

Activation Key	Activated Features
One-look Network	One-look networking feature
Two-way Recording Control	Automatic Two-way Recording feature
Message Backup	Automatic backup of messages
UM/E-mail (128 user)	128 mailboxes
Two-Way Recording (30 users)	30 Two-way Recording/Two-way Transfer users
Mobile Extension (30 users)	30 cellular phone extensions
CA PRO (128 users)	128 CA Pro users
CA Supervisor (1 user)	1 CA Supervisor user
CA Operator Console (1 user)	1 CA Console user
CA Thin Client Server	Use CA in a thin-client environment
CSTA Multiplexer	Multiplexing for CSTA connections

Activation Key Installation Example

The following illustration shows an example of when using 16 SIP trunks, 16 H.323 trunks, 40 IP-PTs, 20 IP softphones, and 20 KX-UT series SIP phones on a private IP network using the mother board.

Example:

Desired Item:
16 SIP trunks
Required Activation Key:
KX-NSM116

Desired Item:
16 H.323 trunks
Required Activation Key:
KX-NSM116

Desired Item:
40 IP-PTs
20 IP softphones
Required Activation Key:
2 of KX-NSM520s
KX-NSM220

Desired Item:
20 KX-UT series
SIP phones
Required Activation Key:
KX-NSM520

Desired Item:
80 IP Telephone Capacity
Required Activation Key:
KX-NSM010

| V-SIPGW16 | V-IPGW16 | V-IPEXT32 | V-SIPEXT32 | V-IPCS4 | V-UTEXT32 |

| V-SIPGW16 | V-IPGW16 | V-IPEXT32 | V-SIPEXT32 | V-IPCS4 | V-UTEXT32 |

| V-SIPGW16 | V-IPGW16 | V-IPEXT32 | V-SIPEXT32 | V-IPCS4 | V-UTEXT32 |

| V-SIPGW16 | V-IPGW16 | V-IPEXT32 | V-SIPEXT32 | V-IPCS4 | V-UTEXT32 |

Virtual Slots

Mother Board

Note

- Up to 30 IP-PTs/IP softphones/KX-UT series SIP phones/third party SIP phones can be used without needing any of the IP telephone capacity activation key files.
- Activation keys for IP telephone capacity are not cumulative; the maximum overall capacity is determined by the highest-numbered installed activation key. In this case, the Up to 100 IP Phone activation key (KX-NSM010) is used for 80 IP telephones.

3.1.2 Activation Key Code and Key Management System

To obtain additional activation keys, you need to purchase the appropriate activation key codes and access the Key Management System. You can download the activation keys as an activation key file from the Key Management System.

To download the activation keys, enter the MPR ID number shown on the back of the main unit, and activation key number and registration ID provided on each activation key code.

For information about the type of activation key codes available, refer to "3.1.1 Type and Maximum Number of Activation Keys".

For details about installing the downloaded activation key file(s) in the Storage Memory Card using Web Maintenance Console, refer to "5.4.4 Installing Additional Activation Keys".

Note

- You can only download the activation key file once using the activation key number and registration ID provided on the activation key code.
- Up to 8 activation keys can be downloaded as one activation key file.
- Up to 997 activation key files can be installed in the optional upgrade Storage Memory Card.
- It is possible to send the activation key file to a specified e-mail address at the same time as downloading it to a PC.
- Make sure to backup the downloaded activation key files on your PC.
- When the mother board has to be replaced due to a system malfunction, the MPR-ID for the mother board is no longer valid. In this case, you need a temporary activation key for maintenance purposes. The temporary activation key can only be used for a limited time period, and can be downloaded from the Key Management System in the same way as downloading activation key files.

Section 4

Installation

This section describes the procedures to install the PBX. Detailed instructions for planning the installation site, installing the main unit and optional service cards, and cabling of peripheral equipment are provided. Further information on peripheral equipment installation is included.

4.1 Before Installation

4.1.1 Before Installation

Please read the following notes concerning installation and connection before installing the PBX and terminal equipment.
Be sure to comply with all applicable laws, regulations, and guidelines.

Notice

Panasonic assumes no responsibility for injuries or property damage resulting from failures arising out of improper installation or operation inconsistent with this documentation.

Safety Installation Instructions

WARNING

When installing telephone wiring, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons, including the following:
- **Never install telephone wiring during a lightning storm.**
- **Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.**
- **Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.**
- **Use caution when installing or modifying telephone lines.**
- **Anti-static precautions should be taken during installation.**

Installation Precautions

The PBX is suitable for mounting on a 19-inch rack, mounting on a wall, or placing on a desktop, and should be installed in a location where it is accessible for inspections and maintenance.
To prevent malfunction, noise, or discolouration, follow the instructions below:

WARNING

Do not install the system in the following locations:
- **Areas where shocks or vibrations are frequent or strong. Such activity may lead to the product falling over and causing injury, or may impair the product's performance.**
- **Areas with high amounts of dust. High amounts of dust can lead to fire or electric shock, and impair the performance of the product.**

CAUTION

Do not install the system in the following locations:
- In direct sunlight and hot, cold, or humid places. (Temperature range: 0 °C to 40 °C)
- Areas where sulphuric gases may be present, such as near thermal springs.
- Near devices that generate high frequencies, such as sewing machines or electric welders.
- Locations where other objects will obstruct the area around the PBX. Be especially careful to leave at least 5 cm to the sides of the PBX for ventilation.

Notice

Do not install the system in the following locations:
- On or near computers, or other office equipment, as well as microwave ovens or air conditioners. (It is preferable not to install the system in the same room as the above equipment.)

- Within 1.8 m of radios and televisions. (Both the PBX and PTs should be at least 1.8 m away from such devices.)

Do not perform the following:

- Do not block the openings of the PBX.
- Do not stack up the optional service cards.

Wiring Precautions

Be sure to follow these instructions when wiring the unit:

CAUTION

- Avoid using the same AC outlet for computers and other office equipment, as noise generated by such equipment may hamper system performance or interrupt the system.
- Unplug the system from its power source when wiring, and plug the system back in only after all wiring is completed.
- Trunks should be installed with surge protectors. For details, refer to "4.2.12 Surge Protector Installation".

Notice

- Use 1-pair telephone cables when connecting SLTs, data terminals, answering machines, computers, etc.
- Mis-wiring may cause the PBX to operate improperly. Refer to "Section 4 Installation" when wiring the system.
- If an extension does not operate properly, disconnect the telephone from the extension line and connect it again, or turn off the PBX using the power switch, then turn it on again.
- Use twisted pair cable for trunk connection.
- To prevent signal noise from interfering with the performance of the product, do not run unshielded telephone cables near AC power cables, computer cables, AC power sources, etc. When running cables near other noise-generating devices or cables, use shielded telephone cables or shield the telephone cables with metal tubing.

Preparing the Network Environment

Be sure to prepare your network's environment for the installation of the PBX according to the intended PBX networking configuration. For details about PBX network configurations, refer to "Section 7 Appendix".

4.2 Installation of the PBX

4.2.1 Unpacking

Unpack the box and check the items below:

Main Unit		1
AC Power Cord		1[*1]
19-inch Rack Attachment Bracket		2
Hook Clip		1
CD-ROM		1
Screw		6

[*1]   The KX-NS1000BX and KX-NS1000XE are supplied with 2 types of AC power cord. Please use whichever is appropriate for the country/area.

4.2.2 Names and Locations

Front

Back

Inside
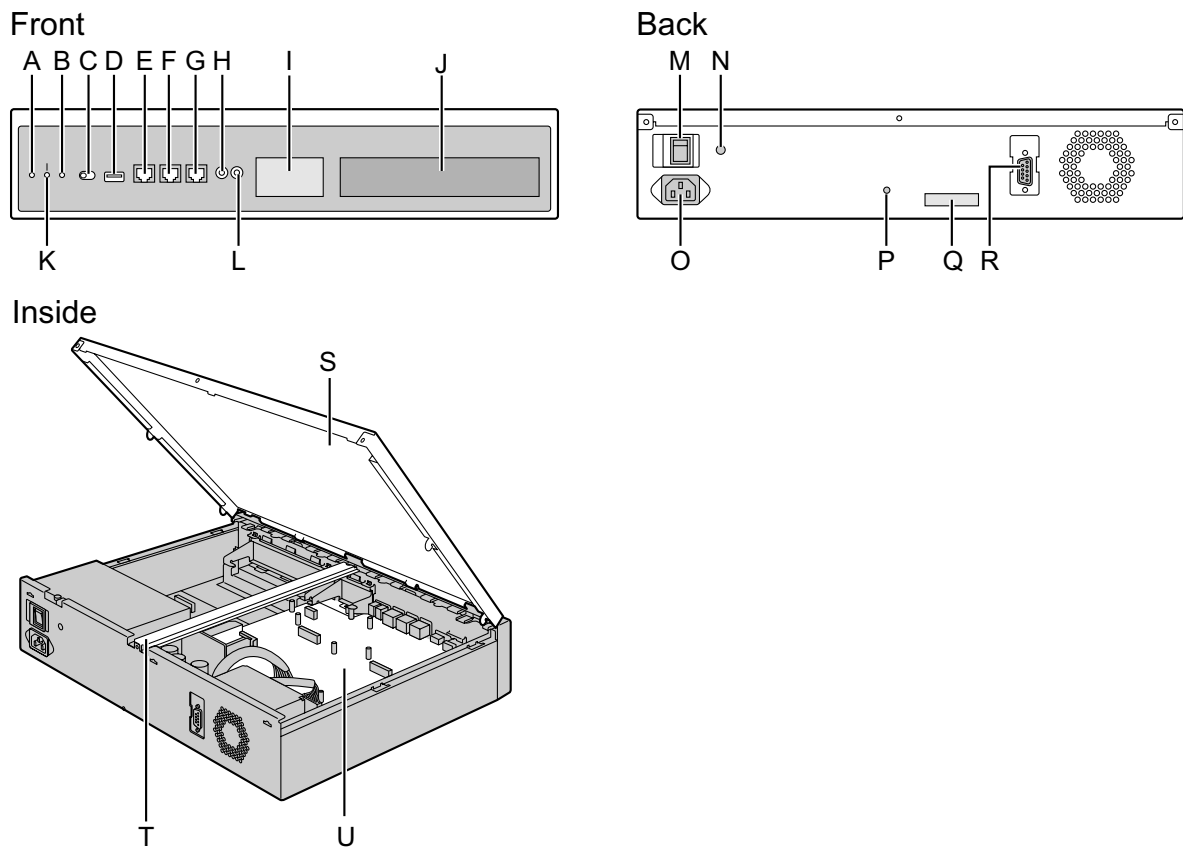
A. STATUS Indicator
B. MASTER Indicator[*1]
C. System Mode Switch
D. USB Port
E. MNT Port
F. LAN Port
G. WAN Port[*2]
H. MOH Port
I. Doorphone Slot
J. Free Slot
K. BATT ALARM Indicator
L. Pager Port
M. Power Switch
N. Earth Terminal
O. AC Inlet
P. Hook Clip Hole
Q. MPR ID
R. RS-232C Port
S. Top Cover
T. Support Bar
U. Mother Board

[*1] For details about the MASTER indicator, refer to "LED Indications".
[*2] The WAN Port is not used with PCMPR Software Version 001.10000.

4.2.3 Opening/Closing the Top Cover

Opening the Top Cover

CAUTION

When opening the top cover, the power switch must be turned off.

1. Confirm that the power switch is turned off.

Power Switch
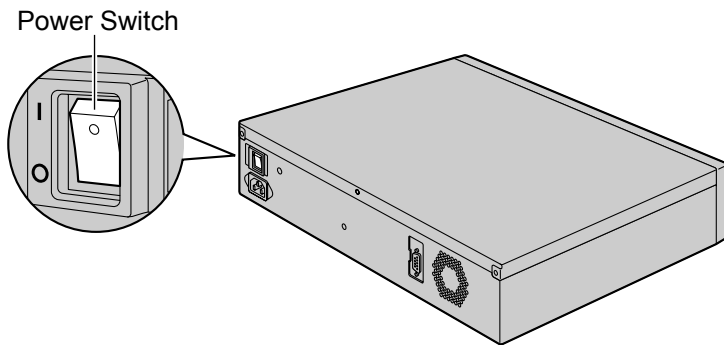
Note

In order to turn off the PBX's power, a system shutdown using Web Maintenance Console must first be performed. For details, refer to "5.5 System Control—System Shutdown" in the PC Programming Manual.

2. Turn the screws anticlockwise to loosen.
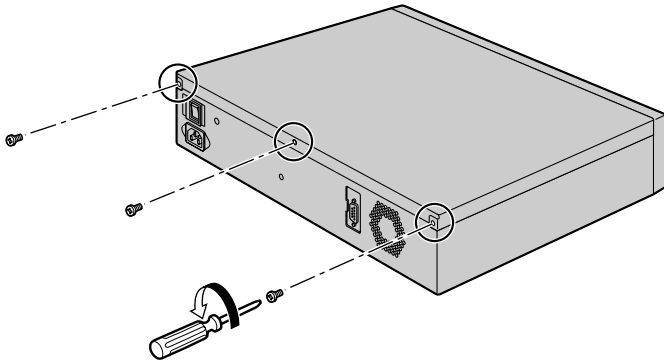
3. Slide the top cover then lift it off.
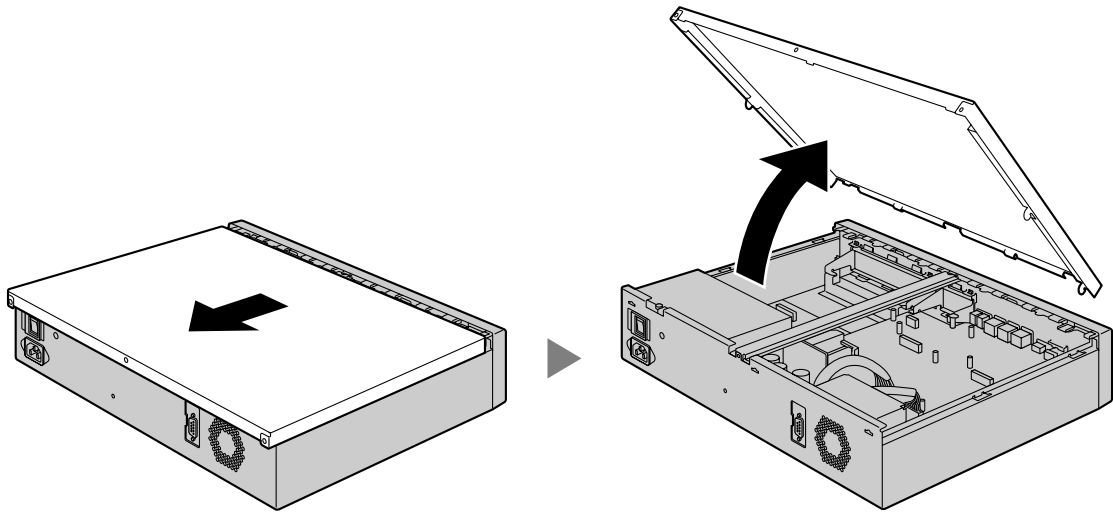
4. Remove the support bar from the PBX.
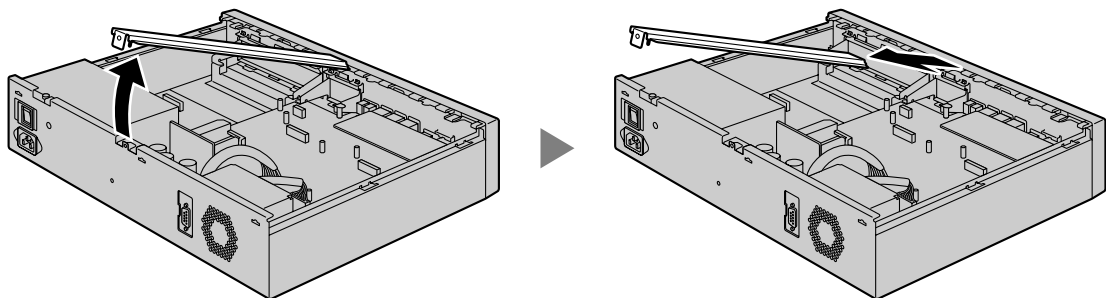
Closing the Top Cover

1. Place the support bar onto the PBX.

2. Place the top cover onto the PBX. Then slide the top cover until it closes properly.
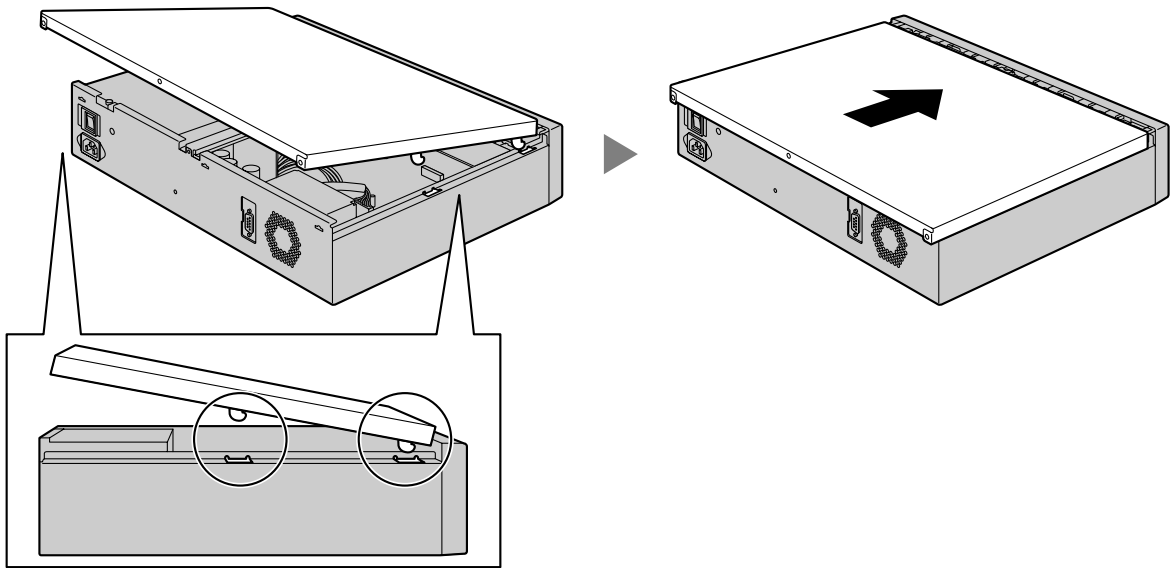
3. Turn the screws clockwise to tighten.
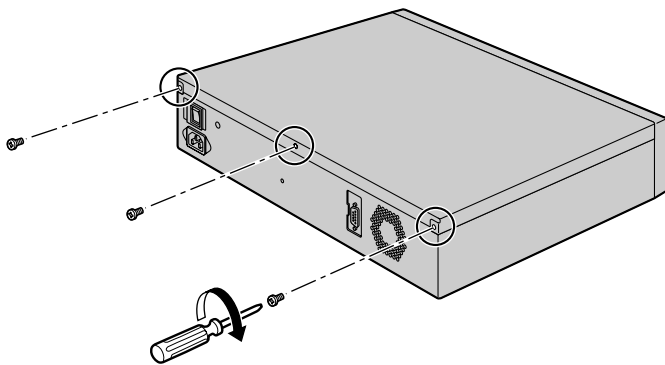
CAUTION

For safety reasons, close the top cover and tighten the screws before operating the PBX.

4.2.4 Frame Earth Connection

1. Loosen the screw.
2. Insert an earthing wire (user-supplied).
3. Tighten the screw.
4. Connect the earthing wire to earth.
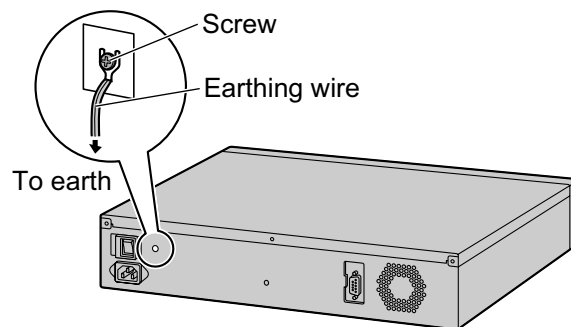
WARNING

- **Proper earthing (connection to earth) is very important to reduce the risk to the user of electrocution or to protect the PBX from the bad effects of external noise in the case of a lightning strike.**
- **The earthing wire of the AC cable has an effect against external noise and lightning strikes, but it may not be enough to protect the PBX and to ensure electromagnetic compatibility. A permanent connection between earth and the earth terminal of the PBX must be made.**

CAUTION

For earthing wire, green-and-yellow insulation is required, and the cross-sectional area of the conductor must be more than 0.75 mm^2 or 18 AWG.

Notice

Be sure to comply with applicable local regulations (e.g., laws, guidelines).

4.2.5 Installing/Removing the Optional Service Cards

CAUTION
- Before touching the product (PBX, cards, etc.), discharge static electricity by touching ground or wearing an earthing strap. Failure to do so may cause the PBX to malfunction due to static electricity.
- When installing or removing the optional service cards, the power switch must be turned off.
- When installing or removing the optional service cards, do not put pressure on any parts of the mother board. Doing so may result in damage to the PBX.

Note

Make sure the AC power cord is not connected to the AC inlet of the PBX.

Installing a DSP Card in a DSP Card Slot

1. Position a DSP card in an open DSP card slot. Then holding the card firmly in place, lower the rear end so that the holes of the card are aligned with the screw holes.

   Note

   There are 2 DSP card slots on the mother board. When installing only 1 DSP card, only one DSP card slot will be used.
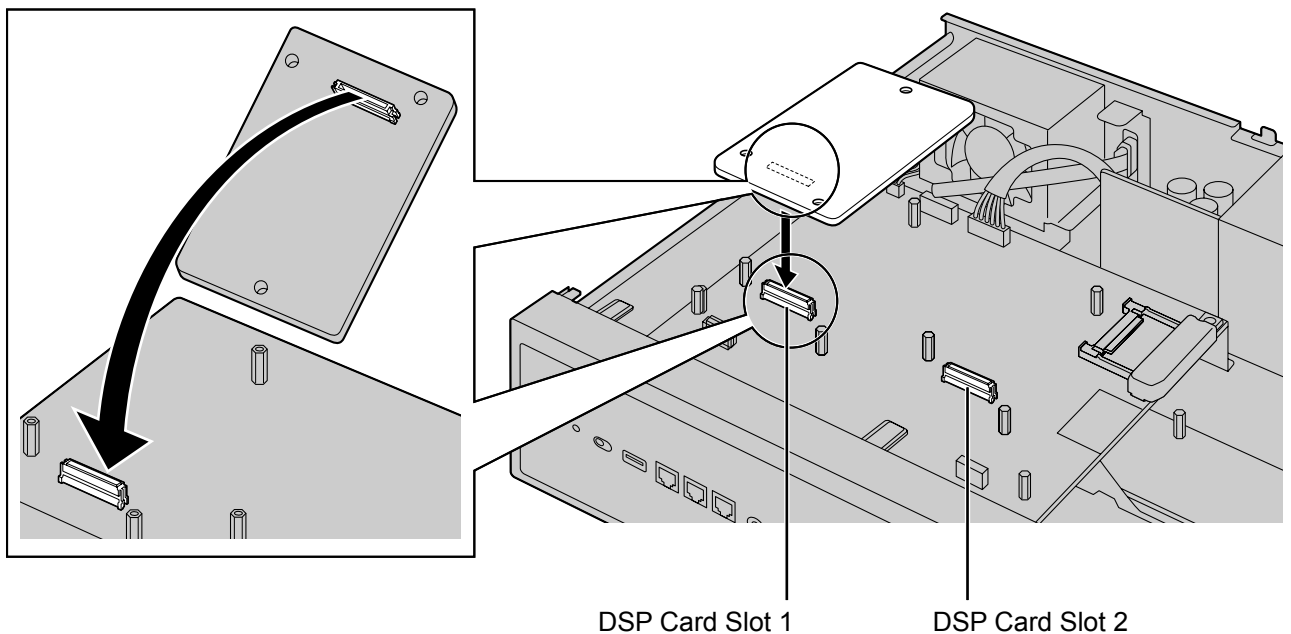
DSP Card Slot 1   DSP Card Slot 2

2. Insert the screws into the holes on the card, and tighten the screws to secure the card.
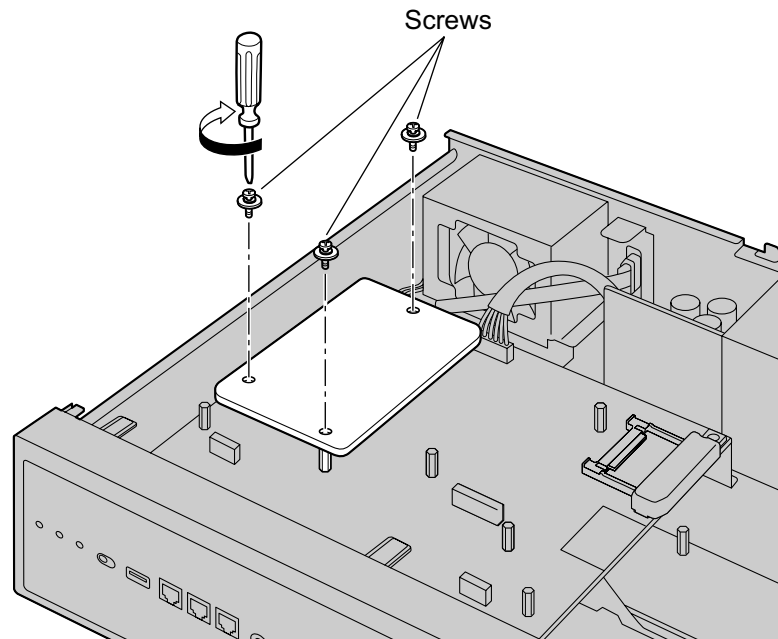
Screws

Removing a DSP Card Installed in the DSP Card Slot

1. Loosen and remove the screws.

Screws

2. Holding the rear end of the card, pull the card in the direction of the arrows.

Installing the Fax Card in the Fax Card Slot

1. Position the FAX card in the FAX card slot. Then, holding the card firmly in place, lower the rear end so that the holes of the card are aligned with the screw holes.
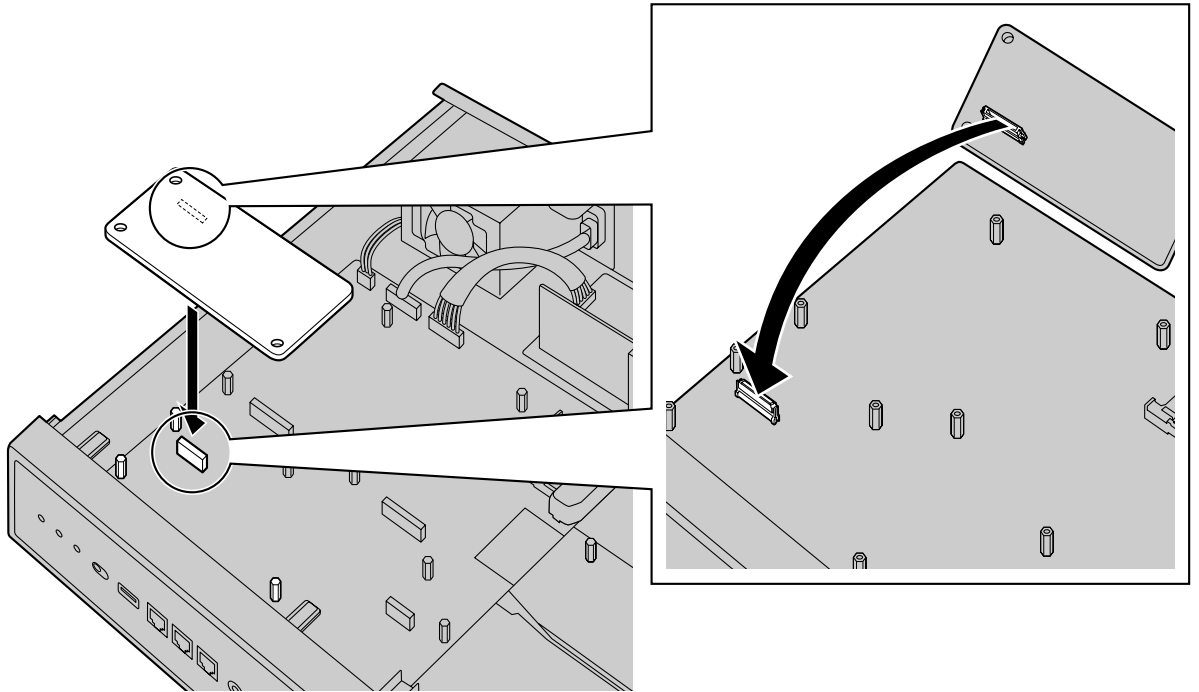
2. Insert the screws into the holes on the card, and tighten the screws to secure the card.
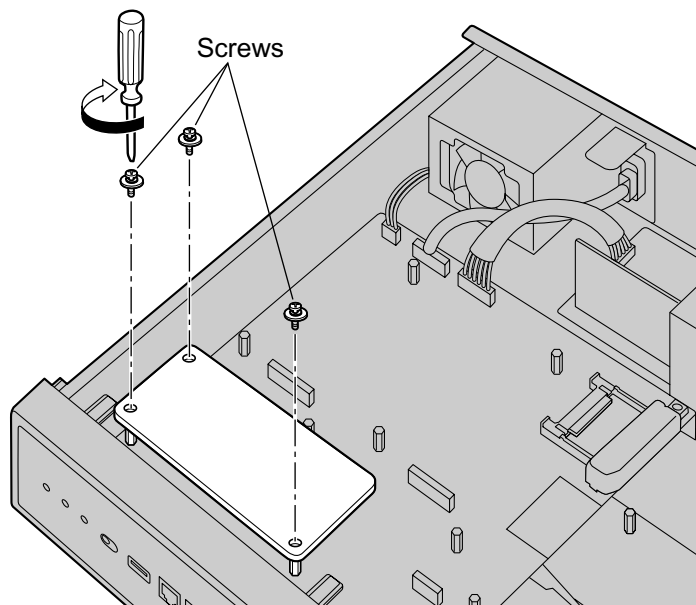
Screws

Removing a Fax Card Installed in the Fax Card Slot

1. Loosen and remove the screws.

Screws
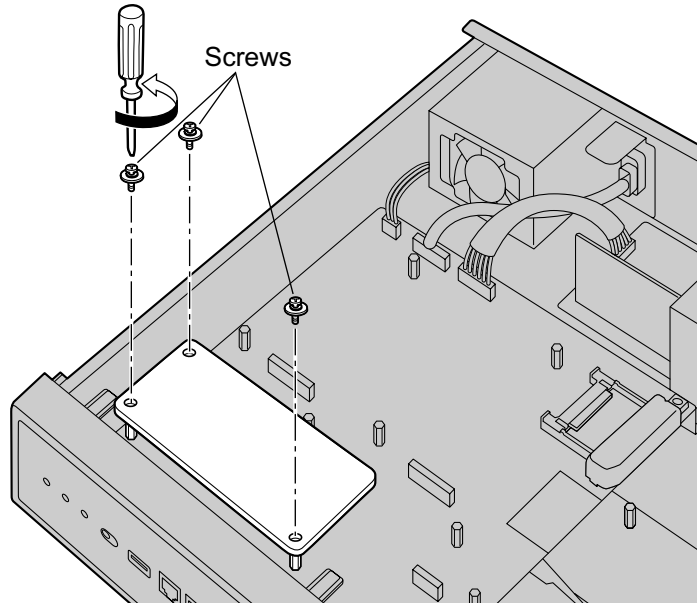
2. Holding the rear end of the card, pull the card in the direction of the arrows.
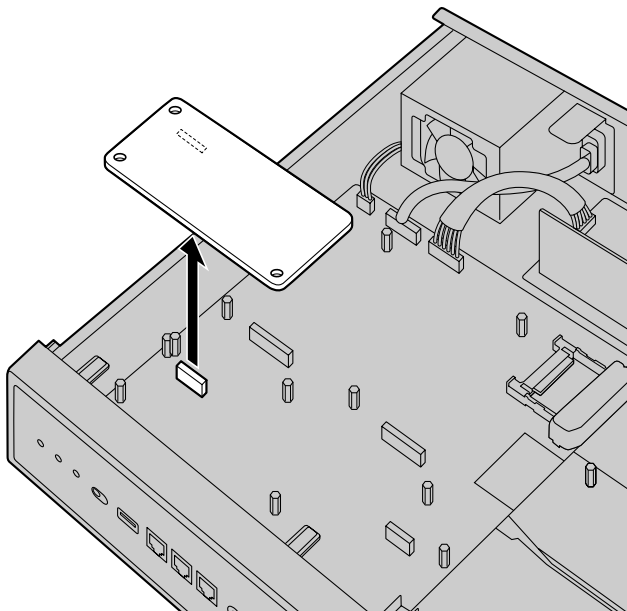
Installing an Optional Service Card in the Free Slot

You can install one of the SLC2/LCOT2, SLC2/BRI4, SLC2/PRI30 or SLC2/PRI23 card. Some of the optional service cards require DIP switch settings which must be done before installing the card. For details, refer to the description of each optional service card in "4.5 Physical Trunk and Extension Cards" and "4.6 The Doorphone Card".

1. Remove the front cover plate for the Free slot.
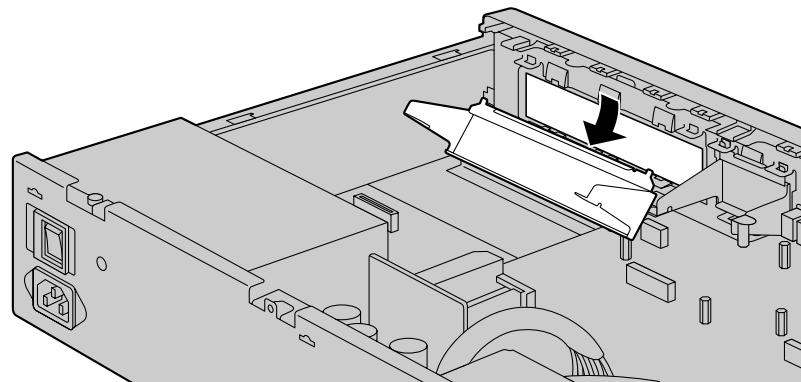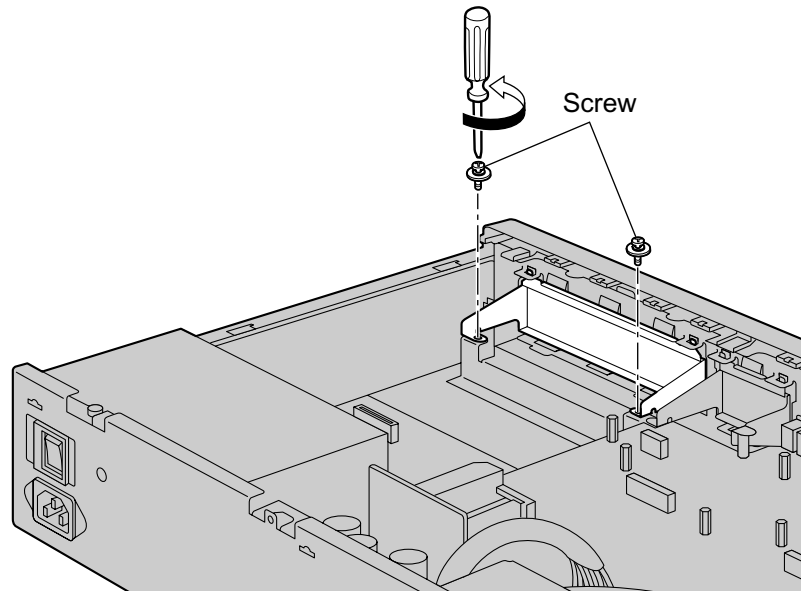
2. Position the card in the open slot, making sure that the tabs on the both sides of the card fit into place. Then, holding the card firmly in place, lower the rear end so that the holes of the card are aligned with the screw holes.
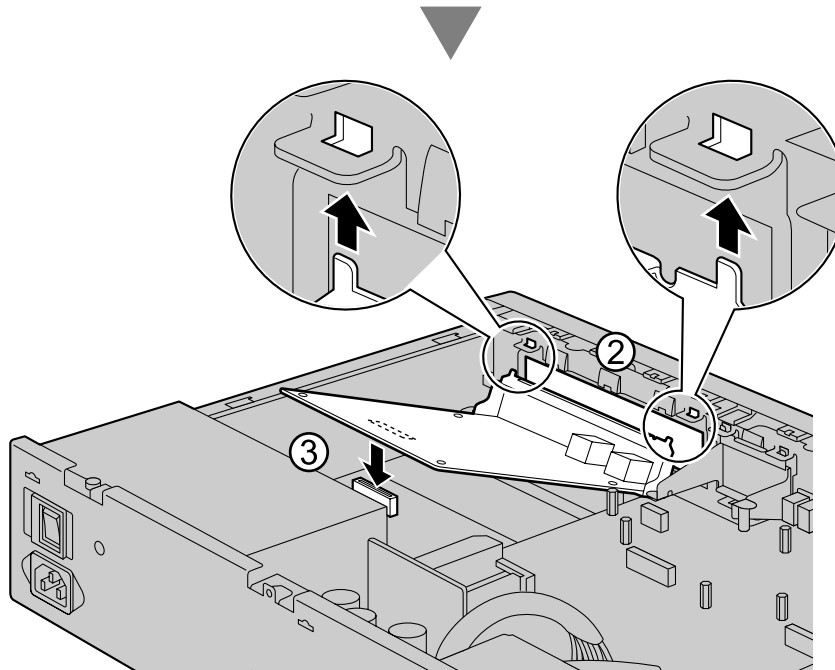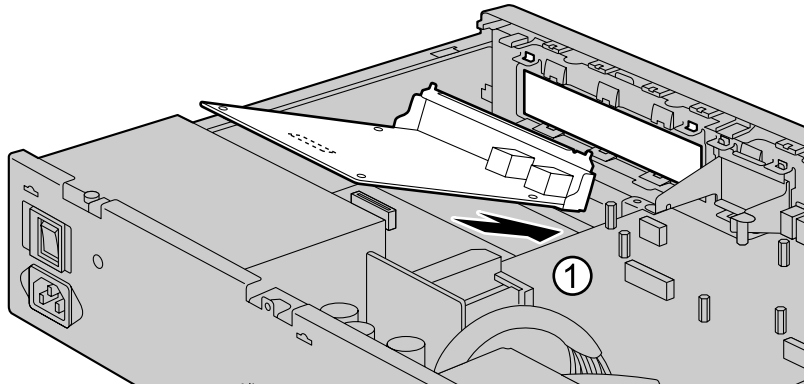
3. Insert the screws into the holes on the card, and tighten the screws to secure the card.

Screws

4. Connect cables to appropriate ports of the card. For details about pin assignments, refer to the appropriate section in "4.5 Physical Trunk and Extension Cards".
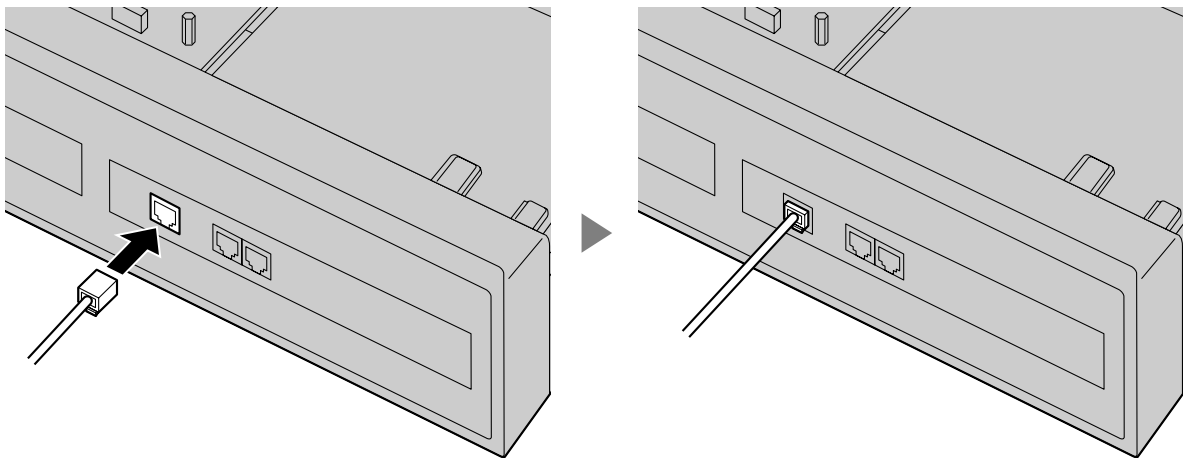
Note

Make sure to connect cables after installing the card in the PBX, not before.

Removing an Optional Service Card from the Free Slot

1. Loosen and remove the screws.
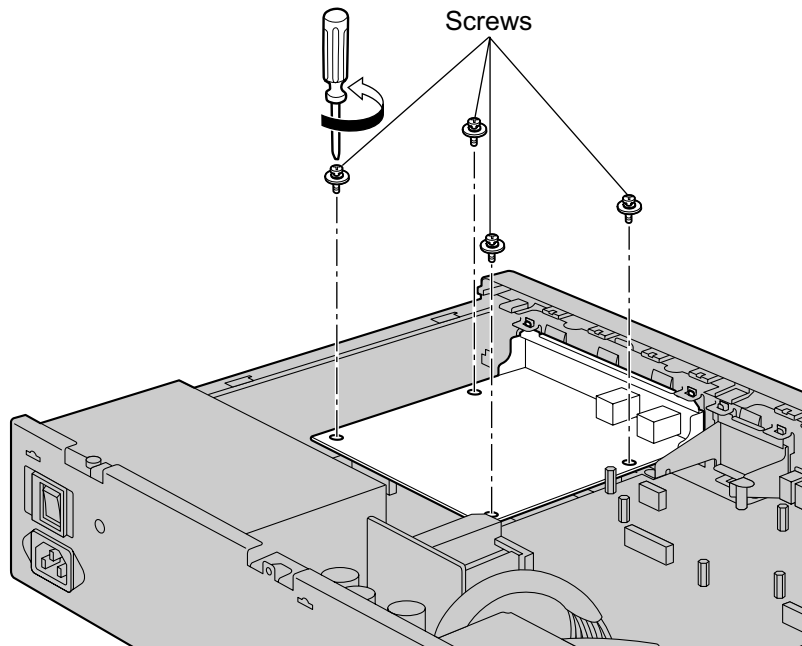
Screws

2. Holding the rear end of the card, pull the card in the direction of the arrows.
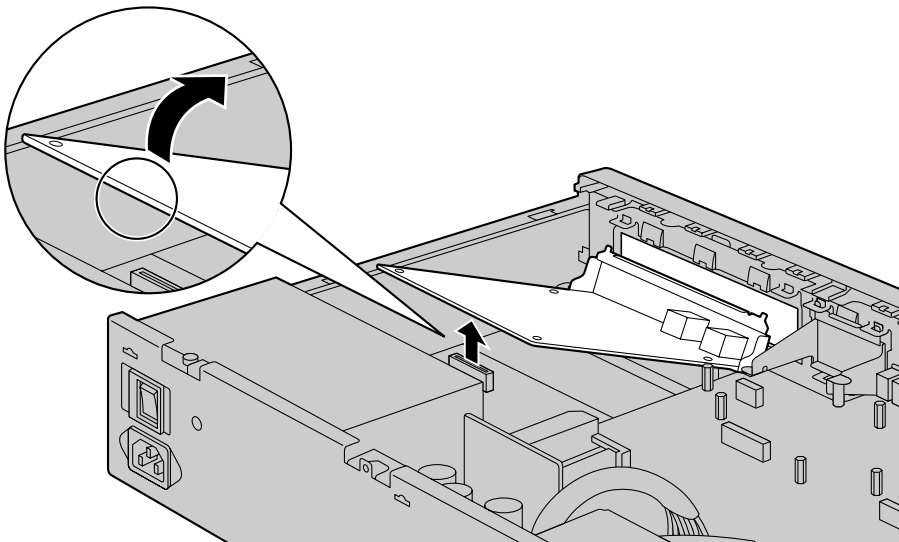
Installing the DOORPHONE Card in the Doorphone Slot

1. Remove the front cover plate for the Doorphone Slot.
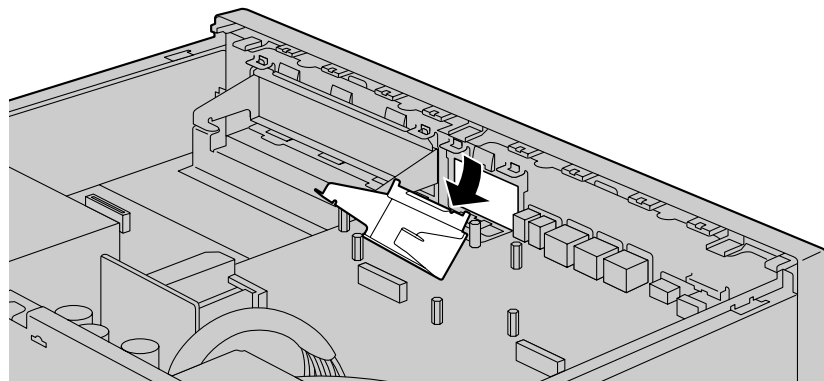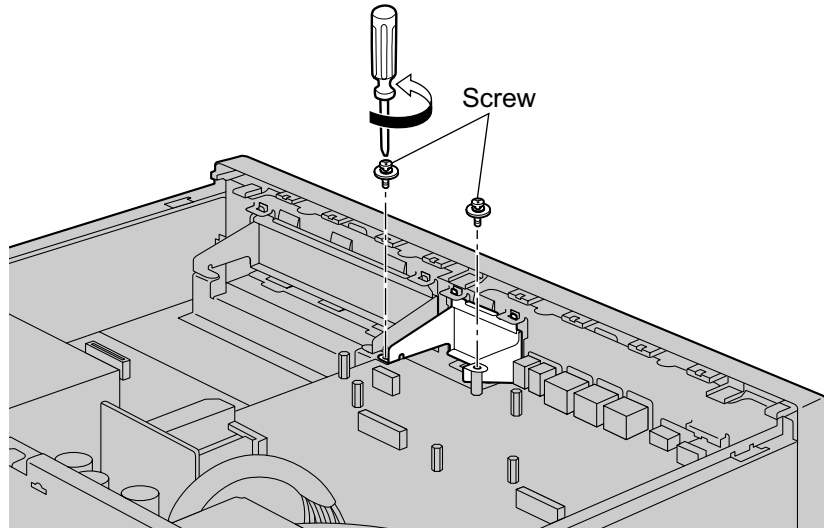
Screw

2. Position the card in the open slot, making sure that the tabs on the both sides of the card fit into place. Then, holding the card firmly in place, lower the rear end so that the holes of the card are aligned with the screw holes.
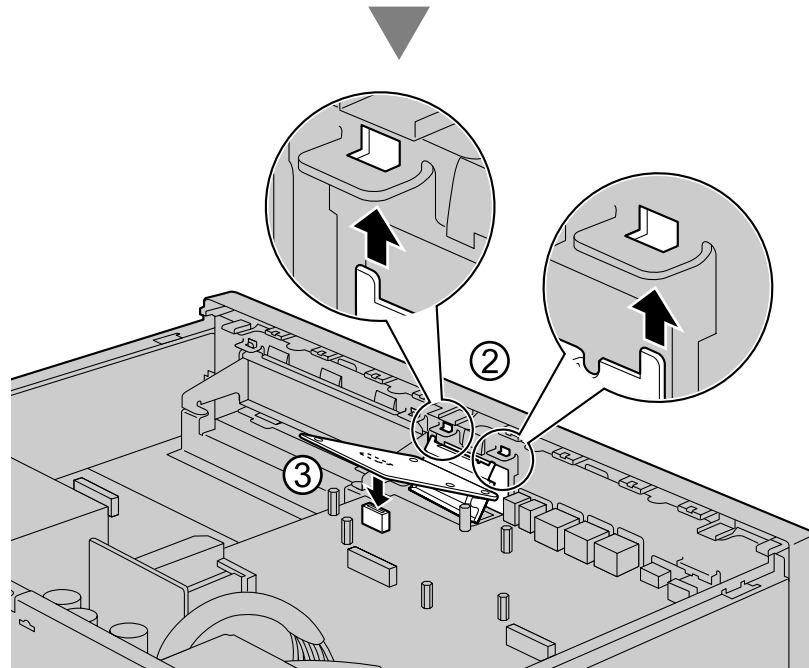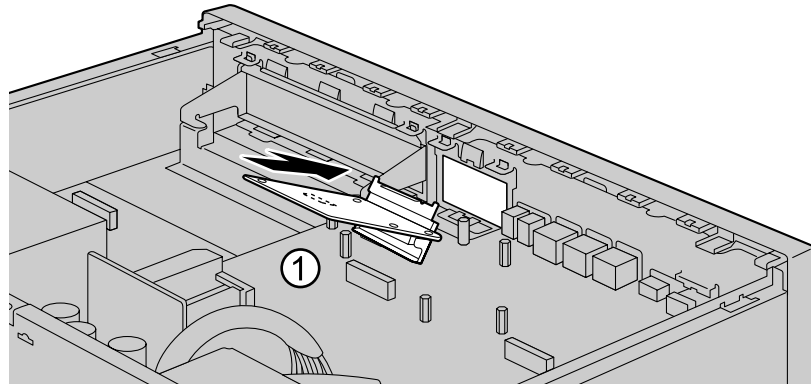
3. Insert the screws into the holes on the card, and tighten the screws to secure the card.

Screws

4. Connect cables to appropriate ports of the card. For details about pin assignments, refer to "4.6.1 DOORPHONE Card (KX-NS0161)" and "4.8 Connecting to a Doorphone, Door Opener, and/or External Sensor".
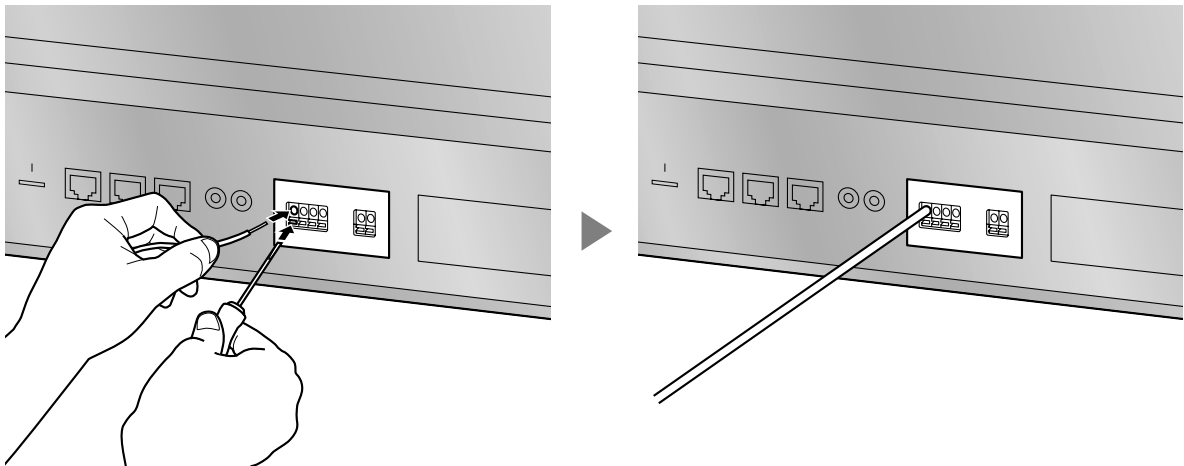
Note

Make sure to connect cables after installing the card in the PBX, not before.

Removing the DOORPHONE Card from the Doorphone Slot

1. Loosen and remove the screws.

Screws
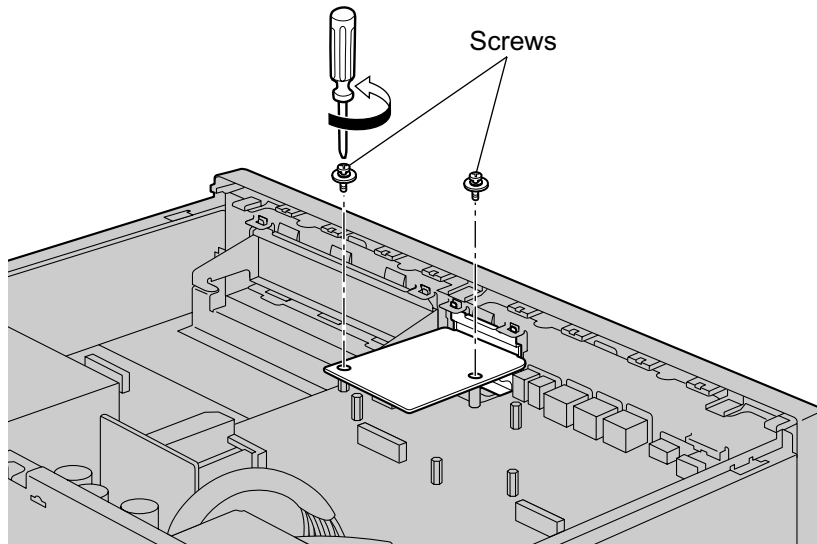
2. Holding the rear end of the card, pull the card in the direction of the arrows.
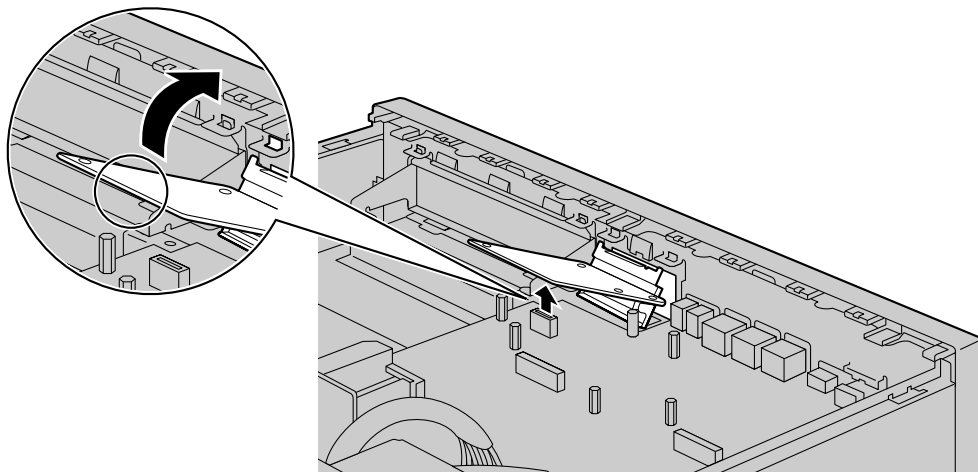
4.2.6 Installing/Removing the Storage Memory Card

Upgrading from the Initially Installed Storage Memory Card

To increase Voice Mail recording time, you can install an optional Storage Memory Card.
For details about optional Storage Memory Cards, refer to "4.3.2 Storage Memory Card (installed by default),
Storage Memory S Card (KX-NS0135), Storage Memory M Card (KX-NS0136), Storage Memory L Card
(KX-NS0137)".

System Prompts

    The Storage Memory Card (installed by default) and optional Storage Memory Cards contain system
prompts for Unified Messaging. However, system prompts language data stored in the Storage Memory
Card (installed by default) differ from those found in the optional Storage Memory Cards.
For information about the system prompt languages in each Storage Memory Card, refer to "7.7 System
Prompt Languages".
The system prompt language data you are using on the initially installed Storage Memory Card must be
backed up if you want to continue using that Storage Memory Card's system prompt language data. After
backing up the system prompt language data, install the optional Storage Memory Card, and then restore
the backed up system prompt language data to the new Storage Memory Card.
This procedure is described below.

1. Complete Easy Setup Wizard after starting the PBX.
   (For details, refer to "5.4.1 Easy Setup Wizard".)
2. Insert a USB memory device into the USB port of the PBX.
   (For details, refer to "Using a USB memory device" in "4.9 Connection of Peripherals".)
3. Back up the desired system prompts to the USB memory device.
   (For details, refer to "6.9 Tool—UM Data Backup" in the PC Programming Manual.)
4. Shut down the PBX, and then turn the power switch off.
   (For details about shutting down the PBX, refer to "5.5 System Control—System Shutdown" in the PC
   Programming Manual.)
5. Remove the Storage Memory Card (installed by default), and then install an optional Storage Memory
   Card.
   (For details, refer to "4.3.2 Storage Memory Card (installed by default), Storage Memory S Card
   (KX-NS0135), Storage Memory M Card (KX-NS0136), Storage Memory L Card (KX-NS0137)".)
6. Start the PBX as described in "System Initialisation Procedure" in "4.12 Starting the PBX".
7. Restore the system prompts backed up in step **3**. For details, refer to "6.10 Tool—UM Data Restore" in
   the PC Programming Manual.

Before Removing the Storage Memory Card

When removing the Storage Memory Card after the PBX has been in use, make a backup of the running system
data so the current data can be restored after installing a new Storage Memory Card. For details about making
backup files, refer to "7.2.2 Utility—File—File Transfer PBX to PC" in the PC Programming Manual.
Backup files cannot be made for some data. For details about which data is not backed up, refer to "Saving
Modified Data" in the PC Programming Manual. For details about restoring Unified Message data from a
backup, refer to "6.10 Tool—UM Data Restore" in the PC Programming Manual.

When you want to back up Unified Messaging system data, a separate backup procedure is required.
For details about backing up Unified Messaging data, refer to "6.9 Tool—UM Data Backup" in the PC
Programming Manual.

CAUTION

- Before touching the product (PBX, cards, etc.), discharge static electricity by touching ground or
  wearing an earthing strap. Failure to do so may cause the PBX to malfunction due to static electricity.
- When installing or removing the Storage Memory Card, the power switch must be turned off.
- When installing or removing the Storage Memory Card, do not put pressure on any parts of the mother
  board. Doing so may result in damage to the PBX.

- The Storage Memory Card contains software for all the processes of the PBX and all the customer data. Therefore, do not allow unauthorised access to prevent data leakage.
- To prevent data leakage, render the Storage Memory Card physically unusable before disposal.

Notice

- Use only the Storage Memory Card included with the PBX, or a Panasonic optional upgrade Storage Memory Card.
- The Storage Memory Card must be inserted in the Storage Memory Card slot of the mother board before startup.

Note

- The ▲ is shown on the label of your Storage Memory Card to indicate the direction for inserting the Storage Memory Card.
- The maximum length of file names for files that are to be stored in the Storage Memory Card is 60 characters.

1. Turn the screw anticlockwise to loosen.
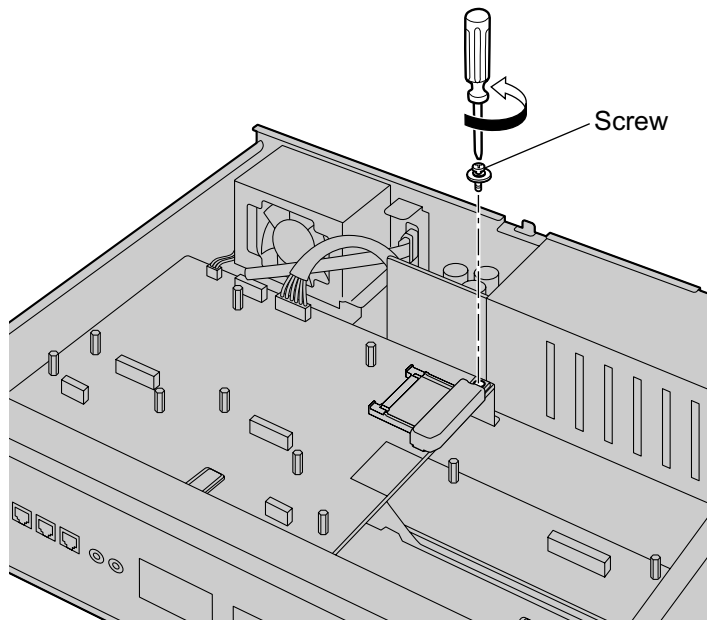
2. Remove the Storage Memory Card slot cover.
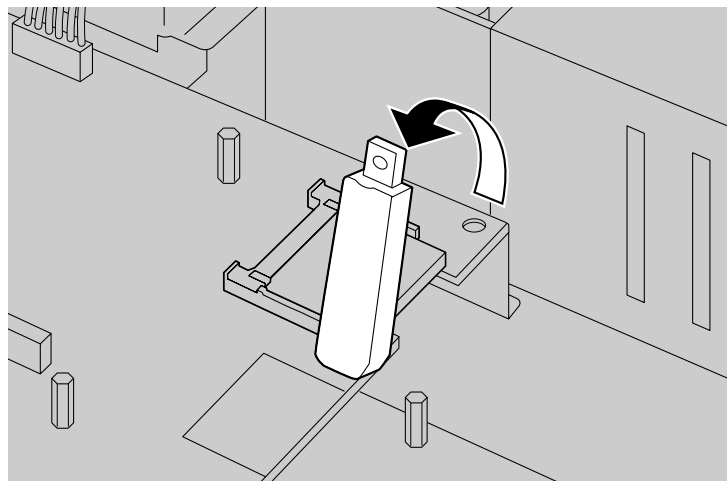
3. Remove the Storage Memory Card installed in the slot on the mother board.
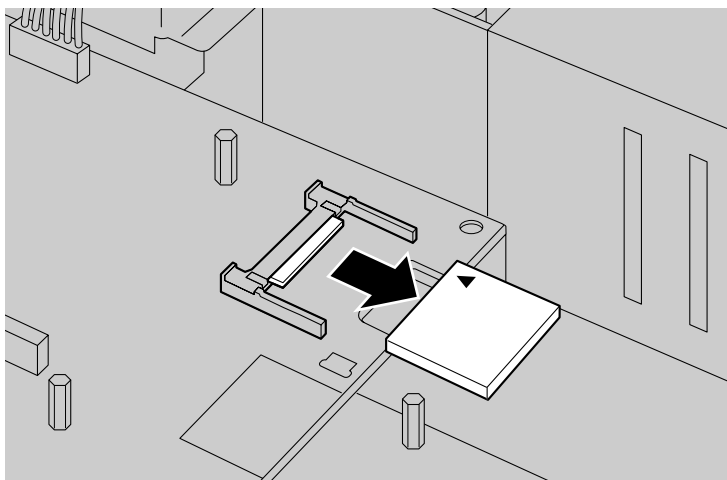
4. Insert the new Storage Memory Card into the slot on the mother board.
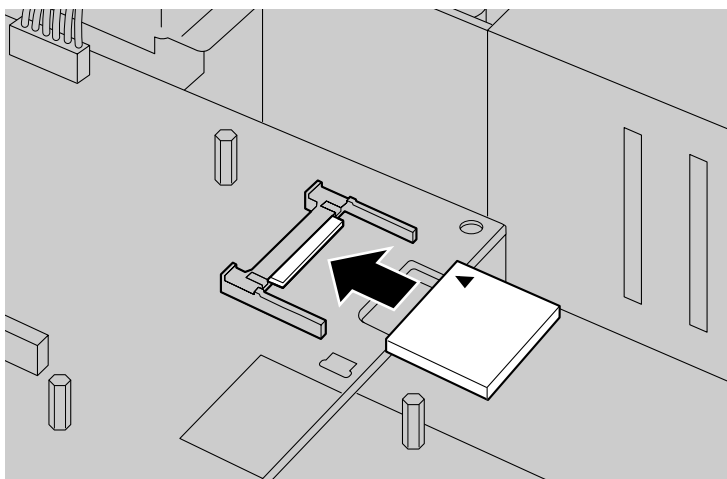
5. Place the cover as shown below.
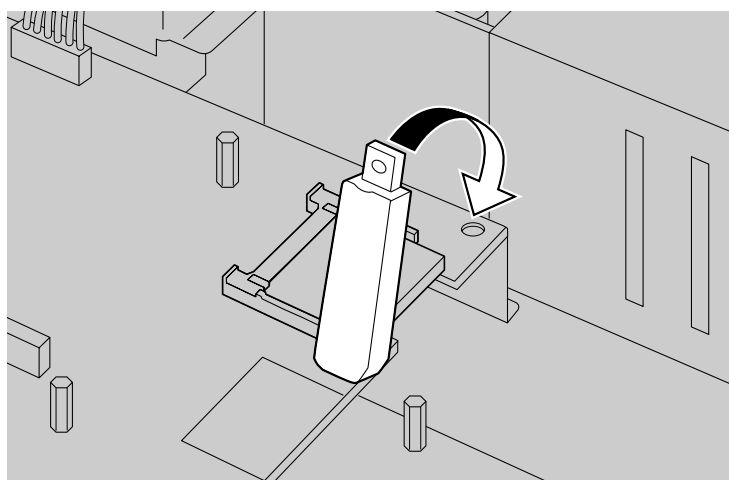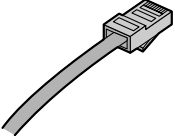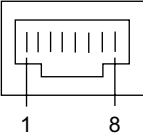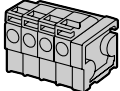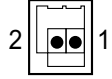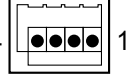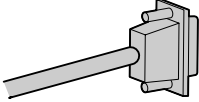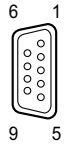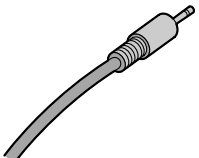
6. Turn the screw clockwise to tighten.

Screw
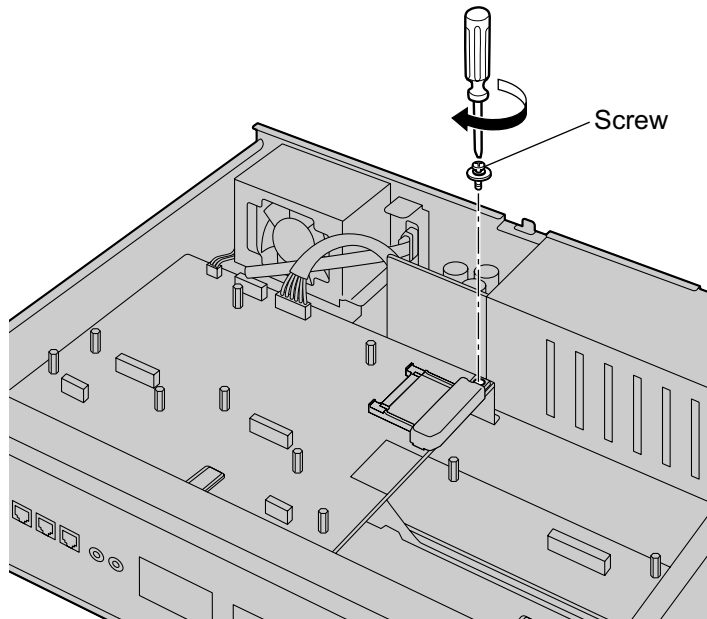
4.2.7 Types of Connectors

Connector Type	Pin Number	Used for
RJ45 (Twisted pair cable)	1　　　8	• Mother board • SLC2/LCOT2 (KX-NS0180) • SLC2/BRI4 (KX-NS0280) • SLC2/PRI30 (KX-NS0290CE) • SLC2/PRI23 (KX-NS0290)
4-pin Terminal Block　　2-pin Terminal Block	2 ●● 1 4 ●●●● 1	• DOORPHONE (KX-NS0161)
RS-232C (Shielded cable)	6　1 9　5	• Main Unit
Mini Plug	2 4	• Mother board

4.2.8 Attaching a Ferrite Core

A ferrite core must be attached when an RJ45 connector is connected to the SLC2/PRI30, SLC2/PRI23 or SLC2/BRI4 card.

For the SLC2/PRI23 and SLC2/PRI30 Cards

For the cable to connect to the ISDN Primary Rate Interface port, wrap the cable once around the ferrite core, then close the case of the ferrite core. Attach the ferrite core 5 cm away from the connector. The ferrite core is included with the card.
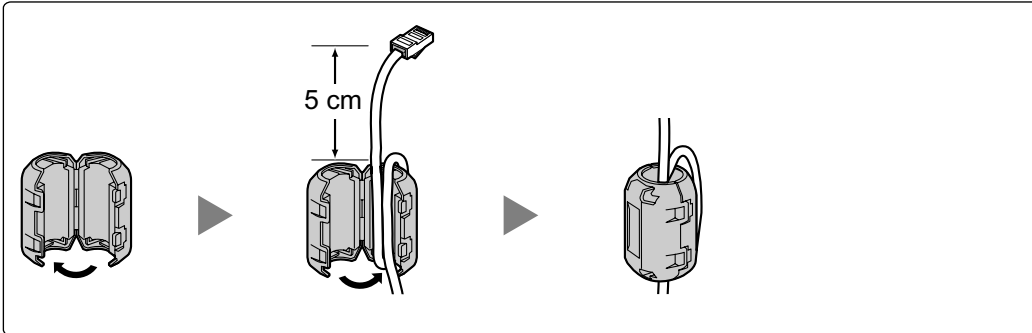
For the SLC2/BRI4 Card

For the cables to connect to the ISDN Basic Rate Interface ports, attach the ferrite cores, then close the cases of the ferrite cores. Attach the ferrite cores as close to the card's connectors as possible. The ferrite cores are included with the card.

When only 1 or 2 cables are used for connection, wrap the cable(s) once around the ferrite core.

When 3 or more cables are used for connections, wrap up to 2 cables around each ferrite core. All cables should be wrapped once around the ferrite core it is passing through.
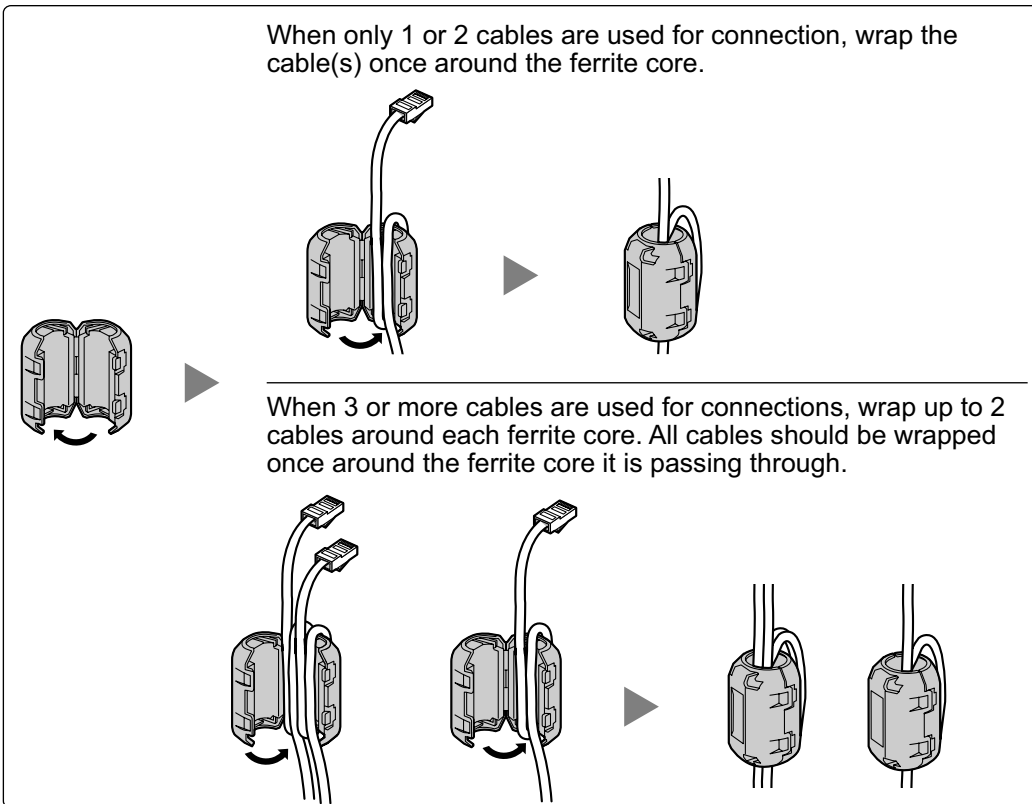
4.2.9 19-inch Rack Mounting

WARNING

- **Be careful not to drop any components. Dropping components may damage them or cause an injury.**
- **When mounting the PBX on a 19-inch rack, only use the 19-inch rack mounting equipment (attachment bracket, screws) included with the PBX.**

CAUTION

- When the PBX is mounted on a 19-inch rack, make sure that the installation of the unit does not cause the temperature of the rack to exceed its limit.
- When the PBX is mounted on a 19-inch rack, do not block the openings of the PBX. Allow space of at least 10 cm around the PBX's fan.
- If the PBX is not installed properly using the securing correct methods, the PBX may fall causing serious damage.
- When this product is no longer in use, make sure to detach it from the rack.

1. Fix the attachment brackets to the left and right sides of the PBX with 3 screws on each side.
   (Recommended torque: 0.8 N·m [8.2 kgf·cm] to 1.0 N·m [10.2 kgf·cm])→ ❶
2. Place the PBX in the 19-inch rack and fix both attachment brackets to the rack with the rack's proprietary mounting equipment. → ❷

Attachment Bracket

Screw
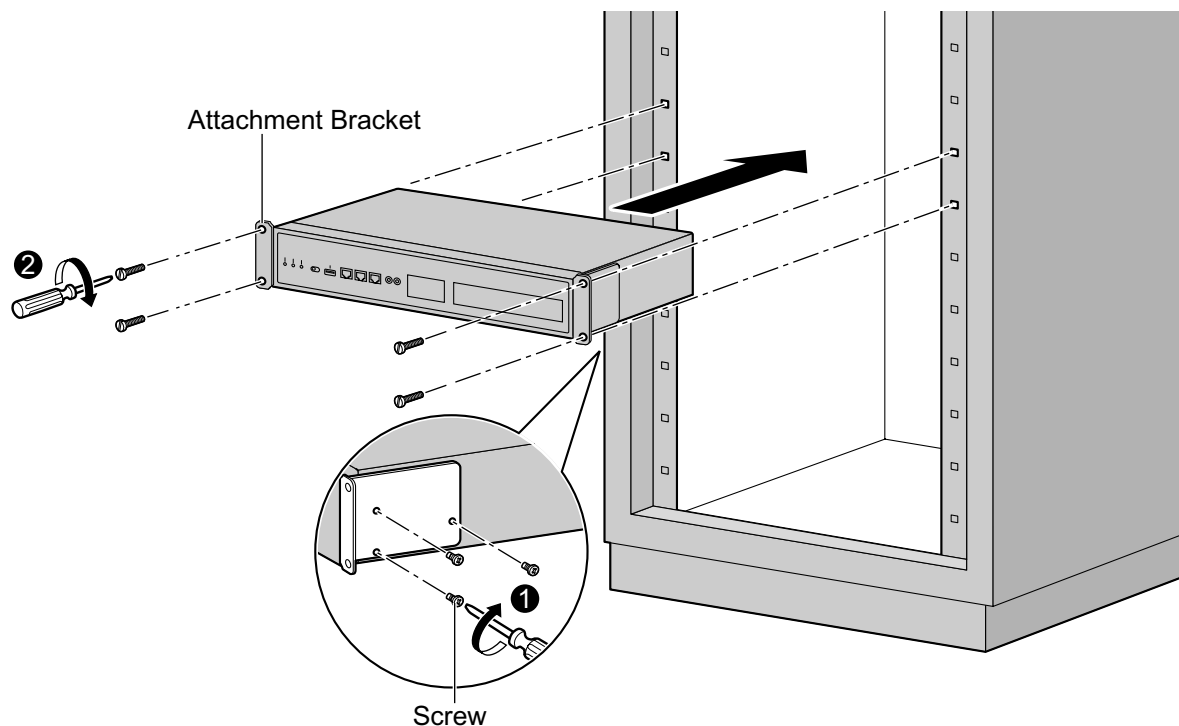
4.2.10 Placing the PBX on a Desktop

When placing the PBX on a desktop, make sure to follow these instructions.

WARNING

Be careful not to drop any components. Dropping components may damage them or cause an injury.

CAUTION

- When the PBX is placed on a desktop, make sure that the PBX is placed as indicated in the diagram below. Do not place it on its side or upside down.
- Do not block the openings of the PBX. Allow space of at least 20 cm above and 10 cm at the sides of the PBX.
- Make sure that the surface behind the PBX is not made of wood.

Desk or Table
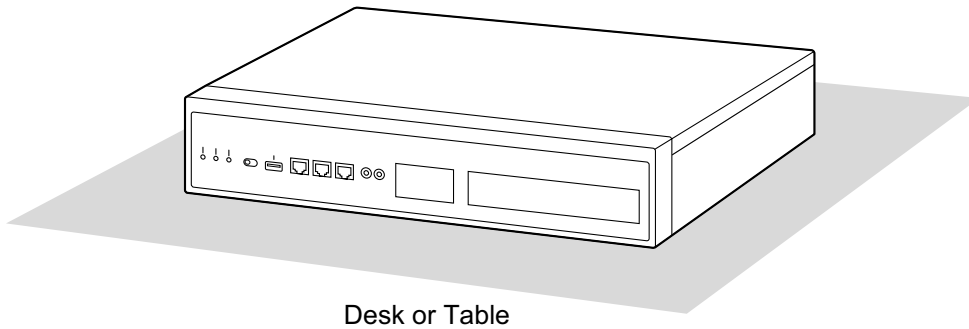
4.2.11 Wall Mounting

The PBX can be mounted on a concrete wall using the optional wall mounting kit.

WARNING

- **Make sure that the wall that the unit will be attached to is strong enough to support approximately 4 times the weight of the unit. If not, it is necessary for the wall to be reinforced.**
- **When mounting the PBX on a wall, only use the wall-mounting equipment (anchor plugs, screws, metal brackets) included with the PBX and the wall mounting kit.**
- **Be careful not to drop any components. Dropping components may damage them or cause an injury.**
- **Proper earthing (connection to earth) is very important to reduce the risk to the user of electrocution or to protect the PBX from the bad effects of external noise in the case of a lightning strike. (See "4.2.4 Frame Earth Connection".)**

CAUTION

- Make sure to install all necessary optional service cards in the PBX before performing the wall mounting procedure. If it is necessary to install or remove a card, make sure to detach the PBX from the wall before installing or removing the card.
- Do not block the openings of the PBX. Allow space of at least 20 cm above and 10 cm at the sides of the PBX.
- Make sure that the surface behind the PBX is flat and free of obstacles, so that the openings on the back of the PBX will not be blocked.
- Make sure that the surface behind the PBX is not made of wood.
- If the PBX is not installed properly using the securing correct methods, the PBX may fall causing serious damage.
- When placing the PBX onto the wall, make sure that the arrows on the metal brackets are pointing upward. If the arrows are not pointing upward, the PBX may fall, resulting in injury.
- When driving the screws into the wall, be careful to avoid touching any metal laths, wire laths or plates in the wall.
- When this unit is no longer in use, make sure to detach it from the wall.

Note

For details about dimensions and weight of the PBX, see "2.3.1 General Description".

Necessary Items

Included in the PBX		
Screw B		6
Included in the wall mounting kit (KX-A247)		
Top Bracket		1
Bottom Bracket		1
Anchor Plug (For use in concrete)		4
Screw A (For use in concrete)		4

Wall Mounting Procedures

1. Measure the actual space as indicated below to mark the 4 screw positions on the wall. Install 4 anchor plugs in the wall and drive in 4 screws (A) leaving a gap of 5 mm between the screw head and the wall.
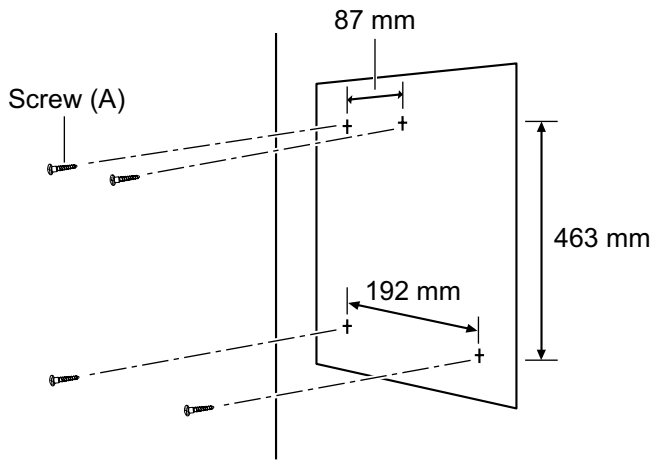
Installation procedure for concrete walls.
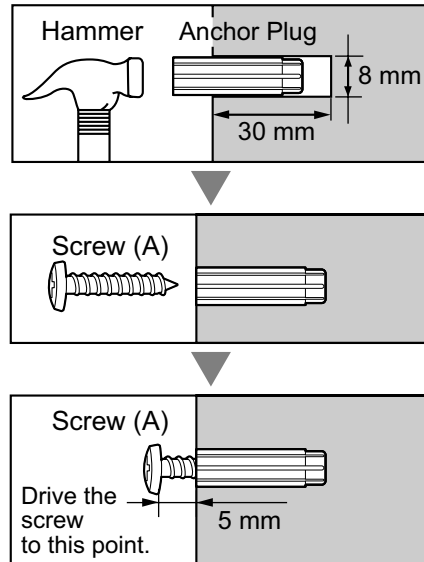
Note

- As indicated above, do not tighten the screws fully. You will tighten the screws in step **6**.
- The pull-out strength of the installation area must be at least 294 N (30 kgf) per screw.

2. Fix the Top Bracket to the left side of the PBX with 3 screws (B). (Recommended torque: 0.8 N·m [8.2 kgf·cm] to 1.0 N·m [10.2 kgf·cm])
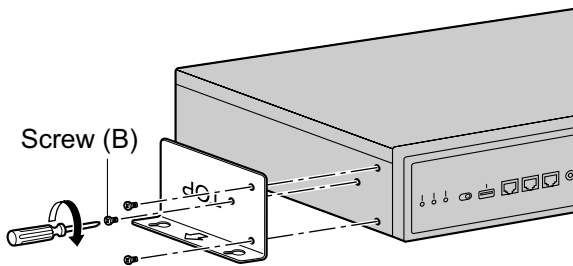
3. Fix the Bottom Bracket to the right side of the PBX with 3 screws (B). (Recommended torque: 0.8 N·m [8.2 kgf·cm] to 1.0 N·m [10.2 kgf·cm])
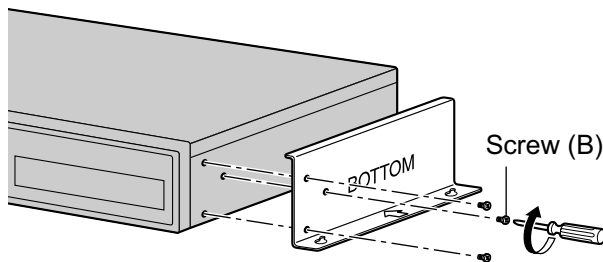
4. Place the PBX onto the wall, making sure that the guide holes hook onto the screw heads.
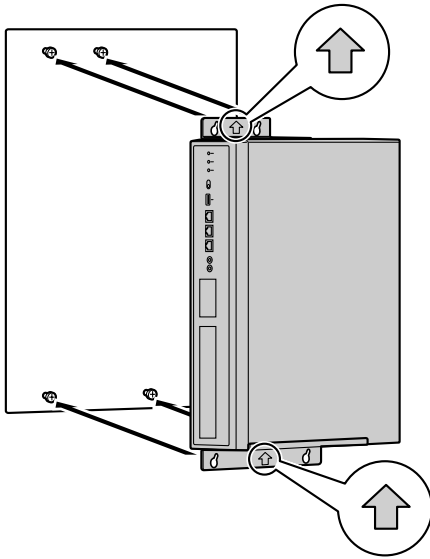
CAUTION

When placing the PBX onto the wall, make sure that the arrows on the metal brackets are pointing upward. If the arrows are not pointing upward, the PBX may fall, resulting in injury. The following illustrations are bad examples of wall mounting.
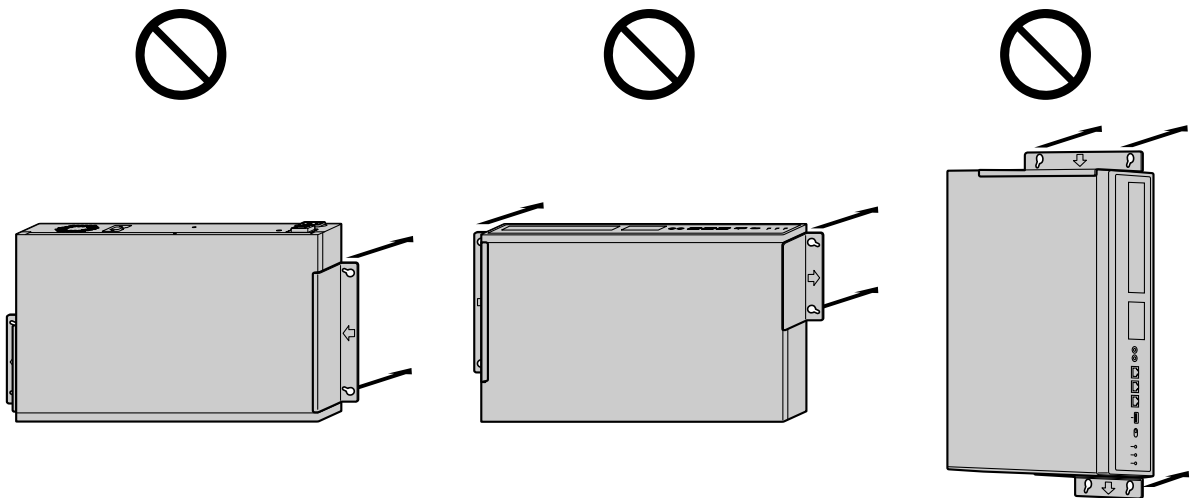
5. Slide the PBX down into the guide holes.

Guide Hole
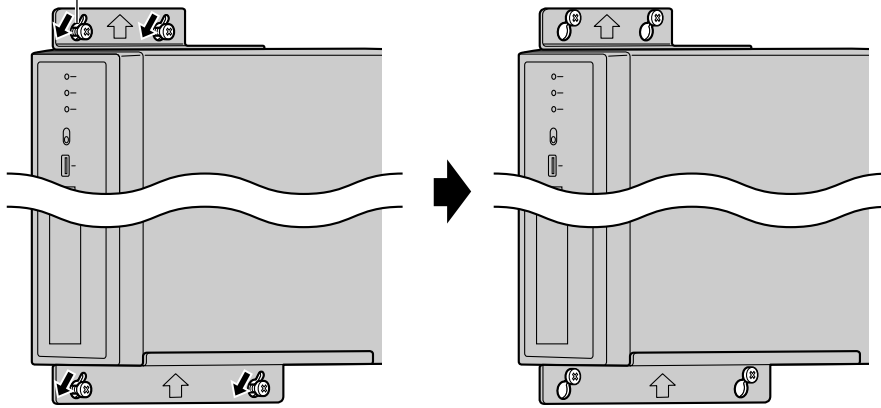
6. Fully tighten all 4 screws (A).

Drive the
screw
to this point.
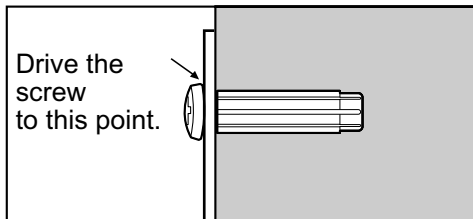
4.2.12 Surge Protector Installation

CAUTION

Performing surge protection is essential. Make sure to follow the instructions in this section.

Overview

A massive electrical surge can be caused if lightning strikes a telephone cable 10 m above ground, or if a telephone line comes into contact with a power line. A surge protector is a device that is connected to a trunk to prevent potentially dangerous electrical surges from entering the building via the trunk and damaging the PBX and connected equipment.

To protect the system from electrical surges, we strongly recommend connecting the system to a surge protector that meets the following specifications:
– Surge arrestor type: 3-electrode arrestor
– DC spark-over voltage: 230 V
– Maximum peak current: at least 10 kA
Additionally, proper earthing is very important for the protection of the system (refer to "4.2.4 Frame Earth Connection").

Many countries/areas have regulations requiring surge protection. Be sure to comply with all applicable laws, regulations, and guidelines.

Installation

Extn.: Extension line
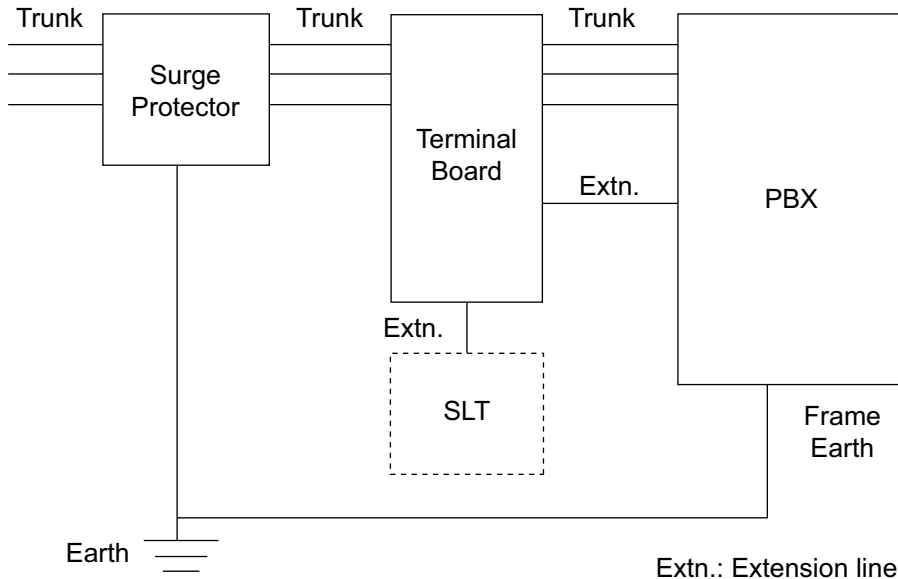
Outside Installation

Extn.: Extension Line
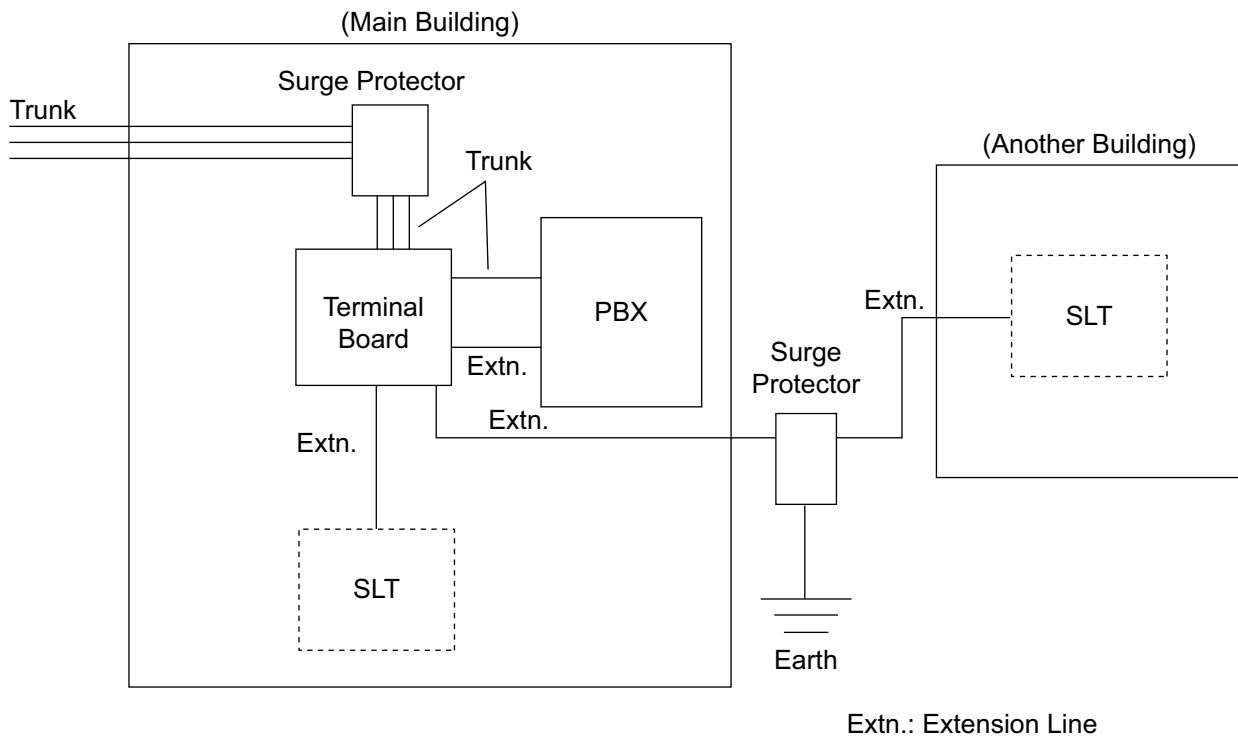
If you install an extension outside of the building, the following precautions are recommended:

a. Install the extension wire underground.

b. Use a conduit to protect the wire.

Note

The surge protector for an extension is different from that for trunks.

Installation of an Earth Rod
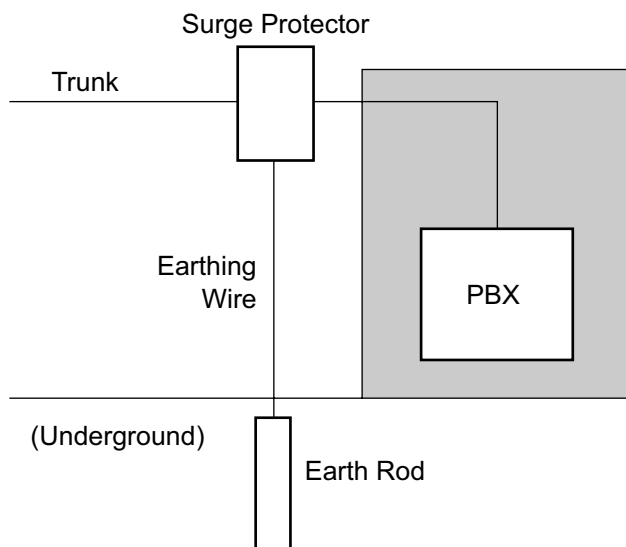
1. Connect the earth rod to the surge protector using an earthing wire with a cross-sectional area of at least 1.3 mm^2.
2. Bury the earth rod near the protector. The earthing wire should be as short as possible.
3. The earthing wire should run straight to the earth rod. Do not run the wire around other objects.
4. Bury the earth rod at least 50 cm underground.

Note
- The above figures are recommendations only.
- The length of earth rod and the required depth depend on the composition of the soil.

4.3 The Mother Board and Expansion Cards

4.3.1 Mother Board

Function

The mother board is the preinstalled processing board with activation keys for CA Basic-Express for 1022 users, use of 8 IP-PT, and 2 Unified Messaging ports. The Virtual Cards (trunk/extension) can be installed in Virtual Slots of the mother board and can be activated with the activation keys. Also, the mother board supports LAN connection so that IP telephones (IP-PTs, IP softphones, SIP phones) and PCs can be connected on a private IP network.

Mountable Cards

- Two of the DSP S, DSP M, or DSP L cards (refer to "4.3.3 DSP S Card (KX-NS0110), DSP M Card (KX-NS0111), DSP L Card (KX-NS0112)")
- Storage Memory Card (refer to "4.3.2 Storage Memory Card (installed by default), Storage Memory S Card (KX-NS0135), Storage Memory M Card (KX-NS0136), Storage Memory L Card (KX-NS0137)")
- FAX card (refer to "4.3.4 FAX Card (KX-NS0106)")
- DOORPHONE card (refer to "4.6.1 DOORPHONE Card (KX-NS0161)")
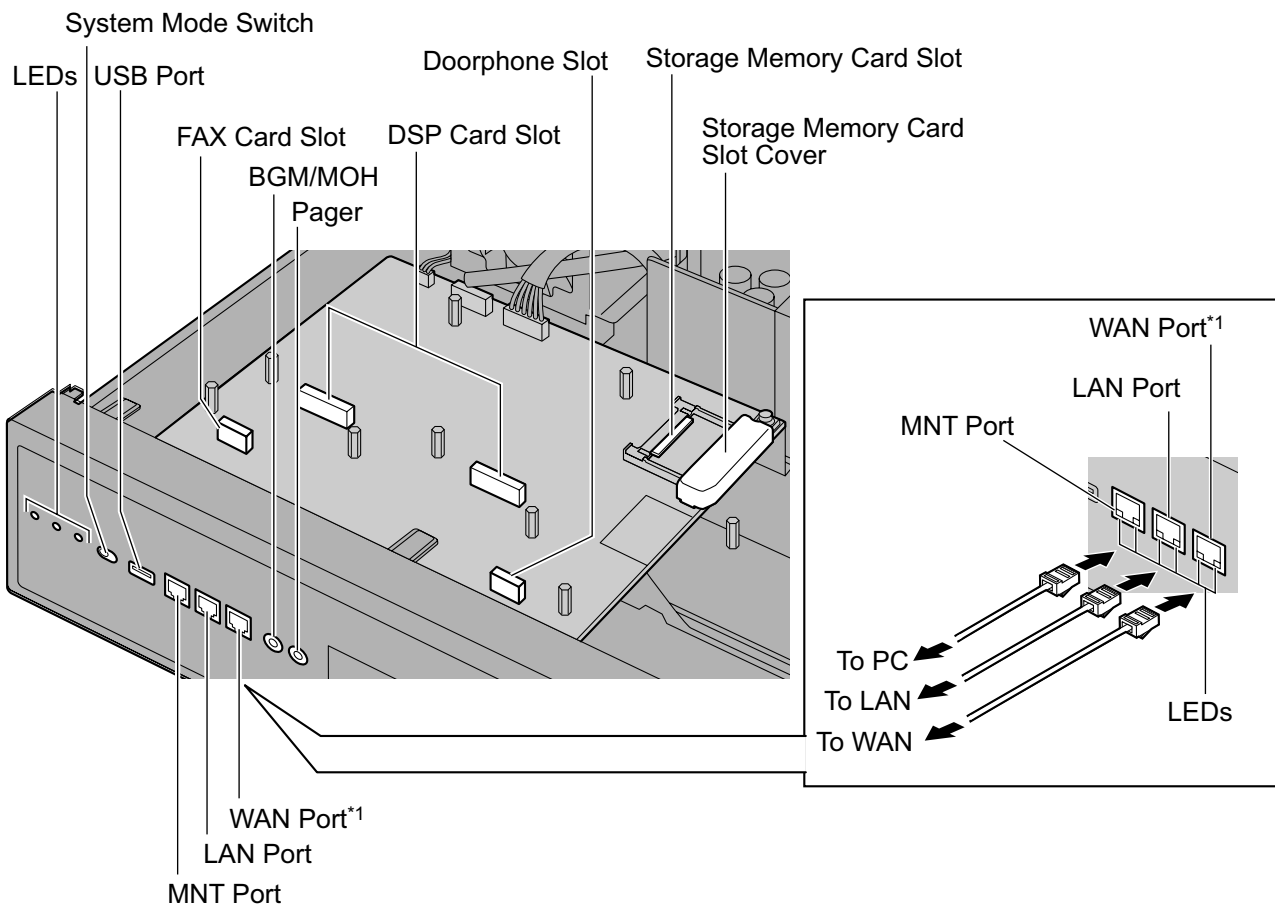
*1   The WAN Port is not used with PCMPR Software Version 001.10000.
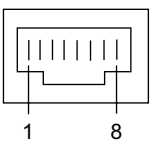
Note
- Make sure to use the MNT port for PC connection, and the LAN port for LAN connection.
- The maximum length of the CAT 5/CAT 5e cables to be connected to the mother board is 100 m.
- For installing and removing the Storage Memory Card, refer to "4.2.6 Installing/Removing the Storage Memory Card".
- For details about Virtual Slots, refer to "2.3.3 System Capacity".
- If the preinstalled activation keys on the mother board are not enough for the desired configuration, you need to purchase activation key codes. For details about the activation keys, refer to "3.1 Information about the Activation Keys".
- For details about connecting to a LAN, refer to "4.10 LAN Connection".
- For details about connecting peripherals, refer to "4.9 Connection of Peripherals".
- For details about System Mode Switch, refer to "4.12 Starting the PBX".
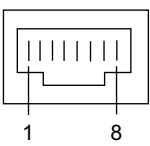
WARNING

A lithium battery is used in the mother board. There is a risk of explosion if the battery is replaced with the incorrect type. Dispose of used batteries according to the manufacturer's instructions.

Pin Assignments

MNT Port/LAN Port/WAN Port[1] (10BASE-T/100BASE-TX)

	No.	Signal Name	Input (I)/Output (O)	Function
	1	TPO+	O	Transmit data+
	2	TPO-	O	Transmit data-
	3	TPI+	I	Receive data+
	4-5	Reserved	–	–
1 8	6	TPI-	I	Receive data-
	7-8	Reserved	–	–

MNT Port/LAN Port/WAN Port[1] (1000BASE-T)

	No.	Signal Name	Input (I)/Output (O)	Function
	1	TRD0 (+)	I/O	Transmit and receive data 0 (+)
	2	TRD0 (-)	I/O	Transmit and receive data 0 (-)
	3	TRD1 (+)	I/O	Transmit and receive data 1 (+)
	4	TRD2 (+)	I/O	Transmit and receive data 2 (+)
	5	TRD2 (-)	I/O	Transmit and receive data 2 (-)
1 8	6	TRD1 (-)	I/O	Transmit and receive data 1 (-)
	7	TRD3 (+)	I/O	Transmit and receive data 3 (+)
	8	TRD3 (-)	I/O	Transmit and receive data 3 (-)

[1] The WAN Port is not used with PCMPR Software Version 001.10000.

LED Indications

Indication			Colour	Description
STATUS			Green	PBX status indication • OFF: Power Off • ON: Power On and running • Flashing: Starting up/Logging in
			Amber	PBX status indication • ON: Ready to shutdown • Flashing: Shutting down
			Red	PBX status indication • ON: Alarm (CPU stop, no IP address[es] assigned for the DSP card[s] by the DHCP server, alarm for each optional service card) • Flashing: Initialise failed
BATT ALARM			Red	Alarm indication • OFF: Normal • ON: Alarm
MASTER			Green	Master/Slave unit status indication • ON: Master
			Amber	Master/Slave unit status indication • ON: Slave • Flashing: Factory default
10BASE-T/ 100BASE-TX/ 1000BASE-T	MNT	LINK	Green	Link status indication • OFF: Off-line • ON: Linked normally • Flashing: In communication
		1000	Green/ Yellow	Data transmission speed indication • OFF: 10 Mbps • Yellow ON: 100 Mbps • Green ON: 1000 Mbps
	LAN	LINK	Green	Link status indication • OFF: Off-line • ON: Linked normally • Flashing: In communication
		1000	Green/ Yellow	Data transmission speed indication • OFF: 10 Mbps • Yellow ON: 100 Mbps • Green ON: 1000 Mbps

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Indication			Colour	Description
	WAN[*1]	LINK	Green	Link status indication • OFF: Off-line • ON: Linked normally • Flashing: In communication
		1000	Green/ Yellow	Data transmission speed indication • OFF: 10 Mbps • Yellow ON: 100 Mbps • Green ON: 1000 Mbps

[*1]   The WAN Port is not used with PCMPR Software Version 001.10000.

4.3.2 Storage Memory Card (installed by default), Storage Memory S Card (KX-NS0135), Storage Memory M Card (KX-NS0136), Storage Memory L Card (KX-NS0137)

Function

Storage Memory Card (Installed by default):	Storage Memory with 2 hours Voice Mail recording time. To increase recording time to a maximum of 15 hours, activate REC Time Expansion (KX-NSU001) activation key.
Storage Memory S:	Storage Memory with maximum of 200 hours Voice Mail recording time.
Storage Memory M:	Storage Memory with maximum of 450 hours Voice Mail recording time.
Storage Memory L:	Storage Memory with maximum of 1000 hours Voice Mail recording time.

Storage Memory Card

Storage Memory Card Slot

Mother Board
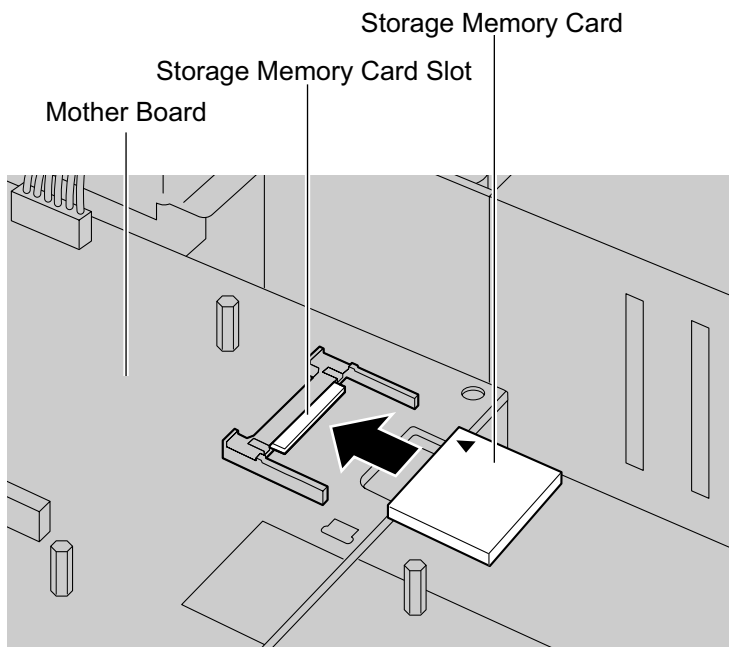
Accessories and User-supplied Items

Accessories (included): none
User-supplied (not included): none

Note

For installing and removing the Storage Memory Card, refer to "4.2.6 Installing/Removing the Storage Memory Card".

4.3.3 DSP S Card (KX-NS0110), DSP M Card (KX-NS0111), DSP L Card (KX-NS0112)

Function

A DSP card is a digital signal processor card with DSP resources that can be used for VoIP calls, conferences, the Unified Messaging feature, and the DISA/OGM feature. The DSP cards are compliant with ITU-T G. 729A and G.711 codec methods.

Depending on the amount of your DSP resource needs, DSP S, DSP M, or DSP L cards can be installed. Up to 2 DSP cards can be installed on the mother board.

To operate the PBX, at least one DSP S, DSP M, or DSP L card must be installed in one of the DSP card slots.
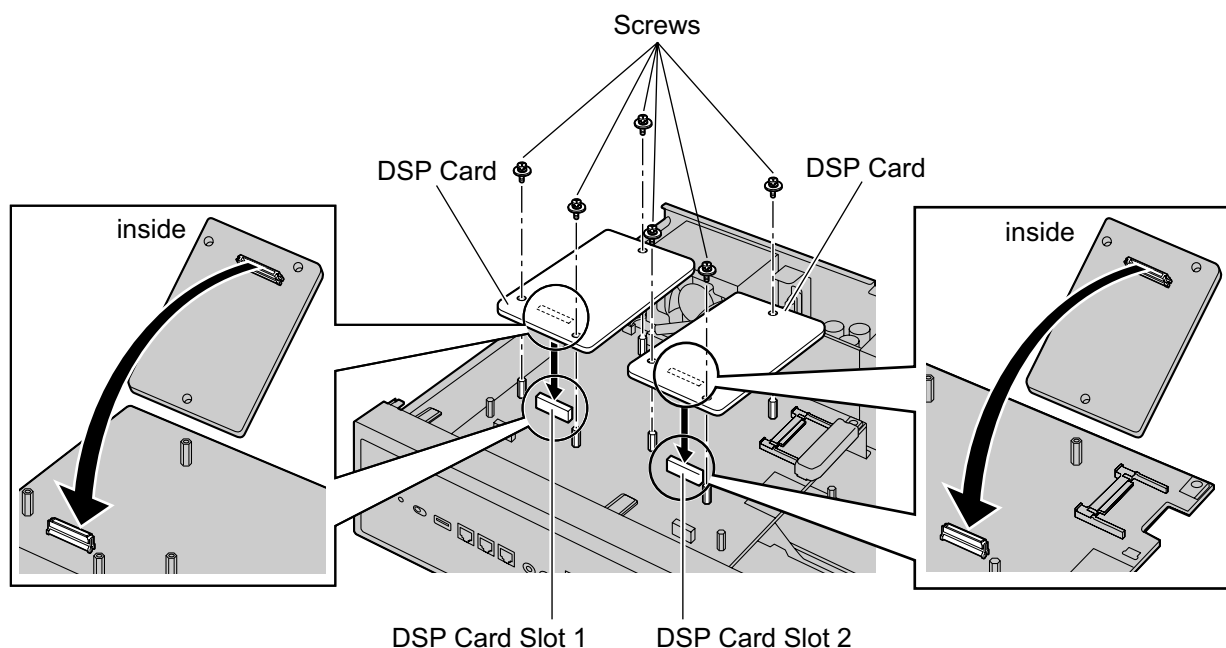
Accessories and User-supplied Items

Accessories (included): Screws × 3
User-supplied (not included): none

CAUTION

When installing or removing optional service cards, do not put pressure on any parts of the mother board. Doing so may result in damage to the PBX.

Note

The DSP Resource Advisor can be used to calculate DSP resource usage easily. For details, refer to "9.32.1.1 PBX Configuration—Configuration—DSP Resource—Setting—DSP Resource Advisor" in the PC Programming Manual.

DSP Resource Information

The number of resources provided by each type of DSP card is as follows:

DSP Card Type	Number of Resources
DSP S	63

DSP Card Type	Number of Resources
DSP M	127
DSP L	254

IP Address Information

Either 1 or 2 IP addresses must be assigned to each DSP card, depending on the type of DSP card. You can assign IP addresses to the DSP cards during Easy Setup Wizard or through system programming.
For details about Easy Setup Wizard, refer to "5.4.1 Easy Setup Wizard".
For details about assigning IP addresses through System Programming, refer to "Changing IP Address Settings".

DSP Card Type	Number of IP Addresses
DSP S/DSP M	1
DSP L	2

4.3.4 FAX Card (KX-NS0106)

Function

1-channel fax server. To be mounted on the mother board.
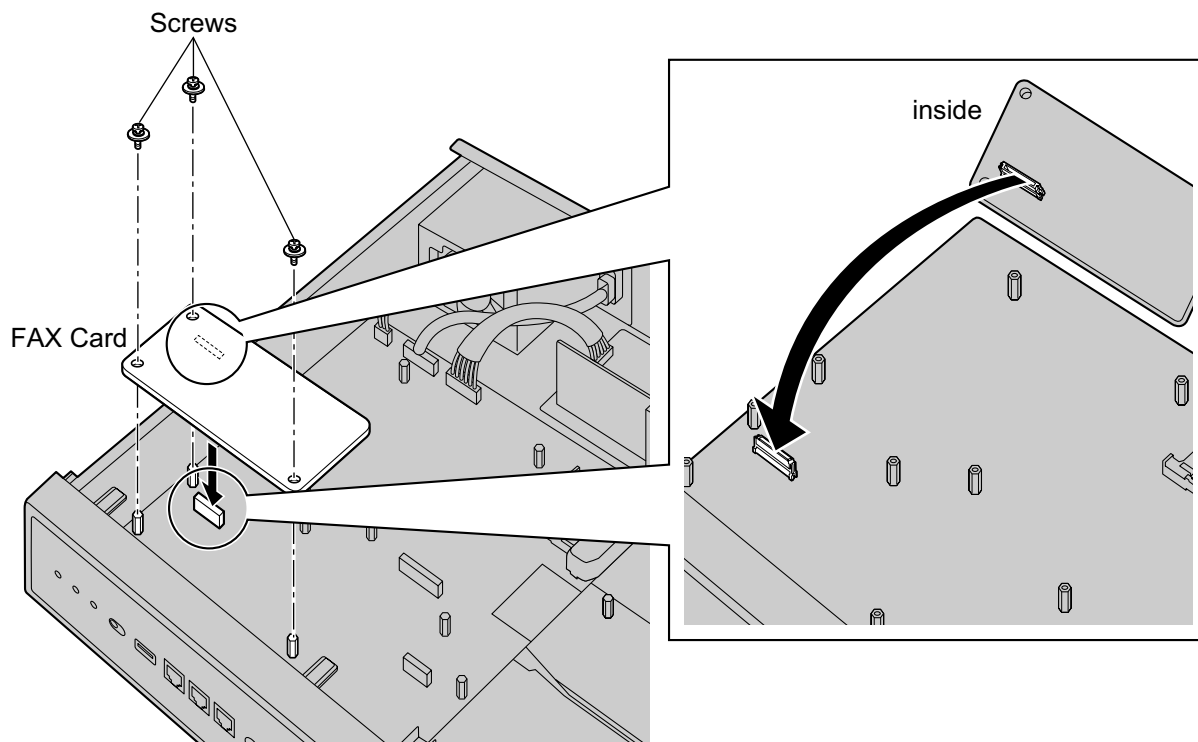
Accessories and User-supplied Items

Accessories (included): Screws × 3
User-supplied (not included): none

Note

> When installing or removing the FAX card, do not put pressure on any parts of the mother board. Doing so may result in damage to the PBX.

4.4 Virtual Cards

Function

Virtual Cards are programs included with the mother board and that are treated as virtual cards by Web Maintenance Console for convenience. Those programs can be activated with the appropriate activation key (apart from V-IPCS4 cards, which do not require activation keys). By installing Virtual Cards in the Virtual Slots of the mother board using Web Maintenance Console, IP trunks, IP extensions, and IP-CSs can be used via the mother board.

Virtual Card	Description
Virtual 16-Channel SIP Trunk Card (V-SIPGW16)	Virtual Card for 16-channel SIP trunk. Compliant with RFC 3261, 3262, 3264, 3311, 3581, 3960 and 4028 protocols, and ITU-T G.729A and G.711 codec methods. Also supports T.38 protocol.
Virtual 16-Channel VoIP Gateway Card (V-IPGW16)	Virtual Card for 16-channel H.323 trunk. Compliant with VoIP H.323 V.5 protocol, and ITU-T G.729A and G.711 codec methods. Also supports T.38 protocol.
Virtual 32-Channel VoIP Extension Card (V-IPEXT32)	Virtual Card for 32 IP-PTs (KX-NT300 series and KX-NT265 [software version 2.00 or later only]). Compliant with Panasonic proprietary protocol, and ITU-T G.729A, G.711 and G.722 codec methods.
Virtual 32-Channel SIP Extension Card (V-SIPEXT32)	Virtual Card for 32 third party SIP phones. Compliant with RFC 3261, 3264, 3310, 2327 and 4028 protocols, and ITU-T G.729A, G.711 and G.722 codec methods.
Virtual 4 IP Cell Station Interface Card (V-IPCS4)	Virtual Card for 4 IP-CSs. Compliant with ITU-T G.729A and G.711 codec methods.
Virtual UT Extension Card (V-UTEXT32)	Virtual Card for 32 KX-UT series SIP phones. Compliant with RFC 2327, 3261, 3264, 3310, 3515, 4028 and 4235 protocols, and ITU-T G.729A, G.711 and G.722 codec methods. Also supports WSD, CWMP and HTTP.

Example: Virtual Cards in the Virtual Slots of the PBX

Virtual Slots

Mother Board
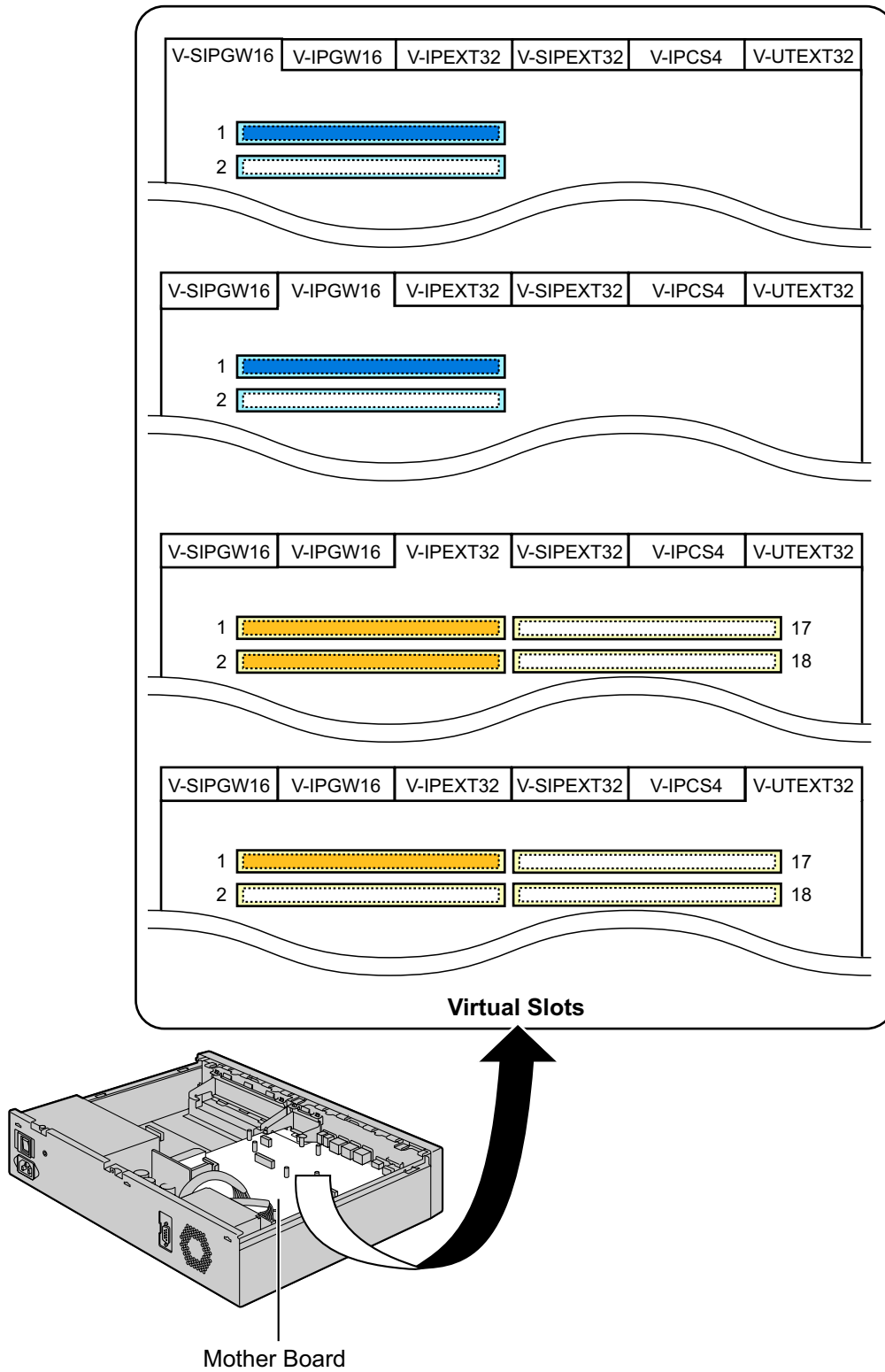
4.5 Physical Trunk and Extension Cards

4.5.1 SLC2/LCOT2 Card (KX-NS0180)

Function

A combination card including:

*   2 analogue trunk ports with Caller ID (FSK/FSK with Call Waiting Caller ID [Visual Caller ID]/DTMF). One port is a power failure transfer (PFT) port.
*   2 extension ports with Caller ID (FSK) for SLTs.
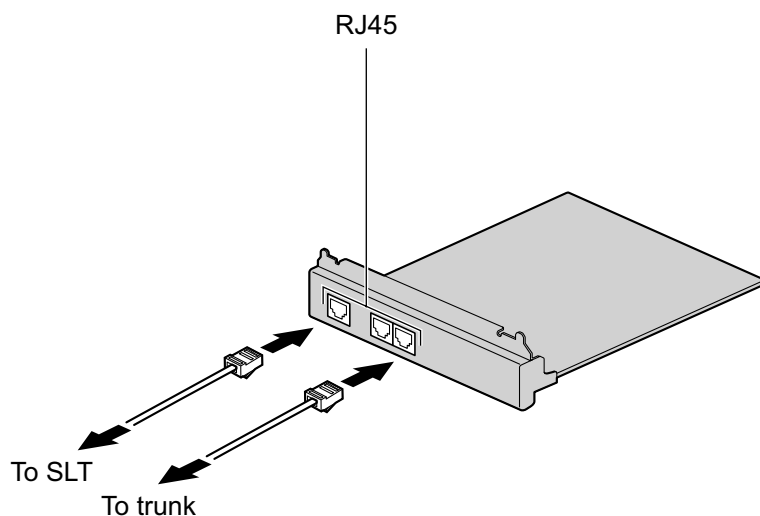
Accessories and User-supplied Items

Accessories (included): Screws × 4
User-supplied (not included): RJ45 connector, Twisted pair cable

Note
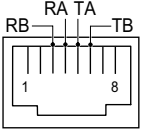
*   For details about power failure transfer, refer to "4.11 Power Failure Ports".
*   To confirm the trunk connection, refer to "Confirming the Trunk Connection" in "4.12 Starting the PBX".

Pin Assignments

RJ45 Connector for Trunk Use

	No.	Signal Name	Function
R T 1 8	1-3	Reserved	–
	4	R	Ring
	5	T	Tip
	6-8	Reserved	–

RJ45 Connector for Single Line Telephone Extension Use

	No.	Signal Name	Function
RB ⎯ ⎯ TB RA TA 1 8	1-2	Reserved	–
	3	RB	Ring B
	4	RA	Ring A
	5	TA	Tip A
	6	TB	Tip B
	7-8	Reserved	–

4.5.2 SLC2/BRI4 Card (KX-NS0280)

Function

A combination card including:
- 4 ISDN Basic Rate Interface ports.
- 2 extension ports with Caller ID (FSK) for SLTs.

EURO-ISDN/ETSI compliant.
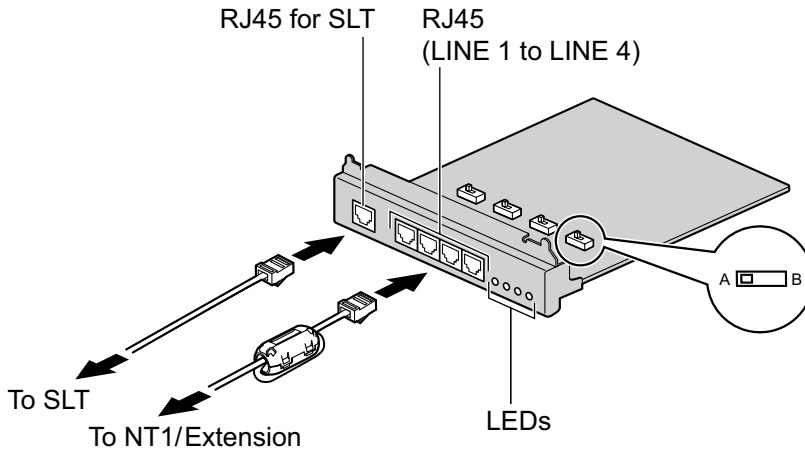
Accessories and User-supplied Items

Accessories (included): Ferrite core × 2, Screws × 4
User-supplied (not included): RJ45 connector, Twisted pair cable

CAUTION

When connecting this optional service card to the trunk, connect through an NT1; do not connect to the U interface of the trunk directly.

Notice

When connecting the RJ45 connector, attach the included ferrite core. Refer to "4.2.8 Attaching a Ferrite Core".

Note
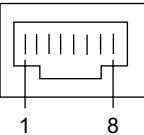
- This optional service card has 100 Ω of terminal resistance. For use in point to multi-point connection, the card must be placed at the end of the bus.
- This optional service card can be used for either trunk or extension connection, by setting the A/B switch or using the connector with appropriate pin assignments.
- To confirm the trunk connection, refer to "Confirming the Trunk Connection" in "4.12 Starting the PBX".

Switch Settings
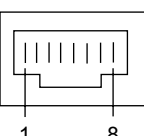
Switch	Type	Usage and Status Definition
A/B	Slide	Select A (default) for trunk or B for extension use.

Pin Assignments
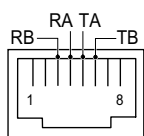
RJ45 Connector for Trunk Use

	No.	Signal Name	Level [V]	Function
	1-2	Reserved	–	–
	3	TX1	(+)	Transmit data 1
	4	RX1	(+)	Receive data 1
	5	RX2	(-)	Receive data 2
	6	TX2	(-)	Transmit data 2
	7-8	Reserved	–	–

RJ45 Connector for Extension Use

	No.	Signal Name	Level [V]	Function
	1-2	Reserved	–	–
	3	RX1	(+)	Receive data 1
	4	TX1	(+)	Transmit data 1
	5	TX2	(-)	Transmit data 2
	6	RX2	(-)	Receive data 2
	7-8	Reserved	–	–
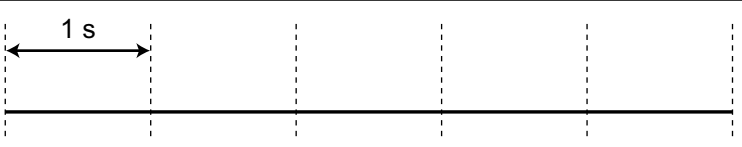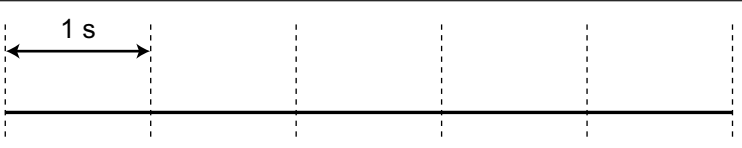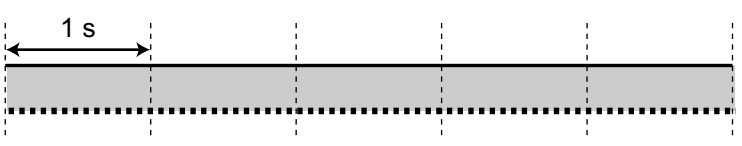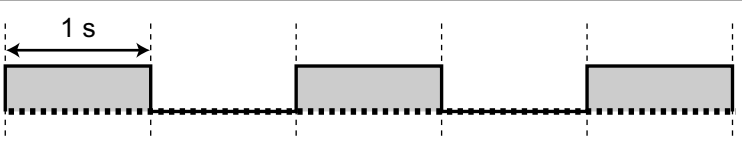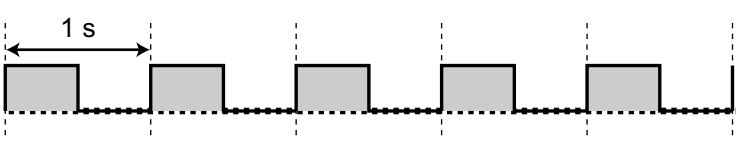
RJ45 Connector for Single Line Telephone Extension Use

	No.	Signal Name	Function
	1-2	Reserved	–
	3	RB	Ring B
	4	RA	Ring A
	5	TA	Tip A
	6	TB	Tip B
	7-8	Reserved	–

LED Indications

Indication	Colour	Description
LINE 4 LINE 3 LINE 2 LINE 1	Green	Line status indication (LINE 1 to LINE 4): Refer to "LINE LED Pattern" below for details.

LINE LED Pattern

Layer 1	Layer 2	Master Clock	LED Pattern
OFF	OFF	OFF	
ON	OFF	OFF	
ON	ON	OFF	
ON	OFF	ON	
ON	ON	ON	

Layer 1: ON (Synchronous)
Layer 2: ON (Link established)/OFF (Link not established)
Master Clock: ON (Master)/OFF (Slave)

Maximum Cabling Distance of ISDN DSU Connection

The maximum length of the cable that connects the DSU and the PBX is shown below:
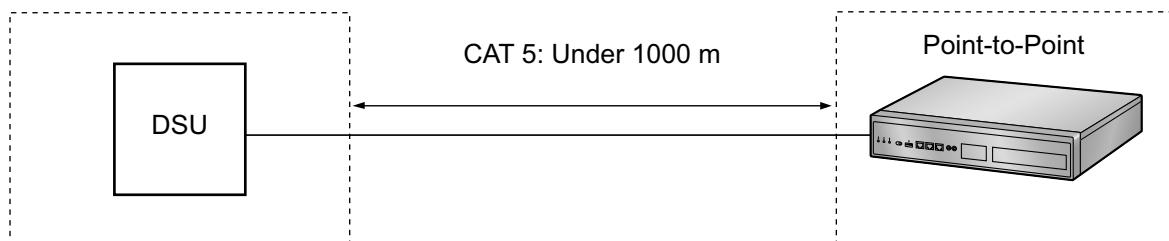
Maximum Cabling Distance of ISDN Terminal Equipment (TE) Connection

The maximum length of the extension cable that connects the PBX and the TE is shown below:
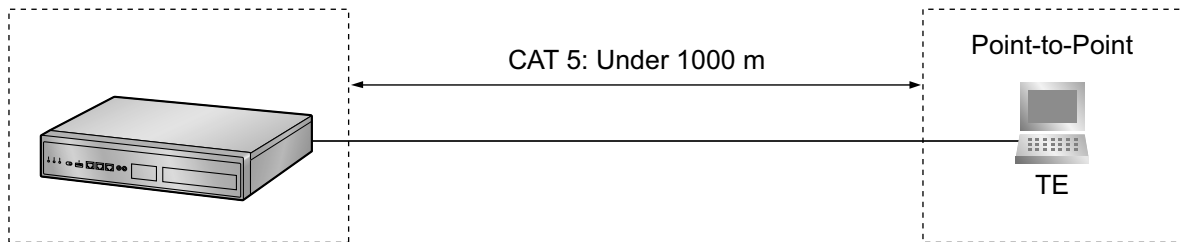
4.5.3 SLC2/PRI30 Card (KX-NS0290CE)

Function

A combination card including:
- 1 ISDN Primary Rate Interface port (30B channels).
- 2 extension ports with Caller ID (FSK) for SLTs.

EURO-ISDN/ETSI compliant.

Accessories and User-supplied Items

Accessories (included): Ferrite core × 1, Screws × 4
User-supplied (not included): RJ45 connector, Twisted pair cable

CAUTION

- When connecting this optional service card to the trunk, connect through an NT1; do not connect to the U interface of the trunk directly.
- PRI ports are SELV ports and should only be connected to SELV services.

Notice

- When connecting the RJ45 connector, attach the included ferrite core. Refer to "4.2.8 Attaching a Ferrite Core".
- The cable to connect to the ISDN Primary Rate Interface port of the SLC2/PRI30 card should be CAT 5 (Category 5) or higher.

Note
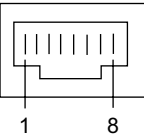
- In some countries/areas, this optional service card must not be connected to the Public Switched Telephone Network.
- This optional service card can be used for either trunk or extension connection, by setting the A/B switch or using the connector with appropriate pin assignments.
- To confirm the trunk connection, refer to "Confirming the Trunk Connection" in "4.12 Starting the PBX".

Switch Settings

Switch	Type	Usage and Status Definition
A/B	Slide	Select A (default) for trunk or B for extension use.

Pin Assignments

RJ45 Connector for Trunk Use

	No.	Signal Name	Level [V]	Function
	1	RX+	(+)	Receive data (+)
	2	RX-	(-)	Receive data (-)
	3	Reserved	–	–
	4	TX-	(-)	Transmit data (-)
	5	TX+	(+)	Transmit data (+)
	6-8	Reserved	–	–

RJ45 Connector for Extension Use

	No.	Signal Name	Level [V]	Function
	1	TX-	(-)	Transmit data (-)
	2	TX+	(+)	Transmit data (+)
	3	Reserved	–	–
	4	RX+	(+)	Receive data (+)
	5	RX-	(-)	Receive data (-)
	6-8	Reserved	–	–

RJ45 Connector for Single Line Telephone Extension Use

	No.	Signal Name	Function
	1-2	Reserved	–
	3	RB	Ring B
	4	RA	Ring A
	5	TA	Tip A
	6	TB	Tip B
	7-8	Reserved	–

LED Indications

Indication	Colour	Description
SERR	Red	Non-synchronisation status indication • OFF: Normal • ON: Out of synchronisation

Indication	Colour	Description
RAI	Red	RAI signal status indication • OFF: Normal • ON: Alarm • Flashing (60 times per minute): Alarm (Clock Master)
AIS	Red	AIS status indication • OFF: Normal • ON: Alarm
SYNC	Green	Synchronisation status indication • OFF: Not synchronised • ON: Synchronised • Flashing (60 times per minute): Synchronised (External Clock Master)
DLK	Green	Data link status indication • OFF: Not established • ON: Established

Maximum Cabling Distance of Extension Connection

The maximum length of the extension cable that connects the PRI port is shown below:

CAT 5: Under 200 m

4.5.4 SLC2/PRI23 Card (KX-NS0290)

Function

A combination card including:
- 1 ISDN Primary Rate Interface port (23B channels).
- 2 extension ports with Caller ID (FSK) for SLTs.

NI (North American standard ISDN protocol) compliant.

Accessories and User-supplied Items

Accessories (included): Ferrite core × 1, Screws × 4
User-supplied (not included): RJ45 connector, Twisted pair cable

CAUTION

- When connecting this optional service card to the trunk, connect through an NT1; do not connect to the U interface of the trunk directly.
- PRI ports are SELV ports and should only be connected to SELV services.

Notice

- When connecting the RJ45 connector, attach the included ferrite core. Refer to "4.2.8 Attaching a Ferrite Core".
- The cable to connect to the ISDN Primary Rate Interface port of the SLC2/PRI23 card should be CAT 5 (Category 5) or higher.

Note

- This optional service card can be used for either trunk or extension connection, by setting the A/B switch or using the connector with appropriate pin assignments.
- To confirm the trunk connection, refer to "Confirming the Trunk Connection" in "4.12 Starting the PBX".

Switch Settings

Switch	Type	Usage and Status Definition
A/B	Slide	Select A (default) for trunk or B for extension use.

Pin Assignments

RJ45 Connector for Trunk Use

	No.	Signal Name	Level [V]	Function
	1	RX+	(+)	Receive data (+)
	2	RX-	(-)	Receive data (-)
	3	Reserved	–	–
	4	TX-	(-)	Transmit data (-)
	5	TX+	(+)	Transmit data (+)
	6-8	Reserved	–	–

RJ45 Connector for Extension Use

	No.	Signal Name	Level [V]	Function
	1	TX-	(-)	Transmit data (-)
	2	TX+	(+)	Transmit data (+)
	3	Reserved	–	–
	4	RX+	(+)	Receive data (+)
	5	RX-	(-)	Receive data (-)
	6-8	Reserved	–	–

RJ45 Connector for Single Line Telephone Extension Use

	No.	Signal Name	Function
	1-2	Reserved	–
	3	RB	Ring B
	4	RA	Ring A
	5	TA	Tip A
	6	TB	Tip B
	7-8	Reserved	–

LED Indications

Indication	Colour	Description
SERR	Red	Non-synchronisation status indication • OFF: Normal • ON: Out of synchronisation

Indication	Colour	Description
RAI	Red	RAI signal status indication • OFF: Normal • ON: Alarm (Clock Slave) • Flashing (60 times per minute): Alarm (Clock Master)
AIS	Red	AIS status indication • OFF: Normal • ON: Alarm
SYNC	Green	Synchronisation status indication • OFF: Not synchronised • ON: Synchronised • Flashing (60 times per minute): Synchronised (External Clock Master)
DLK	Green	Data link status indication • OFF: Not established • ON: Established

Maximum Cabling Distance of Extension Connection

The maximum length of the extension cable that connects the PRI port is shown below:

CAT 5: Under 200 m

4.6 The Doorphone Card

4.6.1 DOORPHONE Card (KX-NS0161)

Function

A doorphone card for 1 doorphone, 1 door opener, and 1 external sensor.
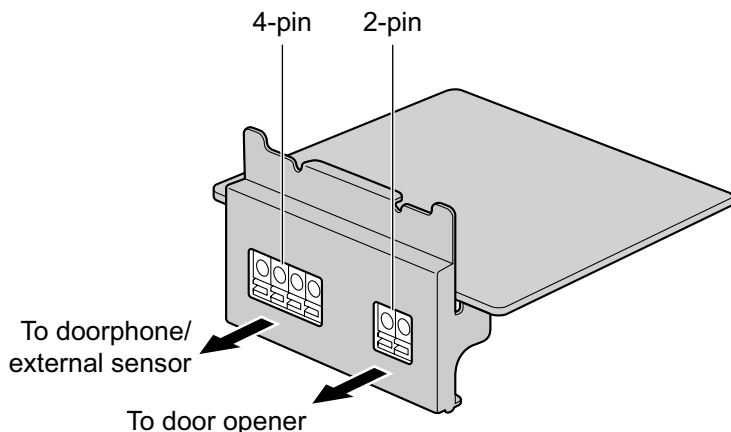
Accessories and User-supplied Items

Accessories (included): Screws × 2
User-supplied (not included): Copper wire

Note

> For details about connecting to a doorphone and/or door opener, refer to "4.8 Connecting to a Doorphone, Door Opener, and/or External Sensor".

Pin Assignments

4-pin Terminal Block

	No.	Signal Name	Function
	1	SENS1b	Sensor 1 common
	2	SENS1a	Sensor 1
	3	COM1	Doorphone 1 receive
	4	DP1	Doorphone 1 transmit

2-pin Terminal Block

	No.	Signal Name	Function
	1	OP1b	Door opener 1 (Relay)
	2	OP1a	Door opener 1 com (Relay com)

External Sensor

Power to the external sensor is provided from the DOORPHONE card and must be grounded through the DOORPHONE card as indicated in the diagram below. A pair of "sensor" and "common" lines are connected to the DOORPHONE card for each external sensor. The PBX detects input from the sensor when the signal is under 100 Ω.

Connection Diagram
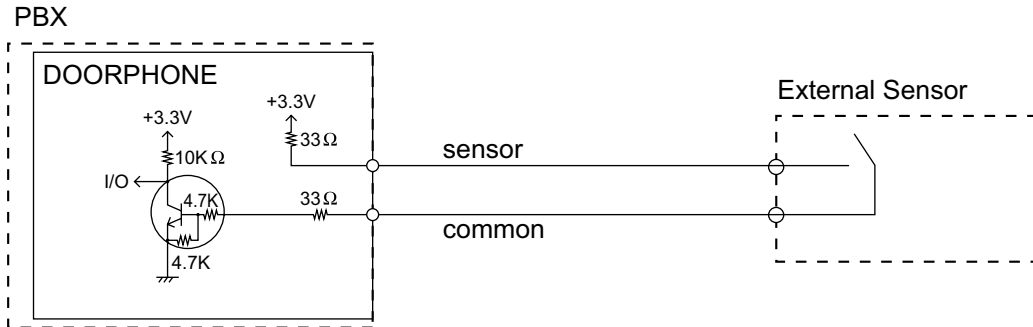
Door Opener

Current Limit: 24 V DC/30 V AC, 1 A maximum

Connecting to the DOORPHONE Card

When connecting a doorphone, door opener, and/or external sensor to the DOORPHONE card, use copper wire with a diameter from 0.42 mm to 1.12 mm. Follow the procedure below to connect a doorphone, door opener, and/or external sensor to the DOORPHONE card.

1. Strip off the insulation of the wire about 10 mm from the end.
2. Use a screwdriver to press on the orange tab at the bottom of the terminal block, and insert the wire into the upper hole.
3. Check from side to ensure that no bare copper wire is exposed.

DOORPHONE Card

10 mm

Copper Wire
(ø 0.42 mm to 1.12 mm)
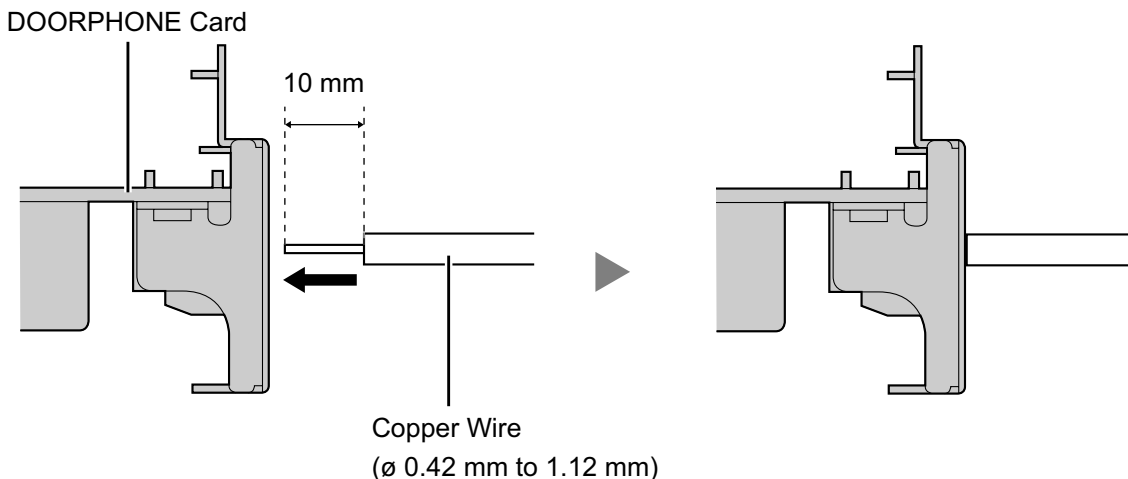
4.7 Connection of SLTs

4.7.1 Maximum Cabling Distances of the Extension Wiring (Twisted Cable)

Cable	Maximum Distance
ø 0.4 mm:	698 m
ø 0.5 mm:	1128 m
ø 0.6 mm:	1798 m
CAT 5:	1128 m

SLT
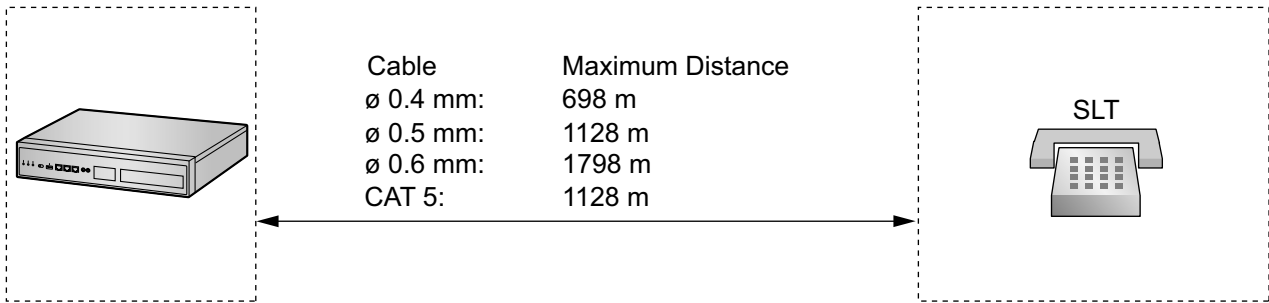
Notice

The maximum cabling distance may vary depending on the conditions.

4.8 Connecting to a Doorphone, Door Opener, and/or External Sensor

The PBX supports 1 each of a doorphone, a door opener, and an external sensor.

Note

Doorphones, door openers, and external sensors are user-supplied.

Maximum Cabling Distance

Cable	Maximum Distance
ø 0.42 mm:	70 m
ø 0.5 mm:	113 m
ø 0.6 mm:	180 m
CAT 5:	113 m

Doorphone

Door Opener

External Sensor
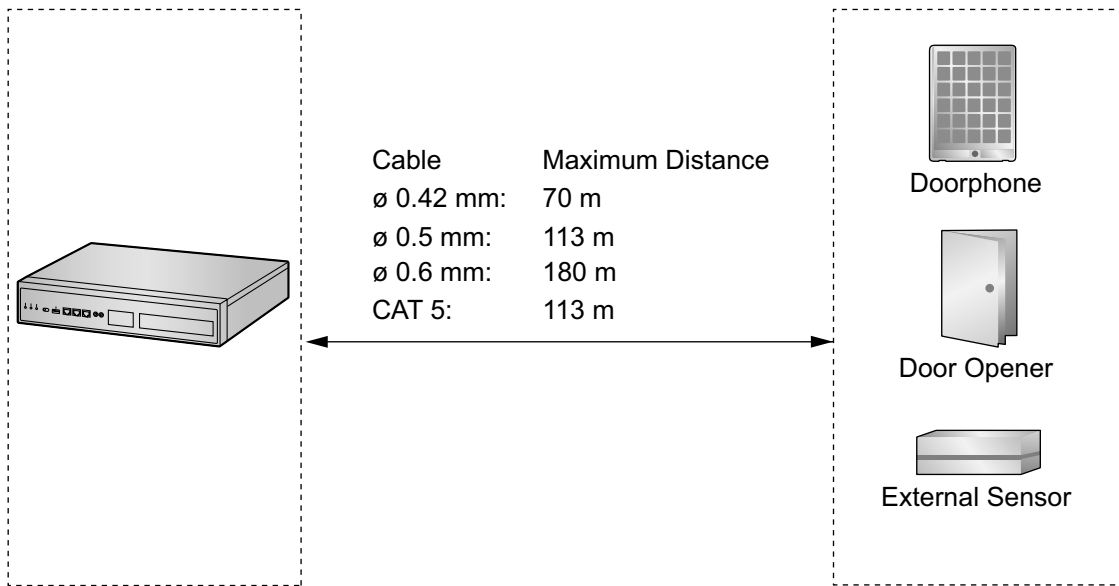
Installing the Doorphone (KX-T30865/KX-T7765)

Note

The illustrations shown in the installation procedure are based on the KX-T30865.

1. Loosen the screw to separate the doorphone into 2 halves.
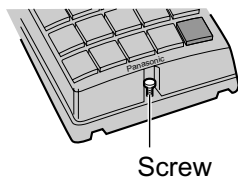
Screw

Note for KX-T7765 Users

When loosening/tightening the screw, do not scratch the cabinet wall with the driver shaft.

Cabinet Wall
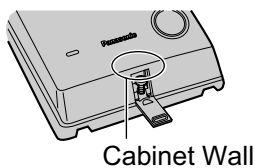
2. Pass the wires through the hole in the base cover, and attach the base cover to a wall using 2 screws.

Screw

To 4-pin terminal block
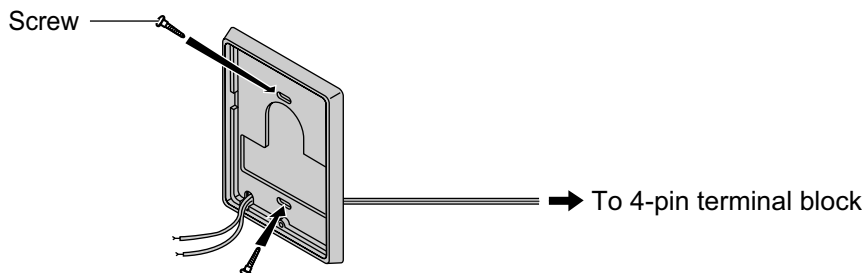
Note

Two kinds of screws are included with the doorphone. Please choose the appropriate kind for your wall type.

: when a doorphone plate has been fixed to the wall

: when you wish to install the doorphone directly onto the wall

3. Connect the wires to the screws located in the back cover.

To 4-pin terminal block
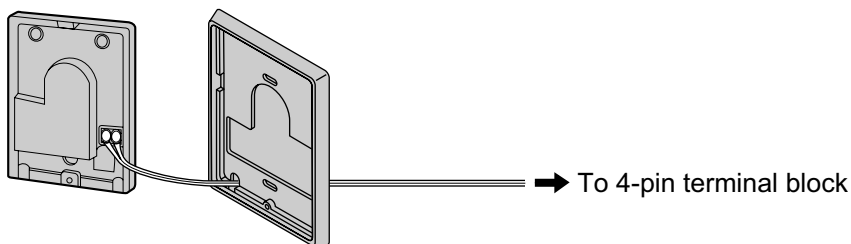
4. Re-attach the 2 halves and re-insert the screw.

Connection

Use 4-pin and 2-pin terminal blocks (included with the card) for connection.

1. While pressing on the orange tab at the bottom of the terminal block using a screwdriver, insert the wire into the upper hole as shown below. Repeat this procedure for each doorphone, door opener, and/or external sensor wire to connect.
Refer to "4.6.1 DOORPHONE Card (KX-NS0161)" for pin assignments.
For information about wiring, refer to "Connecting to the DOORPHONE Card".

Doorphone

Door Opener

External Sensor

4.9 Connection of Peripherals

UPS

USB Memory Device

PC

BGM Music on Hold

Pager: Amplifier/Speaker

PC   Printer

Maximum Distance 5 m

Maximum Distance 100 m

Cable	Maximum Distance
ø 0.4 mm:	10 m
ø 0.5 mm:	10 m
ø 0.6 mm:	10 m
CAT 5/ CAT 5e:	10 m

Cable	Maximum Distance
ø 0.4 mm:	10 m
ø 0.5 mm:	10 m
ø 0.6 mm:	10 m
CAT 5/ CAT 5e:	10 m

Maximum Distance 2 m

USB Port

MNT Port

RS-232C

Back
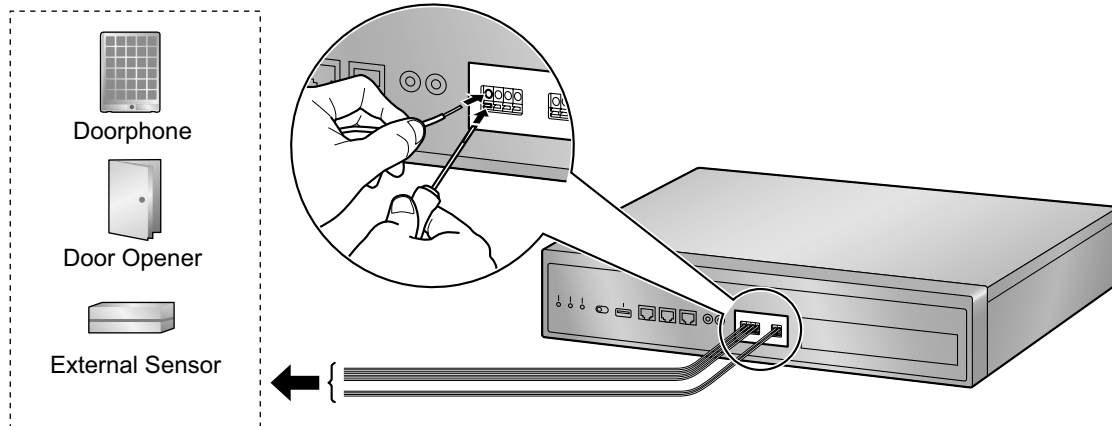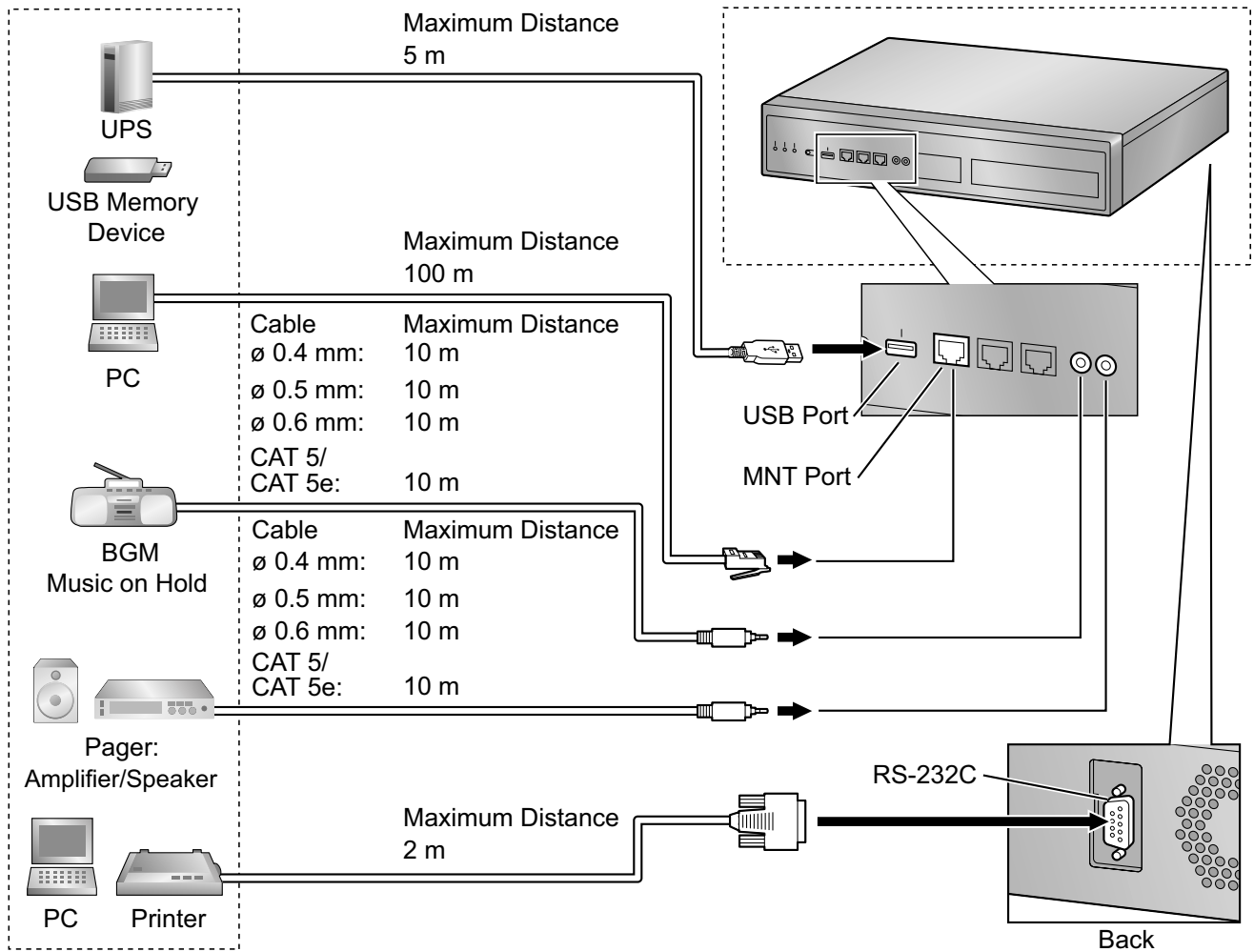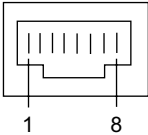
PC (via MNT Port)

A PC can be connected to the PBX via the MNT port of the PBX. It is used for system programming, diagnostics and external system database storage (save/load) functions.

Pin Assignments for 10BASE-T/100BASE-TX

	No.	Signal Name	Input (I)/Output (O)	Function
	1	TPO+	O	Transmit data+
	2	TPO-	O	Transmit data-
	3	TPI+	I	Receive data+
	4-5	Reserved	–	–
	6	TPI-	I	Receive data-
	7-8	Reserved	–	–

Pin Assignments for 1000BASE-T

	No.	Signal Name	Input (I)/ Output (O)	Function
	1	TRD0 (+)	I/O	Transmit and receive data 0 (+)
	2	TRD0 (-)	I/O	Transmit and receive data 0 (-)
	3	TRD1 (+)	I/O	Transmit and receive data 1 (+)
	4	TRD2 (+)	I/O	Transmit and receive data 2 (+)
	5	TRD2 (-)	I/O	Transmit and receive data 2 (-)
	6	TRD1 (-)	I/O	Transmit and receive data 1 (-)
	7	TRD3 (+)	I/O	Transmit and receive data 3 (+)
	8	TRD3 (-)	I/O	Transmit and receive data 3 (-)

Note

You can use 1000BASE-T cables for 10BASE-T/100BASE-TX connections.

BGM/MOH

The PBX provides Background Music and Music on Hold. An external music source (e.g., user-supplied radio) can be connected to the PBX.

CAUTION

The MOH port is an SELV port and should only be connected to an approved SELV device, or in Australia, via a Line Isolation Unit with a Telecommunications Compliance Label.

Notice

- Wiring should be done carefully to prevent undue force being exerted on the plug. Otherwise, sound may only be heard intermittently.
- When the PBX and external music source are not connected to the same earth, hum noise may be induced into Background Music and Music on Hold.

Pager

A paging device (user-supplied) can be connected to the PBX.

CAUTION

The Pager port is an SELV port and should only be connected to an approved SELV device, or in Australia, via a Line Isolation Unit with a Telecommunications Compliance Label.

PC/Printer (via RS-232C)

The PBX is equipped with an RS-232C interface. This interface provides communication between the PBX and the user-supplied devices such as PC or line printers. The RS-232C port is used for SMDR, diagnostics and external system database storage (save/load) functions.
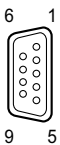
CAUTION

To protect the system, keep the following in mind:

1. Make sure that both connector cases (frame ground) of the RS-232C cross cable (shielded cable) are conductive. If they are not conductive, make sure that both connector cases of the cable are firmly connected.
2. If this is not possible, connect the frame of the PBX to the frame of the PC/Printer using an earthing wire in order to prevent difference in the electrical potentials.

Pin Assignments

	No.	Signal Name	Function	Circuit Type	
				EIA	CCITT
	2	RD (RXD)	Receive Data	BB	104
	3	SD (TXD)	Transmit Data	BA	103
	4	ER (DTR)	Data Terminal Ready	CD	108.2
	5	SG	Signal Ground	AB	102
	6	DR (DSR)	Data Set Ready	CC	107
	7	RS (RTS)	Request To Send	CA	105
	8	CS (CTS)	Clear To Send	CB	106

Connection Charts

For connecting a printer/PC with a 9-pin RS-232C connector

PBX (9-pin)　　　　　　　　　　　　Printer/PC (9-pin)

Circuit Type (EIA)	Signal Name	Pin No.	Pin No.	Signal Name	Circuit Type (EIA)
BB	RD (RXD)	2	2	RD (RXD)	BB
BA	SD (TXD)	3	3	SD (TXD)	BA
CD	ER (DTR)	4	4	ER (DTR)	CD
AB	SG	5	5	SG	AB
CC	DR (DSR)	6	6	DR (DSR)	CC
CA	RS (RTS)	7	7	RS (RTS)	CA
CB	CS (CTS)	8	8	CS (CTS)	CB
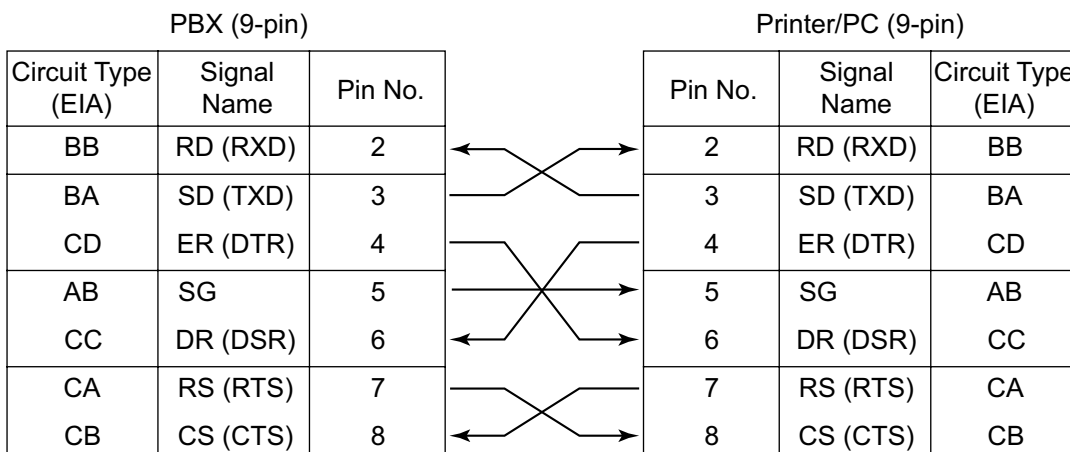
For connecting a printer/PC with a 25-pin RS-232C connector

PBX (9-pin)				Printer/PC (25-pin)		
Circuit Type (EIA)	Signal Name	Pin No.		Pin No.	Signal Name	Circuit Type (EIA)
BB	RD (RXD)	2		1	FG	AA
BA	SD (TXD)	3		3	RD (RXD)	BB
CD	ER (DTR)	4		2	SD (TXD)	BA
AB	SG	5		20	ER (DTR)	CD
CC	DR (DSR)	6		7	SG	AB
CA	RS (RTS)	7		5	CS (CTS)	CB
CB	CS (CTS)	8		6	DR (DSR)	CC
				4	RS (RTS)	CA
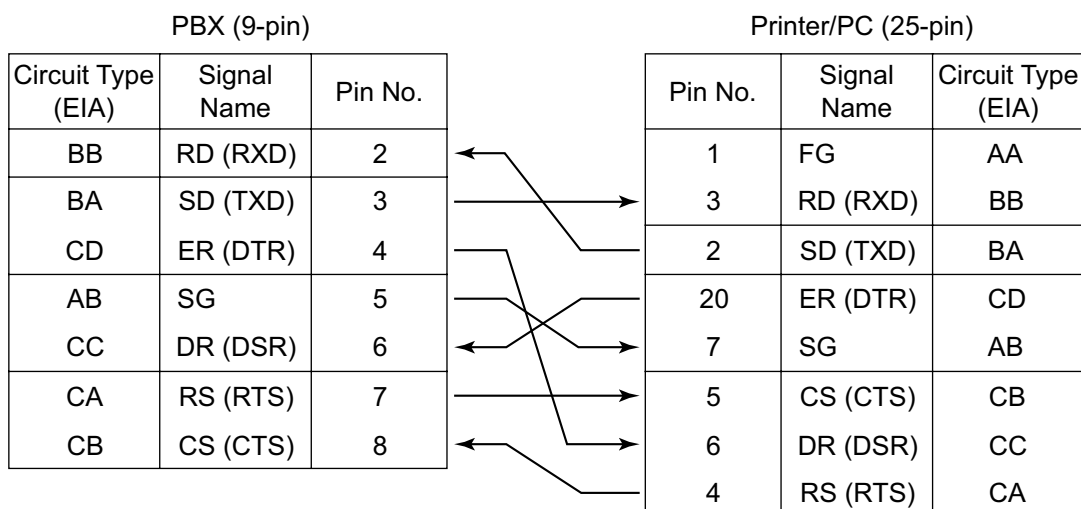
RS-232C Signals

- **Receive Data (RXD):**…(input)
  Conveys signals from the printer or the PC.
- **Transmit Data (TXD):**…(output)
  Conveys signals from the unit to the printer or the PC. A "Mark" condition is held unless data or BREAK signals are being transmitted.
- **Data Terminal Ready (DTR):**…(output)
  This signal line is turned ON by the unit to indicate that it is ON LINE. Circuit ER (DTR) ON does not indicate that communication has been established with the printer or the PC. It is switched OFF when the unit is OFF LINE.
- **Signal Ground (SG)**
  Connects to the DC ground of the unit for all interface signals.
- **Data Set Ready (DSR):**…(input)
  An ON condition of circuit DR (DSR) indicates the printer or the PC is ready. Circuit DR (DSR) ON does not indicate that communication has been established with the printer or the PC.
- **Request To Send (RTS):**…(output)
  This lead is held ON whenever DR (DSR) is ON.
- **Clear To Send (CTS):**…(input)
  An ON condition of circuit CS (CTS) indicates that the printer or the PC is ready to receive data from the unit. The unit does not attempt to transfer data or receive data when circuit CS (CTS) is OFF.
- **Frame Ground (FG)**
  Connects to the unit frame and the earth ground conductor of the AC power cord.

USB Interface for Uninterruptible Power Supply (UPS) and USB Memory Device

The PBX is equipped with a USB 2.0 interface. This interface provides communication between the PBX and user-supplied devices such as a UPS or USB memory device.

Using a USB memory device

A USB memory device can be used to backup and restore the system data of the PBX.
The PBX supports USB memory devices that meet the following specifications:
- File system: FAT
- Maximum capacity: 32 GB

- Maximum current: 500 mA

For details about backing up and restoring using a USB memory device, refer to "6.1 Tool—System Data Backup to USB" in the PC Programming Manual.

Note

Do not use a USB hub when connecting a USB memory device to the PBX.

Using a UPS

A UPS is a device that supplies power for several minutes to a connected device when a power failure occurs. For details about connecting a UPS to the PBX, refer to "Connecting an Uninterruptible Power Supply (UPS)".

Note

When connecting a UPS, use only the USB cable included with the UPS, and do not use a USB hub.

4.10 LAN Connection

4.10.1 LAN Connection for the Main Unit

Connecting the Main Unit to the LAN

The PBX is equipped with a LAN port for connecting to a LAN so that IP telephones (IP-PTs, IP softphones, SIP phones), IP-CSs, PCs and a CTI Server can be connected on a private IP network. When the PBX is connected to the LAN for the first time, you must assign IP addressing information to the PBX. See "5.4 Programming the PBX" for instructions.
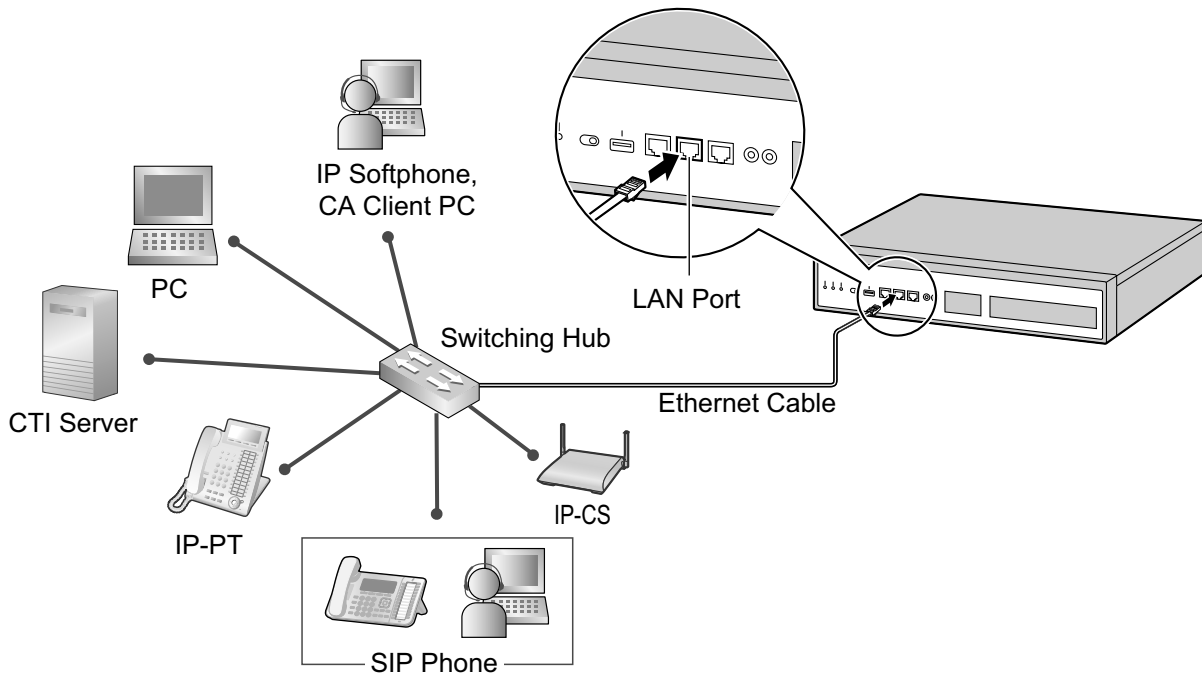
Connection for 10BASE-T/100BASE-TX

Switching Hub			PBX (LAN Port)	
Signal Name	Pin No.		Pin No.	Signal Name
TX+	1	→	1	RX+
TX-	2	←	2	RX-
RX+	3	←	3	TX+
RX-	6	→	6	TX-

Connection for 1000BASE-T

Switching Hub			PBX (LAN Port)	
Signal Name	Pin No.		Pin No.	Signal Name
TRD0 (+)	1	←——→	1	TRD0 (+)
TRD0 (-)	2	←——→	2	TRD0 (-)
TRD1 (+)	3	←——→	3	TRD1 (+)
TRD2 (+)	4	←——→	4	TRD2 (+)
TRD2 (-)	5	←——→	5	TRD2 (-)
TRD1 (-)	6	←——→	6	TRD1 (-)
TRD3 (+)	7	←——→	7	TRD3 (+)
TRD3 (-)	8	←——→	8	TRD3 (-)
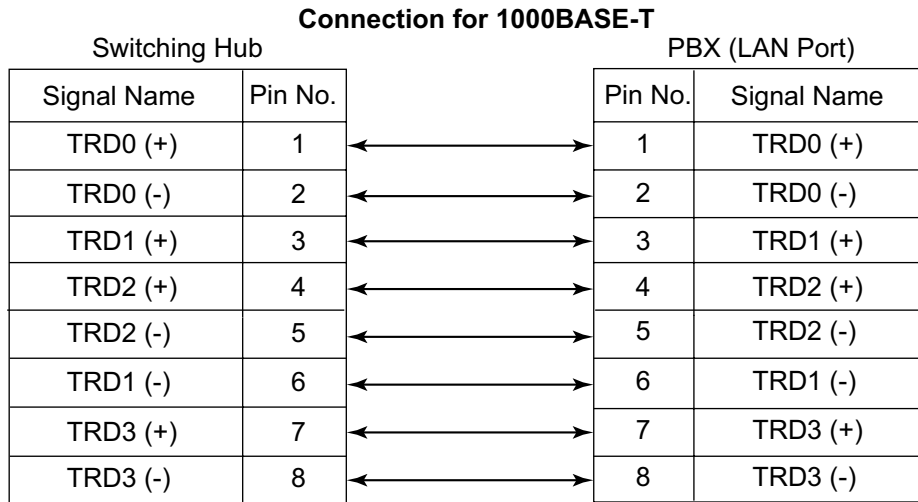
Note

- Use an Ethernet cable with an RJ45 connector for connection to a switching hub. The cable should be a CAT 5 (Category 5) or higher for 10BASE-T/100BASE-TX, or CAT 5e (Enhanced Category 5) or higher for 1000BASE-T.
- Make sure that all CAT 5/CAT 5e cables in use are not over 100 m in length.
- Make sure to set the port of the switching hub that connects to the card to operate under "Auto Negotiation" mode.
- Make sure to create a spanning tree for LAN connection in order to prevent loops from occurring in a multi-bridged environment. Otherwise, some packets may circulate for long periods of time and eventually PBX performance system may degrade.
- The CTI server can be used for connecting PCs on a LAN to provide third party call control CTI. CTI connection uses the CSTA Phase 3 or TAPI 2.1 protocol. The operating system of the PC or CTI server required for third party call control depends on your CTI application software. For details, refer to the manual for your CTI application software.
- When using the VLAN feature on the network, make sure that the PBX is connected to a layer 2 switch that is IEEE 802.1Q compliant, and that is configured for VLANs. In addition, the port of the switching hub to which the PBX is connected must be set to "Untagged". Consult your network administrator for details.

4.10.2 LAN Connections for IP Telephones

When an IP telephone is connected to the LAN and power is supplied for the first time, you will be prompted to set network parameters. The network parameters must be set for the IP telephone before it can be used. Refer to "5.8 Assigning Networking Information to IP Telephones" for instructions.

Connecting an IP Telephone to a Switching Hub

When connecting an IP telephone to the LAN, connect it to a switching hub.

Note

- Use an Ethernet straight cable with an RJ45 connector to connect the IP telephone to a switching hub. The cable should be a CAT 5 (Category 5) or higher for 10BASE-T/100BASE-TX, or CAT 5e (Enhanced Category 5) or higher for 1000BASE-T.
- When using the VLAN feature on the network, make sure that the switching hub to be connected is IEEE 802.1Q compliant and is configured for VLANs. In addition, the port of a switching hub that the IP telephone is connected to must be set to "Trunk" port, to allow VLAN tagging. Consult your network administrator for details.
- Since an IP softphone is installed and operates on a PC, the PC must be connected to the LAN to use the IP softphone on the network.

The diagram below is for connecting an IP-PT to a switching hub. For SIP phones, refer to the documentation of your SIP phone.

Example: KX-NT346

To a Switching Hub

Ethernet Straight Cable

LAN
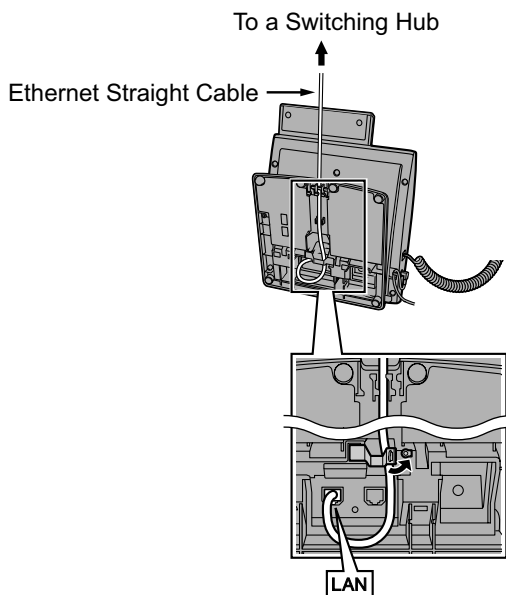
Connecting an AC Adaptor to an IP Telephone

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

Note

> Use only the specified type of AC adaptor for each IP telephone. For details, refer to the documentation of your IP telephone.

Example: KX-NT346

To Wall Socket

AC Adaptor Cord →
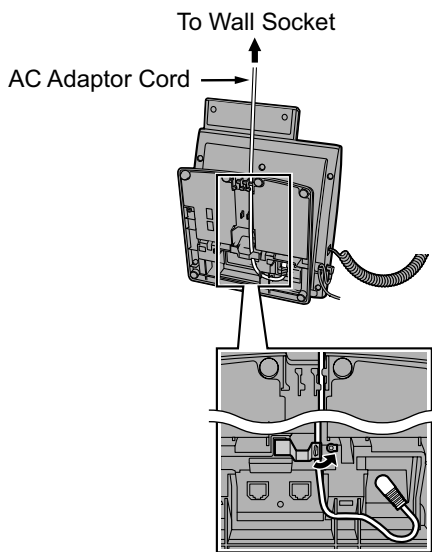
Connecting a PC to an IP Telephone

You can connect a PC to some IP telephones (e.g., KX-NT300 series) using the IP telephone's secondary port. In this case, only a single port from the LAN's network interface (switching hub) is required to connect both the IP telephone and PC to the LAN.

Note

- Use an Ethernet straight cable with an RJ45 connector to connect a PC to the IP telephone. The cable should be a CAT 5 (Category 5) or higher for 10BASE-T/100BASE-TX, or CAT 5e (Enhanced Category 5) or higher for 1000BASE-T.
- Only a PC can be connected to the secondary port of an IP telephone. Other IP telephones, including IP-PTs, or network devices such as routers or switching hubs, cannot be connected.
- The secondary port does not support PoE for connected devices.
- In cases where a PC is connected to the secondary port, if the IP telephone connection to the PBX is disconnected or reset, LAN communication to the PC will also be disrupted.
- Generally, it is recommended that you connect no more than one PC to the secondary port of each IP telephone.

Example: KX-NT346

To a PC

Ethernet Straight Cable

PC
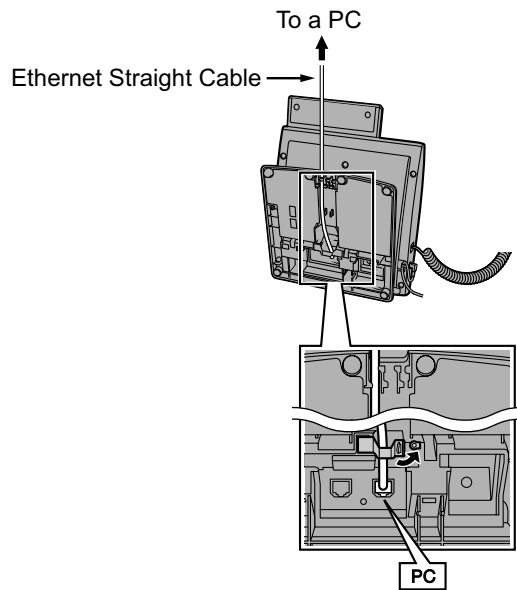
4.11 Power Failure Ports

When the power supply to the PBX fails, power failure transfer (PFT) will switch from the current connection to the Power Failure Connection. Refer to "5.5.2 Power Failure Transfer" in the Feature Guide for further information.

Using SLC2/LCOT2 Card

In the event of a power failure, a specific SLT is automatically supplied power through the PFT port. The PFT ports are the SLC1 port and LCOT1 port on the SLC2/LCOT2 card.

Note

A trunk conversation established during power failure can be maintained even when the power returns and the connection is switched back to the normal configuration from the Power Failure Connection.

4.12 Starting the PBX

WARNING

> **Make sure that the AC outlet is properly earthed, then securely connect the 3-pin AC plug including the earthed pin.**

CAUTION

- Use only the AC power cord included with the PBX.
- Before touching the product (PBX, cards, etc.), discharge static electricity by touching ground or wearing an earthing strap. Failure to do so may cause the PBX to malfunction due to static electricity.
- Once you have started the PBX, if you unplug the PBX, do not initialise it again as described in "System Initialisation Procedure". Otherwise, your programmed data will be cleared. To restart the PBX, refer to "6.1.5 Restarting the PBX".
- The power supply cord is used as the main disconnect device. Ensure that the AC outlet is located near the equipment and is easily accessible.

Installing the Hook Clip for the AC Power Cord

1. Insert the hook clip into the hook clip hole.
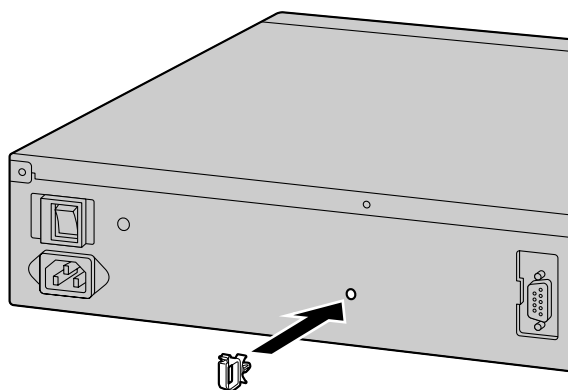
Note

Use only the hook clip included with the PBX.

Connecting the AC Power Cord

1. Plug the AC power cord into the PBX and pass the cord through the hook clip as indicated. Push the hook clip in the direction of the arrow until it clicks.

> **Note**
>
> For safety reasons, do not stretch or pinch the AC power cord.

To UPS
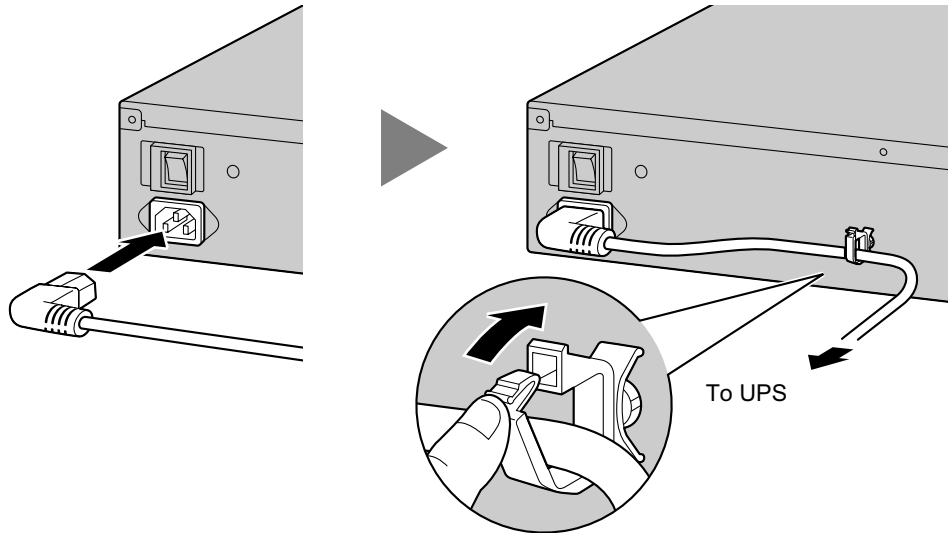
2. **When not using a UPS**:
Plug the other end of the cord into an AC outlet.
When using a UPS:
Plug the other end of the cord into the outlet of the UPS.

Connecting an Uninterruptible Power Supply (UPS)

A UPS can be connected to the PBX and it provides temporal power to the PBX in the event of a power failure. When using the recommended UPS (with a USB interface), the PBX can perform automatic shutdown when the UPS battery ratio is at a specified rate by sending a warning signal to the PBX through the USB port. Therefore, data loss or serious damage to the PBX caused by a sudden power cut can be prevented.
After power is restored, turn off the PBX using the power switch first, and then turn the PBX back on before starting the PBX.

Note

- For details about using Web Maintenance Console to specify the UPS battery ratio to begin automatic shutdown, refer to "4.1.1 Status—Equipment Status—UPS" in the PC Programming Manual.
- For information about the installation of an UPS, refer to the documentation of your UPS.
- For information about the recommended UPS, ask your local Panasonic dealer.

1. Connect the UPS to the USB port of the PBX.

Note

When connecting the UPS, use only the USB cable included with the UPS and do not use USB hubs to connect the UPS and the PBX.

To UPS
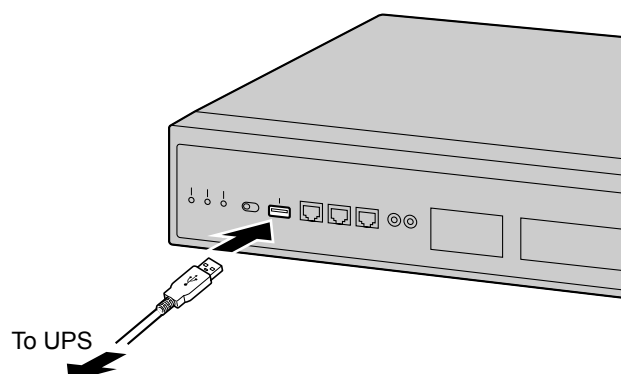
2. Follow the instructions in the documentation of the UPS to setup and start the UPS.

System Initialisation Procedure

Notice

When a UPS is connected, make sure it is started as instructed in the documentation for the UPS.

1. Slide the System Mode Switch to the "SYSTEM INITIALIZE" position.

STATUS Indicator   System Mode Switch
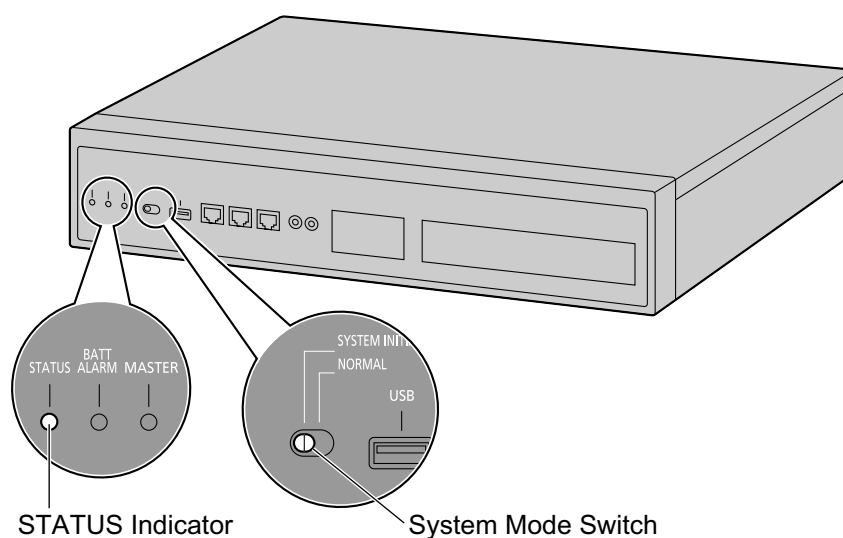
2. Turn on the power switch of the PBX. The STATUS indicator will flash green.
3. While the STATUS indicator is flashing green, slide the System Mode Switch back to the "NORMAL" position. Depending on the configuration, initialisation takes about 2.5 minutes. If successfully executed, the STATUS indicator will stop flashing and remain lit up.

Note

When DSP card(s) are installed and a DHCP server is not connected, each installed DSP card cannot acquire an IP address, and the STATUS indicator will turn red.

All data, except for system prompts and activation key files, will be erased. Data that is erased includes Unified Messaging data, call logs, etc. The settings for the PBX as well as all optional service cards will be initialised to their default values.

<u>Note</u>

- After the PBX is initialised, you can restore system data to the PBX that has been backed up earlier. For details about backing up and restoring system data, refer to "6.1 Tool—System Data Backup to USB", "7.2.2 Utility—File—File Transfer PBX to PC" and "7.2.1 Utility—File—File Transfer PC to PBX" in the PC Programming Manual.
- After the PBX is initialised, you must set up the mandatory settings required for both stand-alone PBXs and PBXs in a One-look network with Easy Setup Wizard. For details refer to "Connecting to Web Maintenance Console" and "5.4.1 Easy Setup Wizard".

Confirming the Trunk Connection

After the SLC2/LCOT2 card is installed, programme the PBX and connect trunks to the PBX.
If SLC2/LCOT2 card is not installed, this confirmation can be skipped.

To confirm that the trunks are successfully connected, dial [✻] [3] [7] + trunk number (3 digits) on an IP telephone, or press the IP telephone's S-CO button. You will hear a dial tone if the trunk is available and connected.

Section 5

Programming with Web Maintenance Console

This section describes the installation procedure, structure, and functions of the Web Maintenance Console for programming IP telephones and the PBX. Further information on programming the PBX for use with SIP trunks and a VoIP network is included.

5.1 Overview of Web Maintenance Console

Web Maintenance Console is designed to serve as an overall system programming reference for the PBX.
You can programme and control the PBX over an IP network using Web Maintenance Console.
This section describes programming basic items using Web Maintenance Console.

Web Maintenance Console Features

Menu Buttons

Login Status
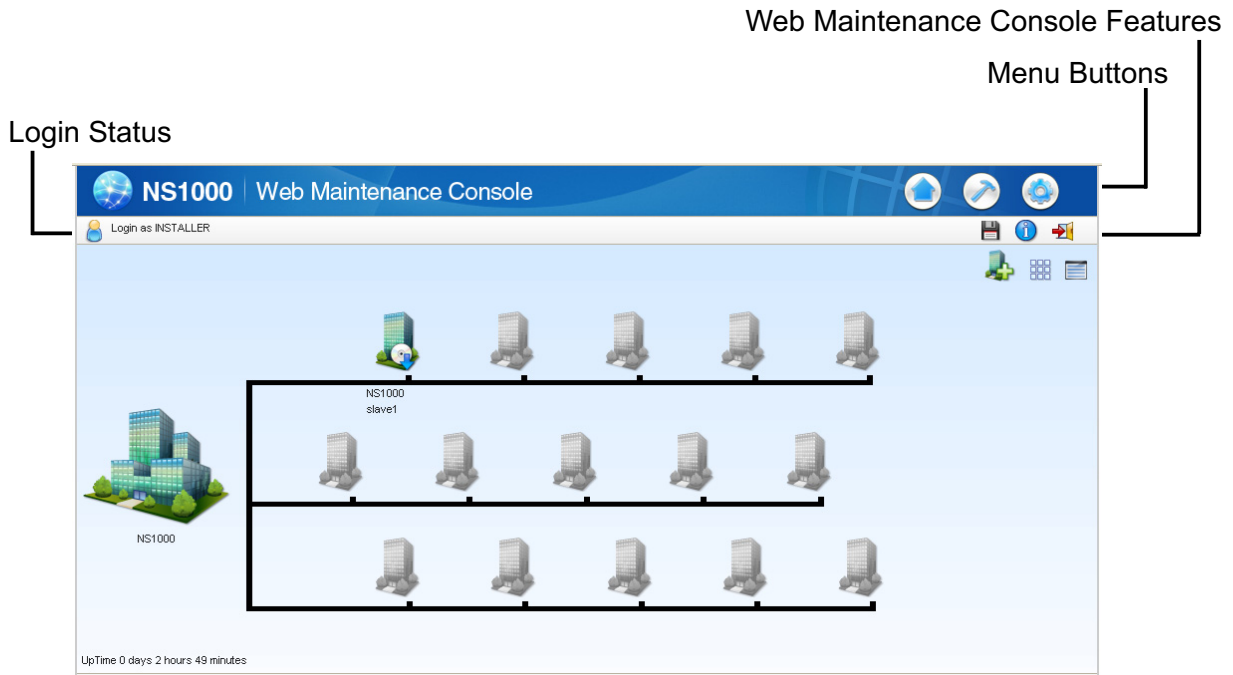
Note

> The contents and design of the software are subject to change without notice.

5.2 PC Connection

KX-NS1000 has 3 physical ports for PC and LAN connections. A default IP address is assigned to each port. A PC connect to the PBX either directly or over a LAN using the appropriate method for the port being used.

Port	Default IP Address
MNT Port	223.0.0.1
LAN Port	192.168.0.101
WAN Port[*1]	Not Used

[*1] The WAN Port is not used with PCMPR Software Version 001.10000.

Direct Connection
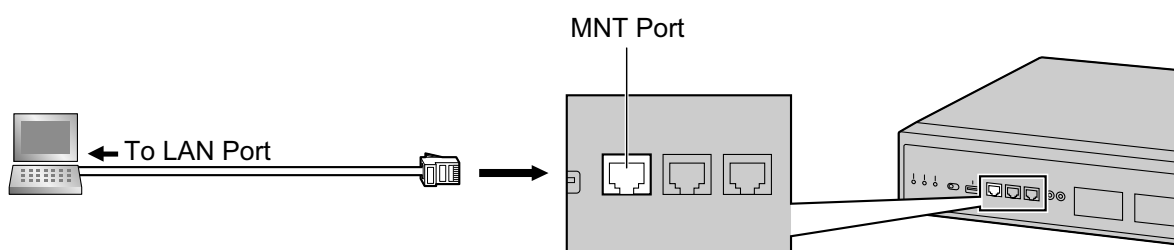
Notice

> When connecting the PC to the MNT port, if the PC is set to obtain the IP address automatically, the IP address of the PC will be set to an appropriate IP address to establish a connection to the PBX.

Note

- Use an Ethernet cable with an RJ45 connector to connect a PC to the PBX.
- For pin assignments and maximum cabling distance, refer to "4.9 Connection of Peripherals".

Connection via LAN
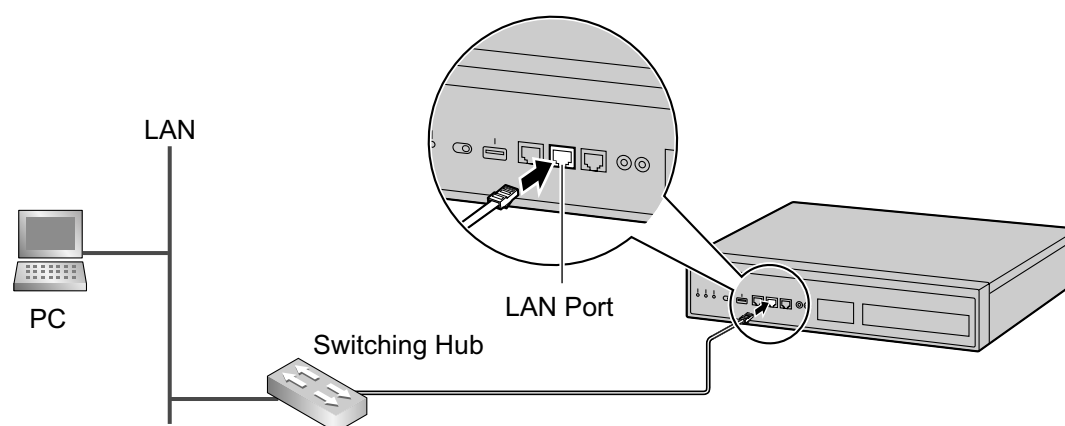
Note

> For details about connecting a switching hub to the PBX, refer to "4.10.1 LAN Connection for the Main Unit".

Connection via Virtual Private Network (VPN)
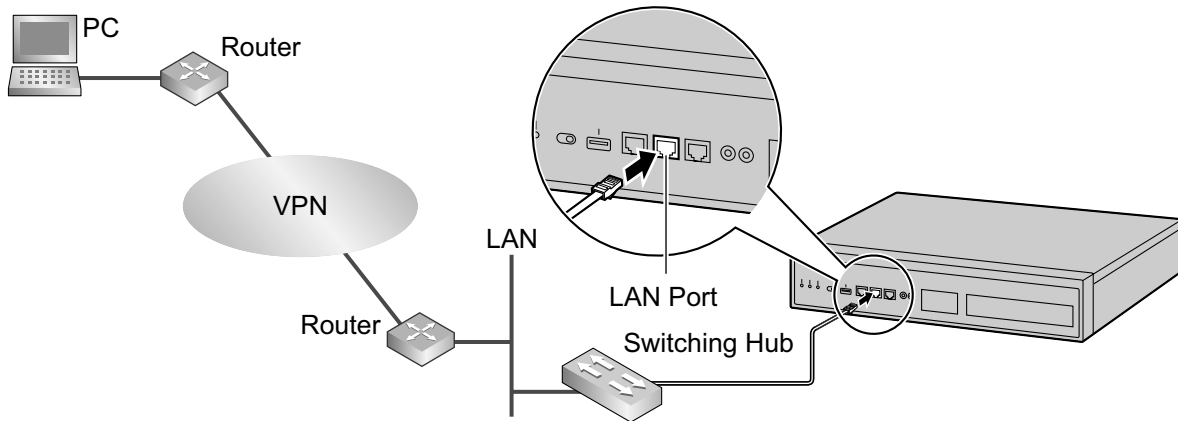
Notice

> To access the PBX via VPN, the PC must be in the same VPN.

Note

> For details about connecting a switching hub to the PBX, refer to "4.10.1 LAN Connection for the Main Unit".

Connection via Internet
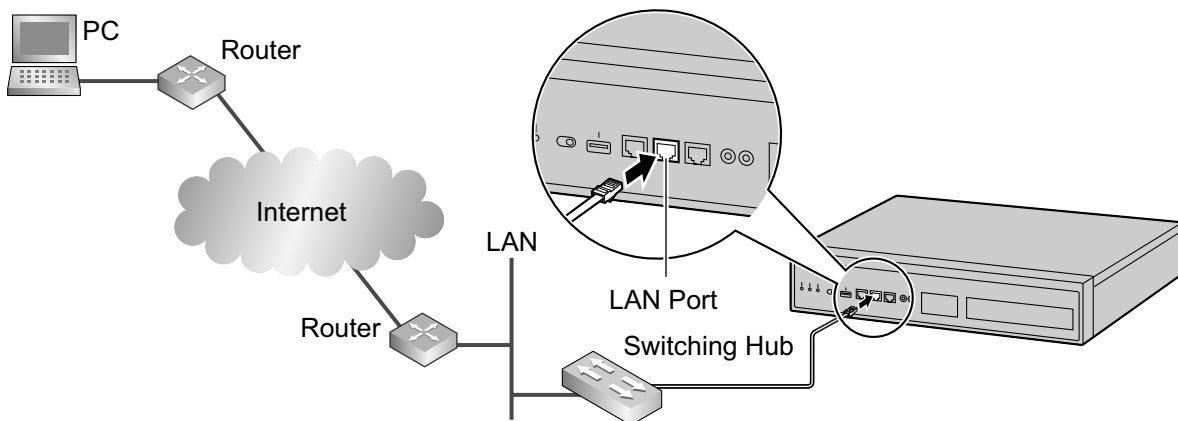
CAUTION

> It is strongly recommended to use SSL encrypted communication when the PC is accessing the PBX via the Internet. To use SSL encryption, routers must have a port set up for https communication.

Notice

> To access the PBX via the internet, routers must have static NAT/NAPT settings enabled.

Note

For details about connecting a switching hub to the PBX, refer to "4.10.1 LAN Connection for the Main
Unit".

5.3 Starting Web Maintenance Console

System Requirements

Required Operating System

- Microsoft® Windows® XP, Windows Vista® Business, or Windows 7 Professional operating system

Recommended Display Settings

- Screen resolution: XGA (1024 × 768)
- DPI setting: Normal size (96 DPI)

Supported Browsers for use with Web Maintenance Console

- Windows Internet Explorer® 8
- Windows Internet Explorer 9
- Mozilla® Firefox® version 6.0 or later.

Note

Always be sure to apply the latest updates to your Web browser software. For details, refer to your Web browser's documentation. Only the browsers and browser versions listed above are supported for use with Web Maintenance Console.

Copyright for MD5

This software uses the Source Code of RSA Data Security, Inc. described in the RFC1321 (MD5 Message-Digest Algorithm).

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Password Security

CAUTION

To the Administrator or Installer regarding the system password
1. Please provide all system passwords to the customer.
2. To avoid unauthorised access and possible abuse of the PBX, keep the passwords secret, and inform the customer of the importance of the passwords, and the possible dangers if they become known to others.
3. The PBX has default passwords preset. For security, change these passwords the first time that you programme the PBX.
4. Change the passwords periodically.

5. It is strongly recommended that passwords of 10 numbers or characters be used for maximum protection against unauthorised access. For a list of numbers and characters that can be used in system passwords, refer to "1.1.3 Entering Characters" in the PC Programming Manual.

Connecting to Web Maintenance Console

1. Connect the PC to the PBX:
   - Connect the PBX to a PC with the MNT port and access the PBX directly from the PC. For details, refer to "Direct Connection" in "5.2 PC Connection".
   - Connect the PBX to a network with the LAN port and access the PBX from a PC in your LAN or VPN. For details, refer to "Connection via LAN", "Connection via Virtual Private Network (VPN) " and "4.10.1 LAN Connection for the Main Unit".
   - Connect the PBX to a network with the LAN port and access the PBX from a PC using an Internet connection. For details, refer to "Connection via Internet" and "4.10.1 LAN Connection for the Main Unit".
2. Access Web Maintenance Console:

MNT Port Connection:

Launch your Web browser and in the address bar, enter the following address exactly as shown: **http://kx-ns1000.**

Note

> Be sure to include the period at the end as shown.

LAN or VPN Connection:

Launch your Web browser and input the IP address of the PBX followed by the Web Maintenance Console port number into the address bar. The input method will differ according to the PC's connection to the PBX. The default IP address for the LAN port of the PBX is 192.168.0.101, and the default Web Maintenance Console port number is 80. Accordingly, the address to enter to connect to the PBX for the first time will be as follows (enter the address exactly as shown):
http://192.168.0.101

Internet Connection (SSL Connection):

When the PC is accessing the PBX from a connection over the internet, the use of SSL is strongly recommended. When using an SSL encrypted connection, the default port is 443. The format of the address to enter to connect to the PBX using an SSL encrypted connection will be as follows:
https://xxx.xxx.xxx.xxx:yyy
- "**xxx.xxx.xxx.xxx**" is the IP address of a device that can be accessed from the Internet, such as the IP address of a network router.
- "**yyy**" is a port number. The network router's port forwarding settings must be configured so that traffic arriving at port "yyy" is forwarded to the correct IP address and port of the PBX in the LAN.
- Port forwarding settings must specify the IP address and the port number of the network router ("**xxx.xxx.xxx.xxx:yyy**") to transfer the packets to the PBX in the LAN, so that the packets sent to the global IP address and specified port of the router will be transferred to the IP address and specified port of the PBX in the LAN.
- Note the usage of "https" instead of "http".
- If you connect to Web Maintenance Console using SSL, a security alert window is displayed. Follow the prompts to install a security certificate. The procedure may vary according to your browser.

Note

> The IP address and Web Maintenance Console port number for the PBX can be changed from their default values. If settings for the LAN port's IP address or port number has been forgotten, connect using the MNT port connection as described above and confirm the LAN port's IP address in

"27.1 Network Service—IP Address/Ports—Basic Settings", and the port in "27.2.3 Network Service —Server Feature—HTTP" in the PC Programming Manual.

3. The Web Maintenance Console login screen is displayed. Log in with the Installer level account name and the default Installer level account password to launch the Easy Setup Wizard. For details about the Easy Setup Wizard, see "5.4.1 Easy Setup Wizard".

5.4 Programming the PBX

5.4.1 Easy Setup Wizard

In the Easy Setup Wizard, you will set up the mandatory settings required for the PBX.
When you log in to Web Maintenance Console for a PBX that is in its initialised, factory default state, the Easy Setup Wizard for that PBX will launch automatically. You must log in using the Installer level account name and password.
– The Installer level account name is "INSTALLER".
– The default Installer level account password is "1234".

1. After Easy Setup Wizard launches, select a language, and then click **Install**.
2. In **Location Setting**:
   a. Select a **PBX Type**:
      - **Master**: Select for a PBX that will be registered as the Master unit of One-look network. Also select for a stand-alone PBX that will not be used in a One-look network.
      - **Slave**: Select for a PBX that will be registered as a Slave unit of a One-look network. If **Slave** is selected, go to step **2-d** below.

      Note

         If the Master unit is located on a different LAN than the Slave unit being registered, the Slave unit will not be able to automatically detect the Master unit for registration. The IP address of the Master unit must be specified. Enter the IP address of the Master unit in **If located on different network from Master PBX**.

   b. Select a **Suffix Code**[1] from the drop-down list if **Master** is selected for **PBX Type**.
   c. Select an **Area**[1] from the drop-down list if **Master** is selected for **PBX Type**.
   d. Click **Next**.

   Note

      If **Suffix Code** is changed from its default value, a notice about restarting the PBX is displayed. Click **OK** to restart the PBX. After the PBX restarts, start Web Maintenance Console again (refer to "Connecting to Web Maintenance Console" in "5.3 Starting Web Maintenance Console"). When you start the Easy Setup Wizard again, you will start from step **3**, below.

   [1] For information about Suffix Codes and Areas to select, refer to "7.6 PBX Region Suffix Codes and Areas".

3. In **PBX Setting**:
   a. Specify a **Site name** if **Master** was selected for **PBX Type** in step **2**.
   b. Select a **Time Zone** from the drop-down list.
   c. Click the **Local Time** box and select the date and time from the menu.
   d. Click **Next**.
4. In **LAN Setting**, the IP addresses for the PBX, DNS server, and DSP cards can be assigned automatically through a DHCP server or entered manually.

   When using a DHCP server:

   a. Select **Obtain an IP address automatically**.
   b. Select **Obtain DNS server address automatically**.
   c. Select **Obtain DSP IP address automatically**.

   Notice

      The boxes will turn grey and the IP address information will be assigned automatically.
      Write down the address information assigned to the PBX for future reference.

     d. Click **Next**.

    When not using a DHCP server:
     a. Select **Use the following IP address**.
     b. Enter an IP address[*1], Subnet Mask[*2], and Default Gateway[*1]. (The default gateway may not need to be specified depending on your network configuration.)
     c. Select **Use the following DNS server address**.
     d. Enter the preferred and alternative DNS IP addresses[*1].
     e. Select **Use the following DSP IP address**.
     f. Enter up to 2 IP addresses[*1] for each installed DSP card.
     g. Click **Next**.
    [*1]   Valid IP address range: "1.0.0.0" to "223.255.255.255"
    [*2]   Valid subnet mask address range: "0–255.0–255.0–255.0–255" (except "0.0.0.0" and "255.255.255.255")

5. In **Registration Setting**, the **IP Terminal Registration Mode** and the **One Look Networking (Trial Activation Key)** can be set.
    a. Select the **IP Terminal Registration Mode**:
      • **Manual**: Select this mode to manually register IP terminal information.
      • **Full Automatic**: Select this mode to automatically register IP terminal information.
      • **Extension Number Input**: Select this mode to automatically register IP terminal information except its extension number. The extension number can then be registered from the IP telephone manually.

      Note
        • Full Automatic and Extension Number Input registration methods may not be available for certain types of IP terminals. In such cases, select the Manual registration method.
        • For more information about the IP terminal registration modes, refer to "5.9.1 Registering IP Telephones".

    b. For **One Look Networking (Trial Activation Key)**, specify whether to activate the 60-day One-look Networking Trial Activation Key.
      – If **Active** is selected, the 60-day trial will begin when the Easy Setup Wizard is completed.
      – If **Non Active** is selected, you will have to activate the trial manually in order to use One-look Networking Features on a trial basis.
    c. Click **Next**.
      If **Slave** has been selected in step **2**, the Easy Setup Wizard will finish at this step. If LAN settings have been changed from their default values in step **4**, you will be prompted to restart the PBX. Click **OK** to restart the PBX. Otherwise, the login screen will be displayed.
      To add the PBX as a Slave unit PBX to the One-look network, use the Add Site Wizard from the Master unit PBX's Home Screen.

6. In **SNTP / Daylight Saving**, enter information for **Automatic Time Adjustment** and **Daylight Saving**, and then click **Next**.

7. In **Maintenance Setting**, the **Installer password**, information for **SNMP Setting** and **SNMP Manager** can be entered.
    a. Enter a password for the Installer level account in **Installer password**. Confirm your input in **Re-enter**.
    b. Specify settings for **SNMP Setting** and **SNMP Manager** if necessary. If you are unsure of your network's SNMP settings, contact your network's administrator.
    c. Click **Finish**.

8. Follow the prompts of the Easy Setup Wizard. After the Easy Setup Wizard is completed, if LAN settings have been changed from their default values in step **4**, you will be prompted to restart the PBX. Click **OK** to restart the PBX. Otherwise, the login screen will be displayed.

9. Log in with the Installer level account using the password entered during Easy Setup Wizard.
The Home Screen is displayed. You may now begin programming the PBX.

Notice

> If an external DHCP server is in use, it must be able to use a "client identifier" option specified by RFC 2131.

Changing IP Address Settings

IP addressing information for the PBX can also be changed from Web Maintenance Console after the Easy Setup Wizard has been completed.

1. Click **Setup** $\rightarrow$ **Network Service** $\rightarrow$ **IP Address/Ports**.
2. Click the **Basic Settings** tab.
3. **When using a DHCP server:**
   a. Select **Obtain an IP address automatically**.
   b. Select **Obtain DNS server address automatically**.
   c. Select **Obtain DSP IP address automatically**.

   Notice

   > The boxes will turn grey and the IP address information will be assigned automatically.
   > Write down the address information assigned to the PBX for future reference.

   When not using a DHCP server:
   a. Select **Use the following IP address**.
   b. Enter an IP address[1], Subnet Mask[2], and Default Gateway[1].
      (The default gateway may not need to be specified depending on your network configuration.)
   c. Select **Use the following DNS server address**.
   d. Enter the preferred and alternative DNS IP addresses[1].
   e. Select **Use the following DSP IP address**.
   f. Enter up to 2 IP addresses[1] for each installed DSP card.
4. Click **OK**.
   a. A screen will appear stating that any changes made in step **3** will be activated after the PBX is restarted.
   b. Click **OK**.
5. Restart the PBX.
   a. Click **Maintenance** $\rightarrow$ **System Control** $\rightarrow$ **System Reset**.
   b. On the System Reset screen, click **Backup**.

[1]   Valid IP address range: "1.0.0.0" to "223.255.255.255"
[2]   Valid subnet mask address range: "0–255.0–255.0–255.0–255" (except "0.0.0.0" and "255.255.255.255")

Notice

- Do not change the IP address of the PBX once IP telephones are registered to the PBX using the set IP address. The IP telephones will not operate properly if the IP address of the PBX is changed. When an external DHCP server is used to automatically assign IP addresses, it must be configured to always allocate the same IP address to the PBX. For details, consult your network administrator.
- If an external DHCP server is in use, it must be able to use a "client identifier" option specified by RFC 2131.
- If an external DHCP server is in use, the KX-NS1000 DHCP Server feature must be disabled.
- The PBX will not start properly if IP addresses cannot be assigned automatically by the DHCP server when the PBX has been set to obtain IP addresses automatically. In this case, you need to consult your network administrator because the DHCP server in your network may not be running or a network failure may have occurred. If the DHCP server is not available, enter IP addresses manually, then restart the PBX. If the PBX cannot be accessed over the network, connect the PC directly to the PBX with an Ethernet cable and access Web Maintenance Console using a direct connection.
  For details about connecting the PC directly to the PBX, refer to "Direct Connection" in "5.2 PC Connection".

- During a long programming session, it is highly recommended that you periodically save the system data to the Storage Memory Card. If the PBX undergoes a sudden power failure or if the system is reset for some reason, all the system data in RAM will be lost. However, if system data has been saved to the Storage Memory Card, it can be easily reloaded.

  To save the system data to the Storage Memory Card while programming, click the disk button (🖫)

  → **Yes** → **OK**. Be sure to save the system data to the Storage Memory Card before restarting the PBX, or any changes may be lost.
- When no operations are performed for more than 60 minutes (default), you will be automatically logged out from Web Maintenance Console and unsaved data will be lost.

Changing the Display Language

The language used for Web Maintenance Console can be changed after the Easy Setup Wizard has completed.
1. Click **Setup** → **Users** → **User Profiles**.
2. Select the check box for the Installer level account.
3. Click ✎.
   The **Edit User** screen will be displayed.
4. Select the preferred language in **Change Language**.
5. Click **OK**.
   The screen will redisplay in the selected language immediately.

5.4.2 Enabling the DHCP Server Feature

This PBX is equipped with a DHCP Server feature. When the feature is enabled, it allows you to centrally manage and automate the assignment of IP addresses for the devices located in same LAN using Web Maintenance Console.
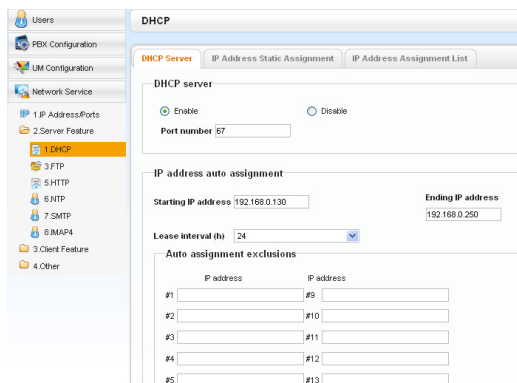
1. Click **Setup** → **Network Service** → **Server Feature** → **DHCP**.

2. On the **DHCP Server** tab, select **Enable** for **DHCP Server**.

3. Enter valid settings for the **IP address auto assignment**.

   Note

   For details about **IP address auto assignment** settings, refer to "27.2.1 Network Service—Server Feature—DHCP" in the PC Programming Manual.

4. Click **OK**.

Note

If an external DHCP server is in use, do not enable the DHCP Server feature. Doing so may allocate inappropriate IP addressing information to the devices.

5.4.3 Installing the Virtual IP Cards to the PBX
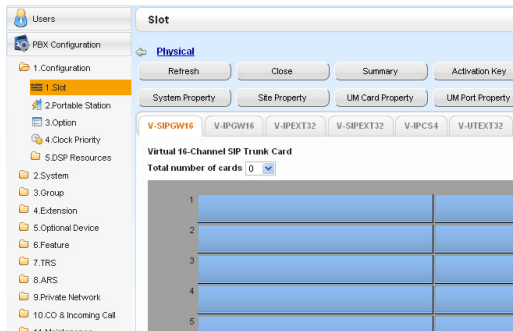
1. **a.** Click **Setup → PBX Configuration → Configuration → Slot**.
   b. Click **Virtual**.

2. **a.** Click on the name of the desired card.
   b. From the **Total number of cards** drop-down list, select the desired number of cards.

3. A confirmation message will be displayed. Click **OK**.

5.4.4 Installing Additional Activation Keys

The corresponding number of IP trunks, IP telephones or enhanced features can be activated by installing the downloaded activation key file(s) using Web Maintenance Console.

Installing the Activation Key Files

Be sure to connect the PC to the PBX in advance. For details about Web Maintenance Console, refer to "5.3 Starting Web Maintenance Console".

1. Log in to Web Maintenance Console using the Installer level account.
2. Click **Maintenance → Utility → Activation Key Installation**.
   Activation Key Installation window will be displayed.
3. Click **Browse** and specify the directory where the activation key files are stored, and click **Open**.
4. A list of activation key files stored in the specified directory is displayed. Check the boxes next to the activation keys to install to the PBX, and click **Install**.
5. The activation keys will be copied to the Master unit, and then the activation keys that Slave units require will be copied to the Slave units of the One-look network. When installation is complete, the message, "The activation key has been installed and activated successfully!" is displayed.
6. Click **Apply**.

Notice

The activation key file can only be installed in the PBX with the MPR ID number entered when the activation key file was downloaded. The activation key file cannot be reissued unless the mother board crashes.

Note

- You can click the provided link to directly access activation key information and programme the number of activated IP trunks and IP softphones.
- For information about programming activation keys using Web Maintenance Console, refer to "9.3 PBX Configuration—Configuration—Slot—Activation Key" in the PC Programming Manual.

5.4.5 Configuration of the Activation Keys

Depending on your configuration, it may be necessary to programme the number of provided IP Trunk channels to be used for H.323 trunks. By default, all of the provided IP Trunk channels will be used for SIP trunks.

Similarly, you can programme how many IP softphone(s) can be used through the IP Softphone/IP Proprietary Telephone activation key. By default, only IP softphone(s) can be used through the IP Softphone/IP Proprietary Telephone activation key.
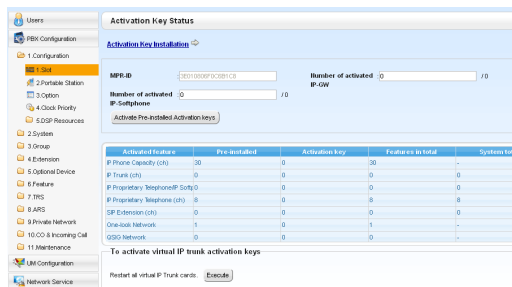
1. **a.** Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.
    b. Click **Activation Key**.

2. **a.** In **Number of activated IP-GW**, type the number of IP Trunk channels to be used for H.323 trunks.

    Note

    > If you have changed the value for **Number of activated IP-GW**, you must click **Execute** to restart the V-IPGW cards for the change to take effect.

    b. In **Number of activated IP-Softphone**, type the number of IP softphones to be used through the IP Softphone/IP Proprietary Telephone activation key.

3. Click **OK**.

5.5 Programming a One-look Network

The Add Site Wizard, which is run from the Home Screen of the Master unit, will add other KX-NS1000 PBXs connected to the private IP network to your One-look network as Slave units.

Note
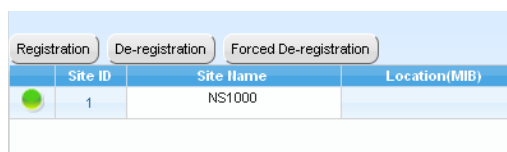
    The PBX to be added must have been configured as a Slave unit using the Easy Setup Wizard.
    For details about Easy Setup Wizard, see "5.4.1 Easy Setup Wizard".

1. To start the Add Site Wizard, click the Add Slave button (🖳) on the Home screen.

2. Follow the prompts of the Add Site Wizard to complete following settings:
   - PBX Setting
   - Registration Setting
   - SNTP / Daylight Saving
   - Maintenance Setting

   Note
   - The parameters which appear in the settings above are described in "5.4.1 Easy Setup Wizard".
   - If 2 or more sites will be added to the One-look network, repeat steps **1** to **2** for each site.

3. After the Add Site Wizard is completed, click **Registration** on the List View of the Home screen.

4. A list of KX-NS1000 PBXs set up as Slave units will be displayed under **Available sites for registration**.
   Select PBXs by their assigned site names and click the right arrow to move them to **Selected sites for registration**.
   Click **Next** to start the registration process.

5. On the **Registration** screen, the status of PBXs being registered is displayed.

6. On the **Registration** screen, the result of the registration process is shown. Click **Close** to continue.
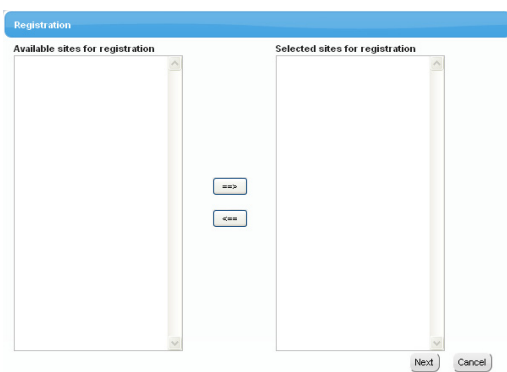
Registered Slave PBXs can now be viewed and selected on the Home Screen for programming.

MASTER LED Transition

When adding Slave units, the MASTER LED of each unit changes as shown in the following table:

Master		Slave (When Slave unit power is turned on before Master unit)		Slave (When Slave unit power is turned on after Master unit)	
Operation	MASTER LED	Operation	MASTER LED	Operation	MASTER LED
		Power On	Amber (Flashing)		
		Log in	Amber		
Power On	Amber (Flashing)				
Log in	Green				
Add Site Wizard	Green				
Add Site Wizard is Completed	Green	Being Registered	Amber (Flashing)		
		Registration is Completed	Amber	Power On	Amber (Flashing)
				Log in	Amber
				Being Registered	Amber (Flashing)
				Registration is Completed	Amber

5.6 Programming a H.323 QSIG Network

There are 2 methods to programme the Virtual 16-Channel VoIP Gateway Card (V-IPGW16 card) to establish VoIP communications between PBXs at different locations, as follows:

PBX code method	The caller dials the unique PBX code of the PBX to which the called party is connected, in addition to the destination number.
Extension number method	The caller dials only the destination number of the called party to call through PBXs at different locations (hence there are fewer digits to dial than with the PBX code method).

Note

- For a detailed explanation about each method, refer to "4.1 Public Network Features" in the Feature Guide.
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5.6.1 Assigning the Hunt Pattern

The hunt pattern determines how to route incoming calls through virtual IP trunks to the PBX. The procedure below demonstrates the process of programming the hunt pattern of the local PBX. After the hunt pattern at the local PBX has been fully assigned, repeat the procedure for the hunt pattern at the remote PBX with the appropriate setting values.
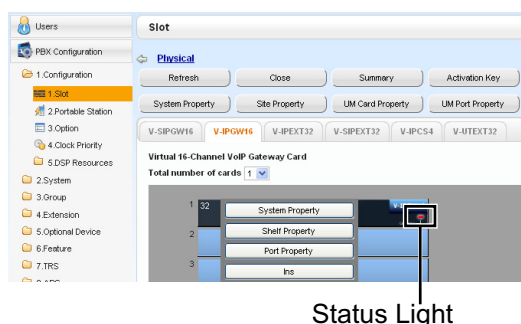
Status Light

1.
  a. Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.
  b. Click **Virtual** → **V-IPGW16**.
  c. If the V-IPGW16 card's status light is green, move the mouse pointer over the card, select **Ous** from the menu that appears, and then click **OK** on the dialogue box. The status light will turn red.
  d. Move the mouse pointer over the installed V-IPGW16 card. A menu will be shown under the mouse pointer.
  e. Click **Shelf Property**.
  f. Click **Hunt Pattern**.
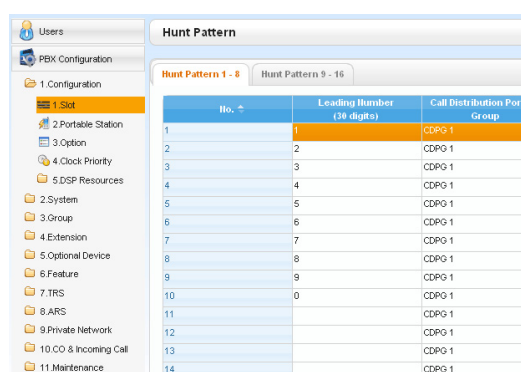
2.
  a. When using the PBX code method:
In the **Leading Number** cell, type the local PBX code and extension starting digit.

When using the extension number method:
In the **Leading Number** cell, type the local extension starting digit.
  b. Click **OK** to return to the Shelf Property screen.

Note

> For more details about hunt pattern assignment, refer to "9.11.2 PBX Configuration—Configuration—Slot —Shelf Property - Virtual IP Gateway—Hunt Pattern" in the PC Programming Manual.

5.6.2 Programming the Address Translation Table

The function of an address translation table in a VoIP network is to provide 2-way translation of telephone numbers and IP addresses[1]. Therefore, a caller can reach the destination by dialling the number without knowing the destination IP address.

The procedure below demonstrates the process of programming the address translation table at the local PBX. After the address translation table at the local PBX has been fully programmed, repeat the procedure for the address translation table at the remote PBX with the appropriate setting values.
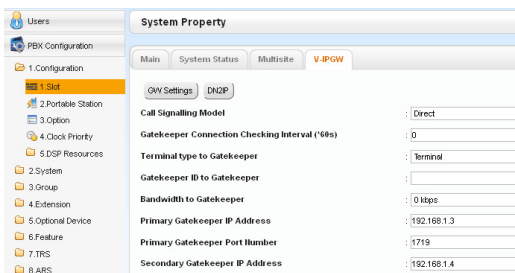
1.
   a. Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.
   b. Click **System Property**.
   c. Click the **V-IPGW** tab.
   d. Click **GW Settings**.
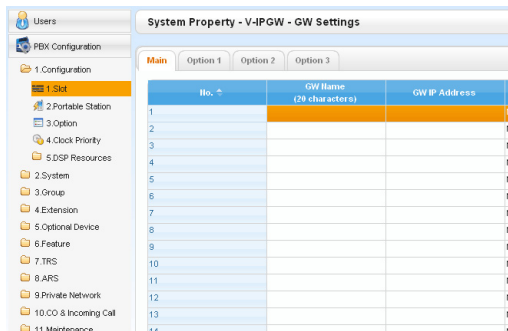
2. In the **Main** tab, do the following to configure the gateway entry for the remote PBX:
   a. In the **GW Name** cell, type a unique identifier of the destination in the VoIP network.
   b. In the **GW IP Address** cell, type the IP address of the destination gateway device.
   c. In the **GW Group** cell, select **None**.

      Note

      > Having the value **None** for **GW Group** means that the destination gateway device does not belong to any gateway group. Grouping is useful when installing multiple gateway devices at one location. For details, refer to "9.4 PBX Configuration—Configuration—Slot—System Property—◆ GW Group" in the PC Programming Manual.

   d. Click **OK** to return to the System Property screen.

[1] IP address-to-telephone number translation can also be handled by using an H.323 Gatekeeper device. To configure Gatekeeper devices, refer to the manufacturer's documentation. This manual focuses on the method using the V-IPGW16 card's internal address translation capabilities.

3.   **a.** Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.

b. Click **System Property**.

c. Click the **V-IPGW** tab.

d. Click **DN2IP**.

e. **When using the PBX code method:**
In the **Leading Number** cell, type the remote PBX code and starting digit of destination extension.

When using the extension number method:
In the **Leading Number** cell, type the remote PBX code and starting digit of destination extension.

f. In the **Remaining Number of Digits** cell, type a number of digits to dial following the leading number.

g. In **GW No./GW Group Selection**, select **GW No.**

h. In the **GW No.** cell, select **1** (the gateway entry for the destination gateway device at the remote PBX).

i. Click **OK**.

Note

For more details about gateway settings, refer to "9.4 PBX Configuration—Configuration—Slot—System Property—GW Settings–Main" in the PC Programming Manual.

5.6.3 Programming the Network Settings

For successful operation of a VoIP network using the V-IPGW16 card, network settings for the PBX at each location must be programmed appropriately. For a detailed discussion of related features, refer to the Feature Guide.

This section details the procedure to programme the network settings for the local PBX. After the programming for the local PBX has been done, repeat the procedure for the remote PBX with the appropriate setting values. The following procedures describe the process of programming the network settings for each numbering method.

Programming for the PBX Code Method
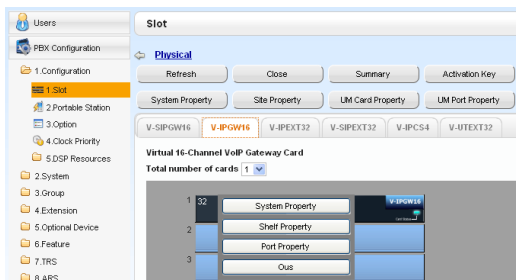
1. a. Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.
    b. Click **Virtual** → **V-IPGW16**.
    c. Move the mouse pointer over the installed V-IPGW16 card to display the menu of options, and click **Ous** (out of service) to set the card to out of service.
    d. Repeat step **c** for each installed V-IPGW16 card until all V-IPGW16 cards are OUS.
    e. Move the mouse pointer over the installed V-IPGW16 card to display the menu of options, and click **Port Property**.

    Confirm that all V-IPGW16 cards are OUS.

    Note

    When a V-IPGW16 card is installed, 8 ports are available for the card (a port has 2 channels).
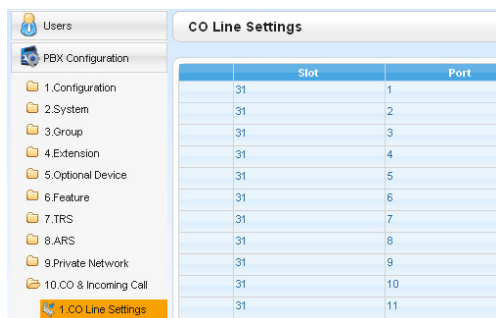
2. a. Click **Setup** → **PBX Configuration** → **CO & Incoming Call**.
    b. Click **CO Line Settings**.
    c. Type the **CO Name** and assign an unused **Trunk Group Number** to be used for all IP trunks.
    d. Click **OK**.

3. **a.** Click **Setup** → **PBX Configuration** → **System**.
   b. Click **Numbering Plan**.
   c. Click **Main**.
   d. Click the **Features** tab.
   e. In the **TIE Line Access** cell, type the dialling number.
   f. Click **OK**.
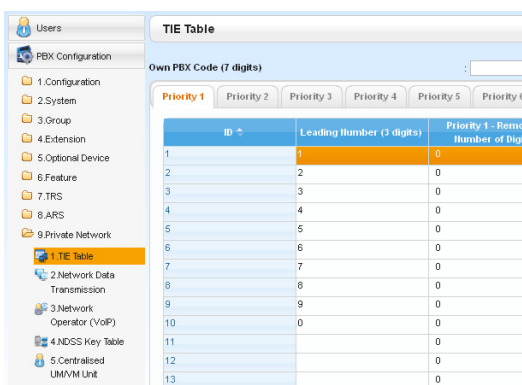
4. **a.** Click **Setup** → **PBX Configuration** → **Private Network**.
   b. Click **TIE Table**.
   c. In the **Own PBX Code** cell, type the PBX code of the local PBX in the network.
   d. In the first unused **Leading Number** cell, type the PBX code of the remote PBX in the network.
   e. In the corresponding **Trunk Group** list, select the number of the trunk group to be used when making calls.
   f. Set the number modification pattern, if necessary.
   g. Click **OK**.
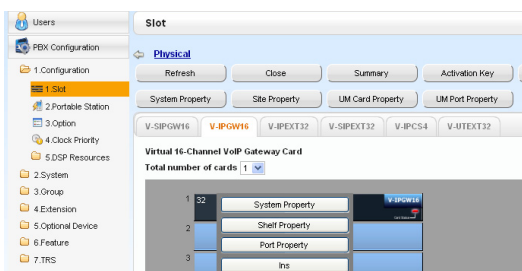
5. **a.** Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.
   b. Click **Virtual** → **V-IPGW16**.
   c. Move the mouse pointer over the installed V-IPGW16 card to display the menu of options, and click **Ins** (in service).
   d. Repeat step **c** for each installed V-IPGW16 card until all V-IPGW16 cards are INS.

Programming for the Extension Number Method

1. **a.** Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.
   b. Click **Virtual** → **V-IPGW16**.
   c. Move the mouse pointer over the installed V-IPGW16 card to display the menu of options.
   d. Click **Port Property**.

Confirm that all V-IPGW16 cards are set to OUS.

Note

When a V-IPGW16 card is installed, 8 ports are available for the card.

2. **a.** Click **Setup** → **PBX Configuration** → **CO & Incoming Call**.

    b. Click **CO Line Settings**.

    c. Type the **CO Name** and assign an unused **Trunk Group Number** to be used for all IP trunks.
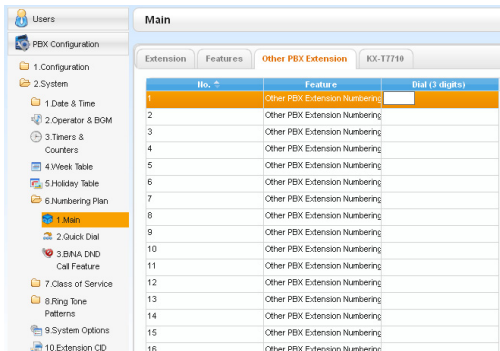
    d. Click **OK**.

3. **a.** Click **Setup** → **PBX Configuration** → **System**.

    b. Click **Numbering Plan**.

    c. Click **Main**.

    d. Click the **Other PBX Extension** tab.

    e. In the **Dial (3 digits)** cell, type a starting digit of destination extension.

    f. Click **OK**.
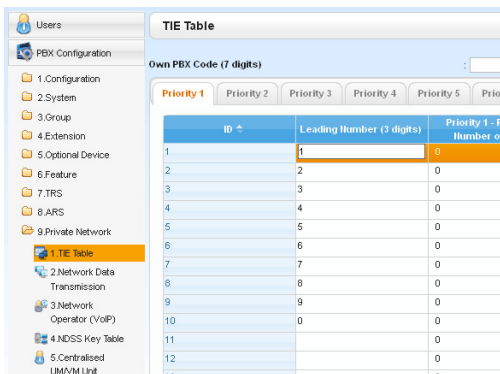
4. **a.** Click **Setup** → **PBX Configuration** → **Private Network**.

    b. Click **TIE Table**.

    c. In the **Leading Number** cell, type the starting digit of destination extension.

    d. Click **OK**.
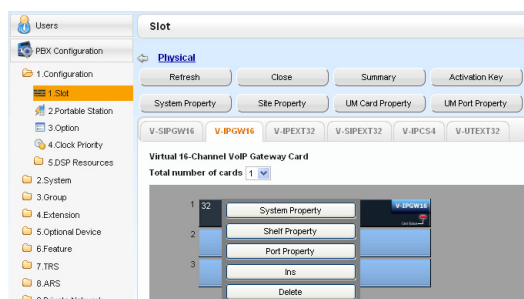
5. **a.** Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.

   b. Click **Virtual** → **V-IPGW16**.

   c. Move the mouse pointer over the installed V-IPGW16 card to display the menu of options, and click **Ins**.

   d. Repeat step **c** for each installed V-IPGW16 card until all V-IPGW16 cards are INS.

Note

> For details about network parameter settings, refer to the relevant sections of the PC Programming Manual.

5.7 Programming SIP Trunks

The Virtual 16-Channel SIP Trunk Card (V-SIPGW16) is a virtual trunk card which is designed to be easily integrated into an Internet Telephony Service provided by an ITSP (Internet Telephony Service Provider). Various settings can be programmed for each virtual SIP gateway port.

Accessing Port Properties
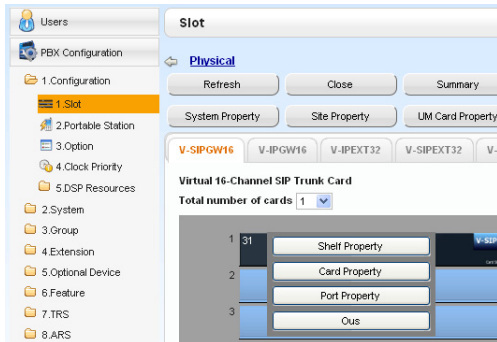
1. Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.

2. Click **Virtual**.

3. Move the mouse pointer over the **V-SIPGW16** card.

4. Click **Port Property**.

Programming Port Properties

Automatic Programming

Some of the parameters can be automatically programmed by selecting the desired SIP provider for each virtual SIP gateway port. Available SIP providers can be selected, and a different SIP provider can be assigned to each virtual SIP gateway port.

Note

It is necessary to import a SIP provider list file (comma-separated value [CSV] file) in advance to use the automatic programming feature.

Follow the steps below to configure a SIP provider.

1. Click **Select Provider**.
   A dialogue box will appear. Available virtual SIP gateway port numbers are displayed in the list.
2. From the **Provider** menu, select the desired SIP provider.

   Note

   If the desired SIP provider is not shown in the drop-down list, it is necessary to programme the desired parameters manually. For information about the manual programming procedure, refer to "Manual Programming" below.

3. Highlight the desired port numbers or click **Select All** to select all the virtual SIP gateway port numbers to be assigned to the SIP provider selected in step **2**.
4. Click **Execute**.
   Appropriate setting values designated by the SIP provider will be set in the parameters for the virtual SIP gateway ports.

Manual Programming

Follow the steps below to programme the parameters which are not automatically programmed by selecting a provider.

1. Click the desired tab.
2. Enter information or select settings from the drop-down list for each parameter.

Parameters that Require Manual Programming

Manual programming is compulsory for the following parameters:
- **User Name**: Specifies the user name (SIP Account) provided by the SIP provider. (Max. 64 characters)
- **Authentication ID**: Specifies the authentication ID required for registration with the SIP server. (Max. 64 characters)
- **Authentication Password**: Specifies the authentication password used for registration with the SIP provider. (Max. 32 characters)

Follow the steps below to programme these 3 parameters.

1. Click an **Account** tab.

2. In the **User Name** column, enter the user name provided by the SIP provider.

3. In the **Authentication ID** column, enter the authentication ID required for registration with the SIP server.

4. In the **Authentication Password** column, the authentication password used for registration with the SIP provider.

5. Click **OK**.

Adding Settings to Provider Profiles

Follow the steps below to add the settings to provider profiles.
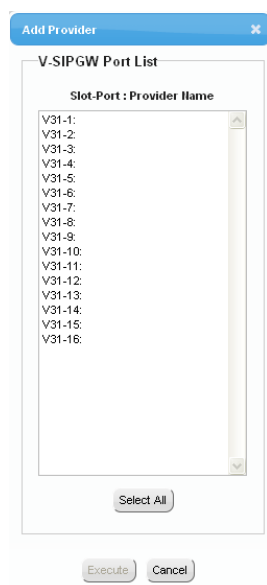
1. Click **Add Provider**.
   A dialogue box will appear. Available virtual SIP gateway port numbers are displayed in the list.

2. Highlight the desired port numbers or click **Select All** to select all the virtual SIP gateway port numbers to add the settings to provider profiles.

3. Click **Execute**.

Note

For more details about SIP gateway port settings, refer to the PC Programming Manual.

5.8 Assigning Networking Information to IP Telephones

5.8.1 Assigning IP Addressing Information

The IP telephone's IP address, subnet mask address and default gateway address, and the PBX's IP address must be assigned to the IP telephone before it can be used on the network. This IP addressing information can be assigned in the following ways:

For IP-PTs

* **Using a DHCP server (DHCP Server feature or an external DHCP server) when the IP-PT is on the same LAN as the PBX**
  The DHCP server automatically assigns the IP address of the IP-PT, the subnet mask address, and the default gateway address to the IP-PT.
  The PBX's IP address can also be assigned automatically to the IP-PT in the process of being registered to the PBX. For details about registering the IP-PT, refer to "5.9.1 Registering IP Telephones".

  Note

  > For information about the DHCP Server feature, refer to "7.1.2 DHCP (Dynamic Host Configuration Protocol) Server".

* **Using a DHCP server (DHCP Server feature or an external DHCP server) when the IP-PT is on a remote office LAN**
  While the DHCP server automatically assigns the IP address of the IP-PT, the subnet mask address, and the default gateway address to the IP-PT, the PBX's IP address must be assigned manually.
  Follow the procedure below to assign the PBX's IP address.
  If you need to set VLAN parameters, follow the procedure described in "5.8.2 Setting VLAN Parameters" after assigning the IP addresses, without ending programming.

  Note

  > * By assigning the PBX's IP address to one IP-PT, it is possible to assign the PBX's IP address to other IP-PTs or IP-CSs on the same LAN through system programming. For details, refer to "9.14 PBX Configuration—Configuration—Slot—V-IPEXT32—Port Property—Option—◆ ANNOUNCE Mode" in the PC Programming Manual.
  > * IP-PTs can only receive IP addressing information from a DHCP server on its own LAN. Therefore, when IP-PTs are located on several LANs, a DHCP server is required on each LAN.
  > * Since the default setting of the DHCP client function is enabled for IP-PTs, simply connect the IP-PTs to the LAN to use the DHCP server.

KX-NT300 series (except KX-NT321)

To start programming

Supply power to the IP-PT. ▶ SETUP ▶▶

Press "SETUP"
when it is displayed.

To enter the IP address of the PBX

Software version 2.00 or later only

▶▶ (ENTER) ▶ (ENTER) ▶ (ENTER) ▶ (ENTER) ▶ (ENTER) ▶▶

Select "PBX".   ENTER   Select "PBX IP Address".   ENTER   Select "Primary PBX".

▶▶ (ENTER) ▶ PBX IP Address ▶ (ENTER) ▶▶

ENTER   ENTER

To enter the IP address of the Secondary PBX (optional for software version 2.00 or later only)

▶▶ (ENTER) ▶ (ENTER) ▶ PBX IP Address ▶ (ENTER) ▶▶

Select "Secondary PBX".   ENTER   ENTER

To set VLAN parameters

▶▶ To the VLAN settings

OR

To end programming

▶▶ (●) ▶ STORE ▶ The IP-PT will reboot and can then be registered to the PBX.

Return to the
Menu screen.   Press "STORE".

KX-NT321

To start programming

Supply power to the IP-PT. ▶ 〔PROGRAM〕 ▶▶

Press PROGRAM
while "Searching" is displayed.

To enter the IP address of the PBX

▶▶ (navigator) ▶ SP-PHONE ▶ (navigator) ▶ SP-PHONE ▶ (navigator) ▶▶

Select "PBX".　Press SP-PHONE.　Select "PBX IP　Press SP-PHONE.　Select "Primary
　　　　　　　　　　　　　　　Address".　　　　　　　　　　　　　PBX".

▶▶ SP-PHONE ▶ **PBX IP Address** ▶ SP-PHONE ▶▶

Press SP-PHONE.　　　　　　　　　　　　　Press SP-PHONE.

To enter the IP address of the Secondary PBX (if required)

▶▶ (navigator) ▶ SP-PHONE ▶ **PBX IP Address** ▶ SP-PHONE ▶▶

Select "Secondary　Press SP-PHONE.　　　　　　　　　　　Press SP-PHONE.
PBX".

▶▶ 〔HOLD〕 ▶▶

Press HOLD twice to return
to the Menu screen.

To set VLAN parameters

▶▶ To the VLAN settings

OR

To end programming

▶▶ 〔AUTO DIAL STORE〕 ▶ (The IP-PT will reboot
and can then be
registered to the PBX.)

Press STORE.

Note

To confirm the connection to the secondary PBX after assigning IP addressing information, (1) turn the IP-PT's power off, and (2) hold the STORE button and **2** key while turning the power on.

KX-NT265 (Software version 2.00 or later only)

To start programming

Supply power to the IP-PT. ▶   ◎ PROG. PROGRAM   ▶▶

Press PROGRAM
while "Searching" is displayed.

To enter the IP address of the PBX

▶▶ VOL VOLUME △▽ ▶ SP-PHONE ▶ | PBX IP Address | ▶ SP-PHONE ▶ HOLD ▶▶

Press VOLUME   Press SP-PHONE   Press SP-PHONE.   Press HOLD to return
to select "PBX".   twice.   to the Menu screen.

To set VLAN parameters

▶▶   To the VLAN settings

OR

To end programming

▶▶ AUTO DIAL ◯ STORE ▶ The IP-PT will reboot
                            and can then be
                            registered to the PBX.

Press STORE.

- **Not using a DHCP server (DHCP Server feature or an external DHCP server) when the IP-PT is on the same LAN as the PBX**
  Only the PBX's IP address can be assigned automatically to the IP-PT in the process of being registered to the PBX. For details about registering the IP-PT, refer to "5.9.1 Registering IP Telephones".
  Follow the procedure below to assign the IP address of the IP-PT, the subnet mask address, and the default gateway address manually.
  If you need to set VLAN parameters, follow the procedure described in "5.8.2 Setting VLAN Parameters" after assigning the IP addresses, without ending programming.

KX-NT300 series (except KX-NT321)

To start programming

Supply power to the IP-PT. ▶ SETUP ▶▶

Press "SETUP" when it is displayed.

To set the IP address of the IP-PT

▶▶ Select "Network". ▶ ENTER ▶ Select "Disable" for DHCP setting. ▶ Select "IP Address". ▶ ENTER ▶▶

▶▶ IP Address*1 ▶ ENTER ▶▶

To set the subnet mask address

▶▶ Select "Subnet Mask". ▶ ENTER ▶ Subnet Mask Address*2 ▶ ENTER ▶▶

To set the default gateway address (if required)

▶▶ Select "Default Gateway". ▶ ENTER ▶ Default Gateway Address*3 ▶ ENTER ▶▶

To enter the IP address of the Secondary PBX (optional for software version 2.00 or later only)

▶▶ Return to the Menu screen. ▶ Select "PBX". ▶ ENTER ▶ Select "PBX IP Address". ▶ ENTER ▶ Select "Secondary PBX".

▶▶ ENTER ▶ PBX IP Address ▶ ENTER ▶▶

▶▶ **Continued on next page**

Continued from previous page ▶▶

To set VLAN parameters

▶▶   ⬡   ▶   To the VLAN settings

Return to the
Menu screen.

OR

To end programming

▶▶   ⬡   ▶   STORE   ▶   The IP-PT will reboot
and can then be
registered to the PBX.

Return to the   Press "STORE".
Menu screen.

*1   Valid IP address range: "1.0.0.0" to "223.255.255.255"
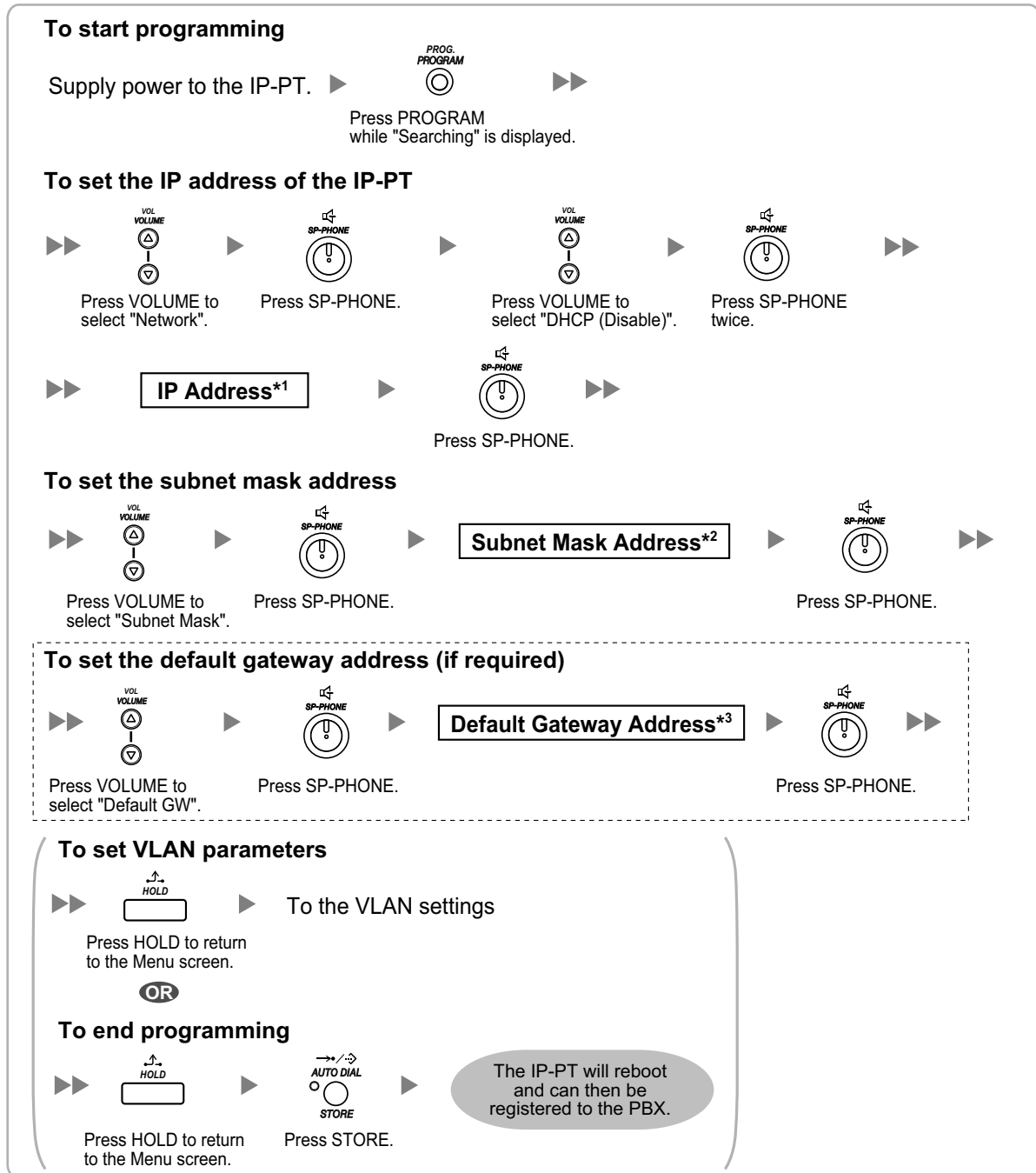*2   Valid subnet mask address range: "0–255.0–255.0–255.0–255" (except "0.0.0.0" and "255.255.255.255")
*3   Valid IP address range: "1.0.0.0" to "223.255.255.255"

KX-NT321

To start programming

Supply power to the IP-PT. ▶   [PROGRAM]   ▶▶

Press PROGRAM
while "Searching" is displayed.

To set the IP address of the IP-PT

▶▶ Select "Network". ▶ Press SP-PHONE. ▶ Select "DHCP (Disable)". ▶ Press SP-PHONE twice. ▶▶

▶▶ **IP Address*1** ▶ Press SP-PHONE. ▶▶

To set the subnet mask address

▶▶ Select "Subnet Mask". ▶ Press SP-PHONE. ▶ **Subnet Mask Address*2** ▶ Press SP-PHONE. ▶▶

To set the default gateway address (if required)

▶▶ Select "Default GW". ▶ Press SP-PHONE. ▶ **Default Gateway Address*3** ▶ Press SP-PHONE. ▶▶

To enter the IP address of the Secondary PBX (if required)

▶▶ [HOLD] Press HOLD to return to the Menu screen. ▶ Select "PBX". ▶ Press SP-PHONE. ▶ Select "PBX IP Address". ▶ Press SP-PHONE. ▶ Select "Secondary PBX". ▶▶

▶▶ Press SP-PHONE. ▶ **PBX IP Address** ▶ Press SP-PHONE. ▶▶

▶▶ [HOLD] ▶▶

Press HOLD twice to return to the Menu screen.

▶▶ **Continued on next page**

Continued from previous page ▶▶

To set VLAN parameters

▶▶ To the VLAN settings

OR

To end programming

▶▶ →•/·☼
AUTO DIAL
◯
STORE

Press STORE.

▶

The IP-PT will reboot and can then be registered to the PBX.

[*1] Valid IP address range: "1.0.0.0" to "223.255.255.255"
[*2] Valid subnet mask address range: "0–255.0–255.0–255.0–255" (except "0.0.0.0" and "255.255.255.255")
[*3] Valid IP address range: "1.0.0.0" to "223.255.255.255"

Note

To confirm the connection to the secondary PBX after assigning IP addressing information, (1) turn the IP-PT's power off, and (2) hold the STORE button and **2** key while turning the power on.

KX-NT265 (Software version 2.00 or later only)

To start programming

Supply power to the IP-PT. ▶

PROG.
PROGRAM
◎

▶▶

Press PROGRAM
while "Searching" is displayed.

To set the IP address of the IP-PT

▶▶   VOL VOLUME △▽   ▶   SP-PHONE   ▶   VOL VOLUME △▽   ▶   SP-PHONE   ▶▶

Press VOLUME to
select "Network".

Press SP-PHONE.

Press VOLUME to
select "DHCP (Disable)".

Press SP-PHONE
twice.

▶▶   **IP Address*1**   ▶   SP-PHONE   ▶▶

Press SP-PHONE.

To set the subnet mask address

▶▶   VOL VOLUME △▽   ▶   SP-PHONE   ▶   **Subnet Mask Address*2**   ▶   SP-PHONE   ▶▶

Press VOLUME to
select "Subnet Mask".

Press SP-PHONE.

Press SP-PHONE.

To set the default gateway address (if required)

▶▶   VOL VOLUME △▽   ▶   SP-PHONE   ▶   **Default Gateway Address*3**   ▶   SP-PHONE   ▶▶

Press VOLUME to
select "Default GW".

Press SP-PHONE.

Press SP-PHONE.

To set VLAN parameters

▶▶   HOLD   ▶   To the VLAN settings

Press HOLD to return
to the Menu screen.

OR

To end programming

▶▶   HOLD   ▶   AUTO DIAL STORE   ▶   The IP-PT will reboot
and can then be
registered to the PBX.

Press HOLD to return
to the Menu screen.

Press STORE.

---

*1   Valid IP address range: "1.0.0.0" to "223.255.255.255"
*2   Valid subnet mask address range: "0–255.0–255.0–255.0–255" (except "0.0.0.0" and "255.255.255.255")
*3   Valid IP address range: "1.0.0.0" to "223.255.255.255"

- **Not using a DHCP server (DHCP Server feature or an external DHCP server) when the IP-PT is on a remote office LAN**
  All of the IP addressing information must be assigned manually.
  Follow the procedure below to assign the IP addressing information.
  If you need to set VLAN parameters, follow the procedure described in "5.8.2 Setting VLAN Parameters" after assigning the IP addresses, without ending programming.

  Note

  By assigning the PBX's IP address to one IP-PT, it is possible to assign the PBX's IP address to other IP-PTs or IP-CSs on the same LAN through system programming. For details, refer to "9.14 PBX Configuration—Configuration—Slot—V-IPEXT32—Port Property—Option—◆ ANNOUNCE Mode" in the PC Programming Manual.

KX-NT300 series (except KX-NT321)

To start programming

Supply power to the IP-PT. ▶ SETUP ▶▶

Press "SETUP" when it is displayed.

To set the IP address of the IP-PT

▶▶ [ENTER] ▶ [ENTER] ▶ [ENTER] ▶ [ENTER] ▶ [ENTER] ▶▶

Select "Network". ENTER Select "Disable" for DHCP setting. Select "IP Address". ENTER

▶▶ IP Address*1 ▶ [ENTER] ▶▶

ENTER

To set the subnet mask address

▶▶ [ENTER] ▶ [ENTER] ▶ Subnet Mask Address*2 ▶ [ENTER] ▶▶

Select "Subnet Mask". ENTER ENTER

To set the default gateway address

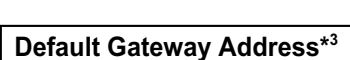▶▶ [ENTER] ▶ [ENTER] ▶ Default Gateway Address*3 ▶ [ENTER] ▶▶

Select "Default Gateway". ENTER ENTER

To enter the IP address of the PBX

```
Software version 2.00 or later only
```

▶▶ [●] ▶ [ENTER] ▶ [ENTER] ▶ [ENTER] ▶ [ENTER] ▶ [ENTER] ▶▶

Return to the Menu screen. Select "PBX". ENTER Select "PBX IP Address". ENTER Select "Primary PBX".

▶▶ [ENTER] ▶ PBX IP Address ▶ [ENTER] ▶▶

ENTER ENTER

▶▶ **Continued on next page**

Continued from previous page ▶▶

To enter the IP address of the Secondary PBX (optional for software version 2.00 or later only)

▶▶ (ENTER) ▶ (ENTER) ▶ | **PBX IP Address** | ▶ (ENTER) ▶▶

Select "Secondary PBX".   ENTER   ENTER

To set VLAN parameters

▶▶ (navigator) ▶ To the VLAN settings

Return to the
Menu screen.

OR

To end programming

▶▶ (navigator) ▶ | **STORE** | ▶ The IP-PT will reboot
and can then be
registered to the PBX.

Return to the   Press "STORE".
Menu screen.

---

*1   Valid IP address range: "1.0.0.0" to "223.255.255.255"
*2   Valid subnet mask address range: "0–255.0–255.0–255.0–255" (except "0.0.0.0" and "255.255.255.255")
*3   Valid IP address range: "1.0.0.0" to "223.255.255.255"

KX-NT321

To start programming

Supply power to the IP-PT. ▶ [PROGRAM] ▶▶

Press PROGRAM
while "Searching" is displayed.

To set the IP address of the IP-PT

▶▶ (navigator) ▶ [SP-PHONE] ▶ (navigator) ▶ [SP-PHONE] ▶▶

Select "Network".   Press SP-PHONE.   Select "DHCP (Disable)".   Press SP-PHONE
twice.

▶▶ | **IP Address*1** | ▶ [SP-PHONE] ▶▶

Press SP-PHONE.

To set the subnet mask address

▶▶ (navigator) ▶ [SP-PHONE] ▶ | **Subnet Mask Address*2** | ▶ [SP-PHONE] ▶▶

Select "Subnet Mask".   Press SP-PHONE.   Press SP-PHONE.

To set the default gateway address

▶▶ (navigator) ▶ [SP-PHONE] ▶ | **Default Gateway Address*3** | ▶ [SP-PHONE] ▶▶

Select "Default GW".   Press SP-PHONE.   Press SP-PHONE.

To enter the IP address of the PBX

▶▶ [HOLD] ▶ (navigator) ▶ [SP-PHONE] ▶ (navigator) ▶ [SP-PHONE] ▶ (navigator) ▶▶

Press HOLD to return   Select "PBX".   Press SP-PHONE.   Select "PBX IP   Press SP-PHONE.   Select "Primary
to the Menu screen.   Address".   PBX".

▶▶ [SP-PHONE] ▶ | **PBX IP Address** | ▶ [SP-PHONE] ▶▶

Press SP-PHONE.   Press SP-PHONE.

To enter the IP address of the Secondary PBX (if required)

▶▶ (navigator) ▶ [SP-PHONE] ▶ | **PBX IP Address** | ▶ [SP-PHONE] ▶▶

Select "Secondary   Press SP-PHONE.   Press SP-PHONE.
PBX".

▶▶   **Continued on next page**

Continued from previous page ▶▶

▶▶ ⬆ HOLD ▶▶

Press HOLD twice to return
to the Menu screen.

To set VLAN parameters

▶▶ To the VLAN settings

OR

To end programming

▶▶ →•/⋯
AUTO DIAL
⬤
STORE ▶ The IP-PT will reboot
and can then be
registered to the PBX.

Press STORE.

*1 Valid IP address range: "1.0.0.0" to "223.255.255.255"
*2 Valid subnet mask address range: "0–255.0–255.0–255.0–255" (except "0.0.0.0" and "255.255.255.255")
*3 Valid IP address range: "1.0.0.0" to "223.255.255.255"

Note

To confirm the connection to the secondary PBX after assigning IP addressing information, (1) turn the IP-PT's power off, and (2) hold the STORE button and **2** key while turning the power on.

KX-NT265 (Software version 2.00 or later only)

To start programming

Supply power to the IP-PT. ▶

PROG.
PROGRAM
◎

▶▶

Press PROGRAM
while "Searching" is displayed.

To set the IP address of the IP-PT

▶▶

VOL
VOLUME
△
▽

▶

SP-PHONE

▶

VOL
VOLUME
△
▽

▶

SP-PHONE

▶▶

Press VOLUME to
select "Network".

Press SP-PHONE.

Press VOLUME to
select "DHCP (Disable)".

Press SP-PHONE
twice.

▶▶ **IP Address*1** ▶

SP-PHONE

▶▶

Press SP-PHONE.

To set the subnet mask address

▶▶

VOL
VOLUME
△
▽

▶

SP-PHONE

▶ **Subnet Mask Address*2** ▶

SP-PHONE

▶▶

Press VOLUME to
select "Subnet Mask".

Press SP-PHONE.

Press SP-PHONE.

To set the default gateway address

▶▶

VOL
VOLUME
△
▽

▶

SP-PHONE

▶ **Default Gateway Address*3** ▶

SP-PHONE

▶▶

Press VOLUME to
select "Default GW".

Press SP-PHONE.

Press SP-PHONE.

To enter the IP address of the PBX

▶▶

HOLD

▶

VOL
VOLUME
△
▽

▶

SP-PHONE

▶ **PBX IP Address** ▶

SP-PHONE

▶

HOLD

▶▶

Press HOLD
twice to return
to the Menu screen.

Press VOLUME
to select "PBX".

Press SP-PHONE
twice.

Press
SP-PHONE.

Press HOLD
to return to the
Menu screen.

To set VLAN parameters

▶▶ To the VLAN settings

OR

To end programming

▶▶

→•/⋅⋅▷
AUTO DIAL
○
STORE

▶ The IP-PT will reboot
and can then be
registered to the PBX.

Press STORE.

---

*1 Valid IP address range: "1.0.0.0" to "223.255.255.255"
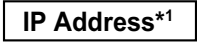*2 Valid subnet mask address range: "0–255.0–255.0–255.0–255" (except "0.0.0.0" and "255.255.255.255")
*3 Valid IP address range: "1.0.0.0" to "223.255.255.255"

For KX-UT Series SIP Phones

Notice

When you want to use a KX-UT series SIP phone that has already been used with another PBX, or that has had its settings programmed, you must reset the SIP phone to its factory default before assigning new IP address information as detailed in the following procedure.
For details, refer to the documentation for the KX-UT series SIP phone.

Assigning the IP addressing information to the SIP phone

* **Using a DHCP server (DHCP Server feature or an external DHCP server) to automate the assignment of IP addressing information**
The DHCP server automatically assigns the IP address of the SIP phone, the subnet mask address, and the default gateway address to the SIP phone.
The PBX's IP address can also be assigned automatically to the SIP phone in the process of being registered to the PBX. For details about registering the SIP phone, refer to "5.9.1 Registering IP Telephones".

  Note

  For information about the DHCP Server feature, refer to "7.1.2 DHCP (Dynamic Host Configuration Protocol) Server".

* **Not using a DHCP server (DHCP Server feature or an external DHCP server) when assigning IP addressing information**
Only the PBX's IP address can be assigned automatically to the SIP phone in the process of being registered to the PBX. For details about registering the SIP phone, refer to "5.9.1 Registering IP Telephones". The IP address of the SIP phone, the subnet mask address, and the default gateway address must be assigned manually. For instructions, refer to the documentation of the SIP phone.

  Note

  * When the PBX is not in the same network as the SIP phone, the IP address of the PBX must be assigned manually. For instructions for manually setting PBX network information, refer to "Assigning the IP address of the PBX to a SIP phone".
  * When assigning IP addressing information to the SIP phone, do not use the phone's Web user interface programming.

Assigning the IP address of the PBX to a SIP phone

The IP address of the PBX is automatically assigned to a SIP phone when the SIP phone is in the same LAN as the PBX. However, when the SIP phone is in a different LAN from the PBX, the following procedure is required to assign the IP address of the PBX manually with using Web user interface.

Notice

Do not perform any other operation rather than following procedure with Web user interface. Otherwise the SIP phone may not work properly. In that case, contact an authorised Panasonic Factory Service Centre.

1. Prepare a configuration file to specify the IP address of the PBX.
   a. Open a text editor on a PC, and then write exactly same as the following:

   ```
   # PCC Standard Format File # DO NOT CHANGE THIS LINE!

   ### Management Server Settings #######
   ACS_URL="http://xxx.xxx.xxx.xxx:yyy/cwmp/cwmpAction.cgi"
   ```

Notice

- For "xxx.xxx.xxx.xxx:yyy", enter the IP address and port number of the network router which is in a same LAN with the PBX.
  The router accessed by the SIP phone must have static NAT/NAPT settings enabled so that the packets sent to xxx.xxx.xxx.xxx:yyy to be transferred to the PBX. For details, refer to "Connection via Internet" in "5.2 PC Connection" and "Internet Connection (SSL Connection):" in "5.3 Starting Web Maintenance Console".
- Configuration files must end with an empty line.

   b. Save the text file as "UT_ACS.cfg".

2. Confirm the IP address of the SIP phone.

   a. Press **Setting** or **Setup** (soft button) on the SIP phone.

   b. Select "`Information Display`", then press **[ENTER]**.

   c. Select "`IP address`".
   The IP address of the SIP phone will be displayed.

   d. Press **[CANCEL]**.

3. Open the port of the SIP phone, which is used by the PCs to access Web user interface.

   a. Press **Setting** or **Setup** (soft button) on the SIP phone.

   b. Press **[#][5][3][4]**.

   c. Select "`On`" for "`Embedded web`", then press **[ENTER]**.

Note

   If no operation are made for 30 minutes, the port will be closed again automatically.

4. Access the Web user interface from the PC.

   a. Open your Web browser, and then enter "http://"followed by the SIP phone's IP address into the address field of your browser.

   b. For authentication, enter your ID and password, and then click **OK**.
   The Installer Level ID and Password are as follows.
   ID: instoperatoruserid
   Password: instpass

   c. Select **Maintenance** → **Import Configuration File**.

   d. Click **Browse…** , and then select the configuration file (UT_ACS.cfg).

   e. Click **Import**.
   When the configuration file is successfully imported, the SIP phone starts to access the PBX automatically.

5. Confirm if the configuration file was successfully loaded.

    a. Select **Maintenance** → **Export Configuration File**.

    b. Click **Export** to download the configuration file being used currently on the SIP phone.
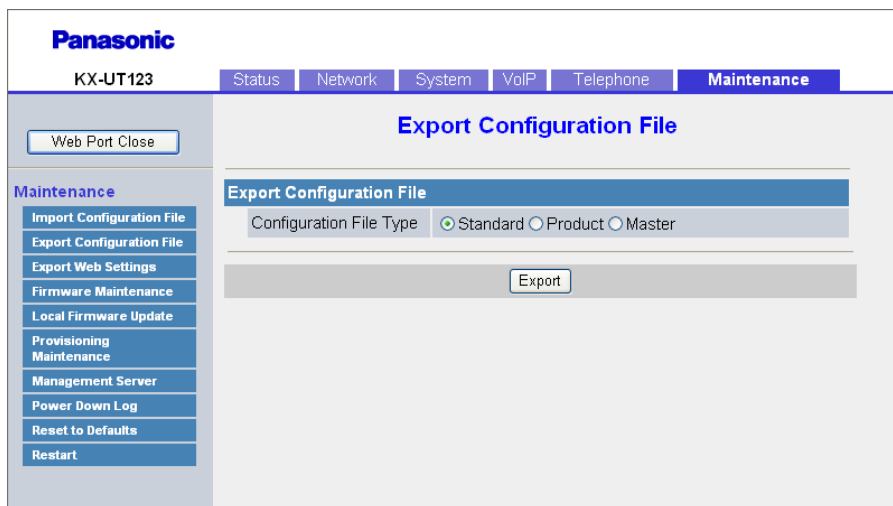
    c. Compare the UT_ACS.cfg file and the downloaded file. If the UT_ACS.cfg file was successfully loaded, the contents of those 2 files will be exactly the same.

    Notice

        When the 2 UT_ACS.cfg files do not match, and if the SIP phone does not work properly, contact an authorised Panasonic Factory Service Centre.

For Non-KX-UT Series SIP Phones

Using a DHCP server (DHCP Server feature or an external DHCP server) to automate the assignment of IP addressing information
The IP address of the SIP phone, the subnet mask address, and the default gateway address can be assigned to the SIP phone automatically by the DHCP server.
The PBX's IP address must be assigned manually on the SIP phone side.
For instructions, refer to the documentation of the SIP phone.

Not using a DHCP server (DHCP Server feature or an external DHCP server) when assigning IP addressing information
All of the IP addressing information must be assigned manually.
For instructions, refer to the documentation of the SIP phone.

Note

- A SIP phone can only receive IP addressing information from a DHCP server on its own LAN. Therefore, when SIP phones are located on several LANs, a DHCP server is required on each LAN.
- When the DHCP client function is enabled for SIP phones, simply connect them to the LAN to use the DHCP server. For details about the DHCP client function setting, refer to the documentation of the SIP phone.

5.8.2 Setting VLAN Parameters

To establish voice communications between IP telephones, the primary ports of the IP telephones and the connected PBX must belong to the same VLAN. Consult your network administrator and obtain the appropriate VLAN ID.

If you are using an IP telephone equipped with two ports, it is possible to place primary and secondary ports of the IP telephone on different VLANs by assigning separate VLAN IDs to each port.

Follow the procedure below for all IP-PTs on the network, using appropriate VLAN IDs.

Note

The procedure for SIP phones may vary depending on the type of the SIP phone being used. Refer to the documentation of your SIP phone for instructions.
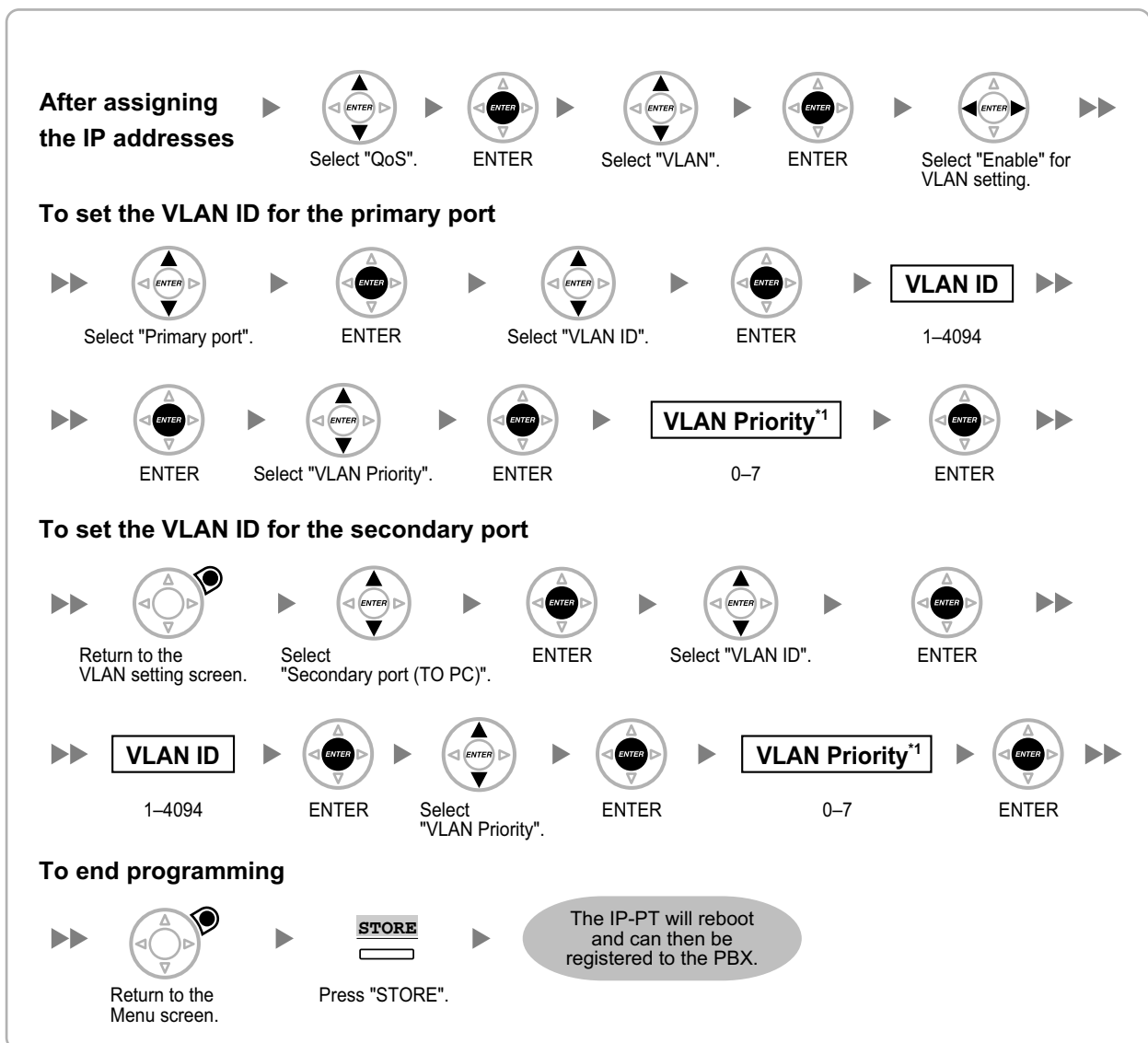
KX-NT300 series (except KX-NT321)

[1] The VLAN priority of the primary port must be set higher than the priority of the secondary port. The larger the number, the higher the priority.

KX-NT321

After assigning the IP addresses ▶ Select "QoS". ▶ Press SP-PHONE. ▶ Select "VLAN". ▶ Press SP-PHONE. ▶▶

▶▶ Select "VLAN (Enable)". ▶ Press SP-PHONE. ▶▶

To set the VLAN ID for the primary port

▶▶ Select "VLAN (Primary)". ▶ Press SP-PHONE. ▶ Select "VLAN ID". ▶ **VLAN ID** 1–4094 ▶ Press SP-PHONE. ▶▶

▶▶ Select "Priority". ▶ **VLAN Priority**[*1] 0–7 ▶ Press SP-PHONE. ▶▶

To set the VLAN ID for the secondary port

▶▶ Select "VLAN (Secondary)". ▶ Press SP-PHONE. ▶ Select "VLAN ID". ▶ **VLAN ID** 1–4094 ▶ Press SP-PHONE. ▶▶

▶▶ Select "Priority". ▶ **VLAN Priority**[*1] 0–7 ▶ Press SP-PHONE. ▶▶

To end programming

▶▶ HOLD Press HOLD three times to return to the Menu screen. ▶ AUTO DIAL STORE Press STORE. ▶ The IP-PT will reboot and can then be registered to the PBX.

*1 The VLAN priority of the primary port must be set higher than the priority of the secondary port. The larger the number, the higher the priority.

KX-NT265 (Software version 2.00 or later only)

After assigning the IP addresses

▶ [VOLUME △▽] ▶ [SP-PHONE] ▶ [VOLUME △▽] ▶ [SP-PHONE] ▶ [VOLUME △▽] ▶▶

Press VOLUME to select "QoS".　　Press SP-PHONE.　　Press VOLUME to select "VLAN".　　Press SP-PHONE.　　Press VOLUME to select "VLAN (Enable)".

▶▶ [SP-PHONE] ▶ **VLAN ID** ▶ [SP-PHONE] ▶ **VLAN Priority** ▶ [SP-PHONE] ▶▶

Press SP-PHONE.　　1–4094　　Press SP-PHONE.　　0–7　　Press SP-PHONE.

To end programming

▶▶ [HOLD] ▶ [AUTO DIAL / STORE] ▶ The IP-PT will reboot and can then be registered to the PBX.

Press HOLD to return to the Menu screen.　　Press STORE.

5.8.3 Setting Diffserv Parameters

Differentiated Services (DiffServ, or DS) is an IP-based QoS technique used to control QoS of VoIP communications by setting the DS field in the header of IP packets. Consult your network administrator for the appropriate setting values for the DS field.

Follow the procedure below to set the Diffserv parameters. Only KX-NT300 series IP-PTs and KX-NT265 IP-PTs can be used to set the parameters.

KX-NT300 series (except KX-NT321)

To start programming

SETUP ▷ Select "Qos". ▷ ENTER ▷ Select "Diffserv". ▷ ENTER ▷▶

Press "SETUP" when it is displayed.

To set the DS field value for the primary port

▶▶ Select "Primary Port". ▷ ENTER ▷ Select "Enable". ▷ ENTER ▷▶

▶▶ **Diffserv** 0.0–7.7 ▷ ENTER ▷▶

To set the DS field value for the secondary port

▶▶ Return to the Diffserv setting screen. ▷ Select "Secondary Port (TO PC)". ▷ ENTER ▷ Select "Enable". ▷▶

▶▶ ENTER ▷ **Diffserv** 0.0–7.7 ▷ ENTER ▷▶

To end programming

▶▶ Return to the Menu screen. ▷ STORE Press "STORE". ▷ The IP-PT will reboot and can then be registered to the PBX.

KX-NT321

To start programming

PROGRAM ▶ (navigator) ▶ SP-PHONE ▶ (navigator) ▶ SP-PHONE ▶▶

Press PROGRAM while "Searching" is displayed.   Select "QoS".   Press SP-PHONE.   Select "Diffserv".   Press SP-PHONE.

To set the DS field value for the primary port

▶▶ (navigator) ▶ SP-PHONE ▶ (navigator) ▶ SP-PHONE ▶▶

Select "Primary Port".   Press SP-PHONE.   Select "DS (Enable)".   Press SP-PHONE.

▶▶ **Diffserv** ▶ SP-PHONE ▶▶

0.0–7.7   Press SP-PHONE.

To set the DS field value for the secondary port

▶▶ HOLD ▶ (navigator) ▶ SP-PHONE ▶ (navigator) ▶▶

Press HOLD to return to the Diffserv setting screen.   Select "Secondary Port".   Press SP-PHONE.   Select "DS (Enable)".

▶▶ SP-PHONE ▶ **Diffserv** ▶ SP-PHONE ▶▶

Press SP-PHONE.   0.0–7.7   Press SP-PHONE.

To end programming

▶▶ HOLD ▶ AUTO DIAL STORE ▶ The IP-PT will reboot and can then be registered to the PBX.

Press HOLD to return to the Menu screen.   Press STORE.

KX-NT265 (Software version 2.00 or later only)

To start programming

Press PROGRAM while "Searching" is displayed.

Press VOLUME to select "QoS".

Press SP-PHONE.

Press VOLUME to select "Diffserv".

Press SP-PHONE.

To set the DS field value

Press VOLUME to select "DS (Enable)".

Press SP-PHONE.

Diffserv

0.0–7.7

Press SP-PHONE.

To end programming

Press HOLD to return to the Menu screen.

Press STORE.

The IP-PT will reboot and can then be registered to the PBX.
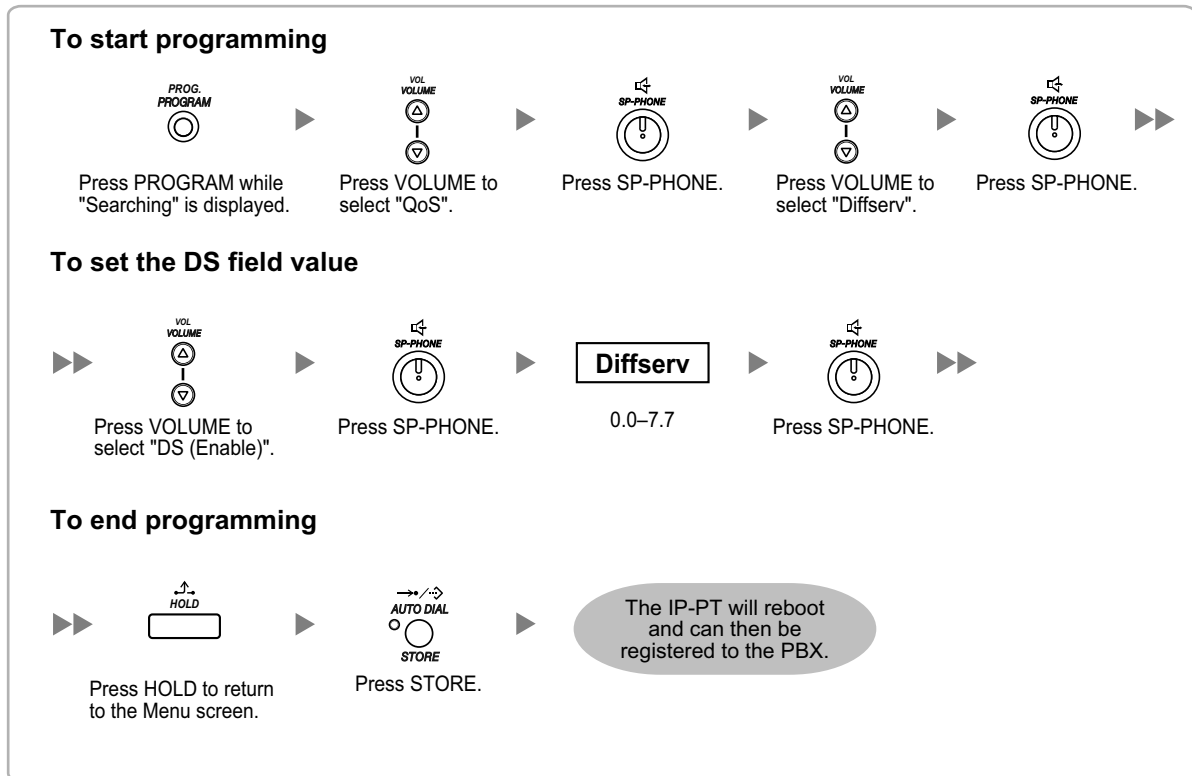
5.8.4 Configuration of IP Ports

A KX-NT300 series IP-PT user or KX-NT265 IP-PT user can configure the port number of PTAP, DHCP, and FTP ports. Consult your network administrator to check whether the configuration of the IP ports is required. Follow the procedure below to configure the port number of the IP ports.

KX-NT300 series (except KX-NT321)

To start programming

SETUP

Press "SETUP" when it is displayed. ▶ Select "IP Port". ▶ ENTER ▶ Password ▶ ENTER
7678

To configure the port number of PTAP Ports

Software version 2.00 or later only

Select "PTAP Server Port". ▶ ENTER ▶ Select "Primary PBX". ▶ ENTER

Port No. ▶ ENTER
1024–65535

To configure the port number of PTAP Ports for the Secondary PBX (optional for software version 2.00 or later only)

Select "PTAP Server Port". ▶ ENTER ▶ Select "Secondary PBX". ▶ ENTER

Port No. ▶ ENTER
1024–65535

Return to the Menu screen. ▶ Select "PTAP Client Port". ▶ ENTER ▶ Port No. ▶ ENTER
1024–65535

To configure the port number of DHCP Ports

Select "DHCP Server Port". ▶ ENTER ▶ Port No. ▶ ENTER
67, 1024–65535

Select "DHCP Client Port". ▶ ENTER ▶ Port No. ▶ ENTER
68, 1024–65535

▶▶ **Continued on next page**

Continued from previous page ▶▶

To configure the port number of FTP Ports

▶▶ [ENTER] ▶ [ENTER] ▶ | **Port No.** | ▶ [ENTER] ▶▶

Select "FTP Server Ctrl Port".　　ENTER　　　21, 1024–65535　　　ENTER

▶▶ [ENTER] ▶ [ENTER] ▶ | **Port No.** | ▶ [ENTER] ▶▶

Select "FTP Client Ctrl Port".　　ENTER　　　1024–65535　　　ENTER

▶▶ [ENTER] ▶ [ENTER] ▶ | **Port No.** | ▶ [ENTER] ▶▶

Select "FTP Client Data Port".　　ENTER　　　1024–65535　　　ENTER

To end programming

▶▶ [navigation key] ▶ **STORE** ▶ The IP-PT will reboot and can then be registered to the PBX.

Return to the Menu screen.　　　Press "STORE".

KX-NT321

To start programming

PROGRAM ▶ ▶ SP-PHONE ▶ **Password** ▶ SP-PHONE ▶▶

Press PROGRAM while "Searching" is displayed.   Select "IP Port".   Press SP-PHONE.   7678   Press SP-PHONE.

To configure the port number of PTAP Ports

▶▶ ▶ SP-PHONE ▶ ▶ SP-PHONE ▶▶

Select "PTAP Server".   Press SP-PHONE.   Select "Primary PBX".   Press SP-PHONE.

▶▶ **Port No.** ▶ SP-PHONE ▶ HOLD ▶▶

1024–65535   Press SP-PHONE.   Press HOLD.

To configure the port number of PTAP Ports for the Secondary PBX (if required)

▶▶ ▶ SP-PHONE ▶ ▶ SP-PHONE ▶▶

Select "PTAP Server".   Press SP-PHONE.   Select "Secondary PBX".   Press SP-PHONE.

▶▶ **Port No.** ▶ SP-PHONE ▶ HOLD ▶▶

1024–65535   Press SP-PHONE.   Press HOLD.

▶▶ ▶ SP-PHONE ▶ **Port No.** ▶ SP-PHONE ▶▶

Select "PTAP Client".   Press SP-PHONE.   1024–65535   Press SP-PHONE.

To configure the port number of DHCP Ports

▶▶ ▶ SP-PHONE ▶ **Port No.** ▶ SP-PHONE ▶▶

Select "DHCP Server".   Press SP-PHONE.   67, 1024–65535   Press SP-PHONE.

▶▶ ▶ SP-PHONE ▶ **Port No.** ▶ SP-PHONE ▶▶

Select "DHCP Client".   Press SP-PHONE.   68, 1024–65535   Press SP-PHONE.

▶▶ **Continued on next page**

Continued from previous page ▶▶

To configure the port number of FTP Ports

▶▶   Select "FTP Server Ctrl".   ▶   SP-PHONE
Press SP-PHONE.   ▶   **Port No.**
21, 1024–65535   ▶   SP-PHONE
Press SP-PHONE.   ▶▶

▶▶   Select "FTP Client Ctrl".   ▶   SP-PHONE
Press SP-PHONE.   ▶   **Port No.**
1024–65535   ▶   SP-PHONE
Press SP-PHONE.   ▶▶

▶▶   Select "FTP Client Data".   ▶   SP-PHONE
Press SP-PHONE.   ▶   **Port No.**
1024–65535   ▶   SP-PHONE
Press SP-PHONE.   ▶▶

To end programming

▶▶   HOLD
Press HOLD to return to the Menu screen.   ▶   AUTO DIAL / STORE
Press STORE.   ▶   The IP-PT will reboot and can then be registered to the PBX.

KX-NT265 (Software version 2.00 or later only)

To start programming

PROG.
PROGRAM ▶ VOL VOLUME ▶ SP-PHONE ▶ **Password** ▶ SP-PHONE ▶▶

Press PROGRAM while "Searching" is displayed.   Press VOLUME to select "IP Port".   Press SP-PHONE.   7678   Press SP-PHONE.

To configure the port number of PTAP Ports

▶▶ VOL VOLUME ▶ SP-PHONE ▶ **Port No.** ▶ SP-PHONE ▶▶

Press VOLUME to select "PTAP Server".   Press SP-PHONE.   1024–65535   Press SP-PHONE.

▶▶ VOL VOLUME ▶ SP-PHONE ▶ **Port No.** ▶ SP-PHONE ▶▶

Press VOLUME to select "PTAP Client".   Press SP-PHONE.   1024–65535   Press SP-PHONE.

To configure the port number of DHCP Ports

▶▶ VOL VOLUME ▶ SP-PHONE ▶ **Port No.** ▶ SP-PHONE ▶▶

Press VOLUME to select "DHCP Server".   Press SP-PHONE.   67, 1024–65535   Press SP-PHONE.

▶▶ VOL VOLUME ▶ SP-PHONE ▶ **Port No.** ▶ SP-PHONE ▶▶

Press VOLUME to select "DHCP Client".   Press SP-PHONE.   68, 1024–65535   Press SP-PHONE.

To configure the port number of FTP Ports

▶▶ VOL VOLUME ▶ SP-PHONE ▶ **Port No.** ▶ SP-PHONE ▶▶

Press VOLUME to select "FTP Server Ctrl".   Press SP-PHONE.   21, 1024–65535   Press SP-PHONE.

▶▶ VOL VOLUME ▶ SP-PHONE ▶ **Port No.** ▶ SP-PHONE ▶▶

Press VOLUME to select "FTP Client Ctrl".   Press SP-PHONE.   1024–65535   Press SP-PHONE.

▶▶ VOL VOLUME ▶ SP-PHONE ▶ **Port No.** ▶ SP-PHONE ▶▶

Press VOLUME to select "FTP Client Data".   Press SP-PHONE.   1024–65535   Press SP-PHONE.

To end programming

▶▶ HOLD ▶ AUTO DIAL STORE ▶ The IP-PT will reboot and can then be registered to the PBX.

Press HOLD to return to the Menu screen.   Press STORE.

Note

    If you wish to change the port number back to default, enter **0** as the port number for the desired port.

5.9 Registering IP Telephones

5.9.1 Registering IP Telephones

After the programming of the PBX and IP telephones is finished (refer to "5.8 Assigning Networking Information to IP Telephones"), the IP telephones must be registered to the PBX. The procedure for registering IP telephones differs according to the IP terminal registration mode specified during the Easy Setup Wizard. This setting can also be changed in the **Site Property**—**Main** screen of the Web Maintenance Console (refer to "9.5.1 PBX Configuration—Configuration—Slot—Site Property—Main—Main—◆ IP Terminal Registration Mode" in the PC Programming Manual). Refer to the following table:

IP Terminals	IP Terminal Registration Mode		
	Full Automatic Mode	**Extension Number Input Mode**	**Manual Mode**
IP-PTs	✓	✓	✓
KX-UT Series SIP Phones	✓	✓[*1]	✓
Non-KX-UT series SIP phones	✓[*2]	✓[*2]	✓
IP-CSs[*3]			✓

✓: Available

[*1]   KX-UT series SIP phones will be registered automatically, in the same way as Full Automatic mode.
[*2]   Non-KX-UT series SIP phones must always be registered to the PBX manually, even if Full Automatic mode or Extension Number Input mode is selected.
[*3]   IP-CSs must always be registered to the PBX manually. For details about registering IP-CSs, refer to the Quick Installation Guide for the IP-CS.

Note
- For KX-UT series SIP phones, the SIP extension password is automatically set to "1234".
- For IP softphones, follow the same registration procedure as IP-PTs.

Full Automatic Mode

If networking settings have been completed, when IP-PTs or KX-UT series SIP phones are connected to the same network as the PBX, they will be registered automatically. No registration procedure is required.

Extension Number Input Mode

For IP-PTs

If networking settings have been completed, when IP-PTs are connected to the same network as the PBX, they will be registered automatically, but extension numbers for the IP-PTs will not be set. Follow the procedure below to register an extension number to complete registration.

1. After completing networking settings, connect the IP-PT to the same network as the PBX. The screen to enter the extension number is displayed on the IP-PT.

2. Enter an extension number.

Note

> When no extension number is entered in this step, the process will time out and the IP-PT will be
> registered without an extension number.

3. Press **[ENTER]** on the IP-PT.

4. Press **[PAUSE]** or "`EXIT`" on the IP-PT.

For KX-UT Series SIP Phones

If networking settings have been completed, when KX-UT series SIP phones are connected to the same
network as the PBX, they will be registered automatically as same as when they are registered in Full Automatic
mode. No registration procedure is required.

Note

> No more than 64 IP-PTs can register extension numbers at the same time.

Manual Mode

For IP-PTs or KX-UT Series SIP Phones

After connecting IP-PTs or KX-UT series SIP phones to the PBX over a network, register those IP terminals
to the PBX manually.
Follow the procedure below for registration.

1.
  a. Click **Setup** → **PBX Configuration** →
Configuration → **Slot**.

  b. **For IP-PTs**:
Click **Virtual** → **V-IPEXT32**.
For KX-UT series SIP phones:
Click **Virtual** → **V-UTEXT32**.

  c. **For IP-PTs**:
Move the mouse pointer over the **V-IPEXT32** card
(Virtual 32-Channel VoIP Extension Card).
For KX-UT series SIP phones:
Move the mouse pointer over the **V-UTEXT32** card
(Virtual UT Extension Card).
A menu will be shown under the mouse pointer.

  d. Click **Port Property**.

To register the IP-PT or KX-UT series SIP phone by entering the MAC address directly:
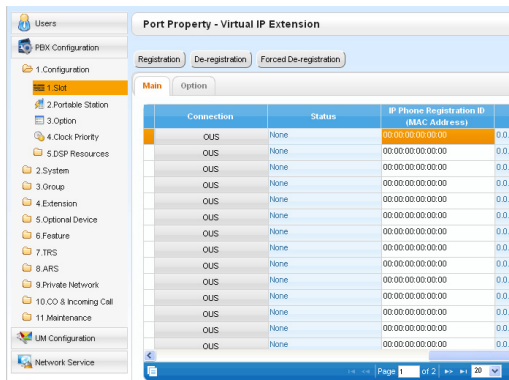
2. If the **Connection** column for the port is **INS**, click **INS**, and then click **OUS** on the dialogue box to change the port's status.

3. Enter the MAC address of the IP-PT or SIP phone in the **IP Phone Registration ID (MAC Address)** cell.

4. Click **Apply**.
Once the IP-PT or SIP phone is successfully registered, its status will update to show "Registered".

5. In the **Connection** column for the port, click **OUS**, and then click **INS** on the dialogue box to change the port's status.

6. For KX-UT series SIP phones only:
Follow the procedure below to change the **IP Terminal Registration Mode** from **Manual** to **Full Automatic**.
　a. Click **Setup** → **PBX Configuration** → **Configuration** → **Slot** → **Site Property** → **Main**.
　b. In the **Main** tab, select **Full Automatic** for **IP Terminal Registration Mode**.
　c. Click **OK**.

To register the IP-PT or KX-UT series SIP phone using the wizard:
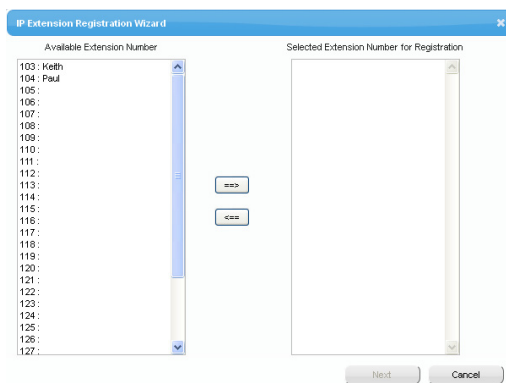
2. Click **Registration**.
A dialogue box will appear. Non-registered (available) extension numbers and names are displayed on the left.

3. **a.** Highlight numbers and names and click the right arrow to select them for registration, and then click **Next**.
　b. Click **Next**. A screen will appear with information on the current IP-PT or SIP phone extension number and name, and index number for programming.

　Note
- If the IP-PT or SIP phone has been connected to the LAN and power has been turned on, the IP address of the PBX will be assigned automatically.
- If not, connect the IP-PT or SIP phone to the LAN and turn the power on within 15 minutes after this operation is done. The IP address of the PBX will then be assigned automatically.

　c. If the registration is still in progress, the dialogue box will show "Registration Executing".
If the registration is successful, the dialogue box will show "Registration Completed". Click **Close**.
Once the IP-PT or SIP phone is successfully registered, its status will update to show "Registered".

For Non-KX-UT Series SIP Phones

After connecting non-KX-UT series SIP phones to the PBX over a network, register those IP terminals to the PBX manually.
Follow the procedure below for registration.

1. **a.** Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.
   b. Click **Virtual** → **V-SIPEXT32**.
   c. Move the mouse pointer over the V-SIPEXT32 card (Virtual 32-Channel SIP Extension Card).
   A menu will be shown under the mouse pointer.
   d. Click **Port Property**.

2. Assign extension numbers to the SIP extensions.
   - If the Automatic Extension Number Set for Extension Card feature is enabled, the extension numbers of SIP extension are automatically assigned. To programme this feature, refer to "9.30 PBX Configuration—Configuration—Option—◆ New Card Installation—Automatic Extension Number Set for Extension Card" in the PC Programming Manual.
   - If not, enter the extension number for each SIP extension manually.

3. Set passwords for the SIP extensions.

a. Click the cell in the **Connection** column for each SIP extension you wish to register. The Command Connection screen appears.

b. Click **OUS**.

c. Enter a password in the Password cell for each SIP extension.

d. Click **Apply**.

e. Click the cell in the **Connection** column for each SIP extension to which a password has been assigned. The Command Connection screen appears.

f. Click **INS**.

g. Click **OK**.
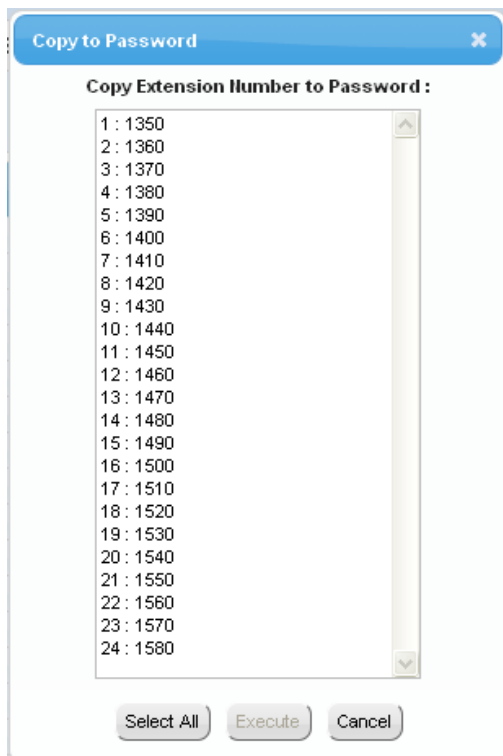
Note

- Alternatively, it is possible to set an extension number as a password for each SIP extension automatically.
- In order to set the password automatically, do the following in substitution for step **c** of the procedure above.
    a. Click **Copy to**. A screen will appear with information on assigned extension numbers for SIP extensions.
    b. Click **Select All**.
    c. Click **Execute** to copy each Extension Number to Password.
    d. Click **Yes**.
    e. Click **OK** to return to the Port Property screen.
- When copying extension numbers to passwords, you can also use the icon on the bottom left of the Virtual SIP Extension Port Property screen.

4. Programme the SIP extension you wish to register.
   a. Set the IP address of the PBX, extension number, and password in the corresponding fields for your SIP extension.
   b. Send a request from the SIP extension to the PBX for registration.
      • If the authentication information of the SIP extension and the PBX match, the registration is successful.

Note

• When programming the SIP extension, the names of the corresponding fields may differ depending on the type of SIP phone you are using.
• For details about the actual operation of SIP phones, refer to the documentation of the SIP phone.
• For certain SIP phones, you may need to set a Sign-in name, which should consist of the extension number and the IP address of the PBX (e.g., 350@192.168.0.101).

5.9.2 De-registering IP Telephones

De-registration of IP-PTs or KX-UT Series SIP Phones

1. Make sure the **IP Terminal Registration Mode** is set to **Manual**.
   a. Click **Setup** → **PBX Configuration** → **Configuration** → **Slot** → **Site Property** → **Main**.
   b. In the **Main** tab, select **Manual** for **IP Terminal Registration Mode**.
   c. Click **OK**.

2. a. Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.
   b. **For IP-PTs**:
      Click **Virtual** → **V-IPEXT32**.
      For KX-UT series SIP phones:
      Click **Virtual** → **V-UTEXT32**.
   c. **For IP-PTs**:
      Move the mouse pointer over the **V-IPEXT32** card (Virtual 32-Channel VoIP Extension Card).
      For KX-UT series SIP phones:
      Move the mouse pointer over the **V-UTEXT32** card (Virtual UT Extension Card).
      A menu will be shown under the mouse pointer.
   d. Click **Port Property**.

3. Click **De-registration**.
   A dialogue box will appear. Registered extension numbers and names are displayed on the left.

4. a. Highlight numbers and names and click the right arrow to select them for de-registration.
   b. Click **Next**.
      A dialogue box will appear.
   c. Click **Confirm**.
      • If the de-registration is successful, the dialogue box will show "De-registration succeed!".
   d. Click **Close**.
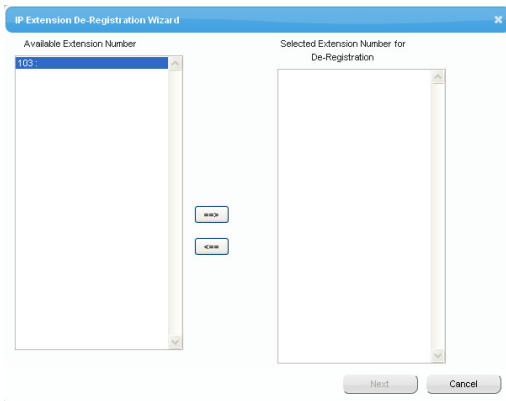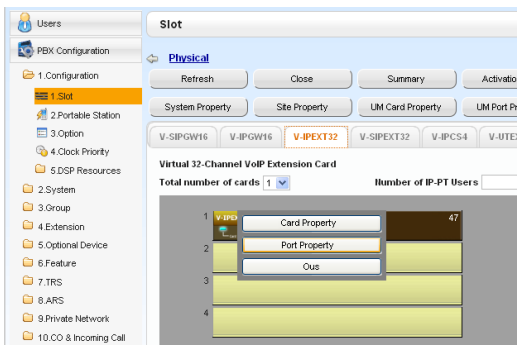
Once the IP-PT or SIP phone is successfully de-registered, the status of the IP telephone will update to show "None".

Forced De-registration of IP-PTs or KX-UT Series SIP Phones

Follow the steps below to forcibly de-register an IP-PT when normal de-registration was unsuccessful.
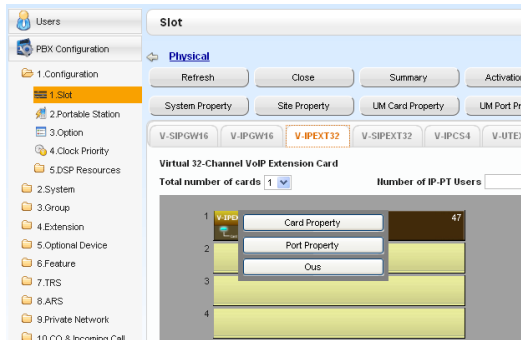
1. a. Click **Setup** → **PBX Configuration** →
      Configuration → **Slot**.
   b. **For IP-PTs**:
      Click **Virtual** → **V-IPEXT32**.
      For KX-UT series SIP phones:
      Click **Virtual** → **V-UTEXT32**.
   c. **For IP-PTs**:
      Move the mouse pointer over the **V-IPEXT32** card
      (Virtual 32-Channel VoIP Extension Card).
      For KX-UT series SIP phones:
      Move the mouse pointer over the **V-UTEXT32** card
      (Virtual UT Extension Card).
   A menu will be shown under the mouse pointer.
   d. Click **Port Property**.

2. Click **Forced De-registration**.
   A dialogue box will appear. Registered extension
   numbers and names are displayed on the left.

3. a. Highlight numbers and names and click the right
      arrow to select them for de-registration.
   b. Click **Next**.
      A dialogue box will appear.
   c. Click **OK**.
      A dialogue box will appear.
   d. Click **Confirm**.
      • If the de-registration is successful, the dialogue
        box will show "Forced de-registration succeed!".
   e. Click **Close**.
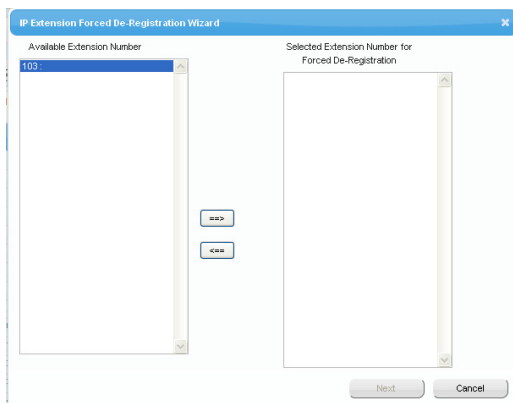
Once the IP-PT or SIP phone is successfully de-registered, the status of the IP telephone will update to show
"None".

De-registration of Non-KX-UT Series SIP Phones

The de-registration of non-KX-UT series SIP phones is carried out by deleting either the extension number or password registered in the PBX.
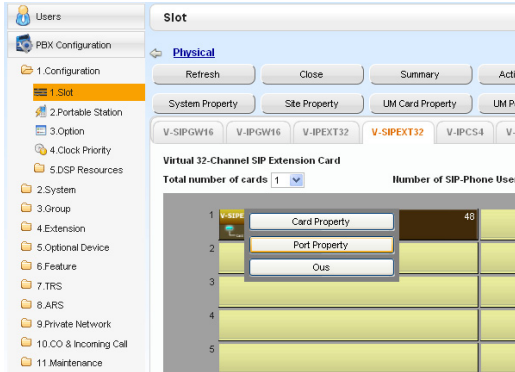
1. **a.** Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.
   b. Click **Virtual** → **V-SIPEXT32**.
   c. Move the mouse pointer over the **V-SIPEXT32** card (Virtual 32-Channel SIP Extension Card).
   A menu will be shown under the mouse pointer.
   d. Click **Port Property**.

2. **a.** Click the cell in the Connection column for the port of the SIP phone to de-register.
   b. In the Command window, click **OUS** to change the status of the port to "OUS".

3. Repeat step **2** for each SIP phone to de-register.

4. Delete either the extension number or password for the SIP phone to de-register, as shown here.

5. Click **OK**.

5.10 Configuration of Users

The system manages information about each user.
Before programming other user settings, the following information must be configured for each user:
- Extension number
- Name
- Unified Messaging mailbox
- Web Maintenance Console login account (ID and password)

Follow the procedure below to efficiently programme basic personal information by adding multiple users with the Add Range feature.

1. Click **Setup** → **PBX Configuration** → **Configuration** → **Slot**.
    Add one or more extension cards to the system, according to your equipment and needs. Extension numbers will be automatically created for each extension card that is added. For details about adding extension cards, refer to "9.1 PBX Configuration—Configuration—Slot" in the PC Programming Manual.
2. Click **Setup** → **PBX Configuration** → **Extension**.
    Enter an extension name for each extension number to be used. For details, refer to the following sections in the PC Programming Manual:
    - 12.1.1 PBX Configuration—Extension—Wired Extension—Extension Settings
    - 12.2.1 PBX Configuration—Extension—Portable Station—Extension Settings

    Note
    > You also can import extension names from a CSV file. For details refer to "6.6 Tool—Import" in the PC Programming Manual.

3. Click **Setup** → **Users** → **User Profiles**.
    You can create multiple user profiles automatically by using the Add Range feature for extension numbers. You can also set an extension number, first name, last name, Unified Messaging mailbox, and Web Maintenance Console login account for each user manually.
    For details, refer to "User Controls" in "8.1 Users—User Profiles" in the PC Programming Manual.
    For each user profile added using the Add Range feature, the following information is automatically assigned:
    - **First Name**: "Ext." + the extension number for the user (e.g., "Ext.101")
    - **Last Name**: The information entered in **Extension Name** for the extension in the **Extension** screen
    - **Login ID**: The extension number (i.e., if the extension is "101", the Login ID for the user will also be "101")
    - **Password**: "PWD" + the extension number for the user (e.g., "PWD101")
4. If additional editing is required for users, settings can be configured on the following screens:
    a. To edit user information: **Setup** → **Users** → **User Profiles**
    b. To edit extension settings: **Setup** → **PBX Configuration** → **Extension**
    c. To edit mailbox settings: **Setup** → **UM Configuration** → **Mailbox Settings**

    Note
    > You also can create mailboxes for Incoming Call Distribution Groups on the **Mailbox Settings** screen.

Section 6

Troubleshooting

This section provides information on the PBX and telephone troubleshooting.

6.1 Troubleshooting

6.1.1 Installation

PROBLEM	PROBABLE CAUSE	SOLUTION
You cannot make/receive calls via an IP network.	• DSP card malfunction	• Replace the corresponding card.
	• Mother board malfunction	• Replace the mother board (be sure to turn off the PBX when replacing).
	• Not enough activation keys	• Purchase additional activation key codes. Please consult a certified dealer for details.
	• Poor connection	• Make sure that an 8-pin twisted pair cable is used for connection. • Make sure that none of the CAT 5/CAT 5e cables in use are over 100 m in length. • Make sure that a straight cable is used for connection to a switching hub.
	• Network malfunction	• Make sure that all network devices in use are switched on. • Make sure that there is no unwanted firewall in the IP network.
IP-PTs/SIP phones do not operate.	• DSP card malfunction	• Replace the corresponding card.
	• Mother board malfunction	• Replace the mother board (be sure to turn off the PBX when replacing).
	• Not enough activation keys	• Purchase additional activation key codes. Please consult a certified dealer for details.
	• IP-PT/SIP phone not registered	• Register the corresponding IP-PT/SIP phone.
	• IP-PT/SIP phone malfunction	• Replace the IP-PT/SIP phone.
	• Poor connection	• Make sure that an 8-pin twisted pair cable is used for connection. • Make sure that none of the CAT 5/CAT 5e cables in use are over 100 m in length. • Make sure that a straight cable is used for connection to a switching hub.
	• Network malfunction	• Make sure that all network devices in use are switched on. • Make sure that the IP-PT/SIP phone is not blocked by the firewall or other network devices.

PROBLEM	PROBABLE CAUSE	SOLUTION
Extensions (except IP-PT/ SIP phone) do not operate.	• Extension card malfunction	• Replace the corresponding card.
	• Poor connection between the PBX and the extension	• Take the extension and plug it into the same extension port using a short telephone cord. If the extension works, then the connection between the PBX and the extension must be repaired.
	• A telephone with an A-A1 relay is connected.	• Make sure that a 2-wire cord is used. • Make sure that the A-A1 relay switch of the telephone is in "OUT" or "OFF" position.
	• Extension malfunction	• Take the extension and plug it into another extension port that is working. If the extension does not work, replace the extension.
The PBX does not operate properly.		• Restart the PBX (refer to "6.1.5 Restarting the PBX"). • Turn off the power switch, and then turn it back on. • Turn off the power switch, and then unplug the PBX. After 5 minutes, plug the PBX back in, and turn the power switch back on.
Noise on external paging.	• Induced noise on the wire between the PBX and the amplifier.	• Use a shielded cable as the connection wire between the PBX and amplifier. A short shielded cable is recommended.
Distorted external music.	• Excessive input level from external music source.	• Decrease the output level of the external music source by using the volume control on the music source.
The STATUS indicator on the front of the cabinet turns on red.	• A major system error occurs in the PBX.	• See the error log using Web Maintenance Console (refer to "6.1.6 Troubleshooting by Error Log").
The LINK indicator of the mother board does not turn on.	• Mother board malfunction	• Replace the mother board (be sure to turn off the PBX when replacing).
	• Poor connection.	• Make sure that an 8-pin twisted pair cable is used for connection. • Make sure that none of the CAT 5/CAT 5e cables in use are over 100 m in length. • Make sure that a straight cable is used for connection to a switching hub.
	• Network malfunction	• Make sure that all network devices in use are switched on.

6.1.2 Connection

Connection between the PBX and an SLT:

CAUSE	SOLUTION
The T/R is connected to the D1/D2. T ●━━━━● R ●━━━━● T ●━━━━● R PBX Extension	Use the correct cord (the inner 2 wires are for T/R). • If a telephone equipped with an A-A1 relay is connected to the PBX, set the A-A1 relay switch of the telephone to "OFF".

Connection between the PBX and an SLT that is polarity-sensitive:

CAUSE	SOLUTION

The "T" is connected to the "R".
 	
     ●
T ●╲╱● T
R ●╱╲● R
     ●
 	
PBX   Extension
	Reverse the connections of the T/R.

Connection between the trunk and the PBX:

CAUSE	SOLUTION

Trunk is connected to the T2/T1.
 	
●━━━● T2
    ● R1
●━━━● T1
    ● R2
 	
Trunk   PBX
 	
Trunk is connected to the T2/R1.
 	
●╲ ● T2
  ╲━● R1
●━━● T1
    ● R2
 	
Trunk   PBX
	Reconnect the trunk to the T1/R1 or T2/R2 of the telephone jack using 2-conductor wiring.

Flowchart (left side):

Can you dial an extension? — No → (connects to first two tables)

Yes ↓

Can you dial out on a trunk? — No → (connects to trunk table)

6.1.3 Operation

PROBLEM	PROBABLE CAUSE	SOLUTION
• Cannot set the IP address, subnet mask address, and PBX IP address to the IP-PT.	• An unusable value is being set.	• Set an IP address within the valid range. IP address of the IP-PT/PBX: "1.0.0.0" to "223.255.255.255" Subnet mask address: "0–255.0–255.0–255.0–255" (except "0.0.0.0" and "255.255.255.255")
• Cannot register the IP-PT.	• The necessary network parameters are not set to the IP-PT.	• When not using the DHCP Server feature or an external DHCP server, set the IP address, subnet mask address, and enter the PBX IP address. If necessary, also enter the IP address of the default gateway. • When using the DHCP Server feature or an external DHCP server, enter the PBX IP address.
• The IP-PT cannot connect to the PBX.	• The wrong IP address, subnet mask address, PBX IP address, or default gateway address was entered.	• Check each parameter and enter the correct value.
	• The Ethernet cable is not connected correctly.	• Check the Ethernet cable connections.
	• The DHCP server is not active.	• Restart the external DHCP server. • Confirm whether the DHCP Server feature is enabled. • Disable DHCP and re-enter settings as appropriate.
• Whenever you try to make calls using a SIP phone, a busy tone is heard.	• The status of the port that the SIP phone is connected to is Out of Service.	• Change the port status from Out of Service to In Service using Web Maintenance Console.
• The IP-PT does not ring.	• The ringer volume is off.	• Turn on the ringer volume.
• Originating an outside call, call transfer, or conference cannot be performed.	• The corresponding flexible button does not exist on the PT.	• Programme the flexible button. Refer to "2.21.1 Fixed Buttons" in the Feature Guide.

PROBLEM	PROBABLE CAUSE	SOLUTION
• The IP address of the PBX for networking has been forgotten.	-	• Connect a PC to the MNT port of the PBX directly and start the Web Maintenance Console using the default IP address of the MNT port, and then confirm the IP address assigned for the LAN port. For details of connecting the PC directly to the PBX, refer to "5.2 PC Connection". For details of checking current IP address of the mother board, refer to "27.1 Network Service—IP Address/Ports —◆ LAN Setting—IP Address" in the PC Programming Manual.

6.1.4 Error Messages

When a major system error occurs, an error message is displayed on the IP-PT.
For IP-PTs with a single line display (e.g., KX-NT265), only an error code (i.e., ERR XXXX-XXXX) will be displayed.

Error Message & IP-PT Activity	Probable Cause	Solution
ERR 1001-0000 **HARDWARE ERROR** Displays error and stops operating.	• Sub CPU malfunction	• Repair or replace the IP-PT.
ERR 1002-0000 **HARDWARE ERROR** Displays error and stops operating.	• Sound hardware malfunction	
ERR 1003-0000 **HARDWARE ERROR** Displays error and stops operating.	• Flash memory malfunction	
ERR 1004-XXXX **HARDWARE ERROR** Displays error and stops operating.	• PHY (network control IC) error	
ERR 1005-0000 **HARDWARE ERROR** Displays error and stops operating.	• SDRAM error	
ERR 1006-0000 **HARDWARE ERROR** Displays error and stops operating.	• SRAM error	
ERR 1007-0000 **HARDWARE ERROR** Displays error and stops operating.	• Sub CPU malfunction for Self Labelling	
ERR 1051-0000 **SOFTWARE ERROR** Displays error and stops operating.	• PBX software version error	• Consult your network administrator.
ERR 2001-XXXX **SYSTEM ERROR** Resets and displays error for 5 seconds while starting up.	• Unexpected error	• If this error is displayed frequently, repair or replace the IP-PT.
ERR 2002-0000 **POOR LAN CONNECTION** Resets and displays error for 5 seconds while starting up.	• Transmission error	• Check with the network administrator whether there is a problem with the LAN. • If this error is displayed frequently, repair or replace the IP-PT.
ERR 2003-0000 **POOR LAN CONNECTION** Resets and displays error for 5 seconds while starting up.		

Error Message & IP-PT Activity	Probable Cause	Solution
ERR 2004-0000 **UNREGISTERED TO SERVER** Resets and displays error for 5 seconds while starting up.	• IP-PT not registered	• Check the registration status of the IP-PT.
ERR 2005-0000 **NO MORE CONNECTIONS** Resets and displays error for 5 seconds while starting up.	• Connection refused by the PBX	
ERR 2006-XXXX **DHCP SERVER REJECTION** Resets and displays error for 5 seconds while starting up.	• IP address lease time from DHCP server has expired • IP address lease renewal was refused by DHCP server	• Consult your network administrator.
ERR 2007-0000 **HARDWARE ERROR** Resets and displays error for 5 seconds while starting up.	• Communication error with sub CPU	• If this error is displayed frequently, repair or replace the IP-PT.
ERR 2008-0000 **HARDWARE ERROR** Resets and displays error for 5 seconds while starting up.	• Sound hardware control error	
ERR 2009-XXXX **MGCP SERVER REJECTION** Resets and displays error for 5 seconds while starting up.	• Error information from the PBX (MGCP server)	• Consult your network administrator.
ERR 2010-0000 **HARDWARE ERROR** Resets and displays error for 5 seconds while starting up.	• Communication error with sub CPU for Self Labelling	• If this error is displayed frequently, repair or replace the IP-PT.
ERR 3001-0000 **HARDWARE ERROR** Displays error until reset the IP-PT.	• Communication error with sub CPU	
ERR 3002-0000 **HARDWARE ERROR** Displays error until reset the IP-PT.	• Sound hardware control error	
ERR 3003-XXXX **DHCP SERVER NOT FOUND** Displays error until reset the IP-PT.	• IP address lease renewal was refused by DHCP server	• Consult your network administrator.
ERR 3100-0000 **BLUETOOTH ERROR** Resets the Bluetooth® wireless headset.	• Bluetooth hardware error	• Repair or replace the Bluetooth wireless headset.

6.1.5 Restarting the PBX

If the PBX does not operate properly, restart the PBX using Web Maintenance Console. Before restarting the PBX, try the system feature again to confirm whether there definitely is a problem or not.

Note

- When the System Mode Switch is set to "NORMAL", restarting the PBX causes the following:
  - Camp-on is cleared.
  - Calls on hold are terminated.
  - Calls on exclusive hold are terminated.
  - Calls in progress are terminated.
  - Call park is cleared.

  Other data stored in memory, except the above, are not cleared.
- Be aware that restarting the PBX with the System Mode Switch in the "SYSTEM INITIALIZE" position clears all data stored in the PBX. Do not perform this operation unless you intend to delete all data from the PBX.
- When the PBX is set to obtain IP addressing information automatically, and the PBX is not able to obtain appropriate IP addressing information from an external DHCP server, the PBX starts up with its default IP addresses and the STATUS indicator on the front of the cabinet turns red. For the default IP addresses, refer to "5.3 Starting Web Maintenance Console".

Operation

If the PBX does not operate properly:
1. Slide the System Mode Switch to the "NORMAL" position.

System Mode Switch
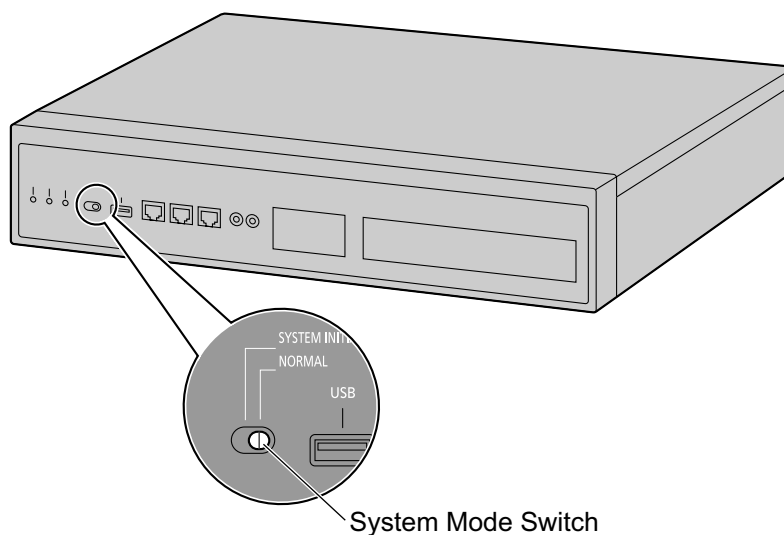
2. Start the Web Maintenance Console.
3. Log in using the Installer level account.
4. On the Home screen, click **Maintenance** → **System Control** → **System Reset**.
5. Follow the prompts.
   Restarting the PBX will start.

Note

- When the power switch is turned on, or when the PBX is recovers from a power failure, the PBX will restart. The time required to restart depends on the number of connected extensions and the number of registered One-look network sites.

Example:

PBX	Extensions	Estimated Time for Starting Up
1 PBX (Stand-alone)	128 KX-UT series SIP phones	more than 5 minutes
16 PBXs (One-look network)	256 KX-UT series SIP phones	more than 15 minutes

- PBX functions cannot be used until restarting is complete. The use of a UPS is recommended; even a momentary power failure can result in a long delay as the PBX restarts, requiring the time as shown above.

https://www.idehal.org/

6.1.6 Troubleshooting by Error Log

When a major system error occurs in the PBX, the STATUS indicator on the front of the cabinet turns red, and the system logs the error information.

Error Log Display Format

Below is the display format of the error log. For information about how to view the error log using Web Maintenance Console, refer to "◆ Print Information—Error Log" in the PC Programming Manual.

Example: Web Maintenance Console

Example: Station Message Detail Recording (SMDR)

```
01/01/10 01:00AM MJ ALM  #014 00 10000 FAN Alarm
01/01/10 01:29AM MN ALM #533 01 50401 Unit start up error
01/01/10 01:39AM MN ALM #091 00 10000 PT connection over
```

Description

	Item		Description
1	Date		The date of the error detection.
2	Time		The time of the error detection.
3	Level	Minor (MN ALM)	Displays minor errors, which affect only a certain part of system operation.
		Major (MJ ALM)	Displays major errors, which affect operation of the whole system, or result in system failure.
4	Error Code		The 3-digit error code assigned by the PBX.

	Item	Description

5	Sub Code	**SMDR**:
		The 8-digit sub code of the relevant hardware (BBWXYYZZ).
		Web Maintenance Console:
		The 6-digit sub code of the relevant hardware (WXYYZZ). (The site number of the PBX can be confirmed in the **Site** column of the Error Log.)
		
		• BB: Site ID (00 to 15)
		   – Corresponds to site numbers of PBXs in the One-look network (1 to 16)
		• W: Slot type
		   – Physical slot: " " (blank)
		   – Virtual slot: "*" (asterisk)
		• X: (1: Unit number, 5: Other than PBX process code)
		
		When X = 1
		• YY: Slot number
		   – Physical slot: 00 to 05
		     (00: Mother board slot; 01 to 05: Optional service card slots)
		   – Virtual slot: 01 to 52
		     (01 to 16: Virtual trunk slots; 17 to 52: Virtual extension slots)
		• ZZ: Port number
		   – For optional service cards:
		     The port number (01 to XX) will be displayed.
		
		When X = 5
		• YY: Process code
		• ZZ: Process number (determined by each process)
		
		Note
		   When there is no parameter for slot and port number, YY and ZZ will be displayed as "00".
		   Example: Sub code for the mother board = "01 10000"

6	Error Message	A description of the error.
7	Log Information	Displays probable causes of the errors and their solutions.

Section 7
Appendix

This section provides information on using the PBX with a VoIP network, the ports used by the PBX, and PBX Region Suffix Codes and Areas.

7.1 Information about Using an IP Network

This section explains common IP network information necessary for setting up One-look networks and QSIG networks.

7.1.1 Using a VoIP Network with the PBX

This PBX supports Panasonic KX-NT300 series and KX-NT265 IP proprietary telephones (IP-PTs), Panasonic IP softphones, and SIP (Session Initiation Protocol) phones (hardphones and softphones) for communication on a Voice over Internet Protocol (VoIP) network. These IP telephones can be used as extensions of the PBX when the local office LAN is connected to other LANs at different locations.
This PBX also enables VoIP communication with PBXs installed at different locations. Since the communication does not take place over conventional telephone network, the high cost of long distance communication is virtually eliminated.
To establish a VoIP network, the virtual cards are used according the requirement of the network. For details about virtual cards, see "4.4 Virtual Cards".
The following diagrams illustrate VoIP network with (i) a remote office LAN and (ii) another PBX installed at different location.

Note

Panasonic IP Cell Station (IP-CS) units are also supported by this PBX for communication on a VoIP network. For details, refer to the Quick Installation Guide for the IP-CS.

(i) Connection Outline of VoIP Network with Remote Office LAN
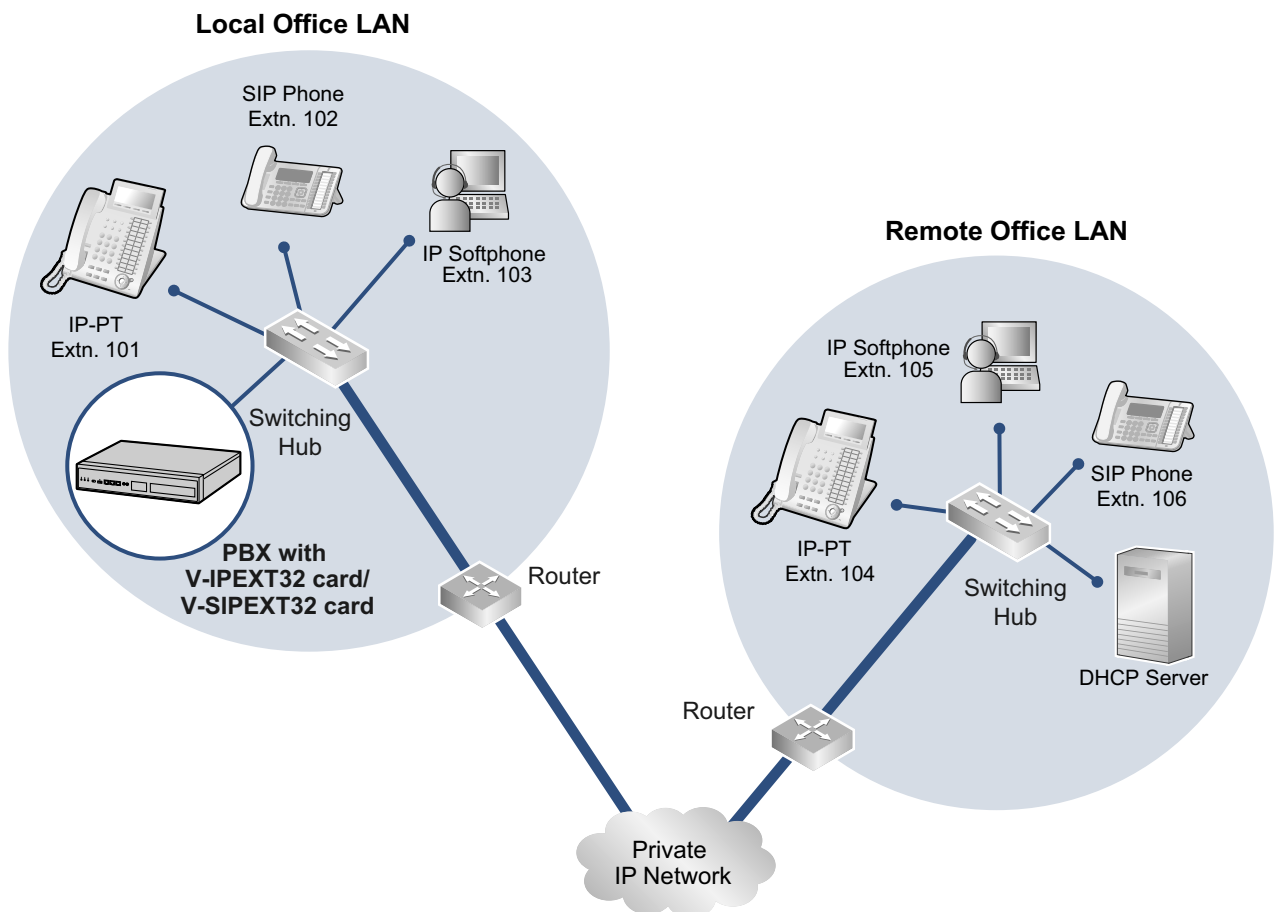
(ii) Connection Outline of VoIP Network with PBX in Other Network
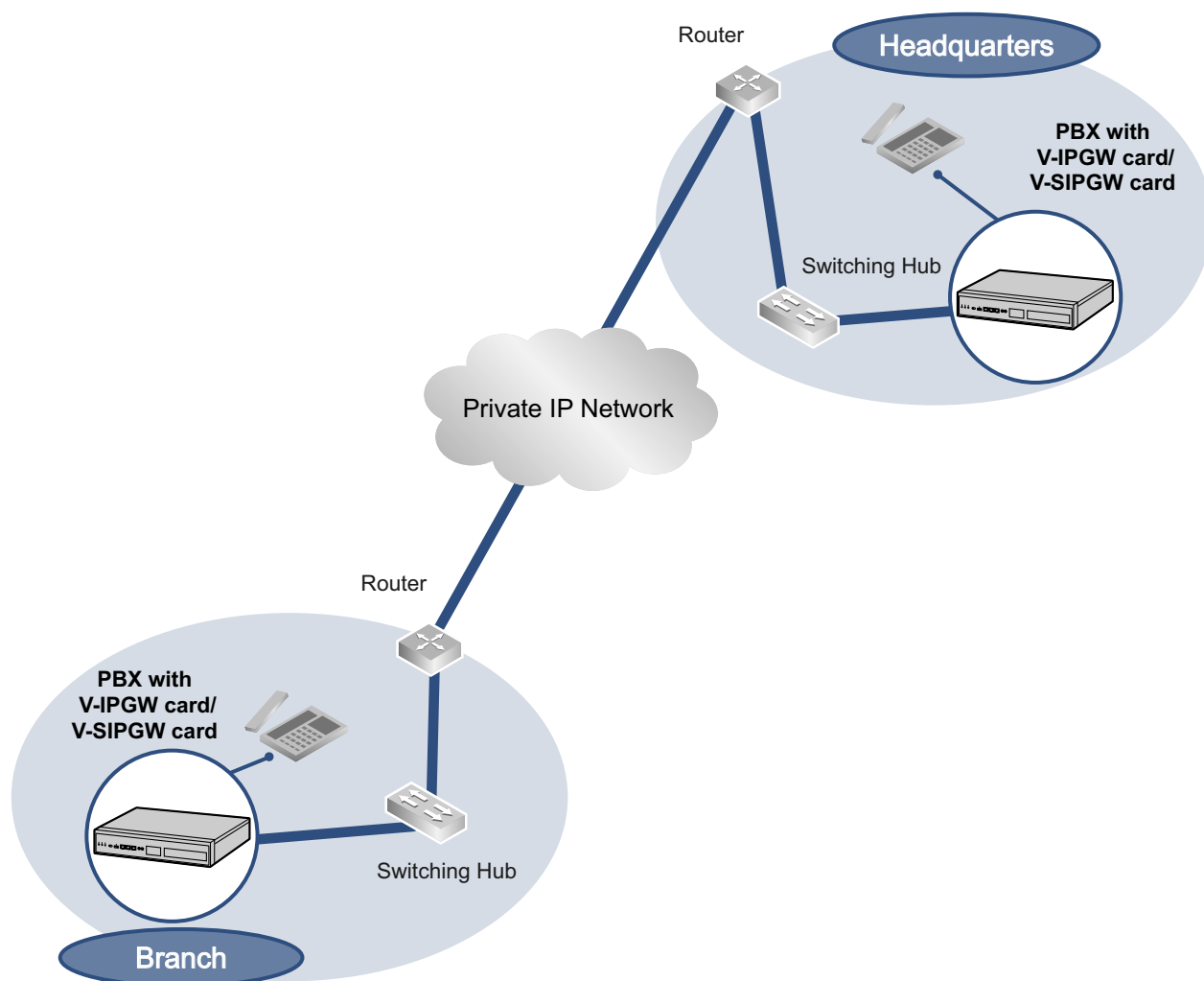
Network Parameters

You will need to have the following IP addressing and QoS information to establish VoIP communication on your network. This information is typically supplied by a network administrator.
Consult your network administrator for specific values.

Parameter	Description
IP telephone IP Address	Identifies the location of IP telephones on the network. Each IP telephone must have a unique IP address.
Subnet Mask Address	Defines which digits of an IP address are used for the network address and the host address at each network location. The IP addresses of the IP telephones and the PBX must fall within the same subnet as that of the default gateway (e.g., router) of the LAN.
Default Gateway Address	Identifies the IP address of the primary gateway (typically a router or similar device) that exchanges IP packets with the other gateways on the VoIP network.

Parameter	Description
PBX IP Address	Identifies the location of the PBX in the network during VoIP communications.
VLAN ID	Identifies the ID of the logical segment within the corporate LAN, through which voice packets from IP telephones travel. For details, refer to "7.1.3 VLAN (Virtual LAN)".
DiffServ (DS)	Identifies the value for the DS field in the header of IP packets, which determines the priority given to packets travelling from IP telephones. For details, refer to "5.8.3 Setting Diffserv Parameters".

Types of IP Network

The speech quality depends on the type of IP network in use. Managed IP networks provide better speech quality compared to unmanaged networks such as satellite communications, where quality of service cannot be guaranteed.

Examples of recommended IP networks

- Digital Leased Line
- IP-VPN (Virtual Private Network)
- Frame Relay

Not recommended

- Satellite communications (Very Small Aperture Terminal system [VSAT], etc.)

Note

- Peer-to-peer calls between IP telephones installed at different locations may not be possible if packet communication cannot be established between the respective networks. In this case, you need to configure the network settings (e.g., a VPN router when using an IP-VPN) to establish packet communication.
- Unlike an IP-VPN, which is set up over a network provider's own IP network, an Internet VPN is set up over the Internet. Internet VPNs are not recommended for VoIP communication because transmission delays and loss of data are likely to occur.
- If multiple Slave units exist in a One-look network using IP-VPN, each Slave unit must have peer-to-peer communication enabled. Therefore, inform your network administrator and make sure that the network supports this requirement.

7.1.2 DHCP (Dynamic Host Configuration Protocol) Server

To establish communication over a VoIP network, IP addresses must be assigned to IP telephones and the PBX to identify their locations on the network. While these addresses can be assigned manually, it is also possible to use a DHCP server to automatically assign IP address information. The KX-NS1000 has a DHCP Server feature. Therefore, the PBX can act as a DHCP server or DHCP client depending on its settings. When the PBX's DHCP Server feature is enabled, it allows you to centrally manage and automate the assignment of IP addresses with Web Maintenance Console. For details, refer to "◆ DHCP Server" in the PC Programming Manual.

When the mother board is connected to the network

PBX
(DHCP Server feature enabled)

When an IP telephone is connected to the network

① Request IP address information

② Assign IP address information to the DSP cards

DSP Card

③ Request IP address information

④ Assign IP address information to an IP telephone
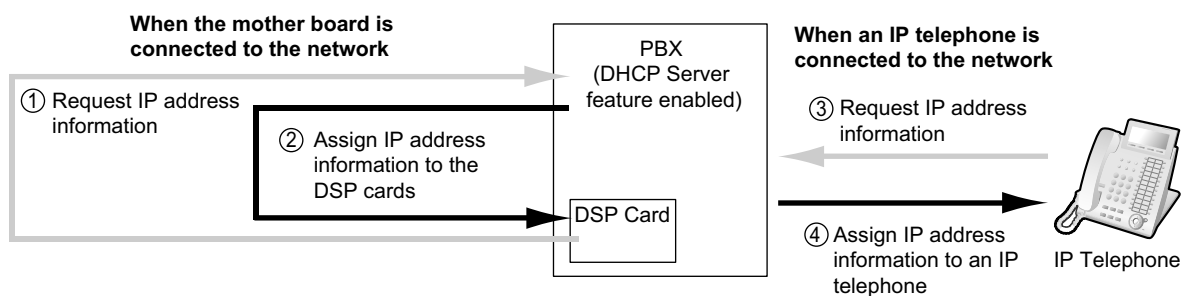
IP Telephone

Note

- The DHCP Server feature is disabled by default. To enable the feature, refer to "5.4.2 Enabling the DHCP Server Feature".
- An IP telephone and the mother board/DSP cards cannot request IP addresses from a DHCP server on another LAN (connected through an IP network). They can only receive IP addresses from a DHCP server on the same LAN. Therefore, when IP telephones are located on several LANs, a DHCP server is required on each LAN. If a DHCP server is not present on the LAN, IP addresses for IP telephones and the mother board/DSP cards on that LAN must be assigned manually.
- When the PBX has been set to act as a DHCP client, use an external DHCP server to assign IP address information automatically.
- When the KX-NS1000 is set as the DHCP client and cannot receive appropriate IP addressing information from an external DHCP server, the PBX keeps using the previous effective IP addressing information and checks whether any overlapping of IP addresses exists. If the IP address of the PBX overlaps with another IP address, the PBX displays a warning to encourage changing the IP address of the PBX.

7.1.3 VLAN (Virtual LAN)

VLANs are logical segments within a corporate LAN. By assigning VLAN settings to IP telephones, it is possible to separate the packets transmitted by an IP telephone according to the type of data and specify which VLAN each data type will be sent over. This allows you to avoid generating unnecessary network traffic on each segment and to reduce the load on the network. As a consequence, speech quality can be assured. Therefore, we recommend using the VLAN feature to perform VoIP communication effectively.

Some IP telephones (e.g., KX-NT300 series) are equipped with 2 ports, primary and secondary, for packet communication. Allocating these ports to different VLANs enables you to split the paths for packets depending on whether the packet contains voice signals or data.
VLAN settings (VLAN ID and VLAN priority) for the primary port affect voice data transmitted by the IP telephone, whereas VLAN settings for the secondary port apply to data transmitted by a PC connected to the IP telephone. When sending packets, the IP telephone can attach information on which VLAN the packets are to be transmitted over (VLAN Tagging). The switching hub that receives these packets reads the VLAN information and sends the packets over the appropriate VLAN. This helps to ensure bandwidth for IP telephone voice transmissions.
In this way, an IP telephone with 2 ports can transmit voice packets from the primary port with higher priority than other packets from the secondary port.

Notice

The PBX's LAN port does not support VLAN tagging. Therefore, connect the PBX's LAN port to a port of the switching hub that is set to "Untagged", and the IP telephone to a port set to "Trunk", to allow VLAN tagging. Consult your network administrator for details.
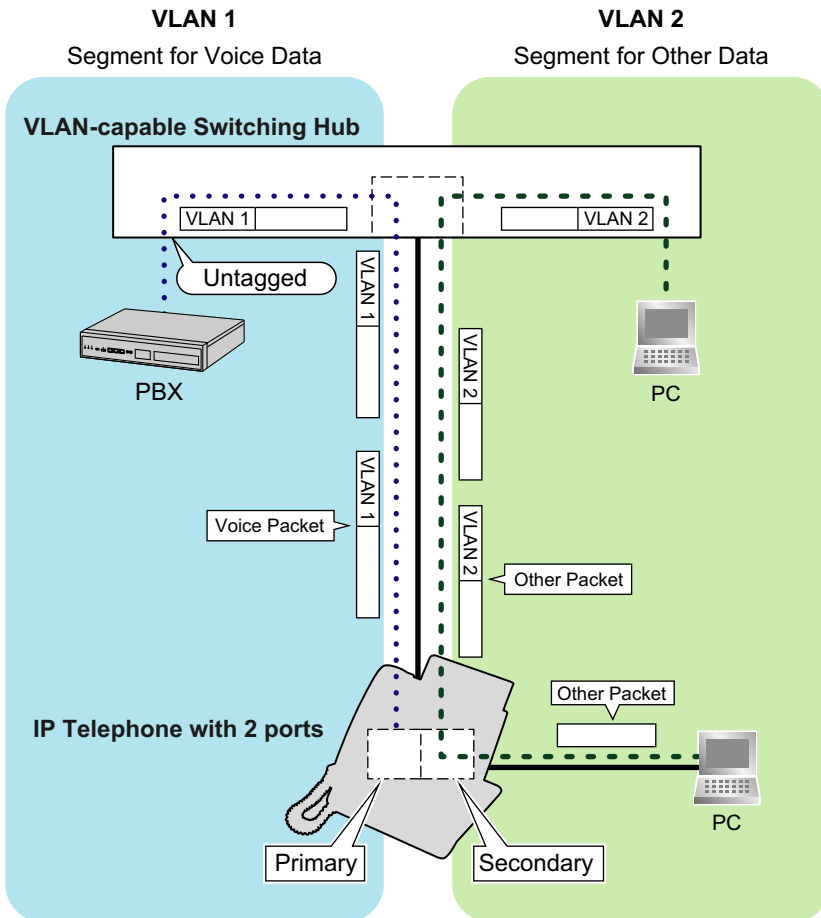
Note

- This VLAN feature complies with IEEE (Institute of Electrical and Electronics Engineers) 802.1Q.
- The PBX receives VLAN settings only from the connected switching hub. Therefore, VLAN settings for the PBX must be assigned at the switching hub.
- When using the VLAN feature on the network, make sure that the main unit is connected to a layer 2 switch that is IEEE 802.1Q compliant, and that is configured for VLANs. In addition, the port of the switching hub to which the card is connected must be set to "Untagged". Consult your network administrator for details.
- When using the VLAN feature on the network, make sure that the switching hub to be connected is IEEE 802.1Q compliant and is configured for VLANs. In addition, the port of a switching hub that the IP telephone is connected to must be set to "Trunk" port, to allow VLAN tagging. Consult your network administrator for details.
- Some PC LAN cards allow VLAN settings to be assigned. However, when using a PC connected to an IP telephone with 2 ports, the VLAN settings for PC communications must be assigned only to the secondary port of the IP telephone. Any VLAN settings assigned to the PC LAN card must be disabled. These settings can usually be identified by "802.1Q", "802.1p", or "VLAN" in their name.
- If you are using an IP telephone with a primary port only (e.g., KX-NT265), a PC cannot be connected to the IP telephone.

7.1.4 Jitter Buffer

When voice signals are packetised and transmitted, individual packets can take different paths through the network and arrive at the destination at varied timings. This is referred to as "jitter", and it can cause degradation in speech quality. To compensate for jitter problems, the "jitter buffer" accumulates the packets temporarily for processing.
To set the size of the jitter buffer, refer to "9.5 PBX Configuration—Configuration—Slot—Site Property—VoIP-DSP Options" in the PC Programming Manual.

7.1.5 Voice Activity Detection (VAD)

VAD conserves bandwidth by detecting silent periods during a call and suppressing the packets of silence from being sent to the network. This feature can be enabled or disabled for codec G.711.
To configure the VAD feature, refer to the appropriate section in the PC Programming Manual.

7.1.6 Network Configuration

You must evaluate the structure of the existing network to see if a VoIP network can be implemented. Below are the points that should be evaluated.

Is the IP network a managed network?

A VoIP network should be implemented on a managed IP network such as Frame Relay, Leased Line, or IP-VPN (Virtual Private Network).
An unmanaged network, such as the Internet (including an Internet VPN), cannot be used to employ a VoIP network because delays and loss in data transmission can cause huge degradation in speech quality.

Is it possible to have static IP addressing?

IP telephones on the network always perform VoIP communications through the PBX. Therefore, the PBX must be assigned static IP addresses, which must be programmed to each IP telephone on the network.

Note

When the DHCP Server feature is disabled and external DHCP servers are not used, static IP addressing must also be enabled for all IP telephones.

Does only a single router provide access to the IP network?

In a dual network, 2 routers provide access to the IP network as shown in the diagram below. However, only one router can be used as an access point to the network.
Therefore, in the diagram below, if router A, whose IP address is assigned as the default gateway IP address of the PBX and the IP telephones, fails, VoIP communications are no longer possible; they are not able to switch their default gateway from router A to router B to access the IP network.
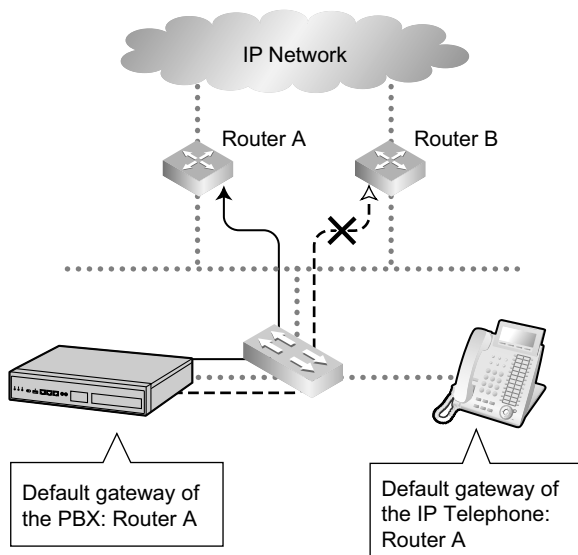
How is the PBX connected to remote extensions?

When the PBX is connected to a remote extensions via public IP network without using IP-VPN, address translation techniques (e.g., NAT/NAPT) are used. These methods prevent VoIP communications from being carried out effectively. In such cases, the use of a Session Border Controller (SBC) will avoid this problem.

Note

- An SBC is not required for:
    – Connections via a Wide Area Ethernet or LAN
    – Connections via IP-VPN
- An SBC is required for:
    – Connections via a public IP network

Connection via Wide Area Ethernet or LAN
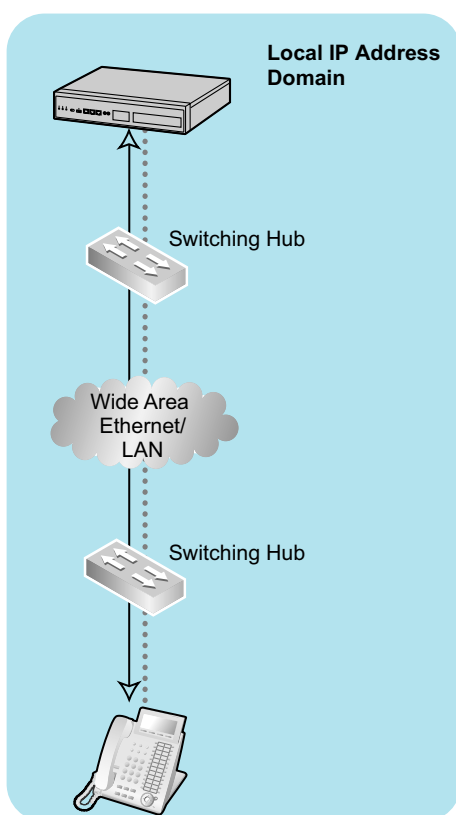
Connection via IP-VPN
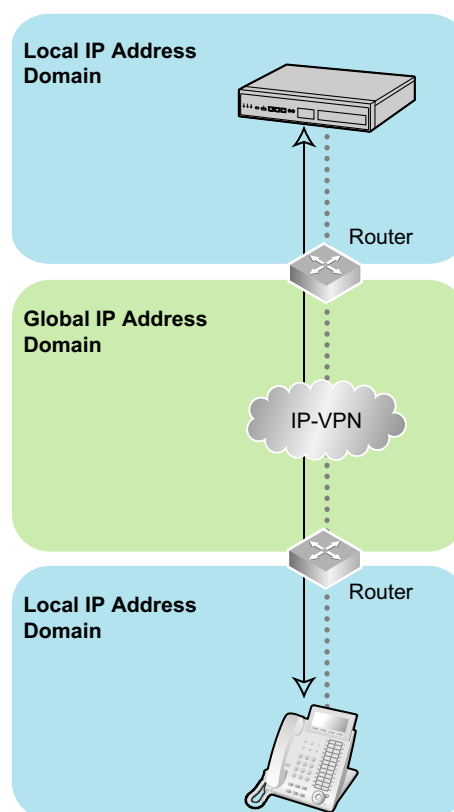
7.1.6 Network Configuration

Connection via Public IP Network

Local IP Address Domain

Router

SBC

Global IP Address Domain

Public
IP Network

SBC

Local IP Address Domain
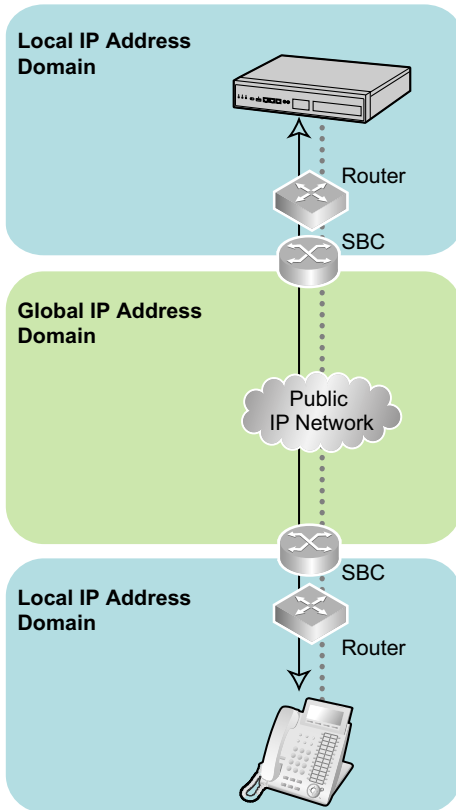
Router

Are the network devices located appropriately for effective VoIP communications?

Transmission delays can cause pauses and loss in VoIP communications. The more network devices (e.g., routers and switching hubs) there are between the PBX and IP telephones or the IP network interface, the longer the transmission delays. This is because a certain amount of delay is inevitable when packets go through each network device.

To prevent unnecessary delays, it is recommended to connect the PBX as close to the IP telephones and the IP network interface as possible so that the number of the network devices is kept to a minimum.
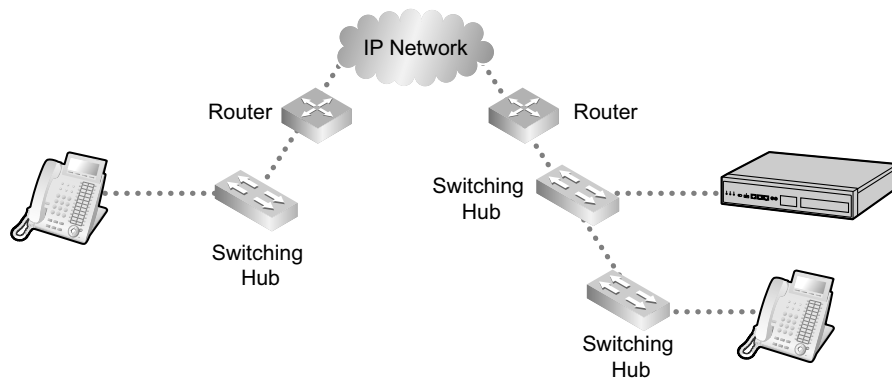
7.1.7 Network Devices

You must evaluate the network devices that are used in the existing network to see if a VoIP network can be implemented. Below are the points that should be evaluated.

Can the firewall pass packets appropriately?

If the VoIP network contains a firewall, the firewall must be configured appropriately to allow VoIP packets to pass through the network without being blocked by filtering. For details about the protocols and port numbers that the PBX uses for VoIP communication, refer to "7.5 Port Security".
The ports for which you need to configure the firewall may vary depending on the network conditions.
For more information, consult your network administrator.

Are layer 2 or higher switches used?

Use of repeater hubs can increase the network load, and therefore may result in degradation in speech quality. To ensure high speech quality, use only layer 2 or higher switches. Use of layer 2 or higher switches is also strongly recommended for connecting IP telephones.

Note

Note that the port of the switching hub that connects to the mother board should be set to operate under "Auto Negotiation" mode.

Does all equipment on the LAN support 1000BASE-T connection?

To use the Gigabit Ethernet feature for the LAN, all equipment on the LAN must support 1000BASE-T. For more information, consult your network administrator.

Are Category 5 (CAT 5) or higher cables used for 10BASE-T/100BASE-TX?

When connecting network devices, make sure to use CAT 5 or higher cables for 10BASE-T/100BASE-TX connection. If other types of cables are used, communication may not be carried out normally.

Are Enhanced Category 5 (CAT 5e) or higher cables used for 1000BASE-T?

When connecting network devices, make sure to use CAT 5e or higher cables for 1000BASE-T. If other types of cables are used, communication may not be carried out normally.

7.1.8 QoS (Quality of Service)

Some routers permit the configuration of priority control features. This allows the router to give higher priority to voice packets and lower the rate of loss and delays during transmissions, hence improving speech quality. It is strongly recommended that you use this feature, especially in networks where traffic is heavy.

Typically, a router identifies what packets to pass in priority by checking the value in the ToS field of the header of IP packets. The V-IPGW16 card has the ability to set the ToS field of outgoing voice packets. When the card is appropriately configured, the router can give voice packets from the card higher priority.
Consult your network administrator when setting the ToS field, as the setting value must conform to the router's specifications.

<u>Note</u>

- Some switches also permit the configuration of priority control features. For more information, consult your network administrator.
- To adjust the value in the ToS field, refer to "9.11 PBX Configuration—Configuration—Slot—V-IPGW16 —Shelf Property" in the PC Programming Manual.

7.2 H.323 Trunks

This section explains information that is necessary for setting up a H.323 QSIG network over an IP network.

7.2.1 Avoid Multiple IP Networks

A huge degradation in speech quality will be produced when calls are made through multiple IP networks as shown below; therefore, it is recommended that you avoid establishing a VoIP network in this fashion.
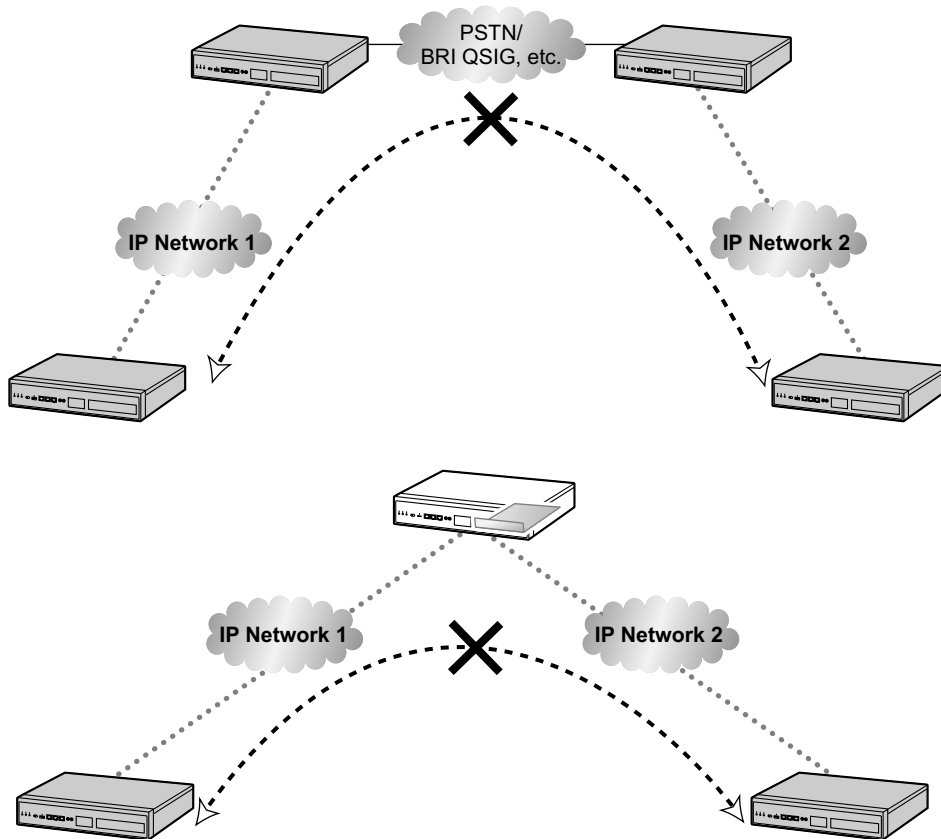
7.2.2 Gatekeeper

The following are the general functions of a gatekeeper:
- Dialled number-to-IP address translation
- Authentication
- Bandwidth control

The gatekeeper provides these network management functions to registered clients. To register with the gatekeeper, you need to configure the V-IPGW16 card to use the gatekeeper and programme the GK Settings table through system programming. For details, refer to "9.11 PBX Configuration—Configuration—Slot—V-IPGW16—Shelf Property—◆ Gatekeeper Available" and "9.11.1 PBX Configuration—Configuration—Slot—V-IPGW16—Shelf Property—GK Settings" in the PC Programming Manual. After programming, the V-IPGW16 card attempts to register with the gatekeeper using registration information such as the IP address of the mother board, and destination telephone numbers specified in the GK Settings table.

Note

- For more information about gatekeeper functions, consult the documentation of the gatekeeper.
- When using a gatekeeper, make sure to choose a compatible model. For more information about gatekeeper compatibility with the V-IPGW16 card, consult a certified dealer.

7.2.3 Bandwidth Assessment

When using the IP telephones and V-IPGW16 card, you must ensure that the IP network in use has enough bandwidth to support VoIP communications. If the amount of bandwidth required for VoIP communications is more than the network can accommodate, speech quality will be compromised. In addition, there may be an adverse effect on the performance of other applications (e.g., e-mail or Web applications) that use the same network. Therefore, care must be taken when assessing bandwidth requirements.

Inform your network administrator of the required bandwidth, and make sure that the network can support VoIP communications even under conditions of maximum network traffic.

Bandwidth Assessment for IP Extension Card

Required Bandwidth per IP Telephone for a Call

The required bandwidth depends on what combination of codecs and packet sending intervals is used. Keep in mind the following points about the type of codecs and packet sending intervals, in terms of speech quality:
- The speech quality of the codecs varies as follows: (High) G.722, G.711, G.729A (Low)[1]
- The shorter the packet sending interval, the higher the speech quality.
- The higher the speech quality the IP telephones provide, the more bandwidth the IP telephones require.

[1] When the preferred codec of each party differs, the call will be established using the lower codec. For example, if the caller prefers G.711 while the called party prefers G.729A, the call will be established using G.729A.

Codec	Packet Sending Interval			
	20 ms	30 ms	40 ms	60 ms
G.722[1]/G.711	87.2 kbps	79.5 kbps	—	—
G.729A	31.2 kbps	23.5 kbps	19.6 kbps	15.7 kbps

[1] G.722 is only available for calls between KX-NT300 series IP-PTs and some SIP phones that support this codec during peer-to-peer communication. For details, refer to "5.2.1.4 Peer-to-Peer (P2P) Connection" in the Feature Guide.

Required Bandwidth for Each IP Extension Card

To allow all IP telephones to make calls simultaneously, it is necessary to keep available the bandwidth required by an IP extension card with the maximum number of IP telephones connected.
Provided below is the formula to calculate the amount of bandwidth required for each IP extension card.

> **When using the V-IPEXT32/V-SIPEXT32 card:**
> Required Bandwidth = (Required Bandwidth per IP telephone $\times$ 32)

Bandwidth Assessment for V-IPGW16 Card

Required Bandwidth for One VoIP Channel

The required bandwidth depends on what combination of codecs and packet sending intervals is used. Keep in mind the following points about the type of codec and packet sending interval, in terms of the speech quality:

- The speech quality of the G.711 codec is higher than that of the G.729A codec.
- The shorter the packet sending interval, the higher the speech quality.
- The higher the speech quality the V-IPGW16 card provides, the more bandwidth the card requires.

Via LAN

Codec	Packet Sending Interval				
	20 ms	30 ms	40 ms	60 ms	90 ms
G.711	87.2 kbps	79.5 kbps	75.6 kbps	71.7 kbps	—
G.729A	31.2 kbps	23.5 kbps	19.6 kbps	15.7 kbps	—

Via WAN (PPP: Point-to-Point Protocol)

Codec	Packet Sending Interval				
	20 ms	30 ms	40 ms	60 ms	90 ms
G.711	84 kbps	77.3 kbps	74 kbps	70.7 kbps	—
G.729A	28 kbps	21 kbps	18 kbps	14.7 kbps	—

Bandwidth Calculation

Provided below is the formula to find out the amount of bandwidth required for VoIP communications:

> **Required Bandwidth**
> = (No. of Fax Machines $\times$ Required Bandwidth for the G.711 codec) +
> [(16 - No. of Fax Machines) $\times$ Required Bandwidth for Voice Communication]

Example

Consider the following case as an example:

- Communication: via LAN
- No. of Fax Machines: 2
- G.711 Packet Sending Interval: 20 ms (requiring 87.2 kbps per channel)
- G.729A Packet Sending Interval for Voice Communication: 20 ms (requiring 31.2 kbps per channel)

In this case, the required bandwidth will be as follows:

> **Required Bandwidth**
> = (2 $\times$ 87.2) + [(16 - 2) $\times$ 31.2]
> = 611.2 (kbps)

Therefore, inform your network administrator and make sure that the network can support a bandwidth of 611.2 kbps even when the network is under conditions of maximum traffic.

Note

It is recommended that all cards on a VoIP network have the same packet sending interval.

Additional Information

As described above, it is possible to control the required bandwidth by selecting a certain combination of codec and packet sending interval. However, it is also possible to control required bandwidth by limiting the number of available virtual VoIP channels.
The V-IPGW16 card supports a total of 8 ports, each having 2 separate channels. By disabling some of the ports, you can reduce the bandwidth required for VoIP communications.

To limit the number of VoIP channels:

Set the status of the ports you wish to disable (starting from the highest-numbered port) to **OUS**.
For example, if you wish to use only 10 of the available 16 virtual VoIP channels (i.e., disable 6 channels), set ports 8, 7, and 6 to **OUS** as shown below:

ateway Port Property

	Shelf	Slot	Port	Connection
Virtual	32	1	INS
Virtual	32	2	INS
Virtual	32	3	INS
Virtual	32	4	INS
Virtual	32	5	INS
Virtual	32	6	OUS
Virtual	32	7	OUS
Virtual	32	8	OUS

In this case, the equation for bandwidth calculation, based on the previous example, will change as follows:

Required Bandwidth
= (No. of Fax Machines × Required Bandwidth for the G.711 codec) +
[(**10** - No. of Fax Machines) × Required Bandwidth for Voice Communication]
= (2 × 87.2) + [(**10** - 2) × 31.2]
= 424 (kbps)

7.2.4 Virtual VoIP Gateway Card Specifications

For details about the RFCs and protocols for the V-IPGW16 card, refer to the following specifications.

ITU-T	H.323
	H.225.0
	H.245
Codecs	G.711 (a-law and μ-law)
	G.729A
Voice Operations	Echo Cancellation (48 ms)
	Jitter Buffer (200 ms)
	VAD (Voice Activity Detection)[1]
	PLC (Packet Loss Concealment)
DTMF Relay	Inband/Outband (RFC2833)/Outband (H.245)
Fax Relay	G.711 Inband/T.38
Protocol/Function	RTP
	RTCP

[1]   VAD is only available for codec G.711.

7.3 SIP Trunks

This section provides information on using SIP trunks with the PBX.

7.3.1 IP Telephony Service

The Virtual 16-Channel SIP Trunk Card (V-SIPGW16) is a virtual trunk card which is designed to be easily integrated into an Internet Telephony Service provided by an ITSP (Internet Telephony Service Provider).

As a major SIP Provider, an ITSP provides its telephony service partly through the conventional telephone network (e.g., ISDN and Mobile), which is fee-based. An ISP (Internet Service Provider), another major SIP Provider, does not provide telephone connection itself. However, providing its users with Internet access, an ISP provides voice communication on the Internet for free. In this way, with VoIP technology based on the SIP protocol, the cost of voice communication can be much cheaper than conventional telephone networks. A maximum of 16 V-SIPGW16 cards can be installed to the virtual slots of the PBX. The channel capacity of the card allows users to connect to up to 32 different ISP/ITSPs.

V-SIPGW16 Connection Outline

The following diagram illustrates a simple VoIP network connecting the V-SIPGW16 card to the Internet.
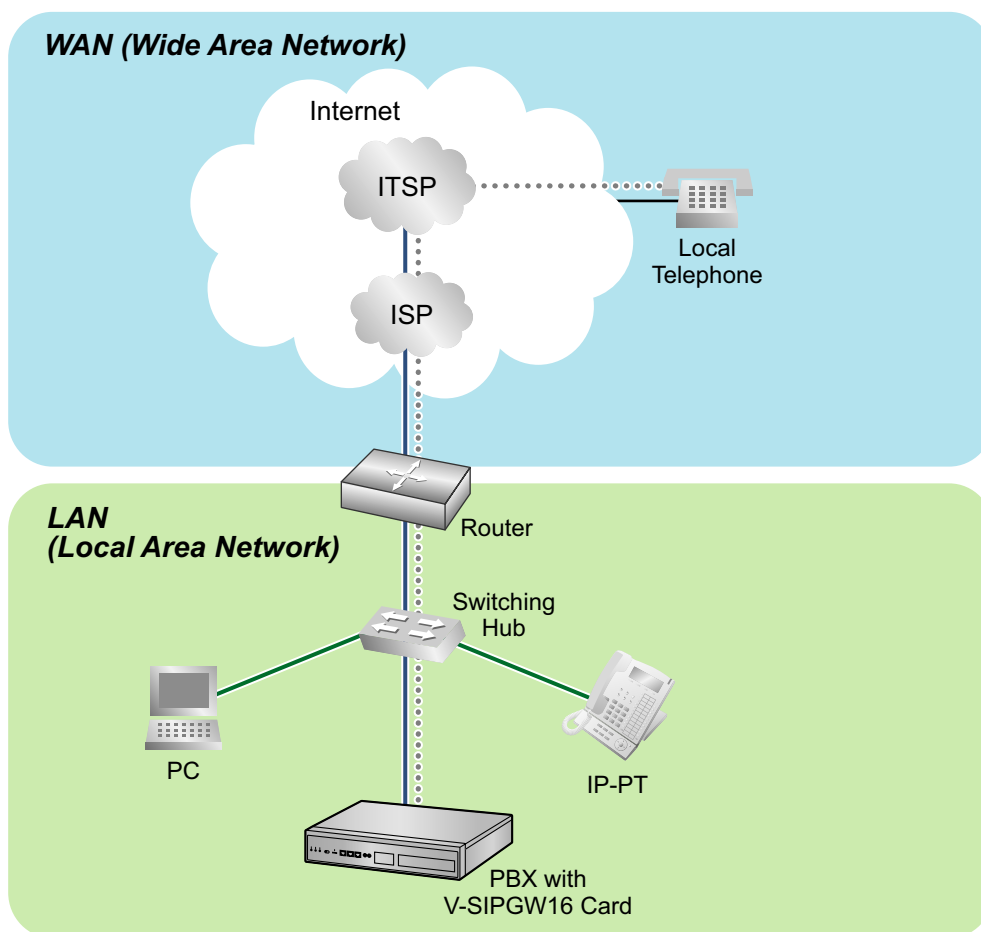
Requirements for Internet Telephony Service

- You need to subscribe with an ISP for Internet connection.

- You need to subscribe with an ITSP for telephone connection. The ISP and ITSP may be part of the same company.

Note
- VoIP communication using the V-SIPGW16 card may deteriorate depending on the ITSP being used.
- VoIP communication using the V-SIPGW16 card may deteriorate depending on the network conditions.

DNS (Domain Name System)

A DNS server normally provides the name resolution service for your PC. As domain names are alphabetic, they are easier to remember. The Internet, however, is based on IP addresses. Therefore, every time a domain name is used, a DNS server must translate the name into the corresponding IP address, and vice versa. For example, the domain name *www.example.com* may be translated to *192.0.34.166*. If one DNS server does not know how to translate a particular domain name, it asks another one, and so on, until the correct IP address is returned.
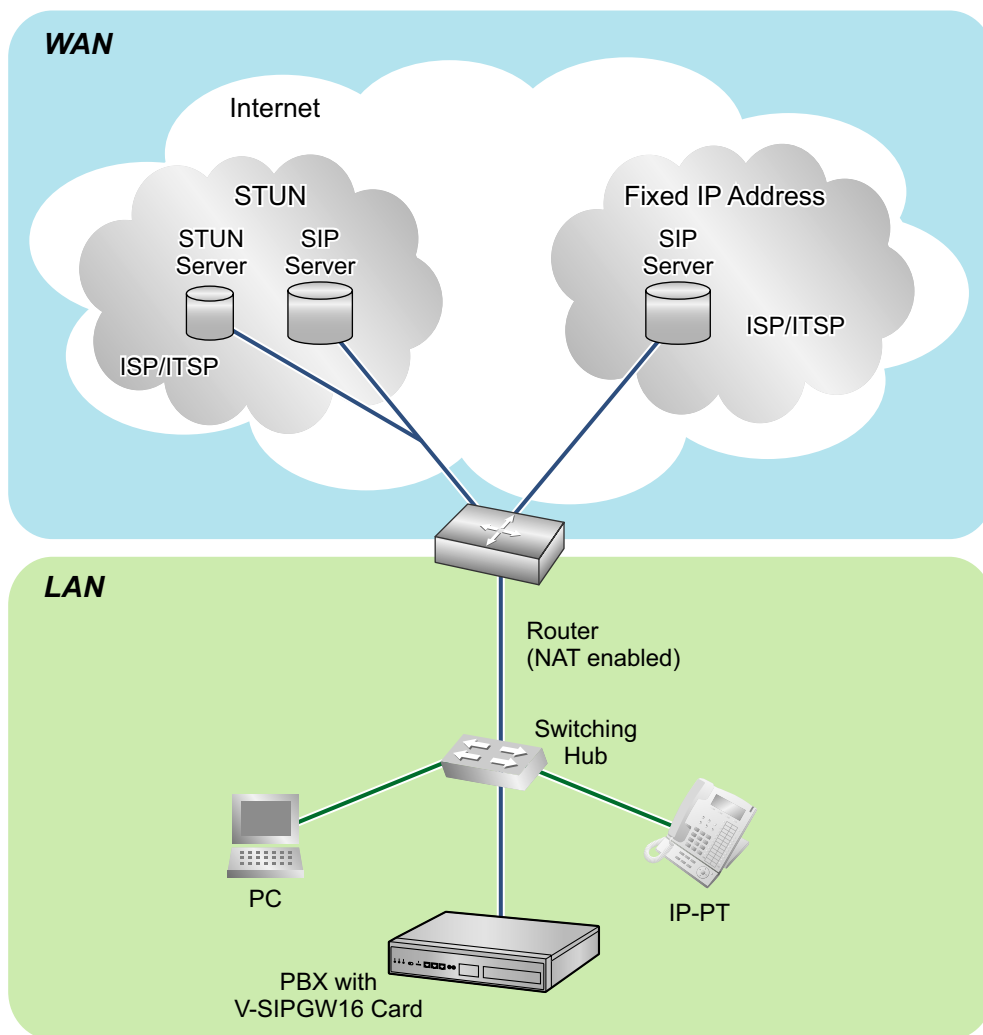
NAT (Network Address Translation) Traversal

When NAT/NAPT (Network Address Port Translation) is enabled, the router translates a local IP address from the PBX into a global IP address. However, the router with NAT enabled does not translate local IP addresses stored in SIP messages into global IP addresses.

Therefore, the address which the SIP Server recognises as the destination IP address to reply to is actually the local IP address of the PBX, not the global IP address of the router. Therefore, if the SIP Server receives a SIP message from the PBX and sends a message back to the PBX using the address stored in the SIP message, the packet information will not reach the PBX.

STUN Servers function to solve the global IP address problem under certain NAT conditions, for example, in case of full duplex communication. A STUN Server, used alongside the SIP Server, finds out the global IP address of the router with NAT enabled. With the STUN feature enabled, the packet information sent by the SIP Server is able to "traverse" NAT and reach the PBX.

The settings can be configured to specify whether to enable the NAT Traversal feature for each ISP/ITSP. In addition, the NAT Traversal method can be selected from "STUN" and "Fixed IP Address". For details, refer to "9.8 PBX Configuration—Configuration—Slot—V-SIPGW—Shelf Property" in the PC Programming Manual.

The V-SIPGW16 card may require the NAT Traversal feature to be enabled to connect to the WAN via a router. The following diagram illustrates how VoIP communication is enabled between the V-SIPGW16 card and the SIP Server (SIP Receiver) via a router with NAT enabled.

WAN

Internet

STUN

STUN
Server

SIP
Server

ISP/ITSP

Fixed IP Address

SIP
Server

ISP/ITSP

LAN

Router
(NAT enabled)

Switching
Hub

PC

IP-PT

PBX with
V-SIPGW16 Card

Note

- If an ISP/ITSP uses a device such as SBC (Session Border Controller), you may not have to enable the NAT Traversal feature.
- A STUN Server is supplied by an ISP/ITSP, and not included with the PBX.

7.3.2 SIP Requirements

Port Requirements

Required Ports for Each Channel

When configuring a router with NAT enabled, you need to secure a certain number of ports for each SIP and RTP/RTCP channel. For RTP/RTCP, the number of required ports is double the number of activated SIP trunks (Ch). For SIP signalling, the number of required ports is always one regardless of the number of activated SIP trunks (Ch).

<Example>

If 4 SIP trunk channels are activated, you need the following number of ports:

Protocol Type	Required Port
RTP	4
RTCP	4
SIP	1
Total	9

Firewall Requirements

If the VoIP network contains a firewall, the firewall must be configured appropriately to allow VoIP packets to pass through the network without being blocked by filtering. For the protocols and port numbers that the PBX uses for VoIP communication, refer to "7.5 Port Security".

The ports for which you need to configure the firewall may vary depending on the network conditions.

For more information, consult your network administrator.

7.3.3 Router Requirements

- Port Forwarding:
  It may be necessary to set the NAT router so that it forwards the incoming packets to the IP address of the V-SIPGW16 card if all of the following conditions are met:
  – the PBX uses a STUN server;
  – a V-SIPGW16 card is located under a NAT router;
  – incoming packets are routed to a SIP Client port or NAT Voice (RTP) UDP port indicated in "7.5 Port Security".

- SIP-NAT Feature:
  When a V-SIPGW16 card is located under a NAT router that supports the SIP-NAT feature[1], it is recommended to disable this feature.
  [1] When NAT is enabled, the router translates the IP address stored in the IP header and the port number stored in the UDP header. When SIP-NAT is enabled, the router also translates the IP address and port number stored in SIP messages.

7.3.4 Bandwidth Requirements

When using the V-SIPGW16 card, you must ensure that the WAN has enough bandwidth to support VoIP communications. Refer to the table below and ensure that the sum of the required bandwidth for each channel is smaller than the amount the WAN (e.g., ADSL network) can provide.

Note that the amount in the table is only a guide. Subscribe to a network that has enough bandwidth. If the amount of bandwidth required for VoIP communications is larger than what the network can accommodate, speech quality will be compromised.

Required Bandwidth for Each Channel

The required bandwidth depends on what combination of codecs and packet sending interval is used. Keep in mind the following points about the type of codec and packet sending interval, in terms of the speech quality:

*   The speech quality of the codecs varies as follows: G.711 (High), G.729A (Low)
*   The shorter the packet sending interval, the higher the speech quality.
*   The higher the speech quality the V-SIPGW16 card provides, the more bandwidth the WAN requires.

Codec	Packet Sending Interval					
	10 ms	**20 ms**	**30 ms**	**40 ms**	**50 ms**	**60 ms**
G.711	110.4 kbps	87.2 kbps	79.5 kbps	75.6 kbps	73.3 kbps	71.7 kbps
G.729A	54.4 kbps	31.2 kbps	23.5 kbps	19.6 kbps	17.3 kbps	15.7 kbps

7.3.5 Virtual SIP Trunk Card Specifications

For details about the RFCs and protocols for the V-SIPGW16 card, refer to the following specifications.

Items	Specification
SIP RFCs	RFC3261 (UDP only)
	RFC3262 (PRACK)
	RFC3264 (Offer/Answer)
	RFC3311 (UPDATE)
	RFC3581 (Symmetric Response Routing/rport)
	RFC4028 (Session Timer)
Codecs	G.711 (a-law and μ-law)
	G.729A
Voice Options	Echo Cancellation (48 ms)
	Jitter Buffer (200 ms)
	VAD (Voice Activity Detection)[1]
	PLC (Packet Loss Concealment)
DTMF Relay	Inband/Outband (RFC2833)/Outband (SIP INFO)
Fax Relay	G.711 Inband/T.38
Protocol/Function	RTP
	RTCP
	DNS (A/SRV)
	NAT Traversal (STUN)
	QoS (ToS field setting in IP header of RTP/RTCP)

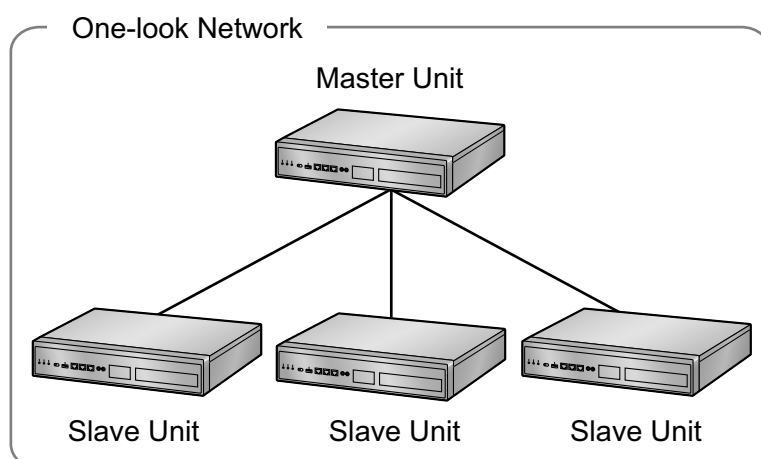[1]   VAD is only available for codec G.711.

7.4 Types of PBX Networks

This section gives an overview of the types of networks the PBX can participate in.

7.4.1 One-look Network

This section gives an overview of One-look networks.

Image of a One-look network:

Features

- A maximum of 16 PBXs can be connected in a One-look network.
- The PBXs specified as Slave units use settings provided by the PBX specified as the Master unit, so a considerable amount of setup is done automatically.
- Resource sharing allows users to interact as if they were all connected to one PBX, which eliminates the need to manage information such as PBX access codes.
- All units in a One-look network can be programmed from one location.

Note

The MASTER indicator LED indicates whether the unit is configured as a Master unit or Slave unit. For details, refer to "LED Indications".

Conditions

- A One-look network must consist only of KX-NS1000 PBXs.
- The sites that will be included in a One-look network must be connected over a private IP network before setting up the One-look network.

Bandwidth Requirements

When implementing a One-look network, you must ensure that the IP network has enough bandwidth to support both VoIP communication and One-look network signalling between PBXs. If the amount of bandwidth required for VoIP communications and signalling is more than the network can accommodate, speech quality will degrade. In addition, there may be an adverse effect on the performance of other applications (e.g., e-mail or Web applications) that use the same network. Therefore, care must be taken when assessing bandwidth requirements.

Inform your network administrator of the required bandwidth, and make sure that the network can support VoIP communications and signalling even under conditions of maximum network traffic.

Required Bandwidth per Call

The required bandwidth depends on the following factors:
- The maximum number of simultaneous calls
- Packet sending interval
- Type of codec used
- Telephone type

Keep in mind the following points about the types of codecs and packet sending intervals, in terms of speech quality:
- The speech quality of the codecs varies as follows: (High) G.722, G.711, G.729A (Low)[1]
- The shorter the packet sending interval, the higher the speech quality.
- The higher the speech quality an IP telephone provides, the more bandwidth it requires.

[1] When the preferred codec of each party differs, the call will be established using the lower quality codec.

For example, if the caller prefers G.711 while the called party prefers G.729A, the call will be established using G.729A.

Number of Simultaneous Calls

The number of simultaneous calls is proportional to number of extensions registered to the PBX, as shown in the chart below. The proportion is approximately 0.25 when the number of registered extensions is 100. For more information about the number of simultaneous calls, ask your local Panasonic dealer.
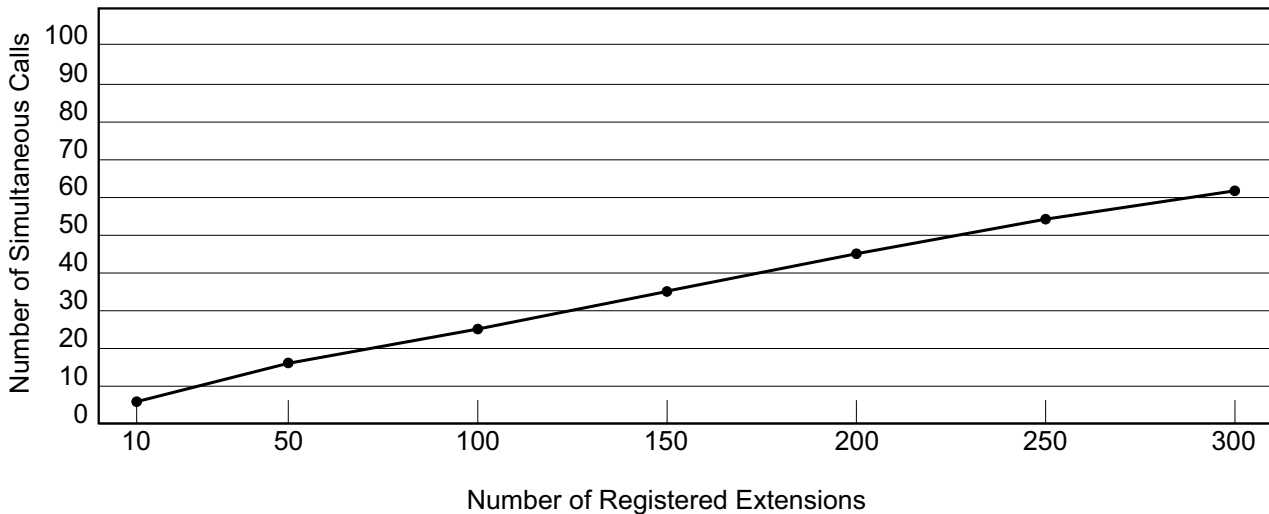
Number of Registered Extensions	10	50	100	150	200	250	300
Number of Simultaneous Calls	6	16	26	35	44	53	61

Required Bandwidth per Call for VoIP Communication

The required bandwidth for VoIP communication is determined by the codec used and the packet sending interval.

Codec	Packet Sending Interval			
	20 ms	**30 ms**	**40 ms**	**60 ms**
G.711/G.722	80 kbps	74.7 kbps	72 kbps	69.4 kbps
G.729A	24 kbps	18.7 kbps	16.0 kbps	13.4 kbps

[*1] G.722 is only available for calls between KX-NT300 series IP-PTs and some SIP phones that support this codec during peer-to-peer communication. For details, refer to "5.2.1.4 Peer-to-Peer (P2P) Connection" in the Feature Guide.

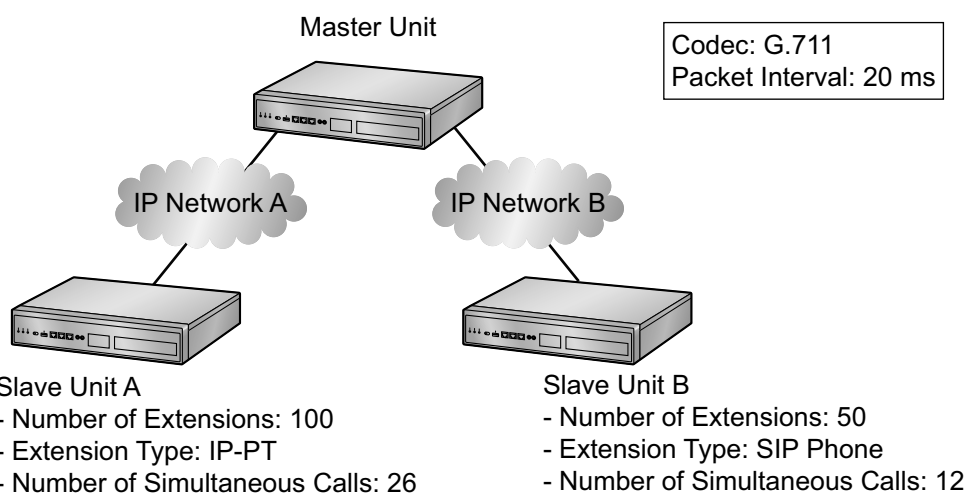**Required Bandwidth per Call for Signalling**

In a One-look network, a certain amount of bandwidth is required for the master unit to handle all the calls in the network. The required bandwidth depends on the type of IP telephone.

Phone Type	Required Bandwidth
IP Telephones (except SIP phones)	7.2 kbps
SIP Phone	16.0 kbps

Example:

The following examples show different cases of assessing bandwidth for a One-look network.

In this example, there are 3 PBXs in a One-look network.

Master Unit

Codec: G.711
Packet Interval: 20 ms

IP Network A

IP Network B

Slave Unit A
- Number of Extensions: 100
- Extension Type: IP-PT
- Number of Simultaneous Calls: 26

Slave Unit B
- Number of Extensions: 50
- Extension Type: SIP Phone
- Number of Simultaneous Calls: 12

Bandwidth assessment for IP network A:
- Bandwidth required for VoIP communication
  = Number of simultaneous calls $\times$ 2 $\times$ Required bandwidth for codecs (kbps)
  = 26 $\times$ 2 $\times$ 80
  = 4160 kbps
- Bandwidth required for signalling
  = Number of simultaneous calls $\times$ Signalling bandwidth per a call for IP telephones (except SIP phones) (kbps)
  = 26 $\times$ 7.2
  = 187.2 kbps
- Total required bandwidth for IP network A
  = Bandwidth required for VoIP communication (kbps) + Bandwidth required for signalling (kbps)
  = 4160 + 187.2
  = 4347.2 kbps

Bandwidth assessment for IP network B:
- Bandwidth required for VoIP communication
  = Number of simultaneous calls $\times$ 2 $\times$ Required bandwidth for codecs (kbps)
  = 12 $\times$ 2 $\times$ 80
  = 1920 kbps
- Bandwidth required for signalling
  Number of simultaneous calls $\times$ Signalling bandwidth per a call for SIP phones (kbps)
  = 12 $\times$ 16
  = 192 kbps
- Total required bandwidth for IP network B
  = Bandwidth required for VoIP communication (kbps) + Bandwidth required for signalling (kbps)
  = 1920 + 192
  = 2112 kbps

Required Items

- KX-NSN001: Activation Key for One-look Network (One-look Network)

Networking Notes

- When setting up a PBX using Easy Setup Wizard, you specify whether the PBX will be the Master unit or a Slave unit. For more details, refer to "5.4.1 Easy Setup Wizard".
- You can add Slave units to the One-look network using Web Maintenance Console. For more details, refer to "5.5 Programming a One-look Network".

Note

- For more details about One-look networks, refer to "4.2 One-look Networking" in the Feature Guide.
- For details about configuring and programming a One-look networks, refer to "3.1.1 Home Screen— Add Site Wizard" in the PC Programming Manual.

7.4.2 H.323 QSIG Network

This section gives an overview of H.323 QSIG networks.

Image of a H.323 QSIG network:
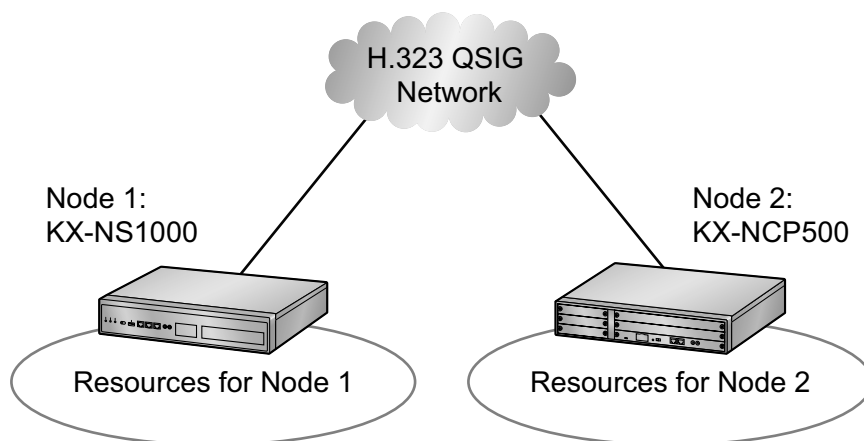
Features

- H.323 QSIG networks can include non-KX-NS1000 PBXs (e.g., KX-TDE200, KX-NCP500).
- Resources are not available to extension users of other PBX without explicit configuration.

Conditions

- PBXs in an H.323 QSIG network must be connected over a private IP network.

Bandwidth Requirements

Refer to "7.2.3 Bandwidth Assessment".

Required Items

- V-IPGW16: Virtual 16-Channel VoIP Gateway Card

Note

The following activation key is required for enhanced QSIG network features (NDSS, Centralised Voice Mail, etc.).
- KX-NSN002: Activation Key for QSIG Network (QSIG Network)

Networking Notes

When a KX-NS1000 is included in the H.323 QSIG network, the PBX must be specified as a Master unit.

Note

- For more details about H.323 QSIG networks, refer to "4.3.1 TIE Line Service" in the Feature Guide.
- For details about configuring and programming a H.323 QSIG network, refer to "◆ TIE Line Access" in the PC Programming Manual.

7.4.3 Working with Multiple PBX Networks

It is possible to connect a One-look network to other PBXs via H.323 QSIG network. In an H.323 QSIG network, the One-look network appears as one PBX.

Image of multiple PBX networks:
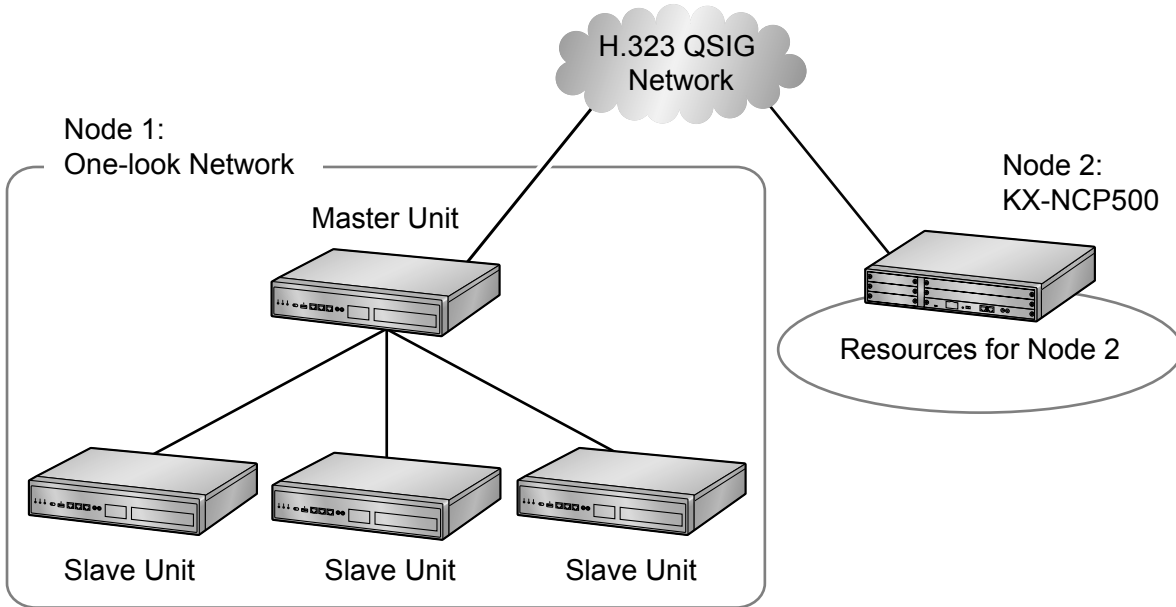
The following table shows the maximum number of sites/nodes that can be included in each type of network.

Network Type	Method	Maximum Sites/Nodes
Private Network	One-look Network	16 sites
QSIG Network	H.323 QSIG Network	512 nodes
Multiple PBX Networks	One-look Network and H.323 QSIG Network	8192 sites

Note

For more details about using multiple PBX networks, refer to "Section 4, Network Features" in the Feature Guide.

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7.5 Port Security

If the VoIP network contains a firewall, the firewall must be configured appropriately to allow VoIP packets to pass through certain ports of the ports listed below without being blocked by filtering. The ports for which you need to configure the firewall may vary depending on the network conditions.
For more information, consult your network administrator.
The following table shows the PBX's ports used for IP communications. Any access to the ports not in this list is ignored.

Port Numbers for LAN Port

Port Number	Protocol	Application	Client/Server	Changeable/ Fixed
25	TCP/UDP	SMTP	Server	Changeable
53	UDP	DNS	Server	Fixed
67	UDP	DHCP	Server	Changeable
68	UDP	DHCP	Client	Changeable
80	TCP	HTTP	Server	Changeable
123	UDP	NTP	Server	Fixed
143	TCP	IMAP	Server	Changeable
161	UDP	SNMP	Server	Changeable
443	TCP	HTTPS	Server	Changeable
465	TCP/UDP	SMTP over SSL	Server	Changeable
993	TCP	IMAP over SSL	Server	Changeable
1717	UDP	Connectionless UDP	-	Changeable
1718	TCP	Connectionless TCP	-	Changeable
1719	UDP	H.225 RAS	-	Changeable
1720	TCP	H.225 Call Signal	-	Changeable
2103	TCP	CMM	Server	Fixed
2300	TCP	Telnet-SMDR	-	Changeable
2727	UDP	MGCP[*1]	-	Changeable
3493	TCP	UPS[*2]	-	Fixed
3702	UDP	WSD	Server	Changeable
4560–4561	UDP	PSAP	-	Changeable
4562	UDP	SSAP	-	Changeable
5060	UDP	SIP UA (EXT)	-	Changeable
7547	TCP	CWMP	Server	Changeable
7580	TCP	HTTP	Server	Fixed

Port Number	Protocol	Application	Client/Server	Changeable/Fixed
8080	TCP	Web Maintenance Console	-	Changeable
9300	UDP	PTAP	-	Changeable
10000–10655	TCP	H.323 Dynamic Port (H.225 Send, H.245 Send/Receive, Connection-less [TCP] Send Port)	-	Changeable
20000	TCP	UM-VMA[*3]	Server	Fixed
30021	TCP/UDP	FTP/FTPS	Server	Changeable
30022	TCP	SSH	Server	Changeable
32727	UDP	MGCP[*1] for IP-CS	-	Changeable
33090	UDP	ACS-MDW	Server	Fixed
33091				
33092	TCP			
33131				
33321	TCP	Access Point Login (Telnet)	Server	Changeable
33333	TCP	CTI 3rd Party Connection	-	Changeable
33334	TCP	CTI 1st Party Connection	-	Changeable
33478	UDP	STUN	Client	Changeable
33702	UDP	ACS-MDW (WSD)	Server	Fixed
35060	UDP	SIP UA (CO)	-	Changeable
39300	UDP	PTAP for IP-CS	-	Changeable
40000–40095	TCP/UDP	FTP/FTPS-Data	Server	Changeable
50000–65535 (Ephemeral)	UDP	SNMP TRAP	Client	Fixed
	TCP/UDP	FTP	Client	
	TCP/UDP	FTP/FTPS-Data	Client	
	UDP	NTP	Client	
	UDP	DNS	Client	
	UDP	SYSLOG	Client	
	TCP/UDP	SMTP	Client	
	TCP/UDP	SMTP over SSL	Client	
	TCP/UDP	POP3	Client	

Port Number	Protocol	Application	Client/Server	Changeable/Fixed
	TCP/UDP	ACS-MDW	Server	

[1] Media Gateway Control Protocol. Used for call control command data and LCD/LED data transmission.
[2] Used by UPS daemon.
[3] Used by Unified Messaging.

Port Numbers for MNT Port

Port Number	Protocol	Application	Client/Server	Changeable/Fixed
21	TCP/UDP	FTP/FTPS	Server	Changeable
25	TCP/UDP	SMTP	Server	Changeable
53	UDP	DNS	Server	Changeable
67	UDP	DHCP	Server	Changeable
80	TCP	HTTP	Server	Changeable
123	UDP	NTP	Server	Fixed
143	TCP	IMAP	Server	Changeable
161	UDP	SNMP	Server	Changeable
443	TCP	HTTPS	Server	Changeable
465	TCP/UDP	SMTP over SSL	Server	Changeable
993	TCP	IMAP over SSL	Server	Changeable
2103	TCP	CMM	Server	Fixed
2300	TCP	Telnet-SMDR	-	Changeable
3493	UDP	UPS[1]	-	Fixed
3702	UDP	WSD	Server	Changeable
7574	TCP	CWMP	Server	Changeable
8080	TCP	Web Maintenance Console	-	Changeable
30022	TCP	SSH	Server	Changeable
33090	UDP	ACS-MDW	Server	Fixed
30091				
30092	TCP			
33131				
33321	TCP	Access Point Login (Telnet)	Server	Changeable
33333	TCP	CTI 3rd Party Connection	-	Changeable
33334	TCP	CTI 1st Party Connection	-	Changeable
33702	UDP	ACS-MDW (WSD)	Server	Fixed

Port Number	Protocol	Application	Client/Server	Changeable/ Fixed
40000–40095	TCP/UDP	FTP/FTPS-Data	Server	Changeable
50000–65535 (Ephemeral)	UDP	SNMP TRAP	Client	Fixed
	TCP/UDP	FTP	Client	
	TCP/UDP	FTP/FTPS-Data	Client	
	UDP	NTP	Client	
	UDP	DNS	Client	
	UDP	SYSLOG	Client	
	TCP/UDP	SMTP	Client	
	TCP/UDP	SMTP over SSL	Client	
	TCP/UDP	POP3	Client	
	TCP/UDP	ACS-MDW	Server	

[1]   Used by UPS daemon.

Port Numbers for Optional DSP Cards

Port Number	Protocol	Application	Client/Server	Changeable/ Fixed
21	TCP/UDP	FTP/FTPS	Server	Changeable
25	TCP/UDP	SMTP	Server	Changeable
53	UDP	DNS	Server	Changeable
67	UDP	DHCP	Server	Changeable
68	UDP	DHCP	Client	Changeable
123	UDP	NTP	Server	Fixed
143	TCP	IMAP	Server	Changeable
161	UDP	SNMP	Server	Changeable
465	TCP/UDP	SMTP over SSL	Server	Changeable
993	TCP	IMAP over SSL	Server	Changeable
2103	TCP	CMM	Server	Fixed
3493	TCP	UPS	-	Fixed
3702	UDP	WSD	Server	Changeable
7547	TCP	CWMP	Server	Changeable
8000	UDP	Conference[1]	-	Fixed
8080	TCP	Web Maintenance Console	-	Changeable

Port Number	Protocol	Application	Client/Server	Changeable/Fixed
12000–13535	UDP	RTP/RTCP	-	Changeable
16000–18047	UDP	RTP/RTCP for NAT traversal	-	Changeable
30022	TCP	SSH	Server	Changeable
33090	UDP	ACS-MDW	Server	Fixed
33091				
33092	TCP			
33131				
33702	UDP	ACS-MDW (WSD)	Server	Fixed
40000–40095	TCP/UDP	FTP/FTPS-Data	Server	Changeable
50000–65535 (Ephemeral)	UDP	SNMP TRAP	Client	Fixed
	TCP/UDP	FTP	Client	
	TCP/UDP	FTP/FTPS-Data	Client	
	UDP	NTP	Client	
	UDP	DNS	Client	
	UDP	SYSLOG	Client	
	TCP/UDP	SMTP	Client	
	TCP/UDP	SMTP over SSL	Client	
	TCP/UDP	POP3	Client	
	TCP/UDP	ACS-MDW	Server	

[*1]   Used for KX-NS1000 conferences.

7.6 PBX Region Suffix Codes and Areas

According to the following table, select the appropriate Suffix Code and Area for your PBX to localise PBX settings to your location.

For KX-NS1000NE

Suffix Code	Area	Suffix Code	Area
G	Germany	CE	Poland
	Austria		Hungary
BL	Belgium		Czech
	Luxembourg		Slovakia
DK	Denmark		Romania
FI	Finland		Slovenia
FR	France		Croatia
JT	Italy		Yugoslavia
NL	Netherlands		Bosnia
NO	Norway		Lithuania
PT	Portugal		Latvia
SP	Spain		Estonia
SE	Sweden		Albania
SL	Switzerland		Bulgaria
TR	Turkey		Macedonia
GR	Greece		Other

For KX-NS1000XE

Suffix Code	Area
HK	Hong Kong
ML	Malaysia
SN	Singapore
TW	Taiwan
BX	Other

For KX-NS1000BX

Suffix Code	Area
SA	South Africa
BX	Other

For KX-NS1000AL

Suffix Code	Area
AL	Australia
NZ	New Zealand

7.7 System Prompt Languages

Note
- The following abbreviations are used in the language file names:
  - UK: United Kingdom
  - US: United States
  - LA: Latin America
  - CA: Canada
  - BR: Brazil
- No. 1 is set by default. For details, see "24.1.1 UM Configuration—System Parameters—Parameters—Prompt Setting—Prompt Setting" in the PC Programming Manual.

System prompt languages stored in the Storage Memory Card (installed by default)

KX-NS1000 Suffix	NE	UK/AL	XE	BX	AG
No. 1 (Primary)	UK-English	UK-English	US-English	US-English	LA-Spanish
No. 2	Spanish	-	LA-Spanish	LA-Spanish	US-English
No. 3	French	-	Mandarin	-	-
No. 4	German	-	Taiwan Mandarin	-	-
No. 5	Dutch	-	Cantonese	-	-
No. 6	Italian	-	-	-	-
No. 7	Swedish	-	-	-	-
No. 8	-	-	-	-	-

KX-NS1000 Suffix	C	RU	UC	BR
No. 1 (Primary)	CA-English	Russian	Ukrainian	BR-Portuguese
No. 2	CA-French	Ukrainian	Russian	US-English
No. 3	-	US-English	US-English	-
No. 4	-	-	-	-
No. 5	-	-	-	-
No. 6	-	-	-	-
No. 7	-	-	-	-
No. 8	-	-	-	-

System prompt languages stored in optional Storage Memory Cards

KX-NS0135/ KX-NS0136/ KX-NS0137 Suffix	X
No. 1 (Primary)	UK-English
No. 2	German
No. 3	Spanish
No. 4	Italian
No. 5	Swedish
No. 6	Dutch
No. 7	CA-English
No. 8	CA-French

7.7 System Prompt Languages

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CE The KX-NS1000UK and KX-NS1000NE are designed to interwork with the:
• Analogue Public Switched Telephone Network (PSTN) of European countries
• Pan-European Integrated Services Digital Network (ISDN) using ISDN basic rate access
• Pan-European Integrated Services Digital Network (ISDN) using ISDN primary rate access

Panasonic System Networks Co., Ltd./Panasonic System Networks Company U.K. Ltd. declares that the KX-NS1000UK and the KX-NS1000NE are in compliance with the essential requirements and other relevant provisions of Radio & Telecommunications Terminal Equipment (R&TTE) Directive 1999/5/EC.
Declarations of Conformity for the relevant Panasonic products described in this manual are available for download by visiting:

http://www.doc.panasonic.de

Contact to Authorised Representative:
Panasonic Testing Centre
Panasonic Marketing Europe GmbH
Winsbergring 15, 22525 Hamburg, Germany

For Future Reference
Please print, record, and retain the following information for future reference.

<u>Note</u>
The serial number of this product can be found on the label affixed to the unit. You should record the model number and the serial number of this unit as a permanent record of your purchase to aid in identification in the event of theft.

MODEL NO.	_____
SERIAL NO.	_____
DATE OF PURCHASE	_____
NAME OF DEALER	_____
DEALER'S ADDRESS	_____
	_____
	_____
	_____
DEALER'S TEL. NO.	_____

Panasonic System Networks Co., Ltd.

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Web Site: http://www.panasonic.net/

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