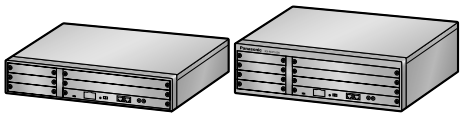
Panasonic

IP Networking Guide

Pure IP-PBX



Model No. KX-NCP500
KX-NCP1000

Thank you for purchasing a Panasonic Pure IP-PBX.
Please read this manual carefully before using this product and save this manual for future use.

KX-NCP500/KX-NCP1000: PBMPR Software File Version 2.0000 or later

In this manual, the suffix of each model number (e.g., KX-NCP500**NE**) is omitted unless necessary.

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Section 1
Introduction

1.1 Overview

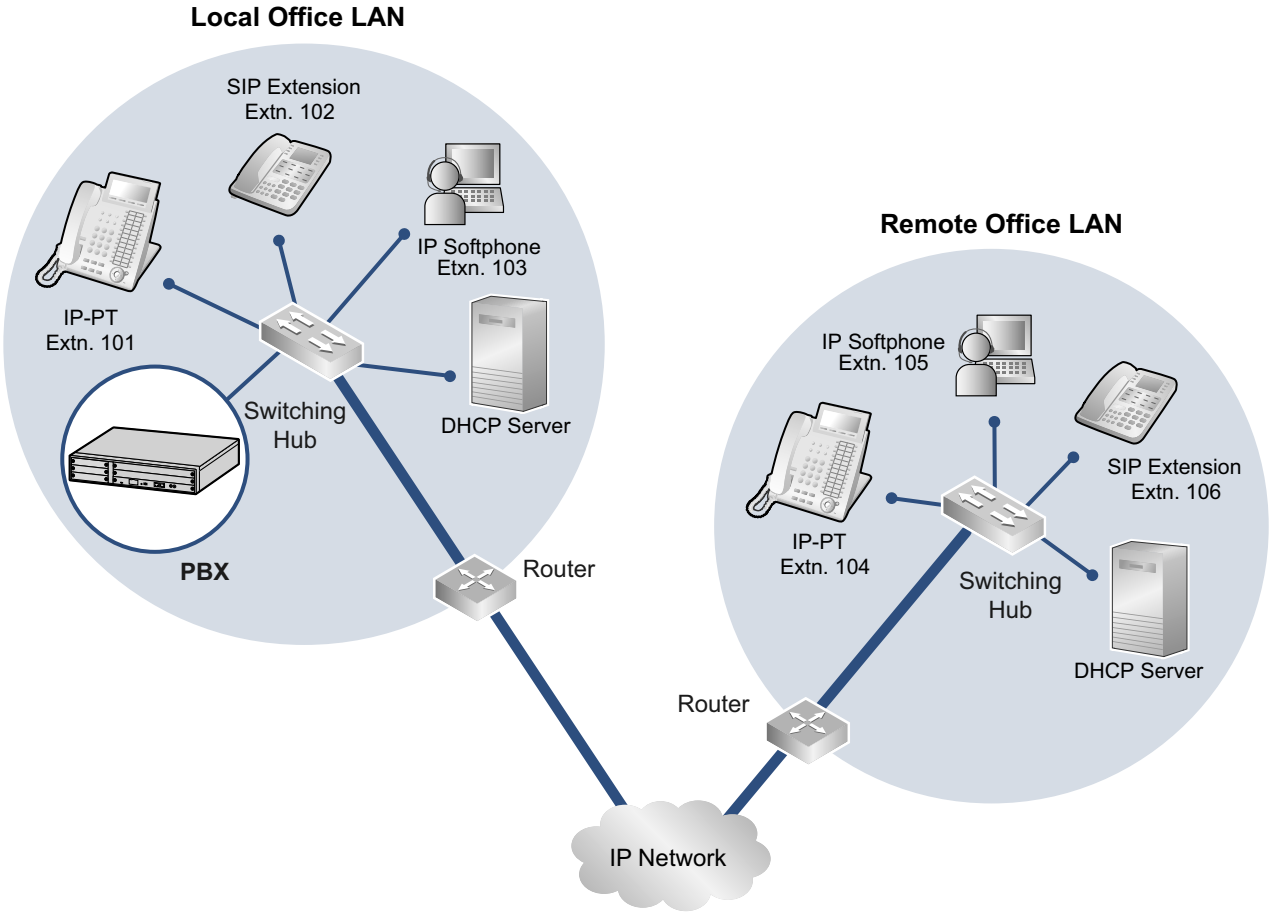
1.1.1 Establishing a VoIP Network with the Pure IP-PBX

Panasonic KX-NCP500/KX-NCP1000 Pure IP-PBX supports Panasonic KX-NT series IP proprietary telephones (IP-PTs), Panasonic IP softphones, and SIP (Session Initiation Protocol) Extensions (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.
The Pure IP-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.
The following diagrams illustrate VoIP network with (i) a remote office LAN and (ii) another PBX installed at different location.

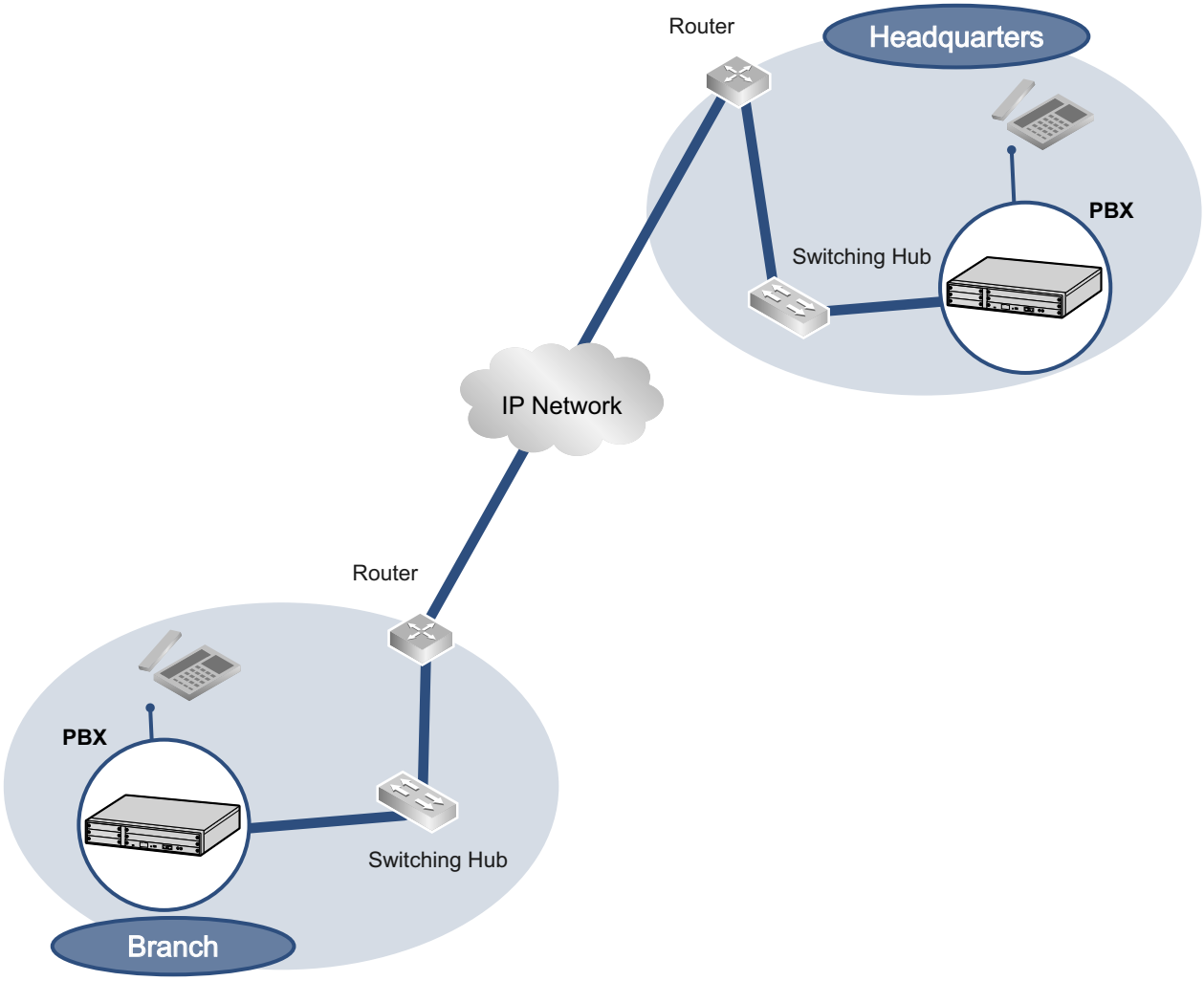
Note

Panasonic IP Cell Station (IP-CS) units are also supported by the Pure IP-PBX for communication on a VoIP network. However, all of the related information is explained in the Quick Installation Guide for the IP-CS, and is therefore omitted from this manual.

(i) VoIP Network with Remote Office LAN



(ii) VoIP Network with Another PBX



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 "1.2.2 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 "4.2.3 Setting the 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 the Internet, where quality of service cannot be guaranteed.

Examples of recommended IP networks

- Digital Leased Line
- IP-VPN (Virtual Private Network)
- Frame Relay

Not recommended

- Internet (including an Internet VPN)

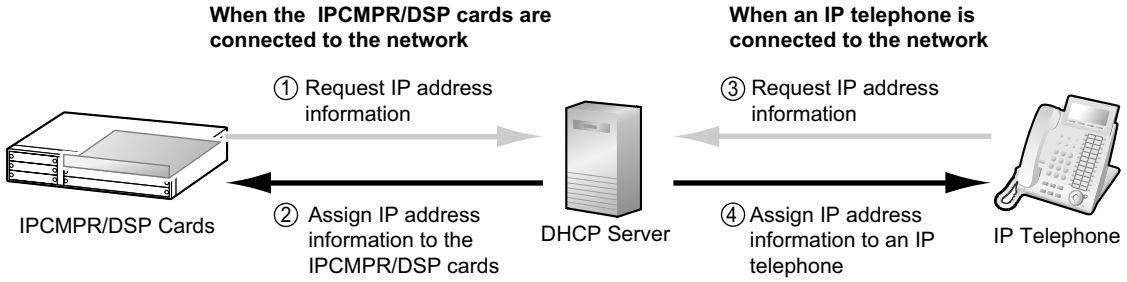
Note

- Peer-to-peer calls between KX-NT300 series IP-PTs 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.

1.2 Network Management

1.2.1 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. Using a DHCP server allows you to centrally manage and automate the assignment of IP addresses.



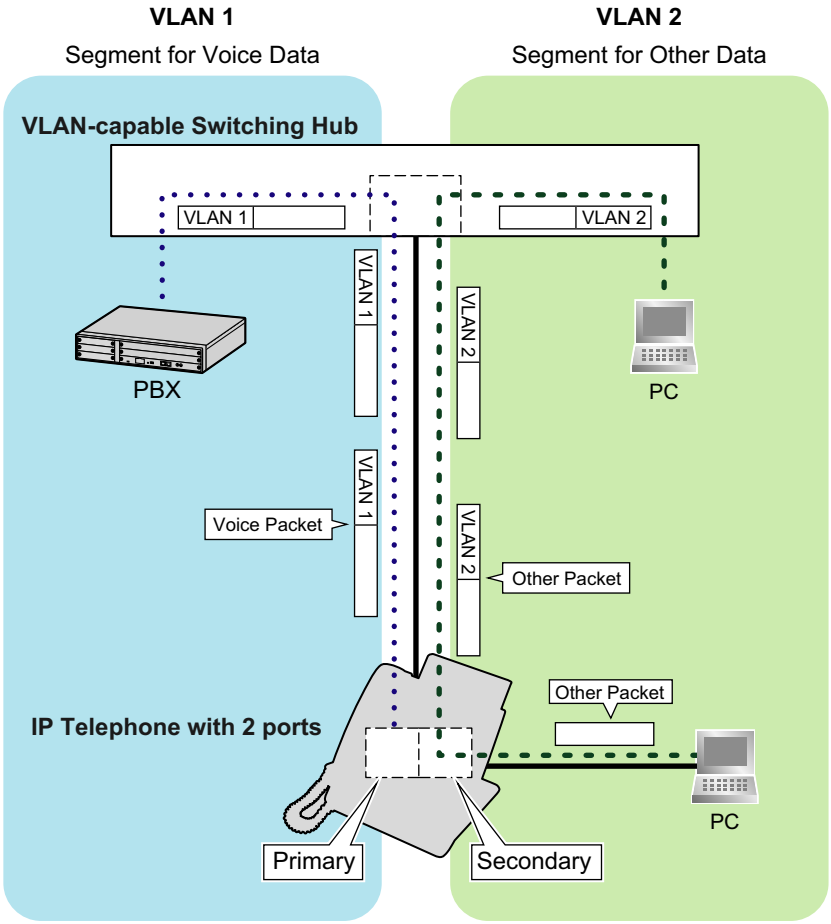
Note

- The PBX is not able to act as a DHCP server. To use the DHCP client function of IP telephones and the IPCMPR/DSP cards, a separate DHCP server is required on the network, as shown above.
- An IP telephone and the IPCMPR/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 IPCMPR/DSP cards on that LAN must be assigned manually.

1.2.2 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.



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.

- 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[*1]), a PC cannot be connected to the IP telephone.

[*1] Only KX-NT265 IP-PTs with a software version of 2.00 or later are supported by KX-NCP500/KX-NCP1000.

1.2.3 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 program the GK Settings table through system programming. For details, refer to "3.9 [1-1] Slot—Shelf Property - Virtual IP Gateway —◆ Gatekeeper Available" and "3.10 [1-1] Slot—Shelf Property - Virtual IP Gateway—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 IPCMPR card, 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.

1.3 Packet Control Features

1.3.1 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 "3.4 [1-1] Slot—Card Property - IPCMPR—VoIP-DSP Option" in the PC Programming Manual.

1.3.2 Voice Activity Detection (VAD)

The 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 each available codec: G.711 and G.729A.
To configure the VAD feature, refer to the appropriate section in the PC Programming Manual.

Note

- To use the VAD feature for a certain codec, be sure to enable it for that codec on both the local and remote gateway devices.
- When connecting the PBX to a KX-TDE or KX-TDA series PBX:
  - The VAD feature cannot be used between the V-IPGW16 and IP-GW4 cards since the V-IPGW16 card does not support the G.723 codec (although calls can be made and received as normal).
  - The VAD feature between the V-IPGW16 and IP-GW16 cards can be enabled through system programming. Refer to "Main—◆ Connection for IP-GW16" under "3.11 [1-1] Slot—Shelf Property - Virtual IP Gateway—GW Settings" in the PC Programming Manual.

1.3.2 Voice Activity Detection (VAD)

Section 2

Guidance for VoIP Installation

2.1 VoIP Requirements

2.1.1 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., email 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 Virtual 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 the KX-NT300 series IP-PTs and some SIP Extensions that support this codec during peer-to-peer communication. For details, refer to "1.31.3 Peer-to-Peer Connection" in the Feature Guide.

Required Bandwidth for Each Virtual IP Extension Card

To allow all IP telephones to make calls simultaneously, it is necessary to keep available the bandwidth required by a virtual 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 virtual IP Extension card.

Required Bandwidth = (Required Bandwidth per IP telephone × 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 × Required Bandwidth for the G.711 codec) +
[(16 - No. of Fax Machines) × 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 × 87.2) + [(16 - 2) × 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

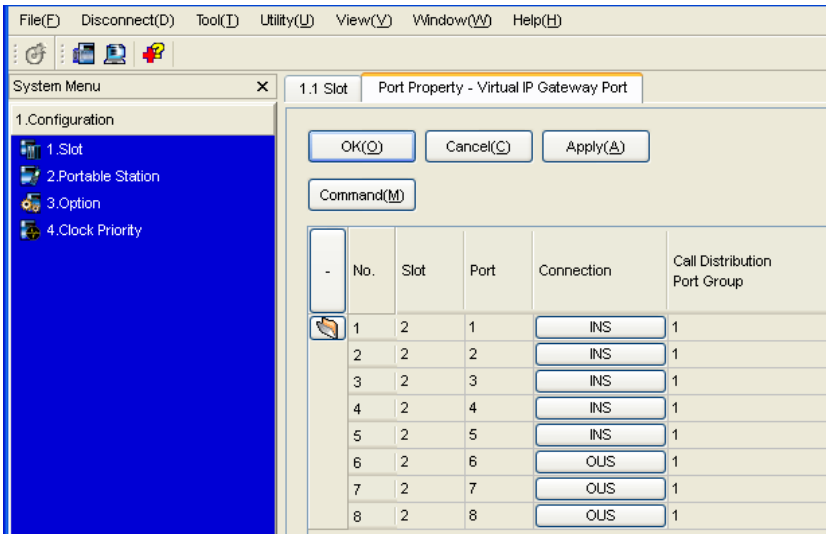
It is recommended that all cards on a VoIP network have the same packet sending interval.

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:



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)

2.1.2 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?

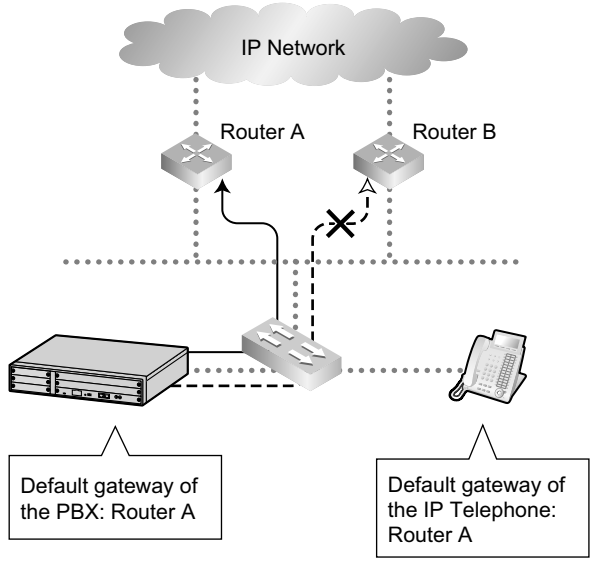
IP telephones on the network always perform VoIP communications through the PBX. Therefore, the PBX must be assigned static IP addresses, which must be programmed to each IP telephone on the network.

Note

When a DHCP server (which automates IP addressing of devices on the network) is not used, static IP addressing must also be enabled for all IP telephones.

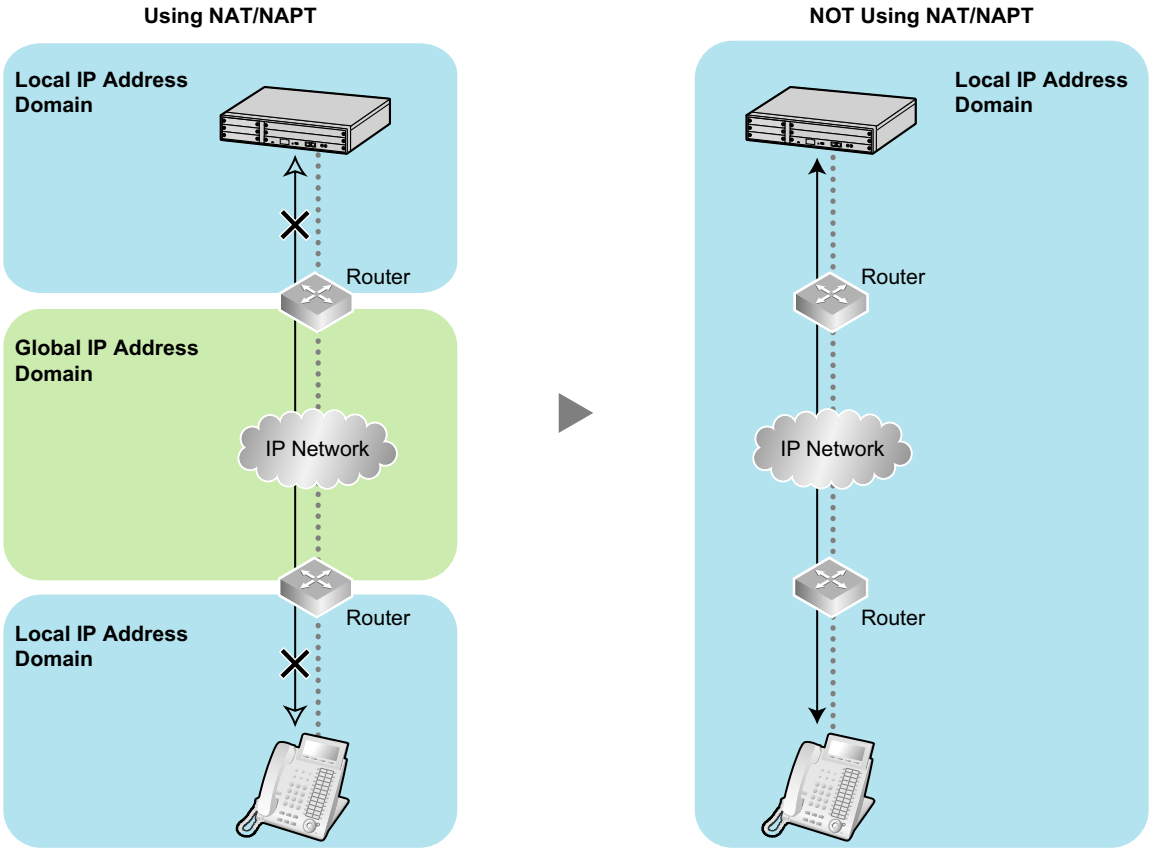
Does only a single router provide access to the IP network?

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.



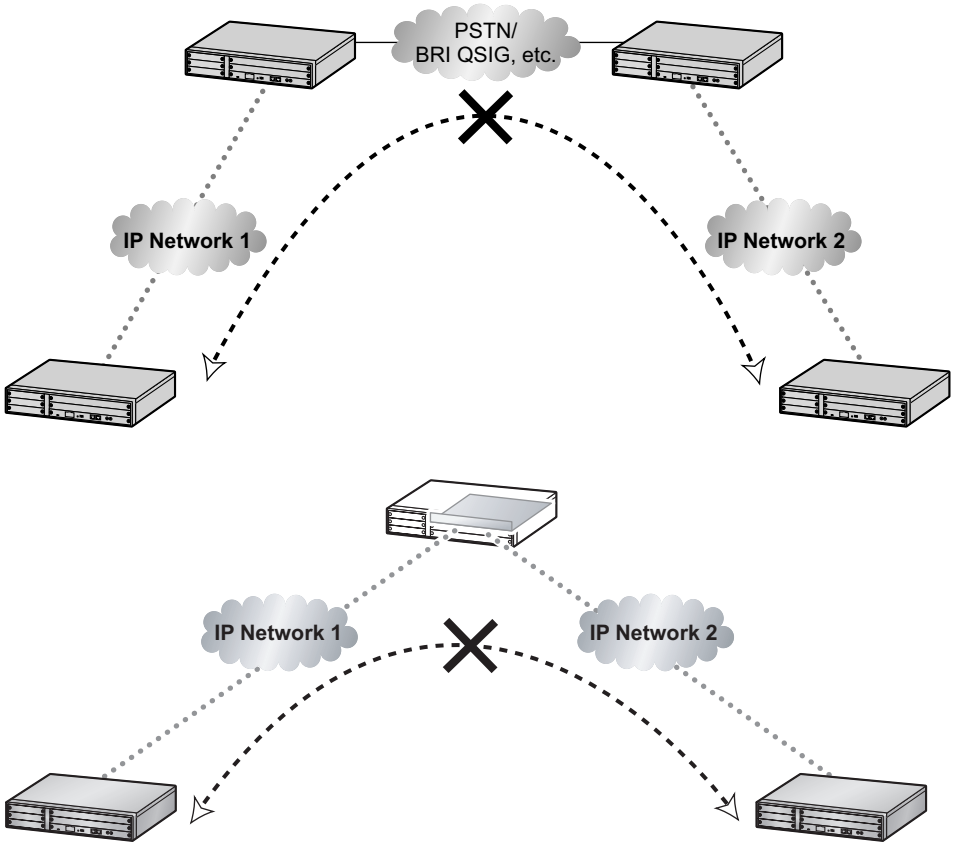
Does the router not use network address translation (NAT/NAPT)?

If the router uses address translation techniques (e.g., NAT/NAPT) to convert between global and local IP addresses, VoIP communications cannot be carried out effectively. Therefore, the routers used to access the IP network must not use NAT/NAPT. Generally, NAT and NAPT are features that are available with routers.



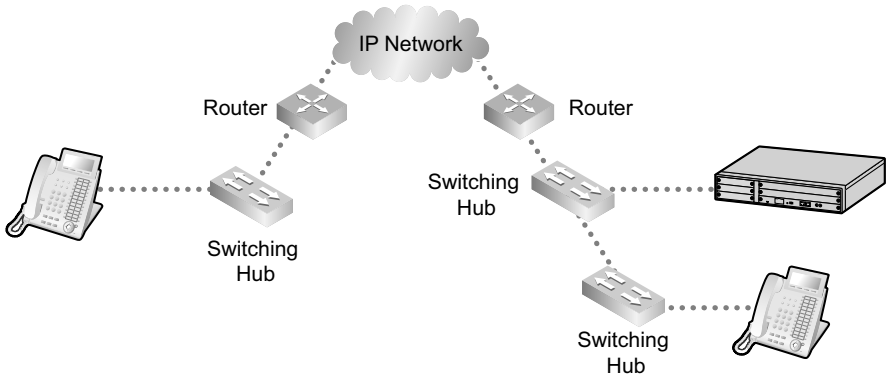
Is there only a single IP network between 2 ends of a call?

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.



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.



2.1.3 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, listed in the table below, to pass through the network without being blocked by filtering.
For more information, consult your network administrator.

[IP Packets from IPCMPR Card and IP Telephones]

Protocol	Description	TCP/UDP	Default Port No.
RTP (IP telephone)	Real-time Transport Protocol. Used for voice data transmission.	UDP	12000 to 12255
Maintenance (IPCMPR)	Panasonic proprietary protocol. Used for communication parameter negotiation with the PBX, download of country/area data, confirmation of connection with the PBX, and notification of error messages and statistical information to the PBX.	TCP	35300
Maintenance (IP telephone)		UDP	9301
MGCP (IPCMPR)	Media Gateway Control Protocol. Used for call control command data and LCD/LED data transmission.	UDP	2727
MGCP (IP telephone)		UDP	2427

Protocol	Description	TCP/UDP	Default Port No.
DHCP (IPCMPR)	Dynamic Host Configuration Protocol. Used for receiving an IP address from a DHCP server.	UDP	67, 68
DHCP (IP telephone)		UDP	67, 68
FTP (Port mode)	File Transfer Protocol. Used for receiving a data file from a FTP server to upgrade the firmware version.	TCP	20, 21
SNTP (IPCMPR)	Simple Network Time Protocol. Used for clock synchronisation.	UDP	123
SNMP (IPCMPR)	Simple Network Management Protocol. Used for monitoring network-attached devices.	UDP	161

[IP Packets from V-IPGW16 Card]

Protocol	TCP/UDP	Default Port No.
HTTP	TCP	10000 to 10447
RTP/RTCP	UDP	
H.245	TCP	
H.225.0 Call Signalling	TCP	1720
H.225.0 RAS	UDP	1719
QSIG Connectionless Tunnelling	TCP	1718
QSIG Connectionless Tunnelling	UDP	1717

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 IPCMPR card should be set to operate under "Auto Negotiation" mode.

Are Category 5 (CAT 5) or higher cables used?

When connecting network devices, make sure to use CAT 5 or higher cables. If other types of cables are used, communications may not be carried out normally.

2.1.4 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.

Note

- 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 "3.9 [1-1] Slot—Shelf Property - Virtual IP Gateway" in the PC Programming Manual.

2.2 VoIP Requirements Checklist

Use the following checklists to see if you can implement a VoIP network. The answers identified in **underlined bold-face letters** are the required answers for the corresponding questions.

Bandwidth Assessment

No.	Question	Answer	Memo	Ref.
1	**Does the network have enough bandwidth to support VoIP communications?** Make sure that there is more bandwidth available for VoIP communications than the amount actually required.	☐ **Yes** ☐ No	• IP network bandwidth = kbps • Available bandwidth for VoIP = kbps • Required bandwidth for VoIP = kbps	p. 14

Network Configuration

No.	Question	Answer	Memo	Ref.
2-a	**Is the IP network a managed network?** Make sure to use a managed IP network such as Frame Relay, Leased Line, or IP-VPN (Virtual Private Network). The IPCMPR card is not intended for use on the Internet (including an Internet VPN).	☐ **Yes** ☐ No	Type of IP network:	p. 17
2-b	**Is it possible to have static IP addressing?**	☐ **Yes** ☐ No		p. 17
2-c	**Does only a single router provide access to the IP network?**	☐ **Yes** ☐ No		p. 17
2-d	**Does the router not use network address translation (NAT/NAPT)?**	☐ **Yes** ☐ No		p. 18
2-e	**Is there only a single IP network between 2 ends of a call?**	☐ **Yes** ☐ No		p. 19
2-f	**Are the network devices located appropriately for effective VoIP communications?** It is recommended to connect the PBX as close to IP telephones and the IP network interface as possible.	☐ **Yes** ☐ No		p. 20

Network Devices

No.	Question	Answer	Memo	Ref.
3-a	**Can the firewall pass packets appropriately?** When a firewall is used, make sure to configure the firewall appropriately to allow VoIP packets to pass through the network without being blocked by filtering.	☐ **Yes** ☐ No	Model of firewall:	p. 20
3-b	**Are layer 2 or higher switches used?** Do not use repeater hubs as they can increase the network load. Also note that the port of the switching hub that connects to the IPCMPR card should be set to operate under "Auto Negotiation" mode.	☐ **Yes** ☐ No	Model of switch:	p. 21
3-c	**Are Category 5 (CAT 5) or higher cables used?**	☐ **Yes** ☐ No		p. 21

QoS (Quality of Service)

No.	Question	Answer	Memo	Ref.
4	**Can the router or switch be configured to use priority control features?**	☐ Yes ☐ No	Model of the router/switch: V-IPGW16 card's ToS field setting:	p. 22

Section 3

Connection to the LAN

This section describes the process of connecting the IPCMPR card and IP telephones to the LAN.

3.1 Connecting the IPCMPR Card to the LAN

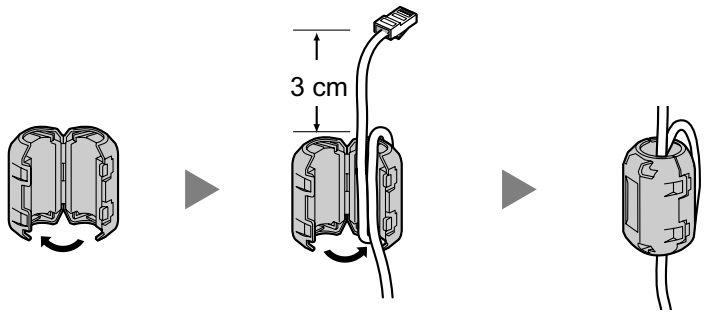
Refer to the following example to connect the IPCMPR card to the LAN.
When the IPCMPR card is connected to the LAN for the first time, you must assign IP addressing information to the card. Refer to "4.1 Programming the IPCMPR Card" for instructions.

Note

- Use an Ethernet straight cable with an RJ45 connector to connect the IPCMPR card to a switching hub. The cable should be a 10BASE-T/100BASE-TX CAT 5 (Category 5) or higher cable.
- Before connecting the IPCMPR card, attach the included ferrite core to the cable.
- Make sure to set the port of the switching hub that connects to the IPCMPR card to operate under "Auto Negotiation" mode.
- When using the VLAN feature on the network, make sure that the IPCMPR card 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 IPCMPR card is connected must be set to "Untagged". Consult your network administrator for details.

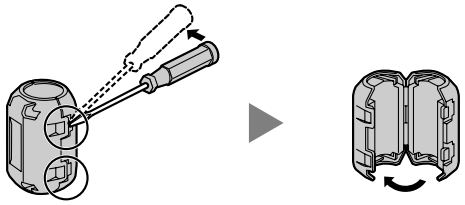
Attaching a ferrite core to the cable

1. Wrap the cable once around the ferrite core, leaving 3 cm between the ferrite core and the connector.
2. Close the case of the ferrite core.

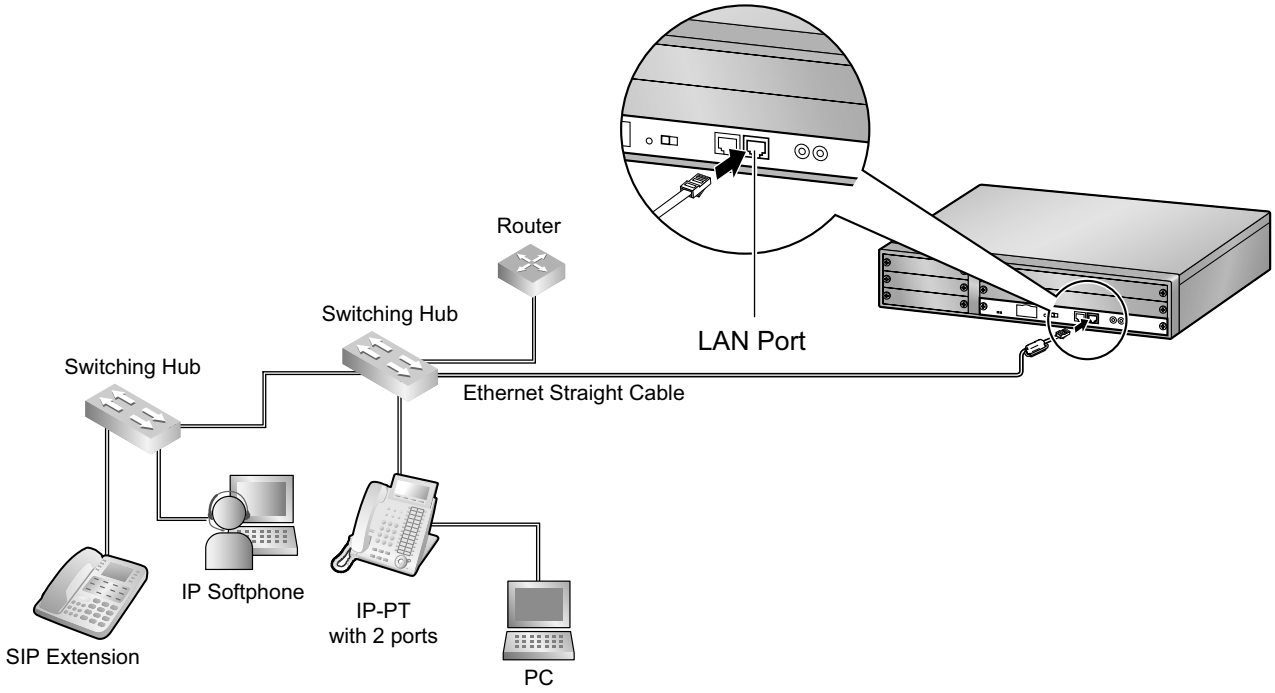


Note

If you need to open the ferrite core, use a flathead screwdriver to unlatch the case.



Connecting the IPCMPR card to a switching hub



3.2 Connecting the 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 "4.2 Programming the IP Telephones" for instructions.

Connecting an IP Telephone to a Switching Hub

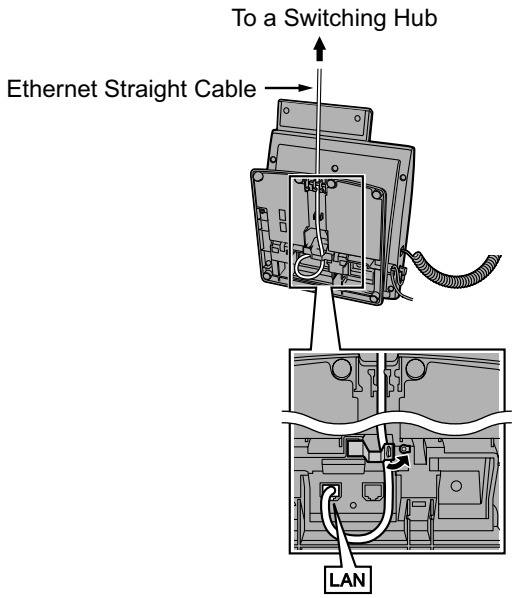
When connecting an IP telephone to the LAN, connect it to a switching hub.

Note

- Use an Ethernet straight cable with an RJ45 connector to connect the IP telephone to a switching hub. The cable should be a 10BASE-T/100BASE-TX CAT 5 (Category 5) or higher cable.
- 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 Extensions, refer to the documentation of your SIP Extension.

Example: KX-NT346



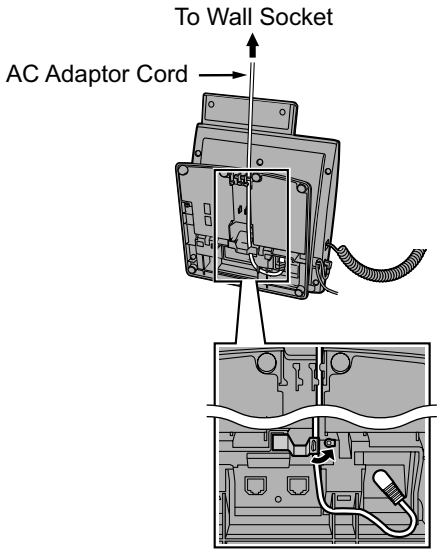
Connecting an AC Adaptor to an IP Telephone

IP-PTs and some SIP Extensions 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



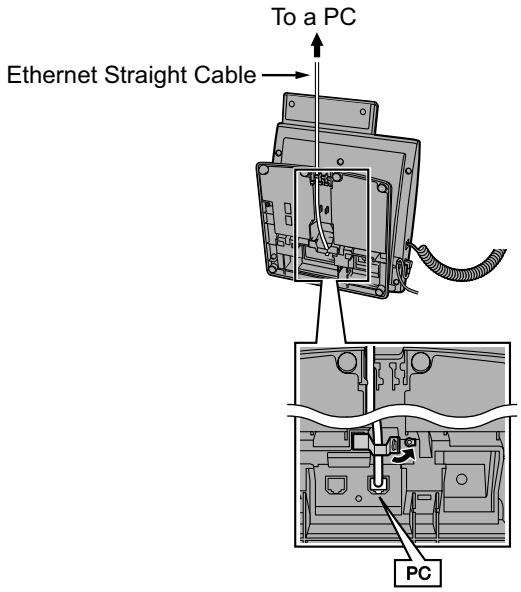
Connecting a PC to an IP Telephone

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 10BASE-T/100BASE-TX CAT 5 (Category 5) or higher cable.
- 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



Section 4

Programming

This section describes the process of programming the IPCMPR card and IP telephones covering the following topics: (1) setting network parameters for the card and IP telephones, and (2) registering and de-registering the IP telephones.

4.1 Programming the IPCMPR Card

4.1.1 Assigning the IP Addressing Information

The IP addressing information for the IPCMPR card can be assigned automatically through a DHCP server or entered manually using the Maintenance Console.

Note

- It is assumed that you have already installed the Maintenance Console on your PC.
- The contents and design of the software are subject to change without notice.
- Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation.

Programming from Quick Setup

1. Connect the PC to the PBX with an Ethernet straight cable or RS-232C cross cable.
2. Start the Maintenance Console from the Start menu.
3. "Information before programming" appears.
   a. Carefully read this important additional information, which includes updates to this and other manuals.
   b. Click **OK** to close this window.
4. a. Enter the Installer Level Programmer Code (default: **INSTALLER**).
   b. Click **OK**.
5. Click **Connect**.
6. a. Select **KX-NCP500/1000** from **PBX Model**.
   b. Select the **LAN** or **RS-232C** tab, depending on the type of PC connection with the PBX.
   c. Specify the settings as required.

      Note

      When connecting to the PBX for the first time selecting **LAN**, the **IP Address** and **Port Number** must be set to **192.168.0.101** and **35300** respectively.

   d. Enter the system password for installer (default: **1234**).
   e. Click **Connect**.
7. Quick Setup will launch automatically. On the IP addressing information screen, the information for the IPCMPR card can be assigned automatically through a DHCP server or entered manually.

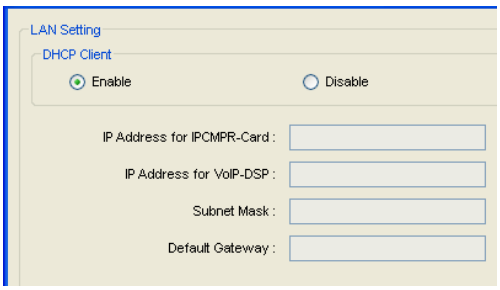
   Note

   If you change any information on this screen and click **Apply**, the PBX will need to be reset.

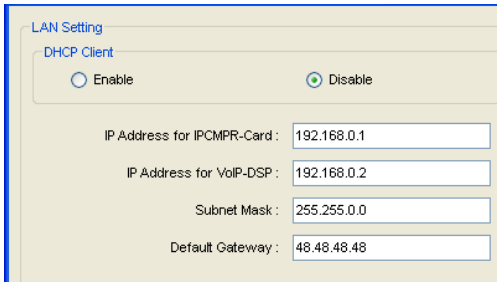
   When using a DHCP server:
   a. Select **Enable** for the **DHCP Client** setting.
   b. Click **Apply**.

   Note

   The boxes will turn grey and the IP addresses will be assigned automatically after the PBX is reset.



When not using a DHCP server:

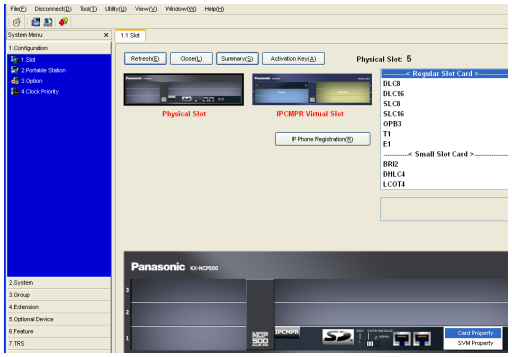


a. Select **Disable** for the **DHCP Client** setting.
b. In the **IP Address for IPCMPR Card** box, type the IP address of the IPCMPR card.*1
c. In the **IP Address for VoIP-DSP** box, type the IP address of the DSP card.*2
d. In the **Subnet Mask** box, type the subnet mask address of the network.*3
e. In the **Default Gateway** box, type the IP address of the default gateway.*4
f. Click **Apply**.

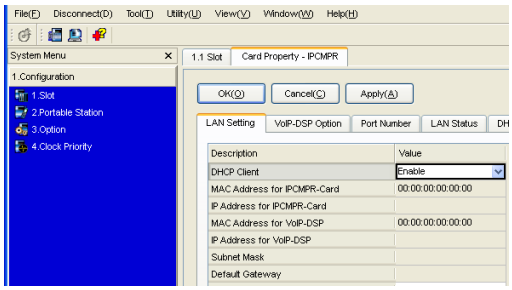
After Quick Setup is completed, if the IP addressing information was not changed, the IP-PT registration screen is displayed. For information on registering IP-PTs to the PBX, refer to "Registration of IP-PTs" in "4.3.1 Registering IP Telephones".

Programming from the system menu

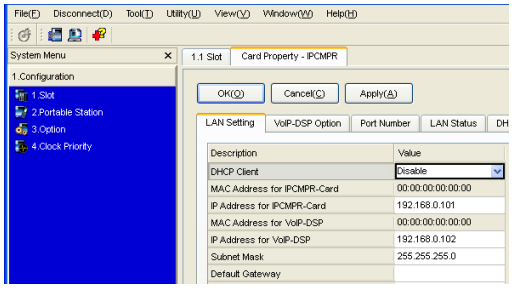
1. The IP addressing information for the IPCMPR card can also be assigned from the system menu.
a. Under **Configuration**, click **Slot**.
b. Move the mouse pointer over the IPCMPR card. A menu will be shown under the mouse pointer.
c. Click **Card Property**.



2. **When using a DHCP server:**
a. Click the **LAN Setting** tab, then select **Enable** for the **DHCP Client** setting.
b. Click **Apply**.



When not using a DHCP server:



a. Click the **LAN Setting** tab, then select **Disable** for the **DHCP Client** setting.
b. In the **IP Address for IPCMPR Card** box, type the IP address of the IPCMPR card.*1
c. In the **IP Address for VoIP-DSP** box, type the IP address of the DSP card.*2
d. In the **Subnet Mask** box, type the subnet mask address of the network.*3
e. In the **Default Gateway** box, type the IP address of the default gateway.*4
f. Click **Apply**.

3. **a.** A screen will appear with information that any changes made in step **2** will be activated after the PBX is restarted.
   b. Click **OK** to restart the PBX.

Notice

- Do not change the IP addresses of the IPCMPR and DSP cards once IP telephones are registered to the PBX using these IP addresses.
  The IP telephones will not operate properly if these IP addresses are changed.
- A DHCP server must be able to use a "client identifier" option specified by RFC 2131.
- The PBX will not start properly if the IP addresses cannot be assigned automatically by the DHCP server when DHCP Client is set to Enable. In this case, you need to consult your network administrator because the DHCP server on your network may not be running or a network failure may have occurred. If the DHCP server is not available, change the DHCP Client setting to Disable and set fixed IP addresses, then restart the PBX.
  To change the DHCP Client setting, connect the PC with an RS-232C cross cable or Ethernet straight cable. When connecting the PC with an Ethernet straight cable, make sure the PBX is disconnected from the LAN and then connect the PC with an Ethernet straight cable using 192.168.0.101 for the IP address of the IPCMPR card.

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

4.2 Programming the IP Telephones

4.2.1 Assigning the IP Addressing Information

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

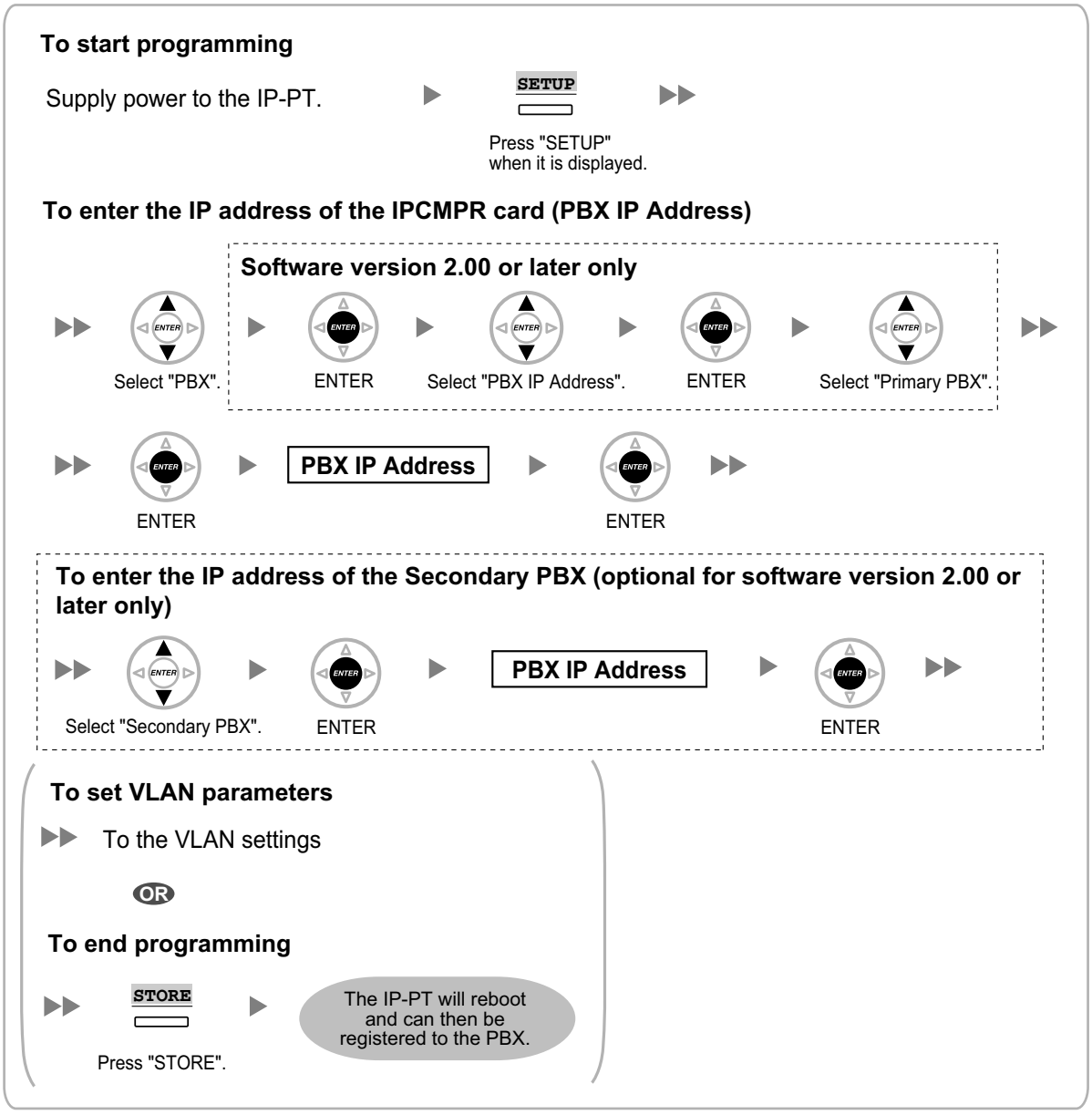
Note

For details for the KX-NT400, refer to the Operating Instructions of the KX-NT400.

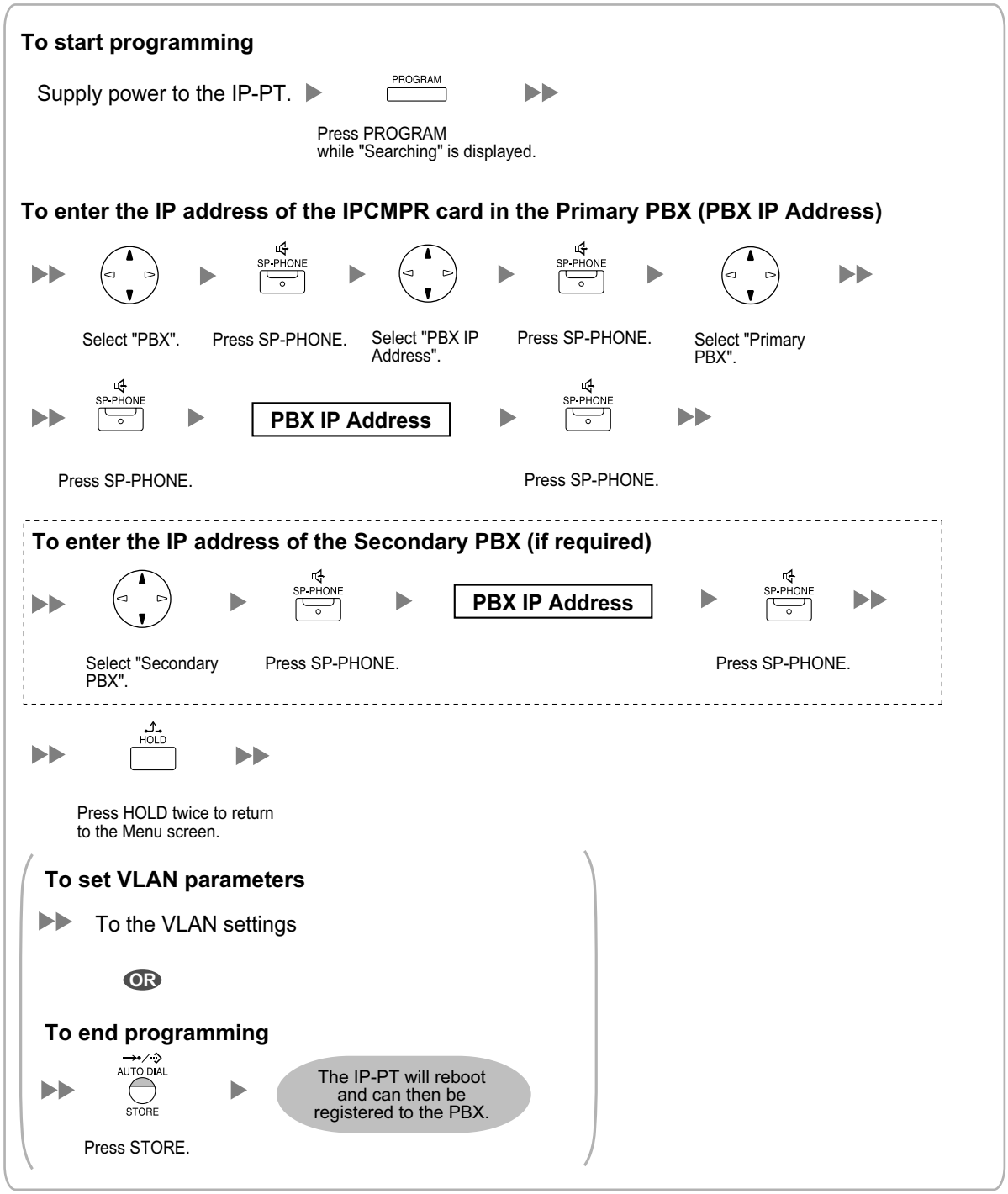
For IP-PTs

1. **Using a DHCP server when the IP-PT is on the same LAN with 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 IP address can also be assigned automatically to the IP-PT in process of being registered to the PBX. For details about registering the IP-PT, refer to "4.3.1 Registering IP Telephones".
2. **Using a DHCP server when the IP-PT is on the 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, only the PBX IP address must be assigned manually.
   Follow the procedure below to assign the PBX IP address.
   If you need to set VLAN parameters, follow the procedure described in "4.2.2 Setting the VLAN Parameters" after assigning the IP addresses without ending programming.

KX-NT300 series (except KX-NT321)



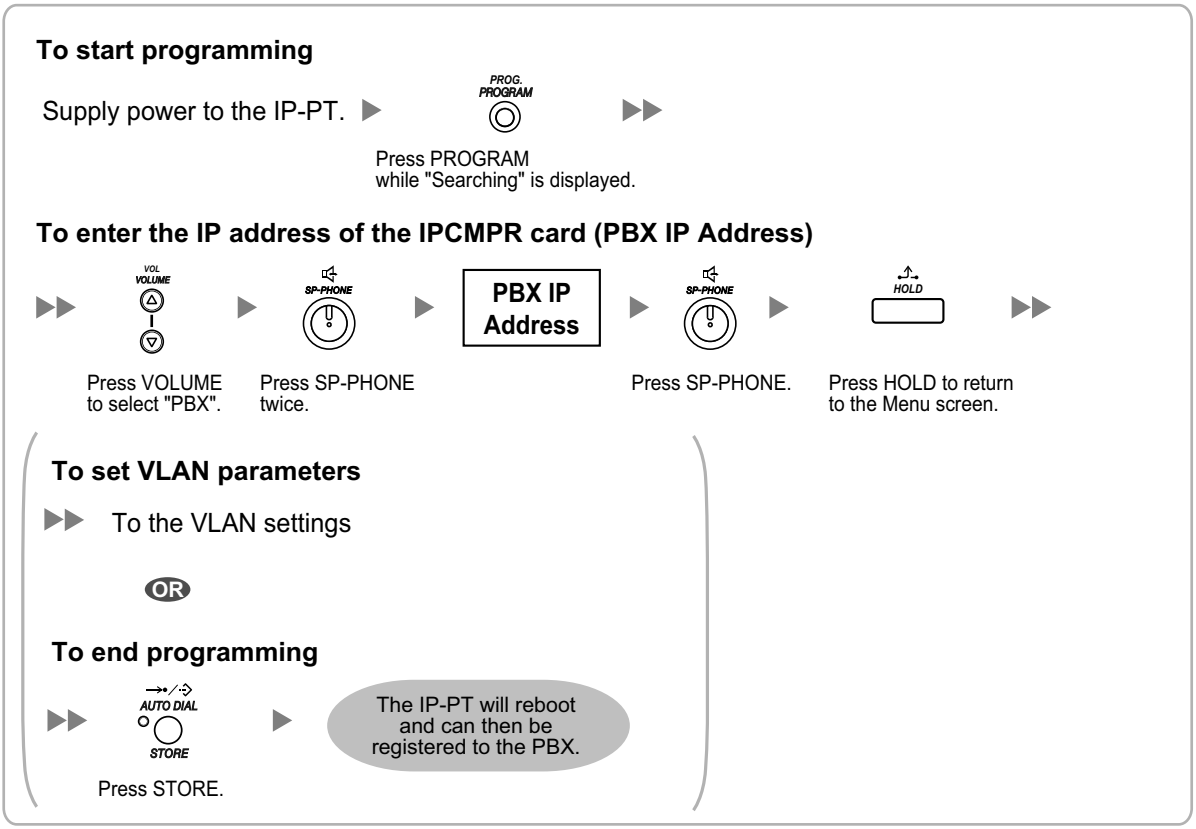
KX-NT321



Note

To confirm the connection to the secondary PBX after programming, (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)



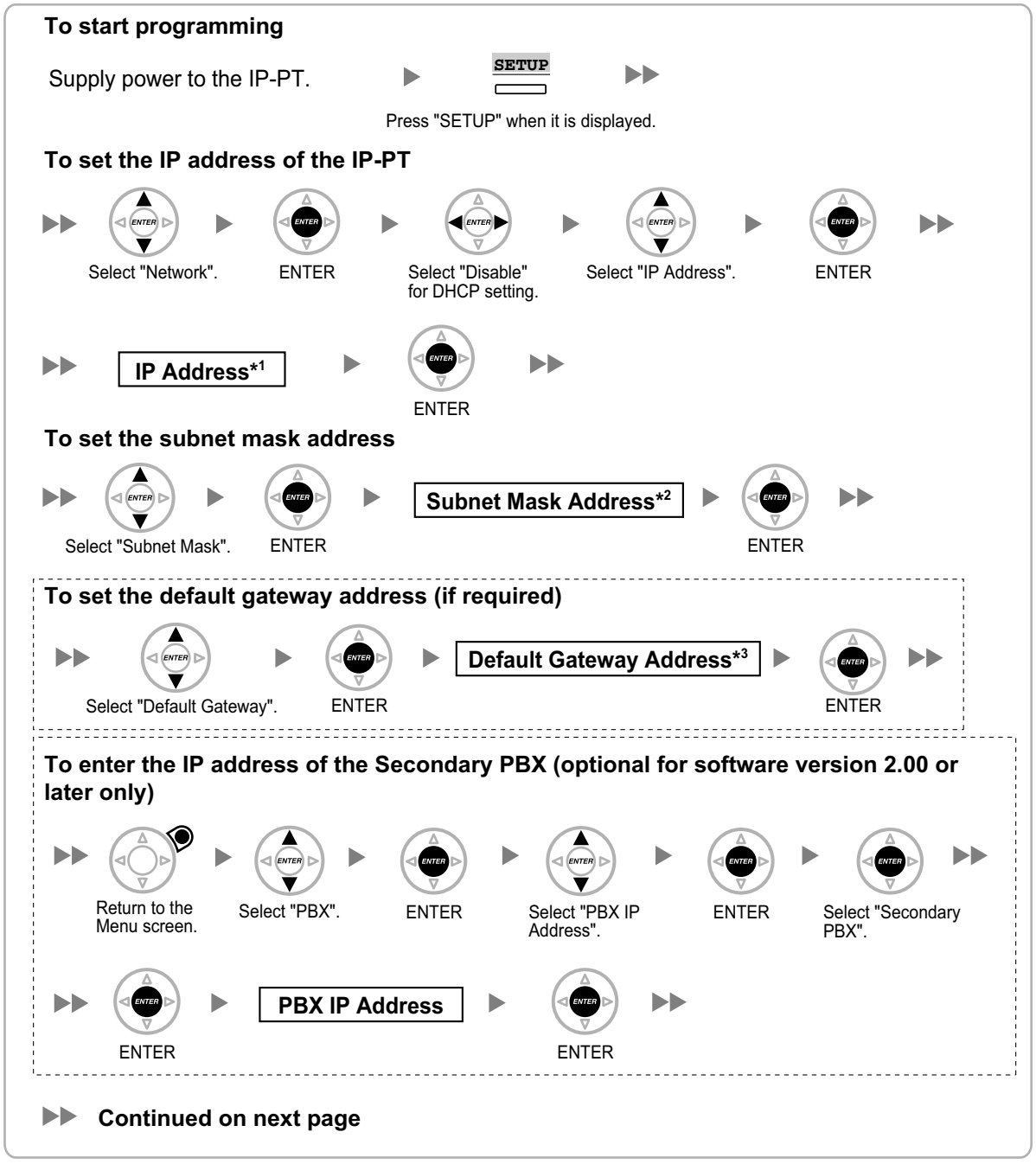
3. Not using a DHCP server when the IP-PT is on the same LAN with the PBX

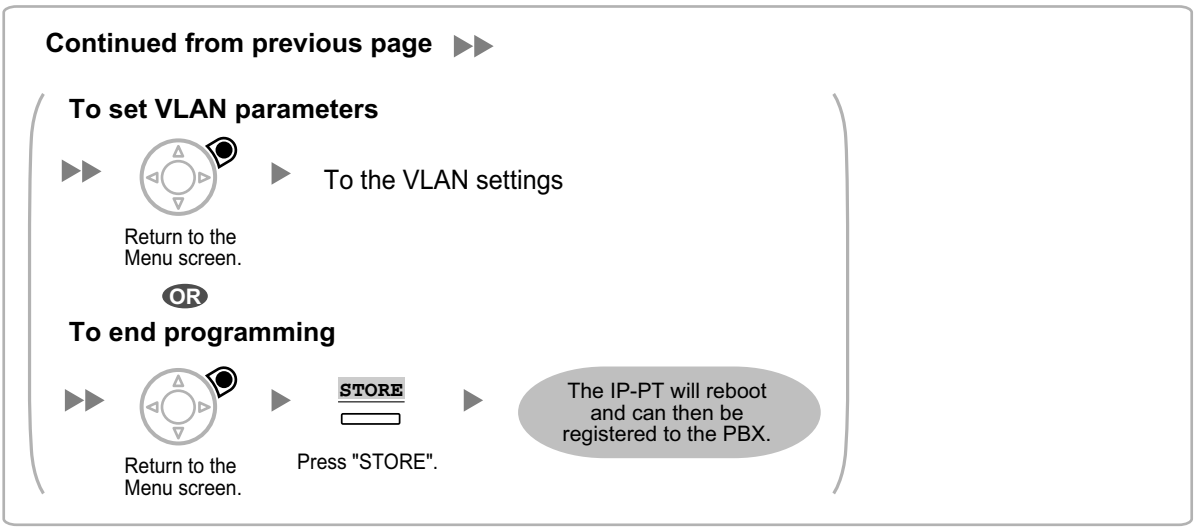
Only the PBX IP address can be assigned automatically to the IP-PT in process of being registered to the PBX. For details about registering the IP-PT, refer to "4.3.1 Registering IP Telephones".

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 "4.2.2 Setting the VLAN Parameters" after assigning the IP addresses without ending programming.

KX-NT300 series (except KX-NT321)





*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

▶▶ ◁▷△▽ ▶ SP-PHONE ▶ ◁▷△▽ ▶ 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

▶▶ ◁▷△▽ ▶ SP-PHONE ▶ **Subnet Mask Address*2** ▶ SP-PHONE ▶▶

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

To set the default gateway address (if required)

▶▶ ◁▷△▽ ▶ SP-PHONE ▶ **Default Gateway Address*3** ▶ SP-PHONE ▶▶

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

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

▶▶ HOLD ▶ ◁▷△▽ ▶ SP-PHONE ▶ ◁▷△▽ ▶ SP-PHONE ▶ ◁▷△▽ ▶▶

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

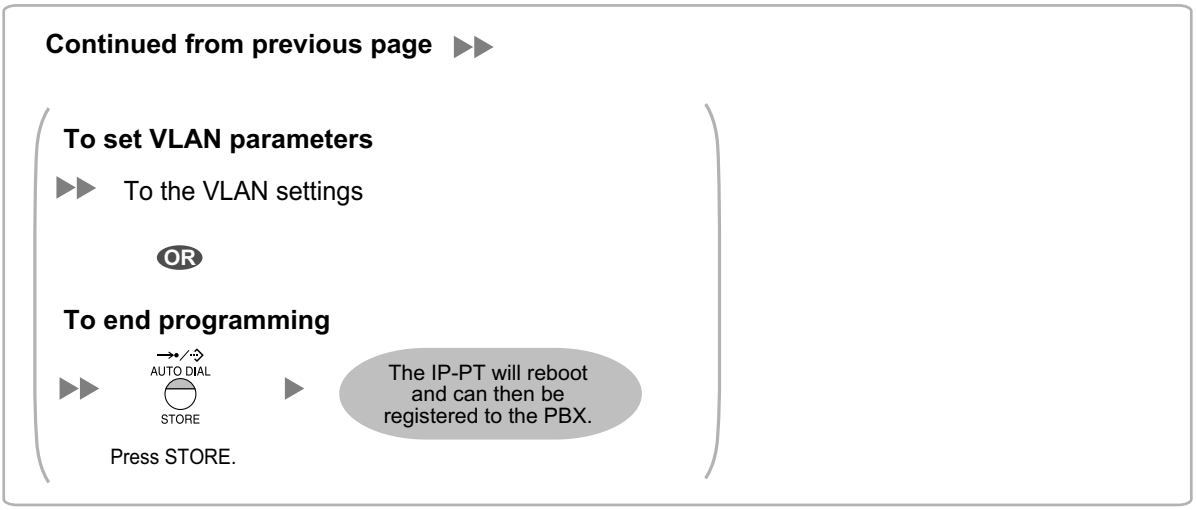
▶▶ SP-PHONE ▶ **PBX IP Address** ▶ SP-PHONE ▶▶

Press SP-PHONE. Press SP-PHONE.

▶▶ HOLD ▶▶

Press HOLD twice to return to the Menu screen.

▶▶ **Continued on next page**

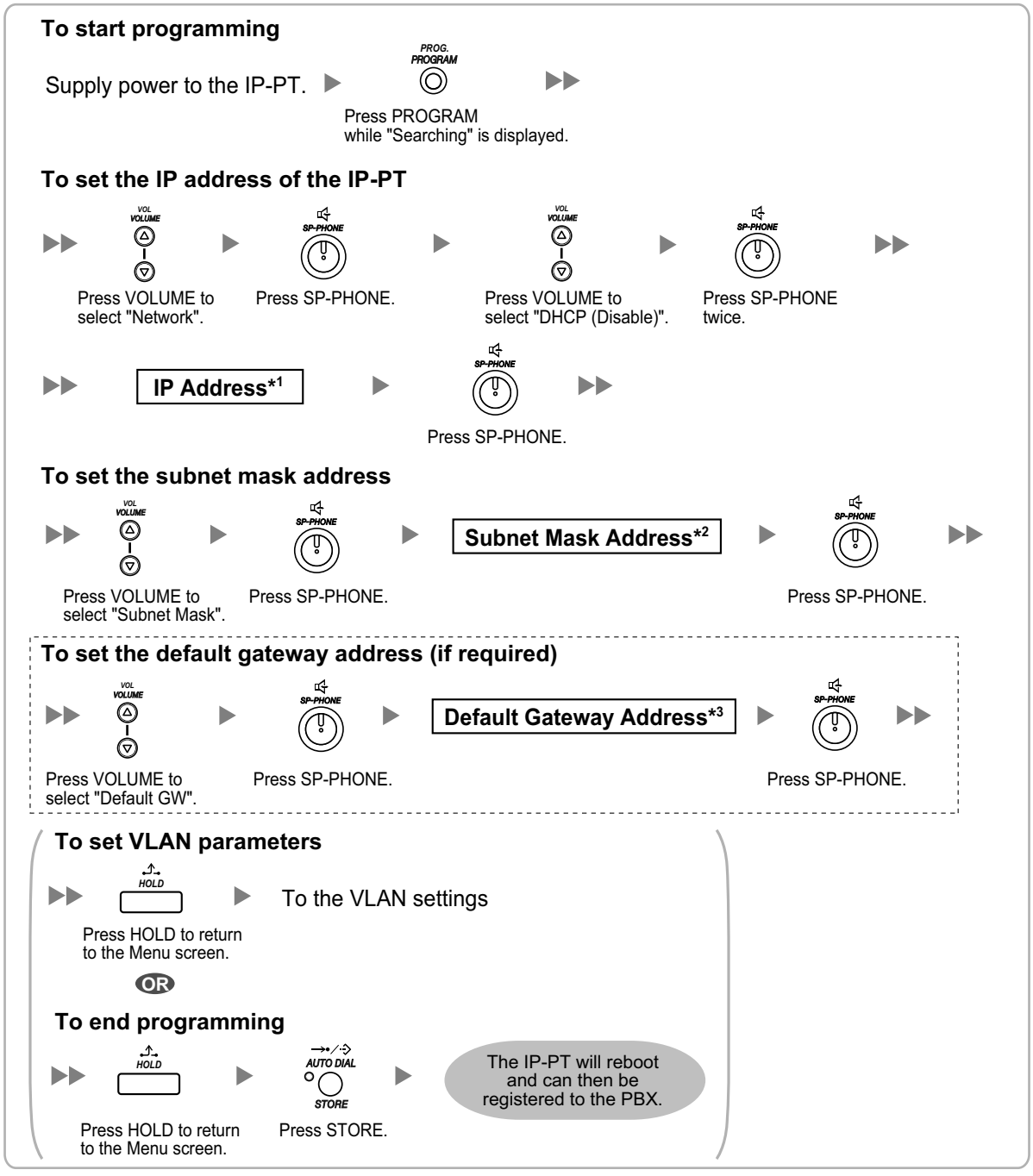


*1 Valid IP address range: "1.0.0.0" to "223.255.255.255"
*2 Valid subnet mask address range: "0–255.0–255.0–255.0–255" (except 0.0.0.0 and 255.255.255.255)
*3 Valid IP address range: "1.0.0.0" to "223.255.255.255"

Note

To confirm the connection to the secondary PBX after programming, (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)



*1 Valid IP address range: "1.0.0.0" to "223.255.255.255"

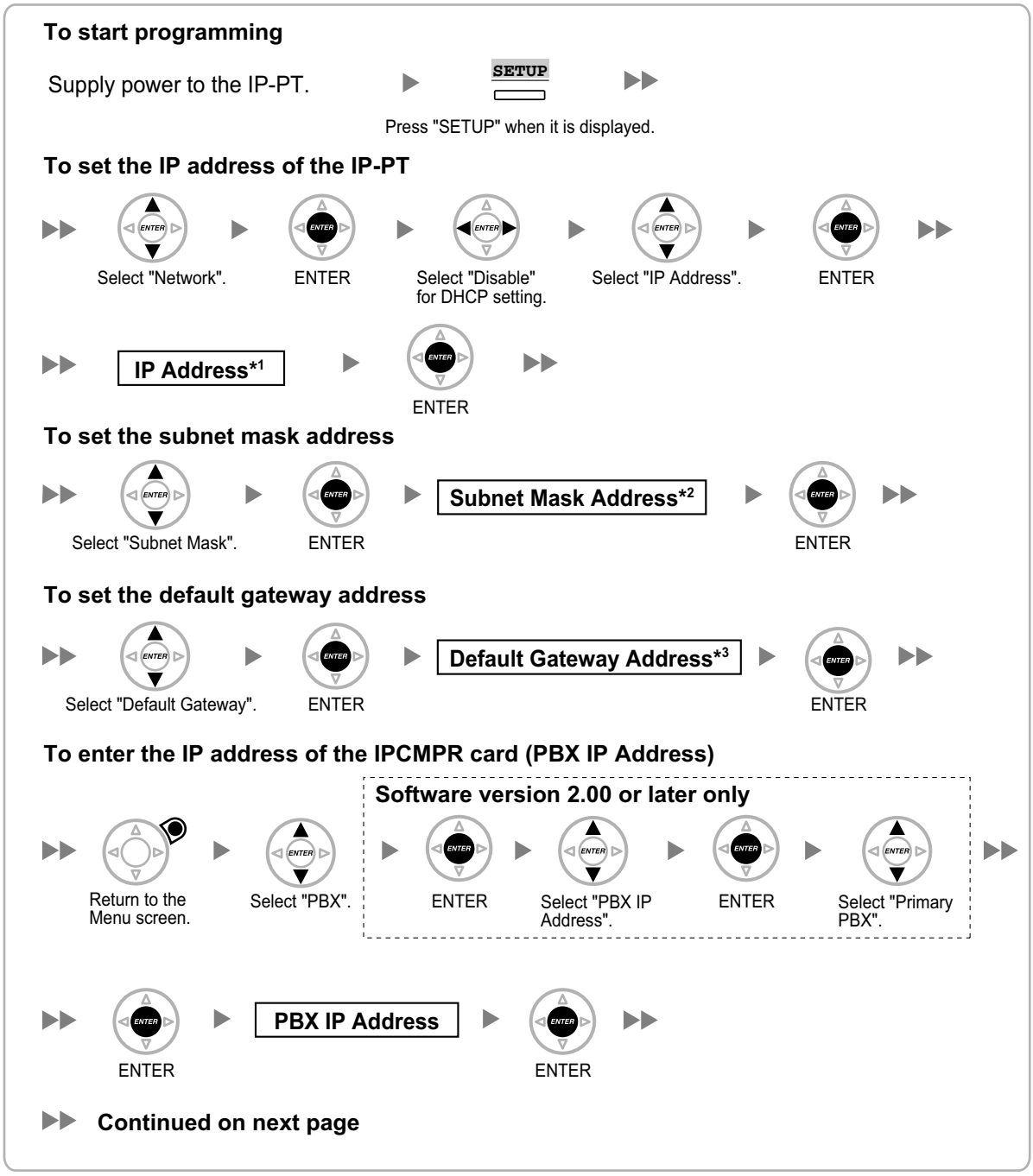
*2 Valid subnet mask address range: "0–255.0–255.0–255.0–255" (except 0.0.0.0 and 255.255.255.255)

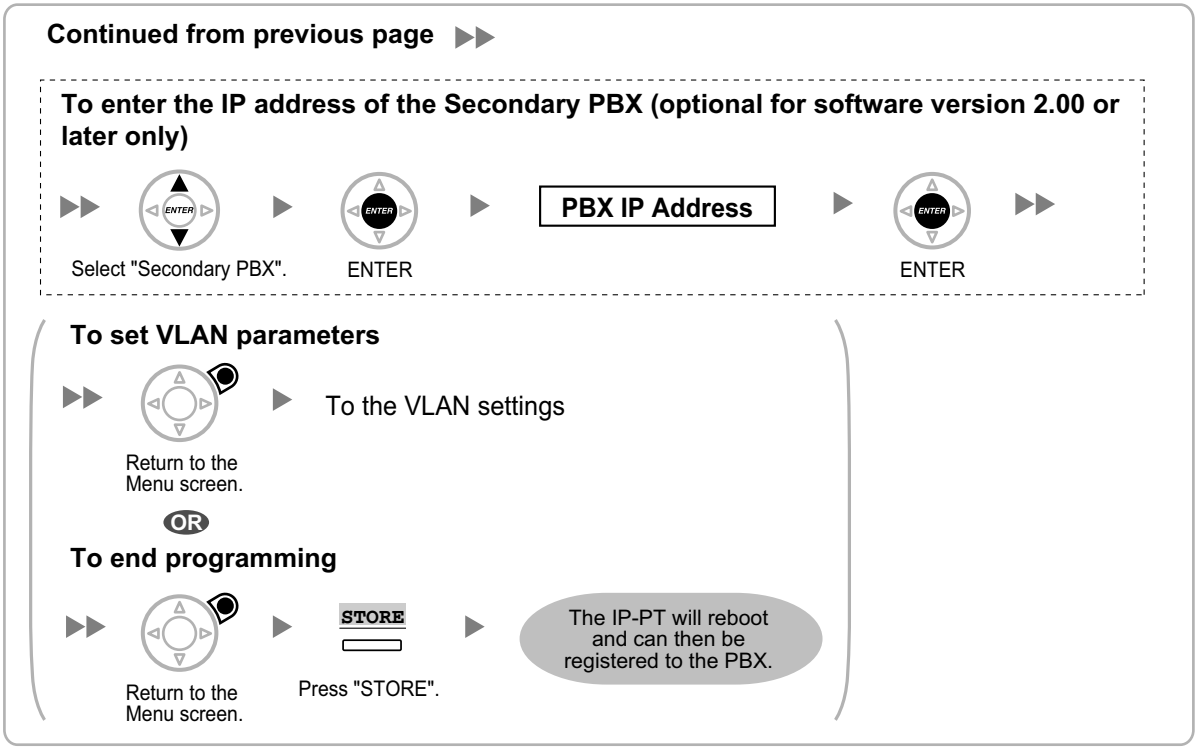
*3 Valid IP address range: "1.0.0.0" to "223.255.255.255"

4. Not using a DHCP server when the IP-PT is on the remote office LAN

All 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 "4.2.2 Setting the VLAN Parameters" after assigning the IP addresses without ending programming.

KX-NT300 series (except KX-NT321)





*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

▶▶ ◁▷ ▶ SP-PHONE ▶ ◁▷ ▶ 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

▶▶ ◁▷ ▶ SP-PHONE ▶ **Subnet Mask Address*2** ▶ SP-PHONE ▶▶

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

To set the default gateway address

▶▶ ◁▷ ▶ SP-PHONE ▶ **Default Gateway Address*3** ▶ SP-PHONE ▶▶

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

To enter the IP address of the IPCMPR card in the Primary PBX (PBX IP Address)

▶▶ HOLD ▶ ◁▷ ▶ SP-PHONE ▶ ◁▷ ▶ SP-PHONE ▶ ◁▷ ▶▶

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

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

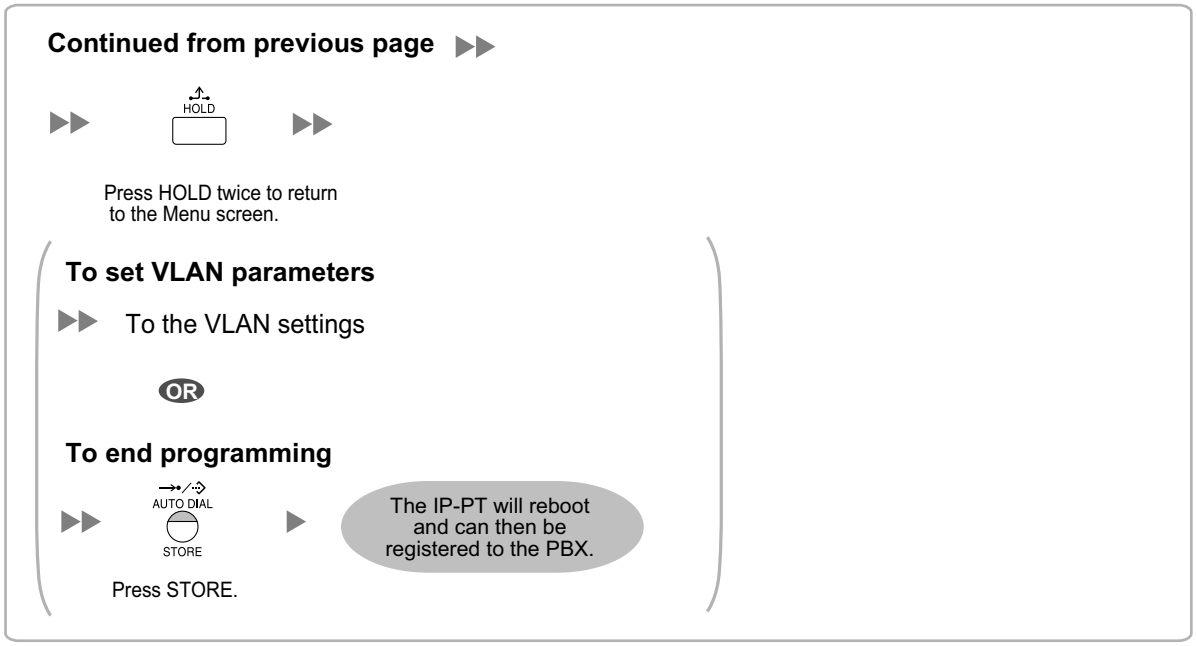
Press SP-PHONE. Press SP-PHONE.

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

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

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

▶▶ **Continued on next page**

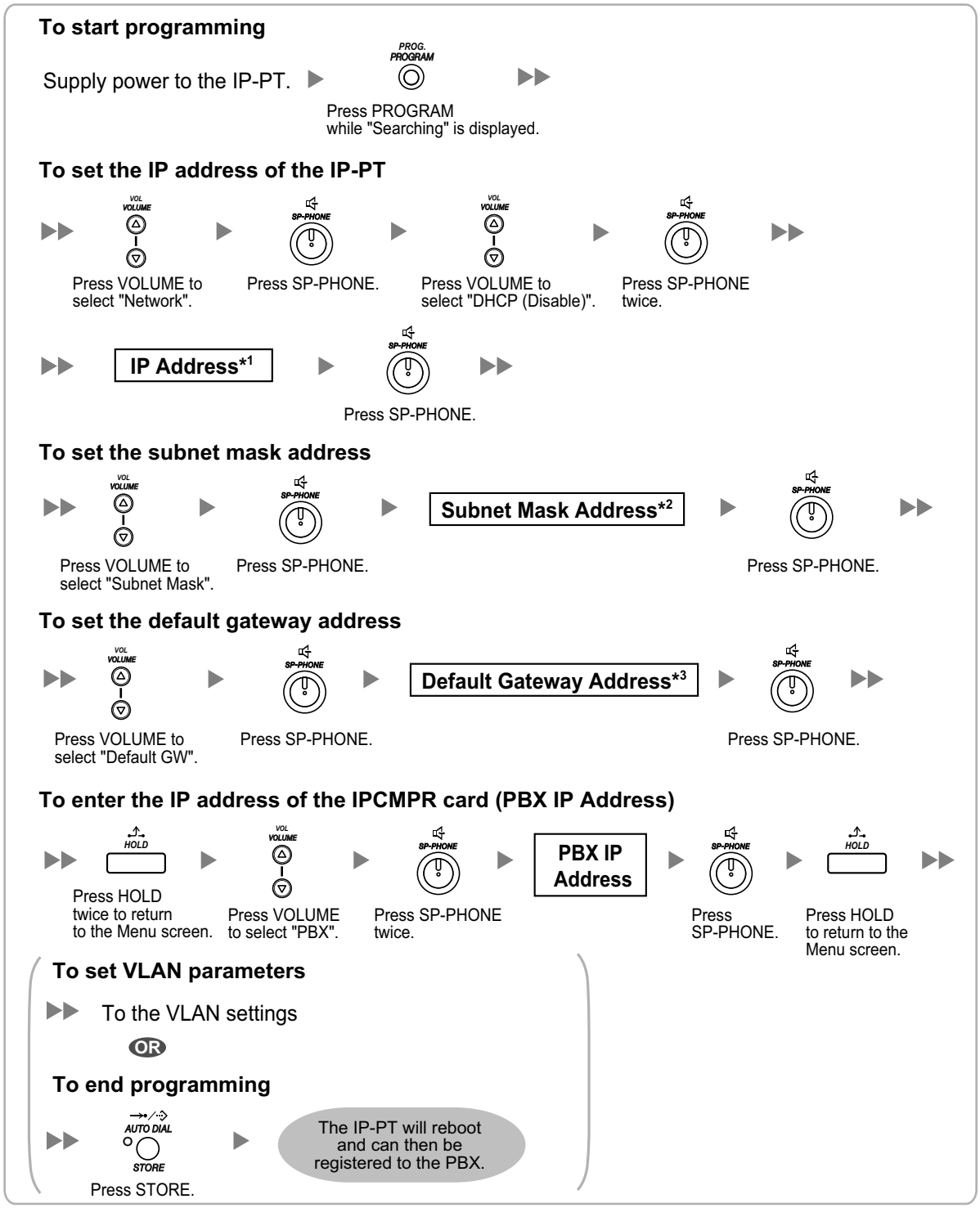


*1 Valid IP address range: "1.0.0.0" to "223.255.255.255"
*2 Valid subnet mask address range: "0–255.0–255.0–255.0–255" (except 0.0.0.0 and 255.255.255.255)
*3 Valid IP address range: "1.0.0.0" to "223.255.255.255"

Note

To confirm the connection to the secondary PBX after programming, (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)



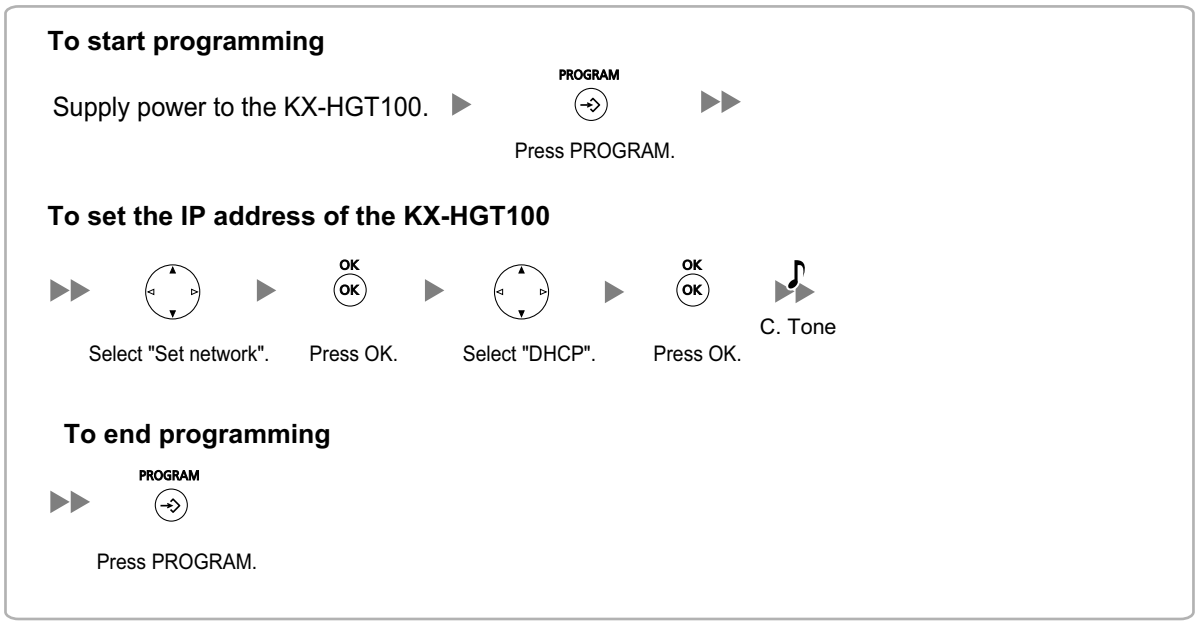
*1 Valid IP address range: "1.0.0.0" to "223.255.255.255"

*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"

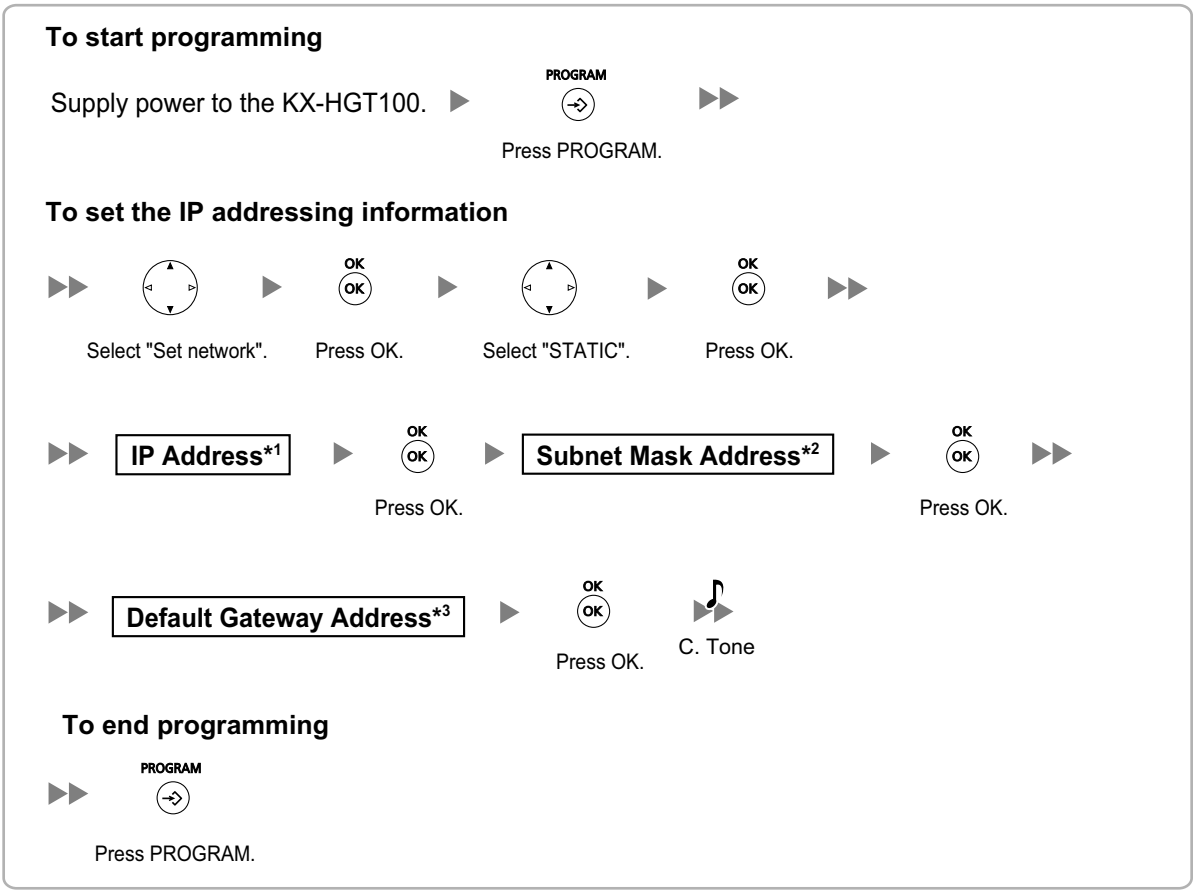
For KX-HGT100 SIP Telephones

1. **Using a DHCP server to automate the assignment of IP addressing information**
   The DHCP server automatically assigns the IP address of the KX-HGT100, the subnet mask address, and the default gateway address to the KX-HGT100.
   The PBX IP address can be assigned to the KX-HGT100 through Web Programming. For details, refer to "4.3.1 Registering IP Telephones".
   Follow the procedure below to assign IP addressing information automatically.



2. **Not using a DHCP server when assigning IP addressing information**
   The IP address of the KX-HGT100, the subnet mask address, and the default gateway address must be assigned manually.
   The PBX IP address can be assigned to the KX-HGT100 through Web Programming. For details, refer to "4.3.1 Registering IP Telephones".

Follow the procedure below to assign IP addressing information manually.



*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 SIP Extensions (except KX-HGT100)

1. **Using a DHCP server to automate the assignment of IP addressing information**
   The IP address of the SIP Extension, the subnet mask address, and the default gateway address can be assigned to the SIP Extension automatically by the DHCP server.
   The IP address of the IPCMPR card (PBX IP address) must be assigned manually on the SIP Extension side.
   For instructions, refer to the documentation of the SIP Extension.
2. **Not using a DHCP server when assigning IP addressing information**
   All the IP addressing information must be assigned manually.
   For instructions, refer to the documentation of the SIP Extension.

Note

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

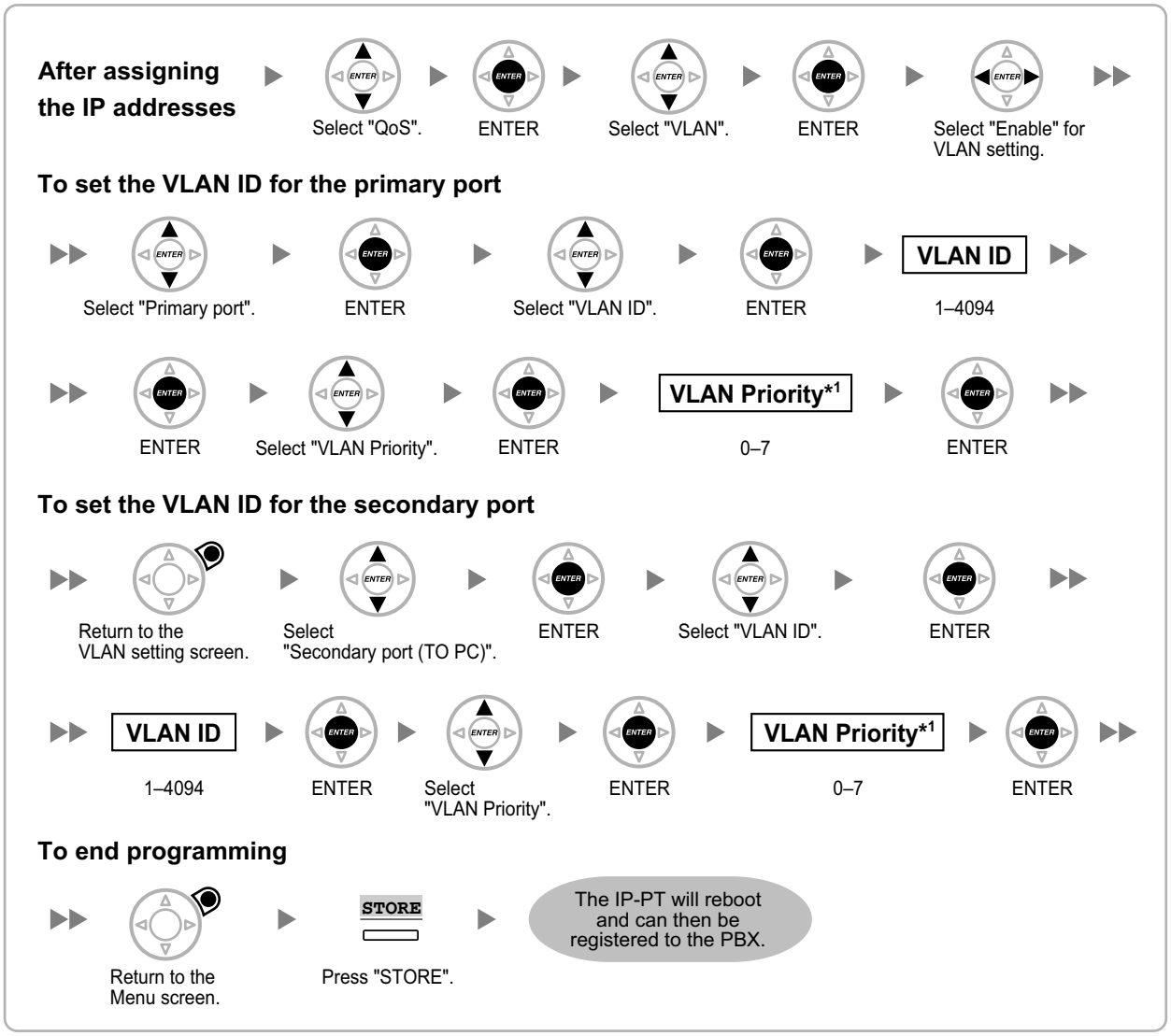
4.2.2 Setting the VLAN Parameters

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

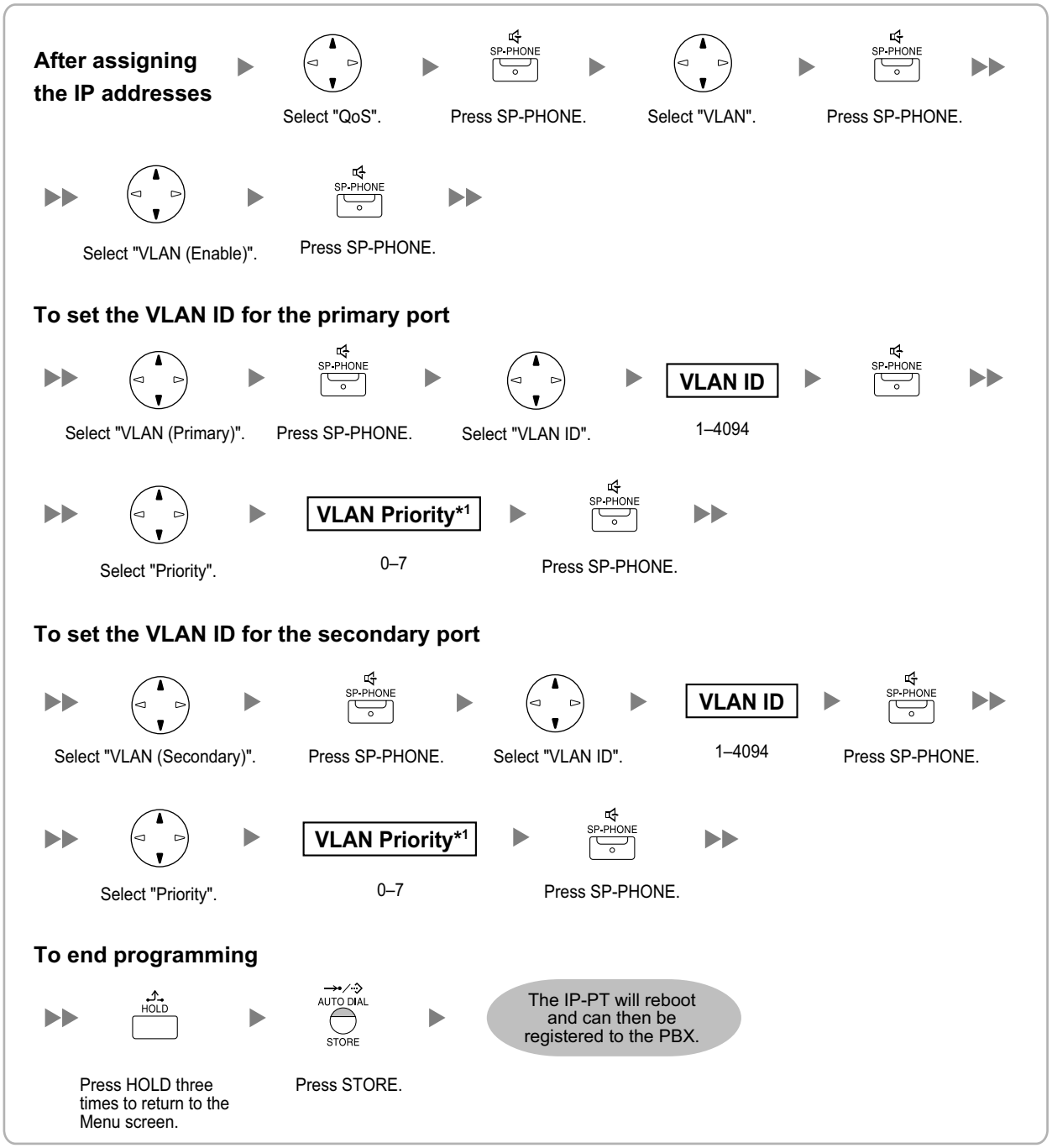
- For details for the KX-NT400, refer to the Operating Instructions of the KX-NT400.
- The procedure for SIP Extensions may vary depending on the type of the SIP Extension being used. Refer to the documentation of your SIP Extension for instructions.

KX-NT300 series (except KX-NT321)



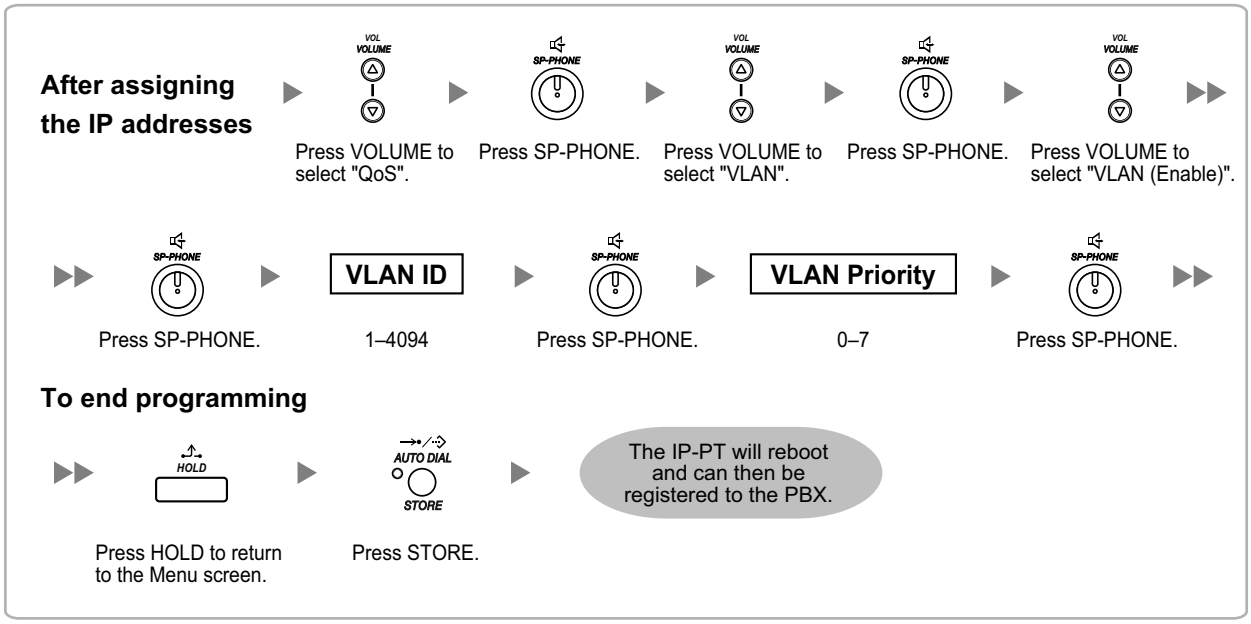
*1 The VLAN priority of the primary port must be set higher than the priority of the secondary port. The larger the number, the higher the priority.

KX-NT321



*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)



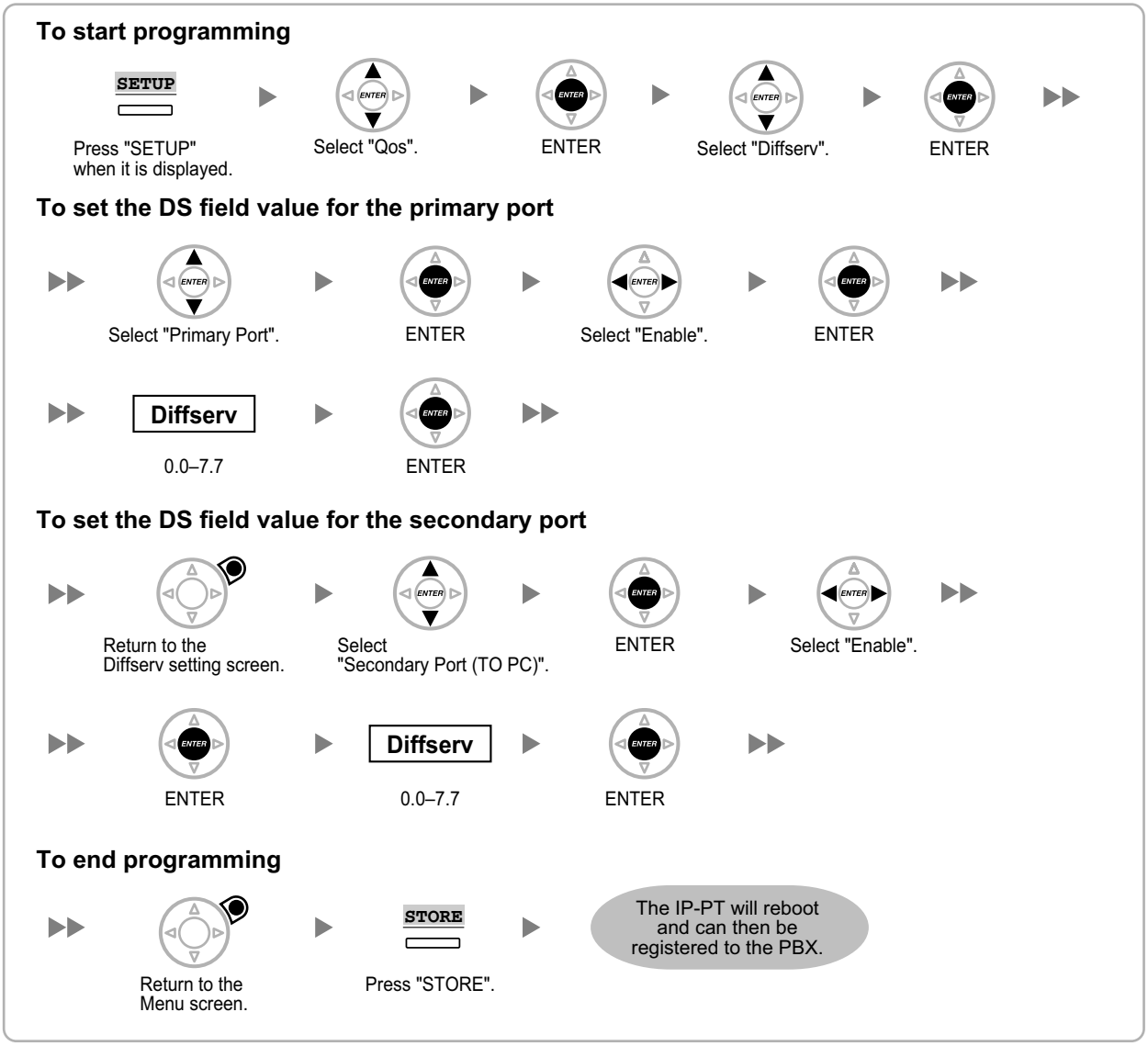
4.2.3 Setting the Diffserv Parameters

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.

Note

For details for the KX-NT400, refer to the Operating Instructions of the KX-NT400.

KX-NT300 series (except KX-NT321)



KX-NT321

To start programming

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

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

0.0–7.7 → Press SP-PHONE.

To set the DS field value for the secondary port

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

Press SP-PHONE. → 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.

KX-NT265 (Software version 2.00 or later only)

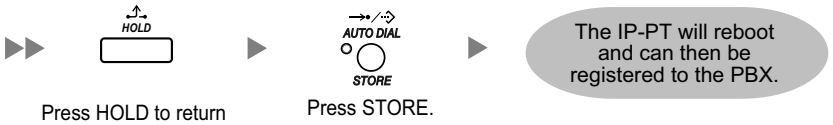
To start programming

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.

4.2.4 Configuration of IP Ports

An 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.

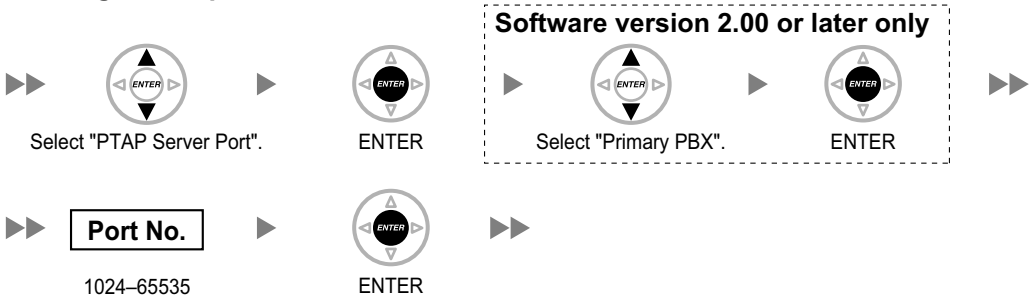
Note

For details for the KX-NT400, refer to the Operating Instructions of the KX-NT400.

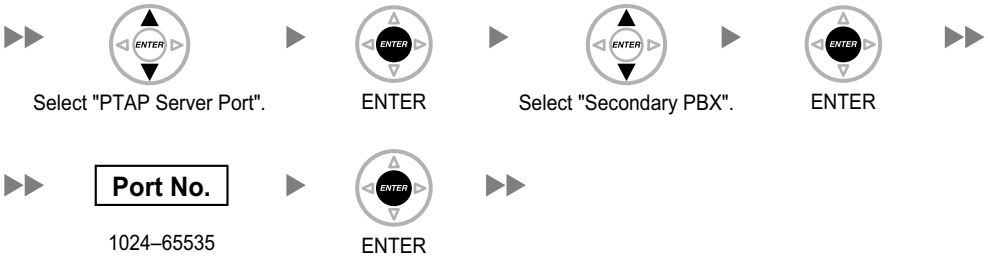
KX-NT300 series (except KX-NT321)

To start programming

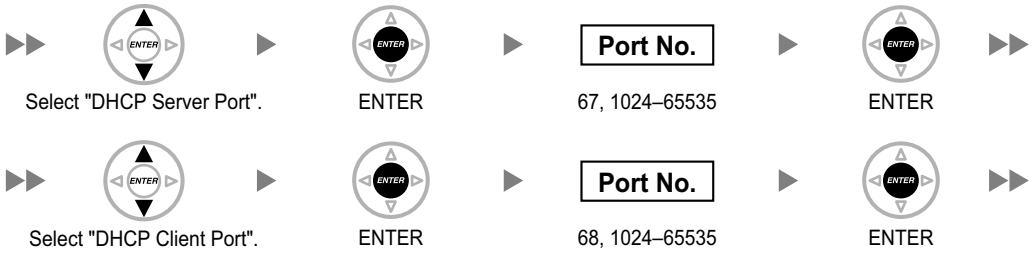
To configure the port number of PTAP Ports



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



To configure the port number of DHCP Ports



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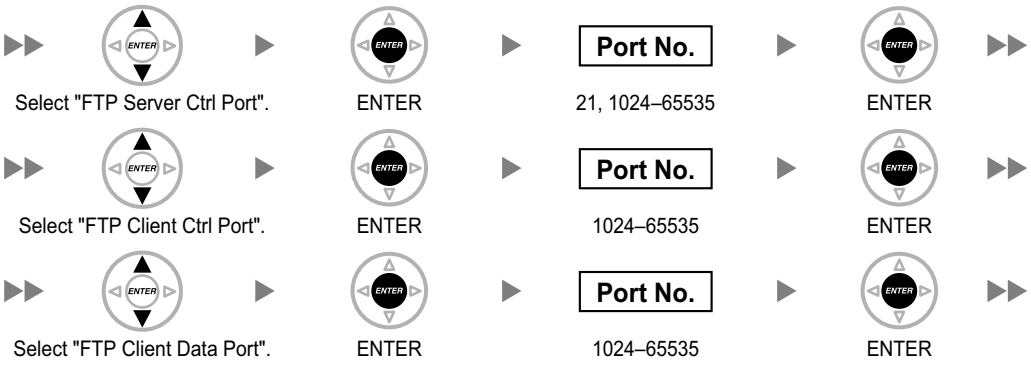
To configure the port number of FTP Ports



To end programming

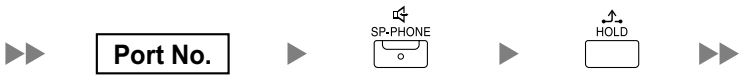
KX-NT321

To start programming

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

To configure the port number of PTAP Ports

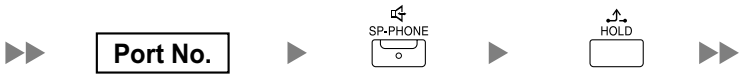
Select "PTAP Server". → Press SP-PHONE. → Select "Primary PBX". → Press SP-PHONE.



1024–65535 → Press SP-PHONE. → Press HOLD.

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

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



1024–65535 → Press SP-PHONE. → Press HOLD.

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

To configure the port number of DHCP Ports

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

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

▶▶ **Continued on next page**

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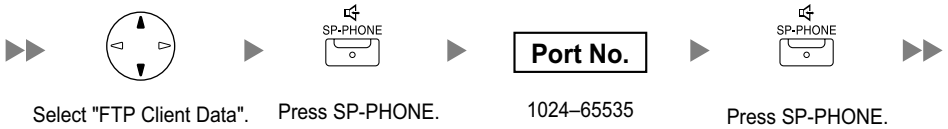
To configure the port number of FTP Ports

Select "FTP Server Ctrl". Press SP-PHONE. 21, 1024–65535 Press SP-PHONE.

Select "FTP Client Ctrl". Press SP-PHONE. 1024–65535 Press SP-PHONE.



Select "FTP Client Data". Press SP-PHONE. 1024–65535 Press SP-PHONE.

To end programming

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 "IP Port". | Press SP-PHONE. | 7678 | Press SP-PHONE.

To configure the port number of PTAP Ports

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

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

To configure the port number of DHCP Ports

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

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

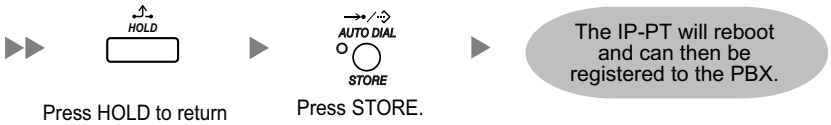
To configure the port number of FTP Ports

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

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

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

To end programming



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.

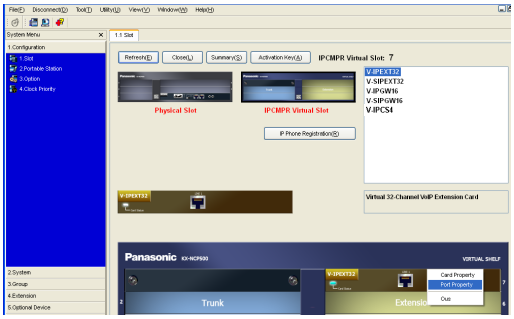
4.3 Registering IP Telephones

4.3.1 Registering IP Telephones

After the programming of the PBX and IP telephone is finished, the IP telephone must be registered to the PBX. This is done using the Maintenance Console.

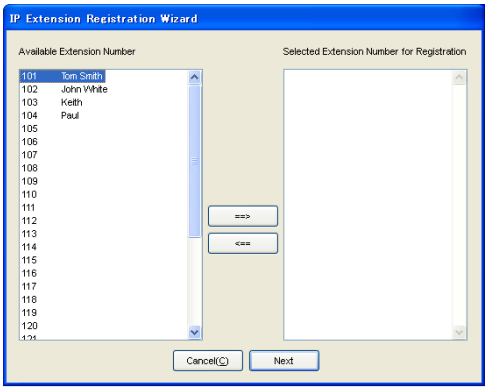
Registration of IP-PTs

1. **a.** Under **Configuration**, click **Slot**.
   b. Move the mouse pointer over the PBX image of **IPCMPR Virtual Slot** at the top of the screen, and click **Select Shelf**. Move the mouse pointer over the V-IPEXT32 card. A menu will be shown under the mouse pointer.
   c. Click **Port Property**.



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.
   b. Click **Next**. A screen will appear with information on the current IP-PT extension number and name, and index number for programming.



Note

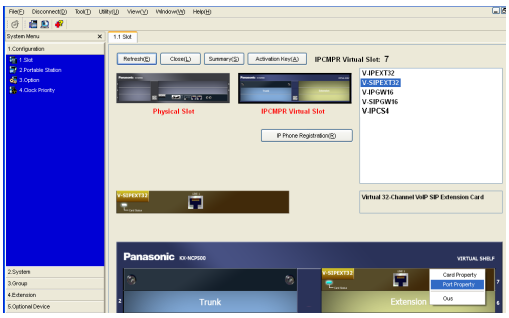
- If the IP-PT has been connected to the LAN and power has been turned on, the IP address of the IPCMPR card will be assigned automatically.
- If not, connect the IP-PT to the LAN and turn the power on within 15 minutes after this operation is done. The IP address of the IPCMPR card will then be assigned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

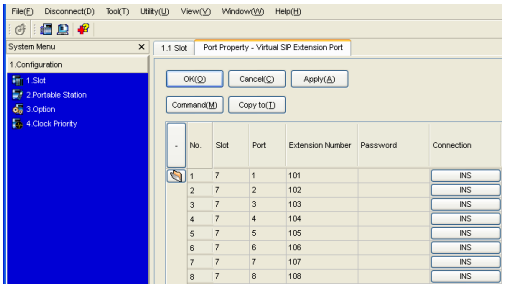
Once the IP-PT is successfully registered, the status of the IP-PT will update to show "Registered".

Registration of SIP Extensions

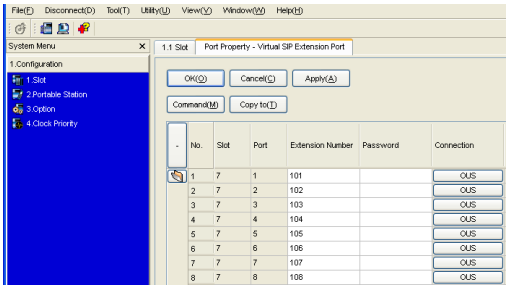
1. **a.** Under **Configuration**, click **Slot**.
   b. Move the mouse pointer over the PBX image of **IPCMPR Virtual Slot** at the top of the screen.
   c. Click **Select Shelf**.
   d. Move the mouse pointer over the V-SIPEXT32 card. A menu will be shown under the mouse pointer.
   e. Click **Port 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 "3.48 [1-3] 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.



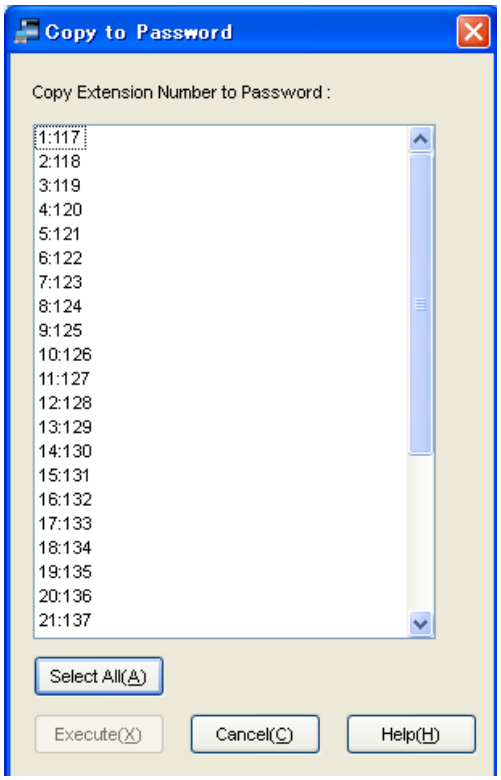
3. Set passwords for the SIP Extensions.
   a. Click the cell in the **Connection** column for each SIP Extension you wish to register. The Command Connection screen appears.
   b. Click **OUS**.
   c. Enter a password in the Password box for each SIP Extension.
   d. Click **Apply**.
   e. Click the 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.



4. Programme the SIP Extension you wish to register.

   [For SIP Extensions (except KX-HGT100)]

   a. Set the IP address of the IPCMPR card, 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 Extension you are using.
   - For details about the actual operation of SIP Extensions, refer to the documentation of the SIP Extension.
   - For certain SIP Extensions, you may need to set a Sign-in name, which should consist of the extension number and the IP address of the IPCMPR card (e.g., 350@192.168.0.101).

[For KX-HGT100 SIP Telephones]
It is necessary to programme the KX-HGT100 through Web Programming to register to the PBX.
Follow the procedures below to prepare your PC for Web Programming and programme the KX-HGT100.

Preparing the PC

System Requirements

- Microsoft® Internet Explorer® 6.0 or later

Trademarks

- Microsoft, Windows, and Internet Explorer are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- All other trademarks identified herein are the property of their respective owners.

Note

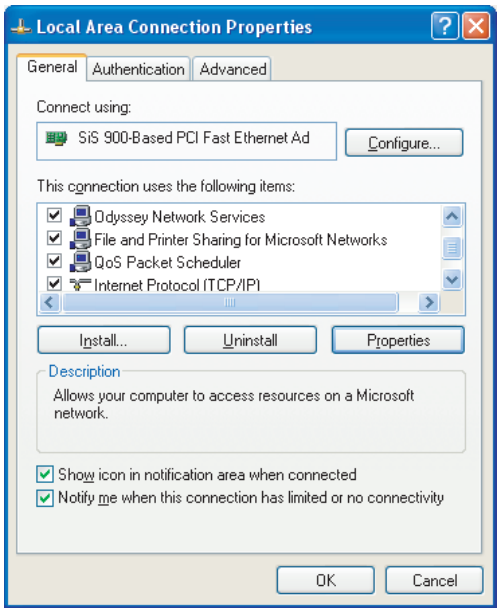
The procedures vary depending on the operating system of the PC.
This example is based on the Windows® XP operating system.

1. Open **Control Panel** from the **Start** menu.

2. **a.** Double-click **Network Connections**.
   b. Double-click **Local Area Connection**.
   c. Click **Properties**.
   d. Confirm that **Internet Protocol (TCP/IP)** is listed.

   Note

   If **Internet Protocol (TCP/IP)** is not listed, you must install TCP/IP. For details about installation, refer to the documentation for Windows XP.

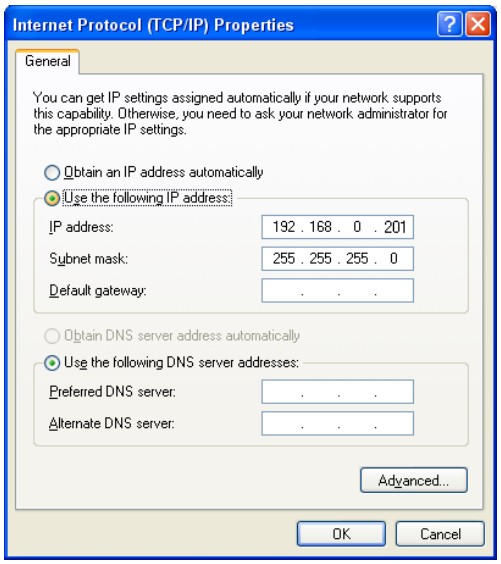


3. Select **Internet Protocol (TCP/IP)** and click **Properties**.

4. **a.** Select **Use the following IP address:**.
   b. In the **IP address** box, type **192.168.0.201**. This is an example entry. Type an IP address different from that assigned to the KX-HGT100 in "4.2.1 Assigning the IP Addressing Information".
   c. In the **Subnet mask** box, type **255.255.255.0**.
   d. Click **OK**.

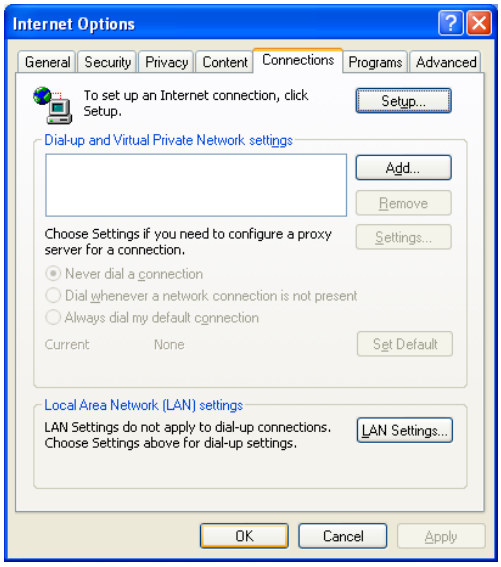
   Note

   To obtain an IP address automatically, select **Obtain an IP address automatically**.



5. **a.** Start Internet Explorer from the **Start** menu.
   b. Click **Internet Options** from the **Tools** menu.

6. **a.** Click the **Connections** tab.
   b. Select **Never dial a connection** if necessary.
   c. Click **LAN Settings**.



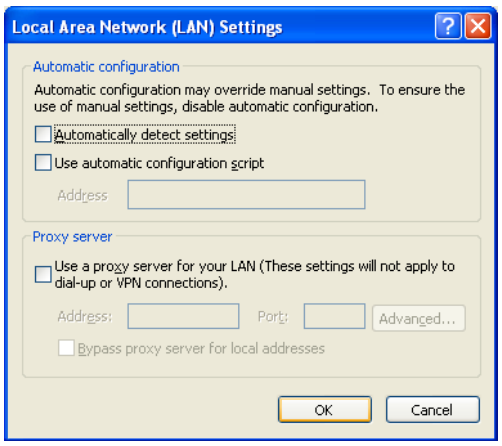
7. **When Not Using a Proxy Server**

   Note

   If you will use a proxy server, see **When Using a Proxy Server**.

   a. Clear all check boxes.
   b. Click **OK**.

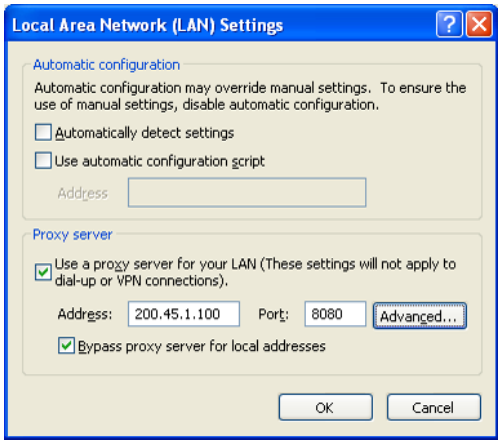
   Your PC is now ready for programming through direct access to the KX-HGT100.



When Using a Proxy Server

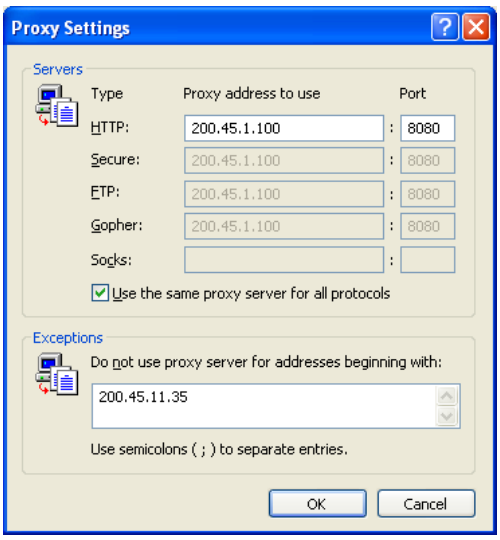
If the network has a proxy server installed, you must apply the appropriate proxy settings to your PC. In this case, follow the steps below instead of step 7 above:

7. **a.** Check all boxes for **Proxy server**.
   b. Click **Advanced**.



8. **a.** Under **Do not use proxy server for addresses beginning with:**, type the IP address of the LAN port of the card.
   b. Click **OK**.

   Your PC is now ready for programming the KX-HGT100 through an IP network.

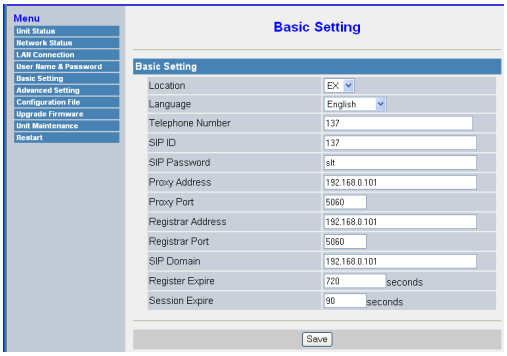


Programming the KX-HGT100

1. Start Internet Explorer from the **Start** menu.
2. **a.** Enter the IP address of the KX-HGT100 in the address box.
   b. Press the Enter key.
3. The log-in screen will appear.
   a. In the **User name** box, type the user name (default: **KX-HGT100**).
   b. In the **Password** box, type the password (default: **kx-hgt100**).
   c. Click **OK**.
4. The top page will appear.
   a. Click **Basic Setting**.
   b. In the **Telephone Number** and **SIP ID** boxes, type the extension number.
   c. In the **SIP Password** box, type the password.
   d. In the **Proxy Address**, **Registrar Address**, and **SIP Domain** boxes, type the IP address of the IPCMPR card.
   e. Click **Save**.
   f. Click **Return to top page**.

   Note

   For information on other parameters, refer to Parameter Descriptions.



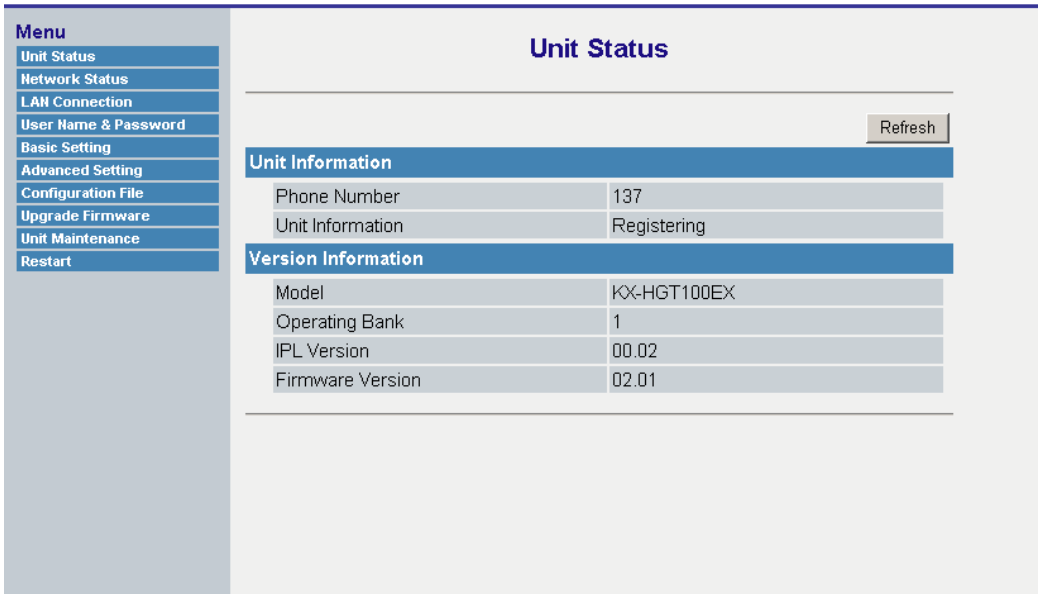
5. **a.** Click **Restart**.
   b. Click **Restart now** for changes to take effect. The KX-HGT100 will be restarted.
   If the authentication information of the KX-HGT100 and the PBX match, the registration is successful.

Note

To access Web Programming after restarting the KX-HGT100, it is necessary to (1) turn the KX-HGT100 power off, and (2) hold the OK and MUTE buttons while turning the power on.

Parameter Descriptions

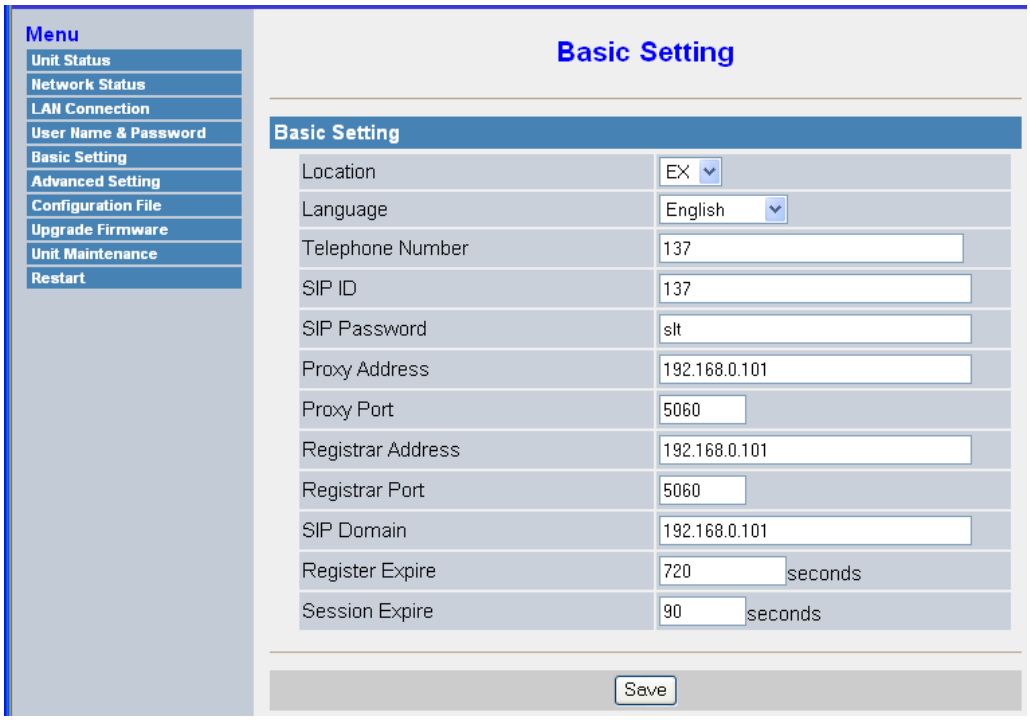
Unit Status



Parameter	Description
Phone Number	Specifies the extension number of the KX-HGT100.
Unit Information	Specifies the status of the KX-HGT100 as follows: • Update Profile: Basic Setting is not programmed (e.g., factory default). • Registering: Registering the KX-HGT100 to the PBX. • Normal: The KX-HGT100 is registered. • Malfunctioning: The KX-HGT100 is in an error state. • LAN cable unplugged: The LAN port of the KX-HGT100 is not receiving any network signal. • IP Address expired: IP address lease time from the DHCP server has expired. • IP Address conflict: The IP address of the KX-HGT100 conflicts with other network devices.
Model	Specifies the model number of the KX-HGT100.
Operating Bank	Specifies the number of the memory bank for the current firmware.[*1]
IPL Version	Specifies the IPL (Initial Program Loader) version.
Firmware Version	Specifies the current firmware version of the KX-HGT100.

[*1] There are two memory banks. The Operating Bank number will cycle between these two memory banks, changing each time the firmware is upgraded.

Basic Setting



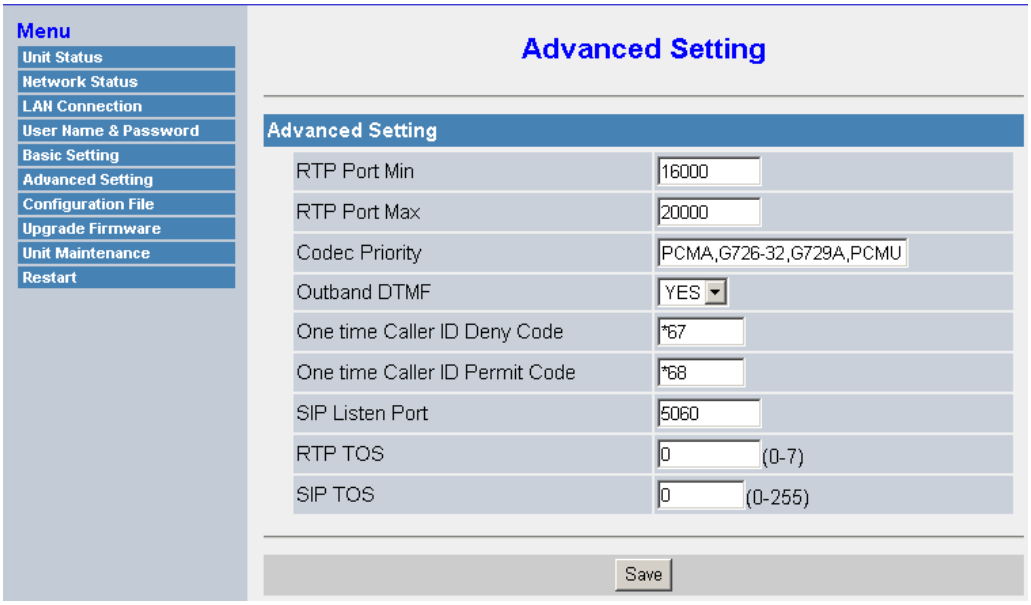
Parameter	Description
Location[*1]	Specifies the location where the KX-HGT100 is installed.
Language	Specifies the language to be displayed on the LCD.
Telephone Number[*3]	Specifies the extension number of the KX-HGT100.
SIP ID[*3]	Specifies the extension number of the KX-HGT100.
SIP Password[*3]	Specifies the password for the KX-HGT100.
Proxy Address[*3]	Specifies the IP address of the IPCMPR card.
Proxy Port[*3]	Specifies the port number associated with the IP address entered in **Proxy Address**.
Registrar Address[*3]	Specifies the IP address of the IPCMPR card.
Registrar Port[*3]	Specifies the port number associated with the IP address entered in **Registrar Address**.
SIP Domain[*3]	Specifies the IP address of the IPCMPR card.
Register Expire	Specifies the length of time (1–4294967295 seconds) that the KX-HGT100 sends the REGISTER message to the PBX.[*2]
Session Expire	Specifies the length of time (60–65535 seconds) after which the KX-HGT100 terminates SIP sessions when no communication is detected.

[*1] This parameter is not available with KX-HGT100C.

[*2] This setting will be overwritten by the SIP Location Hold Time Max. setting of the PBX. For details, refer to "3.17 [1-1] Slot—Card Property - Virtual SIP Extension" in the PC Programming Manual.

[*3] These parameters can also be programmed by the KX-HGT100. For details about the procedure for the KX-HGT100, refer to "Basic Setting programming through the KX-HGT100".

Advanced Setting



Parameter	Description
RTP Port Min	Specifies the minimum port number for RTP transmission and reception (even number only).
RTP Port Max	Specifies the maximum port number for RTP transmission and reception (even number only).
Codec Priority	Specifies the codec types in order of priority. (The codec typed first has the highest priority.) **Note** Calls are always established based on the calling party's codec priority setting.
Outband DTMF	Specifies whether to use Outband (RFC2833) DTMF tones or not. If **NO** is selected, Inband DTMF tones will be used.
One time Caller ID Deny Code	Specifies the number to dial when preventing the calling party's telephone number from being displayed on the called party's telephone for outside calls.*1
One time Caller ID Permit Code	Specifies the number to dial when showing the calling party's telephone number on the called party's telephone for outside calls.*1
SIP Listen Port	Specifies the port number to listen for incoming SIP calls.
RTP TOS	Specifies the ToS value in the IP header of RTP packets.
SIP TOS	Specifies the Diffserv (ToS) value in the IP header of SIP packets.

*1 The number entered in this box has priority over features set via the PBX that use the same feature number.

Basic Setting programming through the KX-HGT100

Follow the procedure below to programme the Basic Setting parameters through the KX-HGT100.

Note

- Before programming these settings, it is recommended to set the IP address of the KX-HGT100. For details about setting IP addresses, refer to "For KX-HGT100 SIP Telephones" in "4.2.1 Assigning the IP Addressing Information".
- It is necessary to turn off, then turn on the power of the KX-HGT100 after programming settings for changes to take effect.

To start programming

Press PROGRAM. Hold INFORMATION for 3 seconds while "Save speed dial?" is displayed.

To configure the Telephone Number/SIP ID

Select desired parameter. Press OK. Max. 32 digits Press OK.

To configure the SIP Password

Select "SIP Password". Press OK. Max. 32 digits Press OK.

To configure the Proxy Address/Registrar Address/SIP Domain

Select desired parameter. Press OK. Enter the IP address of the IPCMPR card. Press OK.

To configure the Proxy Port/Registrar Port

Select desired parameter. Press OK. 1–65535 Press OK.

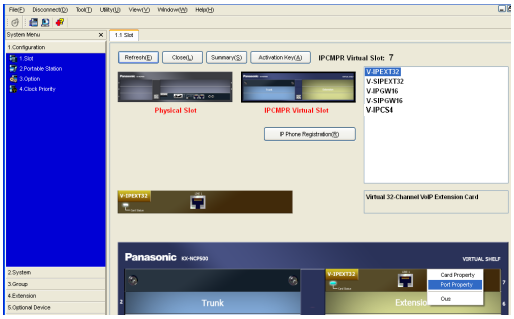
To end programming

Press PROGRAM.

4.3.2 De-registering IP Telephones

De-registration of IP-PTs

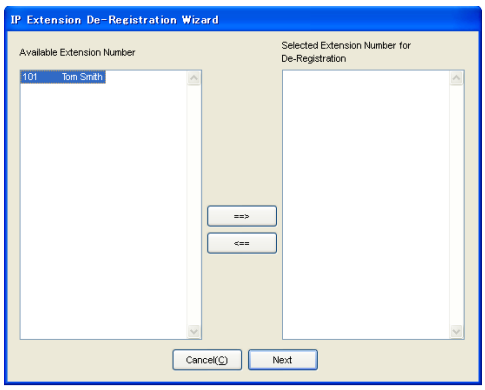
1. **a.** Under **Configuration**, click **Slot**.
   b. Move the mouse pointer over the PBX image of **IPCMPR Virtual Slot** at the top of the screen, and click **Select Shelf**. Move the mouse pointer over the V-IPEXT32 card. A menu will be shown under the mouse pointer.
   c. Click **Port Property**.



2. Click **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 **Confirm**.
   - If the de-registration is successful, the dialogue box will show "De-registration succeed".

   d. Click **Close**.

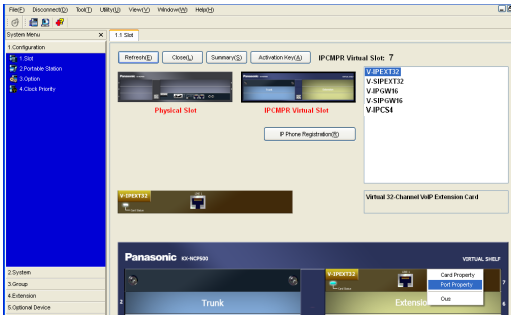


Once the IP-PT is successfully de-registered, the status of the IP-PT will update to show "None".

Forced De-registration of IP-PTs

Follow the steps below to forcibly de-register an IP-PT when normal de-registration was unsuccessful.

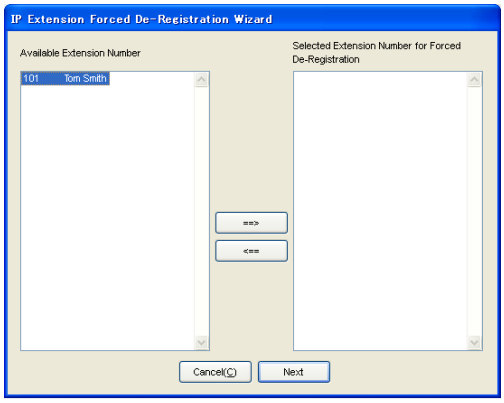
1. **a.** Under **Configuration**, click **Slot**.
   b. Move the mouse pointer over the PBX image of **IPCMPR Virtual Slot** at the top of the screen, and click **Select Shelf**. Move the mouse pointer over the V-IPEXT32 card. A menu will be shown under the mouse pointer.
   c. Click **Port Property**.



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**.

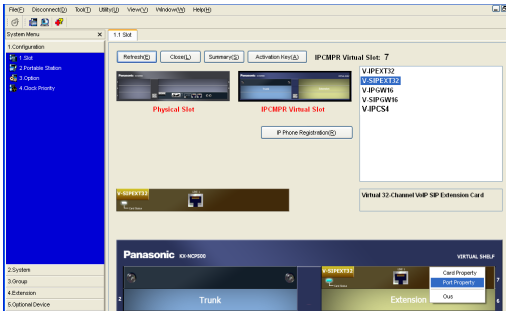


Once the IP-PT is successfully de-registered, the status of the IP-PT will update to show "None".

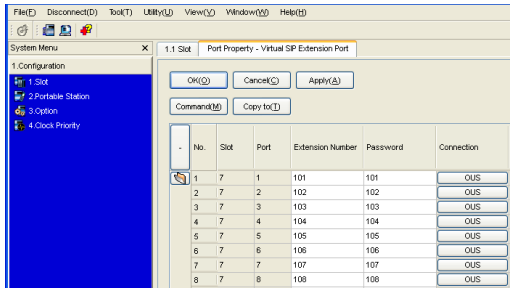
De-registration of SIP Extensions

The de-registration of SIP Extensions is carried out by deleting either the extension number or password registered in the PBX.

1. **a.** Under **Configuration**, click **Slot**.
   b. Move the mouse pointer over the PBX image of **IPCMPR Virtual Slot** at the top of the screen.
   c. Click **Select Shelf**.
   d. Move the mouse pointer over the V-SIPEXT32 card. A menu will be shown under the mouse pointer.
   e. Click **Port Property**.



2. Delete either the extension number or password in the boxes shown right.



Section 5
Appendix

5.1 Revision History

5.1.1 KX-NCP500/KX-NCP1000 PBMPR Software File Version 2.0xxx

Changed Contents

- 1.1.1 Establishing a VoIP Network with the Pure IP-PBX
- 2.1.3 Network Devices
- 4.1.1 Assigning the IP Addressing Information
- 4.2.1 Assigning the IP Addressing Information
- 4.2.2 Setting the VLAN Parameters
- 4.2.3 Setting the Diffserv Parameters
- 4.2.4 Configuration of IP Ports
- 4.3.1 Registering IP Telephones
- 4.3.2 De-registering IP Telephones
- 5.2.1 Error Message

5.2 Troubleshooting

5.2.1 Error Message

When a major system error occurs, an error message is displayed on the IP-PT.
For the IP-PT with a single line display (e.g., KX-NT265 [software version 2.00 or later only]), only an error code (i.e., ERR XXXX-XXXX) will be displayed.

Note

For details for the KX-NT400, refer to the Operating Instructions of the KX-NT400.

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.

Error Message & IP-PT Activity	Probable Cause	Solution
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.		
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.

Error Message & IP-PT Activity	Probable Cause	Solution
ERR 3100-0000 **BLUETOOTH ERROR** Resets the Bluetooth®[*1] wireless headset.	• Bluetooth hardware error	• Repair or replace the Bluetooth wireless headset.

[*1] The Bluetooth® word mark and logos are owned by the Bluetooth SIG, Inc. and any use of such marks by Panasonic Corporation is under licence.

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