KENWOOD

NXR-1700
NXR-1800

Function Reference (FUNC)

Version: 2.00
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Type: E

CONTENTS

OUTLINE

About This Manual

This In-depth manual describes the functions of the NXR-1700/ NXR-1800 repeater. This document is created for the product having the following design specifications:

Item	Specifications	How to Verify
Market Code	E	Printed on the label of the product.
Firmware Version of the Repeater	2.00.00	Can be viewed in the Repeater Information dialog box of KPG-D7.
Version of KPG-D7	V 2.00	Can be viewed in the **About** dialog box of KPG-D7.

Note

- When connecting to a PC via IP, we have confirmed in advance that when using a specific USB-LAN adapter, communication will fail due to the influence of the USB-LAN adapter side.
  If the LED on the left side of the LAN connector of the NXR-1700/ NXR-1800 does not light up, it is assumed that the USB-LAN adapter corresponds to this.
  We have also confirmed that communication can be performed normally via the HUB. If communication seems to be failing, we recommend connecting via HUB.

How to Read the In-depth Manual

The In-depth Manual has the following sections:

NXR-1700/ NXR-1800 Function Reference (FUNC) (this document)

Describes the functions for Analog Conventional, DMR Conventional, and NXDN Conventional, etc. for NXR-1700/ NXR-1800.

NXR-1700/ NXR-1800 Basic Configuration

Describes the function explanation for Web Tool and the rack mounts of NXR-1700/ NXR-1800.

About Notations

The following notations are used in this manual:

[ ]

The characters in [ ] indicate the name of the operating portion of each device and the name of the key of the PC.

“ ” (Double Quotation Mark)

The characters in “ ” indicate the name of the options, buttons, and menus shown on KPG-D7, or the LCD display of the repeater.

Bold Letters

The characters in bold letters indicate the name of the windows, tabs, checkboxes in KPG-D7 and functions assigned to the keys of the repeater.

[ ] + [ ]

This notation is used for describing functions activated by pressing 2 keys on the computer keyboard at the same time. For example, in order to input capital A into a PC, capital A is described as [Shift] + [a], which indicates that the [a] key must be pressed while pressing and holding the [Shift] key.

About the Notation of the Supported Models

This manual describes the supported models according to the following rules:

Model Name	Band	Type	Frequency (RX/ TX)
NXR-1700	VHF	E	136 MHz to 174 MHz
NXR-1800	UHF	E	450 MHz to 520 MHz
		E2	400 MHz to 470 MHz

Abbreviations Used in this Document

The following abbreviations are used in this in-depth manual. Refer to the abbreviation table below.

Abbreviation	Full Spelling or Meaning
AIS	Application Interface Specification (DMR Application Interface)
AUX	Auxiliary
CC	Color Code
Ch	Channel
COR	Carrier Operated Relay
CW	Continuous Wave
deg	degree(s)
DQT	Digital Quiet Talk
DSCP	Differentiated Services Code Point
GID	Group ID
HPA	High Power Amplifier
HSB	Hot Standby
ICMP	Internet Control Message Protocol
I/O	Input/Output
IPRCI	IP Remote Control Interface
Mic	Microphone
QoS	Quality of Service
QT	Quiet Talk
RAN	Radio Access Number
RSSI	Received Signal Strength Indication
RX	Reception, Receiver
SIP	Session Initiation Protocol
SNMP	Simple Network Management Protocol
TOR	Tone Operated Relay
TLS	Transport Layer Security
TOT	Time-out Timer
TX	Transmission, Transmitter
TX LED	Transmission LED
UID	Unit ID
VCO	Voltage Controlled Oscillator
VIP	Virtual IP Address
VLI	Voice Logging Interface
VSWR	Voltage Standing Wave Ratio

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Outline of This Repeater

NXR-1700/ NXR-1800 is the repeater for the use of professionals. The repeater is equipped with analog FM mode and digitally supports DMR Conventional mode (Tier2) and NXDN Conventional mode. NXR-1700/ NXR-1800 can be operated with the TKR-Dx10 series/ NXR-x10 series.

- Equipped with the OLED display, and the channel information and the repeater status can be displayed.
- Equipped with a USB connector, and a headset can be connected.
- Equipped with the Knob, and a control such as the channel selection can be done by the Knob operation.
- A System Log, Communication Log, and Log for failure analysis are supported.
- In addition to User List, the unauthorized use prevention function of the Authentication method (password authentication) is supported.
- For the digital communication protocol, DMR Conventional and NXDN Conventional are supported.
- Mixed mode with analog FM mode and DMR Conventional is supported.
- Equipped with a LAN connector as standard, and the configuration and firmware update via an IP are supported.
- Monitoring the repeater by SNMP is supported.
- Remote control of the repeater by using the Web Tool is supported.
- Console/OTAP Manager/SIP Server/Voice Logger can be connected without the need of an IP gateway.
- Even with an analog channel, basic audio transmission and reception using the channel configuration is supported by AIS/NXIP.
- The IPRCI command of PC Interface Protocol can be used via an IP.
- The IP Conventional network function in DMR Mode/NXDN Mode/Analog Mode is supported.
- The redundancy (Hot Standby) function to switch to a backup repeater in the event of a repeater failure is supported.

General Features

General

- 32 Channels (Maximum programming channel number)

Models

- VHF Models (136 MHz to 174 MHz) (Low: 1 W, High: 50 W)
  Power transmitter up to 50 W @ 50 % Duty, 25 W @ 100 % Duty cycle. Adjustable to 1 W.
- UHF Models (400 MHz to 470 MHz, 450 MHz to 520 MHz) (Low: 1 W, High: 40 W)
  Power transmitter up to 40 W @ 50 % Duty, 25 W @ 100 % Duty cycle. Adjustable to 1 W.

Display Functions

- 1.71 inches OLED display, Display color: Yellow (Background: Black)

Specifications

- Thermal-controlled Cooling Fan
- In addition to the Analog FM Conventional Mode, DMR Conventional (Tier2) Mode/ NXDN Conventional Mode (either one programmable at a time)
- USB-A Connector ready for Audio accessories
- D-Sub 25-pin Connector
- System Redundancy (Hot Standby)
- Built-in IP Network Adapter
- SNMP protocol for direct reporting to generic system
- IP Remote Management (Monitor/Control/Programming/Test Console)
- Ready for IP Interface to External Applications (for Console, OTAP)/ Voice Logging
- Built-in SIP IF without external Console or Gateway (Digital only)
- Enhanced Security (HTTPS)
- Multi-site Conventional IP Network up to 16 Site (Analog/Digital)

The function differences of NXR-1700/ NXR-1800 and TKR-Dx10/ NXR-x10 are as follows:

Function Name	Difference	Analog Mode	DMR Mode	NXDN Mode	Remark
Hot Standby	New *1	✔	✔	✔	-
IP Interface	New *1	✔	✔	✔	-
QoS	New *1	✔	✔	✔	-
-	-	-	-	-	-
Embedded Message	None *2	✔	✔	✔	-
Embedded Message with Password	None *2	✔	✔	✔	-
-	-	-	-	-	-
Fan Action	None *2	✔	✔	✔	-
Forced Firmware Programming Mode	New *1	-	-	-	–
Factory Reset	New *1	-	-	-	-
-	-	-	-	-	-
Transmit Power	None *2	✔	✔	✔	-
Channel Spacing	None *2	✔	-	✔	-
PTT Priority	None *2	✔	✔	✔	-
Channel Type	None *2	✔	✔	✔	-
Signaling Reset Timer	None *2	✔	✔	✔	-
Time-out Timer (TOT)	None *2	✔	✔	✔	–
Local TX Enable/Disable	None *2	✔	✔	✔	–
TX Enable/Disable	None *2	✔	✔	✔	–
Repeat Enable/Disable	None *2	✔	✔	✔	–
Lowest Receive Level Threshold	None *2	✔	✔	✔	–
Standby on Transmit Frequency	None *2	✔	✔	✔	–
Operation Mode	Yes *3	✔	✔	✔	Supports the “TA Direct” configuration.
Take Over	None *2	✔	✔	✔	-
-	-	-	-	-	-
Test Tone	Yes *3	✔	✔	✔	Behaves at the default 1000 Hz
Courtesy Tone	Yes *3	✔	✔	✔	Configuration is common for analog and digital.
-	-	-	-	-	-
QT/ DQT	None *2	✔	-	-	-
QT Decode Delay	None *2	✔	-	-	-

Function Name	Difference	Analog Mode	DMR Mode	NXDN Mode	Remark
Decode Signaling Enable/Disable	None *2	✔	-	✔	-
Encode Signaling Enable/Disable	None *2	✔	-	✔	-
Squelch Tail Elimination	None *2	✔	-	-	-
QT Reverse Burst	None *2	✔	-	-	-
DQT Turn-off Code	None *2	✔	-	-	-
Multiple Encode/Decode Table	None *2	✔	-	✔	-
Repeater Hold Time	None *2	✔	-	✔	-
Squelch Off	None *2	✔	✔	✔	-
Squelch Level	None *2	✔	✔	✔	-
Monitor	None *2	✔	-	✔	-
Busy Channel Lockout (Analog)	None *2	✔	-	-	-
Analog GID	New *1	✔	-	-	-
-	-	-	-	-	-
Slot Selection	None *2	-	✔	-	-
CC	None *2	-	✔	-	-
Busy Channel Lockout (DMR)	Yes *3	-	✔	-	NXR-x10 series: Not supported.
Call Hangtime	None *2	-	✔	-	-
Data Hangtime	None *2	-	✔	-	-
Channel Hangtime (Mixed Channel)	None *2	-	✔	-	-
Channel Hangtime (DMR Channel)	None *2	-	✔	-	-
Unaddress Call	None *2	-	✔	✔	-
User List (GID)	None *2	-	✔	✔	-
User List (UID)	None *2	-	✔	✔	-
Site Group	None *2	-	✔	-	–
Call Interruption	Yes *3	-	✔	-	NXR-x10 series: Not supported.
-	-	-	-	-	-
RAN Encode/ Decode	None *2	-	-	✔	-
NXIP Site ID	Yes *3	-	-	✔	Support for a network is available.
Busy Channel Lockout (NXDN)	None *2	-	-	✔	-
Radio Access Control	New *1	-	-	✔	-
-	-	-	-	-	-
CW ID	None *2	✔	✔	✔	-

Function Name	Difference	Analog Mode	DMR Mode	NXDN Mode	Remark
Transmit Interval Time	None *2	✔	✔	✔	-
Transmit Delay Time	None *2	✔	✔	✔	-
CW Speed	None *2	✔	✔	✔	-
CW Modulation Delay Time	None *2	✔	✔	✔	-
Audio Frequency	None *2	✔	✔	✔	-
Interval Activity Transmit	None *2	✔	✔	✔	-
-	-	-	-	-	-
AUX Input/Output	Yes *3	✔	✔	✔	AUX Input Monitor: External PTT (Channel 1 to Channel 32)
-	-	-	-	-	-
Remote Control	None *2	✔	✔	✔	NXR-1700/ NXR-1800: Using Web Tool TKR-Dx10: Using DTMF
Remote Access Control	New *1	✔	✔	✔	-
-	-	-	-	-	-
Conventional IP Network	Yes *3	✔	✔	✔	Communication between sites is available in Analog Mode.
Intersite Call	Yes *3	✔	✔	✔	Same as above.
IP Casting	Yes *3	✔	✔	✔	Same as above.
Maximum Jitter Buffer Size	Yes *3	✔	✔	✔	Same as above.
Minimum Jitter Buffer Size	Yes *3	✔	✔	✔	Same as above.
Maximum Jitter Buffer Size (Console/ SIP Phone)	Yes *3	✔	✔	✔	Same as above.
Minimum Jitter Buffer Size (Console/ SIP Phone)	Yes *3	✔	✔	✔	Same as above.
Network-wide Signaling	Yes *3	✔	-	✔	Same as above.
Site Roaming	Yes *3	-	✔	✔	Only supports DMR Mode/ NXDN Mode.
Cross-busy	Yes *3	✔	✔	✔	Communication between sites is available in Analog Mode
Busy Channel Lockout (Cross-busy)	Yes *3	✔	✔	✔	Same as above.
Site Group Table	None *2	✔	✔	✔	-
SIP Phone	New *1	–	✔	✔	-
IPRCI	New *1	✔	✔	✔	-
-	-	-	-	-	-
SNMP	New *1	✔	✔	✔	-
-	-	-	-	-	-
Busy Monitoring	New *1	✔	✔	✔	-
Voice Logging	New *1	✔	✔	-	-

Function Name	Difference	Analog Mode	DMR Mode	NXDN Mode	Remark
-	-	-	-	-	-
Power Supply Monitor	None *2	✔	✔	✔	-
Power Supply Lower Level	None *2	✔	✔	✔	-
Operation Tone	None *2	✔	✔	✔	-
-	-	-	-	-	-
Read Authorization Password	None *2	✔	✔	✔	-
Overwrite Password	None *2	✔	✔	✔	-
Network Password	None *2	✔	✔	✔	-
-	-	-	-	-	-
FPU Programming Mode	Yes *3	✔	✔	✔	Write Data to the Repeater: Enables or disables overwrite related to the Web Tool configuration. ・ Time Adjustment ・ User List (DMR Mode/ NXDN Mode) ・ Console List ・ SIP User ID (DMR Mode/ NXDN Mode)
Firmware Programming Mode	Yes *3	✔	✔	✔	By the Web Tool and Multi Loader
PC Test Mode	None *2	✔	✔	✔	-
-	-	-	-	-	-
Communication Log	New *1	✔	✔	✔	-
System Log	New *1	✔	✔	✔	-
Diagnostic Data	New *1	✔	✔	✔	-
-	-	-	-	-	-
Test Console	New *1	✔	✔	✔	-
-	-	-	-	-	-
Multi Loader	New *1	-	-	-	-

*1 New: New item of NXR-1700/ NXR-1800

*2 None: No difference

*3 Yes: With difference

About Options to Use the Functions Described in This Document

To use the functions described in this document, the following KENWOOD optional accessories need to be prepared on your own as necessary:

Model Name	Description
KPG-D7	FPU
KWD-NX10DC	License/ DMR CONVENTIONAL
KWD-NX10NC	License/ NXDN CONVENTIONAL
KWD-NX10MS	License/ CONVENTIONAL IP NETWORK
KWD-NX10SP	License/ SIP PHONE
KAS-20C/ KAS-20S	PC App/ AVL & DISPATCH SOFTWARE (CLIENT/ SERVER)
KPG-180AP	PC App/ OTAP MANAGER SOFTWARE
KPT-300LMC	PC App/ LICENSE MANAGEMENT CLIENT

Note

- Refer to KPG-180AP Basic Operations for details of KPG-180AP, which is OTAP MANAGER SOFTWARE.
- Refer to KPT-300LMC Basic Operations for details of KPT-300LMC, which is LICENSE MANAGEMENT CLIENT.

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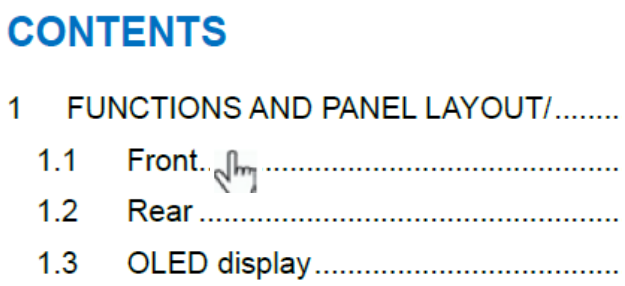
CONTENTS

Clicking a title in the Contents page allows a jump to the corresponding page.



INDEX

Clicking a function name, a title or a page number in the Index pages allows a jump to the corresponding page.

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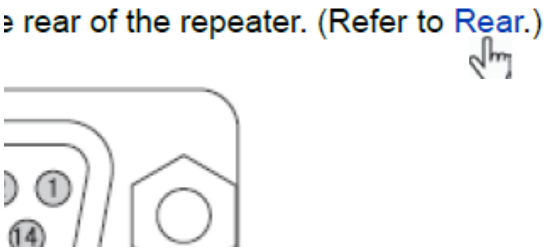
Clicking a portion with blue characters in the main context allows a jump to the corresponding page.



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About HUB

For the HUB connected to the repeater, we recommend the use of the following operation confirmed HUBs (as of June 2023):

Manufacturer	Model Number
NETGEAR	GS308
NETGEAR	GS108T
LINKSYS	LGS108
TP-Link	TL-SG108PE
CISCO	SF 100D-05
CISCO	Catalyst Express 500 WS-CE500-24TT V03
CISCO	CBS250-8T-D *1

*1: Configure “MDIX” for the HUB.

Note

- Use the HUB that supports IEEE 802.3u (100 BASE-TX).

Revision History

Date	Description
2022.10.28	1) Changed the version information in “About This Manual”. 2) Added the description of when the repeater starts with an Unprogrammed error to “Menu List” of “1.3 OLED display”. 3) Changed the display of Table 1-20 “E001” from Unprogramming to Unprogrammed (a specification change). 4) Added “Service Reboot by the Web Tool” to Table 1-23. 5) Revised the item taken over by Switchover of “Hot Standby Function” to only the Virtual IP Address. 6) Added “Service Reboot” to Table 10-1. 7) Changed the display of Table 18-1 “E001” from Unprogramming to Unprogrammed (a specification change). 8) Changed the version number from 1.00 to 1.02.
2023.07.19	1) Changed the version information in “About This Manual”. 2) Added NXR-1800. 3) Added the QoS function. 4) Added the NXDN function. 5) Added the SIP Phone function. 6) Added the IP Remote Control Interface (IPRCI) function. 7) Added the SNMP function. 8) Added the items of SNMP Troubleshooting to SNMP. 9) Added the descriptions of Communication Log and System Log to Log. 10) Added the items of the output contents related to Communication Log and System Log to Log. 11) Added the Multi Loader function. 12) Changed the version number from 1.02 to 2.00.

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The precautions about the construction process for using the Hot Standby function is described.
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<tr><td>Using IP Interface Function

The functions related to IP Network are described.
Page 192</td><td></td></tr>
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<tr><td>Transmission/ Reception</td><td>Changing Transmission Power

The transmission power of the repeater can be changed either to high power or low power.

Transmission Power (Transmit Power)
Page 78</td><td>Configuring the Priority Order of PTT

The repeater has multiple factors for transmission, and the repeater can be operated by configuring the priority order of each factor for transmission.

Configuring the Priority Order of Transmission (PTT Priority)
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	Restricting the Duration of Continuous Transmission of the Repeater Configuring the available duration of continuous transmission prevents the repeater from occupying the frequency. Restricting the Continuous Transmission Time (Time-out Timer (TOT)) Page 86	Knowing about the SIP Phone Communication with a PABX or PSTN SIP Phone, etc. can be performed by connecting the repeater to a SIP Phone Server. Page 167
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	Limiting the Repeating IDs The GIDs and UIDs for repeat transmission can be limited. Limiting the IDs for Repeat Transmission (User List (GID)/ User List (UID)) Page 117	Communicating with Multiple Repeaters Connected by Using an IP Network The communication area can be enlarged by interconnecting multiple repeaters installed in different locations by using an IP network. CONNECTING MULTIPLE REPEATERS BY USING AN IP NETWORK (CONVENTIONAL IP NETWORK) Page 147
NXDN Digital Communication	Avoiding Interference with Other Communications If a channel to be used for the repeater to transmit is being used by other parties, the transmission of the repeater on the channel is automatically restricted. Avoiding Interference with Other Communications (Busy Channel Lockout (NXDN)) Page 130	Using the Radio Access Control function The Radio Access Control function allows only the authorized transceiver to access a system that includes the repeater. Page 131

Security	Using a Password to Protect the Configuration Data of the Repeater To prevent the configuration data of the repeater from being altered without the user's permission, or to prevent the configuration data written in the repeater from being diverted, a password can be set for the configuration data. Password When Reading Configuration Data in a PC (Read Authorization Password) Password When Writing Configuration Data (Overwrite Password) Password When Accessing the Repeater (Network Password) Page 204	
System Management	Knowing about the Operational Statuses, Etc. of a System With the SNMP function, the various operational statuses of a repeater system can be known. Page 183	

1 FUNCTIONS AND PANEL LAYOUT

1.1 Front

(Image: Example showing all except the warning icon)

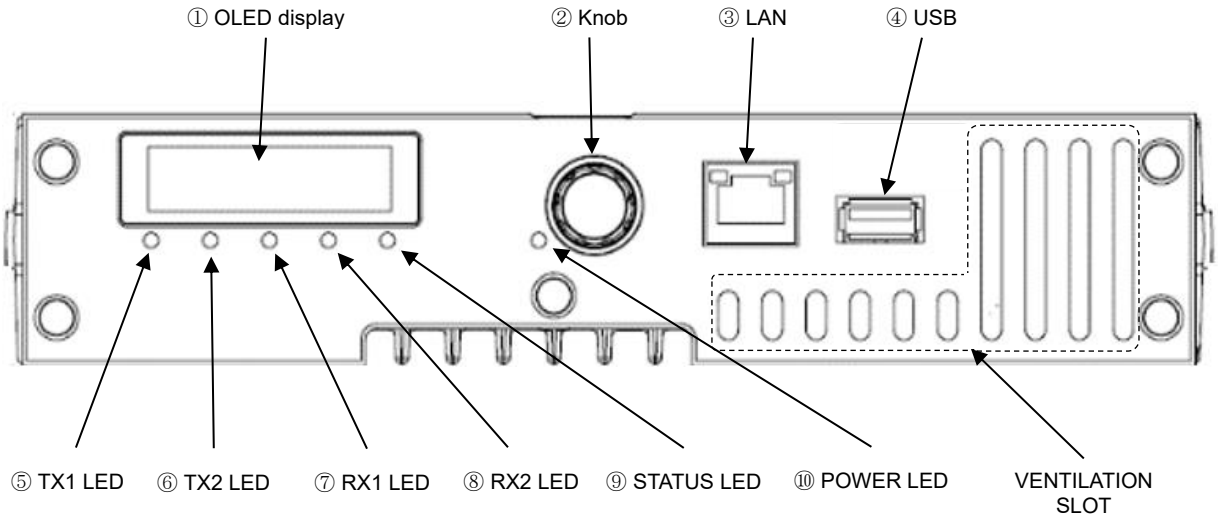


Figure 1-1 Front

Table 1-1 Front

No.	Name	Description
①	OLED display	Displays the channel information and the status of the repeater.
②	Knob	Operating the Knob can turn the repeater on and off (Menu operation) and select channels, etc.
③	LAN	Connects an IP device such as a hub (100 BASE-TX/ 10 BASE-T).
④	USB	Connects a USB accessory. A headset can be connected to monitor the repeat audio or to communicate on a trial basis with the transceivers in a system.
⑤	TX1 LED	Lights while the repeater is transmitting. In other cases, this LED lights depending on the status of the repeater.
⑥	TX2 LED	
⑦	RX1 LED	Lights while the repeater is receiving. In other cases, this LED lights depending on the status of the repeater.
⑧	RX2 LED	
⑨	STATUS LED	Flashes red while any error occurs, such as the PLL unlock or FAN error. The details of the error can be confirmed on the OLED display.
⑩	POWER LED	Lights green when the power of the repeater is turned on. The LED turns off when the power supply voltage (DC 10.8 V to DC 15.6 V) is outside of the operating range.

LAN

This is an Ethernet connection terminal with an RJ-45 connector. Normally, it is connected to a Hub and interfaces with the IP connection devices such as the communication between the repeaters and the communication to a console. It consists of 100 BASE-TX/10 BASE-T.

To use with 100 Mbps, Full Duplex fixed, configure **Auto-Negotiation/Auto-MDIX (LAN)** to be disabled by the FPU.

Table 1-2 Auto-Negotiation/Auto-MDIX (LAN)

Configuration Item	Description
Enable	If Auto-Negotiation/Auto-MDIX (LAN) is enabled, the Auto-Negotiation function and Auto-MDIX function of the repeater LAN terminal are enabled. Normally, use **Auto-Negotiation/Auto-MDIX (LAN)** by enabling the configuration.
Disable	If Auto-Negotiation/Auto-MDIX (LAN) is disabled, the Auto-Negotiation function and Auto-MDIX function of the repeater LAN terminal are disabled. The repeater behaves with 100 Mbps, Full Duplex fixed.

Configuration using KPG-D7

- Configuring **Auto-Negotiation/Auto-MDIX (LAN)** to be enabled or disabled (Edit > Optional Features > Other > Auto-Negotiation/Auto-MDIX (LAN))

USB

Connects a USB accessory.

A headset can be connected to monitor the repeat audio or to communicate on a trial basis with the transceivers in a system.

1.2 Rear

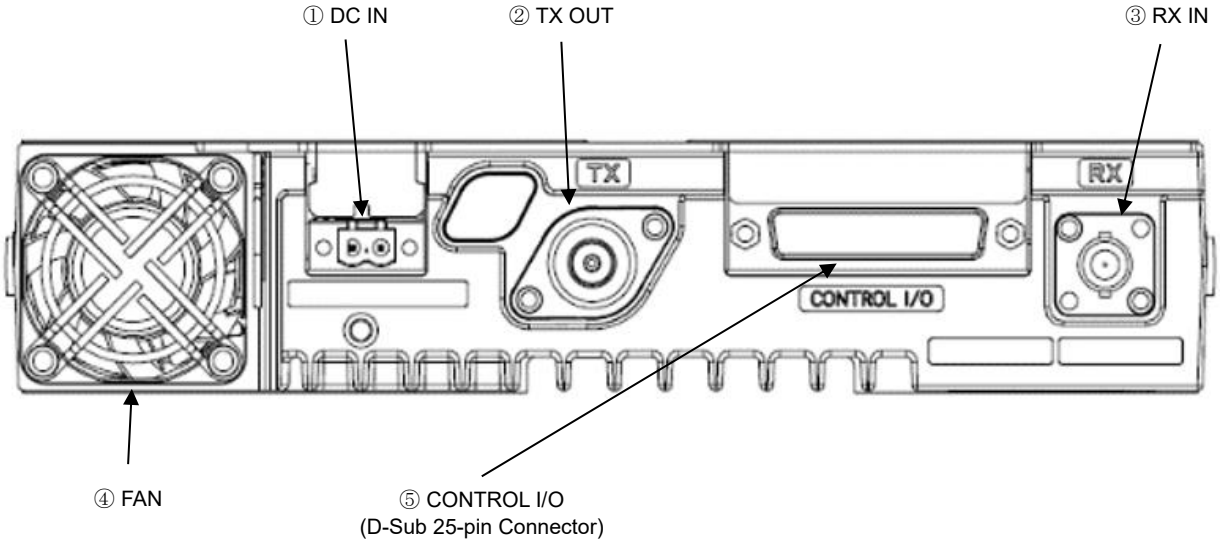


Figure 1-2 Rear

Table 1-3 Rear

No.	Name of Each Part	Description
①	DC IN	Connects DC 13.2 V power source.
②	TX OUT	Connects a transmitting antenna or a duplexer.
③	RX IN	Connects a receiving antenna or a duplexer.
④	FAN	This is a cooling fan that discharges the heat in the repeater generated due to transmission. This cooling fan rotates at the same time as turning on the repeater. If the temperature sensor senses the temperature below the reference temperature, the fan stops spinning.
⑤	CONTROL I/O (D-Sub 25-pin Connector)	Connects an external device and an external controller.

CONTROL I/O (D-Sub 25-pin Connector)

CONTROL I/O (D-Sub 25-pin Connector) is a connector for connecting an external device to the repeater.

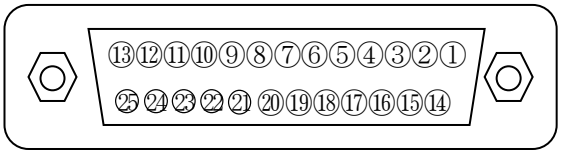


Figure 1-3 CONTROL I/O (D-Sub 25-pin Connector)

The following are the functions of **CONTROL I/O (D-Sub 25-pin Connector)**:

Table 1-4 Functions of CONTROL I/O (D-Sub 25-pin Connector)

Pin No.	Terminal Name	Function
Pin 1	NC	Not Used
	RSSI	RSSI Voltage (Circuit change required) *
	RESET	Reset Input (Circuit change required) *
Pin 2	RXD2	UART
Pin 3	TXD2	UART
Pin 4	AUXI 1	Programmable Function Input 1
	CTS	UART (Circuit change required) *
Pin 5	AUXI 2	Programmable Function Input 2
	RTS	UART (Circuit change required) *
Pin 6	AUXI 3	Programmable Function Input 3
Pin 7	DG	Digital Ground
Pin 8	TD	TX Data input
Pin 9	TA	TX Audio input
Pin 10	RD	RX Data output
Pin 11	RA	RX Audio output
Pin 12	RXG	RX Ground
Pin 13	NC	Not Used
Pin 14	AO1	Programmable Function Output 1
Pin 15	EXT. MON	External Monitor SW input
Pin 16	EXT. PTT	External PTT input
Pin 17	SC	Squelch Control Output
Pin 18	AO2	Programmable Function Output 2
Pin 19	TXG	TX Ground
Pin 20	AUXIO 1	Programmable Function Input/Output 1
Pin 21	AUXIO 2	Programmable Function Input/Output 2
Pin 22	AUXIO 3	Programmable Function Input/Output 3
Pin 23	AUXIO 4	Programmable Function Input/Output 4
Pin 24	AUXIO 5	Programmable Function Input/Output 5
Pin 25	AUXIO 6	Programmable Function Input/Output 6

* Refer to the service manual for the circuit change.

1.3 OLED display

NORMAL display screen

This screen is displayed when the repeater starts up in the user mode.

The status is indicated by an icon on the first line, and the icon position is fixed.

The second line displays the information to identify the repeater.

(Image: Example showing all except the warning icon)

Error display screen

If an Error occurs, the Error display is displayed with precedence over the NORMAL display. The Status LED flashes red if an Error occurs, but details can be confirmed on this screen.

The warning icon blinks at the right end of the first line.

When the Knob is operated at this time, the display changes to the NORMAL display, and the warning icon is lit.

The second line displays the information to identify the error. Operating the Knob restores the NORMAL display, but the warning icon continues blinking until the Error is cleared.

In addition, an Error continues until the Screen Off Timer expires unless the Knob operation is performed. If multiple Errors occur at the same time, the information display for identifying an Error is rotated according to the fixed timer value.

(Image)

Screen when sending by the External PTT

The transmission type is displayed during the transmission by the External PTT (the second line).

(Image)

MENU display screen

The background color of the character is reversed to indicate the item selection.

(Image)

OLED display lit/unlit behavior

Operating the Knob when the OLED display is unlit turns the OLED display on and the NORMAL display appears.

While the NORMAL or MENU display appears, the OLED display turns off if the Knob is not operated during the Screen Off Timer.

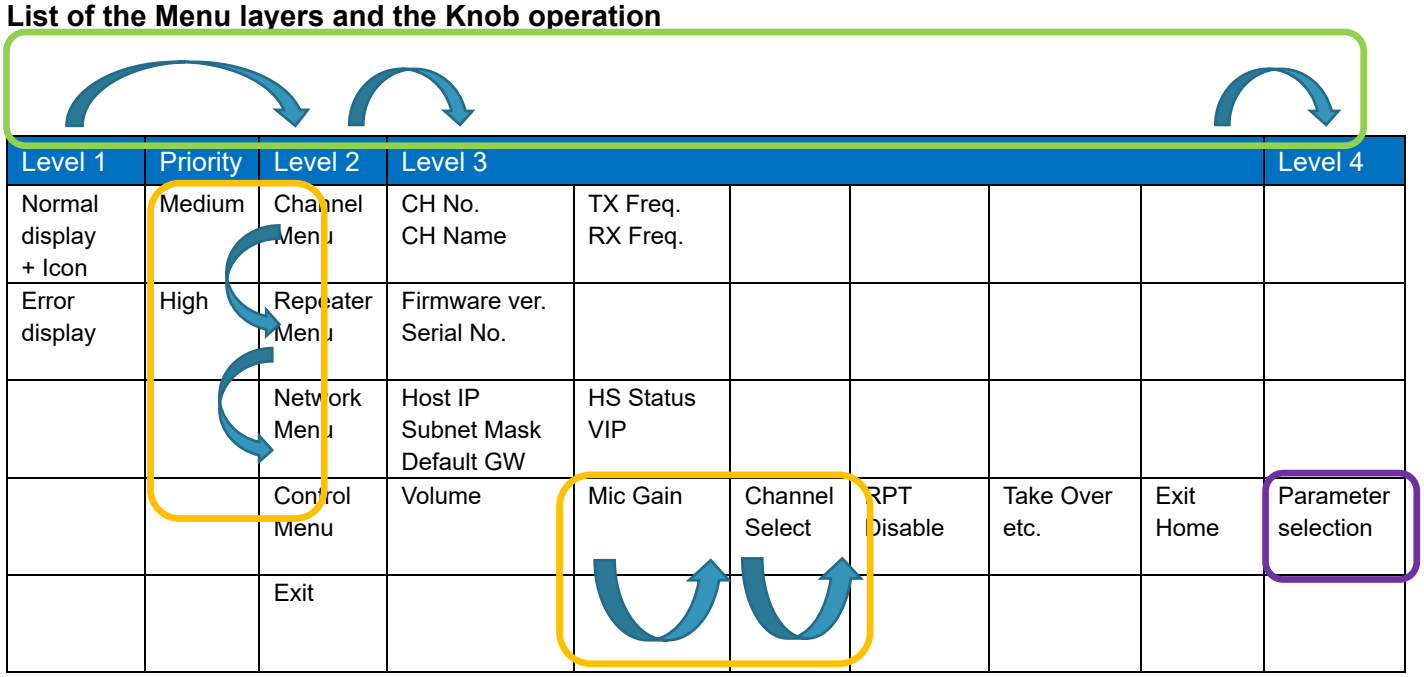
In addition, if a new error occurs, the OLED display automatically lights and the Screen Off Timer starts again.

Knob operation during Normal display

If the Knob operation occurs during the Normal display, the Menu list is displayed.

The Menu is displayed by operating the Knob even during transmission. The Menu operation can also be performed.

List of the Menu layers and the Knob operation



Level 1	Priority	Level 2	Level 3						Level 4
Normal display + Icon	Medium	Channel Menu	CH No. CH Name	TX Freq. RX Freq.					
Error display	High	Repeater Menu	Firmware ver. Serial No.						
		Network Menu	Host IP Subnet Mask Default GW	HS Status VIP					
		Control Menu	Volume	Mic Gain	Channel Select	RPT Disable	Take Over etc.	Exit Home	Parameter selection
		Exit							

Action	Advance	Return	Last ⇔ First	Decision	Once in Sleep	Knob's Push Hold operation
Move between Level	Push	See Table 1-4	None	N/A	Move to Level 1	Move to Level 1
Move within Level	Rotate counterclockwise	Rotate clockwise	None	N/A	Move to Level 1	N/A
Parameter selection	Rotate counterclockwise	Rotate clockwise	None	See Table 1-5	Move to Level 1	Move to Level 1

Figure 1-4 Knob

Push Hold of the Knob

If the Knob is pressed for 500 ms or longer, Hold occurs. If it is less than 500 ms, Push occurs.

A short cut to the Normal display becomes possible by Hold.

Table 1-5 The Return Operation for Migration between Levels

Display Level	Category	Description	Operation	Action
3	Information Display	Channel Information	Push	Returns to Level 2.
		Repeater Information		
		Network Information		
	Menu Selection	Control Menu	Back	
			Home	Returns to Level 1.
4	Parameter Selection	Items for which the parameter change is executed according to the Knob rotation	Push	Returns to Level 3.
		Items for which the parameter change is executed by Push	Exit	

Note

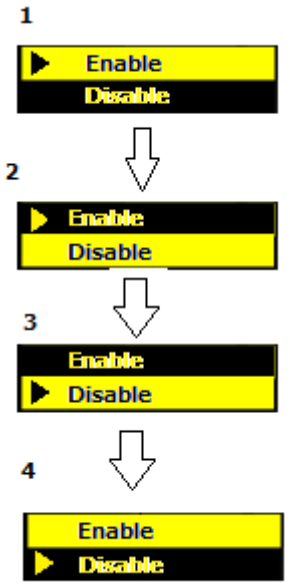
- The Push operation is disabled while the power is turned ON by Test PTT Control (the PTT control for a voice call used for testing). The displayed Level does not return to Level 3.

Table 1-6 Operation for Determination at Level 4

Display Level	Category	Description	Operation for Determination	Action
4	Items for which the parameter change is executed according to the Knob rotation	Test PTT Control	Knob Rotation	Executes by setting the position to ON.
		Volume Adjust		Changes a level by adjusting the relative position of the Knob.
		MIC Gain		
		Brightness		
	Items for which the parameter change is executed by Push	Channel Select	Push	Changes by hovering over the value selected by the Knob and performing the Push operation.
		Slot Select		
		Repeat Disable		
		Take Over		
		Monitor On		
		Squelch On		
		Remote Access Control		
		Scroll Direction		
	Items for which the process is executed by Push	Power Off		Executes.
		USB Port Recovery		

The display during the change operation for the parameters of the items for which the parameter is changed by Push is explained.

Example: When the parameter is changed from Repeat Enable to Repeat Disable

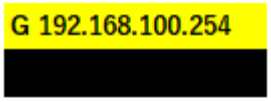


1. When entering the Repeat Disable menu during Repeat Enable
2. If Disable is selected by the Knob rotation, the background color inversion moves to Disable.
3. By pressing the Knob, the icon moves to Disable, and the parameter becomes Repeat Disable.
4. When entering the Repeat Disable menu again

The operations when editing Network Information are explained.

<table>
<tr>
<td>
1


2


3


4


5


</td>
<td>
When the Knob is pressed after Edit is selected in Network Information, the selection menu shown to the left is displayed.

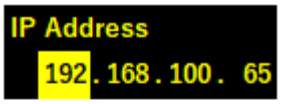
1. By pressing the Knob while Host IP Address is selected, migration to the Host IP Address edit screen occurs.

2. By pressing the Knob while Subnet Mask is selected, migration to the Subnet Mask edit screen occurs.

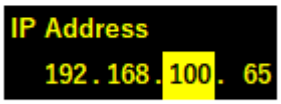
3. By pressing the Knob while Default Gateway is selected, migration to the Default Gateway edit screen occurs.

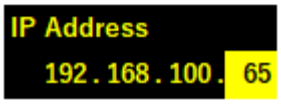
4. By pressing the Knob while Save is selected, the combination of the edited Host IP Address, Subnet Mask, and Default Gateway configurations is checked, the error is displayed when there is a problem, and the configurations are saved and reflected if there are no problems.

5. By pressing the Knob while Cancel is selected, edits are discarded and the Network Information display is restored.
</td>
</tr>
<tr>
<td>
Example of the Host IP Address edit screen

1


2


3


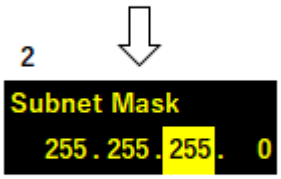
4


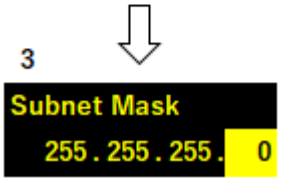
</td>
<td>
Host IP Address edit screen/ Default Gateway edit screen

Host IP Address and Default Gateway are configured in the range from 1.0.0.0 to 223.255.255.255.
However, the following addresses cannot be configured:
・ 127.***.***.***
・ 128.000.***.***
・ 191.255.***.***
・ 192.000.001.***
・ 223.255.255.***

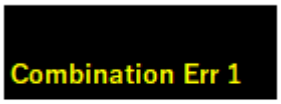
Configuration is done in order from the 1st octet for Host IP Address and Default Gateway.
・ The value of the selected octet is changed by rotating the Knob.
・ Selection migrates to the next octet by pressing the Knob.
・ If an unavailable address is selected, it is skipped or adjusted.
・ By holding the Knob while the 2nd octet or later is selected, the 1st octet can be restored again.
</td>
</tr>
</table>

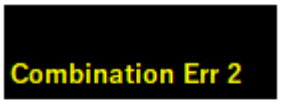
<table>
<tr>
<td>1
 

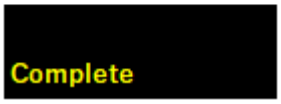
2
 

3
 
</td>
<td>Subnet Mask edit screen

Subnet Mask is configured in the range from 255.0.0.0 to 255.255.255.252.

Because the 1st octet is fixed at 255, configuration is done in order from the 2nd octet.
・ The value of the selected octet is changed by rotating the Knob.
・ Selection migrates to the next octet by pressing the Knob.
・ If an unavailable address is selected, it is skipped or adjusted.
・ If the value other than 255 is configured in an octet, 0 is configured in subsequent octets and the edited contents are confirmed.
・ By holding the Knob while the 3rd octet or later is selected, the 2nd octet can be restored again.</td>
</tr>
<tr>
<td>1
 

2
 

3
 
</td>
<td>Combination check of the Host IP Address and Subnet Mask configurations on save

1. If all bits of the host address in Host IP Address are 1 (the broadcast address), “Combination Err 1” is displayed for 2 seconds and the previous display is restored.

2. If all bits of the host address in Host IP Address are 0 (the network address), “Combination Err 2” is displayed for 2 seconds and the previous display is restored.

3. The repeater restarts to reflect the configuration after “Complete” is displayed if nothing is wrong with the combination.</td>
</tr>
</table>

Icon List

The following are the icons which are used on the OLED display:

Table 1-7 Icon List

Icon	NORMAL / MENU	Function	Remarks
	NORMAL	Electric field strength  : Strong electric field  : Medium electric field  : Weak electric field  : Very weak electric field  : No carrier	The electric field is displayed when RX is received. When a carrier is being detected, the electric field strength is displayed even if the signal is not the waited signal. When a DMR signal is received on a DMR standby channel, the electric field strength of Slot with the stronger electric field strength is displayed.
	NORMAL	TX Power	 : High  : Low Not displayed when the TX frequency is not configured.
	NORMAL	Headset connected	Lights when the headset is connected.
	NORMAL	Monitor ON	Lights when the monitor is turned on.
	NORMAL	Take Over	Lights when Take Over is enabled.
	NORMAL	Repeat Disable	Lights in the Repeat Disable state.
	ERROR	Error state present	Lights when the Error state is present.
	Control	Volume	1 to 32 The received audio volume of the headset is adjusted between 1 to 32. The received audio volume of the headset cannot be adjusted to 0 (zero).
	Control	Mic Gain	1 to 32 The microphone volume of the headset is adjusted between 1 to 32. The microphone volume of the headset cannot be adjusted to 0 (zero).
	Control	Displayed at the beginning of the line of the selected value.	-

Menu List

The following OLED display menus are available if the repeater starts in the user mode:

Table 1-8 Menu List

Layer	Item	Description	Remarks
Channel Information	Channel Number	Displaying the channel number	Read Only
	Channel Name	Displaying the channel name	Read Only
	RX Frequency	Displaying the RX frequency MHz	Read Only
	TX Frequency	Displaying the TX frequency MHz If the TX frequency is not configured, "TX No Freq" is displayed.	Read Only
	Operation Mode	Displaying Operation Mode	Read Only
Repeater Information	Model Name	Model name	Read Only
	Market Code	Market code	Read Only
	Serial Number	Serial number of the main unit	Read Only
	NXDN ESN	Displaying NXDN ESN	Read Only
	Firmware Version	Firmware version	Read Only
	License	Type of the assigned license	Read Only
	Hot Standby Mode	Hot Standby: Main/Sub	Read Only
Network Information	Host IP Address	Displaying the IP address of the main unit	Read Only
	Subnet Mask	Displaying the subnet mask	Read Only
	Default Gateway	Displaying the Default Gateway address	Read Only
	MAC Address	Displaying the MAC address	Read Only
	Hot Standby Status	HSB Active/ HSB Standby/ HSB Failsoft If the Valid of Hot Standby is "OFF" The line is not displayed.	Read Only
	Virtual IP Address	Displaying the VIP If the Valid of Hot Standby is "OFF" The line is not displayed.	Read Only
	Beacon Operating Status	Beacon Master/ Member/ Local/ None If Beacon is disabled, the line is not displayed.	Read Only
	NTP Synchronized Status	Synchronized: OK Synchronized: NG The line is not displayed if Valid is disabled for an NTP Client.	Read Only
Control	Test PTT Control	PTT control for a voice call used for testing	Upper row: Off Lower row: On

Layer	Item	Description	Remarks
	Volume Adjust	Adjusting the received audio volume of the headset	Clockwise rotation: Up Counterclockwise rotation: Down
	MIC Gain	Adjusting the microphone gain of the headset	Clockwise rotation: Up Counterclockwise rotation: Down
	Channel Select	Channel switching	Clockwise rotation: Up Counterclockwise rotation: Down
	Slot Select	Slot switching	Only in DMR Upper row: Slot 1 Lower row: Slot 2
	Repeat Disable	Refer to Repeat Disable for details of the function.	Upper row: Enable Lower row: Disable
	Take Over	Refer to Take Over for details of the function.	Upper row: Off Lower row: On
	Monitor	Refer to Monitor for details of the function.	Upper row: Off Lower row: On
	Squelch Off	Refer to Squelch for details of the function.	Upper row: Off Lower row: On
	USB Port Recovery	Recovering from stoppage of the functions due to an overcurrent of USB port (Displayed if an overcurrent of USB port is detected)	Upper row: Cancel Lower row: Execute
	Remote Access Control	Disabling the user operations via the network	Clockwise rotation: On Counterclockwise rotation: Off
	Brightness	Adjusting the brightness of the OLED display	Clockwise rotation: Up Counterclockwise rotation: Down
	Scroll Direction	Switches the vertical scroll direction of OLED display Menu when rotating the Knob. *1	Upper row: Direction 1 Lower row: Direction 2
	Power Off	Powering off the power source (Displayed if Power Control is enabled)	Upper row: Cancel Lower row: Execute
	Back	Returns to the previous Level.	-
	Home	Returns to Level 1.	-
Error Information	Refer to the Error list.	Refer to the Error list for details.	-

Layer	Item	Description	Remarks
Exit	Exit	Returns to the previous Level.	-

*1 The background color inversion moves up if the Knob is rotated clockwise in Direction 1 (default), and the background color inversion moves down if the Knob is rotated clockwise in Direction 2.

Only the following OLED display menus are available if the repeater starts with an Unprogrammed error:

Table 1-9 Menu List (When an Unprogrammed Error Occurs)

Layer	Item	Description	Remarks
Repeater Information	Model Name	Model name	Read Only
	Market Code	Market code	Read Only
	Serial Number	Serial number of the main unit	Read Only
	NXDN ESN	Displaying NXDN ESN	Read Only
	Firmware Version	Firmware version	Read Only
	License	Type of the assigned license	Read Only
Network Information	Host IP Address	Displaying the IP address of the main unit	Read Only
	Subnet Mask	Displaying the subnet mask	Read Only
	Default Gateway	Displaying the Default Gateway address	Read Only
	MAC Address	Displaying the MAC address	Read Only
	Edit *1	Moves to the edit menu of Host IP Address, Subnet Mask, and Default Gateway if Edit is selected and the Knob is pressed.	-
Control	Scroll Direction	Switches the vertical scroll direction of OLED display Menu when rotating the Knob. *2	Upper row: Direction 1 Lower row: Direction 2
	Power Off	Powering off the power source	Upper row: Cancel Lower row: Execute
	Back	Returns to the previous Level.	-
	Home	Returns to the Unprogrammed error display.	-
Exit	Exit	Returns to the Unprogrammed error display.	-

*1 Displayed only when the admin password of the Web Tool is not configured.

*2 The background color inversion moves up if the Knob is rotated clockwise in Direction 1 (default), and the background color inversion moves down if the Knob is rotated clockwise in Direction 2.

If the repeater starts with an Unprogrammed error, the repeater normally enters the state where Knob Lock is deactivated and the state where Power Control is enabled, and Screen Off Timer does not function.

Control function that cannot be executed due to the status

Test PTT Control

If the status is TX Disable or Local TX Disable, or if the transmission by PTT with a higher priority than Test PTT is being executed, transmission cannot be done with Test PTT even if Test PTT is enabled. In this case, when Test PTT Control is on by rotating the Knob, the background color inversion migrates to the side for on, but the icon remains displayed on the side for off. When transmission becomes possible by Test PTT after TX Disable and Local TX Disable are reset or the transmission by PTT having a higher priority than Test PTT is finished while Test PTT remains on, the icon migrates to the side for on, and the transmission by Test PTT starts.

When TX Disable or Local TX Disable is enabled during the transmission by Test PTT and the transmission by PTT having a higher priority than Test PTT is to start, the background color inversion remains on the side for on, but the icon migrates to the side for off, and the transmission by Test PTT is finished.
Even if Test PTT remains on, the OLED display turns off when no Knob operation occurs and Screen Off Timer expires while transmission by Test PTT is disabled. At this time, Test PTT is disabled.
Refer to Screen Off for details of the OLED display lighting during transmission by Test PTT.

Slot Select

During transmission by External PTT, a slot can be selected by rotating the Knob, but the Push operation is disabled and changing a slot cannot be performed. A slot cannot be changed also during transmission by Test PTT. When moving from the Test PTT control, Test PTT always becomes off; therefore, Slot Select is not operated by using the Knob during transmission with Test PTT.

Display List

Table 1-10 Channel Name Display (Normal)

Item	Display (* is the character configured in Channel Name of the FPU)														Remarks
Channel Name	*	*	*	*	*	*	*	*	*	*	*	*	*	*	-

In the Normal display, the icon is displayed in the upper row and Ch Name is displayed in the lower row.

Table 1-11 Progress Status Display

Item	Display														Remarks
Data Upload	U	p	l	o	a	d	i	n	g						-
	C	o	m	p	l	e	t	e							-

In the Normal display, the icon is displayed in the upper row and the above noted Progress Status is displayed in the lower row.

Progress Status is the function to display the text to indicate transferring the FPU data and firmware or the transfer completion on the OLED display.

Table 1-12 Knob Lock Display

Item	Display														Remarks
Indication	K	n	o	b		L	o	c	k						-

If the Knob is operated when Knob Lock is configured, the warning message indicated above is displayed in the lower row for 1 second.

Table 1-13 Adjusting Brightness Display

Item	Display														Remarks
Indication	L	E	V	E	L		3	2							-

When Brightness is being adjusted, the background brightness changes according to the Knob rotation, and the Level is displayed in the lower row.

Table 1-14 External PTT Display

Item	Display														Remarks
Indication	E	x	t	e	r	n	a	l		P	T	T			-

When transmission by External PTT starts, the transmission type is displayed in the lower row.

Table 1-15 Standby Display

Item	Display														Remarks
Indication	S	t	a	n	d	b	y								-

Standby is displayed in the lower row while the repeater software is stopped after Service Stop (the function to stop the repeater service) is executed from the Web Tool.

Table 1-16 Factory Reset Display

Item	Display														Remarks
Indication	F	a	c	t	o	r	y		R	e	s	e	t		-

When entering the Factory Reset mode, Factory Reset is displayed in the lower row.

Table 1-17 Display During Shut Down

Item	Display														Remarks
Power Off	S	h	u	t	t	i	n	g		d	o	w	n		-

Shutting down is displayed in the lower row while shutting down by the Power Off operation in Menu.

Table 1-18 Display During Firmware Update

Item	Display														Remarks
Firmware Update	F	i	r	m		U	p	d	a	t	i	n	g		-

Firm Updating is displayed in the lower row while the firmware is rewritten by the repeater after Firmware Update is executed from the Web Tool.

Table 1-19 Display During Test Mode

Item	Display														Remarks
Firmware Update	T	e	s	t		M	o	d	e						-

During Test Mode, Test Mode is displayed in the upper row.

Table 1-20 Display During PC Programming Mode

Item	Display														Remarks
Firmware Update	P	C		P	r	o	g	r	a	m	m	i	n	g	-

PC Programming is displayed in the upper row while Read/Write of Tuning Data or the license authentication by KPT-300LMC is being performed.

Table 1-21 Error Display

Item	Display	Remarks
E001	Unprogrammed	-
E002	USB Overcurrent	-
E003	TX Freq Blank	-
E004	ESN Blank	-
E005	Firmware Error	-
E006	Feature Error	-
E007	Force FirmProg	-
E008	DSP Error 1	-
E009	DSP Error 2	-
E102	HSB LAN Error	-
E103	Beacon Error	-
E201	Fan Error	-
E202	PWR Sup Error	-
E204	RX PLL Unlock	-
E205	TX PLL Unlock	-
E206	HPA Error	-
E207	Drive Temp Error	-
E208	TX Temp Error	-
E209	TCXO Temp Error	-
E210	HPA Temp Error	-
E211	IF IC Error	-

If multiple errors occur at the same time, the error display changes periodically.

Table 1-22 MENU Display

Item	Display														Remarks
Channel Information	C	h	a	n	n	e	l		I	n	f	o			-
Channel Number	C	h		3	2										For Ch 32. The number after a single space is left-aligned.
Channel Name	*	*	*	*	*	*	*	*	*	*	*	*	*	*	The text configured in Ch Name of the FPU is displayed.
RX Frequency	R	X	1	3	6.	0	0	6	2	5	0	M	H	z	For 136.006250MHz
TX Frequency	T	X	1	3	6.	0	0	6	2	5	0	M	H	z	For 136.006250MHz
	T	X		N	o		F	r	e	q					When the TX frequency is not configured
Operation Mode	R	e	p	e	a	t									-
	D	u	p	l	e	x									-
	S	i	m	p	l	e	x								-
	T	A		D	i	r	e	c	t						-
															-
															-
															-
Repeater Information	R	e	p	e	a	t	e	r		I	n	f	o		-
Firmware Version	F	i	r	m		V	1.	0	0.	0	0				-
Model Name	N	X	R	-	1	7	0	0							For NXR-1700
	N	X	R	-	1	8	0	0							For NXR-1800
Market Code	M	a	r	k	e	t		C	o	d	e		E		-
Serial Number	S	/	N		B	1	2	3	4	5	6	7			For B1234567
NXDN ESN	N		6	8	0	1	0	0	0	0	0	0	0	1	For 680100000001
Hot Standby Mode	H	S	B		M	a	i	n							-
	H	S	B		S	u	b								-
License	D	M	R		L	i	c.								-
	N	X	D	N		L	i	c.							-
	C	o	n	v		I	P		L	i	c.				-
															-
	S	I	P		P	h	o	n	e		L	i	c.		-
Network Information	N	e	t	w	o	r	k		I	n	f	o			-
Host IP Address	A		1	7	2.	1	6.	0.	6	5					For 172. 16. 0. 65
Subnet Mask	S		2	5	5.	2	5	5.	2	5	5.	1	9	2	For 255. 255. 255. 192
MAC Address	M		E	0	D	A	D	C	0	1	0	2	0	3	For E0:DA:DC:01:02:03
Default Gateway	G		1	7	2.	1	6.	0.	1	2	6				For 172. 16. 0. 126

Item	Display														Remarks
Hot Standby Status	H	S	B		A	c	t	i	v	e					-
	H	S	B		S	t	a	n	d	b	y				-
	H	S	B		F	a	i	l	s	o	f	t			-
Virtual IP Address	V		1	7	2.	1	6.	0.	6	5					Displays only if VIP is enabled.
Beacon Operating Status	B	e	a	c	o	n		M	a	s	t	e	r		-
	B	e	a	c	o	n		M	e	m	b	e	r		-
	B	e	a	c	o	n		L	o	c	a	l			-
	B	e	a	c	o	n		N	o	n	e				-
NTP Synchronized Status	N	T	P		S	y	n	c		O	K				-
	N	T	P		S	y	n	c		N	G				-
Control	C	o	n	t	r	o	l								-
Test PTT Control	T	e	s	t		P	T	T							-
Volume Adjust	V	o	l	u	m	e		A	d	j	u	s	t		-
Mic Gain	M	i	c		G	a	i	n							-
Channel Select	C	h	a	n	n	e	l		S	e	l	e	c	t	-
Slot Select	S	l	o	t		S	e	l	e	c	t				-
Repeat Disable	R	e	p	e	a	t									-
Take Over	T	a	k	e		O	v	e	r						-
Monitor	M	o	n	i	t	o	r								-
Squelch	S	q	u	e	l	c	h								-
USB Port Recovery	U	S	B		R	e	c	o	v	e	r	y			Displays if overcurrent is detected on the USB port.
Remote Access Control	R	e	m	o	t	e		A	c	c	e	s	s		-
Brightness	B	r	i	g	h	t	n	e	s	s					-
Power Off	P	o	w	e	r		O	f	f						Displays only if Power Control configuration is valid.
Exit	E	x	i	t											-
Back	B	a	c	k											-
Home	H	o	m	e											-
	▶		C	h			3	2							Display by Channel Select For Ch32. The number after two spaces is left-aligned.
	▶		O	n											For On. Displays by selecting Take Over, Monitor, Squelch, Remote Access Control, etc.
	▶		O	f	f										For Off. Displays by selecting Take Over, Monitor, Squelch, Remote Access Control, etc.
	▶		E	n	a	b	l	e							For Enable. Displays by selecting Repeat.
	▶		D	i	s	a	b	l	e						For Disable. Displays by selecting Repeat.

Item	Display	Remarks
	▶ C a n c e l	For Cancel. Displays by selecting Power Off, selecting Factory Reset.
	▶ E x e c u t e	For Execute. Displays by selecting Power Off, selecting USB Port Recovery, and by Factory Reset.
	▶ S l o t 1	For Slot 1. Displays by selecting Slot Select.
	▶ S l o t 2	For Slot 2. Displays by selecting Slot Select.

Display priority

The following is the display priority when the startup status is Level 3 (refer to Startup Status):

Upper row: MENU display > Icon display

Lower row: Progress Status display > MENU display > Error display > External PTT display > Normal display

When migrating from the MENU display to the Normal display, External PTT is displayed if during transmission by External PTT.

Screen Off

To reduce the brightness reduction caused by the lighting life of the OLED display, the OLED display turns off if the Knob has not been operated for a certain period of time.

The time until the OLED display turns off can be configured. The OLED display turns on when the Knob is operated while the OLED display turns off.

Table 1-23 Screen Off

Configuration	Description
Screen Off Timer	The duration from the last Knob operation for the OLED display to change from on to off can be configured. Neither “Off” nor “0” can be configured. Screen Off Timer does not function during transmission by Test PTT. The OLED display remains on during transmission by Test PTT even without operation. Screen Off Timer starts after transmission by Test PTT ends.

Progress Status

The text to indicate transferring the FPU data and firmware or the transfer completion is displayed on the OLED display.

Startup Status

The startup status is displayed on the OLED display. (Refer to Display on the OLED Display.)

Table 1-24 Startup Status-1

List of Status Migration by Each Operation		Status Before Operation			
		DC Off	DC On		
			Power Off by Power Control	Power On by Power Control	
				Service Stop	Service Start
Operation	Power Off by Power Control	Disabled	Disabled	Level1	Level1
	Power On by Power Control	Disabled	→	Standby	Level3
	Service Stop by the Web Tool	Disabled	Disabled	Disabled	Standby
	Service Start by the Web Tool	Disabled	Disabled	Level3	Disabled
	Service Restart by the Web Tool	Disabled	Disabled	Level3	Standby -> Level3
	Service Reboot by the Web Tool	Disabled	Disabled	Level1 -> Level3	Level1 -> Level3
	DC On	→	Level1	Standby	Level3

Table 1-25 Startup Status-2

Conditions	Description	Display on the OLED Display	Screen Off Timer
Standby	RF function, Knob function disabled	Standby display	Enabled
Level3	NXR-1700 is activated.	Normal display, etc.	Enabled
Level2	End of Feature Error confirmation	■■■■	N/A
	NXR-1700 is activated.	■■■	N/A
Level1.5 (↑↓)	Kernel is activated.	■■	N/A
Level1	FPGA is activated.	■	N/A

After migrating to Level 3, the indication blinks for 2 seconds for PLL Lock. The service can forcibly be started by pressing the Knob; however, if the service is started while PLL is not locked, a PLL Unlock error is displayed.

Other than the FPU data and the data configured by the Web Tool, the data retention range of the information that can be changed by the user operation is as follows:

Table 1-26 Startup Status-3

Item	Operation Target	Action
Volume Adjust	OLED display Menu	The memory is retained even when the external power is turned off; however, the memory is initialized when the FPU data is written.
MIC Gain	OLED display Menu	
Brightness	OLED display Menu	
Channel Select	OLED display Menu, Web Tool	
Slot Select of all Channels	OLED display Menu, Web Tool	
Power On/Off	Knob , OLED display Menu	
Knob Lock	Web Tool	
Low Power	Web Tool	
Embedded Message with Password (Message)	FPU	The memory is retained even if the external power is turned off or even if the FPU data is written.
Embedded Message with Password (Password)	FPU	
Service Status	Web Tool	
Scroll Direction	OLED display Menu	
Test PTT Control	OLED display Menu	Initialized if the external power is turned off or if the FPU is written.
Repeat Disable	OLED display Menu, Web Tool	
Take Over	OLED display Menu, Web Tool	
Monitor	OLED display Menu, Web Tool	
Squelch	OLED display Menu, Web Tool	
Recovery from Remote Access Control	OLED display Menu	
Decode Signaling	Web Tool	
Encode Signaling	Web Tool	
Call Hangtime	Web Tool	
Channel Hangtime	Web Tool	
Hold Time	Web Tool	
TOT	Web Tool	
TX	Web Tool	

Item	Operation Target	Action
Local TX	Web Tool	
Test Tone	Web Tool	
Voting Tone	Web Tool	
CW ID	Web Tool	
AUX Output Control	Web Tool	
Active Status	Web Tool	

1.4 LED

Table 1-27 LED

LED	Conditions	Description
TX1/ TX2	When the transmission is executed Lighting red	Functions as follows during the DMR transmission: When communicating with the transceiver in Slot 1: TX1 LED lights red. When communicating with the transceiver in Slot 2: TX2 LED lights red. When communicating in both slots: TX1 LED and TX2 LED light red. Also when transmitting Idle in both slots, TX1 LED and TX2 LED light red. During analog transmission and NXDN transmission, TX1 LED and TX2 LED light red.
RX1/ RX2	When the reception occurs Lighting green	On a DMR standby channel, RX1 LED lights green while Slot 1 is receiving a receivable CC matching signal. RX2 LED lights green while Slot 2 is receiving a receivable CC matching signal. However, even if CC matches, RX1/RX2 LED does not light when a Wake Up Message is received. On a mixed channel, if CC matches, RX1/RX2 LED does not light when a Wake Up Message is received. On an analog standby channel, RX1 LED lights green while a carrier is being detected. RX2 LED also lights green while a signaling matching signal is being received. On an NXDN standby channel, RX1 LED lights green while a carrier is being detected. RX2 LED also lights green while a signaling matching signal is being received.
STATUS	When an error occurs Flashing red	Flashes red while any error occurs, such as the PLL unlock or FAN error. The details of the error can be confirmed on the OLED display. Refer to “OLED display” for details.
POWER	While power is on Lighting green	Lights green while power is supplied within the operating range and the power is turned on. The LED turns off when the power supply voltage is outside of the operating range.

TX1/ TX2 LED

Lighting during communication continues for the duration of Call Hangtime and Data Hangtime.

TX1 LED and TX2 LED light red while a Warning Tone for Test Tone, Beacon, and Power Supply Monitor is being transmitted.

RX1/ RX2 LED

On an analog standby channel, the signal strength of the carrier by which RX1/RX2 LED lights varies with squelch control and squelch level. When squelch is off, RX1 LED always lights green.

1.5 KNOB

Power On/Off

The Power On/Off control is performed according to the Power Control configuration.

Table 1-28 Configuration of Power Control

Configuration FPU	Description
Disable	When energized at the rated voltage (13.2 V, the power supply voltage range DC 10.8 V to DC 15.6 V), the Power On behavior is performed automatically. The Knob operation cannot be used to Power Off or On.
Enable	While in the Power Off state, Power On is performed by pressing the Knob. When in the Power On state, Power Off is available from the OLED display menu.

Note

- To turn the power on and off by the Knob operation, **Power Control** needs to be enabled by the FPU.

Configuration using KPG-D7

- Configuring **Power Control** (Edit > Optional Features > Other > Power Control)

2 GETTING STARTED

2.1 Connecting the Repeater to a PC

Communication security

Writing the configuration data to the repeater and IP communications including Remote Monitor and Remote Control can be secured with encryption.

Table 2-1 Details of Communications

Usage	Protocol
Web Tool	HTTPS
Multi Loader	SFTP
FPU	Proprietary encryption

Note

- The factory default HTTPS is not enabled. If a self-signed certificate has been issued and applied, or a certificate purchased from an external certificate authority has been installed and applied, the HTTPS communication is automatically enabled. The HTTP communication can be disabled if HTTPS is enabled.

2.2 Writing the Configuration Data to the Repeater

Configuration items using the FPU

The repeater can read data from and write data to the FPU via the IP.

The following items can be configured by using the FPU:

・Channel Information
・Optional Feature
・Protocol Options
・Function Port
・Multiple Encode/Decode List
・User List
・Console List
・Conventional IP Network
・Site Group Table
・Test Frequency
・Embedded Message
・Embedded Message with Password
・IP Interface
・Voice Logger List
・SIP Phone
・SNMP Settings

Note

- User List and Console List can also be configured from the Web Tool. However, only overwriting can be performed from the Web Tool for the User List and Console List data configured by using the FPU.

Configuration items using the Web Tool

The repeater supports the configuration of the IP address by using the Web Tool (configurable only by using the Web Tool).

The following items can be configured by using the Web Tool:

・User List
・Console List
・Time Setting
・Own IP Setting
・QoS
・Hot Standby
・Security
・Format
・Timer
・Administrator

The following IP addresses are preset at the time of shipment from the factory:

- IP Address: 192.168.0.1
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.0.254

The default configuration of the user name and password of the Web Tool is as follows. Because the password is not configured under the default configuration, change the password after logging in to the Web Tool as required.

- User Name: admin
- Password: (described separately)

About the Password When Logging in to the Web Tool

When the admin password is not configured such as during access for the first time, the screen prompting for the configuration of the password is displayed by entering only User Name as admin and clicking the “Login” button. Refer to User Password about the screen prompting for the configuration of a password. When the password is configured in **User Password,** the state where the Web Tool is logged in occurs. From next time onwards, logging in is done by entering the configured password in the login screen (Figure 2-2). Refer to the User Password section of Basic Configuration for the details of the Password configuration.

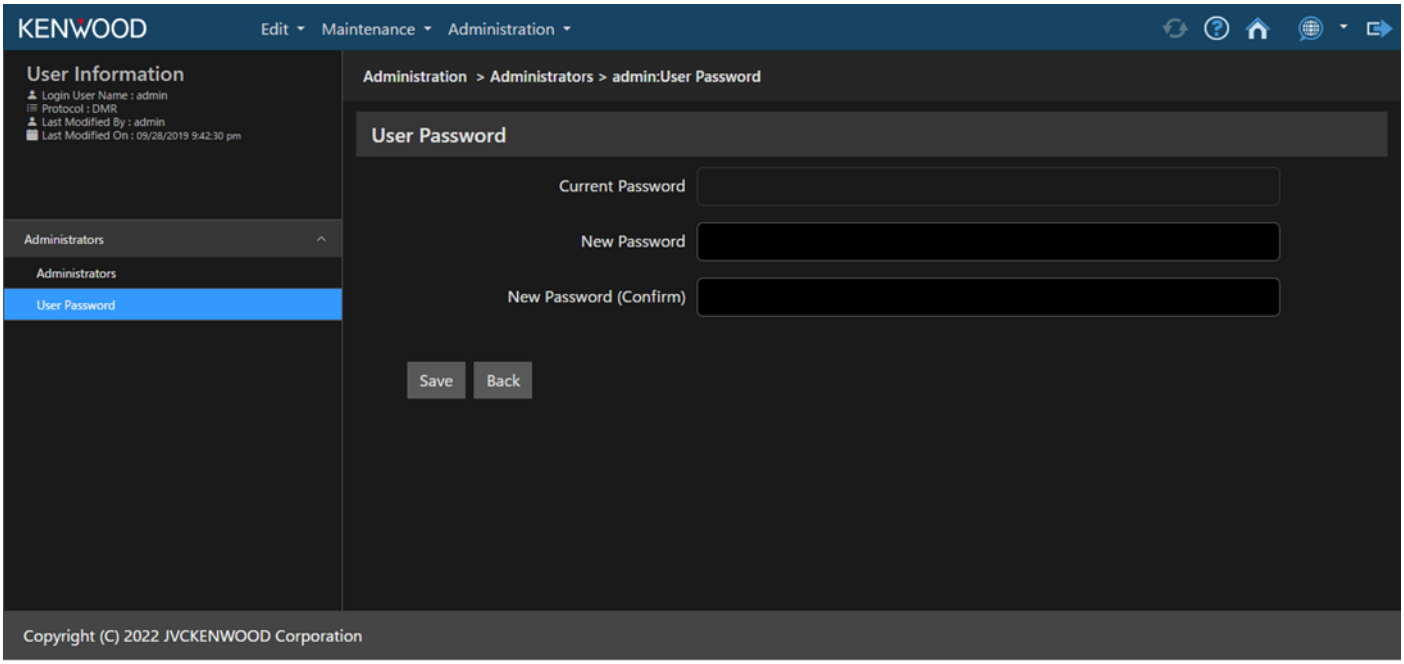


Figure 2-1 User Password (Web Tool)

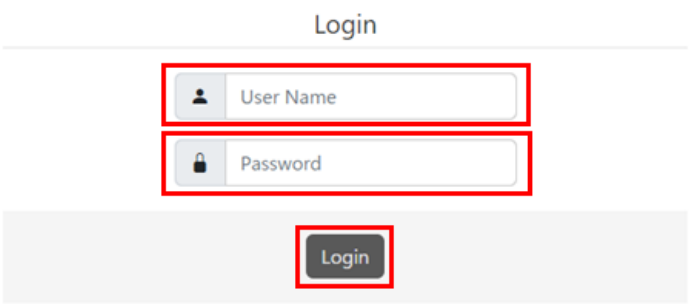


Figure 2-2 Login (Web Tool)

Hot Standby needs to be enabled to use the redundancy function by a Main Repeater and a Sub Repeater. If Hot Standby is enabled, configure Hot Standby Mode for a Main Repeater or Sub Repeater, and configure a Virtual IP Address for either case.

Table 2-2 Action Category for a Physical IP Address and a Virtual IP Address When Hot Standby Is Enabled

Action	PIP (Physical IP Address)	VIP (Virtual IP Address)
Web Tool	✔	-
FPU	✔	-
IP Conventional	-	✔
VLI	-	✔
IPRCI	-	✔
NXIP	-	✔
AIS	-	✔
SIP Phone	-	✔
SNMP	✔	-
Hot Standby Communication	✔	-
Multi Loader	✔	-

Note

- The IP address configured for the repeater main unit via the Web Tool is an item for Read Only in the FPU data.
- To use the Hot Standby function, the Virtual IP Address to be configured for a Main Repeater and for a Sub Repeater needs to be identical.

Time Setting

The time of the repeater can be configured by Time Setting, which is a repeater Web Tool function. To reflect the Time Adjustment function by the FPU, the data needs to be written with Time Adjustment enabled.

Table 2-3 Configuration of Time Setting

Configuration Item	Description
NTP	The NTP Client and NTP Server functions can be configured for the repeater. The clock can be adjusted according to the configuration.
Manual	If the repeater does not behave as the NTP Client, the clock can be manually adjusted.

The time configured for the repeater is used when logging call logs, etc. If “NTP” is configured in **Time Setting**, a different repeater in the system or an external NTP server can be specified.

Table 2-4 Repeater Behavior When Time Adjustment Is Executed from the FPU

	NTP Master	NTP Member
Execution of Time Adjustment in the FPU	Follows Time Adjustment.	Follows the NTP Server.

Configuration using KPG-D7

- Configuring **Time Adjustment** (Program > Write Data to the Repeater > Time Adjustment)

Configuration using Web Tool

- Configuring **Time Settings** (Maintenance > System > Time Settings > Time Adjustment)

2.3 Reading the Configuration Data from the Repeater

Embedding a Message in the Repeater (Embedded Message)

The message can be written to the repeater by using KPG-D7.

Embedded Message

Embedded Message is the function to store a maximum of 64 alphanumeric characters in the repeater. Unique profiles of the repeater, such as a serial number and a file name of configuration data written to the repeater, can be stored in the repeater.

The message can be written to the repeater by using KPG-D7. The embedded message is stored as a part of the configuration data in the repeater.

The embedded messages can be read from the repeater by using KPG-D7.

Configuration using KPG-D7

- Configuring **Embedded Message** (Edit > Embedded Message)

Embedded Message with Password

Embedded Message with Password is the function to store in the repeater a maximum of 64 alphanumeric characters with a password.

Unique profiles for a repeater, such as a serial number and a file name of configuration data written to the repeater, can be stored in the repeater with a password.

The message and the password can be written to the repeater by using KPG-D7. Embedded Message with Password is stored as data separate from the configuration data, not as part of the configuration data.

The password must be entered to write a message. The message cannot be written to the repeater unless the correct password is entered. The embedded messages can be read from the repeater by using KPG-D7.

Configuration using KPG-D7

Configuring **Embedded Message with Password** (Edit > Embedded Message with Password)

2.4 System Structure

Capacity

Table 2-5 Capacity

Item	Analog Mode	DMR Mode	NXDN Mode
Unit ID (UID) Range	-	1 to 16776415	1 to 65519
Group ID (GID) Range	-	1 to 16776415, All, Unaddress	1 to 65519, ALL, Null Group ID
The maximum number of Conventional IP Network connections	Unicast : 16 Multicast : Depends on the router.		
The maximum number of Console connections (per Repeater)	10		
The maximum number of SIP Phone Server connections	-	1	
The maximum number of Voice Logger connections	10		
The maximum number of simultaneous calls using a Console	1	2	1
The maximum number of GID registrations per Console	100		
The maximum number of delivered Consoles per call	10		
The maximum number of SIP User ID registrations:	-	2	1
Recording capacity of Communication Log	Approximately 860,000		
Recording capacity of System Log	200,000		
Recording capacity of Diagnostic Data	1.5 GB		
The maximum number of editable items for Import/Export	-	Unit ID List 1064 (UID List 1000, UID Range 64) Group ID List 1064 (GID List 1000, GID Range 64) Console 10	
Own UID of the repeater	-	1	
The number of configurable channels	32		
Multiple Encode/Decode Table	15		
User List > UID List	-	1000	
User List > UID Range	-	64	
User List > GID List	-	1000	
User List > GID Range	-	64	
Site Group Table	64		
The maximum number of Web Tool user registrations	1000		
The number of users permitted to be logged in to the Web Tool at the same time	4		

Note

- The number of connected Consoles and Voice Loggers is managed independently.

Analog Mode

A digital protocol license (DMR license, NXDN license) is not required if NXR-1700/ NXR-1800 is used only on analog channels. The condition in which a digital protocol license is not assigned is called Analog Mode.

In Analog Mode, NXR-1700/ NXR-1800 behaves as an analog repeater.
In Analog Mode, an Analog IP Conventional system using multiple NXR-1700/ NXR-1800 can be structured.

Table 2-6 Supported Transmission of Conventional IP Network

Sender \ Receiver		NXR-1700/ NXR-1800		
		DMR Mode	NXDN Mode	Analog Mode
NXR-1700/ NXR-1800	DMR Mode	Refer to DMR Mode.	–	Refer to DMR Mode.
	NXDN Mode	–	Refer to NXDN Mode	–
	Analog Mode	Refer to DMR Mode.	–	✔

Transmission by Conventional IP Network is enabled between NXR-1700/ NXR-1800 in Analog Mode.

Note

- Repeater programming needs to be done by using the FPU dedicated to the repeater.
- Conventional IP Network of Analog Mode cannot be used in combination with TKR-Dx10 series/ NXR-x10 series.

DMR Mode

To make the repeater behave as a DMR Conventional repeater, select DMR Mode.

In DMR Mode, a DMR Conventional system using multiple repeaters can be structured.

Repeaters configured for DMR Mode are available on a DMR Conventional system structured with TKR-Dx10 series. If DMR Conventional (KWD-NX10DC) is selected in Product Information of KPG-D7, the repeater behaves as a DMR Conventional repeater.

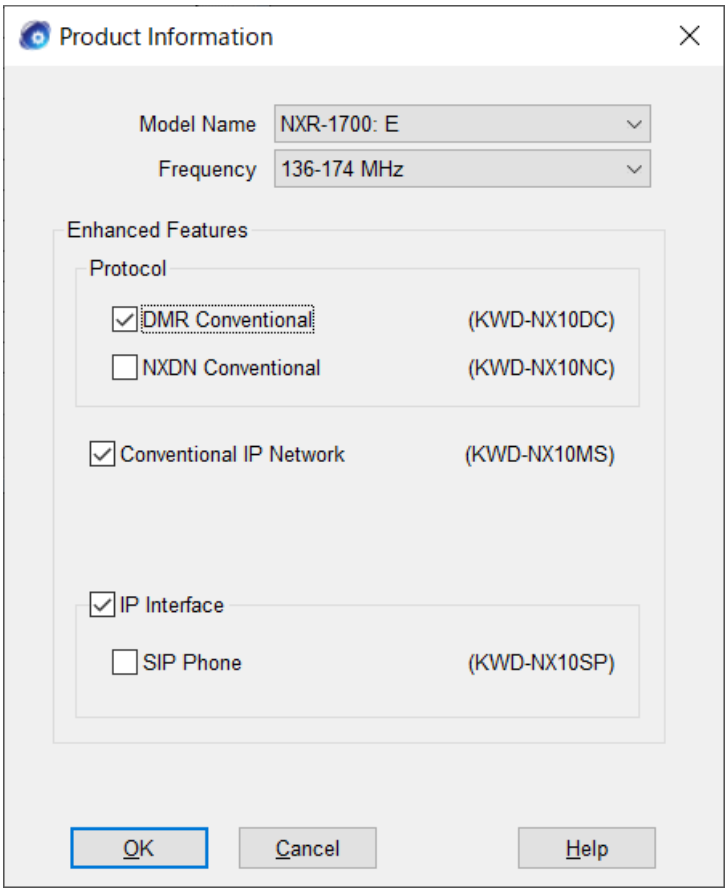


Figure 2-3 Product Information (DMR Conventional)

In Product Information, the repeater functions are enabled by selecting the license assigned to the repeater.

Conventional IP Network of DMR Mode can be used in combination with TKR-Dx10 series.

The following tables show the types of repeaters and the communication status for each Ch Type:

Table 2-7 Supported Transmission of Conventional IP Network (Receiver NXR-1700/ NXR-1800)

Sender \ Receiver		NXR-1700		
		Ch Type DMR	Ch Type Mixed	Ch Type Analog
TKR-Dx10	DMR Frame	✔	✔	–
	Analog Frame			
NXR-1700/ NXR-1800	DMR Frame	✔	✔	–
	Analog Frame	–	✔	✔

Table 2-8 Supported Transmission of Conventional IP Network (Receiver TKR-Dx10 Series)

Sender \ Receiver		TKR-Dx10		
		Ch Type DMR	Ch Type Mixed	Ch Type Analog
TKR-Dx10	DMR Frame	✔	✔	—
	Analog Frame			
NXR-1700/ NXR-1800	DMR Frame	✔ *1	✔ *1	—
	Analog Frame	—	*1	*1

*1 If NXR-1700/ NXR-1800 is used in a system structured with TKR-Dx10 series, NXR-1700/ NXR-1800 needs be programmed to match the functions of the TKR-Dx10 series.

Note

- Repeater programming needs to be done by using the FPU dedicated to the repeater.
- NXR-1700/ NXR-1800 is not supported for the coexistence of DMR Mode and NXDN Mode.

Configuration using KPG-D7

- Configuring **Product Information** (Model > Product Information)

NXDN Mode

Refer to the link about NXDN Mode.

IP Interface Function

To allow the repeater to communicate with the Console, Voice Logger, and SIP Phone Server, **IP Interface** needs to be enabled. If **IP Interface** is enabled in **Product Information** in the FPU, the IP Interface function can be used.

The IP Interface function allows AIS communication and NXIP communication for the Console in each of DMR Mode and NXDN Mode. Also, the VLI communication and SIP Phone function of each mode are supported The IP Interface Protocol communication can be executed also if Analog Mode and Analog channels are configured. The behavior in the following table is applied. Also, the repeater operation by an IPRCI command defined in IP Interface Protocol used by a Console is supported as well.

Table 2-9 IP Interface Function

Operation Mode	Signaling	Application	IP Interface Protocol
DMR Mode	DMR Tier2	Console	AIS
	Analog		AIS
	DMR Tier2	Voice Logger	AIS Based RTP
	Analog		AIS Based RTP
	DMR Tier2	SIP Phone	SIP
	Analog		Not supported

Operation Mode	Signaling	Application	IP Interface Protocol
NXDN Mode	NXDN	Console	NXIP
	Analog		NXIP
	NXDN	SIP Phone	SIP
	Analog		Not supported
Analog Mode	Analog	Console	AIS
		Voice Logger	AIS Based RTP
		SIP Phone	Not supported

Note

- The caller ID for the Console on an Analog channel is the Own ID configured for the repeater.

Hot Standby Function

The Switchover function with the Active state is supported by preparing a Main Repeater and a Sub Repeater. Switchover is the function to switch a Main Repeater and a Sub Repeater.

Also, the status of the role of each repeater can be confirmed on the Web Tool.

Table 2-10 Configuration Items of Hot Standby

Configuration Item Web	Description
Hot Standby	The **Hot Standby** function and the role of the **Hot Standby** function can be configured.
Failsoft Mode	The conditions to migrate to Failsoft Mode can be configured.
Auto Active Status Switch	The time and interval for automatically switching the Active status can be configured.
Virtual IP Address	By sharing the same IP address in **Hot Standby** pairs, the impact on other sites and consoles when the Active status is switched can be minimized.

Both a Main Repeater and Sub Repeater always check each other's PIP (Physical IP Address). After the synchronization state is established, if VIP (**Virtual IP Address**) is enabled on either repeater, the repeater enters the Active state. The repeater for which VIP is not enabled migrates to the Standby state.

After starting, if the synchronization status cannot be established even once within the duration of Failsoft Mode Wait Timer, the Main Repeater migrates to Failsoft Mode and the Sub Repeater enters the Active state. After synchronization, if the repeater in the Active state continues to be out of synchronization with the repeater in the Standby state within the duration of Failsoft Mode Wait Timer, the repeater in the Active state also migrates to Failsoft Mode. If the repeater in the Standby state cannot synchronize with the repeater in the Active state, the repeater in Standby state migrates to the Active state.

If the synchronized Main Repeater and Sub Repeater continue to be out of synchronization for the duration of Failsoft Mode Wait Timer, the repeater in the Active state forcibly restarts with **Hot Standby** disabled. This status is called **Failsoft Mode**, and the radio behavior can be continued as a Single site in the event of the failure of the repeater in the Standby state, etc. VIP is not enabled at this time. E102 (Hot Standby LAN Connection Error) is displayed during Failsoft Mode.

For details, refer to the status migration diagram below:

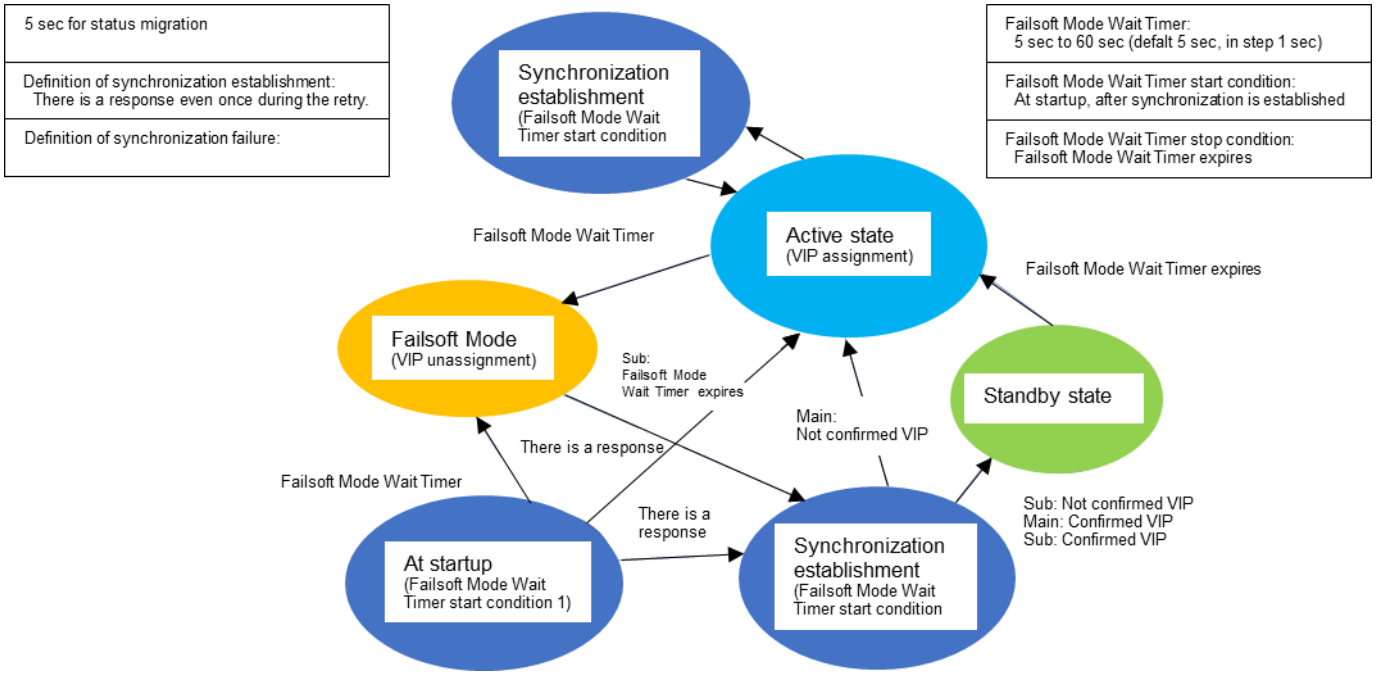


Figure 2-4 Status Migration Diagram

During Switchover, only the Virtual IP Address is taken over to another repeater.
The following data are not taken over:

・Configuration data

・Logs

・Registration information of Console (if the IP Interface function is enabled)

The Active state can be forcibly migrated by using the **Auto Active Status Switch** function or **Active Status Switch** function by Remote Control only when synchronization is established. **Active Status Switch** by Remote Control is the function supported only by a Main Repeater.

The following are the cases where the status is switched to the Standby state by firmware during the Active state.
When a Main Repeater migrates to the Standby state under the following conditions, a Sub Repeater can enter the Active state while synchronization is established.

Table 2-11 Migrating to Standby State by Firmware

Condition	Meaning
E008	DSP Error 1
E009	DSP Error 2
E202	Power Supply Voltage Error
E204	RX PLL Unlock
E205	TX PLL Unlock
E206	Current Consumption (HPA) Error
E207	Temperature (Drive Amp) Error
E208	Temperature (TX Block) Error
E209	Temperature (TCXO) Error
E210	Temperature (HPA) Error

A Sub Repeater can enter the Active state also occurs when the power source of a Main Repeater is OFF (Power OFF by the Menu operation of the OLED display).

Note

- If the Hot Standby configuration is changed, the repeater restarts automatically in the following combinations:
  Hot Standby Valid is changed from ON to OFF or OFF to ON.
  Hot Standby Valid is ON, and Hot Standby Mode is changed from Main to Sub or Sub to Main.
  Virtual IP Address is changed while Hot Standby Valid is ON.
- The repeater restarts automatically under the following conditions when the Hot Standby status changes:
  Entering Failsoft Mode
  From the Standby state to the Active state
- The interval configured in Interval is counted down from the time configured in Switch Time. If the current time exceeds the Switch Time when the configuration is saved, counting down of the cycle does not start until the following Switch Time. Even if Off is configured in Interval, the Active state is switched only once at the configured time of Switch Time.

Configuration using KPG-D7

- None

Configuration using Web Tool

- Configuring each item of the **Hot Standby** function (Maintenance > System > Hot Standby > Hot Standby)
- Configuring the items of the **Failsoft Mode** function (Maintenance > System > Hot Standby > Failsoft Mode)
- Configuring each item of the **Auto Active Status Switch** function (Maintenance > System > Hot Standby > Auto Active Status Switch)
- Configuring each item of the **Virtual IP Address** function (Maintenance > System > Hot Standby > Virtual IP Address)

Steps to Construct Hot Standby (Example)

This section describes the steps to construct the Hot Standby by using NXR-1700_A and NXR-1700_B.

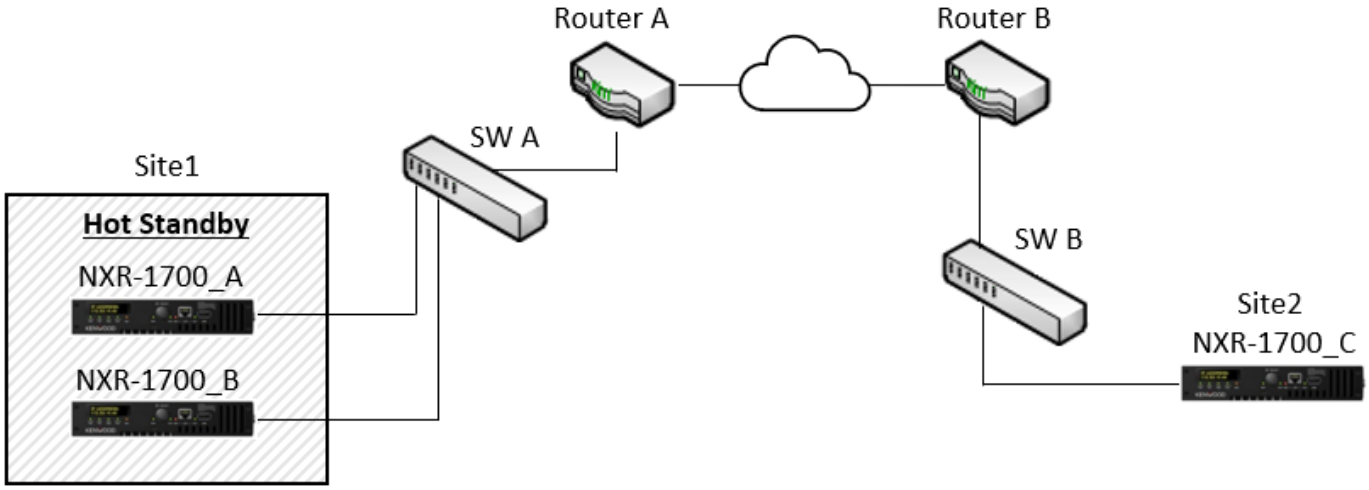


Figure 2-5 Construction Image

- NXR-1700_A (Site 1): Operated as 172.16.0.1 (IP Address) and Hot Standby (Main side).
- NXR-1700_B (Site 1): Operated as 172.16.0.2 (IP Address) and Hot Standby (Sub side).
- NXR-1700_C (Site 2): Operated as 172.16.1.3 (IP Address) and a non-Hot Standby site.
- Virtual IP Address (Site1)： 172.16.0.99

1 Configuring the Web Tool

Each item of the Web Tool is configured.

Table 2-12 Configuration Items of the Web Tool

Item		NXR-1700_A	NXR-1700_B
Hot Standby	Valid	ON	ON
	Mode	Main	Sub
	Monitoring IP Address	172.16.0.2 (IP Address of the Sub side)	172.16.0.1 (IP Address of the Main side)
Failsoft Mode	Failsoft Mode Wait Timer (sec)	Arbitrary value	The same value as the Main side
Auto Active Status Switch	Valid	Arbitrary	-
	Switch Time	Arbitrary	-
	Interval (day)	Arbitrary	-
Virtual IP Address	IP Address	172.16.0.99	172.16.0.99 (The same value as the Main side)

2 Configuring the FPU

Virtual IP Address (Site 1) and IP Address (Site 2) of NXR-1700_C to which the Conventional IP Network is connected are configured in **Unicast IP Address List** for NXR-1700_A and NXR-1700_B.

Configure Unicast IP Address List of NXR-1700_C in the same manner.

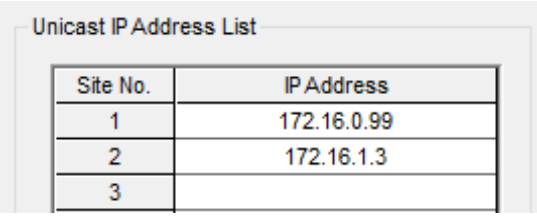


Figure 2-6 Unicast IP Address List

Also, the destination IP Address of when the FPU writing is executed is not the Virtual IP Address, but the Own IP Address of each of NXR-1700_A and NXR-1700_B, which is used for the writing.

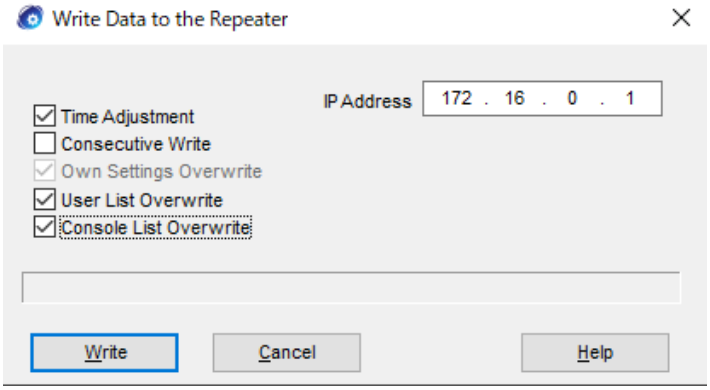


Figure 2-7 Write Data to the Repeater (Example of Writing to NXR-1700_A)

Configuration using KPG-D7

- Configuring **Unicast IP Address List** (Edit > Conventional IP Network > Network > Unicast IP Address List)

Configuration using Web Tool

- Configuring **Hot Standby** (Maintenance > System > Hot Standby)

3 Confirming the status

The Hot Standby status of each repeater is confirmed from the Web Tool or OLED display.

Table 2-13 Status Confirmation of the Web Tool or OLED display

Item			NXR-1700_A	NXR-1700_B
Web Tool	General Information	Hot Standby Mode	Main	Sub
		Hot Standby Status	Active	Standby
		Virtual IP Address	172.16.0.99	172.16.0.99
OLED	Network Information	Hot Standby Status	HSB Active	HSB Standby
		Virtual IP Address	172.16.0.99	172.16.0.99

Note

- Depending on the timing of when the FPU writing is executed, the HSB Active state and HSB Standby state may be reverse. If NXR-1700_B (Sub side) is HSB Active, execute Active Status Switch (Maintenance > Remote Control > Active Status Switch) of the Web Tool of NXR-1700_A, and switch NXR-1700_A (Main side) to HSB Active.
- Also, if HSB LAN Error is displayed on any NXR-1700, confirm the network connections between NXR-1700_A and NXR-1700_B.
  OLED display > Error Information (for OLED display)
  Edit > Home > General Information (for Web Tool)

Hot Standby Recovery Procedure

SW (Switching hub) failure

Status: Main Repeater (Active)/ Sub Repeater (Standby)

If the network device connecting a Main Repeater and a Sub Repeater fails, synchronization between a Main Repeater and a Sub Repeater cannot be established. In this case, a Main Repeater migrates from the Active state to Failsoft Mode. A Sub Repeater migrates to the Active state.

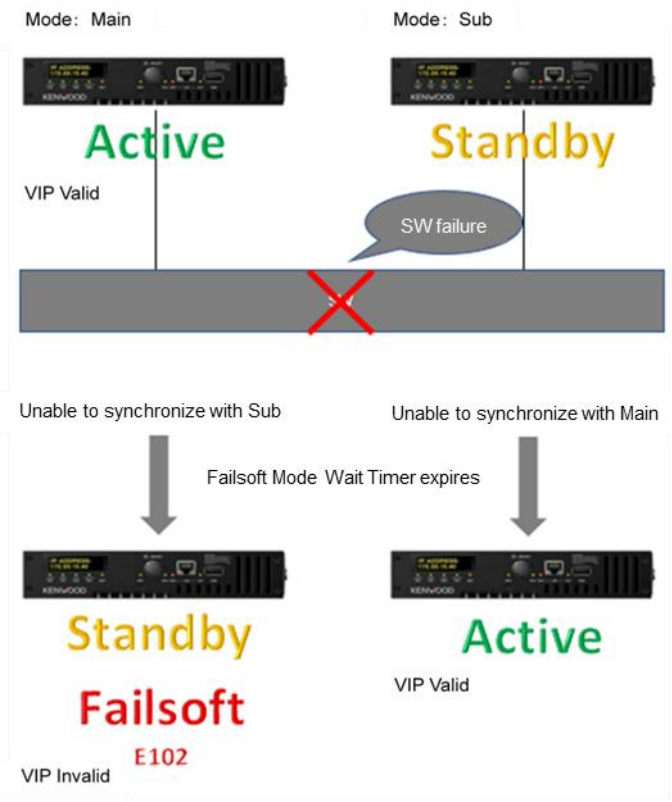


Figure 2-8 SW Failure

SW recovery precautions

Do not power down a Main Repeater and a Sub Repeater.

Replace only network devices.

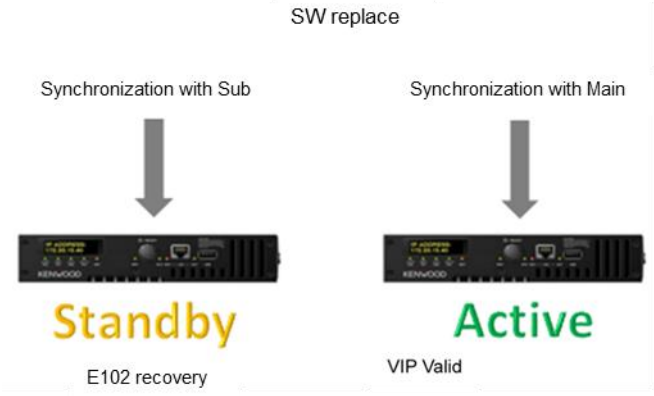


Figure 2-9 SW Recovery

Synchronization between a Main Repeater and a Sub Repeater is restored when the network device is replaced and the network connection between a Main Repeater and a Sub Repeater is restored. At this time, a Main Repeater migrates from Failsoft Mode to the Standby state. A Sub Repeater restores the Hot Standby behavior to maintain the Active state. Because a Main Repeater and a Sub Repeater are synchronized, if **Auto Active Status Switch** is configured, the repeater in the Active state is replaced according to the configuration. Or, the repeater in the Active state can be manually replaced by Active Status Switch. In addition, the status of each repeater can be confirmed from **Hot Standby Status** of the Web Tool and the OLED display.

Repeater failure (Main Repeater)

Status: Main Repeater (Active)/ Sub Repeater (Standby)

If a Main Repeater fails for any reason and is replaced, a Sub Repeater cannot synchronize with the Main Repeater. In this case, a Sub Repeater migrates to the Active state.

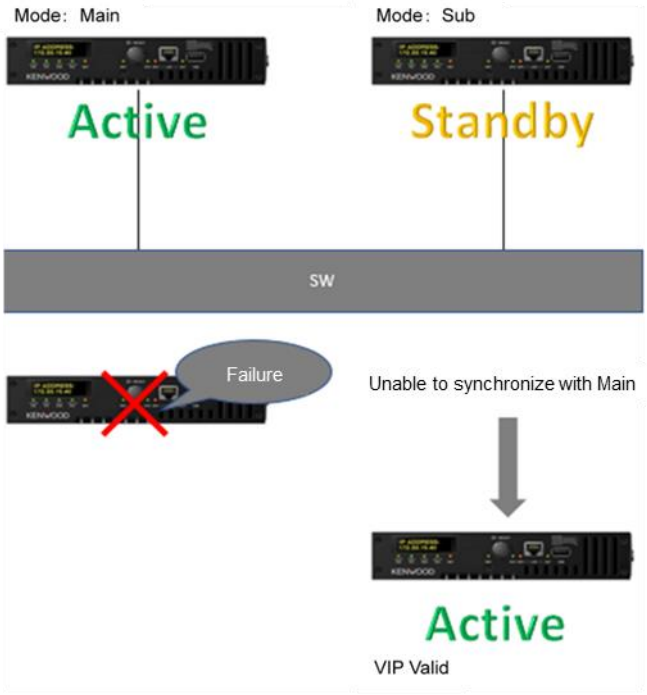


Figure 2-10 Repeater (Main) Failure

Repeater (Main Repeater) recovery precautions

Remove the failed Main Repeater and perform the recovery procedure.

The configuration of a Main Repeater to be replaced needs be the same as the one prior to replacement, and Write needs to be performed beforehand.

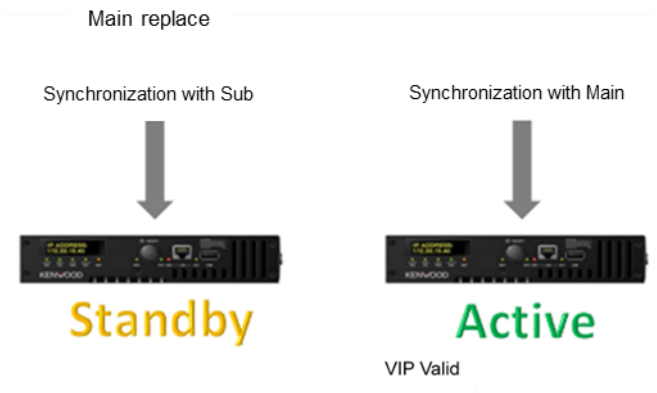


Figure 2-11 Repeater (Main) Recovery

After a Main Repeater is replaced and the power is on, synchronization between a Main Repeater and a Sub Repeater is restored when the network connection between a Main Repeater and a Sub Repeater is restored. At this time, a Main Repeater migrates to the Standby state. A Sub Repeater restores the Hot Standby behavior to maintain the Active state. Because a Main Repeater and a Sub Repeater are synchronized, if **Auto Active Status Switch** is configured, the repeater in the Active state is replaced according to the configuration. Or, the repeater in the Active state can be manually replaced by Active Status Switch. In addition, the status of each repeater can be confirmed from **Hot Standby Status** of the Web Tool and the OLED display.

Repeater failure (Sub Repeater)

Status: Main Repeater (Active)/ Sub Repeater (Standby)

If a Sub Repeater fails for any reason and is replaced, a Main Repeater cannot synchronize with the Sub Repeater. In this case, a Main Repeater migrates to Failsoft Mode.

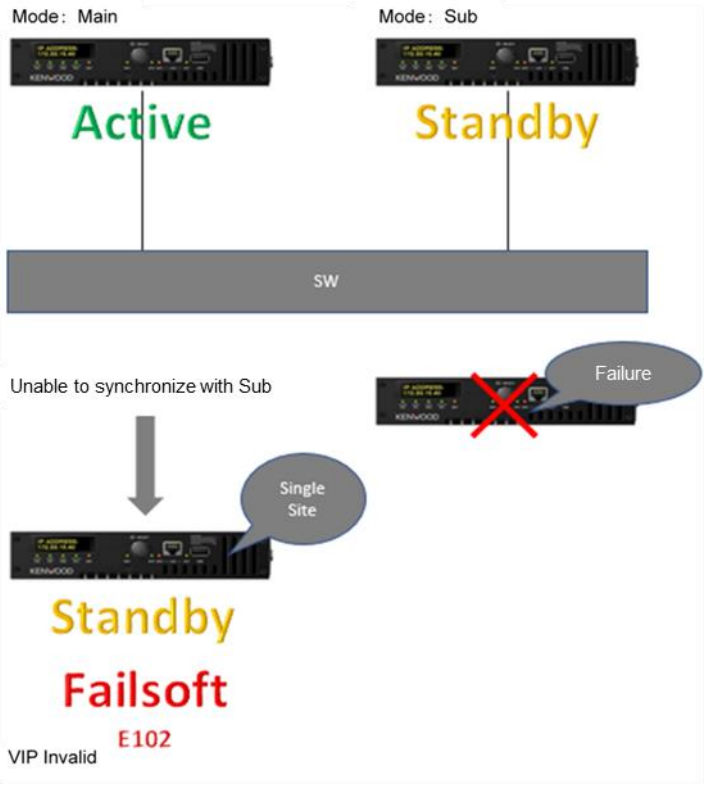


Figure 2-12 Repeater (Sub) Failure

Repeater (Sub Repeater) recovery precautions

Remove the failed Sub Repeater and perform the recovery procedure.

The configuration of a Sub Repeater to be replaced needs be the same as the one prior to replacement, and Write needs to be performed beforehand.

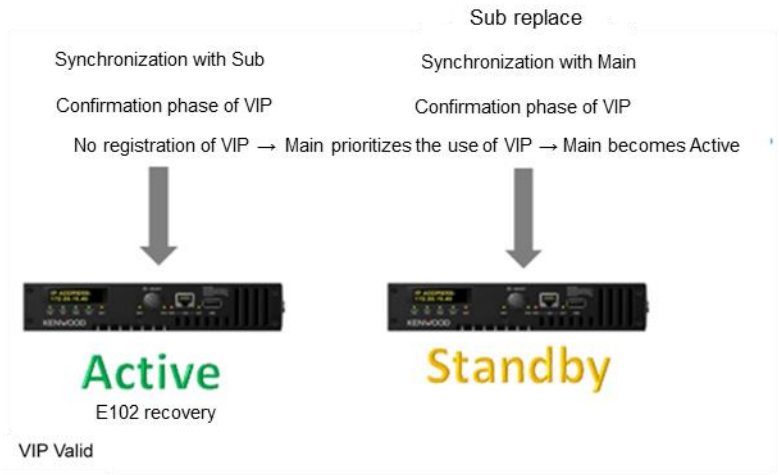


Figure 2-13 Repeater (Sub) Recovery

After a Sub Repeater is replaced and the power is on, synchronization between a Main Repeater and a Sub Repeater is restored when the network connection between a Main Repeater and a Sub Repeater is restored. At this time, a Sub Repeater migrates to the Standby state. A Main Repeater restores the Hot Standby behavior to migrate from Failsoft Mode to the Active state. In addition, the status of each repeater can be confirmed from **Hot Standby Status** of the Web Tool and the OLED display.

QoS Function

QoS (Quality of Service) is the function to control the IP packet priority.
By configuring a DSCP (Differentiated Services Code Point) value for the packets to be sent by the repeater, the packets including the packets to be sent by the repeater can be prioritized for a switch or router in the network.

When DSCP is enabled, a DSCP value is assigned as PHB (Per Hop Behavior) for the specified communication. This allows packets to be queued and scheduled according to the priority configurations of the switches and routers installed in the network, and can reduce loss such as a communication delay and jitter.

Table 2-14 QoS

Configuration Web	Description
Valid	In Valid, the marking by DSCP is enabled or disabled.
Intersite Voice Packet	In Intersite Voice Packet, a DSCP value for packets of voice communication between sites is configured.
Intersite Data Packet	In Intersite Data Packet, a DSCP value for packets of data communication between sites is configured.
Console Voice Packet	In Console Voice Packet, a DSCP value for packets of voice communication addressed to a Console is configured.
Console Data Packet	In Console Data Packet, a DSCP value for packets of data communication addressed to a Console is configured.
SIP Phone Packet	In SIP Phone Packet, a DSCP value for packets of voice communication addressed to a SIP Phone is configured.
VLI Packet	In VLI Packet, a DSCP value for packets of voice communication addressed to a Voice Logger is configured.
ICMP Packet	In ICMP Packet, a DSCP value for ICMP packets is configured.

Note

- The VLAN tag in Layer2 is not supported.
- To use this function, all network devices such as routers and switches in the network need to support DSCP.
- Audio packets transmitted by a Console or SIP Phone cannot be prioritized by the repeater. To prioritize audio packets transmitted by a Console or SIP Phone, configure according to each manufacturer's configuration method and recommended DSCP value.
- Refer to Basic Configuration for details of the configuration items of the QoS function.

Configuration using Web Tool

- Configuring **QoS** (Maintenance > System > IP Configuration > QoS)

3 BASIC OPERATION

3.1 Turning the Repeater On/ Off

Pressing the **Knob** switch located on the front turns the repeater on. To turn the repeater on, **Power Control** needs to be enabled by the FPU. If **Power Control** is disabled, the repeater is automatically turned on by energizing the repeater.
When the repeater is turned on, all LEDs on the front light for 1 sec. Although the LED turns off when 1 sec elapses and the channel name appears on the OLED display, the displayed channel name blinks until PLL is stabilized. After PLL is stabilized, the displayed channel name stops blinking and remains lit and the repeater becomes usable. While the repeater is turned on, the POWER LED lights green.

Refer to Front and KNOB for turning the repeater off.

3.2 Receive

The repeater waits to receive either an analog signal or a digital signal depending on the configuration in Channel Type. Or, the repeater waits to receive both an analog signal and a digital signal.
(Refer to Configuring the Reception Method of a Channel (Channel Type).)
If the repeater receives a signal and the received QT tone, DQT code, or Color Code matches the QT tone, DQT code, or Color Code preconfigured for the repeater, the received audio sounds from the speaker, and the repeater transmits by relaying the signal by using the Repeat PTT control.

3.3 Transmit

The repeater can transmit by using the Repeat PTT control or the TEST PTT control.
If the repeater receives a signal and the received QT tone, DQT code, or Color Code matches the QT tone, DQT code, or Color Code preconfigured for the repeater, the repeater transmits by relaying the signal using the Repeat PTT control.
To transmit on a mixed channel, the repeater transmits an analog signal if the received signal is analog, and the repeater transmits a digital signal if the received signal is digital.

3.4 Configuring the Conditions for the Fan to Function (Fan Action)

Fan Action is the function which activates the fan equipped on the rear of NXR-1700 depending on the status of the repeater.

The following are the fan behaviors that may vary depending on the configuration by using KPG-D7:

Table 3-1 Fan Action

Configuration	Description
Continuous	Starts the fan spinning when the repeater is turned on and keeps the fan spinning all the time. If the temperature sensor senses the temperature below 0 ℃, the fan stops spinning.
Temperature	Makes the fan spinning when the temperature inside the repeater rises, and makes the fan stop spinning when the temperature drops.

Note

- The fan cannot be configured to not operate at all.

Configuration using KPG-D7

- Configuring **Fan Action** (Edit > Optional Features > Common Page 1 > Fan Action)

3.5 Executing Software Reset of the Repeater (Reset)

The software reset of the repeater can be done.

Inputting a signal in the AUX Input port to which “Reset” is assigned executes the software reset, and the repeater is restored to the state just after startup.

(Refer to Available Functions for the AUX Input Ports.)

3.6 Forced Firmware Programming Mode

If the Firmware fails to start and starts in a backed-up state, the repeater starts up in the Forced Firmware Programming mode. In the Forced Firmware Programming mode, Firmware Update by the Web Tool and Multi Loader can be performed.

The following functions cannot be used during the Forced Firmware Programming mode:

- FPU Read/ Write
- Knob operation
- Screen Off Timer
- Factory Reset
- Functions of the repeater as the transceiver

3.7 Factory Reset

The values of general configurations stored in the repeater, the Log information stored by the maintenance function, and the area used for data storage by the Field Support function (Web Tool) can be restored to the factory default state. Perform this operation if a User Name or User Password of the Administrator (Web Tool) or the Access Key of the Multi Loader has been lost, or if an IP Address of the repeater has been forgotten.

The following is the procedure to migrate to Factory Reset:

1. With the 6 pin and 7 pin (DG) of the I/O Interface (D-Sub 25-pin) connected, connect to the external power supply. If Power Control is disabled, proceed to step 3 since step 2 is not required.
2. Press the Knob if Power Control is enabled. The Knob does not need to be continuously pressed at this time.
3. Press the Knob (again if step 2 is executed) after the ■■ indication is confirmed on the OLED display, and continue pressing until the ■■■ indication is displayed. When the ■■■ indication is displayed, stop pressing the Knob to migrate to the Factory Reset screen. If the ■■■■ indication is displayed without migrating to the Factory Reset screen, migrating to the Factory Reset screen procedure is not done correctly, so start again from step 1.
4. Pressing the Knob in the Factory Reset screen displays Cancel at the upper part and Execute at the lower part, and the action for Factory Reset can be selected. To execute Factory Reset, rotate the Knob to select Execute and press the Knob.

The Knob operation in step 4 needs to be performed within 5 seconds. If the operation is not executed within 5 seconds, the process migrates to Level 3 of Startup Status, and the process of migrating to User Mode continues.

The repeater is initialized to the factory default if Factory Reset is executed.
In the factory default, “Unprogrammed” is displayed and the following operations can be performed:

Table 3-2 Items Available for Operation in the Factory Default

Operation	Action
FPU Data Read	The FPU data as the factory default is read from the repeater.
FPU Test Mode	The repeater can enter Test Mode in the FPU.
FPU Data Write	The FPU data of the repeater can be updated.
FPU Repeater Information	The repeater information in the FPU can be acquired.
Embedded Message with Password Read	An Embedded Message is read with no data (blank).
Embedded Message with Password Write	An Embedded Message can be stored without a password because the password is initialized.

4 TRANSMISSION/ RECEPTION/ REPEAT

4.1 Transmit and Receive Frequencies

Transmit and receive frequencies are pairs of frequencies used for transmitting and receiving by the repeater. The transmit and receive frequencies of the repeater can be configured for each channel.

Table 4-1 Transmit/ Receive Frequency Range and Step Size

Model FPU	Transmit and Receive Frequencies	
	Range	In steps of
NXR-1700	136 MHz to 174 MHz	2.5 kHz/ 3.125 kHz/ 5 kHz/ 6.25 kHz
NXR-1800	450 MHz to 520 MHz	3.125 kHz/ 5 kHz/ 6.25 kHz
	400 MHz to 470 MHz	

Configuration using KPG-D7

- Configuring the transmit and receive frequencies for a channel
  (Edit > Channel Information > RX Frequency)
  (Edit > Channel Information > TX Frequency)
  (Edit > Channel Edit > Receive Frequency)
  (Edit > Channel Edit > Transmit Frequency)

4.2 Transmission Power (Transmit Power)

Transmit Power is the transmission power of the repeater. The transmission power of the repeater can be configured for each channel.

Table 4-2 Transmit Power

Model	Transmit Power	
	Low	High
NXR-1700	1 W	50 W
NXR-1800	1 W	40 W

A channel for which High Power is configured can also be temporarily switched to Low Power by the Remote Control function of the Web Tool during operation.

Note

- Transmit Power cannot be switched while the repeater is transmitting.
- A channel for which Low Power is configured cannot be switched to High Power.

Configuration using KPG-D7

- Configuring **Transmit Power** (Edit > Channel Information > Channel Edit > Transmit Power)

4.3 Channel Spacing

Channel Spacing is the channel spacing used by the repeater to transmit and receive.
Channel spacing is the spacing of frequencies between adjacent channels.

Channel Spacing (Analog)

The following is the channel spacing applied when the repeater transmits and receives on an analog channel.
The channel spacing can be configured for each channel by using KPG-D7.
For an analog channel and mixed channel, the **Channel Spacing** which is available by the license of the FPU is different.

- E-type license FPU: Wide 5k, Wide 4k, Narrow
- K-type license FPU: Wide 5k, Narrow

Channel Spacing (NXDN)

The channel spacing applied when the repeater transmits and receives on an NXDN digital channel is Very Narrow (6.25 kHz) and Narrow (12.5 kHz).

Table 4-3 Channel Spacing (Analog/ NXDN)

Channel Spacing	Bandwidth
Wide 5k (Analog Only)	25 kHz
Wide 4k (Analog Only)	20 kHz
Narrow	12.5 kHz
Very Narrow (NXDN Only)	6.25 kHz

Channel Spacing (DMR)

The channel spacing applied when the repeater transmits and receives on a DMR digital channel is Narrow (12.5 kHz). The channel spacing of a DMR digital channel cannot be configured by using KPG-D7.

Configuration using KPG-D7

- Configuring **Channel Spacing (Analog)** (Edit > Channel Information > Channel Edit > Channel Spacing (Analog))
- Configuring **Channel Spacing (NXDN)** (Edit > Channel Information > Channel Edit > Channel Spacing (NXDN))

4.4 Configuring the Priority Order of Transmission (PTT Priority)

The following are the transmission methods of the repeater:

- Test PTT
- External PTT
- Repeat PTT
- Network PTT
- Console PTT
- SIP PTT

PTT Priority is the priority order of these transmission methods. Multiple factors for transmission may overlap when the repeater is operated. In these cases, by switching to the signaling and modulated signal line that match a prioritized PTT, the repeater can switch to the PTT having higher priority when the repeater is transmitting using a PTT having lower priority.
If a PTT having the higher priority is activated while the repeater is transmitting using a PTT having the lower priority, the repeater switches to the signaling and modulation signal line configured for the PTT having higher priority.

Table 4-4 PTT Priority

PTT	Modulation Signal Line
Test PTT	Local Mic
External PTT	TX Audio input
Repeat PTT	Received audio
Console PTT	Received audio (IP network)
Network PTT	Received audio (IP network)
SIP PTT	Received audio (IP network)

Configuration using KPG-D7

- Configuring **PTT Priority** (Edit > Optional Features > Common Page 1 > PTT Priority)

4.5 Configuring the Reception Method of a Channel (Channel Type)

Channel Type is the reception type for each channel. The repeater can be configured to wait to receive either an analog signal or a digital signal, or both types of signals.

Table 4-5 Channel Type

Configuration	Description
Analog	The repeater receives an analog signal.
DMR	The repeater receives a DMR digital signal.
NXDN	The repeater receives an NXDN digital signal.
Mixed	The repeater receives both analog and digital signals.

Configuration using KPG-D7

- Configuring **Channel Type** (Edit > Channel Information > Channel Edit > Channel Type)
- Configuring **Ch Type (Channel Type)** (Edit > Channel Information > Ch Type)

Configuring the Transmission Mode (Transmit Mode)

Transmit Mode is the mode for transmission by using the **PTT** (Test PTT and External PTT) control on a channel with "Mixed" configured in **Channel Type**.

If the repeater is transmitting by using the **PTT** (Test PTT and External PTT) control, the repeater transmits in the mode configured in **Transmit Mode**. However, the transmit mode varies depending on the receiving condition if **Signaling Reset Timer** is configured. (Refer to Configuring the Duration of Transmission in the Received Mode (Signaling Reset Timer).)

Table 4-6 Transmit Mode

Configuration	Description
Analog	The repeater transmits an analog signal when the repeater transmits by using the **PTT** (Test PTT and External PTT) control.
DMR	The repeater transmits a DMR digital signal when the repeater transmits by using the **PTT** (Test PTT and External PTT) control.
NXDN	The repeater transmits an NXDN digital signal when the repeater transmits by using the **PTT** (Test PTT and External PTT) control.

Also, if the repeater is transmitting the received signal by using the Repeat PTT control, the repeater transmits an analog signal if the repeater receives an analog signal, and the repeater transmits a digital signal if the repeater receives a digital signal.

Configuration using KPG-D7

- Configuring **Transmit Mode** (Edit > Channel Information > Channel Edit > Transmit Mode)
- Configuring **TX Mode (Transmit Mode)** (Edit > Channel Information > TX Mode)

4.6 Configuring the Duration of Transmission in the Received Mode (Signaling Reset Timer)

Signaling Reset Timer is the length of time to transmit in the same communication method (either Analog or DMR/ NXDN) as the method for the received signal regardless of the configuration in **Transmit Mode**, if the repeater receives a signal on a mixed channel and the received signaling matches the signaling preconfigured for the repeater. On a mixed channel, whether the repeater transmits in analog mode or DMR/ NXDN digital mode can be configured in **Transmit Mode**. When **Signaling Reset Timer** is configured, if the repeater receives an analog signal and the received QT tone or DQT code matches the QT tone or DQT code preconfigured for the repeater, the repeater transmits in the same analog mode as the received signal, if within the period configured in **Signaling Reset Timer**.

Or, if the repeater receives a DMR digital signal and the received Color Code matches the Color Code preconfigured for the repeater, the repeater transmits in the same DMR digital mode as the received signal, if within the period configured in **Signaling Reset Timer**.

Or, if the repeater receives an NXDN digital signal and the received RAN Code matches the RAN Code preconfigured for the repeater, the repeater transmits in the same NXDN digital mode as the received signal, if within the period configured in **Signaling Reset Timer**.

Signaling Reset Timer starts counting down after reception has completed.

This function can be used only if the repeater transmits by using the PTT (Test PTT and External PTT) control.

The following are the communication methods on a mixed channel depending on the receiving conditions and the configuration in **Transmit Mode**:

Table 4-7 Signaling Reset Timer (1 sec to 300 sec)

Receiving Conditions	Transmit Mode	Communication Method for Transmission Using the PTT (Test PTT and External PTT) control	
If conditions 1) and 2) below are both satisfied: 1) The repeater has never received an analog signal or a digital signal for which the signaling received by the repeater and the signaling configured for the repeater match. 2) Currently, no signal is being received on the mixed channel used by the repeater for transmission. Or, the repeater is receiving an analog signal or a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater do not match.	Analog	Analog	○
	DMR/ NXDN	DMR/ NXDN	
The repeater is receiving a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater match.	Analog	DMR/ NXDN	△
	DMR/ NXDN	DMR/ NXDN	
If conditions 1) to 3) below are all satisfied: 1) The repeater has received a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater match. 2) The reception of the DMR digital signal or the NXDN digital signal in 1) has been completed, and the length of time configured in **Signaling Reset Timer** is counting down. 3) Currently, no signal is being received on the mixed channel used by the repeater for transmission. Or, the repeater is receiving an analog signal or a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater do not match.	Analog	DMR/ NXDN	△
	DMR/ NXDN	DMR/ NXDN	

Receiving Conditions	Transmit Mode	Communication Method for Transmission Using the PTT (Test PTT and External PTT) control	
If conditions 1) to 3) below are all satisfied: 1) The repeater has received a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater match. 2) The reception of the DMR digital signal or the NXDN digital signal in 1) has been completed, and the length of time configured in **Signaling Reset Timer** elapses. 3) Currently, no signal is being received on the mixed channel used by the repeater for transmission. Or, the repeater is receiving an analog signal or a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater do not match.	Analog	Analog	○
	DMR/ NXDN	DMR/ NXDN	
The repeater is receiving an analog signal for which the signaling received by the repeater and the signaling configured for the repeater match.	Analog	Analog	□
	DMR/ NXDN	Analog	
If conditions 1) to 3) below are all satisfied: 1) The repeater has received an analog signal for which the signaling received by the repeater and the signaling configured for the repeater match. 2) The reception of the analog signal in 1) has been completed, and the length of time configured in **Signaling Reset Timer** is counting down. 3) Currently, no signal is being received on the mixed channel used by the repeater for transmission. Or, the repeater is receiving an analog signal or a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater do not match.	Analog	Analog	□
	DMR/ NXDN	Analog	
If conditions 1) to 3) below are all satisfied: 1) The repeater has received an analog signal for which the signaling received by the repeater and the signaling configured for the repeater match.	Analog	Analog	○

Receiving Conditions	Transmit Mode	Communication Method for Transmission Using the PTT (Test PTT and External PTT) control	
2) The reception of the analog signal in 1) has been completed, and the length of time configured in **Signaling Reset Timer** elapses. 3) Currently, no signal is being received on the mixed channel used by the repeater for transmission. Or, the repeater is receiving an analog signal or a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater do not match.	DMR/ NXDN	DMR/ NXDN	

〇: Depends on the configuration in **Transmit Mode**

△: Transmits in DMR/ NXDN mode

□: Transmits in analog mode

If “Off” is configured in **Signaling Reset Timer**, the length of time is no longer restricted, and the repeater transmits by using the **PTT** (Test PTT and External PTT) control in the mode where the repeater previously received a signal. This condition is reset if a channel is changed, if the software is re-started, or if the repeater is turned off.

Table 4-8 Signaling Reset Timer (Off)

Receiving Conditions	Transmit Mode	Communication Method for Transmission Using the PTT (Test PTT and External PTT) control	
If conditions 1) and 2) below are both satisfied: 1) The repeater has never received an analog signal or a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater match. 2) Currently, no signal is being received on the mixed channel used by the repeater for transmission. Or, the repeater is receiving an analog signal or a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater do not match.	Analog	Analog	○
	DMR/ NXDN	DMR/ NXDN	
The repeater is receiving a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater match.	Analog	DMR/ NXDN	△
	DMR/ NXDN	DMR/ NXDN	
If conditions 1) and 2) below are both satisfied: 1) The repeater has received a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater match. 2) Currently, no signal is being received on the mixed channel used by the repeater for transmission. Or, the repeater is receiving an analog signal or a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater do not match.	Analog	DMR/ NXDN	△
	DMR/ NXDN	DMR/ NXDN	
The repeater is receiving an analog signal for which the signaling received by the repeater and the signaling configured for the repeater match.	Analog	Analog	□
	DMR/ NXDN	Analog	
If conditions 1) and 2) below are both satisfied: 1) The repeater has received an analog signal for which the signaling received by the repeater and the signaling configured for the repeater match.	Analog	Analog	□

Receiving Conditions	Transmit Mode	Communication Method for Transmission Using the PTT (Test PTT and External PTT) control	
2) Currently, no signal is being received on the mixed channel used by the repeater for transmission. Or, the repeater is receiving an analog signal or a DMR digital signal or an NXDN digital signal for which the signaling received by the repeater and the signaling configured for the repeater do not match.	DMR/ NXDN	Analog	

〇: Depends on the configuration in **Transmit Mode**

△: Transmits in DMR/ NXDN mode

□: Transmits in analog mode

Note

- Even on a mixed channel, transmission is always made using the communication method configured in **Transmit Mode** on the channel where **Multiple Encode/Decode Table** is used, if the transmission is made using the **PTT** (Test PTT and External PTT) control regardless of the configuration in **Signaling Reset Timer** and receiving conditions.

Configuration using KPG-D7

- Configuring **Signaling Reset Timer** (Edit > Optional Features > Common Page 1 > Signaling Reset Timer)

4.7 Restricting the Continuous Transmission Time (Time-out Timer (TOT))

Time-out Timer (TOT) is the function to restrict the continuous transmission time for the repeater.
This function is used to prevent a user from occupying the repeater and the frequency when the repeater and the frequency are shared with other users. The repeater automatically stops transmitting and releases the channel if the repeater continuously transmits longer than the amount of time configured for this function.
Time-out Timer can be configured for each system. Also, the timers relevant to the **Time-out Timer** function, such as **TOT Pre-alert**, **TOT Rekey Time**, and **TOT Reset Time**, can be configured.
Each function of **Time-out Timer** for transmission by the **PTT** (Test PTT and External PTT) control and for transmission by the Console PTT control can be configured by using KPG-D7.

Note

- If a channel is changed or the repeater is turned off, the countdown for **Time-out Timer** is reset.
- If “Off” is configured in **Time-out Timer**, the repeater does not terminate transmitting by timeout.
- Even if Off is configured in **Time-out Timer**, the duration of the continuous transmission by using the Test PTT is limited to 30 minutes. This is to avoid continuing the transmission if the operation has not been changed to Off after the Test PTT On operation.
- The TOT function does not behave for CW ID transmission and Beacon transmission.
- Time-out Timer behaves for each Slot during DMR transmission.

Configuration using KPG-D7

- Configuring **Time-out Timer (TOT)** of when **PTT** (Repeater PTT, External PTT, Network PTT, Console PTT, Test PTT) is used (Edit > Optional Features > Common Page 1 > Time-out Timer (TOT))

TOT Pre-alert

TOT Pre-alert is the function to notify a user that the continuous transmission by **Time-out Timer** is about to end. The warning tone (TOT Pre-alert Tone (3 beeps)) sounds from the repeater before the transmission ends by **Timeout Timer**.

Example: Time-out Timer: 30 sec, TOT Pre-alert: 4 sec

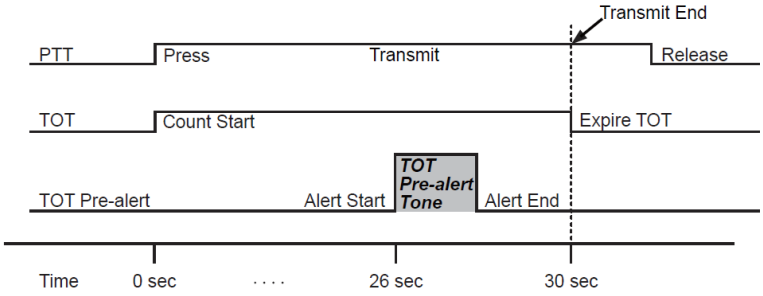


Figure 4-1 TOT Pre-alert

Note

- If “Off” is configured in **TOT Pre-alert**, TOT Pre-alert does not sound from the repeater.

Configuration using KPG-D7

- Configuring **TOT Pre-alert** of when **PTT** (Repeater PTT, External PTT, Network PTT, Console PTT, Test PTT) is used (Edit > Optional Features > Common Page 1 > TOT Pre-alert)

4.8 Toggling the Capability to Transmit by Using the PTT (Test PTT) Control between Enabled and Disabled (Local TX Enable/Disable)

Local TX Enable/Disable is the function to enable or disable the capability to transmit by using the **PTT** (Test PTT) control.

When **Local TX Disable** is enabled, if the **PTT** (Test PTT) control is pressed, a Warning Alert Tone (1 beep) sounds from the repeater and the repeater cannot transmit.

If the configuration of **Local TX Enable/Disable** is changed by using the **Remote Control** function of the **Web Tool**, transmission by using **PTT** (Test PTT) can be toggled between enabled and disabled.

Note

- If **Local TX Disable** is enabled while the repeater is transmitting, the repeater immediately ends the transmission by using the **PTT** (Test PTT) control.
- If a PTT configured to have a priority lower than the **PTT** (Test PTT) control is available for transmission when the repeater ends transmission by using the **PTT** (Test PTT) control by enabling **Local TX Disable** while the repeater is transmitting, the repeater switches the modulation signal line and continues transmission.
  (Refer to Configuring the Priority Order of Transmission (PTT Priority).)

4.9 Toggling All Transmissions by Using PTT Controls Between Enabled and Disabled (TX Enable/Disable)

TX Enable/Disable is the function to enable or disable all transmission.

If **TX Disable** is enabled, all transmissions by using the following PTT controls cannot be executed:

• External PTT

• Test PTT

• Repeat PTT

• Network PTT

• Console PTT

All transmissions by using PTT controls can be toggled between enabled and disabled when the Remote Control function of the Web Tool is used, or when a signal is applied to an AUX Input port.

Table 4-9 Toggling All Transmissions by Using PTT Controls Between Enabled and Disabled

Trigger	Assigned Function	See
AUX Input Port	TX Disable TX Enable	Available Functions for the AUX Input Ports

4.10 Toggling Repeat Behaviors Between Enabled and Disabled (Repeat Enable/Disable)

Repeat Enable/Disable is the function to enable or disable repeat behaviors.

If **Repeat Disable** is enabled, the repeater does not repeat even if the repeater receives a signal which matches the signaling preconfigured for the repeater.

The repeat behavior can be toggled between enabled and disabled when the Remote Control function of the Web Tool is used, when the Knob operation is executed, or when a signal is applied to an AUX Input port.

Table 4-10 Toggling Repeat Behaviors Between Enabled and Disabled

Trigger	Assigned Function	See
AUX Input Port	Repeat Disable Repeat Enable	Available Functions for the AUX Input Ports

Note

- If a PTT configured to have a priority lower than the Repeat PTT is available for transmission when the repeater ends transmission by using the Repeat PTT control by enabling **Repeat Disable** while the repeater is transmitting, the repeater switches the modulation signal line and continues transmission. (Refer to Configuring the Priority Order of Transmission (PTT Priority).)
- If **Repeat Disable** is enabled, the repeater cannot transmit using the Network PTT, Console PTT or SIP PTT.

4.11 Configuring the Threshold to Activate or Deactivate the RSSI Voltage Detection Function (Lowest Receive Level Threshold)

Lowest Receive Level Threshold is the reference RSSI level at which the repeater toggles the **Receive Signal (Threshold)** function assigned to an AUX Output port between activated and deactivated.
If the RSSI level is lower than the level configured in **Lowest Receive Level Threshold**, the AUX Output port to which **Receive Signal (Threshold)** is assigned is activated, and if the level is higher than the configured level, the AUX Output port is deactivated. (Refer to Available Functions for AUX Output Ports.)

While a DMR signal is being received on a DMR standby channel, the Receive Signal (Threshold) function assigned to the AUX Output port is activated if the RSSI voltage is lower than the level configured in Lowest Receive Level Threshold in both Slot 1 and Slot 2, and is deactivated if the RSSI voltage is higher in either Slot 1 or Slot 2.
The FPU configuration value can also be confirmed in the monitor function of Web Tool.

Configuration using KPG-D7

- Configuring **Lowest Receive Level Threshold** (Edit > Optional Features > Common Page 1 > Level > Lowest Receive Level Threshold)

4.12 Waiting to Receive on the Transmit Frequency (Standby on Transmit Frequency)

Standby on Transmit Frequency is the function to wait to receive on the transmit frequency configured for each channel while the repeater is in the standby mode.

For instance, a subscriber having a subscriber unit may be within several meters of the repeater if the repeater system is placed within a building, other than the roof of a building or mountain top. In such a case, if the repeater is locked on the frequency that TX VCO is preprogrammed, the subscriber unit may become busy due to chassis radiation from the repeater even if the repeater is not transmitting. The same phenomenon may occur during a repeater operation check while installing the system or demonstrating. This function must be disabled if the repeater waits to receive on a frequency shifted from the transmit frequency.

If **Standby on Transmit Frequency** is disabled, this trouble can be avoided because the repeater waits to receive shifting the TX VCO by 18.75 kHz while the repeater is in the standby mode. However, the rise time of transmission is delayed if this function is disabled; therefore, we recommend enabling this function except in the above-mentioned cases.

Configuration using KPG-D7

- Configuring **Standby on Transmit Frequency** to be enabled or disabled (Edit > Optional Features > Common Page 1 > Standby on Transmit Frequency)

4.13 Operation Mode

Operation Mode is the function to select an operation mode for each channel.
To use Operation Mode, Operation Mode needs to be configured.

Figure 4-11 Configuration of Operation Mode

Configuration Item FPU	Description
Simplex	This is the mode in which transmission and reception is switched. Transmission and reception cannot be performed simultaneously. If a transmission request (Test PTT or External PTT) occurs during reception, the received audio is muted and a transmit behavior is performed.
Duplex	This is the mode in which transmission and reception can be performed simultaneously. The receive behavior can be continued even if PTT is pressed to transmit. Even if a transmission request occurs during reception, a transmit behavior is performed without muting the received audio.
Repeat	This is the mode to relay the received signal if the repeater receives a signal (the repeat behavior). The repeat operation occurs with BUSY (signaling match), and transmission is performed with transmit frequency and encode signaling, and the received audio (data) is modulated.
TA Direct	This is the mode to receive a call in a DMR direct mode from the transceiver. If a signal is received by using radio communication, repeat transmission is not performed, and it is only transmitted to a Console. When a signal is received from a Console, transmission is performed on the transmit frequency. In this mode, transmission and reception cannot be performed simultaneously. TA Direct can be configured when Channel Type is DMR and Mixed. If Channel Type is Mixed, the same behavior as Simplex occurs in Analog.

Note

- If the transmit frequency and receive frequency are the same, the Duplex behavior, Repeat behavior cannot be performed.
- If Channel Type is DMR and Mixed, Simplex and Duplex cannot be configured.
- TA Direct can be configured only in DMR mode.
- On a channel of TA Direct, a signal of the transceiver in the repeater mode is not received.
- On a DMR standby channel of anything other than TA Direct, a signal of the transceiver in Direct Mode is not received.
- TA Direct only supports the transmission with Dual Slot Direct Mode disabled for the transceiver.
- TA Direct can be configured if the transmit frequency and receive frequency are the same.
- TA Direct only supports Slot 1. Therefore, if a call is made from a Console, the call needs to be made on Slot 1. If a call from a Console is made on Slot 2, the call is rejected.

Configuration using KPG-D7

- Configuring **Operation Mode** (Edit > Channel Information > Chanel Edit > Operation Mode)

4.14 Take Over

Take Over is the function to disable control from an external device.

If this function is enabled, control by the various functions for External Monitor, External PTT, AUX Input, and AUX Input/Output (Input only) is prohibited.

If **Take Over** is enabled during transmission by External PTT, the repeater stops transmission. If External PTT is active when **Take Over** is disabled, the repeater starts transmission.

Take Over can be toggled between enabled and disabled by using the Remote Control function of the Web Tool and by the Knob operation.

Note

- The AUX Input Monitor function is not affected even if **Take Over** is enabled.

5 SOUND

5.1 Tones that Sound When a User Operates the Repeater or When the Repeater Status Is Changed

The following are the tones used for the repeater:

Table 5-1 Tone List

Tone	Description	Remarks
Warring Alert Tone	This tone sounds from the repeater while **PTT** (Test PTT and External PTT) is pressed and held after **Time-out Timer** for **PTT** (Test PTT and External PTT) expired. Also, this tone sounds from the repeater when the repeater attempts to transmit while transmission is disabled by functions such as **TX Disable**.	continuous beep  697 Hz (until the **PTT** control is released)
TOT Pre-Alert Tone	This tone sounds from the repeater when transmission is about to end by **Time-out Timer**.	3 beeps  1633 Hz (50 ms)
Busy Tone	This tone sounds from the repeater when **PTT** (Test PTT) is pressed and held while transmission by **PTT** (Test PTT) is prohibited by the Busy Channel Lockout function.	continuous beep  697 Hz (until the **PTT** control is released)

5.2 Transmitting a Test Tone during Transmission (Test Tone)

Test Tone is the function to send a single tone (1000 Hz). This function is used to adjust the output level of the repeater.
The **Test Tone** transmission can be started or terminated by enabling or disabling **Test Tone** by using the Remote Control function of the Web Tool. Transmitting when **Test Tone** is enabled transmits the 1000 Hz tone during transmission.

For DMR transmission, **Test Tone** is transmitted only when audio transmission is performed. However, **Test Tone** is not transmitted during Hangtime or during the IDLE transmission.
For NXDN transmission, Test Tone is transmitted only when audio transmission is performed. Test Tone is not transmitted during Hold Time.

To prevent being unable to reset **Test Tone** in the event of a network failure, **Test Tone** automatically reverts to be disabled upon a lapse of 10 minutes after changing from disabled to enabled. If 10 minutes have elapsed during transmission, **Test Tone** is disabled after the transmission is completed.

Note

- A test tone is not transmitted while a CW ID or a tone such as a Courtesy Tone is being transmitted.
- If **Test Tone** is enabled during transmission, **Test Tone** is not transmitted during the transmission.
- If **Test Tone** is disabled during transmission, **Test Tone** is transmitted during the transmission.
- A voice is not modulated while a test tone is being transmitted.

5.3 Transmitting a Courtesy Tone After Transmission Ends (Courtesy Tone)

Courtesy Tone is the function for the repeater to transmit a courtesy tone when the transmission using the Repeat PTT/ Network PTT control or **PTT** (Test PTT and External PTT) control ends. This tone notifies a subscriber that the communication is finished and the repeater is available.
Whether **Courtesy Tone** is enabled or disabled and the following configurations related to a courtesy tone can be configured by using KPG-D7:

Table 5-2 Courtesy Tone

Configuration	Description
Frequency	The frequency of the courtesy tone can be configured in the range between 300 Hz and 3000 Hz.
Period	The duration of transmitting a courtesy tone can be configured in the range between 100 ms and 1000 ms.
Encode Pause Time	The threshold time value at which the repeater transmits a courtesy tone can be configured. This function is available only while the repeater transmits using the Repeat PTT/ Network PTT control. The repeater transmits a courtesy tone when the transmission using the Repeat PTT control is finished after the length of time configured in **Encode Pause Time** elapses. The repeater transmits a courtesy tone when the transmission using the Network PTT control is finished after the length of time configured in **Encode Pause Time** elapses.

Note

- When CW ID is transmitted at the time of transmitting a courtesy tone, the courtesy tone will not be transmitted. A courtesy tone will not be transmitted even after the CW ID is transmitted.
- In DMR, Courtesy Tone does not behave by using Repeat PTT, Network PTT, and Console PTT.

Configuration using KPG-D7

- Configuring **Courtesy Tone** to be enabled or disabled and configuring each function of **Courtesy Tone** (Edit > Optional Features > Common Page 2 > Courtesy Tone > Courtesy Tone)

About Transmission of a Courtesy Tone by Using the Repeat PTT Control

A courtesy tone is transmitted when the transmission using the Repeat PTT control is finished after the length of time configured in **Encode Pause Time** elapses.

If “Off” is configured in **Repeater Hold Time**, the transmission using the Repeat PTT control ends after a courtesy tone is transmitted.

If **Repeater Hold Time** is configured, a courtesy tone is transmitted before the length of time configured in **Repeater Hold Time** elapses. After the courtesy tone is transmitted, the transmission using the Repeat PTT control ends when the length of time configured in **Repeater Hold Time** elapses.

(Refer to Continuing Transmission for a Certain Length of Time After Reception Stops (Repeater Hold Time).)

The timing of courtesy tone emission is as follows:

▪If a courtesy tone is transmitted:

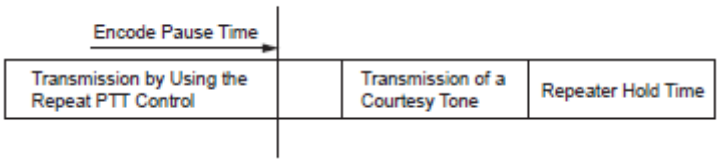


Figure 5-1 Courtesy Tone 1

▪If a courtesy tone is not transmitted:

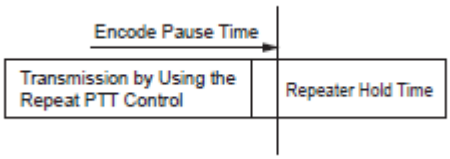


Figure 5-2 Courtesy Tone 2

The repeater does not transmit a courtesy tone if the transmission period using the Repeat PTT control is shorter than the **Encode Pause Time** after a PTT having the higher priority is activated and deactivated during the transmission using the Repeat PTT control.

PTT Priority 1: PTT (Test PTT and External PTT) control

PTT Priority 2: Repeat PTT

Encode Pause Time: 2 sec

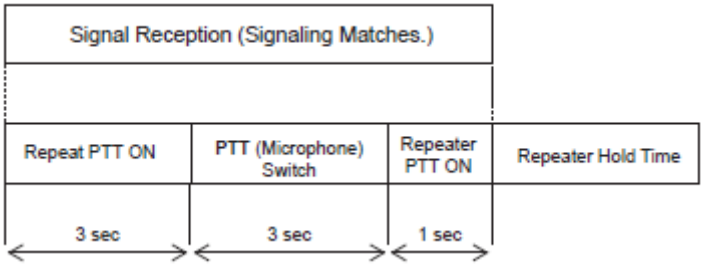


Figure 5-3 Courtesy Tone 3

5.4 Voting Pilot Tone

Voting Pilot Tone is the function to output a Voting Pilot Tone signal from the RA port while the repeater is receiving no signal.

The repeater can be used as the receiver in the Voting System. The repeater always outputs a Voting Pilot Tone signal to the RA port while the repeater is not receiving a signal. When the repeater receives a signal, the repeater stops outputting a Voting Pilot Tone signal, and then outputs the received signal to the RA port. If the signal drops out, the repeater starts outputting a Voting Pilot Tone signal again.

By using KPG-D7, whether Voting Pilot Tone can be enabled or disabled and the Voting Pilot Tone frequency can be configured.

Table 5-3 Voting Pilot Tone

Configuration	Description	Remarks
Voting Pilot Tone	Configures Voting Pilot Tone to be enabled or disabled.	-
Frequency	Configures the Voting Pilot Tone frequency.	-
Function (AUX Input)	Configures “Voting Tone Off” or “Voting Tone On” for one of the AUX Input ports.	-

Note

- The RA port is assigned to pin 11 (RA) of the D-sub 25-pin connector on the rear panel of the repeater.

Configuration using KPG-D7

- Configuring **Voting Pilot Tone** to be enabled or disabled and configuring the frequency **(** Edit > Optional Features > Common Page 2 > Voting Pilot Tone)

6 ANALOG COMMUNICATIONS

The repeater can communicate by transmitting and receiving analog signals on an analog channel.

6.1 Using Signaling

If the repeater receives an analog signal and the received QT tone or DQT code matches the QT tone or DQT code preconfigured for the repeater, the repeater starts the repeat behavior.

・QT (Quiet Talk)
QT is a type of signaling using a continuous sub-audible sine wave (67.0 Hz to 254.1 Hz). The frequency can be configured in steps of 0.1 Hz.

・DQT (Digital Quiet Talk)
DQT is a type of signaling using “1” and “0” in the 23-bit word. An octal code with a number between 000 and 777 can be configured. The DQT signal has a polarity and can be configured as Normal or Inverted, corresponding to the circuit configuration of a repeater or a target repeater.

Also, a maximum of 15 combinations of QT tone and DQT code (Current) can be configured in addition to the QT tone and DQT code (Primary) configured for each channel, and the repeater can wait to receive using the QT/DQT configured for Primary and Current.
(Refer to Waiting to Receive by Multiple Signaling (Multiple Encode/Decode Table).)

Configuration using KPG-D7

- Configuring **QT/DQT Decode** (Edit > Channel Information > Channel Edit > QT/DQT Decode)
- Configuring **QT/DQT Dec (QT/DQT Decode)** (Edit > Channel Information > QT/DQT Dec)
- Configuring **QT/DQT Encode** (Edit > Channel Information > Channel Edit > QT/DQT Encode)
- Configuring **QT/DQT Enc (QT/DQT Encode)** (Edit > Channel Information > Channel Edit > QT/DQT Enc)

Configuring the Length of Time Until the QT Decode is Restarted (QT Decode Delay)

QT Decode Delay is the length of time from when the matching state of the received QT tone becomes inconsistent until the repeater restarts the QT Decode.
This length of time is configured to prevent the QT Reverse Burst code which is sent from the subscriber unit from being detected as a normal QT tone by the repeater.
If the QT goes from consistent to inconsistent while an analog signal of a consistent QT is being received, the repeater does not decode a QT for 80 ms. The QT decode resumes after 80 ms elapses.

Note

- **QT Decode Delay** is enabled if “Mixed” or “Analog” is configured in **Channel Type**.

Toggling the QT/DQT Decode Between Enabled and Disabled (Decode Signaling Enable/Disable)

Decode Signaling Enable/Disable is the function to enable or disable the QT/DQT decode.

If **Decode Signaling Disable** is enabled, the repeater cannot decode QT/DQT.

Note

- The QT/DQT decode cannot be toggled between enabled and disabled when transmitting using the Repeat PTT control. The QT/DQT decode can be toggled between enabled and disabled while transmitting using anything other than the repeat behaviors.
- When transmitting using the Repeat PTT control while **Decode Signaling Disable** is enabled, the QT/DQT (Primary) configured for each channel is used for the signaling of the downlink signal from the repeater.
- If the repeater waits to receive on a mixed channel, this function works only when an analog signal is received.

Toggling the QT/DQT Encode Between Enabled and Disabled (Encode Signaling Enable/Disable)

Encode Signaling Enable/Disable is the function to enable or disable the QT/DQT encode.

If **Encode Signaling Disable** is enabled, the repeater cannot encode QT/DQT.

Note

- The QT/DQT encode can be toggled between enabled or disabled with **Encode Signaling Disable** or **Encode Signaling Enable** during transmission but it cannot be toggled between enabled or disabled with **Encode Signaling Enable/Disable**.
- When transmitting using the Repeat PTT control while **Decode Signaling Disable** is enabled, the QT/DQT (Primary) configured for each channel is used for the signaling of the downlink signal from the repeater.
- If the repeater transmits on a mixed channel, this function works only when an analog signal is transmitted.

Preventing the Receiving Party from Emitting the Squelch Tail Noise When Transmission Ends (Squelch Tail Elimination)

Squelch Tail Elimination is the function to prevent the speaker of the receiving party from emitting the squelch tail noise when transmission ends.

When transmission ends, QT Reverse Burst is output on a channel with QT configured in QT/DQT Encode, and DQT Turn-off Code is output on a channel with DQT configured in QT/DQT Encode.

QT Reverse Burst

QT Reverse Burst is the function to transmit by changing the phase of QT at the end of the transmission. The duration during which QT Reverse Burst is output is 160 ms. When the transceiver of another company is used, **QT Reverse Burst Phase** is configured according to the QT decode function of the transceiver so that tail noise is not emitted.

Configuration using KPG-D7

- Configuring **QT Reverse Burst Phase** (Edit > Optional Features > Common Page 1)

DQT Turn-off Code

DQT Turn-off Code is the function to prevent the speaker of the receiving party from emitting the squelch tail noise by sending the DQT turn-off code after transmission ends on the channel for which DQT Encode is configured.
If a receiving subscriber unit receives the DQT turn-off code, the received audio signal is muted.
The DQT turn-off code is sent for 170 ms and then transmission stops according to the DQT Decode characteristics of the subscriber unit used in the repeater system.

Waiting to Receive by Multiple Signaling (Multiple Encode/Decode Table)

Multiple Encode/Decode Table is the table configured with the Encode/Decode signaling type that the repeater waits to receive along with the Primary signaling (the QT tone or DQT code) configured for each channel. If this function is used, the repeater can wait to receive a maximum of 16 combinations of signaling (a combination of Primary + 15 combinations of Encode/Decode tones and codes).
A maximum of 15 combinations of QT/DQT can be configured in **Multiple Encode/Decode Table**. The signaling configured for each channel is used as Primary for No. 1 signaling in **Multiple Encode/Decode Table**.
In addition, the signaling table to be used can be changed depending on the status of ports by assigning the function to change **Multiple Encode/Decode Table** to AUX Input/Output ports.
(Refer to Available Functions for the AUX Input/Output Ports.)

To use this function, the following configurations need to be configured using KPG-D7:

・Configuring the Multiple Encode/Decode Table

A maximum of 15 **Multiple Encode/Decode Tables** can be configured. A maximum of 15 combinations of QT/DQT are configured for each table. The QT/DQT configured for each channel is used as Primary for No.1 signaling in **Multiple Encode/Decode Table**.

・Configuring the Multiple Encode/Decode Table number to be used for each channel

The **Multiple Encode/Decode Table** number (1 to 15) can be configured for each channel. The repeater can wait to receive the QT/DQT configured for the channel and the QT/DQT configured in **Multiple Encode/Decode Table** of the specified number.

・Configuring the Encode Tone (Multiple)

The QT/DQT to be used to transmit using the **PTT** (Test PTT and External PTT) control can be configured if the repeater receives the QT/DQT on the channel where **Multiple Encode/Decode Table** is configured.

Configuration using KPG-D7

・ Configuring **Multiple Encode/Decode Table** (Edit > Multiple Encode/Decode Table)

6.2 Continuing Transmission for a Certain Length of Time After Reception Stops (Repeater Hold Time)

Repeater Hold Time is the length of time from when reception stops until the repeater terminates transmission using the PTT control (Repeat/ Network/ Console) while the repeater is transmitting the received signal using the PTT control (Repeat/ Network/ Console).
The repeater can continue transmitting for the length of time configured in **Repeater Hold Time** even if the communication using the PTT control (Repeat/ Network/ Console) is finished.

Table 6-1 Configuration of Repeater Hold Time

Configuration	Description
Repeater Hold Time	The length of time during which transmission continues after the reception by the repeater stops is configured.
Repeater Hold Time Enable/Disable	**Repeater Hold Time** can be toggled between enabled and disabled by using Repeater Hold Time Enable/Disable in the Remote Control function of the Web Tool. To execute the above, the function needs to be preconfigured by the FPU to be available.

Note

- If “Off” is configured in **Repeater Hold Time**, the repeater terminates transmitting immediately after reception stops.
- While the **Repeater Hold Time** is counting down, the repeater mutes the transmission audio.
- If **Repeater Hold Time** is disabled while the **Repeater Hold Time** is counting down, the **Repeater Hold Time** continues to count down and the transmission continues. **Repeater Hold Time** becomes disabled after the transmission ends upon lapse of the time configured in **Repeater Hold Time**.
- **Repeater Hold Time** is enabled for analog transmission only (DMR Mode).
- This function works during transmission by Repeat PTT/ Network PTT/ Console PTT. Also, the behavior occurs during the NXDN transmission of a Group Call by SIP PTT as well.

Configuration using KPG-D7

- Configuring **Repeater Hold Time** (Edit > Optional Features > Common Page 1 > Repeater/ External/ Network/ Console PTT > Repeater Hold Time)

6.3 Temporarily Disabling the Squelch (Squelch Off)

Squelch Off is the function to unmute the speaker. Enabling **Squelch Off** disables the signaling decode by QT/DQT, and the speaker is unmuted. If **Squelch Off** is enabled for an analog channel, RX1 LED lights green even if the repeater is not receiving, and the speaker is unmuted regardless of the QT/DQT Decode configuration.
Squelch Off can be toggled between enabled and disabled when a signal is applied to an AUX Input port, or when the repeater is turned on.

Note

- When the repeater is operated in the repeater mode, even if **Squelch Off** is enabled, the repeater does not transmit using the Repeat PTT control unless the received signaling (the QT tone or DQT code) matches the signaling preconfigured for the repeater (the QT tone or DQT code).

6.4 Adjusting the Reception Sensitivity of the Repeater (Squelch Level)

Squelch Level is the threshold receive level by which the repeater can determine that the received signal has a carrier.
If the repeater is not receiving any signals, noise is automatically eliminated. Only when the repeater receives the signal having the higher level than the configured signal level, the squelch opens and the received audio becomes audible.
The level of the received signal which unmutes the speaker can be adjusted by changing the value in **Squelch Level** depending on how the repeater is used; for instance, when an excessively interfering signal is present.
If the repeater receives a signal, the speaker is usually unmuted and emits the received audio at the point adjusted by **Squelch Open**; however, if the maximum value of 9 is configured in **Squelch Level**, the speaker is unmuted at the point adjusted by **Squelch Tight**. If a value of 0 is configured in **Squelch Level**, the repeater is always placed in receive mode.
If no signaling used for reception (the QT tone or DQT code) is configured, the speaker is unmuted on a channel with “Analog” or “Mixed” configured in **Channel Type**.
(Refer to Configuring the Reception Method of a Channel (Channel Type).)

The squelch function can be enabled by the Squelch Off operation even on an NXDN channel. Although RX1 LED lights on an NXDN channel, mute is not forcibly unmuted. The RAN is reset and the repeater is in the standby state for the establishment of frame synchronization.

Note

- **Squelch Level** cannot be configured on a DMR channel and NXDN channel. On a DMR channel and NXDN channel, the repeater behaves with Squelch Level 1 fixed.
- The repeater does not perform the repeat behavior if no signal where QT/ DQT/ RAN/ Color Code matches is received even if Squelch Off is configured.
- On a channel with “NXDN” or “Mixed” configured in **Channel Type**, RX2 LED does not light green unless a signal where the RAN matches is received even if an NXDN signal is received while Squelch Off is configured.

Configuration using KPG-D7

- Configuring **Squelch Level** (Edit > Optional Features > Common Page 1 > Squelch Level)

6.5 Temporarily Disabling the Signaling (Monitor)

Monitor is the function to unmute the speaker if the level of the received signal is high, even if the received signaling (the QT tone, DQT code or RAN code) does not match the signaling preconfigured for the repeater (the QT tone, DQT code or RAN code). This function can be used to check in advance whether or not a channel to be used for transmission is already being used by other groups.
Monitor can be changed from enabled and disabled by using the Remote Control function of the Web Tool and by the Knob operation.
An icon is displayed on the OLED display while **Monitor** is in the enabled state.

The following are the repeater behaviors that may vary depending on the configuration in **Channel Type**.
(Refer to Configuring the Reception Method of a Channel (Channel Type).)

Table 6-2 Configuration of Channel Type (Monitor is Enabled)

Channel Type	Description
Analog DMR	Disables the signaling decode by the QT tone or DQT code and unmutes the speaker just by receiving a carrier.
NXDN	Disables the signaling decoding by the RAN code and unmutes the speaker just by detecting an NXDN frame. The repeater does not unmute the speaker just by receiving a carrier.
Mixed	Disables the signaling decode by the QT tone or DQT code. If an analog signal is received, the speaker is unmuted just by receiving a carrier.

Note

- When the repeater is operated in the repeater mode, even if **Monitor** is enabled, the repeater does not transmit using the Repeat PTT control unless the received signaling (the QT tone or DQT code) matches the signaling preconfigured for the repeater (the QT tone or DQT code).

6.6 Avoiding Interference with Other Communications (Busy Channel Lockout (Analog))

Busy Channel Lockout (Analog) is the function to automatically restrict transmission in order to avoid interfering with the communications of other parties if the channel on which the repeater attempts to transmit using the Test PTT control is already used by another group. Using this function, the repeater can transmit without interfering with the communications of other parties without checking the usage status of the channel.

Table 6-3 Busy Channel Lockout (Analog)

Configuration	Description
No	Disables **Busy Channel Lockout**. Transmission is not restricted even if the analog channel on which the repeater attempts to transmit is busy.
Carrier Only	The repeater cannot transmit while the repeater is receiving a signal.
Incorrect Tone	The repeater cannot transmit if the repeater receives a signal and the received QT tone or DQT code does not match the QT tone or DQT code preconfigured for the repeater. However, the repeater can transmit if the received QT tone or DQT code matches the QT tone or DQT code preconfigured for the repeater.

To transmit on a mixed channel, the repeater is controlled as follows depending on Transmit Mode.

・If "Analog" is configured in Transmit Mode

The repeater transmits according to the configuration in **Busy Channel Lockout (Analog)**.

・If "DMR" is configured in Transmit Mode

The repeater transmits according to the configuration in **Busy Channel Lockout (DMR)**.

In addition, if the **Signaling Reset Timer** is activated on a mixed channel, the repeater transmits according to the configuration in **Busy Channel Lockout** in the same mode (either Analog or DMR) as the mode used for the received signal. If the repeater receives an analog signal, the repeater transmits according to the configuration in **Busy Channel Lockout (Analog)**. If the repeater receives a DMR digital signal, the repeater transmits according to the configuration in **Busy Channel Lockout (DMR)**.

Note

- Refer to "Avoiding Interference with Other Communications (Busy Channel Lockout (DMR)) " for the behavior of the repeater in **Busy Channel Lockout (DMR)**.

Configuration using KPG-D7

- Configuring **Busy Channel Lockout (Analog)** (Edit > Optional Features > Common Page 2 > Test PTT > Busy Channel Lockout (Analog))
- Configuring **Busy Channel Lockout (Analog)** (Edit > Conventional IP Network > General > Cross-busy > Busy Channel Lockout (Analog))

6.7 Using the Network by Using an Analog GID

Analog GID

Analog GID is the function to output an audio packet to an IP Network when an Analog carrier is received by the repeater. By configuring this function, Analog audio ordinarily without an ID can be emitted to a Console and VLI via a Network. Also, a Console can perform an Analog transmission by making a voice call addressed to an ID configured by using this function.

Table 6-4 Analog GID

Configuration Item	Description
Analog GID	Only a Group ID can be configured in **Analog GID**. The configuration range of Analog GID in Analog Mode/DMR Mode is as follows: ・1 to 16776415 The configuration range of Analog GID in NXDN Mode is as follows: ・1 to 65519
Channel Type	Configure Analog Channel or Mixed Channel in **Channel Type** when using an Analog GID. An Analog GID is enabled on an Analog Channel and Mixed Channel.
SIP Session Timer	**SIP Session Timer** is a 5 sec timer to start a countdown after an Analog carrier is received. If Repeat is configured in Operation Mode, **SIP Session Timer** starts after Repeat Hold Time expires.

If the repeater receives an Analog carrier and the QT/DQT matches, the repeater sends audio packets to a Network. In this case, if the delivery destination is a Console and VLI, the Analog GID is sent as the Destination ID and the Own ID is sent as the Source ID.
The call using the Analog GID is distributed to each repeater that corresponds to the configuration of a Console and the configuration in User List. If no configuration exists in User List, the call is delivered to all repeaters configured in Site Group Table.

An Analog transmission can be initiated from the repeater by making a voice call to an Analog GID by using a Console. When a voice call is made to an Analog GID from a Console, while SIP Session Timer behaves on the repeater, Analog transmission can be done and Talk Back can occur by using the QT/DQT that matched immediately before.
If SIP Session Timer is not behaving on the repeater when a voice call is made to an Analog GID from a Console, transmission is done by using the QT/DQT configured in each Channel Edit. Even when the QT/DQT is configured, Analog transmission with the QT/DQT in Encode changed to None can be done by configuring Disable for Encode Signaling of the Web Tool.

Note

- To output Analog audio to a Console, a valid Console configuration needs to be preconfigured in Console List.
- To record an Analog voice call in Voice Logger, configure as the Target GID a Group ID configured in Analog GID.
- An Analog GID can be configured regardless of Operation Mode.
- Operate with a common awareness of the Analog GID between the repeater system administrator and Console users.
- In DMR Mode, if an analog signal is delivered to another repeater in a Conventional IP Network, the fixed value 0xFFFDFF is output as the Destination ID and Own ID is output as the Source ID without the use of an Analog GID.
- In NXDN Mode, if an analog signal is delivered to another repeater in a Conventional IP Network, the fixed value 0xFFF9 is output as the Destination ID and Own ID is output as the Source ID without the use of an Analog GID.
- The communication for which the repeater receives a DMR or NXDN carrier and uses the same Group ID as an Analog GID is distributed to each repeater according to the configuration in Console and User List.
- If a DMR or NXDN carrier is received on an Analog channel with QT/DQT not configured, audio packets are output to the network in the same way as when an Analog carrier is received. However, the audio cannot be played back by a Console because a digital signal is received as an analog signal.

7 DMR DIGITAL COMMUNICATIONS

DMR is a generic name for a digital communication system protocol utilizing 4-level FSK. The repeater can communicate by transmitting and receiving digital signals on a DMR digital channel.

7.1 About Own ID

To initiate various communications using DMR by using the Test PTT control, the **Unit ID (Own)** that is the identification code of the repeater needs to be configured for the repeater.
One **Unit ID (Own)** can be configured for each repeater.

Note

- If the repeater is operated by using the IPRCI command in IP Interface Protocol, the Unit ID (Own) of the repeater needs to be configured as the destination for transmission.

Configuration using KPG-D7

- Configuring **Unit ID (Own)** (Edit > Protocol Options > Unit ID (Own))

7.2 About the Slot Number (Slot Selection)

In DMR, the repeater communicates using the predetermined slot according to the standard.
When DMR digital transmission is initiated by using the Test PTT control or External PTT control, the repeater transmits using the slot configured in **Slot Selection**.
The slot number (1 or 2) to be used for communications can be configured for each channel by using KPG-D7.

If the Slot is switched by using Remote Control of the Web Tool or the “Slot Select” menu on the OLED display, Slot Selection behaves in the Slot switched by using Slot Select, regardless of the configuration in **Slot Selection**.
However, during the transmission by using the Test PTT control or External PTT control, the Slot cannot be switched by “Slot Select”.

Configuration using KPG-D7

- Configuring **Slot Selection** (Edit > Channel Information > Channel Edit > Slot Selection)

7.3 Using Signaling

If the repeater receives a DMR digital signal and the received Color Code matches the Color Code preconfigured for the repeater, the repeater starts the repeat behavior.

Table 7-1 Transmission and Reception Behaviors of Color Code

Repeater Behavior	Description
Reception	If the repeater receives a signal and the received Color Code matches the Color Code preconfigured for the repeater, the repeater transmits by relaying the signal by using the Repeat PTT control. For the repeater behaviors, the same Color Code as the received Color Code is transmitted.
Transmission	If the repeater receives a signal and the received Color Code matches the Color Code preconfigured for the repeater, the repeater transmits by relaying the signal by using the Repeat PTT control. For the repeater behaviors, the same Color Code as the received Color Code is transmitted. To transmit on a mixed channel, the repeater transmits a digital signal if the received signal is digital.

Configuration using KPG-D7

- Configuring **Color Code** (Edit > Channel Information > Channel Edit > Color Code)
- Configuring **Color Code** (Edit > Channel Information > Color Code)

Waiting for Signaling (Multiple Encode/Decode Table)

This function can be used to wait for a maximum of up to 15 types of QT/DQT/ RAN in addition to QT/DQT/ RAN configured for each channel.

Signals can be received from many transceivers by using this function.

Table 7-2 Multiple Encode/Decode Table

Configuration	Description
Multiple Encode/Decode Table	A maximum of 15 tables No.1 to No.15 can be configured in **Multiple Encode/Decode Table**. In Analog Mode or DMR Mode, a maximum of 15 combinations of analog signaling (QT/DQT) can be configured in each table. In NXDN Mode, a maximum of 15 combinations of analog signaling (QT/DQT) and a maximum of 15 combinations of digital signaling (RAN) can be configured in each table.
Multiple Encode/Decode Table (Channel Edit)	The Multiple Encode/Decode Table used for each channel is specified.

On a channel for which the Multiple Encode/Decode Table to be used is specified, the signaling configured for the channel and the signaling configured in the Multiple Encode/Decode Table of the specified number are waited for. The signaling to be waited for is as follows according to Channel Type:

Table 7-3 Multiple Encode/Decode Table (Channel Type)

Configuration	Description
Analog	Waiting occurs for the QT/DQT configured for a channel, and a maximum of 15 QT/DQT configured in the Multiple Encode/Decode Table of the specified number.
NXDN	Waiting occurs for the RAN configured for a channel, and a maximum of 15 RAN configured in the Multiple Encode/Decode Table of the specified number.
Mixed	DMR Mode Waiting occurs for the QT/DQT configured for a channel, and a maximum of 15 QT/DQT configured in the Multiple Encode/Decode Table of the specified number. NXDN Mode Waiting occurs for the QT/DQT and RAN configured for a channel, and a maximum of 15 QT/DQT and a maximum of 15 RAN configured in the Multiple Encode/Decode Table of the specified number.

During Analog repeat behaviors, encoding occurs with the QT/DQT paired with a decoded QT/DQT in the Primary + Multiple Encode/Decode Table.
During NXDN repeat behaviors, encoding occurs with the RAN paired with a decoded RAN in the Primary + Multiple Encode/Decode Table.
Waiting occurs only for the QT/DQT/ RAN of Primary on a channel for which the Multiple Encode/Decode Table to be used is not specified.

Note

- The Multiple Encode/Decode Table cannot be Preset if a channel is Analog or Mixed for Channel Type, and QT/DQT Decode is configured as None in Primary.
- The Multiple Encode/Decode Table with no QT/DQT Decode configured cannot be Preset for a channel.
- In NXDN Mode, the Multiple Encode/Decode Table with no QT/DQT Decode and no RAN Decode configured cannot be Preset for a channel.
- For a channel with “Analog” configured in **Channel Type**, the Multiple Encode/Decode Table with None configured for all QT/DQT Decode cannot be Preset.
- For a channel with “NXDN” configured in Channel Type, the Multiple Encode/Decode Table with None configured for all RAN Decode cannot be Preset.
- In NXDN Mode, for a channel with “Mixed” configured in Channel Type, the Multiple Encode/Decode Table can be Preset only for a channel for which both QT/DQT Decode and RAN Decode are configured.

- If the same signaling is configured several times in the QT/DQT Decode column of Multiple Encode/Decode Table (including Equivalent Code for DQT), and when this signaling is received, which of the several signaling configured in the QT/DQT Decode column matches cannot be determined. Therefore, the signaling to be encoded when the repeater repeats is the signaling configured in QT/DQT Decode column which matched at the time.

Configuration using KPG-D7

- Configuring **Multiple Encode/Decode Table** (Edit > Multiple Encode/Decode Table)
- Configuring **Multiple Encode/Decode Table (Channel Edit)** (Edit > Channel Information > Channel Edit > Multiple Encode/Decode Table)

7.4 Avoiding Interference with Other Communications (Busy Channel Lockout (DMR))

Busy Channel Lockout (DMR) is the function to automatically restrict transmission in order to avoid interfering with the communications of other parties if the channel on which the repeater attempts to transmit using the Test PTT control is already used by another group. Using this function, the repeater can transmit without interfering with the communications of other parties without checking the usage status of the channel.

Table 7-4 Busy Channel Lockout (DMR)

Configuration	Description
No	Disables **Busy Channel Lockout**. Transmission is not restricted even if the analog channel on which the repeater attempts to transmit is busy.
Carrier Only	The repeater cannot transmit while the repeater is receiving a signal.
Correct CC	The repeater cannot transmit if the repeater receives a signal and the received Color Code matches the Color Code preconfigured for the repeater.

To transmit on a mixed channel, the repeater is controlled as follows depending on the configuration in **Transmit Mode**:

・If “Analog” is configured in Transmit Mode

The repeater transmits according to the configuration in **Busy Channel Lockout (Analog)**.

・If “DMR” is configured in Transmit Mode

The repeater transmits according to the configuration in **Busy Channel Lockout (DMR)**.

In addition, if the **Signaling Reset Timer** is activated on a mixed channel, the repeater transmits according to the configuration in **Busy Channel Lockout** in the same mode (either Analog or DMR) as the mode used for the received signal. If the repeater receives an analog signal, the repeater transmits according to the configuration in **Busy Channel Lockout (Analog)**. If the repeater receives a DMR digital signal, the repeater transmits according to the configuration in **Busy Channel Lockout (DMR)**.

Note

- Refer to "Avoiding Interference with Other Communications (Busy Channel Lockout (Analog))" for the behavior of the repeater in **Busy Channel Lockout (Analog)**.

Configuration using KPG-D7

- Configuring **Busy Channel Lockout (DMR)** (Edit > Optional Features > Common Page 2 > Test PTT > Busy Channel Lockout (DMR))
- Configuring **Busy Channel Lockout (DMR)** (Edit > Conventional IP Network > General > Cross-busy > Busy Channel Lockout (DMR))

7.5 Continuing Transmission for a Certain Length of Time After Various Transmissions End

The following functions continue transmission for a certain length of time after various communications in the DMR format end:

• Call Hangtime

• Data Hangtime

• Channel Hangtime (Mixed Channel)

• Channel Hangtime (DMR Channel)

Call Hangtime

Call Hangtime is the function that is used to retain a channel for a certain length of time after the repeater ends transmission of an audio signal.

The repeater starts repeat transmission after a subscriber unit transmits an audio signal. The repeater retains a channel and continues repeat transmission for the length of time configured in **Call Hangtime** after the repeater ends transmission of an audio signal.

Table 7-5 Configuration of Call Hangtime

Configuration	Description
Call Hangtime	The length of time for which a channel is retained after the repeater ends transmission of an audio signal is configured.
Call Hangtime Enable/Disable	**Call Hangtime** can be toggled between enabled and disabled by using Call Hangtime Enable/Disable in the Remote Control function of the Web Tool.

Note

- While the **Call Hangtime** is counting down, the repeater does not start repeat transmission even if the repeater receives an analog signal on a channel with “Mixed” configured in **Channel Type**.
- **Call Hangtime** is enabled only for the transmission of a DMR digital signal. If “Mixed” is configured in **Channel Type**, a test tone is activated when the factor for transmission by the repeater is repeating a DMR digital signal.
- If “TA Direct” is configured in **Operation Mode**, **Call Hangtime** is not activated.
- This function works during transmission by Repeat PTT/ Network PTT/ Console PTT/ External PTT/ Test PTT. Also, the behavior occurs during Group Call transmission by SIP PTT as well.

Configuration using KPG-D7

- Configuring **Call Hangtime** (Edit > Optional Features > Common Page 1 > Repeater/ External/ Network/ Console PTT > Call Hangtime)

Configuration using Web Tool

- Configuring **Call Hangtime Enable/Disable** (Maintenance > Remote Control > Call Hangtime > Enable/Disable)

Data Hangtime

Data Hangtime is the function that is used to retain a channel for a certain length of time after the repeater ends transmission of a data communication signal.

The repeater starts repeat transmission after a subscriber unit transmits a data communication signal. The repeater retains a channel and continues repeat transmission for the length of time configured in **Data Hangtime** after the repeater ends transmission of a data communication signal.

Note

- This function works on a channel with “DMR” or “Mixed” configured in **Channel Type**.(Refer to Configuring the Reception Method of a Channel (Channel Type).)
- While the **Data Hangtime** is counting down, the repeater does not start repeat transmission even if the repeater receives an analog signal on a channel with “Mixed” configured in **Channel Type**.
- If the subscriber unit disables A-bit (Response Expected) and transmits a data communication signal, **Data Hangtime** becomes disabled.
- If “TA Direct” is configured in **Operation Mode**, **Data Hangtime** is not activated.
- This function works during transmission by Repeat PTT/ Network PTT/ Console PTT.

Configuration using KPG-D7

- Configuring **Data Hangtime** (Edit > Optional Features > Common Page 1 > Repeater/ External/ Network/ Console PTT > Data Hangtime)

Channel Hangtime (Mixed Channel)

Channel Hangtime (Mixed Channel) is the function that is used to retain a channel for a certain length of time after the repeater ends transmission in the DMR format on a mixed channel.

The repeater starts repeat transmission after a subscriber unit transmits a DMR digital signal on a mixed channel. The repeater retains a channel and continues repeat transmission for the length of time configured in **Channel Hangtime (Mixed Channel)** after the repeater ends transmission of a DMR digital signal.

Table 7-6 Configuration of Channel Hangtime (Mixed Channel)

Configuration	Description
Channel Hangtime (Mixed Channel)	The length of time for which a channel is retained after the repeater ends transmission of an audio signal is configured.
Call Hangtime Enable/Disable	**Channel Hangtime (Mixed Channel)** can be toggled between enabled and disabled by using Channel Hangtime Enable/Disable in the Remote Control function of the Web Tool.

Note

- This function works on a channel with “Mixed” configured in **Channel Type**. (Refer to Configuring the Reception Method of a Channel (Channel Type).)
- While the **Channel Hangtime (Mixed Channel)** is counting down, the repeater does not start repeat transmission even if the repeater receives an analog signal.
- If both **Call Hangtime** and **Channel Hangtime (Mixed Channel)** are configured in the repeater, the countdown of the **Channel Hangtime (Mixed Channel)** starts after the countdown of the **Call Hangtime** ends.
- If **Data Hangtime** is configured in the repeater, the countdown of the **Channel Hangtime (Mixed Channel)** starts after the **Data Hangtime** ends.
- If the countdown of the **Channel Hangtime (DMR Channel)** or **Channel Hangtime (Mixed Channel)** is extremely shortened, the DMR digital communication required for repeat transmission may not function properly.
- If “TA Direct” is configured in **Operation Mode**, **Channel Hangtime (Mixed Channel)** is not activated.
- This function works during transmission by any PTT (Repeat PTT/ Network PTT/ Console PTT/ External PTT/ SIP PTT/ Test PTT).

Configuration using KPG-D7

- Configuring **Channel Hangtime (Mixed Channel)** (Edit > Optional Features > Common Page 1 > Repeater/ External/ Network/ Console PTT > Channel Hangtime (Mixed Channel))

Configuration using Web Tool

- Configuring **Channel Hangtime Enable/Disable** (Maintenance > Remote Control > Channel Hangtime > Enable / Disable)

Channel Hangtime (DMR Channel)

Channel Hangtime (DMR Channel) is the function that is used to retain a channel for a certain length of time after the repeater ends transmission in the DMR format on a DMR digital channel.

The repeater starts repeat transmission after a subscriber unit transmits a DMR digital signal on a DMR digital channel. The repeater retains a channel and continues repeat transmission for the length of time configured in **Channel Hangtime (DMR Channel)** after the repeater ends transmission of a DMR digital signal.

Table 7-7 Configuration of Channel Hangtime (DMR Channel)

Configuration	Description
Channel Hangtime (DMR Channel)	The length of time for which a channel is retained after the repeater ends transmission of an audio signal is configured.
Channel Hangtime Enable/Disable	**Channel Hangtime (DMR Channel)** can be toggled between enabled and disabled by using Channel Hangtime Enable/Disable in the Remote Control function of the Web Tool.

Note

- This function works on a channel with “DMR” configured in **Channel Type**. (Refer to Configuring the Reception Method of a Channel (Channel Type).)
- While the **Channel Hangtime (DMR Channel)** is counting down, the repeater does not start repeat transmission even if the repeater receives an analog signal.
- If both **Call Hangtime** and **Channel Hangtime (DMR Channel)** are configured in the repeater, the countdown of the **Channel Hangtime (DMR Channel)** starts after the countdown of the Call Hangtime ends.
- If **Data Hangtime** is configured in the repeater, the countdown of the **Channel Hangtime (DMR Channel)** starts after the **Data Hangtime** ends.
- If the countdown of the **Channel Hangtime (DMR Channel)** or **Channel Hangtime (Mixed Channel)** is extremely shortened, the DMR digital communication required for repeat transmission may not function properly.
- If “TA Direct” is configured in **Operation Mode**, **Channel Hangtime (DMR Channel)** is not activated.
- This function works during transmission by any PTT (Repeat PTT/ Network PTT/ Console PTT/ External PTT/ SIP PTT/ Test PTT).

Configuration using KPG-D7

- Configuring **Channel Hangtime (DMR Channel)** (Edit > Optional Features > Common Page 1 > Repeater/ External/ Network/ Console PTT > Channel Hangtime (DMR Channel))

Configuration using Web Tool

- Configuring **Channel Hangtime Enable/Disable** (Maintenance > Remote Control > Channel Hangtime > Enable / Disable)

7.6 Making a Group Call

By using **GID List**, a Group Call can be made for the specified GID.
Group Call can be used to establish group voice communications by initiating a call to a group.

All subscriber units having the same GID can be called. Also, specifying the GID for which “ALL” is configured, all subscriber units can be called.

Note

- To use this function, the same GID needs to be configured for the target subscriber unit to be called.

Configuration using KPG-D7

- Configuring **User List (GID)** (Edit > Channel Information > Channel Edit > User List (GID))
- Configuring **GID List (GID)** (Edit > User List > GID List > GID)

7.7 Making an Unaddress Call

Unaddress Call can be used for a subscriber unit normally belonging to a different group to establish two-way communications exceeding regular communication groups such as when in an emergency. The repeater can communicate without reorganizing the communication group.

To make an Unaddress Call, the Unaddress Call is initiated by the Test PTT/External PTT control by selecting a DMR digital channel.

7.8 Limiting the IDs for Repeat Transmission (User List (GID)/ User List (UID))

User List (GID) and **User List (UID)** are the functions to restrict the IDs to be transmitted by using the Repeat PTT control on the digital channels for which **User List (GID)** or **User List (UID)** is enabled.
If **User List (GID)** or **User List (UID)** is enabled, the repeater repeats only digital signal calls that use the ID permitted in the **User List (GID)** or **User List (UID)**.
If **User List (GID)** and **User List (UID)** are disabled, the repeater repeats all digital signal calls.
However, the received Color Code needs to match the Color Code preconfigured for the repeater as the basic condition to repeat in all cases.

Note

- This function can be used only on a digital channel.
- If the UID and GID to be used for a digital signal call are not permitted for use, the call cannot be made because the repeater does not transmit the repeat transmission. In this case, the receiving subscriber unit is in a silent receiving mode because the repeater continues to transmit an idle signal to allow the call to be transmitted in a vacant slot.

Configuring the GIDs Permitted for Repeat Transmission (GID List)

GID List is the list in which the GIDs permitted for repeat transmission on a digital channel are configured.

The repeater repeats when receiving a call by the GID which is configured in **GID List** and for which “On” is configured in **Valid**. Because subscriber units using unauthorized GIDs are not repeated, the repeater cannot communicate with these subscriber units. In this case, the receiving subscriber unit is in a silent receiving mode because the repeater continues to transmit an idle signal to allow the call to be transmitted in a vacant slot.

A maximum of 1000 GIDs can be configured in **GID List** by using KPG-D7 or Web Tool.

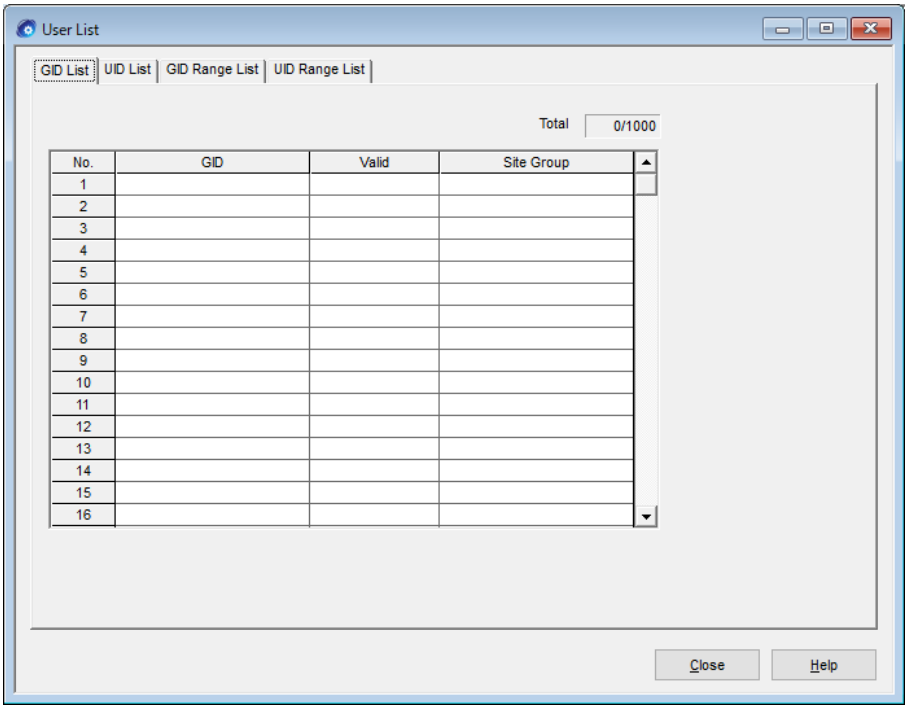


Figure 7-1 GID List

Note

- If “Unaddress” is configured in **GID** of **GID List**, the repeater is permitted to use the codes $FFFFE0 to $FFFFEF.
- If “ALL” is configured in **GID** of **GID List**, the repeater is permitted to use the codes $FFFFF0 to $FFFFFF.

Configuration using KPG-D7

- Configuring **GID List** (Edit > User List > GID List)

Configuration using Web Tool

- Configuring **GID List** (Edit > User List > GID List > GID List)

Configuring the UIDs Permitted for Repeat Transmission (UID List)

UID List is the list in which the UIDs permitted for repeat transmission on a digital channel are configured.

The repeater repeats when receiving a call by the UID which is configured in **UID List** and for which “On” is configured in **Valid**. Because subscriber units using unauthorized UIDs are not repeated, the repeater cannot communicate with these subscriber units. In this case, the receiving subscriber unit is in a silent receiving mode because the repeater continues to transmit an idle signal to allow the call to be transmitted in a vacant slot.

A maximum of 1000 UIDs can be configured in the **UID List** by using KPG-D7 or Web Tool.

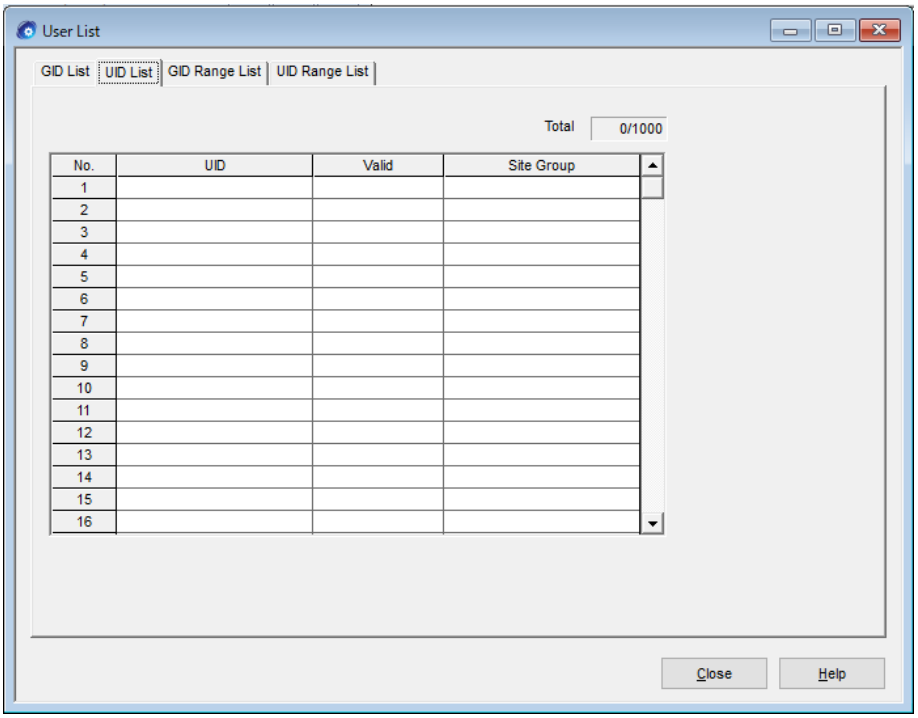


Figure 7-2 UID List

Configuration using KPG-D7

- Configuring **UID List** (Edit > User List > UID List)

Configuration using Web Tool

- Configuring **UID List** (Edit > User List > UID List > UID List)

Configuring the GIDs Permitted for Repeat Transmission All at Once (GID Range)

GID Range List is the list in which the multiple GIDs permitted for repeat transmission on a digital channel are configured all at once as a GID Range list.

The repeater repeats when receiving a call by the GID which is configured in **GID Range List** and for which "On" is configured in **Valid**. Because subscriber units using unauthorized GIDs are not repeated, the repeater cannot communicate with these subscriber units. In this case, the receiving subscriber unit is in a silent receiving mode because the repeater continues to transmit an idle signal to allow the call to be transmitted in a vacant slot.

A maximum of 64 GID Range lists can be configured in **GID Range List** by using KPG-D7 or Web Tool.

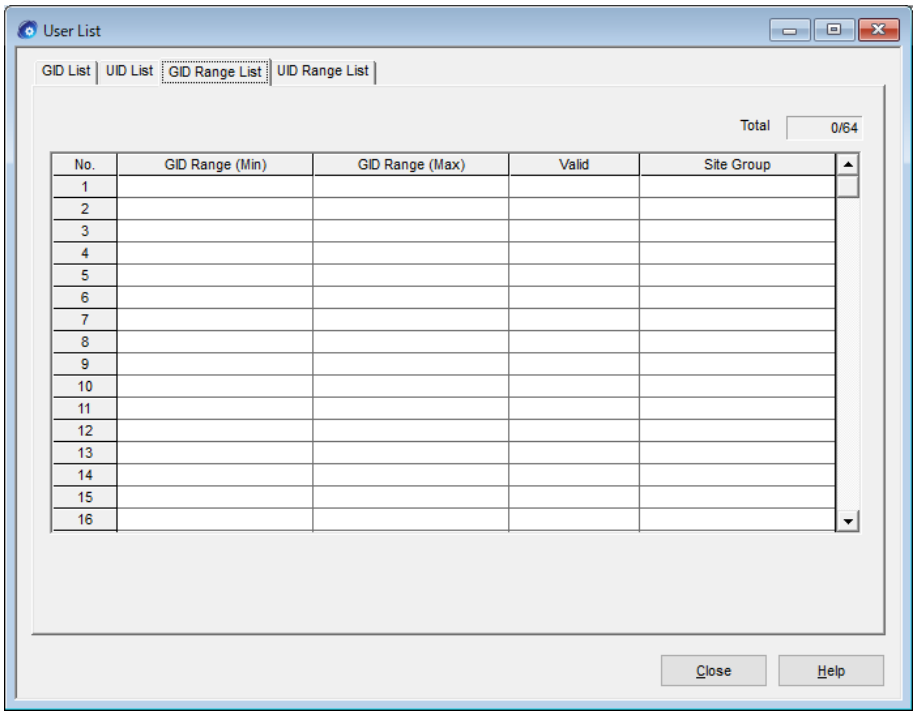


Figure 7-3 GID Range List

Note

- Enter the **GID Range list** from the **GID Range (Min)**. If a GID is not entered in **GID Range (Min)**, the **GID Range (Max)** cannot be entered.
- If a GID is entered in **GID Range (Min)**, the same GID is automatically entered in **GID Range (Max)**.
- "ALL" and "Unaddress" of **GID Range List** can only be configured in **GID Range (Min)**.
- If "Unaddress" is configured in **GID Range (Min)**, the repeater is permitted to use the codes $FFFFE0 to $FFFFEF.
- If “ALL” is configured in **GID Range (Min)**, the repeater is permitted to use the codes $FFFFF0 to $FFFFFF.
- The GID number which is redundant with the already configured GID number between **GID Range (Min)** and **GID Range (Max)** cannot be entered.

Configuration using KPG-D7

- Configuring **GID Range List** (Edit > User List > GID Range List)

Configuration using Web Tool

- Configuring **GID Range List** (Edit > User List > GID Range List > GID Range List)

Configuring the UIDs Permitted for Repeat Transmission All at Once (UID Range)

UID Range List is the list in which the multiple UIDs permitted for repeat transmission on a digital channel are configured all at once as a UID Range list.

The repeater repeats when receiving a call by the UID which is configured in **UID Range List** and for which “On” is configured in **Valid**. Because subscriber units using unauthorized UIDs are not repeated, the repeater cannot communicate with these subscriber units. In this case, the receiving subscriber unit is in a silent receiving mode because the repeater continues to transmit an idle signal to allow the call to be transmitted in a vacant slot.

A maximum of 64 UID Range lists can be configured in **UID Range List** by using KPG-D7 or Web Tool.

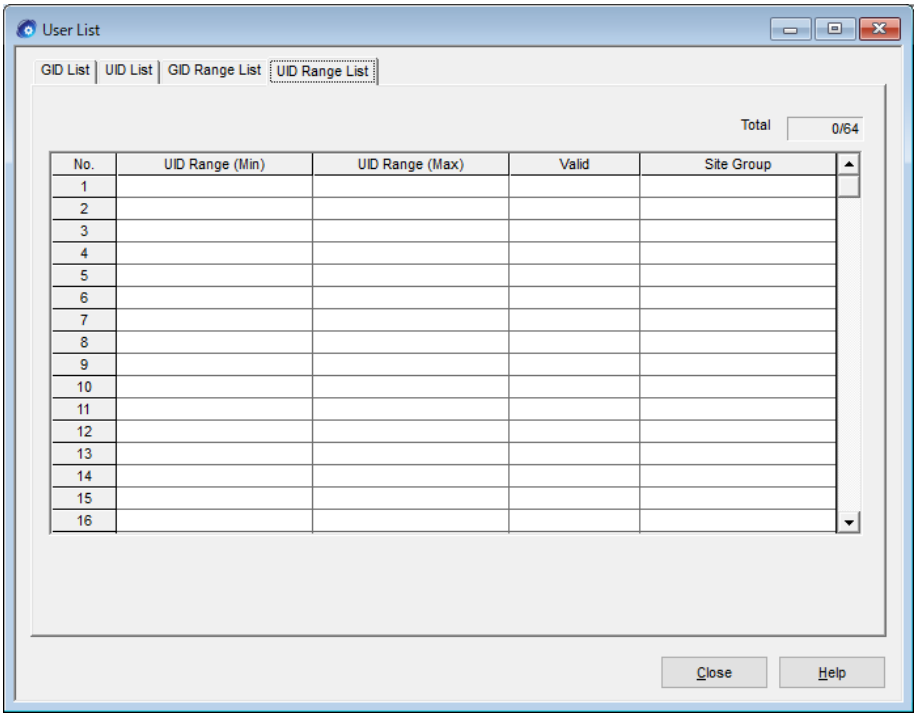


Figure 7-4 UID Range List

Note

- Enter the **UID Range list** from the **UID Range (Min)**. If a UID is not entered in **UID Range (Min)**, the **UID Range (Max)** cannot be entered.
- A UID is directly entered in **UID Range (Min)** and **UID Range (Max)** in the same manner as entering a UID in **UID List**.
- The UID number which is redundant with the already configured UID number between **UID Range (Min)** and **UID Range (Max)** cannot be entered.

Configuration using KPG-D7

- Configuring **UID Range List** (Edit > User List > UID Range List)

Configuration using Web Tool

- Configuring **UID Range List** (Edit > User List > UID Range List > UID Range List)

Configuring User List to Be Enabled or Disabled (User List (GID)/ User List (UID))

Whether the configurations of **User List (GID)** and **User List (UID)** are enabled or disabled can be configured for each channel by using KPG-D7.

In a system where user limit is used, all UIDs may be temporarily enabled for a reason such as an operation check. With this function, a system administrator can temporarily release the right to use the repeaters without deleting the **User List (GID)** and **User List (UID)**.

If this function is enabled, the repeater sends only calls using the ID permitted in the **User List (GID)** and **User List (UID)** to a receiving subscriber unit.

If this function is disabled, the repeater sends all calls made using the digital signal to the receiving subscriber unit. However, the received Color Code needs to match the Color Code preconfigured for the repeater as the basic condition to repeat in all cases.

According to the configuration of **User List (GID)** and **User List (UID)**, the repeater behaves as follows:

Table 7-8 User List (GID)/ User List (UID)

Configuration		Description
User List (GID)	None	**GID List** and **GID Range List** are disabled.
	GID List	**GID List** is enabled, and **GID Range List** is disabled. In order to repeat a Group Call, the use of the repeater needs to be permitted for the target GID. (Refer to Configuring the GIDs Permitted for Repeat Transmission (GID List).)
	GID Range List	**GID Range List** is enabled, and **GID List** is disabled. In order to repeat a Group Call, the use of the repeater needs to be permitted for the target GID. (Refer to Configuring the GIDs Permitted for Repeat Transmission All at Once (GID Range).)
User List (UID)	None	**UID List** and **UID Range List** are disabled.
	UID List	**UID List** is enabled, and **UID Range List** is disabled. In order to repeat an Individual Call or Group Call, the use of the repeater needs to be permitted for the received UID. (Refer to Configuring the UIDs Permitted for Repeat Transmission (UID List).)
	UID Range List	**UID Range List** is enabled, and **UID List** is disabled. In order to repeat an Individual Call or Group Call, the use of the repeater needs to be permitted for the received UID. (Refer to Configuring the UIDs Permitted for Repeat Transmission All at Once (UID Range).)

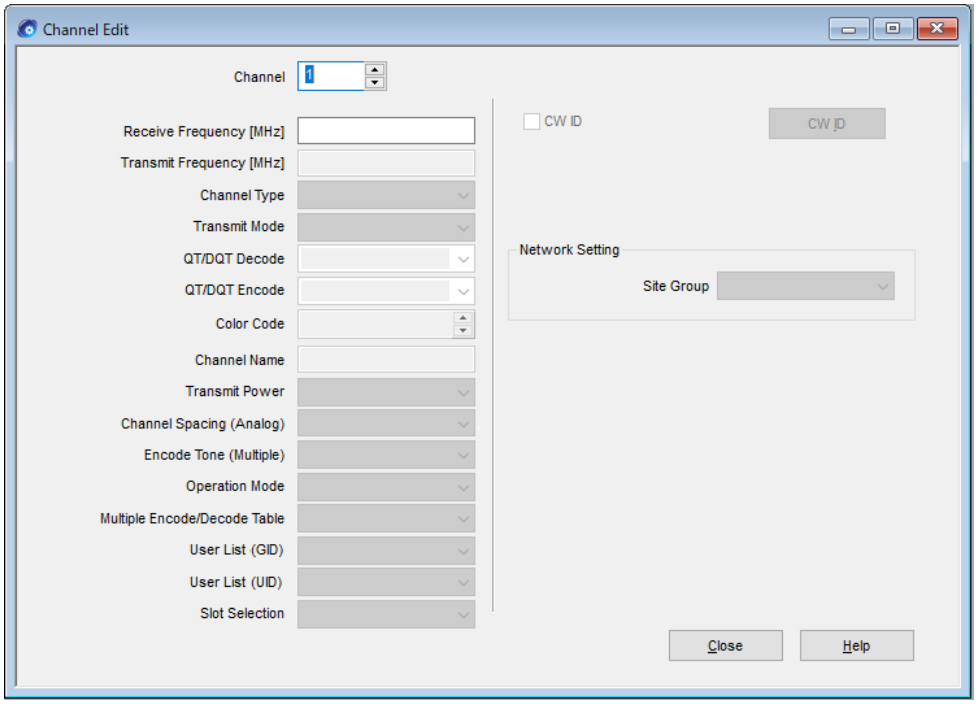


Figure 7-5 User List (GID)/ User List (UID)

Note

- If the UID and GID to be used for a digital signal call are not permitted for use, the call cannot be made because the repeater does not transmit the repeat transmission. In this case, the receiving subscriber unit is in a silent receiving mode because the repeater continues to transmit an idle signal to allow the call to be transmitted in a vacant slot.

Configuration using KPG-D7

- Configuring **User List (GID)** (Edit > Channel Information > Channel Edit > User List (GID))
- Configuring **User List (UID)** (Edit > Channel Information > Channel Edit > User List (UID))

Configuring the Conditions to Initiate an Intersite Call (Site Group)

Site Group is the function to determine how the repeater initiates an Intersite Call when a Group Call to the target GID is initiated or when an Individual Call to the target UID is initiated.

By using KPG-D7, the behavior of the repeater when the repeater initiates an Intersite Call can be configured for each ID configured in **UID List** and **UID Range List** as well as **GID List** and **GID Range List**.

If an Individual Call is received, an Intersite Call will be sent according to the **Site Group** configured for the target Unit ID. However, if both **UID List** and **UID Range List** are disabled, an Intersite Call will be sent according to the Site List configured for each channel.

If a Group Call is received, an Intersite Call will be sent according to the **Site Group** configured for the target Group ID. However, if both **Group ID List** and **Group ID Range** are disabled, an Intersite Call will be sent according to the Site List configured for each channel.

Depending on the configuration in **Site Group**, the repeater behavior when initiating an Intersite Call varies as follows:

Table 7-9 Site Group

Configuration	Description
Selected Channel	The repeater initiates the Intersite Call according to the **Site List** configured for the selected channel.
Local	No Intersite Call is initiated. The repeater transmits by only relaying the received signals.
1 to 64 (Available number of Site Group Table)	The repeater initiates the Intersite Call according to the configuration of the **Site Group Table** for the configured number. (Refer to Configuring the Target of an Intersite Call (Site Group Table).)

Note

- The calling repeater of an Intersite Call makes the Intersite Call by the transmission of the received signal to an IP address configured using the FPU at the same time as the start to repeat transmission by the receipt of a digital signal or analog signal from the transceiver or by the receipt of a packet from a Console.

Configuration using KPG-D7

- Configuring **Site Group** (GID List) (Edit > User List > GID List > Site Group)
- Configuring **Site Group** (GID Range List) (Edit > User List > GID Range List > Site Group)
- Configuring **Site Group** (UID List) (Edit > User List > UID List > Site Group)
- Configuring **Site Group** (UID Range List) (Edit > User List > UID Range List > Site Group)

Configuration using Web Tool

- Configuring **Site Group** (GID List) (Edit > User List > GID List > GID List > Site Group)
- Configuring **Site Group** (GID Range List) (Edit > User List > GID Range List > GID Range List > Site Group)
- Configuring **Site Group** (UID List) (Edit > User List > UID List > UID List > Site Group)
- Configuring **Site Group** (UID Range List) (Edit > User List > UID Range List > UID Range List > Site Group)

7.9 Interrupting Voice Communications from Subscriber Units Other than the Calling Subscriber Unit (Call Interrupt)

Call Interrupt is the function to interrupt voice communications from subscriber units other than the calling subscriber unit by sending and receiving a message requesting Call Interrupt when the repeater repeats transmission.
When a message requesting Call Interrupt is received from a subscriber unit other than the calling subscriber unit, the repeater stops repeating and sends a message requesting Call Interrupt to the calling subscriber unit.
When the calling subscriber unit receives the message requesting Call Interrupt from the repeater, the calling subscriber unit sends a call end message to the repeater, and then stops transmission.
The repeater sends a message requesting Call Interrupt for an approximate maximum of 3.6 sec. If a call end message from the calling subscriber unit cannot be received, the repeater continues to repeat when the calling subscriber unit continues transmission.

Note

- To use this function, **Call Interrupt** also needs to be enabled on the subscriber units.
- While the repeater sends a message requesting Call Interrupt, audio signals are not repeated.
- Because **Call Interrupt** is a function incompatible with the systems and subscriber units of other companies, the function is unavailable if the subscriber units of other companies are used.
- If the configuration of the Intersite Call system is Site 1 and Site 2, the system behaves as follows:

  Site 1: Subscriber Unit 1, Repeater 1

  Site 2: Subscriber Unit 2,

  Subscriber Unit 3 ("Interrupt CALL" is configured in Busy Channel Lockout.), Repeater 2 ("Network PTT" has a higher priority level than "Repeat PTT" in PTT Priority.)

  If Subscriber Unit 2 starts voice communication to Subscriber Unit 3 after Subscriber Unit 1 starts voice communication to Subscriber Unit 3, the voice communication from Subscriber Unit 1 to Subscriber Unit 3 has a higher priority according to the configuration value for PTT Priority in Repeater 2. Also, if a message requesting Call Interrupt is sent from Subscriber Unit 3 to Subscriber Unit 1, the repeat behavior from Subscriber Unit 2 to Subscriber Unit 3 starts after the voice communication from Subscriber Unit 1 is stopped. To interrupt the voice communication from Subscriber Unit 3 to Subscriber Unit 2, Subscriber Unit 3 needs to resend the message requesting Call Interrupt to Subscriber Unit 2.

Configuration using KPG-D7

- Configuring **Call Interruption** to be enabled or disabled (Edit > Protocol Options > Call Interruption)

8 NXDN DIGITAL COMMUNICATIONS

8.1 NXDN Mode

To make the repeater behave as an NXDN Conventional repeater, select NXDN Mode.
In NXDN Mode, an NXDN Conventional system using multiple repeaters can be structured.
Repeaters configured for NXDN Mode are available in an NXDN Conventional system structured with the NXR-x10 series.
To configure NXDN Mode, NXDN Conventional needs to be enabled in Product Information in the FPU.

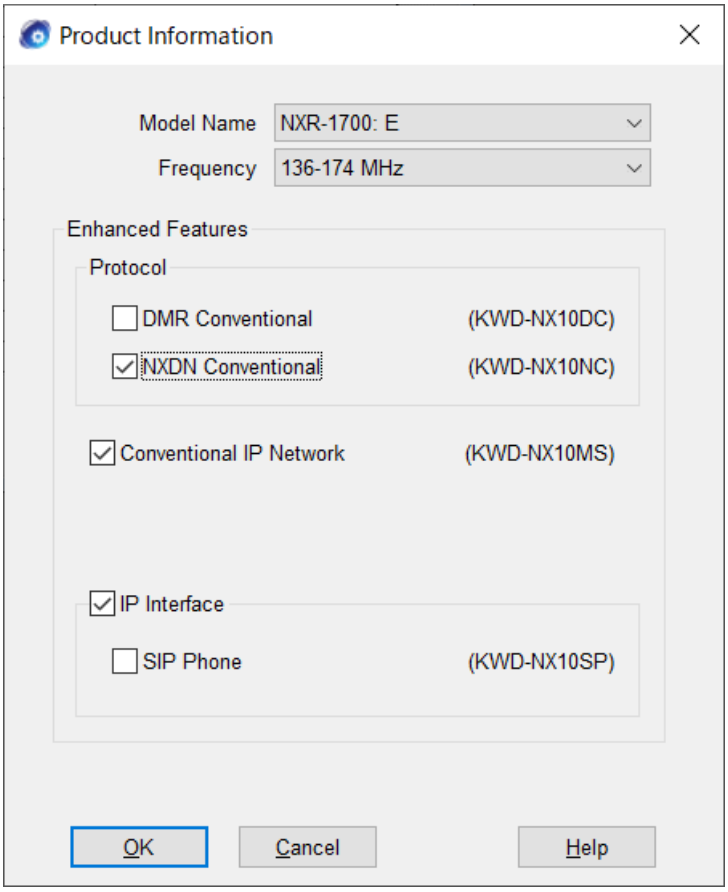


Figure 8-1 Product Information (NXDN Conventional)

For Conventional IP Network in NXDN Mode, NXR-1700/ NXR-1800 is upward compatible with the NXR-x10 series by addition of Analog Frame support, etc.

Table 8-1 Supported Transmission of Conventional IP Network (Receiver: Repeater)

Sender \ Receiver		NXR-1700/ NXR-1800		
		Ch Type NXDN	Ch Type Mixed	Ch Type Analog
NXR-x10 series	NXDN Frame	✔	✔	–
	Analog Frame			
NXR-1700/ NXR-1800	NXDN Frame	✔	✔	–
	Analog Frame	–	✔	✔

Table 8-2 Supported Transmission of Conventional IP Network (Receiver: NXR-x10 Series)

Sender \ Receiver		NXR-x10 series		
		Ch Type NXDN	Ch Type Mixed	Ch Type Analog
NXR-x10 series	NXDN Frame	✔	✔	—
	Analog Frame			
NXR-1700/ NXR-1800	NXDN Frame	✔	✔	—
	Analog Frame	—	✖ *1	✖ *1

*1 If NXR-1700/ NXR-1800 is used in a system structured with the NXR-x10 series, NXR-1700/ NXR-1800 needs to be programmed to match the functions of the NXR-x10 series.

Note

- DMR Mode and NXDN Mode cannot be used in combination.

Configuration using KPG-D7

- Configuring **Product Information** (Model > Product Information)

8.2 RAN Encode/ Decode

Same as QT/ DQT, RAN (Radio Access Number) is also the function to mask unnecessary reception. RAN can be used for transmission and reception in the NXDN format.
If transmission is performed on a channel with NXDN configured in Channel Type or a channel with NXDN configured in Transmit Mode, the RAN configured in RAN Encode is sent.
If the RAN matching the RAN configured in RAN Decode is received on a channel where NXDN or Mixed is configured in Channel Type, the mute is reset and the received audio is output from the RA of D-Sub 25 pin. If a headset is connected to the repeater, the received audio is output from the headset as well. Also, the repeat behavior occurs on the channel where “Repeat” is configured in Operation Mode.

Table 8-3 RAN Encode/Decode

Configuration	Description
RAN Decode	The RAN to be waited for when an NXDN signal is received is configured for each channel.
RAN Encode	The RAN to be used when an NXDN signal is transmitted is configured for each channel.

Note

- If “None” is configured in RAN Decode, the mute is reset for all RAN receptions and the RX2 LED lights green.
- If “Repeat” is configured in Operation Mode, the repeat behavior occurs.
- When the repeater is receiving in the Monitor ON state, the mute is reset for all RANs even if anything other than “None” is configured in RAN Decode, but the repeat behavior does not occur if RAN is inconsistent.

Configuration using KPG-D7

- Configuring **RAN Decode** (Edit > Channel Information > Channel Edit > RAN Decode)
- Configuring **RAN Encode** (Edit > Channel Information > Channel Edit > RAN Encode)

8.3 NXIP Site ID

NXIP Site ID is the function for a system administrator to assign a Site ID to each repeater connected to a Conventional IP Network.
This function is not directly related to communication between Conventional IP Network.
NXIP Site ID is used for a multifunctional Console such as Zetron Max Console to identify and manage as equivalent to a site the repeater which participates in Conventional IP Network via NXIP.

Table 8-4 NXIP Site ID

Configuration FPU	Description
NXIP Site ID	NXIP Site ID is configured from a Site ID of 1 to 4094.

Note

- NXIP Site ID can be configured only in NXDN Mode.

Configuration using KPG-D7

- Configuring **NXIP Site ID** (Edit > IP Interface > NXIP Site ID)

8.4 Avoiding Interference with Other Communications (Busy Channel Lockout (NXDN))

Busy Channel Lockout (NXDN) is the function to automatically restrict transmission in order to avoid interfering with the communications of other parties if the channel on which the repeater attempts to transmit using the Test PTT control is already used by another group. Using this function, the repeater can transmit without interfering with the communications of other parties without checking the usage status of the channel.

Table 8-5 Busy Channel Lockout (NXDN)

設定	説明
No	**Busy Channel Lockout** is disabled. Transmission is not restricted even if the analog channel on which the repeater attempts to transmit is busy.
Carrier Only	The repeater cannot transmit while the repeater is receiving a signal.
Incorrect RAN	The repeater cannot transmit if the repeater receives a signal and the received RAN does not match the RAN preconfigured for the repeater.
Correct RAN	The repeater cannot transmit if the repeater receives a signal and the received RAN matches the RAN preconfigured for the repeater.

To transmit on a mixed channel, the repeater is controlled as follows depending on the configuration in **Transmit Mode**:

・If “Analog” is configured in Transmit Mode

The repeater transmits according to the configuration in **Busy Channel Lockout (Analog)**.

・If “NXDN” is configured in Transmit Mode

The repeater transmits according to the configuration in **Busy Channel Lockout (NXDN)**.

In addition, if the **Signaling Reset Timer** is activated on a mixed channel, the repeater transmits according to the configuration in **Busy Channel Lockout** in the same mode (either Analog or NXDN) as the mode used for the received signal. If the repeater receives an analog signal, the repeater transmits according to the configuration in **Busy Channel Lockout (Analog)**. If the repeater receives an NXDN digital signal, the repeater transmits according to the configuration in **Busy Channel Lockout (NXDN)**.

Note

- Refer to “Avoiding Interference with Other Communications (Busy Channel Lockout (Analog))” for the behavior of the repeater in **Busy Channel Lockout (Analog)**.

Configuration using KPG-D7

- Configuring **Busy Channel Lockout (NXDN)** (Edit > Optional Features > Common Page 2 > Test PTT > Busy Channel Lockout (NXDN))
- Configuring **Busy Channel Lockout (NXDN)** (Edit > Conventional IP Network > General > Cross-busy > Busy Channel Lockout (NXDN))

8.5 Radio Access Control

Radio Access Control is the function which prevents an unauthorized transceiver from accessing the system. Access control is performed by the repeater verifying the transmission from the transceiver by using the Radio Access Control Key after a common Radio Access Control Key for authentication for the transceiver and the repeater is configured.
Radio Access Control is applied to voice communication and data communication. However, it is not applied to voice packets and data packets that are output to the network.
When the repeater transmits by using the Mic PTT, External PTT, Console, or SIP Phone, the repeater transmits with Radio Access Control enabled. The transceiver which has received the transmission from the repeater verifies by using own Radio Access Control Key. If the transceiver is authenticated, the transceiver opens the squelch.

Table 8-6 Radio Access Control

Configuration FPU		Description
Radio Access Control Key		For Radio Access Control Key, one authentication key is configured for the system. For this reason, the repeaters and transceivers in the system must have the same Radio Access Control Key.
Accept Type		In Accept Type, the behavior of Radio Access Control is configured for each channel.
	Normal	Radio Access Control is disabled. The transceiver with Radio Access Control enabled cannot be used.
	Authentication	Radio Access Control is enabled. The transceiver of which Radio Access Control Key does not match cannot be used. The repeater verifies the transceiver transmission by using the Radio Access Control Key. If authentication succeeds, repeat transmission is permitted, and if authentication fails, repeat transmission is prohibited.
	Both	The transceiver with the matching Radio Access Control Key and the transceiver with Radio Access Control disabled can be used together.

If the transceiver authentication fails because the authentication key does not match or because the authentication key has not been configured, the behavior in each Operation Mode is as follows:

Table 8-7 Items of Operation Mode and Behavior in Each Mode

Operation Mode	Mode	
	Analog Mode	NXDN Mode
Simplex	N/A	Transfer rejected *2
Duplex	N/A	Transfer rejected *2
Repeat	N/A	Repeat rejected*1

*1 Repeat rejected: Repeat transmission does not occur even if a call from the transceiver is received. Also, transfer to the network is not performed.

*2 Transfer rejected: Transfer to the network is not performed even if a call from the transceiver is received.

Note

- Radio Access Control can be used along with Encryption.
- From the point of view of security, the Radio Access Control Key cannot be read by the FPU.
- The repeater for which **Radio Access Control** is configured and the existing NXDN Conventional repeater can be connected by using a Conventional IP Network. However, access control by Radio Access Control is available for use by the NXR-1700/ NXR-1800 repeater only.
- To use Radio Access Control, anything other than “Simplex” needs to be configured in **Operation Mode** for the channel, or the receive frequency and transmit frequency need to be different for the channel.

Configuration using KPG-D7

- Configuring **Radio Access Control Key** (Edit > Optional Features > Common Page 1 > Radio Access Control **>** Radio Access Control Key)
- Configuring **Accept Type** (Edit > Channel Information > Channel Edit > Radio Access Control > Accept Type)

9 CW ID

CW ID is the function to automatically send the Morse code configured for a channel at certain time intervals. A CW ID can be sent by configuring a maximum of 32 alphanumeric characters and symbols.

CW ID can be enabled or disabled for each channel by using KPG-D7. Also, the following functions related to CW ID transmission can be configured:

- CW ID
- Transmit Interval Time
- Transmit Delay Time
- CW Speed
- CW Modulation Delay Time
- Audio Frequency
- Interval Activity Transmit

Note

- The repeater switches to analog modulation mode when the repeater sends a CW ID on a digital channel.
- The CW ID On function cannot be activated while a CW ID is being sent.

Configuration using KPG-D7

- Configuring **CW ID** to be enabled or disabled (Edit > Channel Information > Channel Edit > CW ID)

9.1 CW ID

A Morse code containing a maximum of 32 characters can be configured. A single CW ID can be configured for each channel.

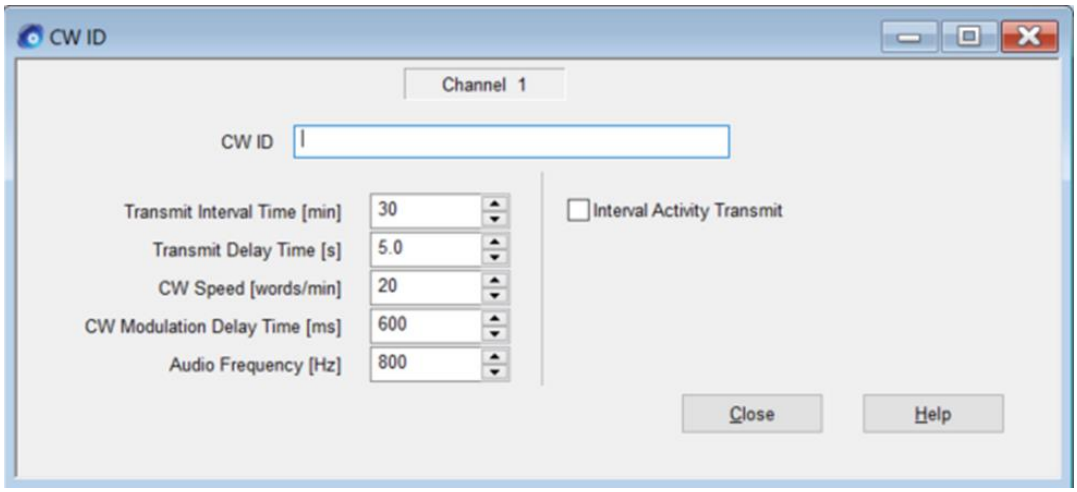


Figure 9-1 CW ID Configuration Display Example

Configuration using KPG-D7

- Configuring **CW ID** (Edit > Channel Information > Channel Edit > CW ID > CW ID)

9.2 Transmit Interval Time

Transmit Interval Time is the interval to send a CW ID. The repeater sends a CW ID repeatedly using the interval configured in **Transmit Interval Time**.

Note

- The countdown for the **Transmit Interval Time** starts under the following conditions:
  When the repeater is reset
  When a channel is changed
  When the CW ID On function is activated

Configuration using KPG-D7

- Configuring **Transmit Interval Time** (Edit > Channel Information > Channel Edit > CW ID > Transmit Interval Time)

9.3 Transmit Delay Time

Transmit Delay Time is the length of time from when the repeater enters one of the following states until the repeater starts transmitting to send a CW ID:

• When the **Transmit Interval Time** elapses
When the transmission is stopped or interrupted after **Transmit Interval Time** elapses during transmission of an audio signal or data signal
When the transmission is stopped if the CW ID transmission is interrupted and an audio signal or data signal is transmitted

The repeater actually starts sending a CW ID when the amount of time configured in **CW Modulation Delay Time** elapses after the repeater starts transmitting.

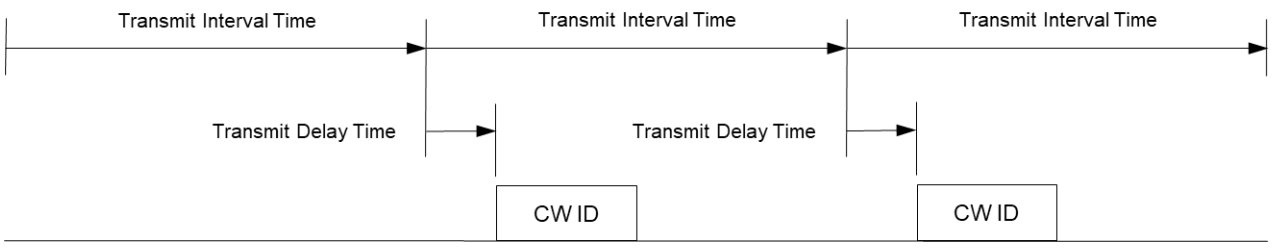


Figure 9-2 Transmit Delay Time

Note

- **Transmit Delay Time** is not applied when the repeater sends a CW ID by using the CW ID On function.
- If “Off” is configured in **Transmit Delay Time**, the repeater immediately starts transmitting.

Configuration using KPG-D7

- Configuring **Transmit Delay Time** (Edit > Channel Information > Channel Edit > CW ID > Transmit Delay Time)

9.4 CW Speed

CW Speed is the speed to send a CW ID.

Configuration using KPG-D7

- Configuring **CW Speed** (Edit > Channel Information > Channel Edit > CW ID > CW Speed)

9.5 CW Modulation Delay Time

CW Modulation Delay Time is the length of time from when the repeater starts transmitting until the repeater starts sending a CW ID.
During the period from when the repeater starts transmitting until the amount of time configured in **CW Modulation Delay Time** elapses, the repeater transmits an unmodulated signal. If the amount of time configured in **CW Modulation Delay Time** elapses, the repeater starts sending a modulated signal of the CW ID.

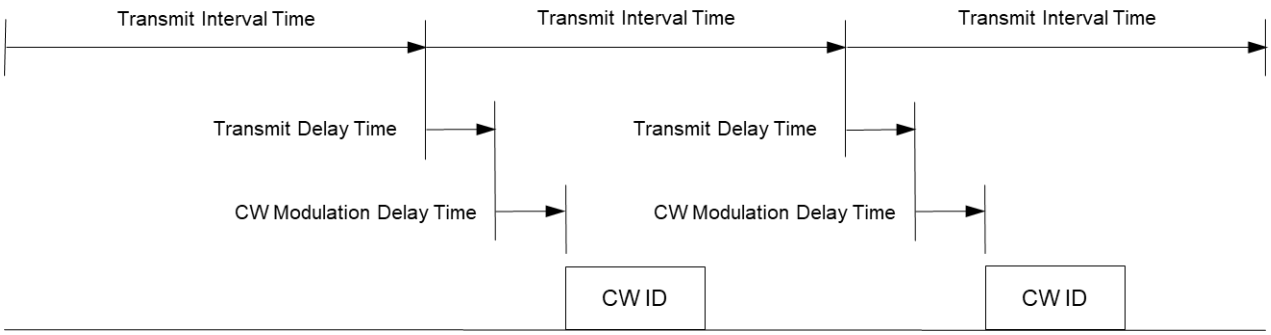


Figure 9-3 CW Modulation Delay Time

Note

- If “Off” is configured in **CW Modulation Delay Time**, the repeater sends a CW ID immediately after the repeater starts transmitting.

Configuration using KPG-D7

- Configuring **CW Modulation Delay Time** (Edit > Channel Information > Channel Edit > CW ID > CW Modulation Delay Time)

9.6 Audio Frequency

Audio Frequency is the frequency used to send a CW ID.

Configuration using KPG-D7

- Configuring **Audio Frequency** (Edit > Channel Information > Channel Edit > CW ID > Audio Frequency)

9.7 Interval Activity Transmit

Interval Activity Transmit is the function to control the intervals to send a CW ID.
If this function is enabled, the repeater sends a CW ID after the amount of time configured in **Transmit Interval Time** elapses only if the repeater starts transmitting while the amount of time configured in **Transmit Interval Time** is counting down. If no transmission is made after sending the CW ID last time, the repeater does not send the CW ID even after the amount of time configured in **Transmit Interval Time** elapses.
If this function is disabled, regardless of the status for whether or not the repeater has transmitted a CW ID, the repeater sends the CW ID when the amount of time configured in **Transmit Interval Time** elapses.

Note

- **Interval Activity Transmit** is not applied when the repeater sends a CW ID by using the CW ID On function.

Configuration using KPG-D7

- Configuring **Interval Activity Transmit** to be enabled or disabled (Edit > Channel Information > Channel Edit > CW ID > Interval Activity Transmit)

10 FUNCTION PORTS

NXR-1700 are equipped with the following input and output ports to which functions can be assigned:

AUX Input/Output 1 to AUX Input/Output 6

Functions of AUX Input ports or AUX Output ports can be assigned to each AUX Input or Output ports. In addition, depending on the status of ports, the functions which changes a channel or signaling to be used can be assigned to AUX Input and Output ports. (Refer to Available Functions for the AUX Input/Output Ports.)

AUX Input 1 to AUX Input 3

AUX Input ports behave as the port to detect the voltage level of the control signal which is externally applied to AUX Input ports. A function assigned to an AUX Input port can be activated or deactivated, or enabled or disabled by the level of the voltage applied from an externally device to AUX Input ports.
(Refer to Available Functions for the AUX Input Ports.)

AUX Output 1 to AUX Output 2

Various functions to control external devices can be assigned to AUX Output ports. The repeater transfers control signals to the external device depending on the repeater status.
(Refer to Available Functions for AUX Output Ports.)

Each input port and output port is available on the D-sub 25-pin connector on the rear of the repeater. (Refer to Rear.)

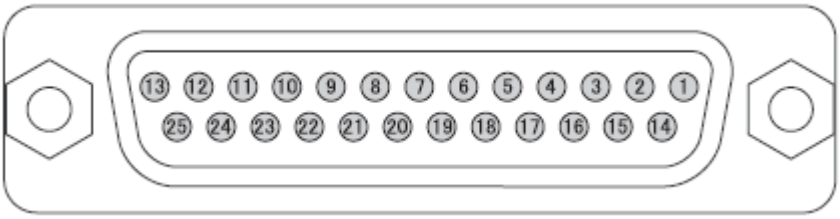


Figure 10-1 D-sub 25-pin Connector

Table 10-1 D-sub 25-pin Connector

Pin Number	Terminal Name	Signal Name	Description
4	AUXI 1	Input	Programmable Function Input 1
5	AUXI 2	Input	Programmable Function Input 2
6	AUXI 3	Input	Programmable Function Input 3
14	AO 1	Output	Programmable Function Output 1
18	AO 2	Output	Programmable Function Output 2
20	AUXIO 1	Input/ Output	Programmable Function Input/ Output 1
21	AUXIO 2	Input/ Output	Programmable Function Input/ Output 2
22	AUXIO 3	Input/ Output	Programmable Function Input/ Output 3
23	AUXIO 4	Input/ Output	Programmable Function Input/ Output 4
24	AUXIO 5	Input/ Output	Programmable Function Input/ Output 5
25	AUXIO 6	Input/ Output	Programmable Function Input/ Output 6

10.1 Available Functions for the AUX Input/Output Ports

One of the following functions can be assigned to the AUX Input/Output ports:

AUX Input

The AUX Input port is assigned.

AUX Output

The AUX Output port is assigned.

10.2 Available Functions for the AUX Input Ports

The following functions can be assigned to the AUX Input ports.

One function can be assigned to an AUX Input port. If a signal input to the AUX Input port is detected, each configured function is activated or enabled.

Table 10-2 Available Functions for the AUX Input Ports

Function Name	Description	Remarks
Repeat Disable	Disables the capability to transmit the received signal by using the Repeat PTT control. The trigger is detected on the Level of the signal input to the AUX Input port. The AUX Input port enters the “Repeat Enable” state when the status of the port goes high level.	Refer to Toggling Repeat Behaviors Between Enabled and Disabled (Repeat Enable/Disable).

Function Name	Description	Remarks
Repeat Enable	Enables the capability to transmit the received signal by using the Repeat PTT control. The trigger is detected on the Level of the signal input to the AUX Input port. The AUX Input port enters the “Repeat Disable” state when the status of the port goes high level.	Refer to Toggling Repeat Behaviors Between Enabled and Disabled (Repeat Enable/Disable).
Reset	The software reset of the repeater is done when Low Level is detected for the port. The repeater returns to the same state as when the repeater is turned on.	Refer to Executing Software Reset of the Repeater (Reset).
TX Disable	Disables all transmissions. The trigger is detected on the Level of the signal input to the AUX Input port. The AUX Input port enters the “TX Enable” state when the status of the port goes high level.	Refer to Toggling All Transmissions by Using PTT Controls Between Enabled and Disabled (TX Enable/Disable).
TX Enable	Enables all transmissions. The trigger is detected on the Level of the signal input to the AUX Input port. The AUX Input port enters the “TX Disable” state when the status of the port goes high level.	Refer to Toggling All Transmissions by Using PTT Controls Between Enabled and Disabled (TX Enable/Disable).
Voting Tone On	Enables Voting Pilot Tone. The trigger is detected on the Level of the signal input to the AUX Input port. The AUX Input port enters the “Voting Tone Off” state when the status of the port goes high level.	
Voting Tone Off	Disables Voting Pilot Tone. The trigger is detected on the Level of the signal input to the AUX Input port. The AUX Input port enters the “Voting Tone On” state when the status of the port goes high level.	
AUX Input Monitor	The status of the port can be monitored by using the Web Tool, etc. This function can be used to monitor the status of a signal input, etc. by connecting to an external device.	
Channel 1 to Channel 32	The current channel of the repeater is changed to the specified channel when the low level is detected for the port. The channel of the repeater is not restored to the previous channel even if the port returns to high level.	

Function Name	Description	Remarks
External PTT (Channel 1) to External PTT (Channel 32)	The repeater performs External PTT transmission after migrating to the specified channel while the port is low level. If the port returns to high level, the repeater stops transmission and restores the previous channel. Only the channel for Simplex/ Duplex/ TA Direct can be specified for the destination channel.	
None	No function is activated.	

In External PTT (Channel 1) to External PTT (Channel 32), the behaviors are as follows:

- During transmission by External PTT (Channel x), a switch to another transmission by PTT Priority does not occur.
- During transmission by External PTT (Channel x), the External PTT (Channel x) port which became low level earlier has priority to continue to behave even if another External PTT (Channel x) port goes low level.
- When transmission by External PTT (Channel x) ends, the ports are checked in order of External PTT, AUX In 1 to AUX In 13 and then AUX I/O 1 to AUX I/O 6, and transmission starts by that port if another low level port is found. If another low level port is not found, the previous channel is restored and the normal behavior occurs.
- If the length of time configured in **Time-out Timer** elapses during transmission by External PTT (Channel x), the repeater stops transmission. At this time, while the port for External PTT (Channel x) is low level, the repeater remains on the destination channel and the repeater emits a Warning Alert Tone. If the port for External PTT (Channel x) returns to high level, the repeater ends the sounding of a Warning Alert Tone and restores the previous channel.
- If the port for External PTT (Channel x) is low level during TX Disable, the repeater migrates to the specified channel, but transmission by External PTT is not performed. The repeater starts transmission on the destination channel if TX Disable is reset, and then the repeater returns to the previous channel after stopping transmission if high level is restored

Configuration using KPG-D7

- Assigning functions to the AUX Input port (Edit > Function Port > AUX > AUX Input)

10.3 Available Functions for AUX Output Ports

The following functions can be assigned to the AUX Output port.

If the function assigned to the AUX Output port is enabled, the output port becomes active.

Table 10-3 Available Functions for AUX Output Ports

Function Name	Description	Remarks
COR	The output port becomes active if the repeater receives a signal. The output port becomes inactive if the repeater receives no signal.	
TOR	The following are the repeater behaviors that may vary depending on the configuration in **Channel Type**: **Analog** If the repeater receives an analog signal and the received QT tone or DQT code matches the QT tone or DQT code preconfigured for the repeater, the output port becomes active. If the received QT tone or DQT code does not match the QT tone or DQT code preconfigured for the repeater, the output port becomes inactive. If no QT tone or DQT code is preconfigured, the output port becomes active when the repeater receives an analog signal. The output port becomes inactive if the transmission ends. **DMR** If the repeater receives a DMR digital signal and the received Color Code matches the Color Code preconfigured for the repeater, the output port becomes active. If the received Color Code does not match the Color Code preconfigured for the repeater, the output port becomes inactive.	Refer to Configuring the Reception Method of a Channel (Channel Type).

Function Name	Description	Remarks
	NXDN If the repeater receives an NXDN digital signal and the received RAN code matches the RAN code preconfigured for the repeater, the output port becomes active. If the received RAN code does not match the RAN code preconfigured for the repeater, the output port becomes inactive. If no RAN code is preconfigured, the output port becomes active even if any RAN code is received. The output port becomes inactive if the reception ends. **Mixed** If the repeater receives an analog signal, the repeater behaves in the same manner as when the repeater receives a signal on an analog channel. If the repeater receives a DMR digital signal, the repeater behaves in the same manner as when the repeater receives a signal on a digital channel. If the repeater receives an NXDN digital signal, the repeater behaves in the same manner as when the repeater receives a signal on an NXDN digital channel.	
Receive Unlock	The output port becomes active if RX PLL is unlocked. The output port becomes inactive if RX PLL is locked.	
Transmit Unlock	The output port becomes active if TX PLL is unlocked. The output port becomes inactive if TX PLL is locked.	
Fan Status	The output port becomes active if the fan stops. The output port becomes inactive if the fan starts running.	
Receive Signal (Threshold)	The output port becomes active if the RSSI voltage is reduced. The output port becomes inactive if the RSSI voltage is increased.	The reference RSSI level can be configured in **Lowest Receive Level Threshold**. (Refer to Configuring the Threshold to Activate or Deactivate the RSSI Voltage Detection Function (Lowest Receive Level Threshold).)

Function Name	Description	Remarks
TXS	The output port becomes active when the repeater transmits. The output port becomes inactive if the repeater exits transmit mode.	
RF Power Down Detection	The output port becomes active if the transmission power is reduced. The output port becomes inactive if the transmission power is increased.	
VSWR Error Detection	The output port becomes active if the strength level of the reflected wave is greater than the threshold value while the repeater is transmitting. The output port becomes inactive if the strength level of the reflected wave is lower than the threshold value while the repeater is transmitting.	
Hot Standby LAN Error	The AUX Output port becomes active if the Hot Standby LAN Connection Error occurs during the Hot Standby operation. The AUX Output port becomes inactive if the error state is reset.	
AUX Output Control	The status of the output port can be controlled by using the Remote Control function of the Web Tool. If “ON” is configured in **AUX Output Control** of the Remote Control function by using the Web Tool, the port is activated according to the configuration in **Logic Type** (Active High or Active Low).	
None	No function is activated.	

Note

- By activating **Squelch Off**, the COR port does not become active unless the repeater is receiving a signal even if the RX1 LED lights.
- Even if the repeater unmutes the speaker by activating **Monitor On**, if a signaling is configured, the TOR port does not become active until the received signaling matches the one preconfigured for the repeater.

Configuration using KPG-D7

- Assigning functions to the AUX Output port (Edit > Function Port > AUX > AUX Output)
- Configuring the threshold for **RF Power Down Detection** (Program > Test Mode > Tuning Item > RF Power Down Detection)

Configuring the Logic for the AUX Output Ports (Logic Type)

Logic Type is the logic to activate or deactivate the AUX Output ports.

According to the configuration in **Logic Type**, the repeater behaves as below:

Table 10-4 Logic Type

Configuration	Description
Active Low	The status of the AUX Output port goes low level when the AUX Output port is activated.
Active High	The status of the AUX Output port goes high level when the AUX Output port is activated.

Configuration using KPG-D7

- Configuring **Logic Type** (Edit > Function Port > AUX > AUX Output > Logic Type)

11 CONTROLLING THE REPEATER BY REMOTE CONTROL (REMOTE CONTROL)

Remote Control is the function to remotely control the repeater via Web by using the Web Tool.

11.1 Remote Control

The repeater supports the Remote Control function via Web. Remote Control means that the repeater is controlled remotely. The supported range is as follows:

Table 11-1 Remote Control

Function	Remarks
Channel Select	The “Apply” button is pressed after entering the desired channel number.
Slot Select	The “Apply” button is pressed after entering the desired slot number.
CW ID	A CW ID is sent by pressing the button.
Decode Signaling Enable/Disable	Pressing the button starts the toggle behavior.
Encode Signaling Enable/Disable	Pressing the button starts the toggle behavior.
Call Hangtime Enable/Disable	Pressing the button starts the toggle behavior.
Channel Hangtime Enable/Disable	Pressing the button starts the toggle behavior.
Hold Time Enable/Disable	Pressing the button starts the toggle behavior.
Local TX Enable/Disable	Pressing the button starts the toggle behavior.
Low Power On/Off	Pressing the button starts the toggle behavior.
Monitor On/Off	Pressing the button starts the toggle behavior.
AUX Output Control	Pressing the button starts the toggle behavior.
Repeat Enable/Disable	Pressing the button starts the toggle behavior.
Squelch On/Off	Pressing the button starts the toggle behavior.
Take Over On/Off	Pressing the button starts the toggle behavior.
Test Tone On/Off	Pressing the button starts the toggle behavior.
TOT Enable/Disable	Pressing the button starts the toggle behavior.
TX Enable/Disable	Pressing the button starts the toggle behavior.
Voting Tone On/Off	Pressing the button starts the toggle behavior.
Knob Lock/Unlock	Pressing the button starts the toggle behavior.
Service Stop	Pressing the button stops the repeater software.
Service Start	Pressing the button starts the behavior of the repeater software.
Service Restart	Pressing the button stops the repeater software, and then the repeater software starts the behavior.
Service Reboot	Pressing the button makes the repeater reset the hardware level, and then the repeater restarts and starts the behavior.
Active Status Switch	The Active state of Hot Standby can be switched.

11.2 Remote Access Control

Remote Access Control is the function which permits or prohibits the connection to the repeater via a network.
A users can prohibit the connection when a network connection is not needed. This allows the repeater to reduce the risk of unauthorized access by malicious users.

Table 11-2 Configuration Items of Remote Access Control

Configuration Item		Description
Remote Access Control FPU	Enable	Allows the access to the repeater via a network. The FPU, Web Tool, and Multi Loader can be used.
	Disable	Prohibits the access to the repeater via a network. The access to the repeater by using the FPU, Web Tool, and Multi Loader is prohibited.

Enabling the configuration allows the access to the repeater via a network. Disabling the configuration disables the access to the repeater via a network. The repeater with **Remote Access Control** disabled cannot be configured by using the FPU via a network. To perform the FPU configuration via a network, the FPU configuration is available by allowing the access from the **OLED display** menu (Remote Access).

Table 11-3 OLED display Control Menu

Item	Menu Item	Description
Control	Remote Access	Permitting/Prohibiting the network connection

In addition, permitting or prohibiting the network connection by Remote Access Control does not affect the communication service between repeaters by Conventional IP Network.

Configuration using KPG-D7

- Configuring **Remote Access Control (** Edit > Optional Features > Common Page 1 > Mode **)**

Configuration using Web Tool

- None

12 CONVENTIONAL IP NETWORK

Conventional IP Network is the function in digital communications to enlarge the communication area by interconnecting multiple repeaters installed in different locations by using an IP network.
Using this function, a subscriber unit can communicate (Intersite Call) with a distant subscriber unit via an IP network.

12.1 Communicating with a Repeater Connected by Using an IP Network (Intersite Call)

Intersite Call is the function to broadcast a call in a wide area by interconnecting multiple repeaters installed in different locations by using an IP network. Using this function, a subscriber unit can communicate with a distant subscriber unit via an IP network.
The following figure shows a diagram of communications by using Intersite Call.

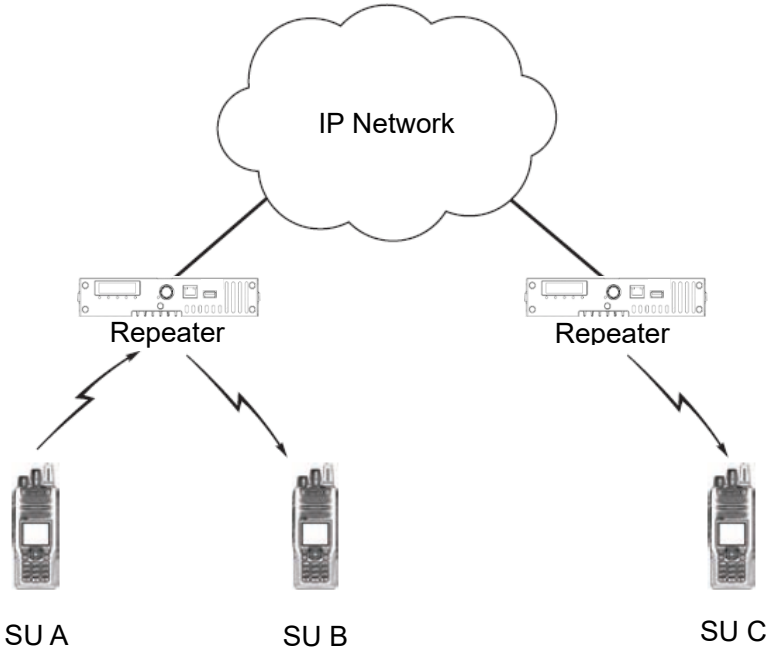


Figure 12-1 Intersite Call

Connecting the repeaters with each other by using an IP network allows the subscriber unit A and subscriber unit C to communicate.
In order to use Intersite Call, all repeaters need to be interconnected via a network device, such as a router.

Also, the following configurations need to be done using KPG-D7.

Configuring **Site Group** in **Network Setting** (configuration of Intersite Call destination)

• Configuring the following configurations for each channel

  • Configuring “DMR”, “NXDN” or “Mixed” in **Channel Type**

  (Refer to Configuring the Reception Method of a Channel (Channel Type).)

  • Configuring **Conventional IP Network** to be enabled or disabled for each channel

  • Configuring a target site for each channel

• Configuring the configurations related to an IP network, such as an IP address

Note

- By configuring the target site of an Intersite Call in **Site Group Table**, the target of the Intersite Call can be changed for each GID or UID by using **User List**.

Configuration using KPG-D7

- Configuring **Site Group** in **Network Setting** (Edit > Channel Information > Channel Edit > Network Setting > Site Group)
- Configuring **Conventional IP Network** to be enabled or disabled (Model > Product Information > Enhanced Features > Conventional IP Network)
- Configuring **Unicast Site List** (Edit > Site Group Table > Unicast Site List)
- Configuring the configurations related to an IP network (Edit > Conventional IP Network > Network > Unicast IP Address List)

Behavior of the Transmitting Repeater (Intersite Call)

The repeater starts transmitting using the Repeat PTT control when the repeater receives a digital signal and an analog signal from a subscriber unit. Or, the repeater starts transmitting using the Console PTT control when the repeater receives packet data from a Console. At the same time, the repeater transmits the received signal and packet data to another repeater that is interconnected by using an IP network.

If the transmitting repeater receives a digital signal from the subscriber unit and transmits the received signal by using the Repeat PTT control, or if the transmitting repeater receives packet data from the Console and transmits the received packet data by using the Console PTT control, the transmitting repeater can make an Intersite Call. The transmitting repeater cannot make an Intersite call if the repeater receives an analog signal from a subscriber unit.

Note

- If **Time-out Timer (TOT)** (Console PTT) is configured, transmission using the Console PTT control stops according to the configuration in **Time-out Timer (TOT)** (Console PTT).
- The transmitting repeater cannot make an Intersite Call if the repeater transmits using the Test PTT control.
- Regardless of whether a subscriber unit makes a Group Call or an Individual Call, the transmitting repeater makes an Intersite Call for the target configured for each channel.

Behavior of the Receiving Repeater (Intersite Call)

The repeater, which receives an Intersite Call from the repeater that is interconnected by using an IP network, sends the received signal by using the Network PTT control according to the configuration in **PTT Priority**. If the repeater receives Intersite Calls from multiple repeaters, the repeater sends the first received signal using the Network PTT control.

If the repeater receives an Intersite Call, the repeater sends the received signal by using the Network PTT control, by using the Color Code configured in the repeater. Also, according to the configuration in **User List**, the repeater can determine whether to send the received signal by using the Network PTT control.

Note

- If **Repeat Disable** is enabled, the repeater cannot transmit using the Network PTT control, Console PTT control or SIP PTT control. (Refer to Toggling Repeat Behaviors Between Enabled and Disabled (Repeat Enable/Disable).)
- The signaling that supports an Intersite Call by analog communication is QT/DQT only. Therefore, a signaling of FleetSync, etc. cannot be used for an Intersite Call.

IP Casting

IP Casting is the communication method used by the repeater to send and receive an Intersite Call by using the **Conventional IP Network** function.

According to the configuration for IP Casting, the repeater behaves as follows:

Table 12-1 IP Casting

Configuration	Description
Unicast	The repeater uses the Unicast communications when the repeater transmits and receives an Intersite Call by using the **Conventional IP Network** function. Unicast is the communication method to send packet data to one site. If there are multiple target sites, the same packet data is sent for multiple times. In order to use this communication method, the target site needs to be configured in **Unicast Site List** by using KPG-D7.
Multicast	The repeater uses the Multicast communications when the repeater transmits and receives an Intersite Call by using the **Conventional IP Network** function. Multicast is the communication method to send packet data to multiple sites. Even if there are multiple target sites, the same packet data is delivered to each site if packet data is sent for once. In order to use this communication method, the target IP address needs to be configured in **Multicast IP Address** by using KPG-D7. The transmitting repeater sends packet data to this **Multicast IP Address** when the repeater makes an Intersite Call by using the Multicast communications. The receiving repeater sends the received packet data by using the Network PTT control after receiving the packet data sent to the **Multicast IP Address** when the receiving repeater receives an Intersite Call.

Note

- A maximum of 16 repeaters can be interconnected if Unicast communications are used. If Multicast communications are used, the number of repeaters that can be interconnected varies depending on the type of network devices, such as a router.
- A network device which supports Multicast needs to be used in order to use Multicast communications.

Configuration using KPG-D7

- Configuring **IP Casting** (Edit > Conventional IP Network > General > Intersite Call > IP Casting)
- Configuring **Unicast IP Address List** (Edit > Conventional IP Network > Network > Unicast IP Address List)
- Configuring **Multicast IP Address** (Edit > Site Group Table > Multicast IP Address)

Maximum Jitter Buffer Size

Maximum Jitter Buffer Size is the maximum length of time to store the received packet data in the buffer memory when the receiving repeater receives an Intersite Call.

If voice communications are made by using Intersite Call, the transmitting repeater sends packet data to the network at certain time intervals. On the other hand, there may be a variation in the intervals for packet data to reach the target site. Therefore, the receiving repeater starts sending the received packet data after the received packet data is stored in the buffer memory for once and the length of time configured in **Minimum Jitter Buffer Size** elapses.

Although the receiving repeater stores the received packet data in the buffer memory, the received packet data is discarded if the receiving repeater receives the packet data exceeding the value configured in **Maximum Jitter Buffer Size** elapses. If the received packet data is discarded, quality of voice communications may be degraded due to audio interruption, etc.

Smaller buffer size reduces delay of the received audio, but the risk of interruption of the received audio increases.

Larger buffer size reduces the risk of interruption of received audio, but delay of the received audio increases.

This function is available only for doing voice communications. The received packet data is not stored in the buffer memory if data communications are made.

Configuration using KPG-D7

- Configuring **Maximum Jitter Buffer Size** (Edit > Conventional IP Network > General > Intersite Call > Maximum Jitter Buffer Size)

Minimum Jitter Buffer Size

Minimum Jitter Buffer Size is the minimum length of time to store the received packet data in the buffer memory when the receiving repeater receives an Intersite Call.

If voice communications are made by using Intersite Call, the transmitting repeater sends packet data to the network at certain time intervals. On the other hand, there may be a variation in the intervals for packet data to reach the target site. Therefore, the receiving repeater starts sending the received packet data after the received packet data is stored in the buffer memory for once and the length of time configured in **Minimum Jitter Buffer Size** elapses.

Smaller buffer size reduces delay of the received audio, but the risk of interruption of the received audio increases.

Larger buffer size reduces the risk of interruption of received audio, but delay of the received audio increases.

This function is available only for doing voice communications. The received packet data is not stored in the buffer memory if data communications are made.

Configuration using KPG-D7

- Configuring **Minimum Jitter Buffer Size** (Edit > Conventional IP Network > General > Intersite Call > Minimum Jitter Buffer Size)

Maximum Jitter Buffer Size (Console/ SIP Phone)

Maximum Jitter Buffer Size (Console/ SIP Phone) has the same behaviors as Maximum Jitter Buffer Size other than the behavior which applies to the audio packet data received from a Console and SIP Phone.

If the connection target is the repeater, the Jitter Buffer appropriate for a Console and SIP Phone can be configured by configuring Maximum Jitter Buffer Size (Console/ SIP Phone) and Maximum Jitter Buffer Size.

Configuration using KPG-D7

- Configuring **Maximum Jitter Buffer Size (Console/ SIP Phone)** (Edit > IP Interface > Console > Maximum Jitter Buffer Size)

Minimum Jitter Buffer Size (Console/ SIP Phone)

Minimum Jitter Buffer Size (Console/ SIP Phone) has the same behaviors as Minimum Jitter Buffer Size other than the behavior which applies to the audio packet data received from a Console and SIP Phone.

If the connection target is the repeater, the Jitter Buffer appropriate for a Console and SIP Phone can be configured by configuring Minimum Jitter Buffer Size (Console/ SIP Phone) and Minimum Jitter Buffer Size.

Configuration using KPG-D7

- Configuring **Minimum Jitter Buffer Size (Console/ SIP Phone)** (Edit > IP Interface > Console > Minimum Jitter Buffer Size)

Network-wide Signaling

Network-wide Signaling is the function to determine the behavior of the repeater which receives an Intersite Call when the repeater transmits using the Network PTT control.

According to the configuration in **Network-wide Signaling**, the repeater which receives an Intersite Call behaves as follows:

Table 12-2 Network-wide Signaling

Configuration	Description
Caller Site	The repeater which receives an Intersite Call transmits the received signal using the Network PTT control by using the Signaling Encode that is same code as the Signaling Encode used by the transmitting repeater. The Signaling Encode can be changed for each call; hence the group can be distinguished by the Signaling Encode while the same channel is shared among several groups.
Site Dependent	The repeater which receives an Intersite Call transmits using the Signaling Encode configured for each repeater. If **Multiple Encode/Decode Table** is configured, the repeater transmits using the Signaling Encode configured in **Multiple Encode/Decode Table**. If the received Signaling Encode matches the Signaling Encode preconfigured in **Multiple Encode/Decode Table**, the repeater transmits the received signal by using the Network PTT control. If **Multiple Encode/Decode Table** is not configured, the repeater transmits by using the Signaling Encode (Primary) configured for the channel. In this case, the repeater transmits the received signal by using the Network PTT control, regardless of whether the received Signaling Encode matches the Signaling Encode (Primary) configured for the channel. If the repeaters sharing the same frequency are adjacent and the Signaling Encode is used for distinction, and if the Signaling Encode used for transmission is determined as license conditions for frequency, this configuration is used.

Note

- Configure “Site Dependent” in **Network-wide Signaling** to restrict the delivery range of an Intersite Call for each GID or UID by using **User List**.
- In the system where the TKR-Dx10 series coexists, only the operation with “Multiple Encode/Decode Table” disabled in the configuration of **Site Dependent** is possible.
- The repeater behaves only as Site Dependent on a DMR channel.

Configuration using KPG-D7

- Configuring **Network-wide Signaling** (Edit > Conventional IP Network > Intersite Call > General > Network-wide Signaling)

12.2 Site Roaming

Site Roaming is the function to migrate automatically to the site (channel) providing better radio environment if a subscriber unit serves in the digital communications.

If a moving subscriber unit goes outside of the communication area, the subscriber unit can communicate via the repeater if there is an interconnected repeater by using an IP network in the location where the subscriber unit is used.

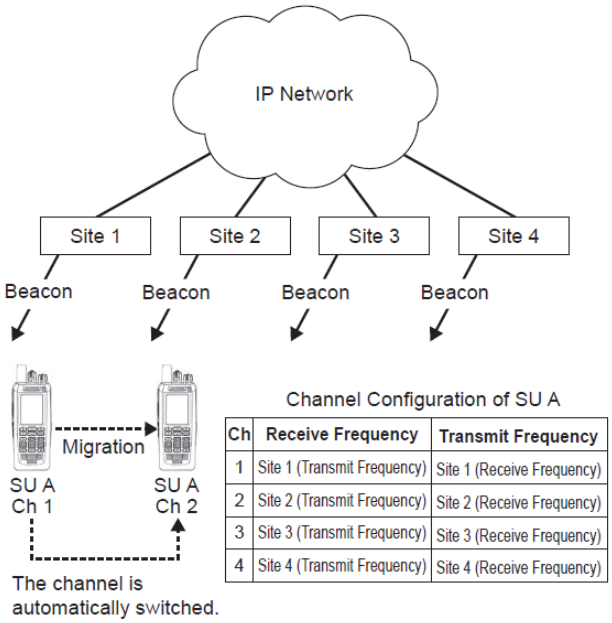


Figure 12-2 Site Roaming

Beacon

Each of the interconnected repeaters by using an IP network simultaneously transmits a beacon at certain time intervals. A subscriber unit measures the strength of the received beacon and then migrates to the site (channel) having the strongest signal automatically.

For beacon, both slots (No. 1 and No. 2) are idle signals. If the repeater transmits repeat transmission, the unused slot becomes an idle signal.

In order to use **Site Roaming**, **Beacon** need to be enabled by using KPG-D7 and **Conventional IP Network** needs to be enabled for each channel. In addition, the functions associated with an IP Network, such as an IP Address, need to be configured.

Note

- The repeater can only transmit a beacon on the channel configured as below:
  Channel Type: DMR or Mixed or NXDN
- In order to use **Site Roaming**, the function associated with Site Roaming also needs to be configured for a subscriber unit.
- If the repeater is in the “Squelch Off” status, the repeater does not transmit a beacon on the channel with “Mixed” configured in **Channel Type**.
- In DMR Mode, a beacon can be transmitted if “Repeat” is configured in **Operation Mode**.
- In NXDN Mode, a beacon can be transmitted if “Repeat” or “Duplex” is configured in **Operation Mode**.

Configuration using KPG-D7

- Configuring **Site Group** in **Network Setting** (Edit > Channel Information > Channel Edit > Network Setting > Site Group)
- Configuring **Beacon** to be enabled or disabled (Edit > Conventional IP Network > General > Site Roaming > Beacon)
- Configuring **Conventional IP Network** to be enabled or disabled (Model > Product Information > Enhanced Features > Conventional IP Network)

Host Repeater

Host Repeater manages the timing by which each repeater interconnected by using an IP network transmits a beacon.

The repeaters interconnected by using the IP network almost simultaneously start transmitting a beacon to enable a subscriber unit to compare the strength of the received beacon and then automatically migrate to the site (channel) having the strongest signal.

Multiple repeaters start transmitting a beacon almost simultaneously with reference to the **Host Repeater**.

Host Repeater notifies the start of transmission of a beacon to the other repeaters interconnected by using an IP network and then transmits the beacon when the length of time configured for **Transmit Interval Time** elapses after the end of the transmission, such as of audio and messages. The repeaters other than the **Host Repeater** transmit a beacon when the repeaters receive the notification from the **Host Repeater**.

According to the configuration for **Host Repeater**, the repeater behaves as follows:

Table 12-3 Host Repeater

Display	Section Name
Primary	In a **Conventional IP Network** system, the repeater always behaves as the **Host Repeater** (Primary Host Repeater). The behavior status is displayed in Beacon Operating Status. ・ “Master” is displayed in Beacon Operating Status of WEB Tool > Home. ・ “Beacon Master” is displayed in Beacon Operating Status of OLED > Network Information.
Secondary	In a **Conventional IP Network** system, the repeater behaves as the secondary **Host Repeater** (Secondary Host Repeater). If the communications with the Primary Host Repeater are available, the Secondary Host Repeater synchronizes the timing to start transmitting a beacon with reference to the Primary Host Repeater. If the communications with the Primary Host Repeater become unavailable due to communication failure, etc., the Secondary Host Repeater starts behaving as the **Host Repeater**. When the communications with the Primary Host Repeater are restored, the Secondary Host Repeater stops behaving as the **Host Repeater**. The behavior status is displayed in Beacon Operating Status. When the connection to the Primary Host Repeater is established ・ “Member” is displayed in Beacon Operating Status of WEB Tool > Home. ・ “Beacon Member” is displayed in Beacon Operating Status of OLED > Network Information. When no connection to the Primary Host Repeater is established ・ “Master” is displayed in Beacon Operating Status of WEB Tool > Home. ・ “Beacon Master” is displayed in Beacon Operating Status of OLED > Network Information.
Deselected (Continuous)	In a **Conventional IP Network** system, the repeater does not behave as the **Host Repeater**. The repeater for which Deselected (Continuous) is configured, if the communications with the Primary Host Repeater are available, synchronizes the timing to start transmitting a beacon with reference to the Primary Host Repeater. If the communications with the Primary Host Repeater are unavailable, the Secondary Host Repeater becomes the reference repeater. If both the Primary Host Repeater and the Secondary Host Repeater are unavailable, the repeater continues to transmit a beacon according to the configurations for **Duration** and **Transmit Interval Time**. If the communications with the Primary Host Repeater or the Secondary Host Repeater are restored, the repeater synchronizes the timing to start transmitting a beacon with reference to the Primary Host Repeater or the Secondary Host Repeater.

Display	Section Name
	The behavior status is displayed in Beacon Operating Status. When the connection to the Primary Host Repeater or Secondary Host Repeater is established ・ “Member” is displayed in Beacon Operating Status of WEB Tool > Home. ・ “Beacon Member” is displayed in Beacon Operating Status of OLED > Network Information. When no connection to the Primary Host Repeater and the Secondary Host Repeater is established ・ “Local” is displayed in Beacon Operating Status of WEB Tool > Home. ・ “Beacon Local” is displayed in Beacon Operating Status of OLED > Network Information.
Deselected (Suspended)	In a **Conventional IP Network** system, the repeater does not behave as the **Host Repeater**. The repeater for which Deselected (Suspended) is configured synchronizes the timing to start transmitting a beacon with reference to the Primary Host Repeater if the communications with the Primary Host Repeater are available. If the communications with the Primary Host Repeater are unavailable, the Secondary Host Repeater becomes the reference repeater. The repeater for which Deselected (Suspended) is configured stops transmitting a beacon if the communications with the Host Repeater are unavailable. If the communications with the Primary Host Repeater or the Secondary Host Repeater are restored, the repeater synchronizes the timing to start transmitting a beacon with reference to the Primary Host Repeater or the Secondary Host Repeater. The behavior status is displayed in Beacon Operating Status. When the connection to the Primary Host Repeater or Secondary Host Repeater is established ・ “Member” is displayed in Beacon Operating Status of WEB Tool > Home. ・ “Beacon Member” is displayed in Beacon Operating Status of OLED > Network Information. When no connection to the Primary Host Repeater and the Secondary Host Repeater is established ・ “None” is displayed in Beacon Operating Status of WEB Tool > Home. ・ “Beacon None” is displayed in Beacon Operating Status of OLED > Network Information.

Note

- From among the repeaters interconnected by using an IP network, configure one repeater as Primary and one repeater as Secondary respectively.
- To use this function, **Beacon** needs to be enabled, and the configurations related to Site Roaming need to be configured even on the subscriber units.
- Configure **Common Multicast IP Address** only when “Multicast” is configured in **IP Casting**.
- To synchronize the timing to transmit a beacon, the configuration value in **Transmit Interval Time** needs to be the same for each repeater, and the configuration value in **Duration** needs to be the same for each repeater.

Configuration using KPG-D7

- Configuring **Host Repeater** to be enabled or disabled (Edit > Conventional IP Network > General > Site Roaming > Host Repeater)

Duration

Duration is the length of time for which the interconnected repeaters by using an IP network continue to transmit a beacon.

The repeater must transmit a beacon until the subscriber unit determines the site providing good radio environment using the received beacon. If the number of repeaters interconnected by using an IP network increases, the length of time for the subscriber unit to determine the site providing good radio environment increases; hence a long duration needs to be configured for **Duration**.

Note

- To use this function, **Beacon** needs to be enabled, and the configurations related to Site Roaming need to be configured even on the subscriber units.

Configuration using KPG-D7

- Configuring **Duration** (Edit > Conventional IP Network > General > Site Roaming > Duration)

Transmit Interval Time

Transmit Interval Time is the interval time in which the interconnected repeaters by using an IP network transmit a beacon.

The frequency, which the subscriber unit determines the site providing better radio environment and then automatically migrates to the site (channel), can be controlled by using the configuration for **Transmit Interval Time**. For instance, if the subscriber unit moves at a high speed, the subscriber unit frequently moves to accessible area of each site; hence the site providing good radio environment frequently changes. In this case, configuring a short duration for Transmit Interval Time enables the subscriber unit to determine the site providing better radio environment at short intervals. On the contrary, if the subscriber unit hardly moves from the accessible area of the same site, the subscriber unit does not need to determine the site providing better radio environment at short intervals; hence a long duration can be configured for **Transmit Interval Time**.

Duration is not included in **Transmit Interval Time**. Therefore a beacon is transmitted after **Transmit Interval Time** elapses after the repeat transmission, periodic beacon transmission based on when the repeater transmission ends is provided.

Note

- The repeater starts transmitting a beacon at the interval of **Transmit Interval Time** configured for the repeater at the own station in principal. Therefore, in order to synchronize the timing to start transmitting a beacon, the same configured value needs to be configured for **Transmit Interval Time** in each repeater.
- To use this function, **Beacon** needs to be enabled, and the configurations related to Site Roaming need to be configured even on the subscriber units.
- In NXDN Mode, Duration is included in Transmit Interval Time, but in DMR Mode, Duration is not included in Transmit Interval Time.
- In NXDN Mode, no change occurs in the beacon transmission timing before and after the repeat transmission, but in DMR Mode, the beacon transmission is performed after the Transmit Interval Time period has elapsed after the repeat transmission.

Configuration using KPG-D7

- Configuring **Transmit Interval Time** (Edit > Conventional IP Network > General > Site Roaming > Transmit Interval Time)

Common Multicast IP Address

Common Multicast IP Address is the IP address of the target site used by the repeater configured as the Host Repeater to notify the arrival of the timing to transmit a beacon.
The address provided by the network administrator must be entered for **Common Multicast IP Address**.

Note

- This function can be used only if the repeater configured as the **Host Repeater** transmits a beacon by Multicast communications. (Refer to IP Casting, Host Repeater.)
- A network device which supports Multicast needs to be used in order to use **Common Multicast IP Address**.

Configuration using KPG-D7

- Configuring **Common Multicast IP Address** (Edit > Conventional IP Network > General > Site Roaming > Common Multicast IP Address)

12.3 Restricting Transmission to Avoid Interference with Other Communications (Cross-busy)

The repeater can restrict transmission in order to prevent the transmission from interfering with other communications if the channel is being used by another transceiver when the repeater transmits using the Repeat PTT control, Network PTT control, Console PTT control or SIP PTT control.
In order to use this function, an external transceiver that is used to monitor the transmit frequency of the repeater is required. Also, **Repeat Disable** needs to be assigned to an AUX Input port of the repeater.
If the BUSY signal is applied from an external transceiver monitoring the transmit frequency of the repeater to the AUX Input port to which **Repeat Disable** is assigned, the repeater determines whether to allow the transmission by using the Repeat PTT control, Network PTT control or Console PTT control.
According to the configuration for **Cross-busy**, the repeater behaves as below:

Table 12-4 Cross-busy 1

Configuration for Cross-busy	Description
Enabled	The repeater continues transmitting even if **Repeat Disable** becomes enabled during the transmission by using the Repeat PTT control, Network PTT control or Console PTT control.
Disabled	The repeater stops transmitting if **Repeat Disable** becomes enabled during the transmission by using the Repeat PTT control, Network PTT control or Console PTT control.

Also, the behavior varies according to the transmission status of the repeater, the configuration for **Cross-busy**, and the status of Repeat Disable/Enable.

If transmission starts by using the Repeat PTT control or Network PTT control while not transmitting:

Table 12-5 Cross-busy 2

Configuration for Cross-busy	The Status of Repeat Disable/ Enable	The Behavior of the Repeat PTT control, Network PTT control or Console PTT control
Enabled	Repeat Enable	Transmits
	Repeat Disable	Does not transmit
Disabled	Repeat Enable	Transmits
	Repeat Disable	Does not transmit

If transmission starts by using the Repeat PTT control or Network PTT control having a higher priority during transmission:

Table 12-6 Cross-busy 3

Configuration for Cross-busy	The Status of Repeat Disable/ Enable	The Behavior of the Repeat PTT control, Network PTT control or Console PTT control
Enabled	Repeat Enable	Starts a new transmission
	Repeat Disable	Starts a new transmission
Disabled	Repeat Enable	Starts a new transmission
	Repeat Disable	Does not transmit

During transmission by using the Repeat PTT control or Network PTT control:

Table 12-7 Cross-busy 4

Configuration for Cross-busy	The Status of Repeat Disable/ Enable	The Behavior of the Repeat PTT control, Network PTT control or Console PTT control
Enabled	Repeat Enable (No change)	Continues transmission
	Repeat Enable → Repeat Disable	Continues transmission
Disabled	Repeat Enable (No change)	Continues transmission
	Repeat Enable → Repeat Disable	Stops transmission

If the Repeat PTT control or Network PTT control is enabled:

Table 12-8 Cross-busy 5

Configuration for Cross-busy	The Status of Repeat Disable/ Enable	The Behavior of the Repeat PTT control, Network PTT control or Console PTT control
Enabled	Repeat Disable (No change)	Continues to stop transmission
	Repeat Disable → Repeat Enable	Starts transmission
Disabled	Repeat Disable (No change)	Continues to stop transmission
	Repeat Disable → Repeat Enable	Starts transmission

Note

- **Cross-busy** can be configured only if **Conventional IP Network** is enabled in Product Information.

Configuration using KPG-D7

- Configuring **Cross-busy** to be enabled or disabled (Edit > Conventional IP Network > General > Cross-busy)

Avoiding Interference with Other Communications (Busy Channel Lockout (Cross-busy))

Busy Channel Lockout (Cross-busy) is the function used by the repeater to restrict transmission automatically in order to avoid interfering with communications if the channel on which the repeater attempts to transmit using the Network PTT control or Console PTT control or attempts to transmit a Beacon is already used by other transceivers. According to the configuration for **Busy Channel Lockout (Cross-busy)**, the repeater behaves as below:

Table 12-9 Busy Channel Lockout (Cross-busy)

Configuration for Cross-busy	Description
No	Disables **Busy Channel Lockout**. No transmission is restricted even if the digital channel on which the repeater attempts to transmit is busy.
Carrier Only	The repeater cannot transmit while the repeater is receiving a signal.
Incorrect Tone (Analog Mode Only)	The repeater cannot transmit if the repeater receives a signal and the received QT tone or DQT code does not match the QT tone or DQT code preconfigured for the repeater. However, the repeater can transmit if the received QT tone or DQT code matches the QT tone or DQT code preconfigured for the repeater.
Correct CC (DMR Mode Only)	The repeater cannot transmit if the repeater receives a signal and the received Color Code matches the Color Code preconfigured for the repeater.
Incorrect RAN (NXDN Mode Only)	The repeater cannot transmit if the repeater receives a signal and the received RAN does not match the RAN preconfigured for the repeater.
Correct RAN (NXDN Mode Only)	The repeater cannot transmit if the repeater receives a signal and the received RAN matches the RAN preconfigured for the repeater.

Note

- The transmission by using the Network PTT control or Console PTT control is not allowed if the Repeat PTT control is configured to have a higher priority than the Network PTT control or Console PTT control in **PTT Priority**.
- The repeater continues transmitting even if the conditions to restrict transmission by **Busy Channel Lockout** are established during the transmission by using the Network PTT control or Console PTT control. However, the transmission using the Network PTT control or Console PTT control stops if the transmission using the Repeat PTT control starts.

Configuration using KPG-D7

- Configuring **Busy Channel Lockout (Cross-busy)** to be enabled or disabled (Edit > Conventional IP Network > General > Cross-busy)

12.4 Configuring the Target of an Intersite Call (Site Group Table)

Site Group Table is the table for which **Multicast IP Address** or **Unicast Site List** which are used as the target to make an Intersite Call is configured in addition to **Multicast IP Address** or Unicast Site List configured for each channel.
By using KPG-D7, **Multicast IP Address** or **Unicast Site List** can be configured for each table of the maximum 64 tables to be used as the target of an Intersite Call.
Also, whether or not to use **Site Group Table** can be configured for each GID or UID registered in **User List**. By using **Site Group Table**, the target of an Intersite Call can be changed by each GID or UID.

Note

- A maximum of 16 repeaters can be interconnected if Unicast communications are used. If Multicast communications are used, the number of repeaters that can be interconnected varies depending on the type of network devices, such as a router.
- A network device which supports Multicast needs to be used in order to use Multicast communications.

Configuration using KPG-D7

- Configuring **Site Group Table** (Edit > Site Group Table)

12.5 About the Network Configuration

In order to use **Conventional IP Network**, the following functions associated with an IP network need to be configured for the repeater by using KPG-D7 or Web Tool:

- IP Address
- Subnet Mask
- Default Gateway
- Unicast IP Address List

IP Address

IP Address is the IP address of the repeater at own station. If the repeater makes Unicast communications, the IP address of the site configured in **Site Number** is automatically configured. If the repeater makes Multicast communications, the IP address can be configured by being directly entered.
The IP address provided by the network administrator must be configured in **IP Address**.

Configuration using Web Tool

- Configuring **IP Address** (System > IP Configuration > New Configuration > IP Address)

Subnet Mask

Subnet Mask is the subnet mask number of the repeater at own station.

The subnet mask number provided by the network administrator must be configured in **Subnet Mask**.

Configuration using Web Tool

- Configuring **Subnet Mask** (System > IP Configuration > New Configuration > Subnet Mask)

Default Gateway

Default Gateway is the gateway IP address which is used by the repeater at own station.

The IP address of the gateway provided by the network administrator must be entered in **Default Gateway**.

Configuration using Web Tool

- Configuring **Default Gateway** (System > IP Configuration > New Configuration > Default Gateway)

Unicast IP Address List

Unicast IP Address List is the list for which the IP address of each repeater interconnected using an IP network is configured. The IP address configured in **Unicast IP Address List** becomes the target when the repeater makes Unicast communications.

A maximum of 16 IP addresses can be configured in **Unicast IP Address List**, but one of the IP addresses is configured as the IP address of the repeater of the own station.

Configuration using KPG-D7

- Configuring **Unicast IP Address List** (Edit > Conventional IP Network > Network > Unicast IP Address List)

12.6 Using Console

Console is the function that enables communication with the transceiver by connecting to the repeater from outside the wireless area by using Console Interface.
To use this function, the Unit ID of the Console to be permitted to connect to the repeater needs to be configured in **Console List**.

Note

- If operated in DMR Mode, the communication between Console and the repeater is compliant with “DMR Application Interface” (AIS) issued by the DMR Association.
- If operated in NXDN Mode, the communication between a Console and the repeater is compliant with NXIP Console Interface.
- Even on an analog channel, a voice call to a Console is available for the repeater by using the Analog GID function.

Configuration using KPG-D7

- Configuring the UID of Console (Edit > Conventional IP Network > Console > Console ID List)

Registration Behavior of Console

To make a voice or data communication to the transceiver by connecting to a repeater using a Console, the use of the repeater needs to be previously declared. This occurs when the UID of a Console is registered in the repeater by a Registration request from the Console.
Use of the repeater is permitted if the repeater receives the Registration request from a Console and the UID of the Console matches the UID configured for the repeater. By permitting use of the repeater, the transmission and reception of audio or data are enabled in the Console.
For a Console to receive a Group Call, the GID to be received needs to be registered in the repeater by a Group Registration request from the Console.
Although 10 Consoles can be registered for each repeater, only up to 2 Consoles are permitted to communicate at the same time.
In Group Registration of a Console, multiple GIDs can be registered in the repeater at the same time. Up to 100 GIDs can be registered for each Console at the same time.

Transmission Behavior of Console

If the Console PTT control is enabled by receiving a call request from a Console and transmission is enabled, the repeater starts RF transmission of audio and data packets received from the Console, and the repeater transmits to other sites, according to the configuration of **PTT Priority**. In this case, if the channel is a channel with **User List** enabled, whether an ID sent by the Console PTT control is permitted in User List is also checked.

Note

- If **Repeat Disable** is enabled, the repeater cannot transmit using the Console PTT control.

Reception Behavior of Console

For a Console to receive audio or data from the transceiver, the Unit ID and Group ID of the Console need to be registered in the repeater by a Registration request of Console Interface.

If a digital signal is received from a subscriber unit and transmission is started using the Repeat PTT control, or if an Intersite Call is received from another repeater connected by the IP and transmission is started using the Network PTT control, the repeater starts transmission of audio or data packets for the Console when the ID of this communication matches the ID preconfigured for the Console.

12.7 SIP Phone

Communication with a PSTN/ PABX SIP Phone, etc. can be performed by connecting the repeater to a SIP Phone Server.
To connect the repeater and SIP Phone Server, license authorization is required.
The repeater with the SIP Phone function enabled is connected to the SIP Phone Server by a SIP session and the audio is relayed. By properly configuring the SIP Phone Server, communication between the transceiver and PSTN/PABX SIP Phone can be made. In addition, the subscription to an IP phone service is separately required to use a PSTN.

When Phone Call communications are made from the transceiver, the repeater can send AMBE+2 audio data to a SIP Phone Server after converting to G.711 (PCMU/ PCMA). When Phone Call communications are made from a SIP Phone to the transceiver, the repeater can send G.711 (PCMU/ PCMA) audio data to the transceiver after converting to AMBE+2.

A Phone Call made from a SIP Phone is distributed according to User List or Network Setting > Site Group by corresponding to an Individual and Group.
During a Phone Call made from a SIP Phone, the repeater determines whether or not a signal from the transceiver is for Talkback. For Talkback, the repeater accepts Talkback without the determination of PTT Priority for the signal from the transceiver. For no Talkback, the repeater performs the determination of PTT Priority for the SIP PTT by handling as Repeat PTT. During Talkback, PTT Priority is treated as the SIP PTT.

A Phone Call made from the transceiver only corresponds to an Individual, and the Phone Call is distributed according to Network Setting > Site Group. The audio data transmitted by a SIP Phone Server after a Phone Call made from the transceiver starts is distributed according to User List or Network Setting > Site Group of the repeater connected to the SIP Phone Server.
A Phone Call cannot be made from a Console. In addition, a Console can only receive a Grope Phone Call.

To receive a Phone Call from a site other than the site directly connected to a SIP Phone Server, configure Repeat PTT > Network PTT in **PTT Priority** for the receiving repeater. If Network PTT > Repeat PTT is configured in **PTT Priority**, audio emits from Asterisk when a Phone Call starts by the receive operation of a subscriber unit. Therefore, during a Phone Call, the Network PTT transmission always behaves, and Talkback from the transceiver is not accepted.

If Console PTT occurs during SIP PTT, the connection to a SIP Phone disconnects in DMR Mode, and the switch is made to the Console PTT. If Console PTT occurs during SIP PTT, the SIP PTT is suspended in NXDN Mode, and the switch is made to the Console PTT.

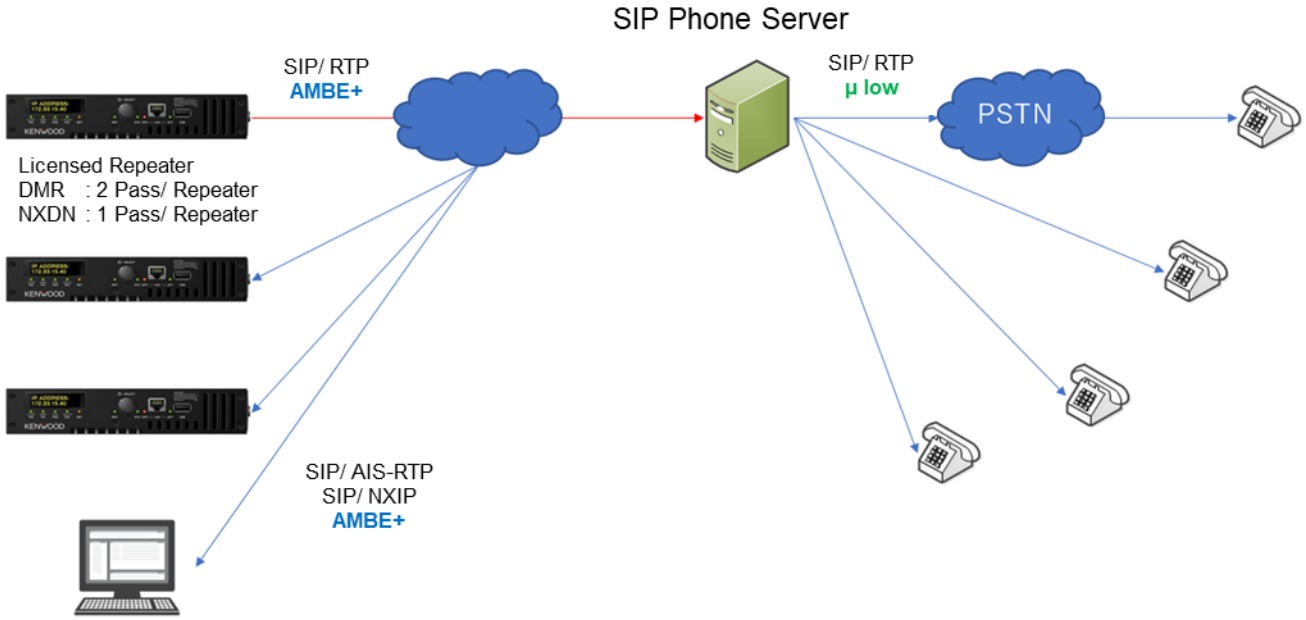


Figure 12-3 SIP Phone (TLS Disabled)

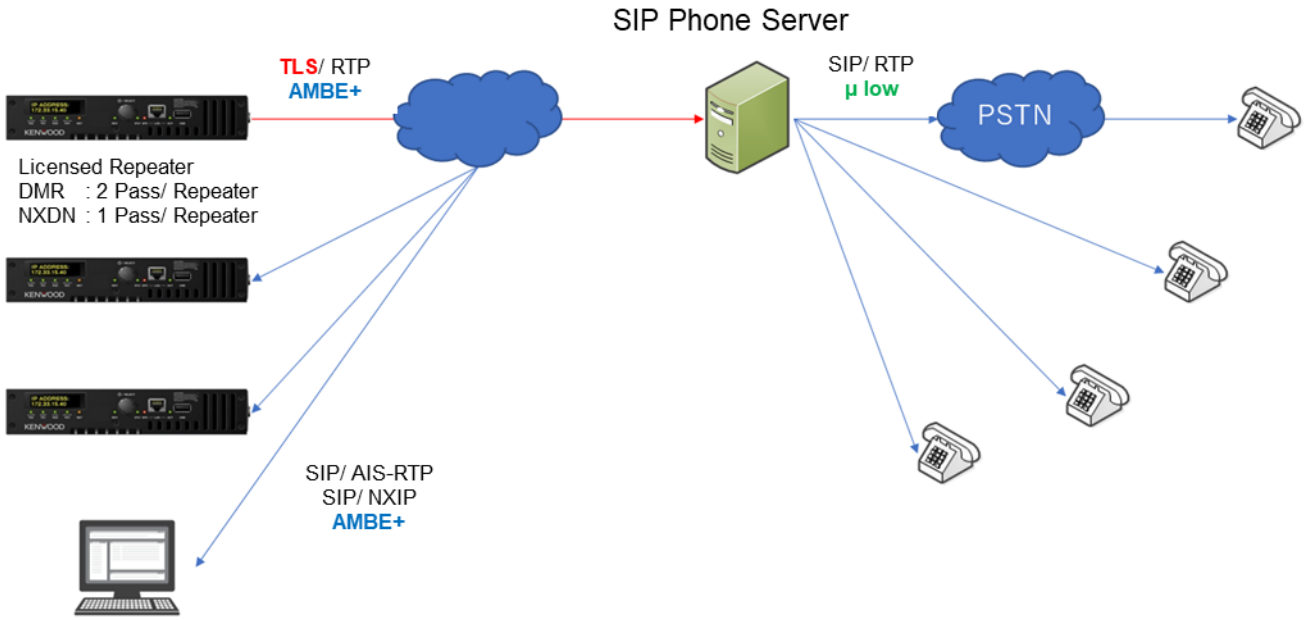


Figure 12-4 SIP Phone (TLS Enabled)

By enabling IP Interface and SIP Phone, the SIP Phone function can be used.

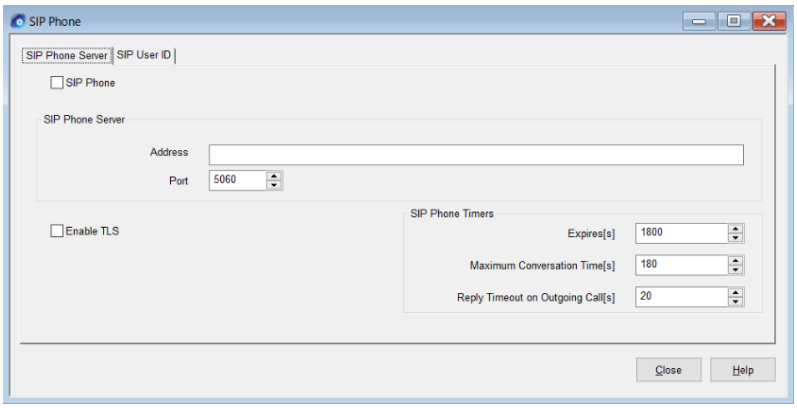


Figure 12-5 SIP Phone Server

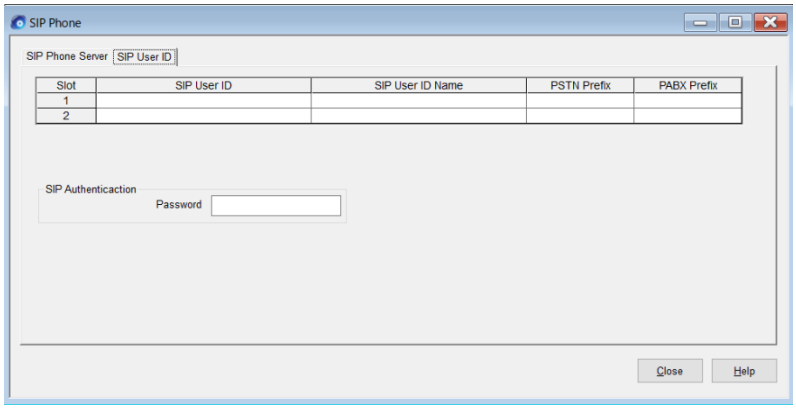


Figure 12-6 SIP User ID (DMR Mode)

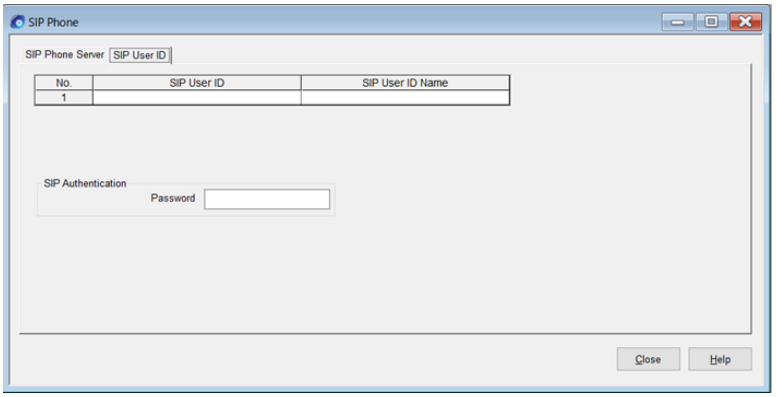


Figure 12-7 SIP User ID (NXDN Mode)

Table 12-10 SIP Phone

Configuration FPU	Description
SIP Phone Server Address / Port	In SIP Phone Server Address / Port, the Address (IP Address or Name) and Port (the SIP receive port of a SIP Phone Server) of the SIP Phone Server to be the connection target are configured. One SIP Phone Server can be connected to one repeater.

Configuration FPU	Description
Enable TLS	**Enable TLS** is the function to switch the session between a SIP Phone Server and the repeater to TLS. TLS is a mechanism which can use communications between various server clients using TCP/ IP as secure communication paths. By enabling **Enable TLS**, the repeater can encrypt the SIP session to a SIP Phone Server. This allows information such as the unique ID used for connection to the SIP Phone Server to be concealed. Enable **TLS** is enabled and the SIP session is encrypted. Disable **TLS** is disabled and the SIP session is normal with the SIP session not encrypted.
Expires [s]	**Expires** is a registration validity period of SIP User ID for the SIP Phone Server by the repeater. Before the validity period expires, Registration to a SIP Phone Server is performed by the repeater.
Maximum Conversation Time [s]	Maximum Conversation Time is the maximum length of time to maintain the call if a Phone Call is established between the repeater and SIP server. This timer is used to prevent a Phone Call from being held for overly long. Also, if no disconnect request from the transceiver or SIP Phone exists, or if a disconnect request cannot be received for any reason, the call is disconnected when the timer expires. A system administrator can structure a system that suits the operation environment of the system by configuring this timer. For example, shortening the time of each communication for the system where congestion frequently occurs allows more users to communicate. Unlimited The disconnection of a call is not performed when the length of time elapses. 120 sec to 600 sec During Phone Call communication, the communication of a Phone Call is disconnected when the length of time configured in **Maximum Conversation Time** elapses and PTT for the transceiver or Console is released. When the length of time configured in **Maximum Conversation Time** elapses and the transceiver or Console is transmitting audio, the communication of a Phone Call is disconnected after PTT is released.
Reply Timeout on Outgoing Call [s]	If no response is received for a certain length of time from the transceiver or Console after a Phone Call is established between the repeater and SIP server, the call is disconnected when the timer expires.

Configuration FPU	Description
	This timer is used to prevent a Phone Call from being held for overly long, such as when no response of audio packets from the transceiver or Console occurs for a certain period of time. A system administrator can structure a system that suits the operation environment of the system by configuring this timer. Unlimited The disconnection of a call is not performed when the length of time elapses. 20 sec to 120 sec If an audio packet from the transceiver or Console cannot be detected after a Phone Call is established, this timer is activated. The timer stops if an audio packet is detected before the length of time configured in **Reply Timeout on Outgoing Call** elapses. The communication of a Phone Call is disconnected when the length of time configured in **Reply Timeout on Outgoing Call** elapses.
Password (SIP Authentication)	**Password** is the function to configure the password for the session connection between a SIP Phone Server and the repeater. Configure and use the same value as the password linked to the SIP User ID of the repeater configured for the SIP Phone Server. The use of a password to connect sessions depends on the configuration of the SIP Phone Server. In the connection of a session, the repeater performs session connection to the SIP Phone that uses the configured password when the request for a password is received from the SIP Phone Server. **If a password is not configured** This is used if a password is not used for the session connection to a SIP Phone Server. A password is not applied to the REGISTER and INVITE methods. **If a password is configured** The repeater performs session connection to a SIP Phone by using the configured password when the request for a password is received from a SIP Phone Server. The configured password is applied to the REGISTER and INVITE methods.
Slot (DMR Mode Only)	Slot is the slot to assign a call with the repeater when a call request is received from a SIP Phone.

Configuration FPU	Description
SIP User ID	SIP User ID is the ID for SIP connection by the repeater to a SIP Phone Server. By using a configured SIP User ID, Registration to a SIP Phone Server is performed by the repeater. Therefore, the same ID as the SIP User ID configured for the repeater needs to be registered beforehand for the SIP Phone Server. Two SIP User IDs can be configured in DMR Mode, for slot 1 and for slot 2. If a call request is received from a SIP Phone, the repeater delivers the Phone Call after specifying the slot that corresponds to a SIP User ID. In NXDN Mode, one SIP User ID can be configured for one repeater. Even if a SIP User ID is registered, if Registration to a SIP Phone Server is not executed for the SIP User ID, communication cannot be done by using the SIP User ID.
SIP User ID Name	SIP User ID Name is the function to configure the name for a SIP User ID.
PSTN Prefix / PABX Prefix (DMR Mode Only)	PSTN Prefix / PABX Prefix is the identifier to determine whether a Paging Call made from the transceiver is addressed to a SIP Phone. A call to a SIP Phone from the transceiver is made by using a Paging Call. The repeater determines whether the destination configured for a Paging Call is a SIP Phone. PSTN Prefix and PABX Prefix digits are compared from the beginning of an ID of a Paging Call, and if they match, the repeater determines the call is addressed to the SIP Phone. Refer to Table 12-12 and Table 12-13 for details. Two PSTN Prefix/ PABX Prefix can be configured in DMR Mode, for slot 1 and for slot 2. The repeater compares the first one digit to up to four digits of the ID specified by a Paging Call with PSTN Prefix and PABX Prefix. If the comparison result matches, the Paging Call is treated as a call addressed to a SIP Phone. The comparison of the ID of the Paging Call to Prefix is performed starting from PSTN Prefix, and if no match is made, the comparison is made to PABX Prefix. The number of digits for comparison of the ID of the Paging Call to PSTN Prefix or PABX Prefix follows each configuration in PSTN Prefix and PABX Prefix. If a Paging Call ID and PSTN Prefix match, the repeater notifies the caller ID of a relayed audio signal received from a SIP Phone as FFFEE0 after the call is established. If a Paging Call ID and PABX Prefix match, the repeater notifies the caller ID of a relayed audio signal received from a SIP Phone as FFFEE1 after the call is established.

Note

- In DMR Mode, Phone Call communication from the transceiver can be made in 2 slots for each repeater.
- All Group Call and Unaddress Call are not supported for a call by a SIP Phone.
- Communications using Scrambler, AES/DES Encryption, and ARC4 Encryption are not supported for a call by a SIP Phone.
- Priority for a Phone Call made from a SIP Phone Server can be changed by the SIP PTT.
- A Phone Call made from the transceiver is treated as the Repeat PTT.
- If another SIP PTT occurs during the SIP PTT, the first SIP PTT is retained and the later SIP PTT is rejected.

Configuration using KPG-D7

- Configuring **SIP Phone** to be enabled or disabled (Edit > SIP Phone > SIP Phone Server > SIP Phone)
- Configuring **Address** (Edit > SIP Phone > SIP Phone Server > SIP Phone Server > Address)
- Configuring **Port** (Edit > SIP Phone > SIP Phone Server > SIP Phone Server > Port)
- Configuring **Enable TLS** to be enabled or disabled (Edit > SIP Phone > SIP Phone Server > Enable TLS)
- Configuring **Expires [s]** (Edit > SIP Phone > SIP Phone Server > SIP Phone Timers > Expires [s])
- Configuring **Maximum Conversation Time [s]** (Edit > SIP Phone > SIP Phone Server > SIP Phone Timers > Maximum Conversation Time [s])
- Configuring **Reply Timeout on Outgoing Call [s]** (Edit > SIP Phone > SIP Phone Server > SIP Phone Timers > Reply Timeout on Outgoing Call [s])
- Configuring **Password** (SIP Authentication) (Edit > SIP Phone > SIP User ID > SIP Authentication > Password)
- Configuring **SIP User ID** (Edit > SIP Phone > SIP User ID > SIP User ID)
- Configuring **SIP User ID Name** (Edit > SIP Phone > SIP User ID > SIP User ID Name)
- Configuring **PSTN Prefix** (Edit > SIP Phone > SIP User ID > PSTN Prefix)
- Configuring **PABX Prefix** (Edit > SIP Phone > SIP User ID > PABX Prefix)

Operation Method

The operation method if Asterisk is used as the SIP Phone Server is explained.

Table 12-11 Terms

Terms	Description
SIP Phone ID	A SIP Phone ID is an extension number configured for Asterisk. When a call request is received to a SIP Phone ID, Asterisk converts to the corresponding extension number or external number and initiates a call.
PSTN Phone Number	PSTN Phone Number shall refer to the telephone number obtained from PSTN service subscription in this explanation.
Ring Back Tone	Ring Back Tone is the calling tone and sounds for the caller.
Ring Tone	Ring Tone is the incoming call tone and sounds for the recipient.
Busy Tone	Busy Tone is the busy tone and sounds for the caller.

Table 12-12 In the Case of a Transceiver Call to PABX

Item	Description	
Transmit Operation	DMR Mode: Paging Call DMR Mode: Autodial NXDN Mode: Autodial	Entry: Prefix + SIP Phone ID Entry: Autodial Entry: Autodial
Prefix	1 to 9999 (DMR Mode Only)	PABX Prefix
Destination	Extension number that corresponds to a SIP Phone ID	
	For DMR Mode (Paging Call) ・ The repeater notifies Asterisk of a call request with the SIP Phone ID notified from the transceiver. ・ Asterisk calls the extension number that corresponds to the notified SIP Phone ID. ・ A SIP Phone ID and extension number are linked in the Asterisk configuration. For DMR Mode (Autodial) ・ An extension number needs to be prefixed with “02”. In addition, Asterisk needs to be configured to use Asterisk to determine the destination and, if the destination is PABX, to dial the specified extension number. For NXDN Mode ・ If both PSTN and PABX are used, allow whether the destination is PSTN or PABX to be distinguished, for example, by prefixing an extension number with a certain code. In addition, Asterisk needs to be configured to use Asterisk to determine the destination and, if the destination is PABX, to dial the specified extension number.	
Ring Back Tone	Sounds	Sounds according to the Asterisk “Answer” configuration
Ring Tone	Sounds	Depends on the SIP Phone specifications (The repeater notifies Asterisk of INVITE.)

Item	Description	
Busy Tone	Selectable	Selectable whether to sound according to the Asterisk “Busy” configuration
Receive Operation	The receive operation is performed by using a SIP Phone.	
Remarks	The relationship of a SIP Phone ID and extension number is one-to-one. For DMR Mode (Paging Call) · If the beginning of a destination ID of a Paging Call and PABX Prefix match, the repeater notifies the transceiver of the caller ID of an audio signal from a telephone as FFFEE1. · Regardless of whether or not sip.conf of Asterisk is configured, the repeater returns a Paging Call response. For DMR Mode (Autodial) · The repeater notifies the transceiver of the caller ID of an audio signal from a telephone as FFFEE1. For NXDN Mode · The repeater notifies the transceiver of the caller ID of an audio signal from a telephone as FFF5.	

Table 12-13 In the Case of a Transceiver Call to PSTN

Item	Description	
Transmit Operation	DMR Mode: Paging Call DMR Mode: Autodial NXDN Mode: Autodial	Entry: Prefix + SIP Phone ID Entry: Autodial Entry: Autodial
Prefix	1 to 9999 (DMR Mode Only)	PSTN Prefix
Destination	External number that corresponds to a SIP Phone ID	
	For DMR Mode (Paging Call) · The repeater notifies Asterisk of a call request with the SIP Phone ID notified from the transceiver. · Asterisk calls the external number that corresponds to the notified SIP Phone ID. · A SIP Phone ID and external number are linked in the Asterisk configuration. For DMR Mode (Autodial) · An external number needs to be prefixed with “01”. In addition, Asterisk needs to be configured to use Asterisk to determine the destination and, if the destination is PSTN, to dial the specified external number.	

Item	Description	
	For NXDN Mode ・ If both PSTN and PABX are used, allow whether the destination is PSTN or PABX to be distinguished, for example, by prefixing an external number with a certain code. In addition, Asterisk needs to be configured to use Asterisk to determine the destination and, if the destination is PSTN, to dial the specified external number.	
Ring Back Tone	Sounds	Sounds according to the Asterisk “Answer” configuration
Ring Tone	Sounds	Depends on the SIP Phone specifications (The repeater notifies Asterisk of INVITE.)
Busy Tone	Selectable	Selectable whether to sound according to the Asterisk “Busy” configuration
Receive Operation	The receive operation is performed by using a SIP Phone.	
Remarks	The relationship of a SIP Phone ID and external number is one-to-one. For DMR Mode (Paging Call) ・ If the beginning of a destination ID of a Paging Call and PSTN Prefix match, the repeater notifies the transceiver of the caller ID of an audio signal from a telephone as FFFEE0. ・ The destination external number cannot be entered directly due to the entry digit limit of a Paging Call. ・ Regardless of whether or not sip.conf of Asterisk is configured, the repeater returns a Paging Call response. For DMR Mode (Autodial) ・ The repeater notifies the transceiver of the caller ID of an audio signal from a telephone as FFFEE0. For NXDN Mode ・ The repeater notifies the transceiver of the caller ID of an audio signal from a telephone as FFF5.	

Table 12-14 In the Case of a SIP Phone Call to PABX

Item	Description	
Transmit Operation	SIP Phone dialing operation	Entry: The desired number
Destination	DMR Mode: DMR ID NXDN Mode: NXDN ID	
	・ Based on the desired number notified from a SIP Phone, Asterisk notifies the repeater of a call request according to the configuration. ・ In DMR Mode, the entered number is converted to the desired DMR ID according to the Asterisk configuration. ・ In NXDN Mode, the entered number is converted to the desired NXDN ID according to the Asterisk configuration. ・ The repeater notifies the transceiver of a call request with the DMR ID and NXDN ID notified by Asterisk.	
Ring Back Tone	Sounds	Sounds according to the RTP generated by the repeater.
Ring Tone	Sounds	Sounds according to the RTP generated by the repeater.
Busy Tone	Does not sound.	Because the repeater does not detect whether the transceiver is busy, the repeater sends the same RTP as Ring Back Tone and Ring Tone.
Receive Operation	Individual Call	PTT is pressed on the transceiver.
	Group Call	PTT is pressed on the transceiver.
Remarks	・ In DMR Mode, the repeater notifies the transceiver of the caller ID of a call request as FFFEE1. The configuration of Asterisk is required for notification. ・ In NXDN Mode, the repeater notifies the transceiver of the caller ID of a call request as FFF5. The configuration of Asterisk is required for notification.	

Table 12-15 In the Case of a SIP Phone Call to PSTN

Item	Description	
Transmit Operation	SIP Phone dialing operation	Entry: PSTN Phone Number
Destination	DMR Mode: DMR ID NXDN Mode: NXDN ID	
	• When a call request is received from a SIP Phone to the PSTN Phone Number, Asterisk notifies the repeater of a call request according to the configuration. • In DMR Mode, a PSTN Phone Number is converted to the desired DMR ID according to the Asterisk configuration. • In NXDN Mode, a PSTN Phone Number is converted to the desired NXDN ID according to the Asterisk configuration. • When a call request is received from Asterisk, the repeater notifies the transceiver of the call request with the DMR ID and NXDN ID notified by Asterisk.	
Ring Back Tone	Sounds	Sounds according to the RTP generated by the repeater.
Ring Tone	Sounds	Sounds according to the RTP generated by the repeater.
Busy Tone	Does not sound.	Because the repeater does not detect whether the transceiver is busy, the repeater sends the same RTP as Ring Back Tone and Ring Tone.
Receive Operation	Individual Call	PTT is pressed on the transceiver.
	Group Call	PTT is pressed on the transceiver.
Remarks	• For a telephone from PSTN, the destination phone number is the phone number (PSTN Phone Number) obtained from the PSTN service subscription. • In DMR Mode, the repeater notifies the transceiver of the caller ID of a call request as FFFEE0. The configuration of Asterisk is required for notification. • In NXDN Mode, the repeater notifies the transceiver of the caller ID of a call request as FFF5. The configuration of Asterisk is required for notification.	

Target SIP Phone ID

In Target SIP Phone ID, the Voice Logger to be the destination of a recording of an Individual Call made from the transceiver by using a Paging Call to a SIP Phone can be configured.

Table 12-16 Target SIP Phone ID

Configuration FPU	Description
Default Voice Logger ID	The Voice Logger to be the destination of a recording of an Individual Call addressed to a SIP Phone using anything other than the SIP Phone ID configured in Target SIP Phone ID is configured. Target SIP Phone ID is configured. If no configuration of Target SIP Phone ID exists, all Individual Calls made from the transceiver to a SIP Phone are recorded to the Voice Logger of Default Voice Logger ID. ・ The Voice Logger to record an Individual Call addressed to a SIP Phone is selected from Voice Logger List. The configuration is done by specifying the Voice Logger ID. ・ This is the destination of a recording of an Individual Call addressed to a SIP Phone of anything other than a SIP Phone ID configured in Target SIP Phone ID. ・ If Default Voice Logger ID is not configured, recording is not executed. ・ In DMR Mode, all Individual Calls made by using DTMF from the transceiver to a SIP Phone are recorded to the Voice Logger of Default Voice Logger ID.
SIP Phone ID Range (Min-Max) (DMR Mode Only)	SIP Phone ID Range (Min) and SIP Phone ID Range (Max) are the functions to configure the minimum value and maximum value of the SIP Phone ID range targeted for recording. SIP Phone ID Range (Min) and SIP Phone ID Range (Max) can be used only in DMR Mode. SIP Phone ID Range (Min) This is the minimum value of SIP Phone ID targeted for recording. SIP Phone ID Range (Max) This is the maximum value of SIP Phone ID targeted for recording. The same ID can be entered in SIP Phone ID Range (Min) and SIP Phone ID Range (Max). In this case, the ID is handled as a single SIP Phone ID. For example, if the configurations are SIP Phone ID Range (Min) = 10 and SIP Phone ID Range (Max) = 10, only voice calls of the destination SIP Phone ID = 10 are recorded in the Voice Logger configured for the specified Voice Logger ID.
Voice Logger ID (DMR Mode Only)	The Voice Logger to be the destination of a recording for a SIP Phone ID targeted for recording specified in SIP Phone ID Range is configured. The Voice Logger to record an Individual Call addressed to a SIP Phone with a SIP Phone ID specified in SIP Phone ID Range as the destination is configured. It is selected from Voice Logger List.

Configuration FPU	Description
	Voice Logger ID can be used only in DMR Mode. ・ The Voice Logger to record an Individual Call addressed to a SIP Phone is selected from Voice Logger List. The configuration is done by specifying the Voice Logger ID. ・ If Voice Logger ID is not configured, recording is not executed.

Configuration using KPG-D7

- Configuring **Default Voice Logger ID** (Edit > Voice Logger > Target SIP Phone ID > Default Voice Logger ID)
- Configuring **SIP Phone ID Range (Min)** (Edit > Voice Logger > Target SIP Phone ID > SIP Phone ID Range (Min))
- Configuring **SIP Phone ID Range (Max)** (Edit > Voice Logger > Target SIP Phone ID > SIP Phone ID Range (Max))
- Configuring **Voice Logger ID** (Edit > Voice Logger > Target SIP Phone ID > Voice Logger ID)

12.8 IP Remote Control Interface (IPRCI)

IP Remote Control Interface (IPRCI) is the function to enable the use of the commands which control the repeater itself via IP.

Unit ID Output

Unit ID Output is the function that can send the calling UID and destination ID of the received communication (voice) to the IPRCI Console.

Table 12-17 Unit ID Output

Configuration FPU	Description
Unit ID Output	Unit ID Output is configured to be enabled or disabled for digital mode and analog mode.

The data to be sent can be received by the IPRCI Console. By using this function, the dispatcher can monitor in real time the transceivers that are transmitting. In addition, the UID to be sent can also be used for management of the call log.

The repeater sends the calling UID and destination UID or destination GID of the received communication (voice) to the IPRCI Console. Even if the condition to unmute is not satisfied, the repeater sends the calling UID and destination ID to the IPRCI Console with the audio remaining muted upon receipt of voice communications. In analog mode, the calling UID is Own ID of the repeater and the destination ID is Analog GID (zero if Analog GID is not configured).

Table 12-18 In DMR Mode

Received Communication	Monitor Off		Monitor On		Squelch Off	
	Command	USB Headset	Command	USB Headset	Command	USB Headset
CC matches	xl	Mute is reset	xl	Mute is reset	xl	Mute is reset
CC does not match	N/A	Muted	N/A	Muted	N/A	Muted

Table 12-19 In NXDN Mode

Received Communication	Monitor Off		Monitor On		Squelch Off	
	Command	USB Headset	Command	USB Headset	Command	USB Headset
RAN matches	gl	Mute is reset	gl	Mute is reset	gl	Mute is reset
RAN does not match	N/A	Muted	N/A	Mute is reset	N/A	Mute is reset

Table 12-20 In Analog Mode

Received Communication	Monitor Off		Monitor On		Squelch Off	
	Command	USB Headset	Command	USB Headset	Command	USB Headset
QT/DQT matches	xl	Mute is reset	xl	Mute is reset	xl	Mute is reset
QT/DQT does not match	N/A	Muted	N/A	Mute is reset	N/A	Mute is reset

The transmission behavior of Unit ID Output is the same behavior in Operation Mode for which a Console can be used.
In DMR Mode, the match of the received CC is the required condition for the behavior of Unit ID Output.
In NXDN Mode, the match of the received RAN is the required condition for the behavior of Unit ID Output.
In Analog Mode, the match of the received QT/DQT is the required condition for the behavior of Unit ID Output.

Note

- In a single transmission operation, a UID may be output more than once depending on the reception status of the receiver.
- The timing to output the UID is when the frame is synchronized. Therefore, even if a single Call operation is performed, a UID may be output more than once if the synchronization is lost and then established.

J Command Output

J Command Output is the function to notify the status change by an IPRCI command when the repeater status such as the enabling or disabling of a PTT function and the RSSI level changes.

Table 12-21 J Command Output

Configuration FPU	Description
J Command Output	J Command Output is configured to be enabled or disabled for digital mode and analog mode.

The IPRCI command indicating the status change (such as J Command) is sent to the IPRCI Console when the repeater status changes.
If **J Command Output** is enabled, the status change is sent to the IPRCI Console by an IPRCI command when the change of the repeater status such as the enabling or disabling of a PTT function and the RSSI level occurs.
If **J Command Output** is disabled, the IPRCI command is sent to the IPRCI Console when a command output request is made from the IPRCI Console.

Configuration using KPG-D7

- Configuring **Unit ID Output** to be enabled or disabled (Edit > Optional Features > Common Page 3 > IP Remote Control Interface (IPRCI) > IPRCI Output > Unit ID Output)
- Configuring **J Command Output** to be enabled or disabled (Edit > Optional Features > Common Page 3 > IP Remote Control Interface (IPRCI) > IPRCI Output > J Command Output)

13 MANAGING DEVICES ON AN IP NETWORK (SNMP)

13.1 SNMP

SNMP (Simple Network Management Protocol) is the protocol for managing devices in an IP network and is specified by RFC 1157, etc. The application called SNMP Manager can monitor the system and confirm the various operating environments by referring to a file called MIB (Management Information Base) for managing devices via communication network.

The SNMP function supports a Trap which triggers a particular event to inform it, and a Polling to which information is requested at the desired timing from SNMP Manager.

For the managed information, in addition to the listed KENWOOD proprietary MIB, MIB-2 System group is supported as the common MIB.

The following are the supported items for the KENWOOD proprietary MIB and the combination of information notification methods (Response, Trap).

For the KENWOOD proprietary MIB, incorporate the MIB file included in the firmware data into SNMP Manager and confirm the file.

Table 13-1 Supported Items for the KENWOOD Proprietary MIB and the Combination of Information Notification Methods (Response, Trap)

Genre 1	Genre 2	Control Item	Description	Response	Trap
General	Information	IP Address	IP Address	Y	-
		Virtual IP Address	Virtual IP Address	Y	-
		Channel Name	Channel Name	Y	-
		Channel Type	Channel Type	Y	-
		Site No.	Site Number	Y	-
		Model Name	Model Name	Y	-
		Destination	Market Code	Y	-
		Mode	Mode (fixed at Conventional)	Y	-
		Operation Mode	Operation Mode	Y	-
		Hot Standby Mode	Main/ Sub	Y	-
		Protocol	Analog/ DMR/ NXDN	Y	-
	Status	Repeater Status	Standby/ Processing/ Running	Y	Y
		Hot Standby Status	Failsoft/ Active/ Standby	Y	-
		Next Switch Time	Next Switch Time	Y	-
		Beacon Mode	Local/ Master/ Member/ None	Y	-
		CW ID Status	On/ Off	Y	Y

Table 13-1 Supported Items for the KENWOOD Proprietary MIB and the Combination of Information Notification Methods (Response, Trap)

Genre 1	Genre 2	Control Item	Description	Response	Trap
General	Control	Channel Select	1 to 32	Y	-
		Slot Select	1/ 2	Y	-
		Repeat	Enable/ Disable	Y	Y
		Take Over	On/ Off	Y	Y
		Knob Status	Lock/ Unlock	Y	-
		CW ID	Detected/ Undetected	-	Y
		Decode Signaling	Enable/ Disable	Y	Y
		Encode Signaling	Enable/ Disable	Y	Y
		Call Hangtime	Enable/ Disable	Y	Y
		Channel Hangtime	Enable/ Disable	Y	Y
		Hold Time	Enable/ Disable	Y	Y
		Local TX	Enable/ Disable	Y	Y
		Low Power	On/ Off	Y	Y
		Monitor	On/ Off	Y	Y
		Squelch	On/ Off	Y	Y
		Test Tone	On/ Off	Y	Y
		TOT	Enable/ Disable	Y	Y
		TX	Enable/ Disable	Y	Y
		Voting Tone	On/ Off	Y	Y
		Service	Detected/ Undetected	-	Y
		Active Status Switch	Detected/ Undetected	-	Y
		AUX Output 1	On/ Off	Y	Y
		AUX Output 2	On/ Off	Y	Y
		AUX In/Out 1 (Output)	On/ Off	Y	Y
		AUX In/Out 2 (Output)	On/ Off	Y	Y
		AUX In/Out 3 (Output)	On/ Off	Y	Y
		AUX In/Out 4 (Output)	On/ Off	Y	Y
		AUX In/Out 5 (Output)	On/ Off	Y	Y
		AUX In/Out 6 (Output)	On/ Off	Y	Y
	Warning	Hot Standby LAN Connection	HSB Failsoft/ Connected/ Disconnected	Y	Y
		Beacon Sync	StandAlone / Connected/ Disconnected	Y	Y
	Error	Unprogrammed	Error/ Normal	Y	Y
		USB Over Current	Error/ Normal	Y	Y
		TX Frequency Data Blank	Error/ Normal	Y	Y
		ESN Blank	Error/ Normal	Y	Y
		Feature Error	Error/ Normal	Y	Y
		Force Firmware Programming Mode	Error/ Normal	Y	Y

Table 13-1 Supported Items for the KENWOOD Proprietary MIB and the Combination of Information Notification Methods (Response, Trap)

Genre 1	Genre 2	Control Item	Description	Response	Trap
Hardware	Common	TX Status	On/ Off	Y	-
		RX Status	On/ Off	Y	-
		RX Status (Slot2)*	On/ Off	Y	-
		RSSI	Electric Field Strength	Y	-
		RSSI (Slot2)*	Electric Field Strength	Y	-
		FER	Frame Error Rate	Y	-
		FER (Slot2)*	Frame Error Rate	Y	-
		Signaling	Signaling Matching/Not matching	Y	Y
		Signaling (Slot2)*	Signaling Matching/Not matching	Y	Y
		Forward Power Level	Forward RF Power at the Antenna Terminal	Y	-
		Fan Error Detection (Fan Lock Error)	Fan Error Detection	Y	Y
		VSWR	Reflected Wave Strength during Transmission	Y	-
		VSWR Error Detection	VSWR Error Detection	Y	Y
		RF Power Down Detection	Transmit Power Decrease	Y	Y
		Receive Signal (Threshold)	RSSI Voltage Decrease	Y	Y
	Voltage	VCO Control Voltage (Reception)	VCO Control Voltage (Reception)	Y	-
		VCO Control Voltage (Transmission)	VCO Control Voltage (Transmission)	Y	-
		Power Supply Voltage	Power Supply Voltage	Y	-
		Power Supply Voltage Status	Power Supply Voltage Status. Error if it goes lower than the lower limit threshold	Y	Y
	PLL	PLL Lock Detection (Reception)	PLL Lock Detection (Reception)	Y	Y
		PLL Lock Detection (Transmission)	PLL Lock Detection (Transmission)	Y	Y
	Consumption	Current Consumption (HPA)	HPA Current Consumption	Y	Y
	Temperature	Temperature (Drive Amp)	Drive Amp Temperature	Y	Y
		Temperature (TX Block)	TX Block Temperature	Y	Y
		Temperature (TCXO)	TCXO Temperature	Y	Y
		Temperature (HPA)	HPA Temperature	Y	Y
	AUX Port	AUX Input 1	On/ Off	Y	Y
		AUX Input 2	On/ Off	Y	Y
		AUX Input 3	On/ Off	Y	Y
		AUX In/Out 1 (Input)	On/ Off	Y	Y
		AUX In/Out 2 (Input)	On/ Off	Y	Y
		AUX In/Out 3 (Input)	On/ Off	Y	Y
		AUX In/Out 4 (Input)	On/ Off	Y	Y
		AUX In/Out 5 (Input)	On/ Off	Y	Y
		AUX In/Out 6 (Input)	On/ Off	Y	Y

* RX Status (Slot1/Slot2), RSSI (Slot1/Slot2), FER (Slot1/Slot2), and Signaling (Slot1/Slot2) are each 2 items because information is acquired and notified for each slot when a DMR signal is being received. When a signal of anything other than DMR is being received, the same information is displayed for both items.

Table 13-2 SNMP

Configuration FPU	Description
SNMP Interface	Configures the SNMP function to be enabled or disabled. If SNMP Interface is enabled, the repeater responds to Polling. Also, the repeater performs the Trap notification. If SNMP Interface is disabled, the repeater does not respond to Polling. Also, the repeater does not perform the Trap notification.
Community Name	Configures the name of the network range to be monitored by SNMP. Community Name is used as the password for information acquisition by SNMP. When the Community Name added to an SNMP request matches **Community Name** configured for the repeater, the repeater behaves according to the request.
Trap Destination Address	Configures the SNMP trap destination address (IP Address or Name). The repeater notifies the configured **Trap Destination IP Address** of the SNMP trap when a failure value occurs or the status changes.
Trap Event (General)	Configures whether to notify a Trap for each category of the General genre (Status, Control, Warning, Error). Among the categories shown in Genre 2 of Table “Supported Items for the KENWOOD Proprietary MIB and the Combination of Information Notification Methods (Response, Trap)”, the enabled control items (Trap column: Y) are notified as a Trap.
Trap Event (Hardware)	Configures whether to notify a Trap for each category of the Hardware genre (Common, Voltage, PLL, Consumption, Temperature, AUX Port). Among the categories shown in Genre 2 of Table “Supported Items for the KENWOOD Proprietary MIB and the Combination of Information Notification Methods (Response, Trap)”, the enabled control items (Trap column: Y) are notified as a Trap.

Configuration using KPG-D7

- Configuring **SNMP Interface** to be enabled or disabled (Edit > SNMP Settings > SNMP Interface)
- Configuring **Community Name** (Edit > SNMP Settings > Community Name)
- Configuring **Trap Destination Address 1 to 4** (Edit > SNMP Settings > Trap Destination Address 1 to 4)
- Configuring **Status** of **Trap Event (General)** to be enabled or disabled (Edit > SNMP Settings > Trap Event (General) > Status)
- Configuring **Control** of **Trap Event (General)** to be enabled or disabled (Edit > SNMP Settings > Trap Event (General) > Control)
- Configuring **Warning** of **Trap Event (General)** to be enabled or disabled (Edit > SNMP Settings > Trap Event (General) > Warning)
- Configuring **Error** of **Trap Event (General)** to be enabled or disabled (Edit > SNMP Settings > Trap Event (General) > Error)
- Configuring **Common** of **Trap Event (Hardware)** to be enabled or disabled (Edit > SNMP Settings > Trap Event (Hardware) > Common)
- Configuring **Voltage** of **Trap Event (Hardware)** to be enabled or disabled (Edit > SNMP Settings > Trap Event (Hardware) > Voltage)
- Configuring **PLL** of **Trap Event (Hardware)** to be enabled or disabled (Edit > SNMP Settings > Trap Event (Hardware) > PLL)
- Configuring **Consumption** of **Trap Event (Hardware)** to be enabled or disabled (Edit > SNMP Settings > Trap Event (Hardware) > Consumption)
- Configuring **Temperature** of **Trap Event (Hardware)** to be enabled or disabled (Edit > SNMP Settings > Trap Event (Hardware) > Temperature)
- Configuring **AUX Port** of **Trap Event (Hardware)** to be enabled or disabled (Edit > SNMP Settings > Trap Event (Hardware) > AUX Port)

13.2 SNMP Troubleshooting

This section describes the Trap information and excludes the Polling information among the information sent from SNMP. A Trap and Polling have different mechanisms for obtaining the OID (Object Identifier) information as shown below:

- Trap information: The repeater detects the status change by itself, and the repeater outputs the OID information spontaneously.
- Polling information: When the information acquisition request is made, the repeater outputs the OID information.

The following table describes the Trap of generic MIB supported by the repeater:

Table 13-3 Supported Items of the Repeater in the Generic MIB Trap

OID (Object Identifier)	Name	Description	Trouble Shooting
1.3.6.1.6.3.1.1.5.1	coldStart	Is output when NXR-1700/ NXR-1800 reboots or recovers from a power failure.	If no user action is taken or a power failure has not occurred, confirm the NXR-1700/ NXR-1800 status and check for unauthorized users because there is a possibility of unintended behavior.
1.3.6.1.6.3.1.1.5.5	authenticationFailure	Is output when a request from SNMP Manager causes an authentication error.	Confirm that the Community Name configuration is correct. Also, confirm that there are no unauthorized users.

The following table (proprietary MIB Trap) describes the KENWOOD proprietary MIB:

Table 13-4 KENWOOD Proprietary MIB

OID (Object Identifier)	Name	Description	Trouble Shooting
1.3.6.1.4.1.46861.1.1.1.3.1.2	Hot Standby LAN Connection	Is output when the connection between the Main Repeater and Sub Repeater is disconnected in Hot Standby.	Confirm the connection status between the Main Repeater and Sub Repeater.
1.3.6.1.4.1.46861.1.1.1.3.2.2	Beacon Sync	Is output when the Beacon Member cannot receive a Beacon synchronization signal from the Beacon Master.	Confirm the connection status between the Beacon Member and Beacon Master.
1.3.6.1.4.1.46861.1.1.1.4.1.2	Unprogrammed	Is output when none of the channels have been configured.	Configure the channel data by using the FPU.
1.3.6.1.4.1.46861.1.1.1.4.2.2	USB Over Current	Is output when an overcurrent occurs in the connected USB device.	Disconnect the connected USB device and execute USB Port Recovery.
1.3.6.1.4.1.46861.1.1.1.4.3.2	TX Frequency Data Blank	Is output when the transmission is to be performed on the channel for which a transmit frequency is not configured.	Configure a transmit frequency by using the FPU.
1.3.6.1.4.1.46861.1.1.1.4.4.2	ESN Blank	Is output when the ESN is not written.	If this problem occurs, contact JVCKENWOOD sales company technical staff.
1.3.6.1.4.1.46861.1.1.1.4.5.2	Feature Error	Is output when the software option function with no license authentication is enabled in the FPU configuration.	Apply the required license or disable the software option function with no license authentication.
1.3.6.1.4.1.46861.1.1.1.4.6.2	Force Firmware Programming Mode	Is output when the writing of firmware fails and startup occurs by using the old firmware.	Execute the writing of firmware in order to start up with Forced Firmware Programming Mode.

OID (Object Identifier)	Name	Description	Trouble Shooting
1.3.6.1.4.1.46861.1.1.2.1.8.2	Fan Error Detection	Is output when the fan can no longer spin.	Confirm the fan status. If a fan error cannot be confirmed, contact JVCKENWOOD sales company technical staff.
1.3.6.1.4.1.46861.1.1.2.2.7.2	Power Supply Voltage Status	Is output when the power supply voltage goes below the lower limit of the threshold.	Confirm if the power cord, etc. is connected to the repeater and if the value of the power supply voltage is within the specification range.
1.3.6.1.4.1.46861.1.1.2.3.1.2	PLL Unlock Detection (RX)	Is output when the RX PLL unlocks.	Restart the repeater because the PLL IC may not have the correct data configuration. Or, execute Tuning Data > Restore of the FPU.
1.3.6.1.4.1.46861.1.1.2.3.2.2	PLL Unlock Detection (TX)	Is output when the TX PLL unlocks.	Restart the repeater because the PLL IC may not have the correct data configuration. Or, execute Tuning Data > Restore of the FPU.
1.3.6.1.4.1.46861.1.1.2.4.3.2	Current Consumption (HPA) Error	Is output when an error in the HPA current consumption is detected.	If this problem occurs, contact JVCKENWOOD sales company technical staff.
1.3.6.1.4.1.46861.1.1.2.5.5.2	Temperature (Drive Amp) Error	Is output when an error in the Drive Amp temperature is detected.	Stop the repeater transmission and confirm if the symptom improves. If the symptom does not improve, contact JVCKENWOOD sales company technical staff.

OID (Object Identifier)	Name	Description	Trouble Shooting
1.3.6.1.4.1.46861.1.1.2.5.6.2	Temperature (TX Block) Error	Is output when an error in the TX Block temperature is detected.	Stop the repeater transmission and confirm if the symptom improves. If the symptom does not improve, contact JVCKENWOOD sales company technical staff.
1.3.6.1.4.1.46861.1.1.2.5.7.2	Temperature (TCXO) Error	Is output when an error in the TCXO temperature is detected.	Stop the repeater transmission and confirm if the symptom improves. If the symptom does not improve, contact JVCKENWOOD sales company technical staff.
1.3.6.1.4.1.46861.1.1.2.5.8.2	Temperature (HPA) Error	Is output when an error in the HPA temperature is detected.	Stop the repeater transmission and confirm if the symptom improves. If the symptom does not improve, contact JVCKENWOOD sales company technical staff.
1.3.6.1.4.1.46861.1.1.2.1.17.2	VSWR Error Detect	Is output when the strength level of the reflected wave goes higher than the threshold value during transmission.	Confirm that a transmitting antenna (50 Ω) is connected. If it is connected, contact JVCKENWOOD sales company technical staff.
1.3.6.1.4.1.46861.1.1.2.1.16.2	RF Power Down Detect	Is output when the transmit power output decreases.	Stop the repeater transmission and confirm if the symptom improves. If the symptom does not improve, contact JVCKENWOOD sales company technical staff.

Note

- For proper operation of the repeater, the power cable and transmitting antenna (50 Ω) need to be connected to the repeater.

14 IP INTERFACE FUNCTION

14.1 Console

Console enables communication with the transceiver by connecting to the repeater from outside the wireless area by using Console Interface. The UID of a Console needs to be configured for connecting to the repeater. Also, the priority order to use the repeater can be configured for each configured Console.

To operate in DMR, the communication between a Console and the repeater complies with “DMR Application Interface”, commonly known as AIS, issued by the DMR Association.

To operate in NXDN, the communication between a Console and the repeater complies with NXIP Console Interface.

Table 14-1 Console

Configuration	Description
Valid	Valid is the function to select the enabling and disabling the use of a configured Console. By disabling Valid to temporarily stop the use of a specific Console, the temporary stop can be done without deleting the configuration of the Console.
Unit ID	The UID configured for a Console is displayed. The UID of a Console permitted for connection to the repeater is configured in Unit ID. The repeater accepts Registration from a configured UID. The UID of a Console to be used needs to be configured because Registration from an unregistered UID is not accepted. Refer to Table 2-5 Capacity for the range of UID that can be entered.
Unit ID Name	Unit ID Name is the name of a UID configured for a Console. For Unit ID Name, an arbitrary name can be configured. By configuring Unit ID Name, a Console can be identified and managed by name. The configured names of UIDs of each Console are displayed in a list in Console List.
Comment	Comment is a comment related to a registered Console. The information related to a Console can be recorded. An arbitrary text message can be entered to easily confirm a Console in the Web Tool.
Priority	In Priority, the priority order to use the repeater for each Console is configured. If the repeater is being used for transmission from a Console of low priority order when voice and data transmission is done from a different Console of high priority order, the Console of high priority is reserved as the next user of the repeater. When the transmission of the Console of low priority order ends, the repeater disconnects this communication without entering Hold Timer and switches to transmission from the reserved Console. With this behavior, the transmission from a Console can be prioritized for as much as possible if transmission from this specific Console needs to be prioritized. If another Console is transmitting when a call request of a Console is made, the behavior occurs as already described separately according to the configuration in Priority.

For a Console, to make voice and data communication to the transceiver by connecting to the repeater, the use of the repeater needs to be previously declared. Although 10 Consoles can be registered for each repeater, only up to 2 Consoles are permitted to communicate at the same time.

Use of the repeater is permitted if the repeater receives the Registration request from a Console and the UID of the Console matches the configured UID. By permitting use of the repeater, the transmission and reception of audio and data are enabled in the Console. Data communication supports Status, Short Data, and Long Data. In addition, only audio is supported for Analog communication.

If Group Registration of a Console is received and the GID matches the GID configured in User List, the use of the repeater is permitted for the Console to receive a Group Call.
If an Analog carrier is received in DMR Mode or Analog Mode, audio with an Analog GID as the destination is output to an IP on Slot 1. Refer to Analog GID for details.
For transmission of audio with an Analog GID as the destination from a Console in DMR Mode or Analog Mode, the behavior of the repeater does not change even if Slot 1 or Slot 2 is selected.
If an Analog carrier is received in NXDN Mode, audio with an Analog GID as the destination is output to an IP by Channel Spacing (NXDN) configured for the channel. Refer to Analog GID for details.
The audio codec of the repeater and Console supports AMBE+2 and G.711 (PCMU).

Note

- If an inactive SIP connection occurs, such as if audio data is interrupted, after SIP connection is made, the SIP connection for the repeater ends when a certain length of time (65 sec) elapses.

Busy Monitoring

This function allows the Busy Monitoring information of the repeater to be sent to a Console. If a Busy Monitoring notification request is received from a Console, the repeater notifies to the Console of the Busy Monitoring information.

Table 14-2 Busy Monitoring

Configuration FPU	Description
Product Information	If IP Interface is enabled in Busy Monitoring, a response can be returned for a Busy Monitoring notification request from a Console.
Repeat Disable	If Repeat Disable is configured in AUX Input, the Busy status is acquired.

If the repeater receives a Busy Monitoring notification request from a Console, the repeater notifies to the Console of the Busy Monitoring information of the repeater.
If operated in Analog Mode, the Cross Busy status in Analog can be acquired by Busy Monitoring notification.
If operated in DMR Mode, the Slot 1 status, Slot 2 status, and Cross Busy status in Analog can be acquired by Busy Monitoring notification.
If operated in NXDN Mode, the RX Status of the repeater can be acquired by Busy Monitoring notification.

Note

- The repeater supports Busy Monitoring using AIS if operated in Analog Mode or DMR Mode.
- The repeater supports Busy Monitoring using NX-NNPP if operated in NXDN Mode.

Configuration using KPG-D7

- Configuring **IP Interface** to be enabled or disabled (Model > Product Information > IP Interface)
- Configuring **Repeat Disable** (Edit > Function Port > AUX > AUX Input > Function)

14.2 Voice Logging

Voice Logging is the function to transfer a VLI packet to Voice Logger (3rd party voice record application) by using Voice Logging Interface (VLI) for a voice call that occurs in a system.
A voice call be recorded by connecting the repeater and Voice Logger.

- Voice Logger List
- Target UID
- Target GID
- Target SIP Phone ID

Voice Logging can record an Individual Call, Group Call, ALL Call, Unaddress Call, Null Group ID Call, and Phone Call. An Analog transmission received by the repeater is delivered to Voice Logger with an Analog GID as the destination GID. Therefore, recording can be done to the desired Voice Logger by configuring Target GID. Voice Logger can be configured to each GID and each UID.
The Voice Logger can be configured for a SIP Phone Call made from the transceiver.

Voice Logger List

In Voice Logger List, a list of configured Voice Logger can be confirmed and each Voice Logger can be edited.

Table 14-3 Voice Logging List

Configuration FPU	Description
Voice Logger ID	A management number of Voice Logger configured in Voice Logger List can be confirmed. Voice Logger ID is handled as the reference value for the Default Voice Logger ID and Voice Logger ID of the Target GID, Target UID, and Target SIP Phone ID.
Valid	Valid is the function to enable and disable the use of Voice Logger. By disabling Valid to temporarily stop the use of Voice Logger, the temporary stop can be done without deleting the configuration in Voice Logger. If Valid is enabled, a voice call can be recorded by sending the audio packet to Voice Logger. ON Permits transmission to the target Voice Logger. OFF Prohibits transmission to the target Voice Logger.
IP Address	An IP address of Voice Logger is configured. An audio packet is sent to Voice Logger with the value configured in IP Address as the destination IP address. IP Address can be redundantly configured in Voice Logger List. This allows the same Voice Logger to be used depending on the port.
Port	The lowest value for the receive port number of Voice Logger is configured. An audio packet is sent to Voice Logger with the value configured in Port as the destination port number. A redundant value can be configured in Port. An audio packet is sent to Voice Logger by using a single port for 1 voice call within the range from Port to Port (Max) as the receive port of Voice Logger.
Port(Max) Read Only	The highest value for the receive port number of Voice Logger is displayed. An audio packet is sent to Voice Logger by using the range from Port to Port (Max) as the destination port number. The port number displayed in Port (Max) is the highest value assigned as the receive port of Voice Logger. A port number indicated by the range from Port to Port (Max) is individually used for each single voice call, and the port number being used becomes available when the call ends. The value in Port (Max) is automatically calculated from the value configured in Maximum Number of Talk Path with the port number configured in Port as the base.

Configuration FPU	Description
Maximum Number of Talk Path	The highest number of voice calls that are sent to Voice Logger is displayed. The number of voice calls that are sent to Voice Logger is restricted by limiting the configured value of Maximum Number of Talk Path as the maximum value. The number of voice calls is increased by 1 when a voice call is initiated. The number of voice calls is decreased by 1 when a voice call ends. If the total number of voice calls exceeds the configured value of Maximum Number of Talk Path, the excess voice calls are not sent to Voice Logger. In DMR Mode, the maximum number of concurrent calls is “2” when Slot 1 and Slot 2 are used at the same time. Therefore, **Maximum Number of Talk Path** configured for the repeater is “1” or “2”. If “3” or greater is configured in **Maximum Number of Talk Path** in KPG-D7 version V1.01 or earlier, the configured value in **Maximum Number of Talk Path** is corrected to “2” if KPG-D7 version V2.00 or later is used. Because multiple calls are not made at the same time in Analog Mode, the value in **Maximum Number of Talk Path** configured for the repeater is “1”.

Configuration using KPG-D7

- Configuring **Voice Logger ID** (Edit > Voice Logger > Voice Logger List > Voice Logger ID)
- Configuring **Valid** (Edit > Voice Logger > Voice Logger List > Valid)
- Configuring **IP Address** (Edit > Voice Logger > Voice Logger List > IP Address)
- Configuring **Port** (Edit > Voice Logger > Voice Logger List > Port)
- Configuring **Maximum Number of Talk Path** (Edit > Voice Logger > Voice Logger List > Maximum Number of Talk Path)

Target UID

In Target UID, a UID targeted for recording and the list of Voice Logger to be the destination of a recording can be confirmed, and a UID targeted for recording to each Voice Logger can be edited.

Table 14-4 Target UID

Configuration	Description
Default Voice Logger ID	The Voice Logger to be the destination of a recording of an Individual Call using anything other a UID configured in Target UID is configured. If no configuration of Target UID exists, all Individual Calls are recorded to the Voice Logger of Default Voice Logger ID. ・ The Voice Logger to record an Individual Call is selected from Voice Logger List. The configuration is done after specifying the Voice Logger ID. ・ This is the destination of a recording of an Individual Call of anything other than a UID configured in Target UID. ・ If Default Voice Logger ID is not configured, an Individual Call is not recorded to the Voice Logger. ・ An Individual Call sent from the transceiver to a SIP Phone by using a Paging Call is recorded to the Voice Logger for the corresponding SIP Phone ID by determining Prefix.
UID Range (Min-Max)	The minimum value and maximum value of the UID range targeted for recording are configured. This is the function to specify the range of UID for recording. A UID in the range from UID Range (Min) to UID Range (Max) is a target for recording. UID Range (Min) This is the minimum value of UID targeted for recording. UID Range (Max) This is the maximum value of UID targeted for recording. The same UID can be entered in UID Range (Min) and UID Range (Max). In this case, the UID is handled as a single UID. For example, if the configurations are UID Range (Min) = 10 and UID Range (Max) = 10, only voice calls of the destination UID = 10 are recorded in the Voice Logger configured for the specified Voice Logger ID. If operated in DMR, the configuration range of ID shows as integers from 1 to 16776415.
Voice Logger ID	The Voice Logger to record an Individual Call with a UID specified in UID Range as the destination is configured. It is selected from Voice Logger List.

Configuration	Description
	・ The Voice Logger to record an Individual Call is selected from Voice Logger List. The configuration is done by specifying the Voice Logger ID. ・ If Voice Logger ID is not configured, an Individual Call is not recorded to the Voice Logger. ・ An Individual Call sent from a SIP Phone is also recorded in the same way.

Configuration using KPG-D7

- Configuring **Default Voice Logger ID** (Edit > Voice Logger > Target UID > Default Voice Logger ID)
- Configuring **UID Range (Min)** (Edit > Voice Logger > Target UID > UID Range (Min))
- Configuring **UID Range (Max)** (Edit > Voice Logger > Target UID > UID Range (Max))
- Configuring **Voice Logger ID** (Edit > Voice Logger > Target UID > Voice Logger ID)

Target GID

In Target GID, a GID targeted for recording and the list of Voice Logger to be the destination of a recording can be confirmed, and a GID targeted for recording to each Voice Logger can be edited.

Table 14-5 Target GID

Configuration	Description
Default Voice Logger ID	The Voice Logger to be the destination of a recording of a Group Call using anything other a GID configured in Target GID is configured. If no configuration of Target GID exists, all Group Calls are recorded to the Voice Logger of Default Voice Logger ID. ・ The Voice Logger to record a Group Call is selected from Voice Logger List. The configuration is done after specifying the Voice Logger ID. ・ This is the destination of a recording of a Group Call of anything other than a GID configured in Target GID. ・ If Default Voice Logger ID is not configured, a Group Call is not recorded to the Voice Logger. ・ A voice call by Analog reception is transferred to a network with an Analog GID as the destination. An Analog voice call can be recorded by configuring an Analog GID in Target GID. ・ In Analog Mode, A voice call by Analog reception can be recorded by the Voice Logger configured in Default Voice Logger ID.
All Group Call Voice Logger ID	The Voice Logger to be the destination of a recording of an All Group Call is configured.
Unaddress Call Voice Logger ID	The Voice Logger to be the destination of a recording of an Unaddress Call is configured. For a call by a SIP Phone, Unaddress Call is not supported.

Configuration	Description
GID Range (Min-Max)	The minimum value and maximum value of the GID range targeted for recording are configured. A GID in the range from GID Range (Min) to GID Range (Max) is a target for recording. GID Range (Min) This is the minimum value of GID targeted for recording. GID Range (Max) This is the maximum value of GID targeted for recording. The same GID can be entered in GID Range (Min) and GID Range (Max). In this case, the GID is handled as a single GID. For example, if the configurations are GID Range (Min) = 10 and GID Range (Max) = 10, only voice calls of the destination GID = 10 are recorded in the Voice Logger configured for the specified Voice Logger ID. If operated in DMR, the configuration range of ID shows as integers from 1 to 16776415.
Voice Logger ID	The Voice Logger to record a Group Call with a GID specified in GID Range as the destination is configured. It is selected from Voice Logger List. ・ The Voice Logger to record a Group Call is selected from Voice Logger List. The configuration is done by specifying the Voice Logger ID. ・ If Voice Logger ID is not configured, a Group Call is not recorded to the Voice Logger. ・ A Group Call sent from a SIP Phone is also recorded in the same way.

Configuration using KPG-D7

- Configuring **Default Voice Logger ID** (Edit > Voice Logger > Target GID > Default Voice Logger ID)
- Configuring **All Group Call Voice Logger ID** (Edit > Voice Logger > Target GID > All Group Call Voice Logger ID)
- Configuring **Unaddress Call Voice Logger ID** (Edit > Voice Logger > Target GID > Unaddress Call Voice Logger ID)
- Configuring **GID Range (Min)** (Edit > Voice Logger > Target GID > GID Range (Min))
- Configuring **GID Range (Max)** (Edit > Voice Logger > Target GID > GID Range (Max))
- Configuring **Voice Logger ID** (Edit > Voice Logger > Target GID > Voice Logger ID)

Target SIP Phone ID

Refer to the link about Target SIP Phone ID.

15 POWER SUPPLY MONITOR

Power Supply Monitor is the function to monitor the power supply of the repeater and warn a user according to the voltage level that the voltage of the repeater is reduced.
Using the AUX Output port or transmitting a tone warns a user that the voltage of the repeater is reduced.
The warning voltage (**Power Supply Lower Level**) at each warning level can be configured using KPG-D7.
In addition, at each of the warning levels, a warning tone and an operation tone can be configured. According to emergency levels, such as a caution or a warning, these tones can be used.

Table 15-1 Power Supply Monitor

Item FPU	Description
Warning Tone	Configures Warning Tone to be enabled or disabled.
Frequency (Warning Tone)	Configures the frequency of Warning Tone.
Operation Tone	Configures Operation Tone to be enabled or disabled.
Frequency (Operation Tone)	Configures the frequency of Operation Tone.
Interval (Operation Tone)	Configures the interval at which Operation Tone is transmitted.
Power Supply Lower Level	Configures the power supply voltage threshold at which Power Supply Monitor goes Active.
Function (AUX Output)	Configures **Power Supply Lower Limit** for any AUX Output if the Power Supply Monitor status is notified by AUX Port.

Configuration using KPG-D7

- Configuring **Warning Tone** to be enabled or disabled (Edit > Optional Features > Common Page 2 > Power Supply Monitor > Warning Tone > Warning Tone)
- Configuring **Frequency** (Edit > Optional Features > Common Page 2 > Power Supply Monitor > Warning Tone > Frequency)
- Configuring **Operation Tone** to be enabled or disabled (Edit > Optional Features > Common Page 2 > Power Supply Monitor > Operation Tone > Operation Tone)
- Configuring **Frequency** (Edit > Optional Features > Common Page 2 > Power Supply Monitor > Operation Tone > Frequency)
- Configuring **Interval** (Edit > Optional Features > Common Page 2 > Power Supply Monitor > Operation Tone > Interval)
- Configuring **Power Supply Lower Level** (Edit > Optional Features > Common Page 2 > Power Supply Monitor > Power Supply Lower Level)
- Configuring **Function** of **AUX Output** (Edit > Function Port > AUX > AUX Output > Function)

15.1 Configuring the Threshold Value to Detect the Reduced Voltage Level (Power Supply Lower Level)

Power Supply Lower Level is the threshold level of the voltage to detect that the voltage of the repeater is reduced and activate **Power Supply Monitor**.
If the power supply of the repeater is lower than the voltage level configured in **Power Supply Lower Level**, **Power Supply Monitor** becomes active. If the power supply of the repeater is higher than the voltage level configured in **Power Supply Lower Level**, **Power Supply Monitor** becomes inactive.
If **Power Supply Monitor** becomes active, the repeater warns a user that the voltage of the repeater is reduced according to the configuration by using KPG-D7.

Configuration using KPG-D7

- Configuring **Power Supply Lower Level** (Edit > Optional Features > Common Page 2 > Power Supply Monitor > Power Supply Lower Level)

15.2 Warning by the AUX Output Port

Assigning “Power Supply Lower Limit” to the AUX Output port, the active or inactive condition of **Power Supply Monitor** is sent to the AUX Output port. (Refer to Available Functions for AUX Output Ports.)

Note

- The logic to activate or deactivate the AUX Output ports can be configured either to “Active High” or “Active Low”.

Configuration using KPG-D7

- Assigning functions to the AUX Output port (Edit > Function Port > AUX > AUX Output)

15.3 Warning by Warning Tone

If **Power Supply Monitor** becomes active, transmitting a warning tone warns a user that the voltage of the repeater is reduced.

A warning tone is transmitted for 5 sec upon lapse of 500 ms after **Power Supply Monitor** becomes active.

The transmitted warning tone can be configured as desired.

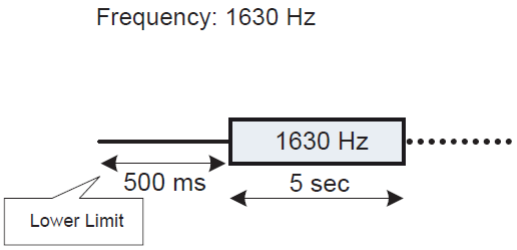


Figure 15-1 Warning Tone

Note

- Because the warning tone is transformed by the vocoder if a warning tone is transmitted on digital channel, the warning tone may not be transmitted with the originally configured tone frequency, and the tone frequency may slightly drift from the original tone frequency.
- The deviation for a warning tone cannot be adjusted individually. The following is the volume when a warning tone is transmitted:
  Analog: Applies the deviation for a test tone.
  Digital: The fixed value
- A warning tone is transmitted even if **Power Supply Monitor** becomes active while transmitting. However, the transmission of a warning tone is suspended while a CW ID or CW message is being sent. In this case, the transmission of a warning tone starts when the transmission of various signals ends.
- If Power Supply Monitor becomes active while a test tone is being transmitted, the test tone transmission ends and a warning tone transmission starts.
- No warning tone is transmitted even if Power Supply Monitor becomes active while TX Disable is enabled. Also, transmission of a warning tone ends if TX Disable becomes enabled while a warning tone is being transmitted.

Configuration using KPG-D7

- Configuring **Warning Tone** (Edit > Optional Features > Common Page 2)

15.4 Warning by Operation Tone

If **Power Supply Monitor** becomes active, transmitting an operation tone warns a user that the voltage of the repeater is reduced.

An operation tone is transmitted at certain time intervals when the transmission is started by using the Repeat PTT, External PTT, or Test PTT control while **Power Supply Monitor** is active. The tone frequency of an operation tone to be transmitted and the transmission time intervals for an operation tone can be configured as desired.

An operation tone which is transmitted by control of **Power Supply Monitor** is a single tone.

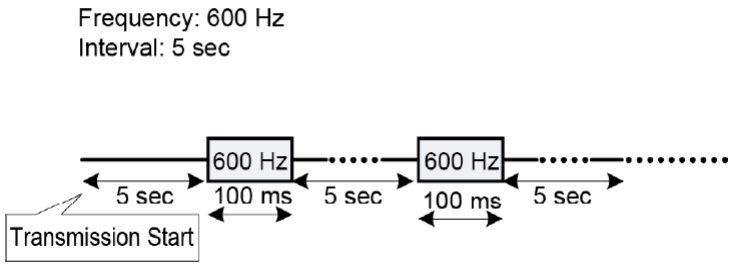


Figure 15-2 Operation Tone (Power Supply Monitor)

Note

- Although an operation tone is superimposed with a voice signal and then modulated if the operation tone is transmitted on an analog channel, the voice signal is intermittently interrupted and the operation tone is modulated if an operation tone is transmitted on digital channel.
- Because an operation tone is transformed by the vocoder if the operation tone is transmitted on digital channel, the operation tone may not be transmitted with the originally configured tone frequency, and the tone frequency may slightly drift from the original tone frequency.
- The deviation for an operation tone cannot be adjusted individually. The following is the volume when an operation tone is transmitted:
  Analog: Applies the deviation for a CW ID tone.
  Digital: The fixed value
- An operation tone is not transmitted even if the transmission interval time for an operation tone has elapsed while a CW ID or test tone is being transmitted.

Configuration using KPG-D7

- Configuring **Operation Tone** (Edit > Optional Features > Common Page 2)

16 PROTECTING DATA OF THE REPEATER BY A PASSWORD

The repeater is equipped with a password function for protecting the configuration data of the repeater.

16.1 Password When Reading Configuration Data in a PC (Read Authorization Password)

Read Authorization Password is the function to protect the configuration data in the repeater and prevents the operating frequencies from being read by an unauthorized person if an unexpected situation occurs, such as when the repeater is stolen. To read configuration data by using KPG-D7 from the repeater with **Read Authorization Password** configured, the password must be entered on a PC. If the password does not match, the configuration data configured for the repeater cannot be read.

Configuration using KPG-D7

- Configuring **Read Authorization Password** (Edit > Optional Features > Common Page 1 > Data Password > Read Authorization Password)

16.2 Password When Writing Configuration Data (Overwrite Password)

Overwrite Password is the function to protect the configuration data in the repeater and prevents the frequency data from being overwritten by an unauthorized person if an unexpected situation occurs, such as when the repeater is stolen. To write configuration data by using KPG-D7 to the repeater with **Overwrite Password** configured, the password must be entered on a PC. If the password does not match, the configuration data cannot be written to the repeater.

Configuration using KPG-D7

- Configuring **Overwrite Password** (Edit > Optional Features > Common Page 1 > Data Password > Overwrite Password)

16.3 Password When Accessing the Repeater (Network Password)

Network Password is the password used when the repeater and a PC with KPG-D7 installed communicate via an IP network. If **Network Password** is configured for the repeater, entering a password is required on a PC when the following operations are executed via an IP network by using KPG-D7. If the password does not match, these operations cannot be executed.

• Read Data from the Repeater
• Write Data to the Repeater
• Repeater Information

If the access to the repeater succeeds by entering a password when one of the above operations is executed, the password does not need to be entered again until KPG-D7 exits.

Configuration using KPG-D7

- Configuring **Network Password** (Edit > Optional Features > Common Page 1 > Data Password > Network Password)

17 MODE

The repeater has several modes: a mode for writing the configuration data to the repeater, a mode for reading the configuration data from the repeater to KPG-D7, a mode for updating the firmware, and a mode for testing transmit and receive characteristics of the repeater.

17.1 Writing and Reading Configuration Data (FPU Programming Mode)

FPU Programming Mode is the mode to write the configuration data configured by using KPG-D7 to the repeater or to read the configuration data configured for the repeater to KPG-D7.

Note

- When writing the configuration data to the repeater ends, the repeater restarts operations and starts the behavior of the written configuration data.
- Refer to the help texts attached to KPG-D7 for the operation in FPU Programming Mode.

17.2 Overwriting Firmware (Firmware Programming Mode)

Firmware Programming Mode is the mode to write the firmware to the repeater.
When the firmware rewriting completes, the repeater restarts.

Via the network

By accessing the Web Tool from a Web browser, the firmware can be written to the repeater via the network. During the firmware writing, “Firm Updating” is displayed on the OLED display. The IP address to be accessed is the unique IP address of the repeater. In addition, during the firmware rewriting, the repeater behavior is stopped. When the firmware rewriting completes, “Shutting down” is displayed on the OLED display, and the repeater initiates restart. Also, during the firmware rewriting, the repeater can be turned off by pressing and holding the Knob for 3 sec. In addition, the firmware rewriting can be prohibited by using the **Remote Access Control** configuration.

Multi Loader

Multi Loader is the PC application to register multiple repeaters and rewrite the firmware in order. Because Firmware Update for only the single connected repeater is supported by the Web Tool, **Multi Loader** is used for the use that supports Firmware Update of an entire system.

When the system is reset due to power outage while updating firmware

When the repeater turns off due to a power failure, etc., the performance of the appropriate measure in each case is recommended.

Table 17-1 Appropriate Measures When the Repeater Turns Off Due to a Power Failure, Etc.

State When a Power Failure, Etc. Occurs	Condition	Appropriate Measure	Remarks
After firmware update completes	If firmware update has not restarted after the repeater recovers from a power failure, etc.	Perform firmware update again.	-
During **Reboot**	If the “Reboot” command by the Web Tool is used	Perform firmware update again.	-
	If “RESET” by the D-sub 25-pin connector behaves	Same as above.	-
During **Shut Down**	If “Power Off” of the OLED display is used	If the repeater automatically restarts, perform firmware update again. Execute “Power Off” by the OLED display after firmware update.	-

17.3 Testing or Adjusting the Transmit and Receive Capabilities of the Repeater (PC Test Mode)

PC Test Mode is the mode to test transmit and receive characteristics of the repeater by using KPG-D7.
The repeater can be placed in PC Test Mode by operating KPG-D7 after connecting the repeater to a PC by using the network.
In PC Test Mode, transmit and receive characteristics of the repeater can be tested using the preconfigured test channel and test signaling. Also, transmit and receive characteristics of the repeater can be adjusted in PC Test Mode.

Note

- Refer to the service manual for instructions on how to operate the repeater in PC Test Mode.

18 LOG

18.1 Communication Log

Communication Log is a recording of a voice call or data communication that occurs in a system.

The communication log can be acquired in a CSV format file. A system administrator can acquire the communication log to check the details of communications. By processing the acquired communication log, the communication log can also be used as billing information of system users.

Table 18-1 Configuration Items of Communication Log

Item Web	Description
Start Date	The date to start acquiring the communication log is specified.
End Date	The date to complete the acquisition of the communication log is specified.
Download” button	Clicking the "Download" button enables you to download the Communication Log file.

The repeater records and stores a communication that occurs in a system.

If the recording capacity is reached maximum, the record from the oldest is automatically deleted.

The Communication Log is downloaded from the Web Tool. Clicking the “Download” button downloads in the CSV format the contents recorded in the dedicated area of Communication Log. For Communication Log, only the content of the system type in operation is downloaded and output.

Note

- In Analog communication, the ID information is not recorded.
- When Hot Standby is performed, Communication Log is recorded only for the Active Repeater.
- The call logs can be cleared by using Log Clear.
- If the specified range of Start Date and End Date is configured wide, the number of Communication Log records also increases, which increases the downloading time. Downloading for a limited period is recommended.
- Communication Log is recorded when “Repeat” is configured in **Operation Mode**.

Configuration using KPG-D7

- None

Configuration using Web Tool

- Configuring the items related to the downloading of **Communication Log** (Maintenance > Log > Communication Log > Communication Log)
- Clearing the Log data (Maintenance > System > Clear > Log)

18.2 System Log

System Log is the record of changes in the status of the repeater, user operations, etc.

The system log can be acquired in a CSV format file. A system administrator can acquire the system log to check the status of the repeater. The system log is the record for the early detection of a failure by a system administrator when the system is in abnormal operations, such as breakdown or misconfiguration.

Table 18-2 Configuration Items of System Log

Item Web	Description
Start Date	The date to start acquiring the system log is specified.
End Date	The date to complete the acquisition of the system log is specified.
“Download” button	Clicking the "Download" button enables you to download the System Log file.

The repeater records and stores the event that occurs in the repeater (status change, user operation, activation and stop, etc.).

The System Log is downloaded from the Web Tool. Clicking the “Download” button downloads in the CSV format the contents recorded in the dedicated area of System Log.

Note

- The records of System Log can be cleared by using Log Clear.
- If the specified range of Start Date and End Date is configured wide, the number of System Log records also increases, which increases the downloading time. Downloading for a limited period is recommended.

Configuration using KPG-D7

- None

Configuration using Web Tool

- Configuring the items related to the downloading of **System Log** (Maintenance > Log > System Log > System Log)
- Clearing the Log data (Maintenance > System > Clear > Log)

18.3 Diagnostic Data

Diagnostic Data is the internal information (various logs, etc.) of the repeater.

This information is intended for problem analysis in the event of failure and is used by the sales company and designers.

Table 18-3 Configuration Items of Diagnostic Data

Item Web	Description
Start Date	The date to start acquiring the diagnostic data is specified.
End Date	The date to complete the acquisition of the diagnostic data is specified.
“Download” button	Clicking the “Download” button enables the downloading of the Diagnostic Data file.

Diagnostic Data is a collection of configuration data and logs, and is used by retrieving the required information. This information is used by the designer for the purpose of failure analysis and cannot be viewed. Diagnostic Data contains the Core file, and Syslog.

Download of Diagnostic Data is performed from the Web Tool.

Note

- To acquire Syslog, Syslog needs to be configured.
- From the point of view of problem analysis, Diagnostic Data cannot be cleared even by Log Clear.
- If the specified range of Start Date and End Date is configured wide, the number of records increases, which increases the downloading time. Downloading for a limited period is recommended.

Configuration using KPG-D7

- None

Configuration using Web Tool

- Configuring the items related to the downloading of **Diagnostic Data** (Maintenance > Log > Diagnostic Data > Diagnostic Data)

18.4 Content of Communication Log

This section describes details of the output from the repeater about the Communication Log which is output by the following names:

- Database Name：mgw_comm_log.db
- Table Name：comm_log
- Row Max：-

Table 18-4 Communication Log Table

Column Name	Description	Range
record_date_time	Date and time of log recording	YYYY-MM-DD HH:MM:SS.SSS
start_date_time	Communication start date and time	YYYY-MM-DD HH:MM:SS.SSS
end_date_time	Communication end date and time	YYYY-MM-DD HH:MM:SS.SSS
talk_time	Communication time	HH:MM:SS 00:00:00: Not used
operation_mode	Selected Operation Mode	"*": Location Registration, Registration Clear, Group Registration, Group Registration Clear "Repeat"
channel	Channel No. selected during the execution of a call (communication)	"*": Location Registration, Registration Clear, Group Registration, Group Registration Clear "1" to "32"
record_type	Record type code	"*": None "'LR": Location Registration "GR": Group Registration "GC": Group Registration Clear "RC": Registration Clear "VC": Voice Call "LD": Long Data Call "SD": Short Data Call "ST": Status Call "RM": Remote Control/ Remote Monitor "GP": Positioning "RK": Radio Check "SQ": Status Request "PA": Paging Call (DMR Call Alert)
signaling_type	Signaling	Signaling CC/RAN/QT,DQT
call_type	Communication type code	"*": None "I": Individual "B": Broadcast "C": Conference "P": Phone Call "AN":Analog
emergency	Communication level code	"*": None "E": Emergency (AIS の service options "Emergency=True" または value が "126" (Emergency Alarm)) "N": Normal
calling_id	Calling DMR/ NXDN unique number	0: Not used
		DMR: 1 to 16777215, PSTN (16776928), PABX (16776929) NXDN: 1 to 65519, Phone (65525)

Column Name	Description	Range
called_id	Destination DMR/ NXDN unique number	0: Not used
		DMR: 1 to 16777215, Unaddress Call (16777199), All Call (16777215), PSTN (16776928), PABX (16776929) NXDN: 1 to 65519, Null Group Call (00000), All Call (65535), Phone (65525)
telephone_number	Telephone number	"unused": None A maximum of 32 characters ・ Paging Phone Call: ID excluding Prefix ・ DTMF Phone Call: unused
called_id_type	Destination communication type	"*": None "U": Unit ID "G": Group ID
call_relay	Communication relay information	"*": None I: Intrasite O: When the calling site for an Intersite Call is the own site T: The calling site for an Intersite Call of when the Intersite Call is received
caller_site	Calling site No.	"*": Multicast "Site No"
ip_address	IP Address of the calling site	"IP Address"
timeslot	Time slot	"*": None "1" "2"

18.5 Content of System Log

This section describes details of the output from the repeater about the System Log which is output by the following names:

- Database Name：mgw_system_log.db
- Table Name：system_log
- Row Max：200,000

Table 18-5 System Log Table

Column Name	Description	Range
record_date_time	Date and time of log recording	YYYY-MM-DD HH:MM:SS.SSS
message	Record of changes in the status of the repeater, user operations, etc.	Text string

19 TEST CONSOLE

Test Console is the software used by a field engineer to conduct the trial voice communication.

This repeater supports the downloading of test console via Web.

The test console to be downloaded itself and its attached libraries, etc. need to be installed manually. The supported range of the test console is as follows:

Table 19-1 Test Console

Function	Remarks
Console IP Address	The IP address of a PC where the Console functions is configured.
Console ID	The Console ID of a Test Console is configured.
Repeater IP Address	The IP address of the repeater that is the download source is automatically configured.
Channel Spacing	Channel Spacing is the configuration item for only Test Console in NXDN Mode. This item configures the Channel Spacing used for transmission. The Channel Spacing (NXDN) configuration of the channel selected in the downloading repeater is configured as the default.
Destination type	Individual or Group is configured.
Destination ID	Only one ID to be the destination is configured.
Slot Select	For DMR, a slot for a call is selected.
RAN Encode	RAN Encode is the configuration for only Test Console in NXDN Mode. This configuration configures the RAN Encode used for transmission. The RAN Decode configuration of the channel selected in the downloading repeater is configured as the default.
PTT	Voice call start button

Note

- Test Console supports voice communication. Test Console does not support data communication.
- Test Console of DMR Mode can be downloaded during operation in DMR Mode and Analog Mode. Test Console of NXDN Mode can be downloaded during operation in NXDN Mode.

19.1 Description

Test Console is the software used by a field engineer to conduct the trial voice communication.

In the Test Console, the repeater is connected by the IP.

19.2 Downloading the Test Console

A field engineer can obtain the Test Console from the Web Tool of the repeater.

Maintenance > Field Support > Test Console > Download

The downloaded ZIP file is extracted to any folder on the local PC. The folder contains the following files:

・TestConsole_DMR.exe (DMR Mode, Analog Mode)

・TestConsole_NXDN.exe (NXDN Mode)

・-.json

19.3 Starting and Exiting the Test Console

The TestConsole_DMR.exe (TestConsole_NXDN.exe) is executed.

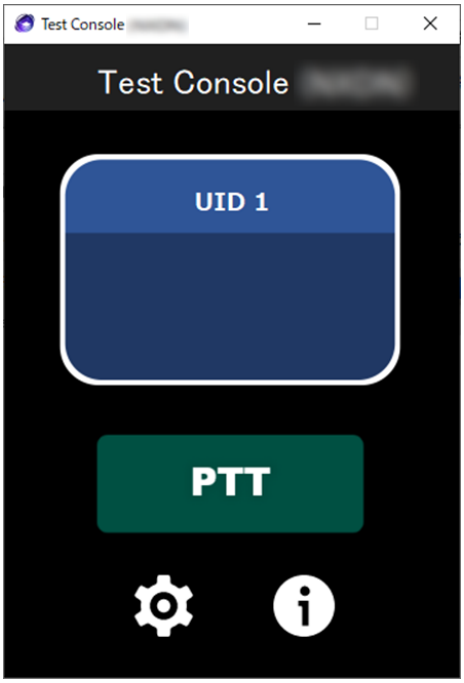


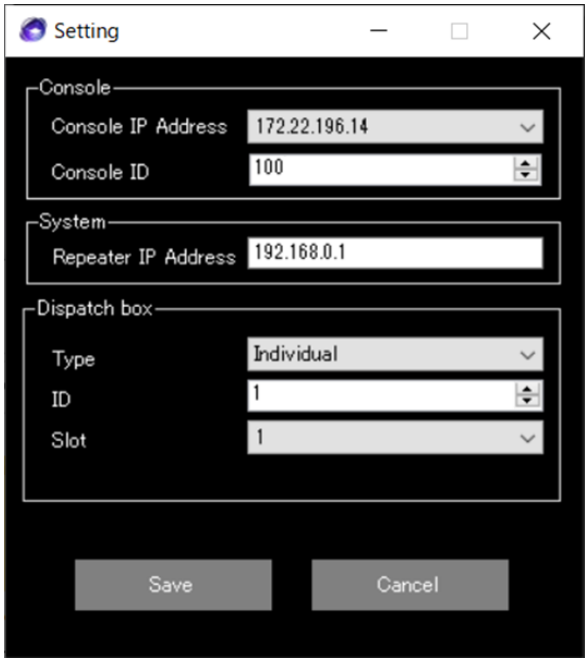
Figure 19-1 Main Window

“PTT” : Sends audio.

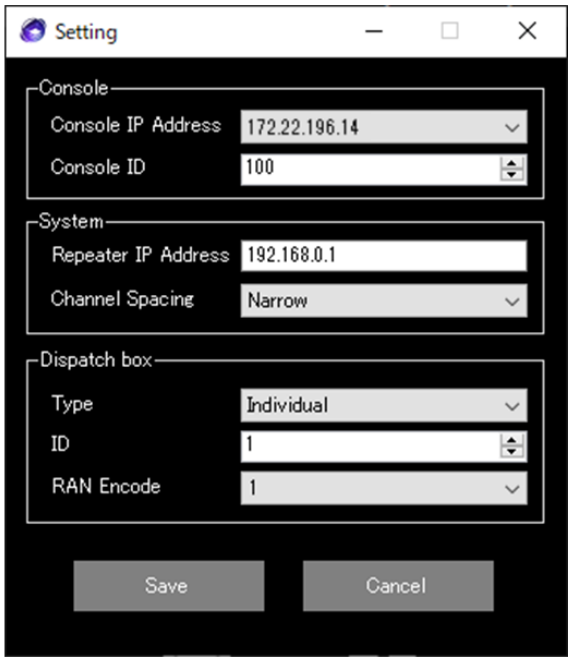
“Gear” : Performs the configuration.

“i” : Displays the About window.

19.4 Configuring the Test Console



(DMR Mode)



(NXDN Mode)

Figure 19-2 Configuration Window

Console IP Address

The IP address of the port recognized on the device where the application is executed is displayed by the dropdown list, and the IP address is selected.

Default:

If a PC has one IPv4 address: IP address of the PC

If a PC has more than one IPv4 address: Blank (selected by using the dropdown list)

Anything other than the above: Blank

Console ID

A Console ID of the Test Console is configured. Registration in Console List of the repeater is required.

Default: 1

Repeater IP Address

An IP address of the connected repeater is configured.

Default: The IP address configured in the repeater targeted for Download

Channel Spacing (NXDN Mode Only)

The Channel Spacing used for transmission is configured.

Default: The Channel Spacing (NXDN) configuration of the channel selected in the downloading repeater

Type configuration

“Individual” or “Group” is selected.

Default: Group

If “Individual” is selected

A voice call to an Individual ID configured in ID of the Dispatch box can be made.

An Individual Call to a Console ID can be received.

If “Group” is selected

A voice call to a GID configured in ID of the Dispatch box can be made.

An Individual Call to a Console ID can be received.

A voice call to a GID configured in ID of the Dispatch box can be received.

ID configuration

An ID for the trial voice communication is configured.

・Individual 1 to 16776415 (DMR Mode), 1 to 65519 (NXDN Mode)

・Group 1 to 16776415, ALL, Unaddress (DMR Mode)

1 to 65519, ALL (NXDN Mode)

Default: 1

Slot configuration (DMR Mode Only)

A Slot for the trial voice communication is selected. “1” or “2” is selected.

Default: 1

RAN Encode configuration (NXDN Mode Only)

The RAN Encode used for transmission is configured.

Default: The RAN Decode configuration of the channel selected in the downloading repeater

Save button

The configuration value is confirmed and the dialog box is closed by pressing the button.

Cancel button

The configuration value is not confirmed and the dialog box is closed by pressing the button.

Note

- To perform audio transmission and reception by using the analog channel configuration of the repeater, configure as follows:

  Type configuration: Group

  ID configuration: The FPU configuration value of Analog GID

  Slot configuration: 1

The About window opens by pressing the i button.

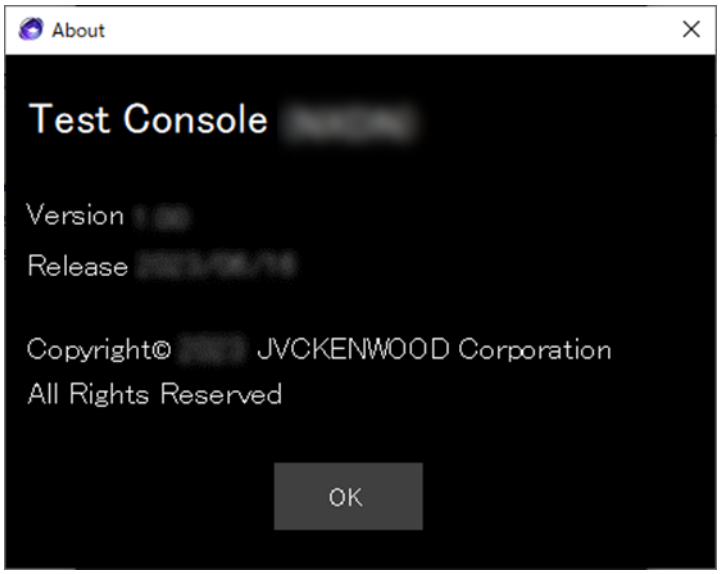


Figure 19-3 About Window

19.5 Operation of the Test Console

Transmission

A voice communication (transmission from the Test Console) with the specified Type/ID is performed by pressing the PTT button. During transmission, the destination ID (red) is displayed. During communication, the PTT button is in the communication state. The PTT button cannot be pressed when communication with the repeater is not possible.

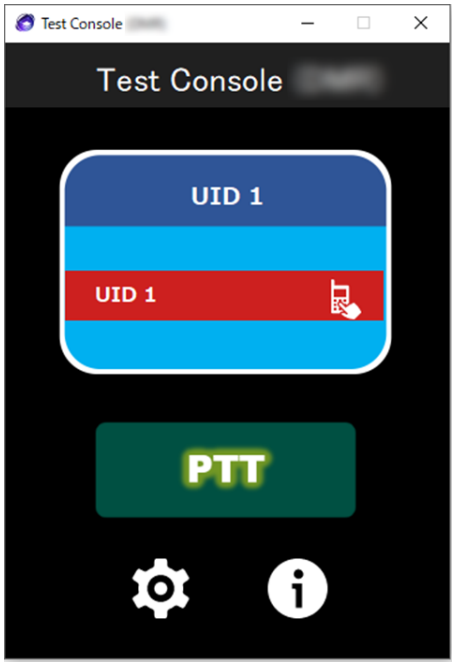


Figure 19-4 During Transmission

Reception

Voice communication of the specified Type (Group)/ID or Individual voice communication with a Console ID of the Test Console as the destination can be heard.

The PTT button cannot be pressed (cannot transmit) in the reception state.

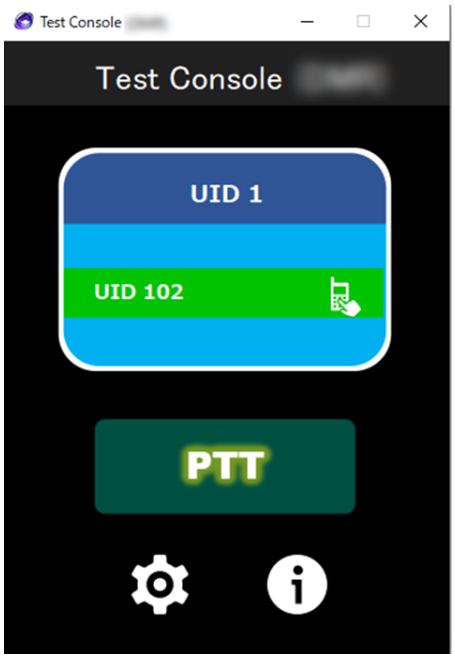


Figure 19-5 During Reception

20 MULTI LOADER

Multi Loader is the application for writing the firmware to the repeater via an IP network. The **Multi Loader** runs on Windows.

By using the Multi Loader, writing the firmware to multiple repeaters can be performed collectively.

The contents configured about writing targets can be saved as a file, and the need for the entry of writing targets each time can be avoided by reading this file to the Multi Loader. The Multi Loader supports operation using the keyboard.

Table 20-1 Outline of the Multi Loader

Function	Description
Supported OS	Windows 10/ 11
Behaviors to the repeaters	· The firmware can be transferred to the repeater. · A firmware switch request can be made to the repeater. After the repeater writes the transferred firmware to itself, the repeater starts the behavior with the new firmware triggered by switching the firmware. · A request to acquire the firmware version, status, etc. can be made to the repeater.
Writing behavior of the firmware to the repeater	Writing the firmware to multiple repeaters is supported. The writing of the firmware to the repeater is performed one by one and step by step. The firmware is not written to multiple repeaters simultaneously.
Connection to the repeater	Only IP Network is supported for connecting to the repeater.
Firmware transfer method	· For the firmware transfer method, full rewriting that transfers the entire firmware and differential rewriting that transfers only the necessary blocks are supported. · For the firmware transfer, the Access Key authentication is supported.
Supported languages	For supported languages of the Multi Loader, only English is supported.
License	The Multi Loader does not have any additional licensed functions.
File	The **Multi Loader** program is included in KPG-D7.
Help	The Multi Loader does not support the help.

Note

- Because the firmware waiting for Reactivation is retained in the RAM area, the firmware waiting for Reactivation is deleted if the repeater is turned off before Reactivation completes.
- The clock of the PC where the Multi Loader behaves and the clock of the repeater need to be configured to be synchronized if Specified Time is used. Reactivation is not performed at the intended time when the clocks of a PC and the repeater are not synchronized.

The basic specifications of the Multi Loader are as follows:

Table 20-2 Basic Specifications of the Multi Loader

Item	Description
Supported models	Repeater
Maximum number of writing targets that can be configured	Unicast 32 (16×2 Hot Standby) Multicast not supported
Open/Save	Saves and reads the configuration files of the Multi Loader.
Transfer	The firmware is transferred to the repeater.
Access Key	Performs the SFTP authentication by the firmware transfer. Applicable to Transfer, Reactivation, and version check.
Reactivation	Performs a firmware switch request for the repeater. ・ Auto Restart ・ Remote Reactivation ・ Specified Time
Status Request	Makes a request to acquire the status and the version information to the repeater.
Cancel	Cancels Transfer, Reactivation, and Status Request.

20.1 About Connection

In the Multi Loader, the repeater is connected by the TCP connection via an IP Network. The acceptable maximum of 16 repeaters in a system for unicast communications is supported, and the connection can also be made to a maximum of 32 repeaters in consideration of Hot Standby.

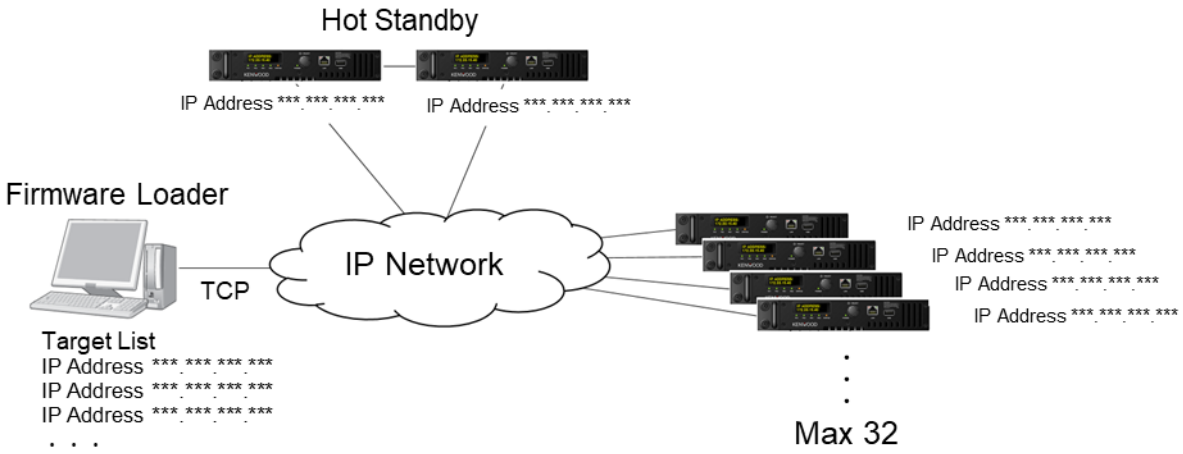


Figure 20-1 Multi Loader

20.2 How to Use

A system administrator can write firmware to multiple repeaters by using the Multi Loader.
In the Multi Loader, the timing of the firmware transfer and the timing of when the repeater starts up with the transferred firmware can be specified. In addition, the operation of the repeater can be continued without stopping the service even while the firmware is being transferred; therefore, the following operations can be performed by the Multi Loader:

- A system administrators can perform the firmware transfer in advance even while the system is in operation. At this time, the system continues operation with the old firmware without stopping the service. Then, by making a firmware switch request using night time, etc. when the usage of the system settles down, the firmware that has been transferred in advance can be activated and the repeater can be operated with the new firmware.

- In the unlikely event that a firmware specification error occurs, because the repeater does not switch to the new firmware unless a firmware switch request is executed, the firmware transfer can be performed again if the firmware switch request has not been executed.

- The Multi Loader can perform various operations collectively to multiple repeaters individually. Therefore, for example, after the firmware has been transferred to all the repeaters in the system, a firmware switch request can be partially made to the repeaters to make some parts of the system run with the new firmware.
- The repeater manages a reboot and firmware switch separately. Therefore, if the firmware transfer is complete and the repeater is waiting for a firmware switch request and an unintended reboot occurs due to a momentary interruption or power failure, the repeater starts up with the old firmware.

20.3 Screen Specifications

In the main screen of the Multi Loader, the firmware and a target repeater are configured, and the firmware transfer, Reactivation, and Status Request can be performed.

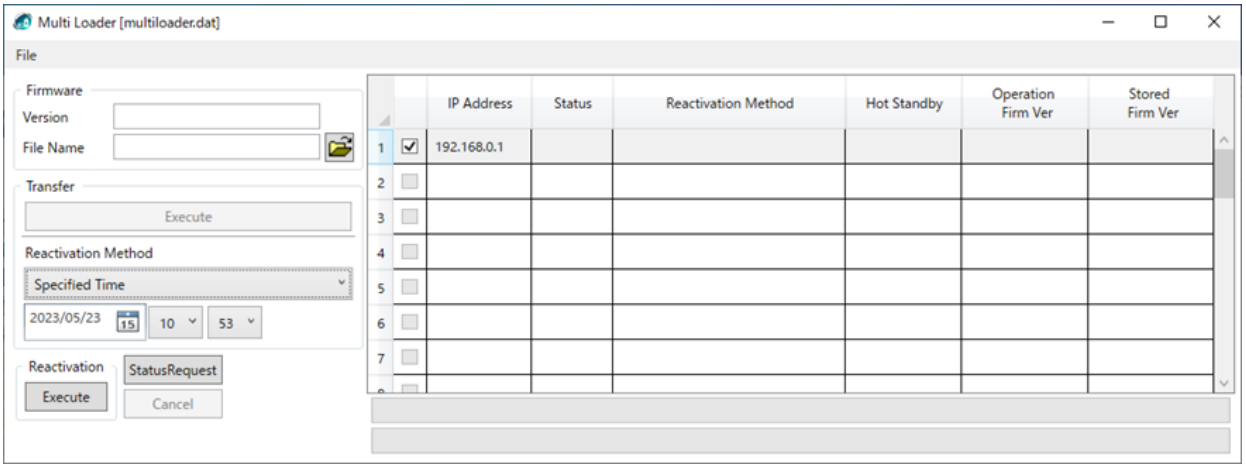


Figure 20-2 Main Screen

The contents about the items of the main screen are described below:

Table 20-3 Configuration Items of the Main Screen

Item	Description
Firmware	The firmware configuration is performed. The version and file name of the selected firmware are displayed.
Transfer	The type of firmware transfer is configured and executed. ・ Pressing the “Execute” button starts the firmware transfer. ・ The type is selected from the Reactivation Method pulldown menu.
Reactivation	Pressing the “Execute” button starts Reactivation.
“Status Request” button	Pressing the “Status Request” button starts Status Request.
“Cancel” button	Pressing the “Cancel” button cancels the active Transfer, Reactivation, and Status Request.
Target List	The following are displayed. Also, an IP Address is configured, and the repeater targeted for the operation is selected. ・ No ・ Target ・ IP Address ・ Status ・ Reactivation method ・ Hot Standby ・ Operation Firm Version ・ Stored Firm Version

Access Key Configuration Screen

The **Access Key** used for the SFTP authentication is configured. The configuration needs to be the same as the **Access Key** configured by using the Web Tool in the target repeater.

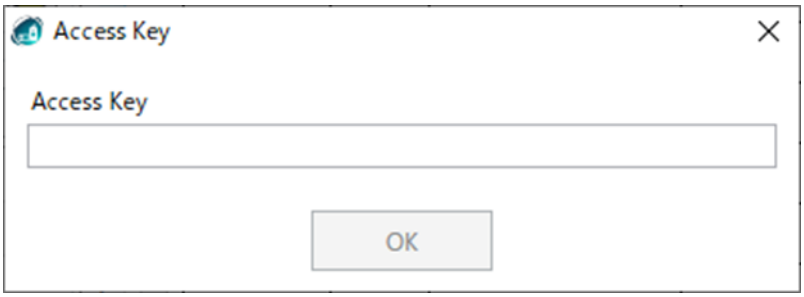


Figure 20-3 Access Key Configuration Screen

Access Key

The **Access Key** of the desired value is configured. After pressing the “OK” button, the value for **Access Key** is changed to the entered **Access Key** value. Also, the configured **Access Key** value is retained in the repeater until the Multi Loader ends.

The **Access Key** configuration screen is started in the following cases:

- When Transfer, Reactivation, or Status Request is executed for the first time after the Multi Loader starts up
- If the execution result for the previous operation includes Error05 (SFTP sequence authentication error) when the second or subsequent Transfer, Reactivation, or Status Request is executed

Menu Bar

The Menu Bar is displayed as below:

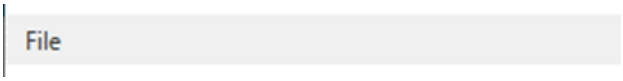


Figure 20-4 Menu Bar

File

File is the function used to perform various operations of a saved IP Address file.

Table 20-5 File

Item	Description
New	In New, the IP Address, Target, and displayed information configured in Target List can be initialized.
Open	Open is used to read a saved IP Address file.
Save	In Save, the file is overwritten with the edited IP Address and is saved.
Save As	In Save As, the edited IP Address is saved to a file with a desired name.
About	The About screen is displayed.
Exit	The program is exited. If the IP Address is changed and Save is not executed before the program is exited, a confirmation message related to saving the configuration is displayed.

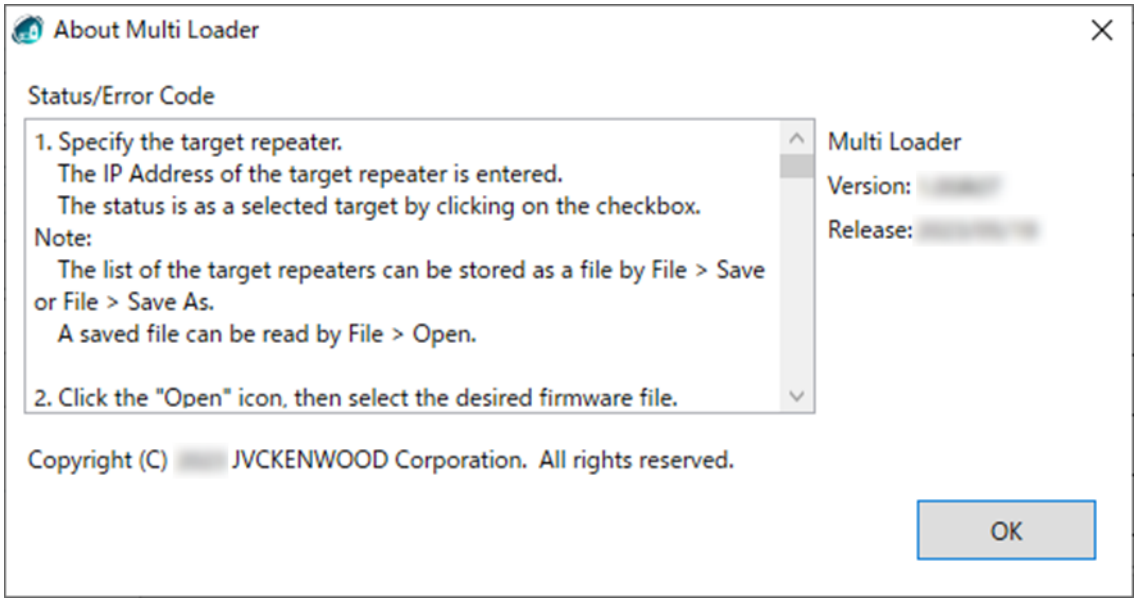


Figure 20-5 About

Progress Bar

Progress Bar is the function to display the progress status of Transfer, Reactivation, and Status Request.

Table 20-6 Progress Bar

Item	Description
Progress Bar1	The progress in the target repeater when Transfer, Reactivation, or Status Request is executed is displayed.
Progress Bar2	How many of the target repeaters for which the operations have been completed is displayed when Transfer, Reactivation, or Status Request is executed.

20.4 Operation (from Startup to Firmware Conversion, Transfer, and Transfer Completion)

If the Multi Loader is activated, the destination of when the Multi Loader is previously stopped is displayed.
A system administrator can select the desired firmware.
A system administrator can configure or select the desired destination. For the configuration method of the destination, reading the configuration file and manual operation can be performed.
The following operations can be performed by a system administrator for the repeater:

Table 20-7 Operations by a System Administrator

Item	Description
Transfer	The firmware transfer is performed by pressing the “Transfer” button. This operation does not stop the system operation, so it can be performed at any time. The repeater continues to behave with the old firmware that is currently running, even after the firmware transfer is complete. Reactivation is required for the repeater to behave with the transferred new firmware. If multiple destination repeaters are configured, the firmware is transferred in order from the first destination repeater. ・ For the firmware transfer, password authentication is supported. ・ For the firmware transfer, full rewriting and differential rewriting are supported. Full rewriting and differential rewriting are automatically switched by confirming the firmware version of the repeater when the firmware transfer is started. While Transfer is being performed, the process can be canceled by pressing the “Cancel” button.
Reactivation	The request for a reboot is made to the repeater by pressing the “Reactivation” button. The repeater starts the firmware switch according to the **Reactivation** configuration and starts the behavior with the new firmware when the firmware switch is complete. If multiple destination repeaters are configured, Reactivation is performed in order from the first destination repeater. While Reactivation is being performed, the process can be canceled by pressing the “Cancel” button.
Status Request	A request to acquire the status and the version information is made by pressing the “Status Request” button. When the repeater receives the status acquisition request, the repeater returns the current status to the Multi Loader. When the destination configuration file is opened, the Multi Loader automatically makes a request to the configured destination to acquire the information. If multiple destination repeaters are configured, Status Request is performed in order from the first destination repeater.
Cancel	Pressing the “Cancel” button cancels Transfer, Reactivation, and Status Request.

Also, when Transfer or Reactivation is executed, the result of the execution of Transfer or Reactivation can be displayed by Status Request.

If the target repeater is waiting for Reactivation, updating and overwriting can be performed for the items of Reactivation Method. Refer to the Table of the link about the items of Reactivation Method.

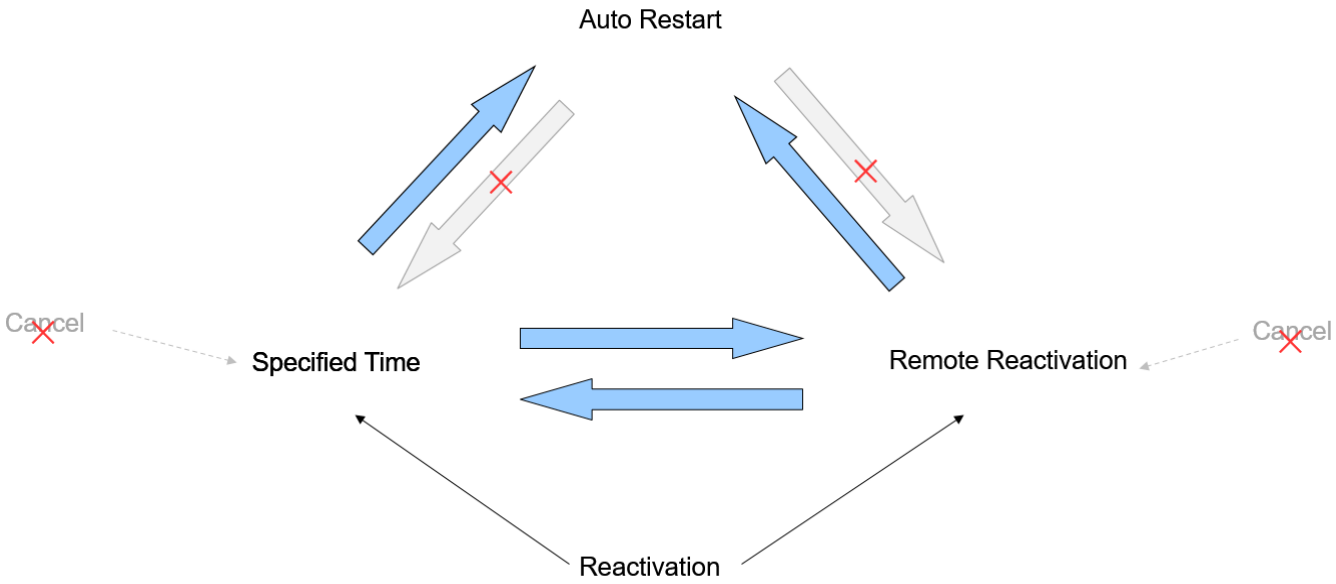


Figure 20-6 Relationship of Enabling or Disabling the Rewriting of Reactivation Method

Auto Restart is available while waiting for Reactivation of Specified Time.

After the firmware transfer is complete, the repeater firmware is automatically switched.

Auto Restart is available while waiting for Reactivation of Remote Reactivation.

After the firmware transfer is complete, the repeater firmware is automatically switched.

Change to Remote Reactivation is available while waiting for Reactivation of Specified Time.

The time specification is disabled and Remote Reactivation is in standby state.

Change to Specified Time is available while waiting for Reactivation of Remote Reactivation.

The Reactivation standby state is disabled and the time specification by Specified Time is in standby state.

Reactivation is valid for the repeaters waiting for Reactivation by Remote Reactivation and Specified Time.

After Reactivation is received, the repeater firmware is switched.

Reactivation Method

Refer to the following table for the items of Reactivation Method:

Table 20-8 Reactivation Method

Item	Description
Auto Restart (*default)	If Transfer with **Auto Restart** configured is performed, the repeater automatically starts the firmware switch and starts the behavior with the new firmware after the firmware transfer is complete.
Remote Reactivation	When **Remote Reactivation** is received, the repeater starts the firmware switch. If the new firmware has been written by Transfer, the repeater starts the behavior with the new firmware after the firmware switch is complete.
Specified Time	By using **Specified Time**, the repeater firmware switch can be started at any configured date and time. The time specified in Specified Time is notified as the relative time for the repeater. This causes the repeater to start the firmware switch after a specified time has elapsed. Also, if Remote Reactivation is received while the repeater is waiting for a firmware switch, the firmware switch starts at that time.
Date Time	The repeater firmware switch time is configured.

Table 20-9 Precautions of Reactivation

Item	Description
If the clock of the PC running the Multi Loader and the internal clock in the repeater deviate	The Multi Loader does not detect the time deviation of the clock in the repeater. Therefore, the configured time until the firmware switch starts is configured as the time indicated by the PC clock; however, the repeater calculates the difference from the internal clock and starts Reactivation after that time has elapsed.
If the time on the PC running the Multi Loader deviates from the actual time	The Multi Loader does not detect the time deviation of the actual time on the repeater. Therefore, the time until the firmware switch starts is configured as the time indicated by the PC clock; however, the repeater calculates the difference from the internal clock and starts Reactivation after that time has elapsed.
Handling the daylight saving time in Specified Time	The Multi Loader does not detect the ±1 hour due to the daylight saving time. For example, if the time for starting the firmware switch is configured across the start of daylight saving time, Reactivation starts at a timing of ±1 hour after the start of daylight saving time. Reactivation is only started according to the elapsed time from the time when the firmware switch is specified in Specified Time.
Handling the time zone in Specified Time	The Multi Loader does not support the system across time zones. It is assumed that the PC running the Multi Loader and the targeted repeaters are in the same time zone. For example, if Specified Time is executed to the repeater in a different time zone, Reactivation is started according to the elapsed time from the time specified for the firmware switch with reference to the time zone of the PC running the Multi Loader.
If the time is configured by the repeater from the Web Tool while waiting for the firmware switch by Specified Time	The repeater starts Reactivation at the time configured in **Specified Time** with reference to the time after a change. For example, if a firmware switch of which Specified Time is 15:00 is in the standby state, and the current time is 12:00, the time on the repeater is advanced from 12:00 to 9:00 at this point. In this case, Reactivation is started when the time on the repeater is 15:00 after 6 hours. Also, if the time after a change exceeds the time specified in Specified Time, Reactivation is performed when the specified time is exceeded.
If Firmware Update occurs from WEB while waiting for the firmware switch (Remote Reactivation, Specified Time)	Firmware Update of WEB takes precedence, and the state of waiting for the firmware switch by the Multi Loader is disabled. When Firmware Update by WEB is complete, the repeater starts up with that firmware.

Status Request

Table 20-10 Status Request Status

Repeater Status	Description
Status00	Transferring: Transferring the firmware
Status01	Updating: Overwrite script is being executed (firmware is written to the Standby area).
Status02	Standby (Wait Reboot): Overwrite script is complete (wait for rebooting).
Status03	Rebooting: Rebooting
Status04	Activated: Startup is complete with the new firmware that has been transferred.
Error01	When access to the repeater fails
Error02	When the firmware is written a repeater other than the corresponding repeater
Error03	When a Port Open error occurs
Error04	When the writing of an unsupported firmware to the repeater is performed
Error05	When an SFTP sequence authentication error occurs
Error06	When in Force Firmware Programming Mode

Table 20-11 Version Information

Version Information	Description
Operation_Firm_Ver	The firmware version in operation is displayed.
Stored_Firm_Ver	The firmware version on standby is displayed.
Reactivation Method	The type of Reactivation selected when Transfer is executed is displayed. Usage: If the firmware switch trigger is lost, Reactivation can be actively executed from the Multi Loader by referring to the type of Reactivation. For Specified Time, the configured startup time is written at the same time.
Hot Standby	Active, Standby, or Failsoft is displayed.

21 ERROR MESSAGE LIST FROM REPEATER

Table 21-1 Error Message List

Error Code	Item	Condition of Occurrence	Threshold
E001	Unprogrammed	When all Channel are Blank	N/A
E002	USB Overcurrent	When an overcurrent occurs in the connected USB device	500 mA
E003	TX Frequency Data Blank	When an attempt is made to transmit on a Channel whose transmit frequency is Blank	N/A
E004	ESN Blank	When the ESN is not written	N/A
E005	Firmware Startup Error	When startup does not occur even in the forced PG mode	N/A
E006	Feature Error	When a Software Option function which is not permitted in the repeater is permitted in the FPU configuration	N/A
E007	Force Firmware Programming Mode	When the rewriting of the firmware from the Web Tool is on standby after the writing of the firmware fails and startup occurs by using the saved old firmware	N/A
E008	DSP Error 1	When the DSP cannot be started for some reason	N/A
E009	DSP Error 2	When the DSP does not have a library to use When the DSP is old	N/A
E102	Hot Standby LAN Connection Error	When communication between a Main Repeater and Sub Repeater is interrupted	Failsoft Mode Wait Timer
E103	Beacon Sync Disconnect	When a Member unit cannot receive a Beacon synchronization signal from a Master unit	Transmit Interval Time (Site Roaming)
E201	Fan Error	When the Fan can no longer spin	N/A
E202	Power Supply Voltage Error	When the power supply voltage goes lower than the lower limit threshold	Power Supply Lower Level
E204	RX PLL Unlock	When an unlocked RX PLL is detected	N/A
E205	TX PLL Unlock	When an unlocked TX PLL is detected	N/A
E206	Current Consumption (HPA) Error	When an error in the HPA current consumption is detected	Fixed value
E207	Temperature (Drive Amp) Error	When a Drive Amp temperature error is detected	Fixed value

Error Code	Item	Condition of Occurrence	Threshold
E208	Temperature (TX Block) Error	When a TX Block temperature error is detected	Fixed value
E209	Temperature (TCXO) Error	When a TCXO temperature error is detected	N/A
E210	Temperature (HPA) Error	When an HPA temperature error is detected	Fixed value
E211	IF IC Error	CLK_M (AD9864_M) behavior error	N/A

While any of the E207, E208, and E210 errors occurs, or when any of these errors occurs during transmission, the repeater transmits after the transmit power is lowered by 12 dB. Even in the state where these errors are resolved during transmission, the repeater continues to keep the transmit power until the transmission ends. When transmission is initiated in the state where E207, E208, and E210 errors are all resolved, the repeater executes transmission with the normal transmit power.

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