NEXLINK

Intelligent Interoperability Gateway

Model IOP-1

FOR THE KENWOOD
NX-700, NX-800, TK-7180, TK-8180
TRANSCIEVERS

INSTRUCTION MANUAL

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Contents

FEATURES:

- Extends existing repeater coverage to the 3G and 4G cellular networks, PSTN, or users private internal PBX system without adding equipment at the repeater site
- A smartphone is not required. The NexLink gateway works on any phone with a DTMF pad including cell phones, smart phones, desk phones, internal PBX extensions etc.
- Control an NX-700, NX-800 or TK-7180, TK-8180 radio as if you were sitting in front of it from any (cell) phone
- Zero use of system(site) resources when monitoring a zone/channel
- Single “black box” plug ‘n play solution. No monthly charges, no internet required (when using a standard copper pair or internal PBX analog link), no computer or servers required, no software to learn/install
- Allows for selection of up to 900 different individual or groups to scan, talk or monitor
- Easy to use voicemail style interface
- Adds instant plug ‘n play interoperability from cellular to repeater for emergencies
- Can be used to cross connect covert operations using a cellphone to existing repeater infrastructure.
- Passcode protected from unauthorized use
- Can be installed on Kenwood NXDN digital systems, standard analog conventional systems, or LTR systems.
- Installation can be done in minutes, on or off site.
- Allows system owner/operators to monitor customer activities.

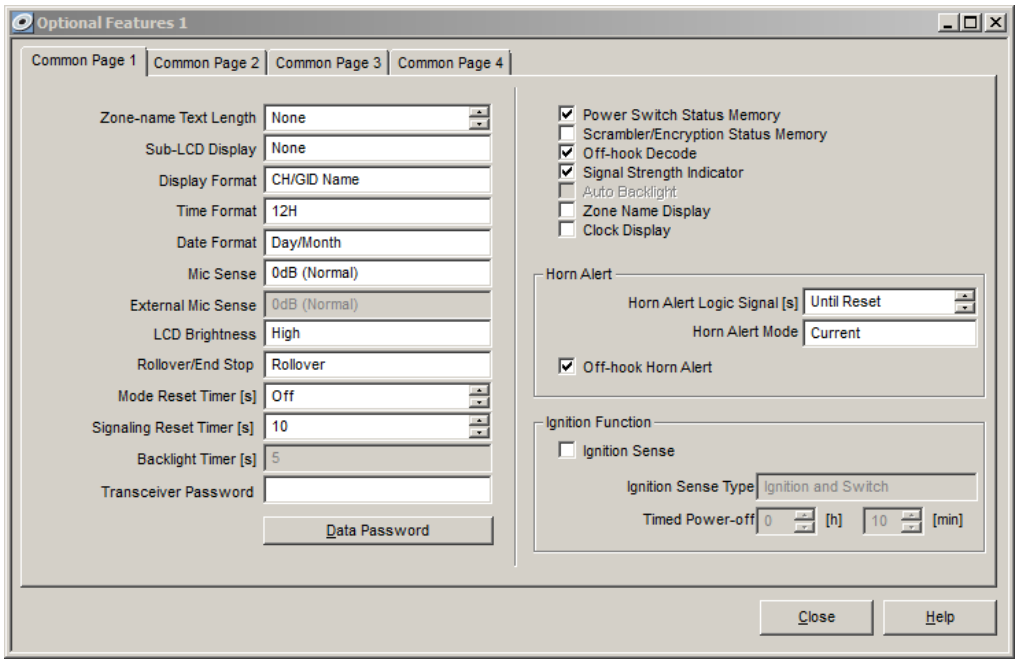
INTRODUCTION

The NEXLINK interoperability gateway is an intelligent cross connection from cellular, PBX or PSTN networks to Kenwood NEXEDGE or any other analog repeater system. It works by allowing a user to remotely access the repeater just by placing a regular telephone call to the NEXLINK gateway from any cell phone, standard land line phone or internal PBX. The NEXLINK gateway auto-answers an incoming call. At this point the user has full control over the connected Kenwood radio as if sitting in front of it. Within seconds the user can instantly connect to digital or analog talk groups. An interactive voicemail type system is used to allow the user to select talk groups via the DTMF pad on their phone. Once a talk group is selected, the user presses the DTMF 1 key to start a call/transmission. To end the call the user presses the DTMF 0 key. The user can just hang up the phone to shut down the link. The NEXLINK gateway plugs directly into a Kenwood NEXEDGE NX700, NX800, TK-7180, or TK-8180 mobile radio using the supplied plug & play cable kit. A standard telephone line, or VOIP line(with an off the shelf analog terminal adapter), or internal analog PBX extention is required to the NEXLINK gateway which is used as the link. The NEXLINK gateway does not need to be located at the site and uses the existing repeater infrastructure to operate. The gateway, radio, and link source(TELCO) simply needs to be located within range of the repeater site.

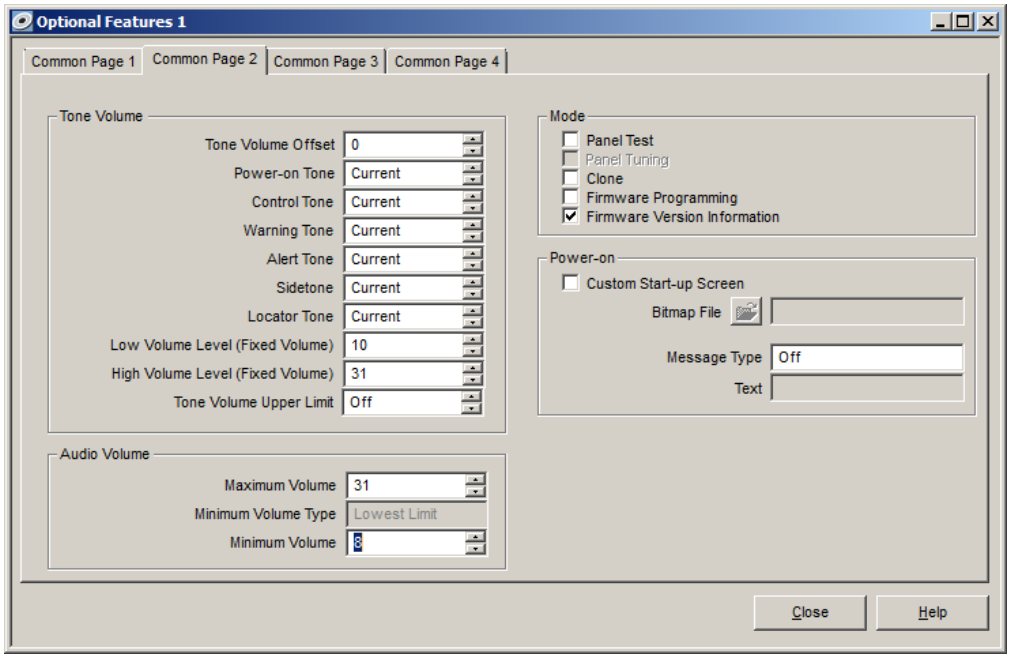
TYPICAL APPLICATIONS

PROGRAMMING THE RADIO USING KPG 111D OR KPG-111DN

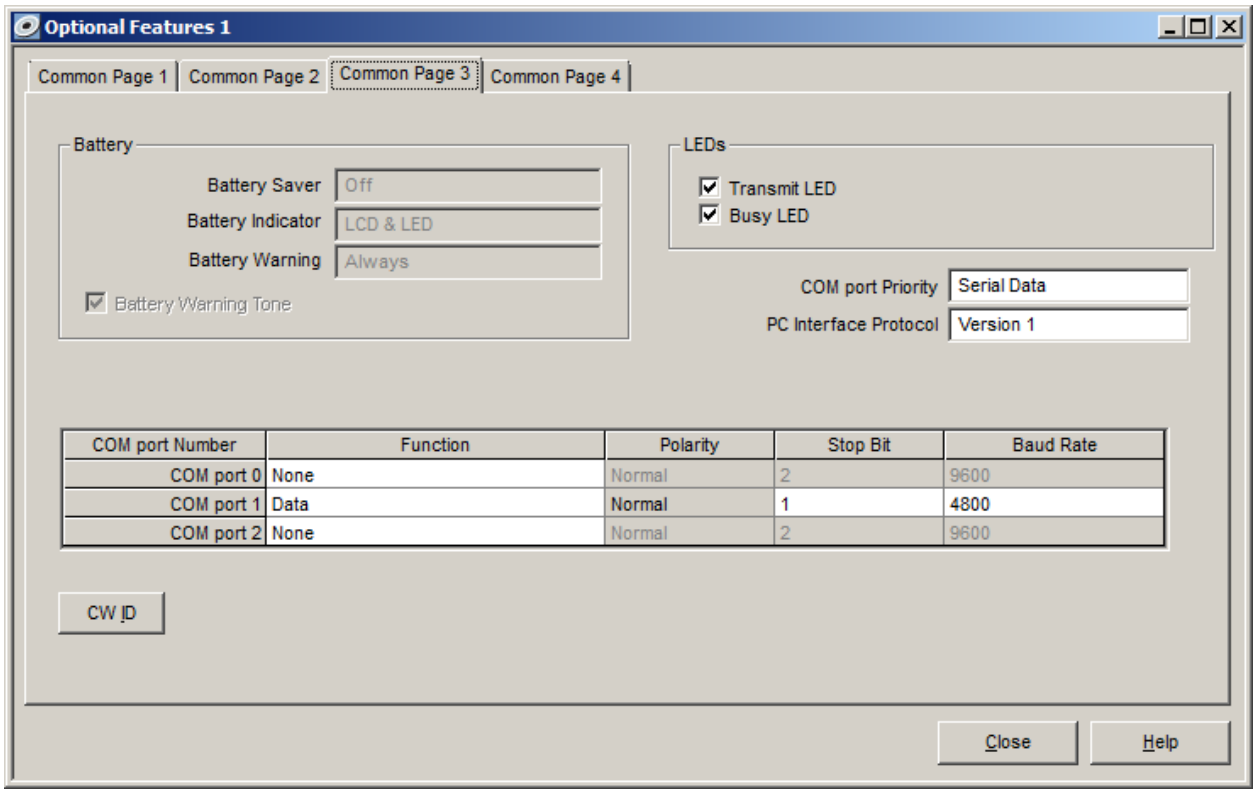
There is required programming that must be completed in the radio using Kenwoods' KPG-111 software before the NEXLINK will work. The following screen captures show these settings:

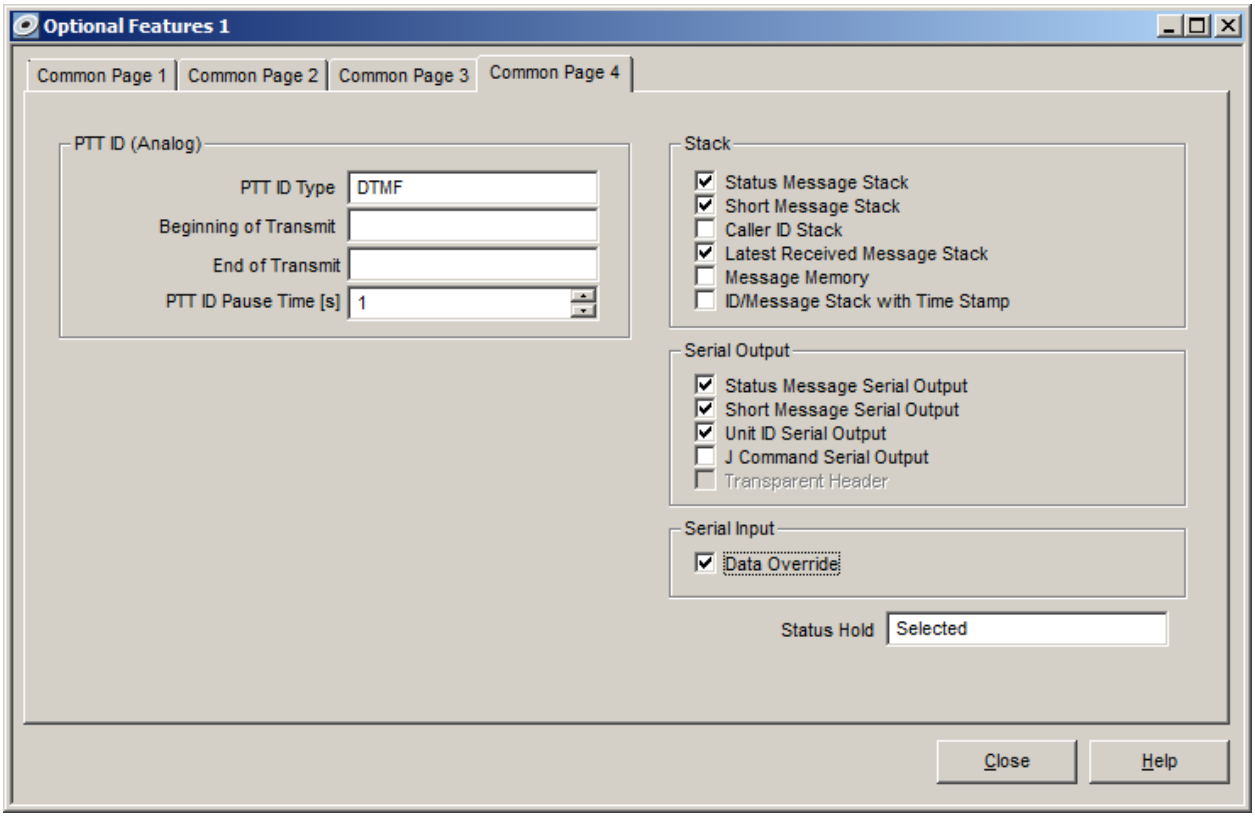


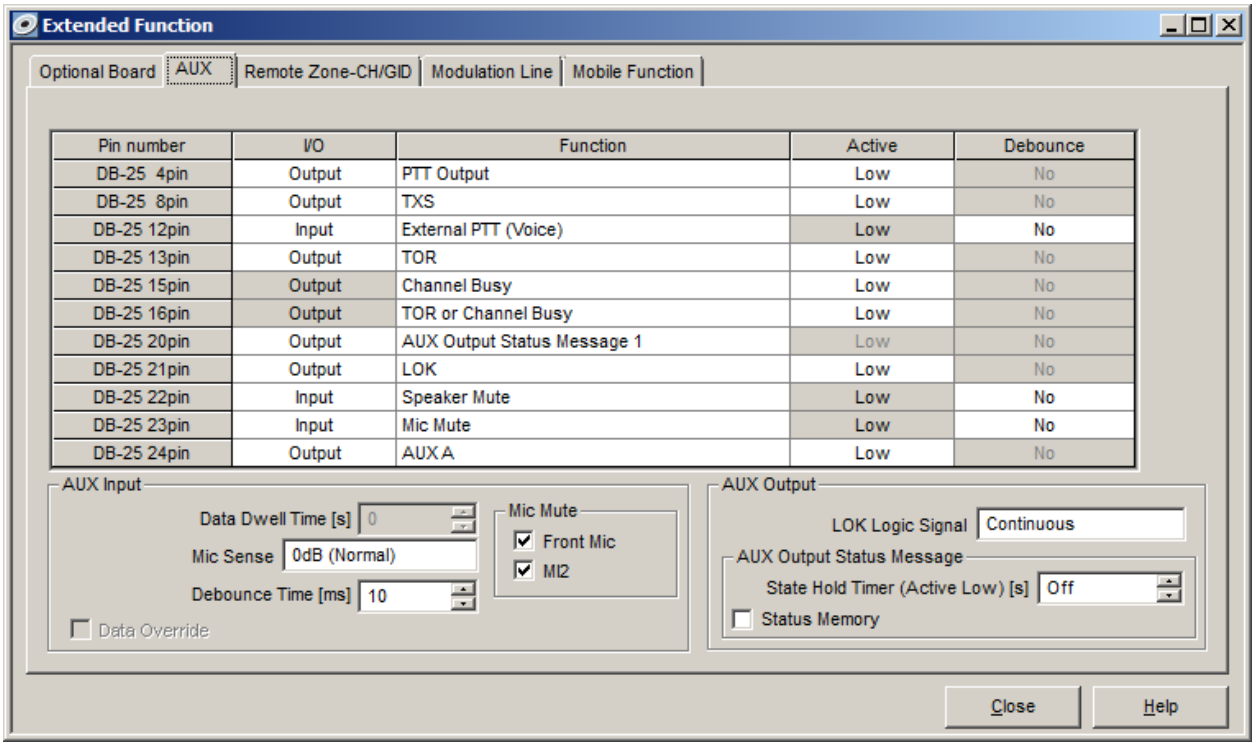
The critical setting here is the "Power Switch Status Memory", which needs to be checked just in case of a power outage. The unit will power up automatically.

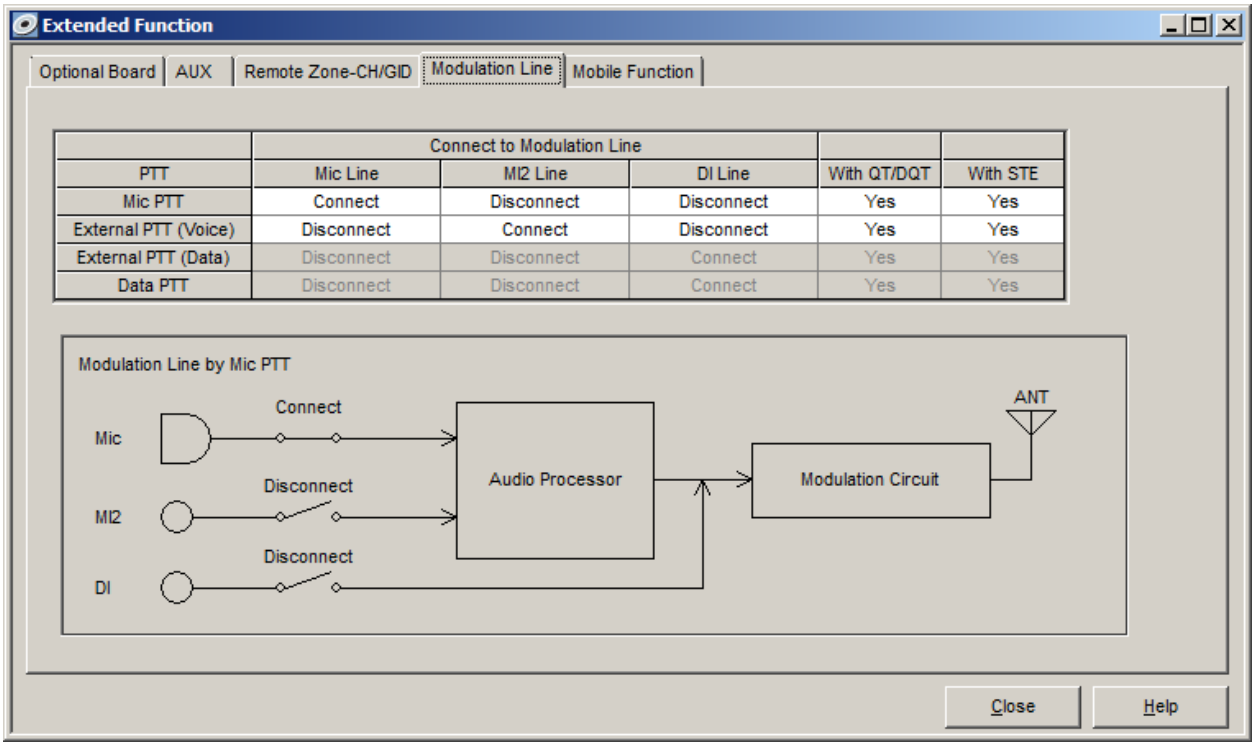


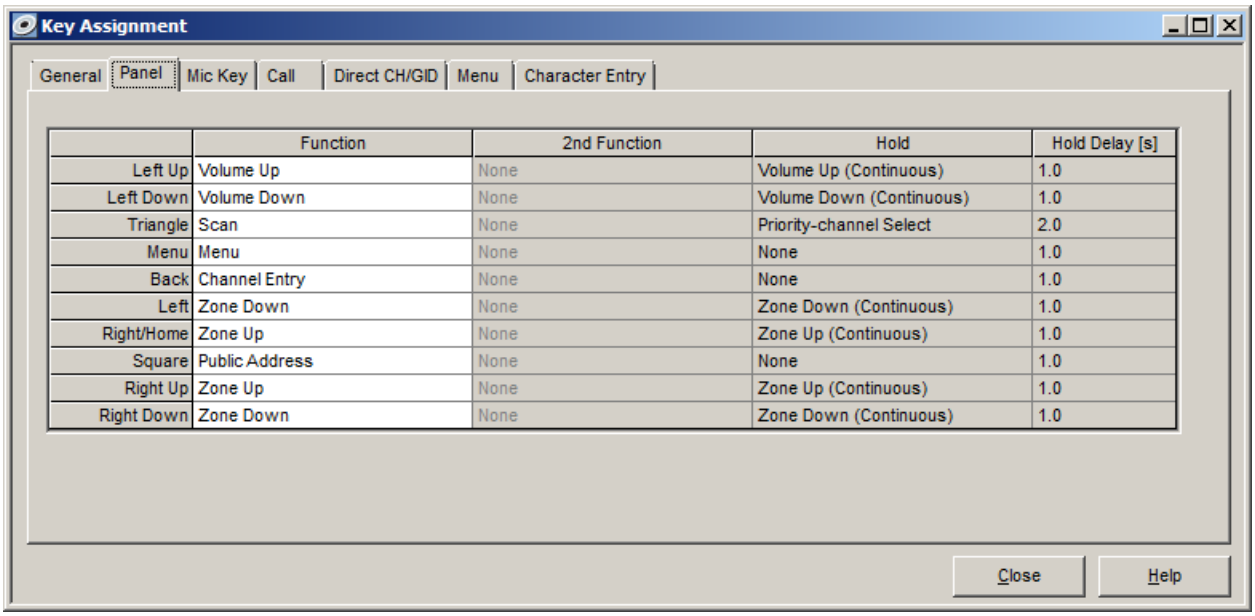
The critical setting on this page is where you set the default minimum volume level. When the radio powers up, the minimum volume level will be the level set to the user of the IOP-1. The default is 8 but can vary depending on the phone line type. See the installation section for more details.


Optional Features 1
Common Page 1
Common Page 2
Common Page 3
Common Page 4
Battery
Battery Saver
Off
Battery Indicator
LCD & LED
Battery Warning
Always
Battery Warning Tone
LEDs
Transmit LED
Busy LED
COM port Priority
Serial Data
PC Interface Protocol
Version 1
COM port Number
Function
Polarity
Stop Bit
Baud Rate
COM port 0
None
Normal
2
9600
COM port 1
Data
Normal
1
4800
COM port 2
None
Normal
2
9600
CW ID
Close
Help


Optional Features 1
Common Page 1
Common Page 2
Common Page 3
Common Page 4
PTT ID (Analog)
PTT ID Type
DTMF
Beginning of Transmit
End of Transmit
PTT ID Pause Time [s]
1
Stack
Status Message Stack
Short Message Stack
Caller ID Stack
Latest Received Message Stack
Message Memory
ID/Message Stack with Time Stamp
Serial Output
Status Message Serial Output
Short Message Serial Output
Unit ID Serial Output
J Command Serial Output
Transparent Header
Serial Input
Data Override
Status Hold
Selected
Close
Help

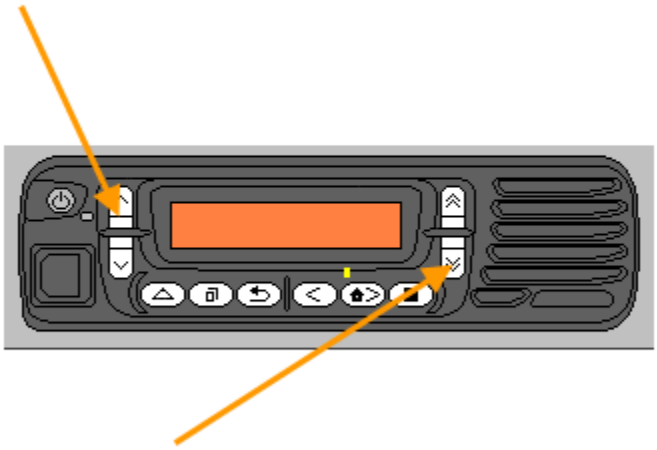

Extended Function
Optional Board
AUX
Remote Zone-CH/GID
Modulation Line
Mobile Function
Pin number | I/O | Function | Active | Debounce
DB-25 4pin | Output | PTT Output | Low | No
DB-25 8pin | Output | TXS | Low | No
DB-25 12pin | Input | External PTT (Voice) | Low | No
DB-25 13pin | Output | TOR | Low | No
DB-25 15pin | Output | Channel Busy | Low | No
DB-25 16pin | Output | TOR or Channel Busy | Low | No
DB-25 20pin | Output | AUX Output Status Message 1 | Low | No
DB-25 21pin | Output | LOK | Low | No
DB-25 22pin | Input | Speaker Mute | Low | No
DB-25 23pin | Input | Mic Mute | Low | No
DB-25 24pin | Output | AUX A | Low | No
AUX Input
Data Dwell Time [s]
0
Mic Sense
0dB (Normal)
Debounce Time [ms]
10
Data Override
Mic Mute
Front Mic
MI2
AUX Output
LOK Logic Signal
Continuous
AUX Output Status Message
State Hold Timer (Active Low) [s]
Off
Status Memory
Close
Help


Extended Function
Optional Board
AUX
Remote Zone-CH/GID
Modulation Line
Mobile Function
Connect to Modulation Line
PTT | Mic Line | MI2 Line | DI Line | With QT/DQT | With STE
Mic PTT | Connect | Disconnect | Disconnect | Yes | Yes
External PTT (Voice) | Disconnect | Connect | Disconnect | Yes | Yes
External PTT (Data) | Disconnect | Disconnect | Connect | Yes | Yes
Data PTT | Disconnect | Disconnect | Connect | Yes | Yes
Modulation Line by Mic PTT
Mic
Connect
MI2
Disconnect
DI
Disconnect
Audio Processor
Modulation Circuit
ANT
Close
Help



	Function	2nd Function	Hold	Hold Delay [s]
Left Up	Volume Up	None	Volume Up (Continuous)	1.0
Left Down	Volume Down	None	Volume Down (Continuous)	1.0
Triangle	Scan	None	Priority-channel Select	2.0
Menu	Menu	None	None	1.0
Back	Channel Entry	None	None	1.0
Left	Zone Down	None	Zone Down (Continuous)	1.0
Right/Home	Zone Up	None	Zone Up (Continuous)	1.0
Square	Public Address	None	None	1.0
Right Up	Zone Up	None	Zone Up (Continuous)	1.0
Right Down	Zone Down	None	Zone Down (Continuous)	1.0

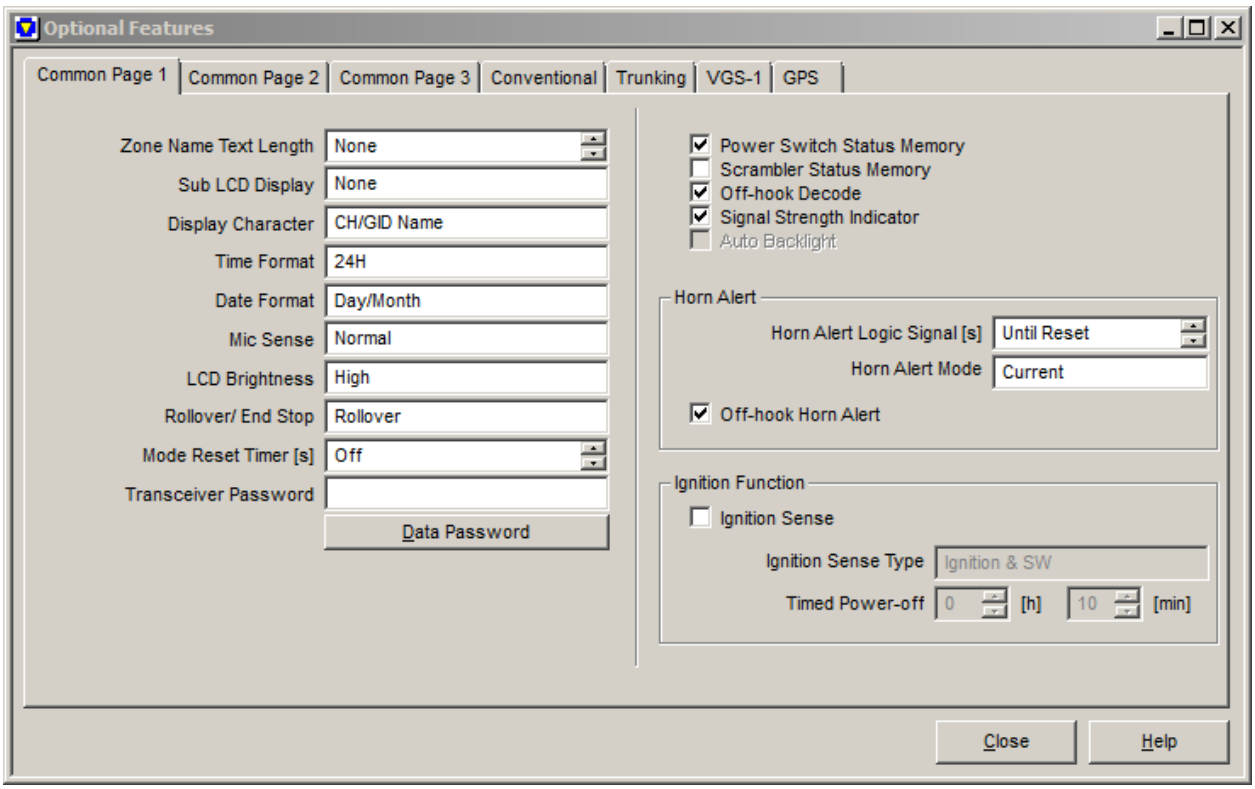
When programming is complete,
the left up and down arrows control volume.



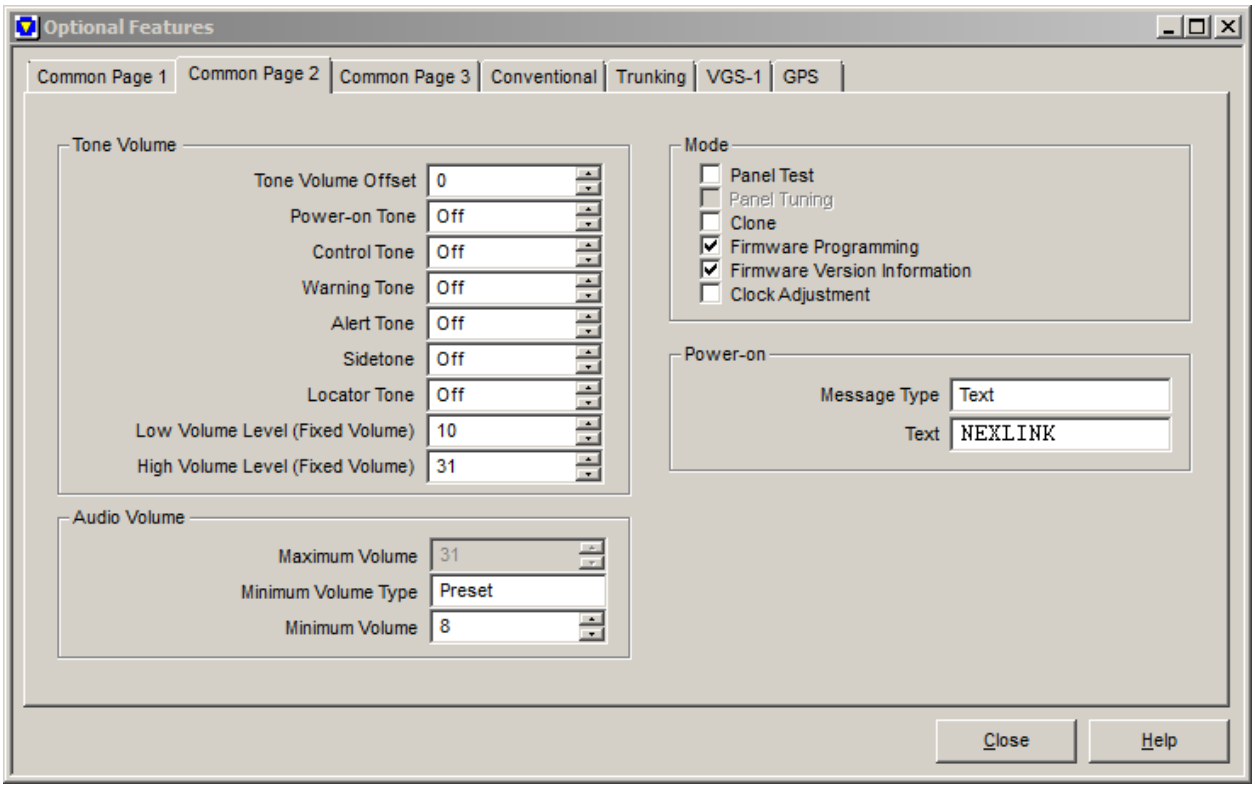
The right up and down arrows control the zone.

PROGRAMMING THE RADIO-KPG 89D

There is required programming that must be completed in the radio using Kenwoods' KPG-89 software before the NEXLINK will work. The following screen captures show these settings:



The main setting here is the "Power Switch Status Memory", which needs to be checked just in case of a power outage. The unit will power up automatically.



The main setting of concern on this page is the AUDIO VOLUME where you set the default volume level. When the radio powers up, the minimum volume level will be the level set to the user of the IOP-1. The default is 8 but can vary depending on the phone line type. See the installation section for more details.

Optional Features

Common Page 1 | Common Page 2 | Common Page 3 | Conventional | Trunking | VGS-1 | GPS

Battery

Battery Saver: Off

Battery Warning: While Transmitting

☑ Battery Status

PTT ID

PTT ID Type: DTMF

Beginning of Transmit:

End of Transmit:

PTT ID Pause Time [s]: 1

COM port No.	Function	Polarity	Stop Bit	Baud Rate
COM port 0	None	Normal	2	9600
COM port 1	Data	Normal	1	4800
COM port 2	None	Normal	2	9600

Close | Help

Optional Features

Common Page 1 | Common Page 2 | Common Page 3 | Conventional | Trunking | VGS-1 | GPS

☑ Busy LED
☐ PTT Release Tone
☐ Restricted ID in TA

Squelch Level: 5

Mute Hold Time [ms]: 600

VOX

☐ VOX Function

VOX Gain Level: 5

VOX Delay Time [s]: 0.5

☐ Cancel Operation
☐ VOX Proceed Tone
☐ TX Inhibit while Receiving

PTT Proceed Tone (Conventional)

☐ PTT Proceed Tone

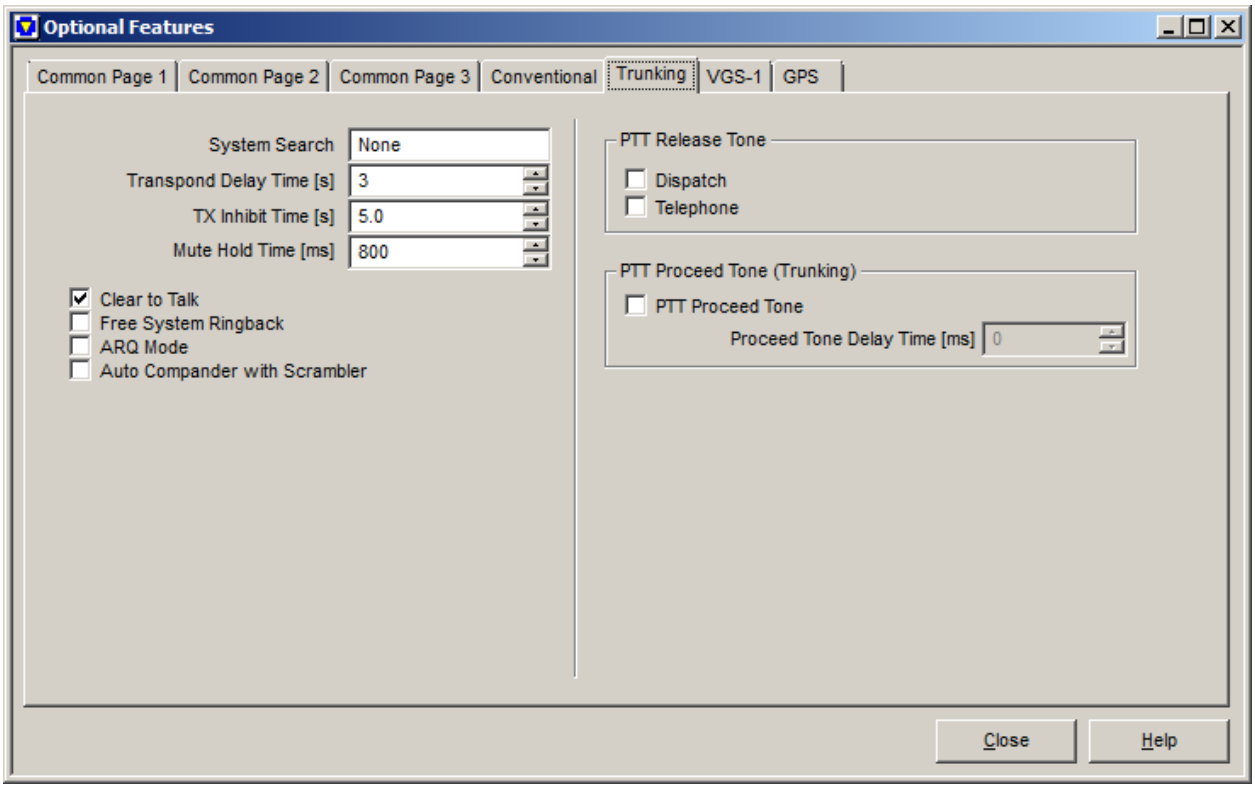
Proceed Tone Delay Time [ms]: 0

☐ OST Status Memory ☑ Tone Off

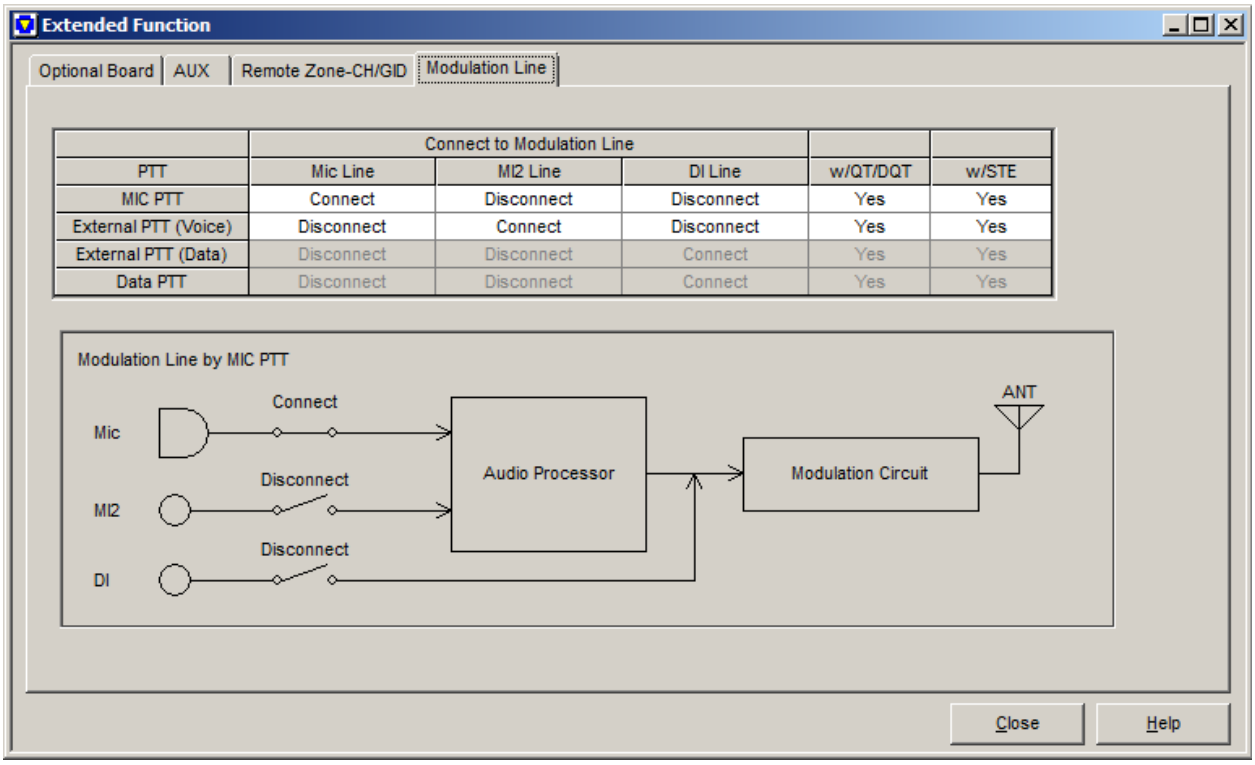
No.	OST Name	QT/DQT Dec	QT/DQT Enc
1		None	None
2		None	None
3		None	None
4		None	None
5		None	None
6		None	None
7		None	None
8		None	None
9		None	None
10		None	None
11		None	None
12		None	None
13		None	None
14		None	None

Standard QT

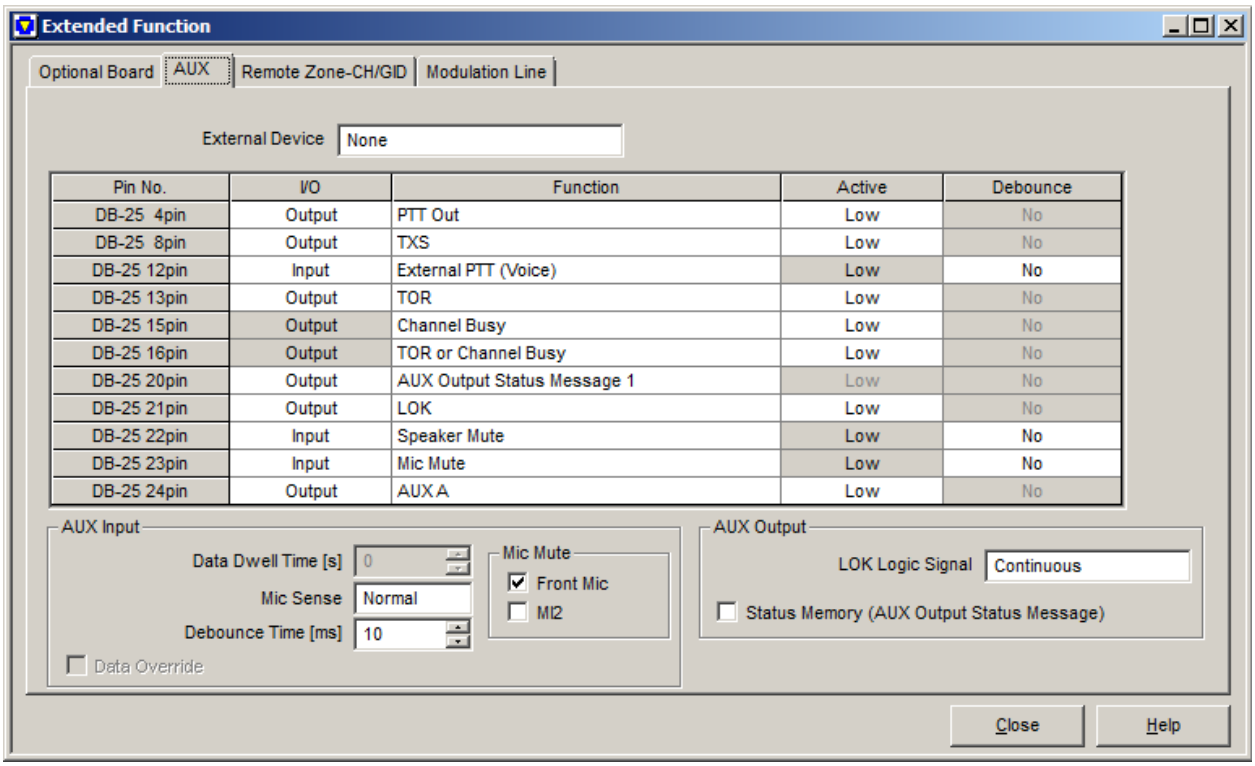
Close | Help

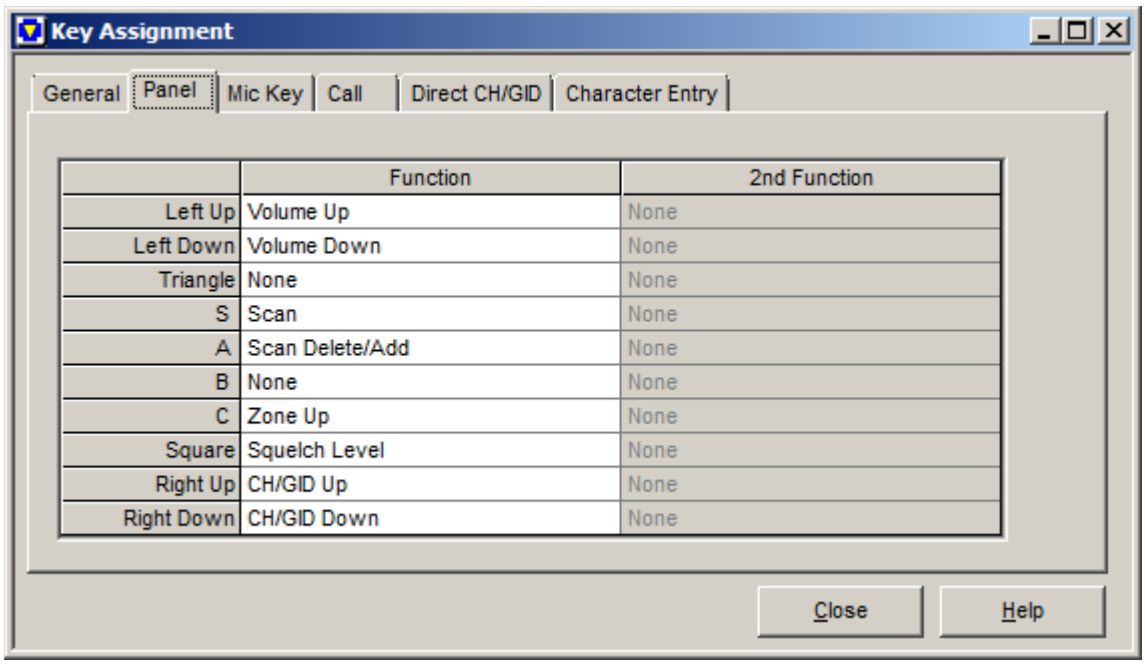


PTT Proceed tones and PTT Release tones are generated by the IOP-1. Therefore you can uncheck these boxes.



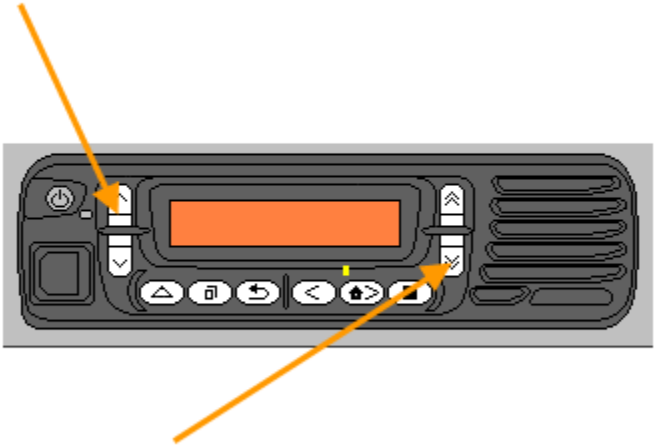
	Connect to Modulation Line				
PTT	Mic Line	MI2 Line	DI Line	w/QT/DQT	w/STE
MIC PTT	Connect	Disconnect	Disconnect	Yes	Yes
External PTT (Voice)	Disconnect	Connect	Disconnect	Yes	Yes
External PTT (Data)	Disconnect	Disconnect	Connect	Yes	Yes
Data PTT	Disconnect	Disconnect	Connect	Yes	Yes


Extended Function
Optional Board
AUX
Remote Zone-CH/GID
Modulation Line
External Device
None
Pin No.
I/O
Function
Active
Debounce
DB-25 4pin
Output
PTT Out
Low
No
DB-25 8pin
Output
TXS
Low
No
DB-25 12pin
Input
External PTT (Voice)
Low
No
DB-25 13pin
Output
TOR
Low
No
DB-25 15pin
Output
Channel Busy
Low
No
DB-25 16pin
Output
TOR or Channel Busy
Low
No
DB-25 20pin
Output
AUX Output Status Message 1
Low
No
DB-25 21pin
Output
LOK
Low
No
DB-25 22pin
Input
Speaker Mute
Low
No
DB-25 23pin
Input
Mic Mute
Low
No
DB-25 24pin
Output
AUX A
Low
No
AUX Input
Data Dwell Time [s]
0
Mic Sense
Normal
Debounce Time [ms]
10
Data Override
Mic Mute
Front Mic
MI2
AUX Output
LOK Logic Signal
Continuous
Status Memory (AUX Output Status Message)
Close
Help



	Function	2nd Function
Left Up	Volume Up	None
Left Down	Volume Down	None
Triangle	None	None
S	Scan	None
A	Scan Delete/Add	None
B	None	None
C	Zone Up	None
Square	Squelch Level	None
Right Up	CH/GID Up	None
Right Down	CH/GID Down	None

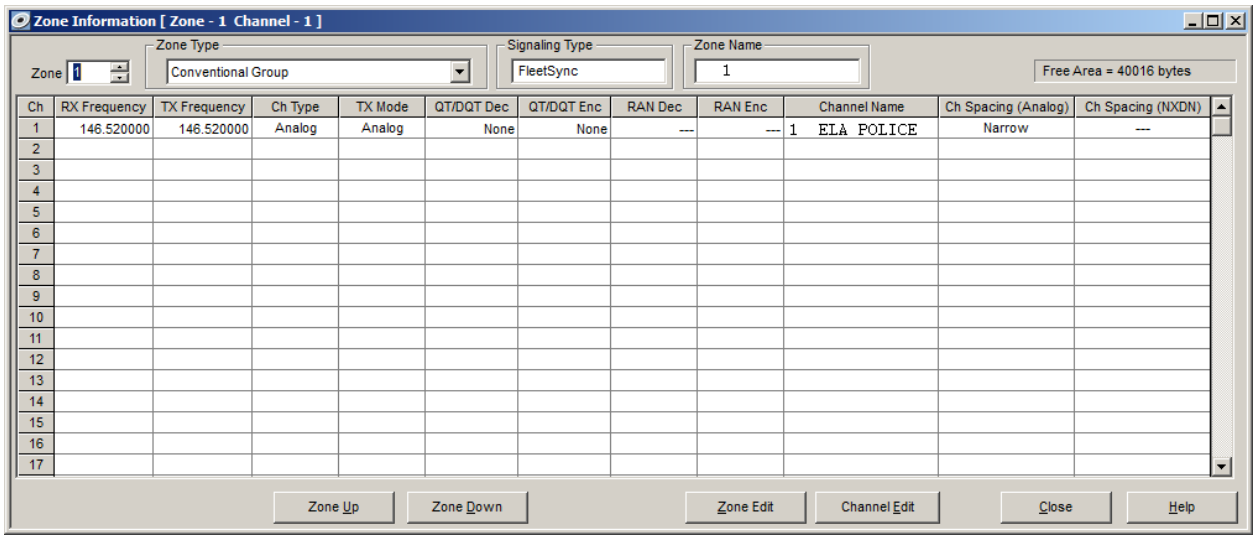
When programming is complete,
the left up and down arrows control volume.



The right up and down arrows control the zone.

ZONE AND CHANNEL PROGRAMMING

The NEXLINK gateway can remotely control zones 1-9 and channels 1-99 of these zones. If your existing configuration is out of range of these channels, then you will need to change the programming accordingly. Make sure that all additional settings that apply specifically to your system are programmed. These include channel frequencies, zone type, signaling, site information etc.



Ch	RX Frequency	TX Frequency	Ch Type	TX Mode	QT/DQT Dec	QT/DQT Enc	RAN Dec	RAN Enc	Channel Name	Ch Spacing (Analog)	Ch Spacing (NXDN)
1	146.520000	146.520000	Analog	Analog	None	None	---	---	1 ELA POLICE	Narrow	---
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											

See the “Gateway Operation” section on how to select these channels that are programmed.

INSTALLATION

PSTN CONNECTION

The installation should be done at a location that has an available PSTN connection such as a standard copper pair, digital PBX with an ATA (analog telephone adapter) connection, or VOIP telephone service ATA such as Vonage or MagicJack. Most telephone connections that have a ring voltage and "tip and ring" connections (also referred to as 2-wire, POTS) should work with the NEXLINK gateway. This connection is plugged into the port labeled TELCO on the gateway.

RADIO RF PATH

The RF path to and from the repeater site needs to have a solid signal to and from the radio connected to the gateway. It is not necessary for the radio and the NEXLINK gateway to be located at the tower site. For instance, a radio located at a service dispatch area with an outside antenna that has a solid signal to and from the repeater is perfect. If the radio is to be located at the tower site, then the appropriate measures should be taken to ensure a solid and balanced RF connection. Before connecting the gateway to the radio, make sure that all programmed zones in the radio have a clear transmit and receive path and the programmed ID's and zones are the desired user/groups to be used with the gateway.

PLUG AND PLAY CABLE CONNECTIONS

The NEXLINK gateway comes complete with all the cables required for connection to the radio. Plug the cable harness as shown in Fig 1.

MIC GAIN SETTING

The MIC GAIN on the front panel of the gateway should be set at about 10:00 using the indentation on the shaft of the control. This control adjusts the level of audio that is sent out over the air to the repeater from the user on the TELCO port of the gateway. This setting may vary slightly depending on the installation. This level should be set so that the user of the gateway sounds almost the same as all other users on the system.

RADIO VOLUME SETTINGS

The radio volume sets how much level will be put on to the telephone line link. This setting may vary depending on what type of phone line you have connected to the IOP-1(for instance, a PBX line might have different levels than a regular telephone line). To set this level, make a call to the IOP-1 and listen to the channel activity on your cellphone. Adjust your cell phones volume to the middle level. Listen to activity on the channel and adjust the volume on the radio until the level appears to be the same level as on a regular cell phone call. Once you have determined the volume level that sounds best from the front panel of the radio, program this level as the default minimum level in the radio using the Kenwood FPU software (the default level is 8). This setting is found in the software under “OPTIONAL FEATURES”, “COMMON PAGE 2”.

JUMPER SETTINGS

The IOP-1 has several jumper settings that must be set upon initial installation. See the jumper section for more details.

Supplied Plug N' Play Cable Harness Description

3 Connections to
The NEXLINK Gateway.

2 Connections to
The Radio.

Connections

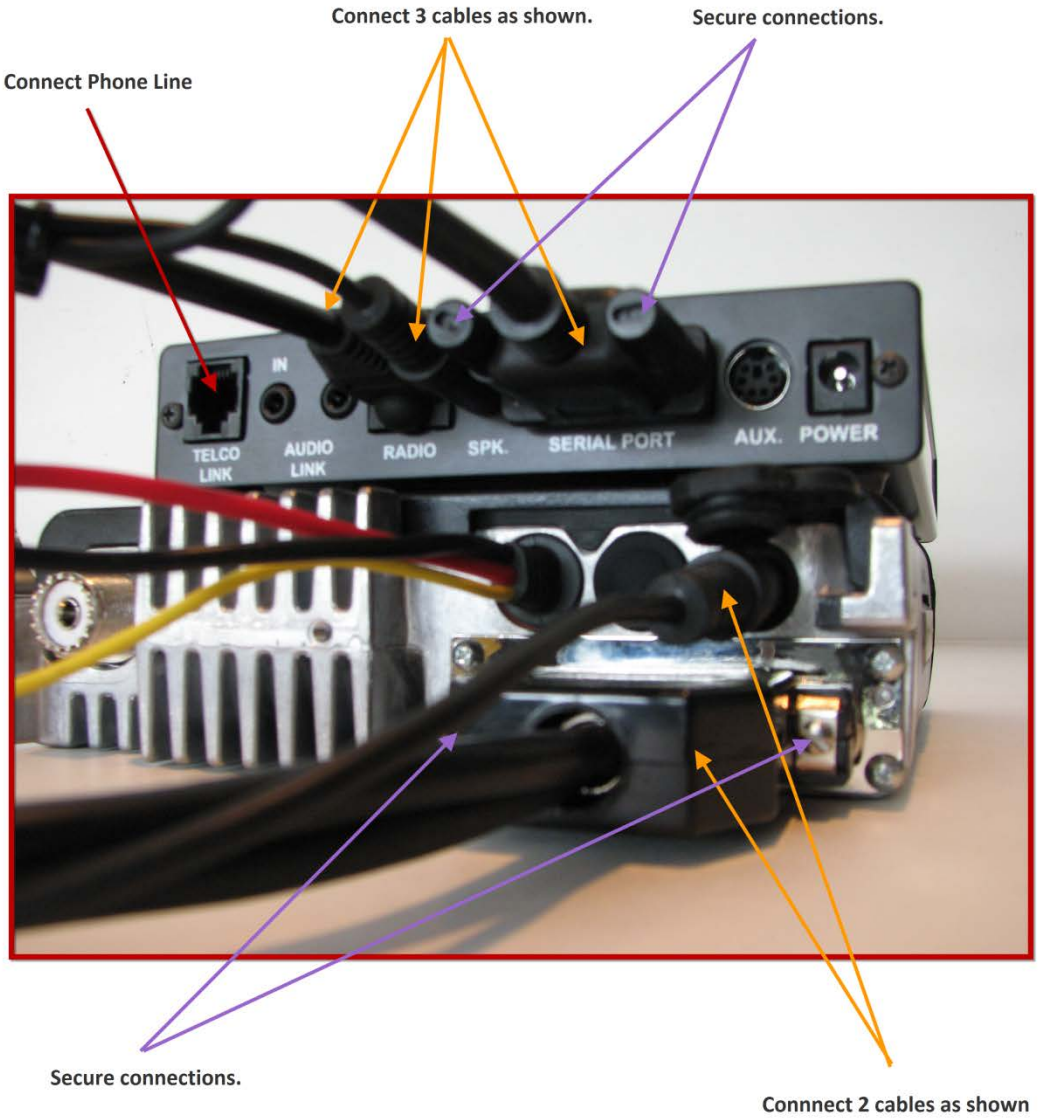


Fig 1.

SETTINGS MENU

The NexLink gateway has a SETTINGS menu that allows certain setup features to be changed. It is accessed by calling into the gateway and using DTMF tones to change the settings. CONFIG jumper ALARM on the pc board must be installed (refer to the jumper settings section). Once this jumper is installed, the following commands will be available when calling into the gateway. This jumper is installed when shipped from the factory. It is recommended that it be removed once the setup is completed.

ENTER SETTINGS MODE, Press #2

When calling into the gateway the gateway will ask for a passcode. Once this pass code is entered correctly the gateway will respond with the zone selected on the radio. At this point the user will be in "operate" mode. The user will need to Press #2 to enter SETTINGS mode. The gateway will respond "SETTINGS". From here you have 3 different functions:

SET THE PASSCODE, Press 1

The NexLink gateway is equipped with a 4 digit DTMF passcode feature in case an erroneous user calls the gateway. The default passcode as shipped is 1234. Press 1 in this menu and the gateway will respond with "Enter your passcode". Enter 4 numeric digits. The gateway will repeat the passcode to you. Press one if correct. The gateway will respond with "SETTINGS MENU" to let you know it has changed the passcode.

NUMBER OF RINGS TO ANSWER, Press 2, and then the desired number of rings.

The NexLink gateway can be programmed to answer after a set number of rings. Press DTMF 2, then the number of rings you would like the gateway to auto-answer the call. The gateway will respond with "SETTINGS MENU" to let you know it has changed the number of rings.

RETURN TO THE MONITOR MENU, Press 9

JUMPER SETTING DESCRIPTION

The figure to the right shows the CONFIG jumpers on the gateway. To access the jumpers, remove the rear two screws of the gateway and set aside the rear panel. Slide the pc board out and locate the CONFIG jumpers shown on the right. The description of these jumpers is as follows:

ANSR –If this jumper is in, the gateway will answer if ring voltage is detected on the TELCO port. This jumper should always be in.

MUTE- If this jumper is in, the audio from the radio is muted when voice prompts are heard. If this jumper is out, the audio is from the radio is mixed with the voice prompt audio. The factory default is in for this jumper.

PW- If the passcode is unknown the user can put this jumper in and then power the gateway. The passcode will return to 1234, the number of rings to answer will return to default of 2, and the voice prompt audio will default to full volume. The factory default for this jumper is out, or disabled.

HUDET- If this jumper is in, the gateway will detect reverse polarity signaling on the TELCO port. Reverse polarity detection is provided by the phone company or the analog terminal adapter (ATA) when a user on the other end of the call hangs up. It is a valuable function if your equipment/phone company supports it because if the user on a call gets “dropped” by the cellular service, the NexLink gateway will immediately disconnect, allowing the user to call back immediately. If your equipment/phone company does not support this signaling, the user will need to wait for the timer in the gateway to reset, allowing the user to not get an immediate busy signal. The factory default for this jumper is in or enabled.

ALARM- If this jumper is in, the SETTINGS menu in the gateway is enabled. This is mainly used to first set the passcode of the gateway. It is installed by the factory at the time of purchase. After the user sets up the passcode, this jumper should be removed. (See the section “SETTINGS MENU”)

4- This jumper controls how the NEXLINK will handshake with the site. This jumper should be in if any channels you have programmed are trunked. If all systems you are using are conventional systems or simplex or talk around, then this jumper should be out.

2-If this jumper is in, the passcode prompt will be disabled and full access to the gateway will be available without entering a passcode. This feature might be convenient if the unit is installed on an inside PBX analog telephone line where there would be limited personnel use.

1-If this jumper is out, the timeout timer mentioned in the "Operation" section of this manual is set to 1 minute. If the jumper is installed, it will be set to 30 seconds. The factory default is not installed or 1 minute.

Reassembly of the Gateway

Place the PC board back on the 2nd groove from the bottom of the unit. Slide the pc board until the LEDs pop through the holes in the front panel. Replace the rear panel, then screw the two screws back in.

GATEWAY OPERATION

Once the NEXLINK gateway is properly installed and the radio is programmed to be used with the NEXLINK gateway, operation is as follows:

ACCESSING THE GATEWAY

To gain access to the gateway, the user simply dials the telephone number connected to the TELCO port on the gateway from a cellphone or any other phone(which usually has a memory stored in the phone for the gateway telephone number). The gateway could also be connected to a PBX system. In that case, the user would enter the internal extention number. The NEXLINK gateway will auto-answer the call and ask the user for a 4 digit passcode(the passcode entry can be disabled, see the "JUMPER SETTING DESCRIPTION, jumper 2" section of this manual). After sucessful entry, the gateway will respond "NEXLINK Ready". Immediately audio from the receiver in the radio(Zone 1, Channel 1) is passed to the users phone to monitor Zone 1 Channel 1 activity.

MONITORING THE CHANNEL

If the user just chooses to monitor the frequency, after 1(or 2 minutes, see the "JUMPER SETTING DESCRIPTION, jumper 1) minutes the user will be asked "Are you still there?" to see if the user is still actively using the gateway(the gateway is checking for a possible dropped call). The user must respond by pressing "0" or any other key to reset the activity timer. If the user does not respond within one more minute, the gateway will end the call. The gateway will never interrupt the user with "Are you still there" if the user is active in a conversation that has transmissions less than 1(or 2) minutes. The user will only be asked if the user shows no sign of activity. It is reccommened that if the user is monitoring for extended periods of time that the user mute the microphone on the users' phone to maintain audio in one direction. If the user would like to monitor for extended periods of time without having to reset the activity timer, the RDC-1 or remote dispatch console accessory can be used (refer to the section RDC-1 Remote Dispatch Console).

Figure 2 below shows the DTMF button functions from the users phone. The phone does not need to be a smartphone device.

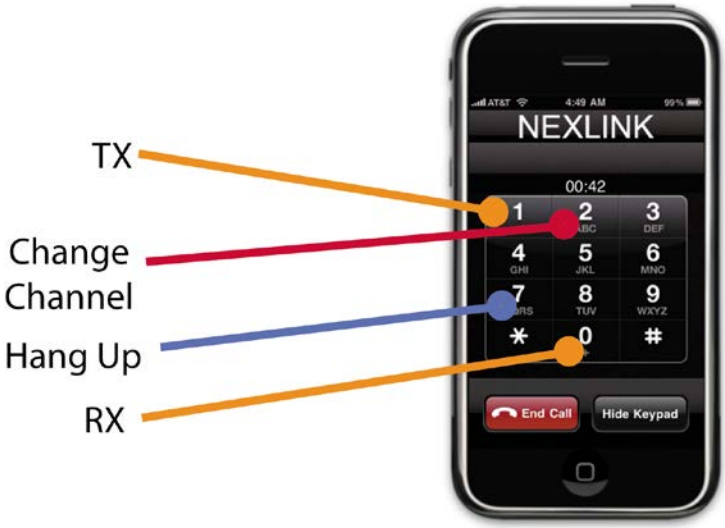


Fig. 2

ZONE SELECTION, PRESS KEY 2

After pressing 2 on the users DTMF pad, the user will be asked for the channel number. This is a 3 digit number. The first two digits are the zone number(1-99) and the next digit is the channel number(1-9). If there is no zone programmed in the radio that the user makes a request for, the unit will verbally respond "Channel Unavalable". For zone 1, channel 1 the user would pres 011. For zone 14, channel 5 the user would enter 145.

MAKING A CALL (TRANSMIT MODE), PRESS KEY (1)

Pressing the 1 key will cause the NEXLINK gateway to command the radio to transmit. It is the equivalent of pressing the PTT on the radios microphone. The gateway will respond with a triple beep, letting you know that the handshake with the repeater was successful and you are now on the air. If the repeater cannot be accessed for any reason, the gateway will respond with "Channel Unavailable" instead. Audio from the users' phone is presented to the radio for transmission. Speak clearly and into the microphone on your phone*. The use of a headset on your phone during gateway operation is highly recommended. This allows the users to speak and send the required commands via DTMF without moving the phone back and forth on and off the ear. Speakerphone use is not recommended for conversations. The speakerphone feature on your phone may work fine for monitoring the channel or if the user is has low background noise. It is good practice to use the microphone mute function on your phone when monitoring the channel for any extended periods.* The user can speak for up to 1 minute after which the user will get a "Are you still there?" voice prompt request. If the user does not respond

SWITCHING BACK TO RECEIVE MODE, PRESS KEY (0)

Press the “0” key to stop transmitting, shown in green in Fig 2. After pressing “0” the gateway will respond with a 1khz. tone letting you know that you are now in receive mode monitoring the channel. This key also serves as a reset for the activity timer. See the previous section “Monitoring the Channel” for more information on resetting this timer.

CALL TERMINATION, PRESS (7) TO HANG UP

It is very important that the user press 7 key to end the call with the gateway before hanging up the call. This ensures that the gateway resets properly for the next user instead of possibly waiting for expiration of the activity timer mentioned previously. The gateway will verbally respond with a pleasant “Goodbye” after you press 7.

ENTERING THE SETTINGS MENU, PRESS 9

If the “SETTINGS MODE” jumper is in place, (See Jumper Setting Description section of this manual) pressing 9 will allow access to the Settings Menu. See the section “SETTINGS MENU” for further details on this feature.

EXITING THE SETTINGS MENU, PRESS 9

The user may exit the SETTINGS MENU by pressing 9.

RESETING THE TIMER, PRESS (0)

If the user monitors the channel for a long duration, pressing zero resets the timeout timer. Refer to “MONITORING THE CHANNEL” in the section above.

Remote Dispatch Console

The PDC-1 or Remote Dispatch Console is a battery operated portable dispatch console that can allow operators/dispatchers to communicate or monitor as they would if they were a subscriber on the system from most cell phones. The PDC-1 provides all of the signaling for the NEXLINK unit so that the user can just press the PTT lever on the microphone. The RDC provides an external jack for a powered speaker, headset or AUX connector on a vehicle. It will also provide the signaling for keeping the link active to remove this responsibility from the user.

TECHNICAL SUPPORT

Technical Support is available directly from onthegodevices Monday-Friday 9:00am-5pm, EST. Please call 954-261-8968 for assistance.

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FCC DECLARATION OF CONFORMITY

NEXLINK INTEROPERABILITY GATEWAY
IOP-1

I, the undersigned, hereby declare that the equipment specified above conforms to FCC Part 15 Directive(s) and standards.

July 01, 2012

Mr. John Troy, onthegodevices LLC