GENERAL DYNAMICS
C4 Systems

Exhibit 8 – User's Manual

General Dynamics C4 Systems

PathMaker Network Radio

FCC ID: MIJPNR-1000

Model No. PNR-1000

8.0   User's Manual (Draft)

PATHMAKER™ User Documentation

User Documentation

PATHMAKER™
Network Radio

GENERAL DYNAMICS

C4 Systems

8220 East Roosevelt Street
Scottsdale, AZ 85257

99-P42565K_Rev B
Software Version 5.2

PATH**MAKER**™ User Documentation

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INTRODUCTION

Pathmaker is a <mark>voice-oriented,</mark> handheld radio communications device providing groups of users with unlimited mobility and coverage without the need for a fixed infrastructure. By creating an ad hoc, self-routing mobile network, Pathmaker ensures high quality voice, data, and video communications together with simultaneous connectivity to external networks.

Pathmaker offers a simultaneous voice and data wireless mesh network at the end unit level (radio device, cell phone/PDA, etc.). General Dynamic's technology enables each Pathmaker device to function as if it were a voice and data router/repeater. As such, Pathmaker creates a powerful multi-hop/multi-user dynamic network that extends coverage to the tactical edge and overcomes the daily issues of infrastructure dependency, blocked transmissions (walls, metal, dead-spots, climate, etc.) and out-of-range communication.

Figure 1 - Pathmaker Radio

General Information

Pathmaker Network Radios provide dynamic wireless, mobile, ad-hoc networking communications without reliance on network infrastructure. Pathmaker Radio users become their own network, which makes the radios ideal for use in remote locations where no infrastructure exists or where the infrastructure has been destroyed or overloaded.

Safety Precautions

Carefully read all of the cautions and warnings before using the radio:

- Before using, maintaining, or installing the Pathmaker radio and battery charger, carefully read and observe all safety recommendations in the relevant technical manuals.

- Do not use the radio equipment for uses other than those indicated in the present manual.

- For correct use of the radio equipment, read and observe all that is listed in this user's guide.

- Do expose the Pathmaker Radio to heat sources greater 60°C.

- Do not install or remove the battery when refueling a vehicle or in the presence of fuel.

- Do not place the Pathmaker radio above the airbags or in their area of action. If an airbag is activated, it may not inflate correctly and/or may hurl the portable unit, with great force, inside the passenger compartment where the vehicle occupants are located.

- The external antenna connector not used during normal operations must be protected by a proper cover.

- Use the connector covers when the connector is not in use is recommended.

- Do not cause short circuits between the battery terminals. Do not place the batteries on metal surfaces.

- Do not place metal tools on the battery terminals.

- Do not place battery in a pocket, purse/bag, or any other container with metal objects.

- Replace the batteries with equivalent batteries approved by the manufacturer.

- When replacing the batteries, follow the instructions given in the relevant technical manual.

- Do not use batteries that are not damaged, have liquid leaks or evident gaseous emissions.

- Replace damaged radio battery before operating the radio.

- When using the battery charger be sure there is adequate ventilation, the power cord will not be stepped on or tripped on. Do not use the battery charger outside of the environment for which it is specified.

- The battery may vent or explode if the battery is incorrectly installed on the radio.

- Even if the battery is discharged it may vent or explode if burned or placed near a fire.

- Use only battery chargers recommended by the manufacturer, and follow all instructions for using and recharging the battery in the manual.

- Do not use the Pathmaker radio if the antenna is damaged.

- Turn off the radio, if the equipment enables you to do so, in electromagnetically sensitive environments (ex. hospitals, airports, etc.).

- The Pathmaker radio may cause electromagnetic interference (EMI) to other equipment if it is not adequately shielded for EMI immunity.

- The Pathmaker radio may cause interference with pacemakers or other electro-medical equipment.

- Power the radio off before entering environments which have a potentially explosive atmosphere (ex. fuel storage sites, filling stations, etc.).

- Do not remove or replace the battery while in environments which have a potentially explosive atmosphere (ex. fuel storage sites, filling stations, etc.).

- Do not use the battery charger in environments which have a potentially explosive atmosphere (ex. fuel storage sites, filling stations, etc.).

- All maintenance on the Pathmaker radio must be done in accordance with the manual.

- The Battery Charger and Pathmaker radio (Other than batteries, antennas, connector covers etc.) have no user replaceable parts and must be returned to General Dynamics for service.

- Use only original accessories and accessories approved by the manufacturer are suitable for the Pathmaker. The use of different accessories (earphone, antenna, etc.) invalidates the warranty and may cause a hazard.

- Follow the battery charger instructions in order to use it safely.

- Do not use the battery charger if the power supply cord and/or plug are damaged.

The following, while not direct safety precautions are recommended good user practices:

- Avoid touching the antenna when the radio is on, because this may reduce the radio's range and degrade communications.

- When using the earphone, hold the Pathmaker with the antenna straight up and speak clearly into the microphone.

- When using the earphone, do not allow the cord to become wrapped around the radio or antenna.

- Hold the Pathmaker with the antenna straight up and approximately 3 cm away from your head during voice communications using the loudspeaker.

Modes and Features

- Simultaneous voice, data, and video communications.
- Half-duplex voice calls (Push-to-talk)
- Call types: Private, Group, Broadcast and multi-session
- Quality of Service - voice calls given priority over data packet
- Data packet transfer performed in parallel to voice calls
- Multiple Private data sessions
- Network gateway extension to external legacy communications networks such as PMR (Tetra, P25) Satellite, GSM, VHF/UHF, SATCOM, IP & PSTN
- Very low energy consumption

List of Items Furnished

Table 1 - List of Items Furnished

Description	Part Number
Pathmaker radio	01-P42559K001
Battery pack (Installed on radio.)	60-P42581K001
User Documentation	99-P42565K

Accessories

Table 2 - Accessories

Description	Part Number
Assembly, Gateway GSM	01-P42570K001
Assembly, Gateway Analog	01-P42573K001
Cable, Pathmaker USB Data	30-P42577K001
Charger, Single Pod 110-230V	60-P42593K001
Charger, Six Pod 110-230V	60-P42594K001
Microphone, Heavy Duty Submersible	50-P42595K001
Earpiece, Rubberized D Shape	50-P42596K001
Earpiece, Transparent Acoustic Tube	50-P42597K001
Earpiece, Rubberized	50-P42598K001
PTT, Large In-Line	50-P42599K001
Microphone, Compact Speaker Mic	50-P42600K001

Electrical Characteristics

Table 3 - Electrical Characteristics

Frequency band	2.4 GHz – 2.485 GHz
Equipment type	2-way radio device
User data rate (max)	Up to 400 Kbps
Static Rx sensitivity	–93 dBm
TX output power	100 mW to 0.5 W
FSK modulation	512KHz deviation
RF channel bandwidth	2 MHz
Encryption	128/256 bits
Audio max power	1 Watt into 8 ohms
Power supply	7.4V Li-Ion 1800 mAh
Dimensions and weight including battery and antenna	130 (h) x 59.5 (w) x 37 (d) mm, 277g
Air interface ad-hoc protocol	QOLSR variant, multi-hop best-in-class ad-hoc networking
Commercial GPS	3-5m, standard NMEA protocols (Position Location Information with GPS)
Data terminal interface	RS232, USB
Battery	18 hours on single battery pack (AA battery option)
Range	1 km Clear Line of Sight

Environmental Operation and Storage

Table 4 - Environmental Specifications

Environmental Protection	IP67 submersible 1m for 30 minutes
Military Standard	MIL-STD 810C/D/E/F
Climatic conditions	- ETSI EN 300 019-1-7 - EN 300 019-2-7 class 7.3
Dust and rain protection	IEC 529 class IP54
Operating temperature range	TBD
Storage temperature range	-40°C to +85°C
Transportation conditions	ETS 300 019-1-2 class 2.3
Vibration and shock	- ETSI EN 300 019-1-7 class 7M - MIL STD 810 E/F – Method 514.4/5 (vibrations) - MIL STD 810 E/F – Method 516.4/5 (shock) - Free fall 1 meter height on concrete surface
Plastic parts	Finishing: compliant to SP-92100555
Aluminum parts	Color: black, orange, grey; Paint: epoxy based resin; Finishing: compliant to SP-92100555

System

Pathmaker type radios automatically create a self-configuring network without the need for any fixed infrastructure or base station sites. Each unit automatically acts as a relay station to other radios if this is required by their deployment pattern and mobility paths.

Pathmaker Network Radios provide a dynamic wireless, mobile, ad-hoc, automatic, self organized RF mesh network without reliance on network infrastructure. Each Pathmaker radio functions as a voice and data router/repeater creating a powerful multi-hop/multi-user dynamic network that extends coverage till the tactical edge and overcomes the daily issues of infrastructure dependency, blocked transmissions (walls, metal, dead-spots, climate, etc.) and out of range communication.   Because Pathmaker Radio users become their own network, the radios are ideal for use in remote locations where no infrastructure exists or where the infrastructure has been destroyed or overloaded. Pathmaker radios are built for critical missions in challenging conditions and provide superior simultaneous voice, data, and video communications and allow for multiple users on a single frequency to conserve spectrum space. With a maximum of 32 radio users per network, users can form traditional squad communications groups, or extend range and coverage by connecting to multiple networks.

Where legacy network infrastructure exists, the Pathmaker Network Radio System can take advantage of those networks by providing gateways, thereby increasing the network's footprint and reach. Users can form traditional squad communications groups, or extend range and coverage by connecting to multiple networks. Users can communicate privately (one-to-one), as a group (one-to-many), multiple group (broadcast), and have multiple private and group sessions on one RF channel. The Pathmaker Network automatically indicates what radios are available on the Network via each radio's given nickname. As radios leave and enter the network, the available contact list is automatically updated.

Supported gateways include: GSM Cellular, PSTN, IP, and Analog – including analog devices such as a UHF/VHF/HF radio (i.e., P25 radios, analog SATCOM terminals, etc.).

Figure 2 - Network with Gateways

SETUP

Normal setup includes unpacking, inspecting for damage, and charging the battery. Other setup procedures specific to a particular operating mode are included in the Operation section of this manual.

Unpacking

Inspect the hardware for damage. Retain the packing material and the shipping container, if desired, for possible future use. Return shipping label? Instructions?

Charging the Battery

The battery charger provides rapid recharging of the lithium-ion battery pack provided with the Pathmaker radio. The charger may be placed on any flat surface, such as a desktop, or it may be bulkhead mounted using the [provided?] mounting hardware. The battery may be inserted into the charger alone or while mounted to the radio. When charge is complete, the charger automatically switches to standby mode.

Two chargers are available, a single-unit charger as shown below, and a six-unit charger. The operation for each is the same.

The normal time to charge a fully discharged battery is 120 minutes.

To operate the charger:
1. Plug the AC power cord of the charger into an AC supply between 100 to 240 VAC. The LED should not illuminate. If it does illuminate, check the AC supply or replace the charger.
2. Switch the radio off.
3. Insert the battery into the charger, either with or without the radio attached. The LED will illuminate RED indicating the battery is charging.
4. When the LED illuminates GREEN, charge is complete. The radio may be removed or may remain in place on the charger.

Figure 3 - Charging the Battery

The LED is normally off when the charger is plugged in and no radio or battery is installed.

If the LED does not illuminate at all when the radio or battery is installed, check AC power or try reseating the radio or battery.

If the LED illuminates flashing RED at any time, the charger is defective and should be replaced.

Precautions
- Keep the charger in a well ventilated, dry place.
- Do not use the charger with any other batteries.
- Do not use the charger as a power supply.
- Never charge a radio that is switched on.
- Never insert metal objects into the charger.
- Do not touch the charger terminals.
- Do not connect the charger to a power source outside the 100 to 240 VAC range.
- Do not disassemble the charger.

OPERATION

This section contains a description of the radio, controls and indicators and operation of the radio. A detailed description of each menu option is also included.

Equipment Description

The front panel contains the display, the keyboard, and an LED indicator showing outgoing and incoming calls.

The rear panel contains the battery compartment. The left-hand panel contains the push and push-to-talk buttons.

The top panel holds a receptacle used to connect accessories. It also holds the antenna connector and rotary switch.

The components are illustrated in the following figure and functionally listed in the table below. The callouts in the illustration refer to the sequence numbers in the table.

Figure 4 - Radio Components

Table 5 - Radio Components

No.	Designation	Description/Function
1	Antenna	Wireless communication at 2.4 GHz band
2	Panic	Emergency button
3	Accessory Connector	USB, Microphone, PTT, Earphone
4	Rotary switch	Multi-function switch: Rotate to set level of volume or select menu items.

No.	Designation	Description/Function
5	LED Indicator	Red indicates outgoing call Green indicates incoming call
6	Display	Displays status of the device and menu options
7	Scrolling key	Scroll up to select menu options
8	Scrolling key	Scroll down to select menu options
9	Keyboard	Alpha-Numeric keyboard
10	Pound key	Lock or unlock the keyboard. First press the Asterisk key, then the Pound key
11	Speaker/MIC	Internal loudspeaker/Microphone
12	Asterisk key	Lock or unlock the keyboard. First press the Asterisk key then the Pound key
13	Key	Function Keys
14	Power ON/OFF	Continuous press (3 sec) ON/OFF Momentary press back to main screen
15	Push switch	Cancel (back to main screen)
16	Push switch	Push-to-talk
17	Push switch	Channel list
18	Shortcut Keys	P1 – broadcast / phone call answer P2 - private list / phone call send P3 – group list /phone call end

Main Screen

Press and hold the Power ON/OFF key until the unit turns on. This will initialize the unit.

Initialization can take a few seconds. When initialization is complete, the main screen will appear.
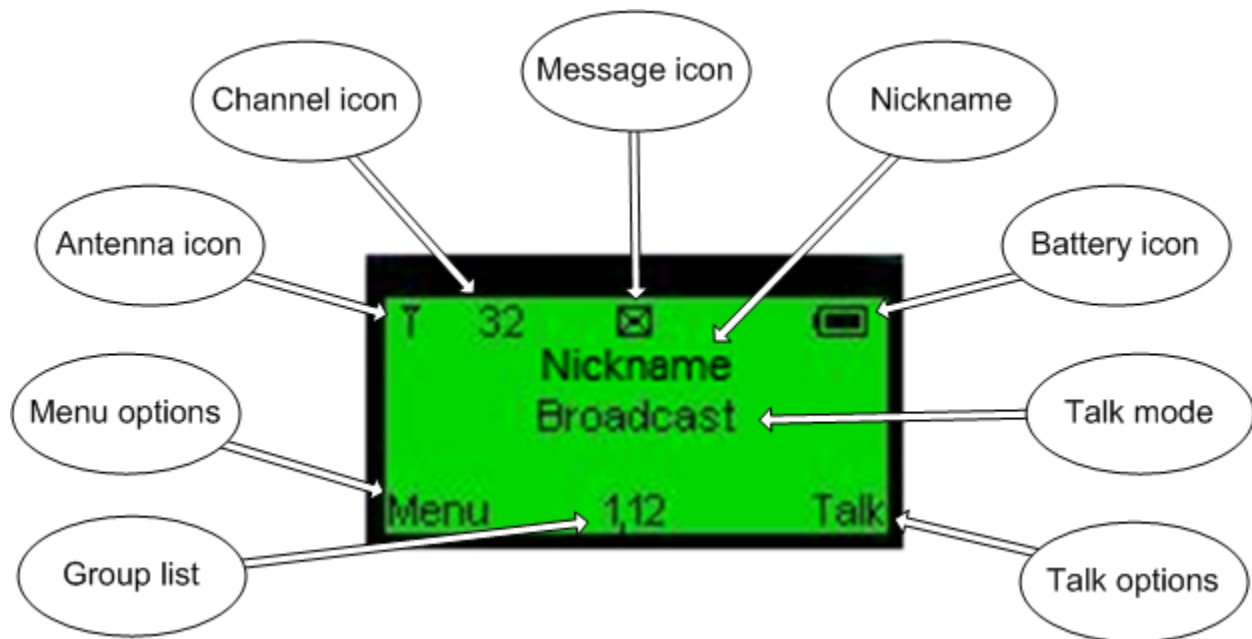
Figure 5 - Main Screen

In this illustration, the radio's nickname is *Nickname*, the radio is transmitting on channel 32, the transmission mode is Broadcast, there are two groups - 1 and 12 - in the Group list, the battery is fully charged, and it is connected to a mesh network (which is indicated by the antenna icon appearing in the screen). The message icon indicates that there is an unread text message in the inbox.

Display icons

Battery icon - Indicates the current level of battery power on a five graded scale.

Antenna icon - Indicates location of a valid Pathmaker network.

Messages (Reception) icon - Indicates message reception.

G, A, IP Gateway icons - Indicates the connection to external Gateway. G = GSM, A = Analog. IP = IP gateway.

GPS – Indicates GPS function.

⎕ Headset icon – Indicates headset attached.

⎕⊣⎕ Serial cable icon – Indicates connection of serial cable.

❖ Outgoing Broadcast call icon – Indicates outgoing broadcast call from the unit.

↕ Outgoing Group call icon - Indicates outgoing group call from the unit.

◆ Outgoing Private call icon - Indicates outgoing private call from the unit.

❖ Incoming Broadcast call icon – Indicates incoming broadcast call.

↕ Incoming Group call icon – Indicates incoming group call from one of the group members.

◆ Incoming Group call icon – Indicates incoming private call.

Function Keys

The function keys are indicated on the Menu screen as shown below:

Figure 6 - Function Keys

To open the menu options, press the left function key.

To open the talk mode options, press the right function key.

General Information

There are three general forms of communication when using the Pathmaker radio, voice, text, and data. Each of which is described briefly below. Step-by-step procedures are described in detail in below.

Voice Communications

Voice communications take place as they would using any general purpose transceiver. Once the communications channel and transmit mode (Broadcast, Group, or Private)

are set, press the push-to-talk (PTT) switch to transmit voice messages. Release the PTT to receive voice.

Text Communications

Text communications take place in much the same way as text messages are performed in common cell phones. Once the communications channel and transmit mode (Broadcast, Group, or Private) are set, use the main menu to select Messages and type the desired message.

Data Communications

Data communications include video and require connection to a computer using the USB cable. The computer, in turn, is connected to the data source such as a video camera. The Pathmaker is used to transmit the data to the next link.

Voice Communications

There are four levels of communications and they are called Talk Modes. Each Talk Mode has a defined priority over the other modes. The Talk Modes are Broadcast, Group, Private, and Priority. The terms refer to the transmit characteristics of a given mode. A given talk mode defines which network members are targeted to receive a message. It does not restrict reception from other radios.

For example, a radio in broadcast mode will be heard by any other radio that is using the same channel and is also in receive mode (PTT not pressed).

A radio set to the group talk mode will only be heard by radios in the same group.

A radio in private talk mode will only be heard by the radio selected for private communications. It is like a phone call.

In each of these cases, the transmitting radio will only be heard by radios that are in receive mode (PTT not pressed) and on the same channel. Other radios that happen to be transmitting at the time of the call are not affected until they are also in receive mode.

Priority mode is a special case of broadcast. The transmitting "commander" radio not only interrupts any currently received communication, it also disables the transmissions of any radios that are transmitting and places them into receive mode as long as the Commander's PTT is depressed.

Finally, the Group Prioritization mode may be thought of as a sub-set of commander mode. A radio may be set to interrupt both the receive and transmit of a number of radios in a group selected to had priority over another.

Operating Procedures

Selected basic operating procedures are shown below.

POWER ON/OFF

Power On

1. Press and hold the ON/OFF switch.

2. After a few seconds the Pathmaker screen will appear.

3. Release the ON/OFF switch.

4. The main screen will appear. Radio is ready to operate.

Power Off

1. Press and hold the power ON/OFF switch.

2. Shutdown confirmation screen will appear.

Shutdown ?

Ok   Back

3. Release the power ON/OFF switch.

4. Press and release the left function key to confirm shutdown.
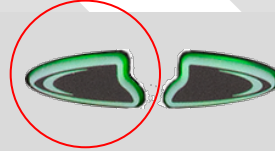
5. Shutdown screen is displayed. Radio will power off automatically.

Shutting Down

SELECTING A CHANNEL

1. Press and release the channel key.
    Marked with ⬦.

    This is the top third of the push switch.

2. The Select Channel screen will appear.

3. Rotate the rotary switch or press and release the scroll keys to select desired channel.

4. Highlight desired channel.
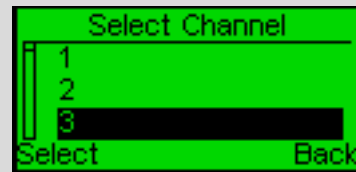
5. Press and release the left function key to save.
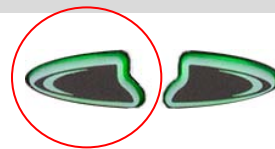
VOLUME ADJUST

1. Begin at main screen.

2. Turn rotary switch to adjust volume.

3. Adjust to desired level.
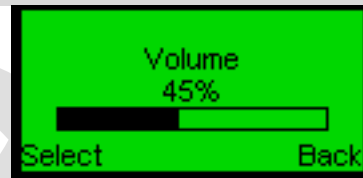
4. Press and release left function key to save or wait until display returns to Main screen.
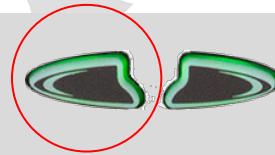
TALK SELECT USING MENUS

1. Start at the Main screen.

```
03  🔒🔓      0   🔋
        SEP
     Broadcast
Menu              Talk
```

2. Press and release right function key.
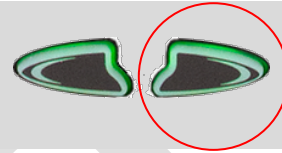
3. Talk Select menu screen is displayed.
   Examples:
   Broadcast – Talk with everyone on same channel.
   Group – Talk only with members of same group.
   Private – Talk only with individual identified by nickname.

```
           Talk
   Broadcast
   Group List
   Private List
Select            Back
```

4. Select desired talk mode using rotary switch or scroll keys.

5. Highlight desired talk mode.

```
           Talk
   Broadcast
   Group List
   Private List
Select            Back
```

6. Press and release left function key.
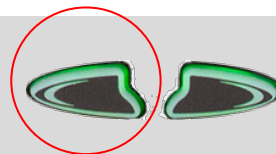
PUSH-TO-TALK

1. Press and hold center of Push-to-Talk switch.

Marked with: ═ It's the middle third of the push switch.

2. Speak into microphone.

3. Three left-facing arrows indicate Broadcast.

```
Y  03  🖵🖵        0     ▬
           SEP
      ⇕← Broadcast
Menu        1,2        Talk
```
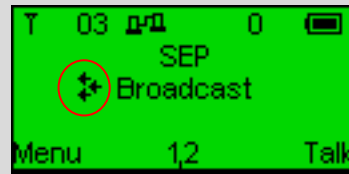
4. Two left-facing arrows indicate Group call.

```
Y  03  🖵🖵        0     ▬
           SEP
       ⇕ Alfa
Menu        1,2        Talk
```

5. One left-facing arrow indicates Private call.

```
Y  03  🖵🖵        0     ▬
           SEP
       ← OCT
Menu        1,2        Talk
```
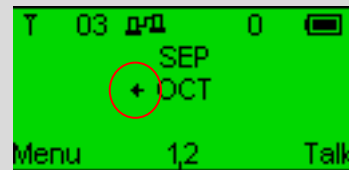
TEXT MESSAGE

1. Begin at main screen

```
03 ☐☐      0    ▭
       SEP
    Broadcast
Menu            Talk
```

2. Press and release left function key.

3. Use scroll keys to select.

```
       Menu
Messages
Settings
Select          Back
```
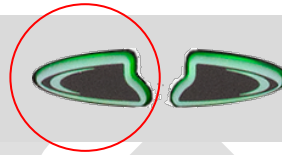
4. Press and release left function key.

5. Use scroll keys to select.

```
     Messages
Inbox
New
Templates
Select          Back
```
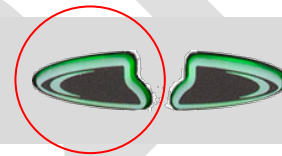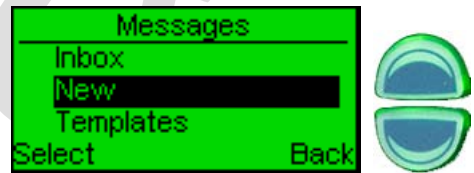
6. Press and release left function key.
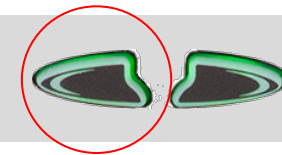
7. Type message using keypad.

```
        New
TEXT  MESSAG_

Options   ABC   Clear
```
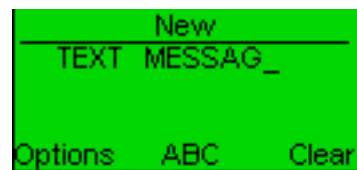
8. Press and release left function key.

9. Send message.

```
      Options
Send
Save
Clear text
Select          Back
```
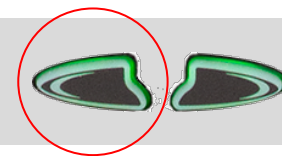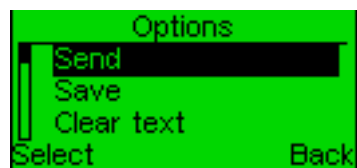
EDIT KEYS	
Backspace and delete	Punctuation Space Uppercase Lowercase Numerals

99-P42565K

Talk Screen Options

To enter the Talk screen, from the Main screen press the right function key. The Talk options are listed in the following table.

TALK SCREEN

This screen provides quick access to device communication options, presenting a selection of users, groups to talk to, GW networks, registering incoming/outgoing calls, units in panic, and configuring the communication interface according to your personal preferences.

Talk Menu Screen. This screen includes several options. Scroll to the desired option using the Up-Down/Rotary keys and select.

The Talk Menu map is shown below.

Prioritize Mode*	Broadcast	Prioritize Group*	Group List	Private List
			• Assigned Groups	• Radios in network

Units in Panic	Incoming calls	Outgoing calls
• Radios in panic	• Incoming call list	• Outgoing call list
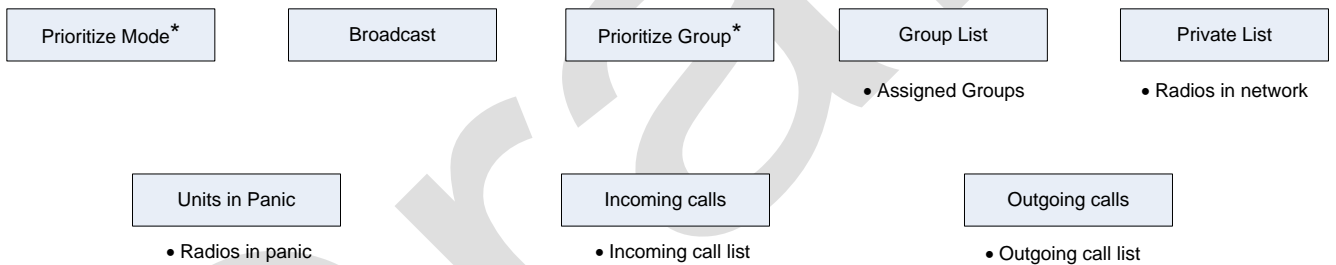
* Prioritize Mode and Prioritize Group menus are only visible if the Commander mode is set ON in the Technician menu.

Figure 7 - Talk Menu Map

The Talk options are listed in the following table.

Table 6 - Talk Options

1st level	2nd Level	Function
Prioritize Mode		Broadcast session overwrites any other sessions on the network
Broadcast		Talk session to all units in the network
Group list	Displays the list of groups the unit is related to	Select a group from the list. Talk session to units related to a selected group.
Private list	Displays the list of participants in the network	Select participant from the list. Talk session to selected unit.
Units in Panic	Select	Displays the units in Panic mode. Select a unit to private talk
Incoming calls		Displays incoming calls
Outgoing calls		Displays outgoing calls

SHORTCUTS

Several shortcuts are available to speed navigation of the menus.

P1 - Broadcast

P2 - Private list / phone call answer

P3 – Group list /phone call end

Push Switch (above Push-to-talk switch) – Displays channel list when in main menu screen.

Power ON/OFF – Momentary depress to go back to main screen.

99-P42565K

Note:

The Rotary switch can be used to set volume levels, scroll through menu options, and scroll channels depending on which screen is displayed. If the Main Screen is displayed, it will control volume. If a menu screen is displayed it will control navigation to menus. If the list of channels is displayed, it will control which channel is selected.

PRIORITIZE MODE

To operate in this mode enter **Settings > Technician** and set the unit as **Commander On**.

In **Talk** mode select **Prioritize Mode**. On the Main menu you are informed that the unit operates in this mode.
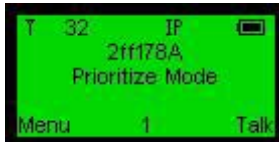
Any broadcast, group, or private call sent from the unit operating in this mode overwrites all other sessions in the network.

BROADCAST

Messages will be sent to all radios on the same channel.

Sets the unit in Broadcast mode (default communication mode) and returns to the **Main** screen. Pressing the **PTT** will broadcast (voice or data) through the network.

GROUP LIST

Selecting this option will limit your conversations to your group members only.
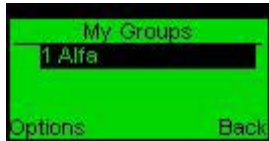
The group list will be displayed only if you have groups listed in the **My Group** list. Pressing the **PTT** will connect you (voice or data) with your group members only.

PRIVATE (POINT TO POINT)

Private selection screen presents a list of existing network nicknames which are part of network coverage at a given moment.
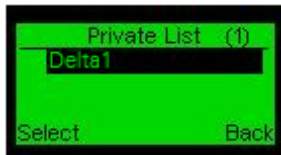
Call destination selection screen.

To select a call destination, scroll to the desired nickname and press **Select**. The display will return to the **Main** screen showing your interlocutor.

Main screen showing outgoing private call.

UNITS IN PANIC

Panic mode

In **Panic** mode, the communication mode of the unit is set to continuous broadcast of a panic alarm signal and stays in that mode until the communication mode is manually changed. This mode does not disrupt the regular communication functions (incoming/outgoing voice communications).

To activate panic mode, press and hold down the **panic** button (red button on top of the unit). The screen indicates panic pressed.

When in "panic pressed" status, all units will automatically change to **Panic** screen displaying the list of units in **Panic** mode. Panic mode overrides groups and private modes.
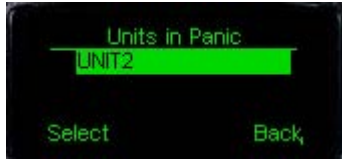
You may establish a private call with a unit from the list by selecting it.

Units in Panic screen appears on your unit (black background), showing the list of all units in panic.

Selection of a unit returns the display to the **Main** screen, switching the communication mode to **Private**, with the selected unit.

To deactivate **Panic** mode, again press and hold down the P**anic** button. This will return the display to the **Main Menu** screen via the **Panic released** screen.

INCOMING AND OUTGOING CALLS

Incoming Calls screen allows you to select from among the last 10 incoming calls for calling back. It is a very convenient way to reply to a private call.

From the Main Screen, press the right function key and select Incoming calls.

OUTGOING CALLS

The Outgoing Calls screen allows you to view or select from among the last 10 outgoing calls to repeat the call.

From the Main Screen, press the right function key and select Outgoing calls. Pressing the **Answer** button from the **Main** screen will get you to the Outgoing calls screen as well.

Using the Pathmaker Radio

The Pathmaker radios can be set to function as a general User, Commander, Relay and Bridge device, depending on a given scenario.

User – The User function is the most common. No special setup is required other than selecting a channel and pressing the PTT switch for voice communications in the Broadcast, Group, or Private modes. Text messaging is also performed in this mode of operation. To send a text message, from the Main Screen, press the left function key and then select New to enter the desired text.

Commander – The radio designated as a Commander has voice priority of all other radios in a network. No matter what other voice communication is taking place (Broadcast, Group, or Private) the Commander's message takes priority.

To set a radio as a Commander, from the Main Screen select **Settings** > **Technician** > **Commander ON**.

Relay – Any radio can automatically serve as a relay device without user intervention. However, in some scenarios, it may be beneficial to designate an unattended radio as a relay to connect other members of a network who are otherwise out of range. In this mode, the radio keyboard is locked, the display and LED are dimmed and the volume is muted.

To set a radio as a relay station, from the Main Screen select **Settings** > **Technician** > **Drop Down** > **ON**.

Main Screen

INCOMING AND OUTGOING CALLS

Incoming calls are displayed on the **Main** screen as follows:

Incoming Broadcast Call On Main Screen

Incoming Private Call On Main Screen

 Incoming Group Call On Main Screen

The LED will become green when an incoming call is received.

Outgoing calls are displayed on the **Main** screen as follows:

 Outgoing Broadcast Call On Main Screen

 Outgoing Private Call On Main Screen

 Outgoing Group Call On Main Screen

When pressing the **PTT** or when voice transmission is activated, the LED indicator turns red.

MENU SCREENS

In the main screen, press the left function key. Two options are available, Messages and Settings.

The **Menu** screen lists the options. Scroll to the desired option and press **Select** (left function key).

MESSAGES

Pathmaker can send and receive short user inputs and predefined messages through the network and external interfaces. The predefined messages are listed in the Templates screen. Newly received messages are saved to the Inbox**.**

The following table lists the menu options.

Messages Menu Options

1st level	2nd Level	3rd Level	Function
Inbox	Option	Select	View incoming messages
		Details	Details of a message
		Send	Send a message
		Erase	Erase a message
		Erase All	Erase all messages
New	Option	Send	Send a message
		Save	Save a message
		Clear text	Clear a message
		Back	Back to the previous level
		Exit	Exit menu options
Templates			Any message which can be used as a template

MESSAGE MENU SCREEN

Select *Messages* from the main **Menu** screen.
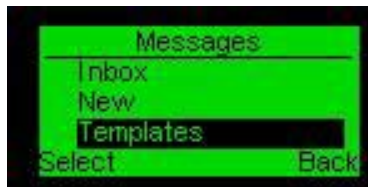
Messages Menu Screen
Select the appropriate message format (*Inbox* for incoming messages, *New* for outgoing message and **Templates** for sending predefined outgoing message).

Messages Received Screen.
When a message is received, the Message (reception) icon will pop up. Go to **Inbox** to view the message.

If the message is received, a small envelope-shaped icon is displayed.

MESSAGES - INBOX

MESSAGES – INBOX - OPTIONS

This screen allows you to manage your messages.

To display the message (new or template), choose **Select.** Select **Details** to view received message details. The **Details** screen will appear.

Choose the **Send** option in case you want to forward the message. A window showing you the sending modes (Broadcast, Group, and Private) will appear, allowing you to choose the sending mode. After sending, you will see a sending completion notification on the screen.

To erase the message, choose **Erase**. The inbox message will be erased. Use **Erase All** for all inbox messages.

Select **Back** to return to the **Inbox** screen or press the **END** button to return to the

main screen.

To display the message (new or template), choose **Select**. Select **Details** to view received message details. The **Details** screen will appear.

MESSAGES - OPTIONS - DETAILS

This screen shows inbox message **Sender**.

Inbox Message Details Screen.

MESSAGES - OPTIONS - SEND

This screen shows the sending modes list. Select the relevant mode for sending your message.

Inbox Sending Modes Screen

MESSAGES - NEW

This screen allows you to compose new messages.
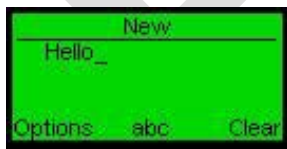
	New Message Screen.
	To compose a message, use text buttons. You are limited to 160 characters at the most.
	Use the **pound** key "**#**" to change between "ABC" - signing the upper case letters, "abc" - signing the lower case letters and "123" - signing the digits from 0 to 9. Use the asterisk key "*" to add symbols.
	Use the **Clear** option to erase text.

MESSAGES – NEW - OPTIONS

The **Options** screen allows you to manage the newly-written message.
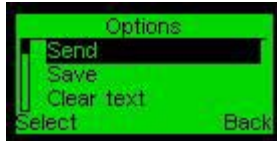
New Message Options Screen

Use **Send** to send the message out. A screen with sending modes will appear (choose the sending method – Broadcast, Private or Group). After sending, you will see a sending completion notification on the screen.

Use **Save** to save the message to the list of templates.

Use **Clear text** to clear message text and go back to *"***New***" message* screen.

Use **Exit** to return to Main screen.

Press **Back** to go back to the **New** message screen.

MESSAGES - TEMPLATES

This screen contains a set of predefined messages saved by the user. Every newly-saved message will appear as a template.
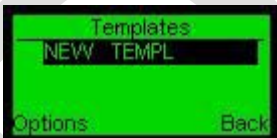
To add a message to the Template list, go to Messages > New. Create the message and then press Options > Save. The text will be saved to the templates list.

Scroll up/down to the desired message using the **up-down/rotary** keys, and press *Options* (left function key). The **Options** screen will appear.

MESSAGES - TEMPLATES - OPTIONS

This screen allows you to manage your template message(s).

Template Options Screen.
To view the template message, choose **Select**.

To send the message, choose **Send**.

A screen with sending modes displays (select the sending method – Broadcast, Private or Group). After sending, you will see a sending completion notification on the screen.

To erase the message, choose **Erase**. The template message will be erased. Use **Erase All** to erase all template messages.

Press **Back** to return to the templates.

Settings

The **Settings** screen allows you to configure various device settings; Accessibility settings - such as interface language, themes, display fonts, contrast, volume and a MIC sensitivity option; advanced settings such as Nickname, My Groups, Add Group, Radio Channel, Serial interface Baud rate, Matrix of the network, Dark mode, Save mode and Technician mode.

Settings Screen.
Scroll to the desired option and use the *Select* option.

Edit Nickname	My Groups	Add Group	My VLANs	Add VLAN	Matrix
• Edit Screen	• Assigned Groups	• Group List	• Assigned VLANs	• VLAN List	• Matrix Screen

GPS	GPS Setup	Com Ports	Accessibility	Save Mode on/off	Dark Mode on/off
• Coordinate Screen	• Interval • GPS GW/Type EP • GPS On/Off • Distribute On/Off • Send PC On/Off	• RS232 • USB	• Language • Contrast • Volume • MIC Sensitivity		

Voice FB on/off	Alert Tones	Select Channel	Remote Update	Technician	About
	• Panic on/off • Busy on/off • Out of Service on/off • Net Join on/off • Sms on/off • Power Up on/off • Power Down on/off • Volume on/off • Low Battery on/off			• Select channel • Edit Groups • Remote Update ► • Master Reset • BER Meter ► • Listen Mode on/off • Key Locked on/off • Drop Down on/off • Emergency on/off • PTT auto/on/off • Crypt ► • Show ID on/off • Commander on/off • GW Sound on/off • Matrix Setup ► • Debug Level ► • Compilation Date • About	

NOTE: The ► symbol indicates additional menus.

Figure 8 - Settings Menu Map

Table 7 - Settings Menu Options

1st level	2nd Level	3rd Level	Function
Edit Nickname	Option	Set Back	Set nickname. Back one level.
My Groups	Displays list of groups currently assigned to the radio. Max of two.	Prioritize (Only if Commander mode is set ON.) Delete Selected Group	Prioritize selected group. Cancel assignment of the selected group.
Add Group	Displays list of all groups.		Displays list of groups can be related to. Max of two.
My VLANs	Displays list of VLANs currently assigned to the radio. Max of two.		
Add VLAN			Displays list of VLANs can be related to. Max of two.
Contact List *	Options	New	Add new contact to the list
		Delete	Delete contact from list
		Edit Name	Edit selected contact name
		Edit Number	Edit selected contact number
		Info	Contact Information

1st level	2nd Level	3rd Level	Function
		Send Contact	Send contact information to other units in the network
Matrix	Scroll between the 4 displays		Display network connectivity with other units
GPS			Displays location coordinates
	Info		Displays list of received satellites
GPS Setup	Interval		GPS data transmit in seconds. Range from 4 to 250 seconds.
	GPS GW Type EP		Set the device as GPS GateWay or EndPoint *
	GPS ON/OFF		Toggle switch turns the device GPS option On or Off
	Distribute ON/OFF		Toggle switch turns the device GPS distribute option On or Off
	Send PC ON/OFF.		Toggle switch turns the GPS data transmit to PC option On or Off

* The radio can function as GPS Gate Way or End Point.
Gate Way transmits GPS data of all devices connected to the network at preset intervals (in seconds) to the PC.

End Point transmits GPS data only of his location to the PC at preset interval.

1st level	2nd Level	3rd Level	Function
Com Ports	RS-232 USB	Baud rate	921600 default
		Loopback ON/OFF	Activate Local Loopback. Test purposes only.
		Alarms ON/OFF	Activate transfer of alarm messages via USB
		Activate ON/OFF	Activate USB communication port
Accessibility	Language	English	Select from list
	Contrast		Set the contrast of the display
	Volume		Set the volume of the speaker
	MIC Sensitivity		Set the sensitivity of the microphone. Maximum recommended setting is 75%.
Save Mode ON/OFF			ON – If device is not used for 13 sec, display will be dimmed OFF – display illuminated continuously
Dark Mode ON/OFF			ON – No display illumination OFF – display illuminated continuously unless Save Mode is set ON. (See above.)
Voice FB ON/OFF			Activate audible channel feedback

| 1st level	2nd Level	3rd Level	Function
Alert tone	Busy ON/OFF		Activate tone when the called party is busy
	Out service ON/OFF		Activate tone when the called party is out of network service
	Net Join ON/OFF		Activate tone when the unit joins network (get ID from the network)
	SMS ON/OFF		Activate tone when text message (SMS) is received at the unit
	Power Up ON/OFF		Activate tone when the unit turns on
	Power Down ON/OFF		Activate tone when the unit turns off
	Volume ON/OFF		Activate tone when volume level changes
	Low Battery ON/OFF		Activate tone when battery voltage passes low threshold level. What is the threshold?
Select Channel	1 – 40 channel range		Select channel from the list

1st level	2nd Level	3rd Level	Function
Technician			Enter code to access technician menu
About	HID NID ** SW HW		Hard ID of the unit Network ID of the unit Software version Hardware version

*Contact list provides information and ability to communicate with GSM or legacy networks via relevant gateway.

** The unit can operate with devices of the same NID.

SETTINGS - EDIT NICKNAME

Nicknames are used to uniquely identify a given radio. Nicknames are optional but greatly enhance user identification. This screen assists you with creating and editing a nickname.
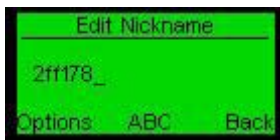
Edit Nicknames Screen.

Enter a Nickname for your unit by using the text buttons. Use # button to change between "ABC" - enters the upper case letters, "abc" - enters the lower case letters and "123" - enters the digits from 0 to 9. To erase text use the **down scroll key**.

Use the **Back** option to return to the **Settings** screen.

Select **Options** to set or cancel your nickname.

SETTINGS - EDIT NICKNAME - OPTIONS

This screen allows you to **Set** or **Cancel** the setting of the nickname you entered.

Nicknames Options Screen
Choose the option and press **Select.** The **Back** option will return to the **Edit Nicknames** screen.

Use the **Back** option to return to the **Settings** screen.

Use **Scroll down Key** for "Clear character" function.

SETTINGS - ADD GROUP

Groups are used for selective voice communications with other members of the same group. This screen assists you to add groups to the **My Groups** list.
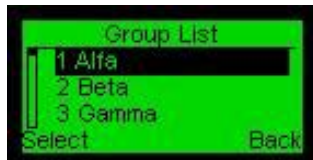
Add Group Screen. Add the group by selecting it from the list. Membership in a maximum of two groups is allowed. The group list is editable in the Technician menu, which is described below. The **Back** option will bring you to the Setting screen.
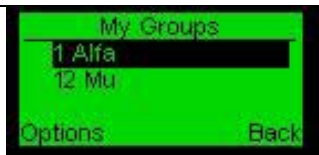
Group List Full Notification. If there are already two groups listed and you intend to add an additional group, "*List is full*" notification is displayed.

The **My Groups** screen will automatically display, allowing you to delete a group from the list to make room for other groups to be added.
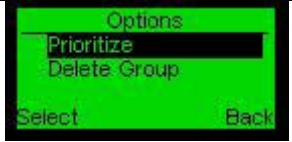
SETTINGS - MY GROUPS
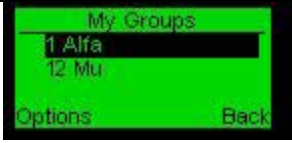
This screen allows you to see the groups you belong to. You can be part of at most two groups at a time.

|	
My Groups 1 Alfa 12 Mu Options Back	My groups screen showing the two groups this radio belongs to.

		Upon becoming a group member, **Group List** will be added automatically to your **Talk** screen menu, and the added group numbers will appear on your main screen.
		My Groups Options Screen. Entering the **Options** screen allows you to prioritize one of the groups, or delete it from the **My Groups** list. Pressing the **Back** option will take you back to the **Menu** screen**.**
		In order to communicate with your selected group members only, enter the **Group List** from the **Talk** screen or press P3 (group list shortcut key) and choose the desired group.

Note:

If a unit must not be part of a group, the **My Groups** list can be empty. Being part of a group will allow **Group** communication mode within the network.

SETTINGS – MY VLANS

VLANs are used for selective data communications (such as video) with other members of the same group. VLANs are used with data communications in much the same way Groups are used for voice communications. Up to two VLANs may be assigned to a given radio.
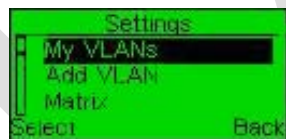
To see a list of assigned VLANs, Select My VLANs.

My VLANs Screen, This screen displays the list of active VLANs. Scroll down the screen to view the list and then select the relevant VLAN. To remove a VLAN select **Delete**.


Add VLANs Screen, This screen assists you to add more VLANs to the My VLANs list. To add a VLAN, select Add VLAN, scroll to the desired VLAN and press the Select (left) function key.

SETTINGS - CONTACT LIST

If your Pathmaker network is connected to a legacy network via GSM gateway, you can enter any phone number and save it for future options.

Note:
For this feature to function as described, the call function must be operational and the GSM gateway must be connected.
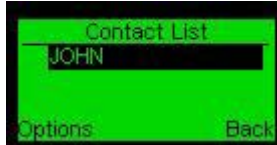
Contact List Screen. The **Contact List** holds the all phone numbers and names associated with the phone number.

Contact List Options Screen. Select **Options** to access further options from the list.
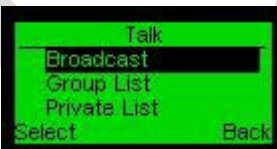
New: Add a new number or name to the list.

Delete: Delete a number or name from the list.

Edit Name: Select any name from the list to edit it.

Edit Number: select any number from the list to edit it.

Info: Displays information about a selected entry.

Send Contact: Select the mode of transmission from the list.

Send Contact Screen. The options are:

Broadcast: Sends a message to all radios within Broadcast range.
Group List: All radios associated with that group on the network will receive the message.

Private List: Only the radio with selected nickname will receive the message.

SETTINGS – MATRIX

This screen displays the connectivity map of your network.

Matrix screen. The network units are displayed in boxes. Units with black background are relay stations and units with white background are regular stations. The number of units in the Network is the number of boxes which appear in the **Matrix** screens.

You can browse **Matrix** screens using the Left function key. There are four screens, each showing 8 devices. The matrix screens display up to 32 units in your network.

You can recognize your unit by **me** beneath the box representing your unit, (icon numbered "0" in this case). The number in the box displays the ID number of the unit in the network.
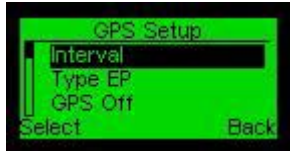
SETTINGS – GPS

GPS information can be viewed and managed using the GPS and GPS Setup menus.
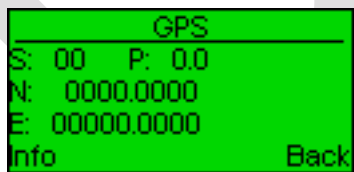
Select GPS to display the current coordinates.
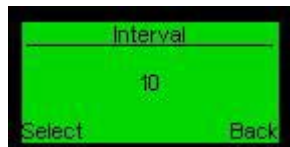
SETTINGS – GPS SETUP

The following GPS Setup screens assist you to handle the GPS setup and GPS functionality of the device.

Scroll down the list to select the appropriate action.

SETTINGS – GPS SETUP - INTERVAL

This screen enables you to set the time interval (in seconds) the device transmits its position to the other devices in the network and to the PC.

Select Interval   on the previous screen then apply the Scroll keys to set the time interval and then press Select.

SETTINGS – GPS SETUP - GPS GW/ EP TYPE

This screen sets the GPS data kind functionality of the device.
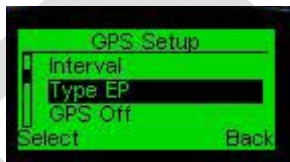
GPS GW/Type EP screen. Gate Way transmits GPS data of all devices connected to the network at preset intervals (in seconds) to the PC.

End Point transmits GPS data only of this location to the PC at preset interval.

SETTINGS – GPS SETUP - GPS

This screen assists you to turn On or Off the GPS module of the device.

GPS On/Off Screen.

- If GPS function is On, the main screen displays the satellite ✴ icon.
- The phantom view icon indicates that the GPS module is on but not "locked to a satellite".

- The icon turns to into black after locked to a satellite.

SETTINGS – GPS SETUP- DISTRIBUTE ON/OFF

This screen assists you to stop or start GPS data distribution toward other devices in the network.
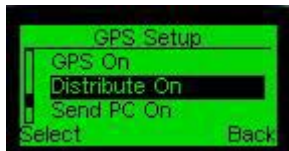
- Distribute On – GPS coordinates are sent to all other units in network.

- Distribute Off - GPS coordinates are not sent to all other units in network.

SETTINGS – GPS SETUP- SEND PC

The collected GPS data can be forwarded to a PC.
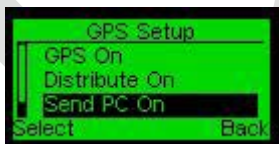
Turn the option to On to activate this function. Connect the radio to the PC over the USB cable.

SETTINGS – COM PORTS

Select the applicable serial communication port and connect the cable. The USB receptacle is located on the top of the unit.

Com Port Selection Screen. Use this screen to set the USB or RS-232 port.

Port Options Screen. After you select the applicable port, the **Port Options** screen displays.

Select the applicable option from the list.

Baud Rate Adjustment Screen
The baud rate screen allows you to set the serial baud rate of the unit.

The baud rate settings are used for data and gateway voice/data communications. The default is 921600. Use the default Baud rate the first time you use the device.

Loopback is a test function only and sets the local loop back of the unit on or off.

Alarms can be set on or off.

To activate the selected port, set this option on.

SETTINGS - ACCESSIBILITY

The accessibility settings allow you to configure the unit for convenient utilization.

Accessibility Screen. Available settings are:
- Language
- Contrast
- Volume
- MIC Sensitivity

Settings - Accessibility - Language
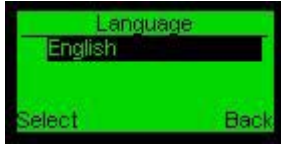
Language Screen. This screen allows you to select the device interface language. For this version it is English.

Settings – Accessibility - Contrast
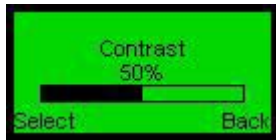
Contrast Screen. This screen allows you to set the contrast of the display.
Select this option and set the contrast by rotating the rotary switch.

Settings – Accessibility - Volume

Volume Screen. This screen allows you to set the volume of the speaker.

Select this option and set the volume by rotating the rotary switch.

Settings – Accessibility - MIC Sensitivity

Microphone Sensitivity Screen. This screen allows you to set the sensitivity of the microphone. Select this option and set the volume by rotating the rotary switch.

Maximum recommended setting is 75%.

SETTINGS - SAVE MODE

This option allows you to turn on the **Screen Saver Mode** of the unit in order to reduce your battery power consumption.

Save Mode Option. In this mode, the screen will be dimmed automatically after 13 seconds if during this period no keys (Keypad keys, Rotary button, Panic button, and Push button) are pressed.
The screen will turn back on after you press any key.

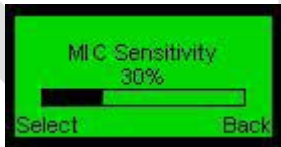When turned on, the **Save Mode** option will display **on**, when turned off, it will display **off**. To turn the mode on or off, select it in the **Settings** screen.

SETTINGS - DARK MODE

This option allows you to turn the **Dark** operation **Mode** of the unit on or off. To do so, select it in the Settings screen.

Dark Mode Option. When turned on, the Dark Mode option will display on, the screen will be dimmed, and the LED indicating incoming and outgoing calls will be turned off.

When turned off, the **Dark Mode** option will display **off**, and the screen brightness will follow the settings of the **Save Mode**.

SETTINGS - VOICE FB

This menu option enables voice feedback indicating when the channel is changed.

Voice FB Screen. Set the menu option to on or OFF as applicable.

SETTINGS - ALERT TONES

You can activate various audible alert tones listed on this screen.

Alert Tones Screen. Press the left function key to set the option to on to enable the alert.

- **Busy** – when the called party is busy. Alerts the sender when the sender makes a private call to the called radio and the called party is already in a call**.**
- **Out of service** – when your device is out of service.
- **Net Join** – when your unit joins the network.
- **SMS** – set to on to enable reception of text (SMS – Short Message Service) messages.
- **Power Up** – when the unit is turned on.
- **Power Off** – when the unit is turned off.
- **Volume** – when on you can listen to changes each time the volume control button is turned to the left or right.
- **Low Battery** – when on, you are alerted if the battery charge level becomes low.

SETTINGS – SELECT CHANNEL

This screen is used in selecting a unique radio channel.
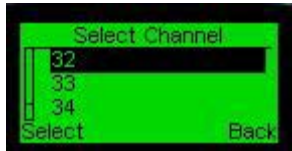
Channel Selection Screen. Pathmaker system can operate on 40 different channels. You can select any channel from 1 to 40. You can use the scrolling keys or the volume control to select the desired channel.

In order to set up a network, all units must transmit on the same channel.

The **Push** switch ( ) serves as a shortcut key to this screen from the Main menu screen.

SETTINGS - TECHNICIAN

This screen is used for internal system administrator settings, network complex calibration settings, etc. This screen is password protected. When the screen displays, enter your password within 30 seconds and then press **Select**.
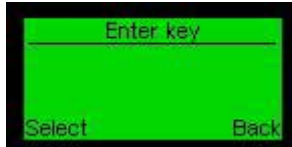
Technician password enter screen.

The menu options are listed in the following figure and table.

Select channel	Edit Groups	Remote Update	Master Reset	BER Meter	Listen Mode on/off
• Channel Screen	• Groups List	• Receive Update • Transmit Update	• Confirmation	• Transmit • Receive • Transmit FEC • Receive FEC	

Key Locked on/off	Drop Down on/off	Emergency on/off	PTT auto/on/off	Crypt	Show ID on/off
				• Crypt Key • Crypt Data on/off • Crypt Voice on/off • Crypt Statistics	

Commander on/off	GW Sound on/off	Matrix Setup	Debug Level	Compilation Date	About
		• Matrix On/Off • RSSI On/Off	• None • Debug • Errors • Warnings • Info • All		

Figure 9 - Technician Menu Map

TECHNICIAN SUB-MENU OPTIONS

1st Level	2nd Level	Function
Select Channel	1 to 40 channel range	Select channel from list
Edit Group *	List of groups	Select group name to edit
Remote Update**	Receive Update Transmit Update	Set all units to be updated to Receive Update mode Set one unit with updated firmware to Transmit Update mode
Master Reset		Reset the unit to default parameters
BER Meter***	Transmit Receive Transmit FEC (Forward Error Correction) Receive FEC	Transmission without FEC Receive without FEC Transmission with FEC Receive with FEC
Listen Mode ON/OFF ****		Off normal operation On listen only to the network
Key Locked ON/OFF		Off normal operation On the unit is automatically locked when turned on
Drop Down ON/OFF *****		Off normal operation On drop down station
Emergency ON/OFF		Off no panic function On panic enabled
PTT auto ON/OFF		Auto PTT enabled only if no headset connected Off no PTT at the unit ON PTT enabled

1st Level	2nd Level	Function
Crypt	Crypt Key	16 character alpha-numeric key.
	Crypt Data ON/OFF	Enables or disables data encryption.
	Crypt voice ON/OFF	Enables or disables voice encryption.
	Crypt Statistics	Displays encrypted Voice and data packets sent & received in unit.
Show ID ON/OFF		Off - ID of the unit not displayed on main screen. On - ID displayed on main screen.
Commander ON/OFF		Off - Normal operation On - Prioritized mode enabled.
GW Sound ON/OFF		Off no sound. On sound enabled. Activate only on Bridge Unit connected to gateway.
Matrix Setup	Matrix ON/OFF	Display of the Matrix ON/OFF
	RSSI ON/OFF	Display RF reception parameters of the units received.
Debug level	None	Set level of the debug tool No printout
	Errors	Error messages only
	Warnings	Warning and error messages only
	Info	Info warning and error messages only
	All	All messages

1st Level	2nd Level	Function
Compilation Date		Displays date of compilation
About	HID NID SW HW	Hard ID of the unit Network ID of the network Software version Hardware version

Notes:

* Edit group should be executed on all units related to the operating network.

** The minimal distance between transmit and receive unit should be 1.5 meters. Transmit unit must be in line of sight with the receive units. All units must be on the same channel.

*** BER (bit error rate) tests the quality of RF reception between two units. Test can be executed with FEC (Forward Error Correction) or without. Both units have to be on the same channel and on the same mode (FEC / no FEC).

**** Unit in listen mode receives information from directly received units depending on network condition.

***** When this function is activated, the display and LEDs dim, keyboard locks and volume mutes. (In this mode the unit serves usually as a relay station).
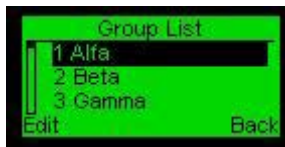
TECHNICIAN - SELECT CHANNEL

All radios must be on the same channel to communicate.
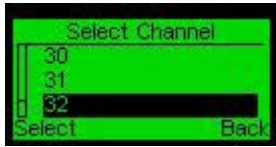
Channels are numbered from 1 to 40. Select the appropriate channel and press **Select**. The number of the selected channel will be displayed on the main menu.

TECHNICIAN - EDIT GROUP

This screen displays the list of group names which can be edited further.

Group names must match in order for the radios to communicate in a group. If a given group name is changed in one radio, the name of the same group has to be changed in all units related to same network.

TECHNICIAN - REMOTE UPDATE

This screen is used to update the firmware version.
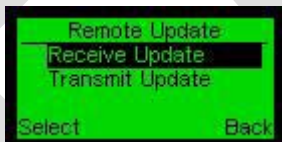
Select a separate channel for all units to be updated.

On units to be updated, select **Receive Update** and then press **Select**.

Select an updated unit with the relevant firmware version, set it to **Transmit Update** and then press **Select**.

There should be a minimum distance of 1.5 meters between the transmit unit and the receive units. Verify that line of sight exists between transmitting unit and receiving units.

TECHNICIAN - MASTER RESET

This screen is used to reset the unit to its default parameters.

Press **Confirm** to endorse the reset operation of the unit to its default version parameters.
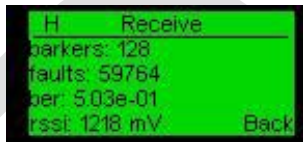
TECHNICIAN - BER METER

This screen is used to check the quality of RF reception without correction or in FEC mode with correction.

To initiate the BER (Bit Error Rate) test, set one unit to **Transmit** mode and the other unit to **Receive** mode.

Select **Transmit** to view the transmit Baud rate.

The test results are displayed on the receiver unit.

To initiate the FEC (Forward Error Correction) test, set one unit to **Transmit** mode and the other unit to **Receive** mode.

Note:

Verify that both units are on the same channel and mode (with or without FEC).

TECHNICIAN - LISTEN MODE ON/OFF

The unit in **Listen** mode cannot transmit and does not relate to the network structure. It will not be displayed on the MATRIX of the units in the network.

Unit in **Listen** mode receives information only from directly received units depending on network condition.

This menu option functions like a rotary switch.

OFF – unit operates in normal mode.

ON – the unit can listen only.
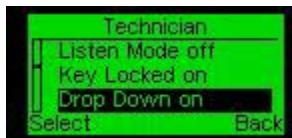
TECHNICIAN - KEY LOCKED ON/OFF

This menu option functions like a rotary switch.

OFF – the keyboard is not locked.

ON – the keyboard is locked

TECHNICIAN - DROP DOWN ON/OFF

This menu option functions like a rotary switch.

OFF – The unit operates normally.

ON – The unit functions as a relay station and the keyboard locks.

TECHNICIAN - EMERGENCY ON/OFF

This menu option functions like a rotary switch.

OFF – panic function disabled

ON – panic function enabled

TECHNICIAN - PTT – AUTO/ON/OFF

This menu option functions like a rotary switch.

Auto – push-to-talk enabled only if no headset is connected

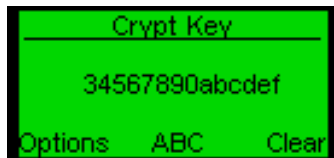**OFF** - push-to-talk disabled

ON - push-to-talk enabled

TECHNICIAN – CRYPT (ENCRYPTION)

These screens are used enable & configure encryption of voice or data transmitted in the network.

Select Crypt to enter encryption settings.

Crypt Key – 16 characters key -Used for all encryption (Voice & data) – must be the same for all network.

Crypt data OFF – Transmitted Data is not encrypted.

Crypt data ON – – Transmitted Data is encrypted.

Crypt Voice OFF – Transmitted Voice is not encrypted.

Crypt Voice ON – Transmitted Voice is encrypted.

Displays encrypted voice and data packets sent & received in unit.

E-D – Encrypted data.

E-V - Encrypted voice.

D-D - Decrypted data.

D-V - Decrypted voice.

TECHNICIAN - SHOW ID ON/OFF

Unit ID is determined by the order in which a radio enters the network.

This menu option functions like a rotary switch.

OFF – Unit ID is not displayed on the main menu.

ON - unit ID is displayed on the main menu

TECHNICIAN - COMMANDER ON/OFF

This function must be set to on to enable the Prioritize function in the talk menu. This menu option functions like a rotary switch.

OFF – Normal operation

ON – The radio's transmissions take priority over any others in the network.

TECHNICIAN - GW SOUND ON/OFF

This menu option functions like a rotary switch.

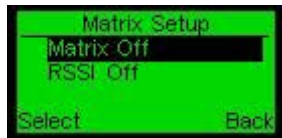When the radio operates as a bridge unit, the sound can be turned off.

OFF – sound is disabled

ON – sound is enabled

TECHNICIAN - MATRIX SETUP

You can select the following options:

- Matrix (Displays units and their functionality in the network)
- RSSI (Displays receive signal parameters)

When **Matrix** is set on, letters in the boxes display the functionality of the units as listed in the Matrix Code below.

	Matrix code **R** – relay station **O** – the unit contacts you via the relay station (you do not see the unit directly) **M** – main relay station (best connected relay node) **L** – transmission from this unit is received but is below the required reception level and consequently cannot be part of the network **N** – transmission from this unit is received but it cannot be part of the network due to limitations of the network. **Note**: Units displayed by an empty box indicates that the unit functions normally (not as a relay) and receives transmissions directly.
	When **RSSI** is set on, the receive signal parameters are displayed. The top left digits represent the number of packets directly received from a possible last 9 packets window. The top right digit represents the quality of the link used to communicate: 3 is the best, 0 is no link. The character in the middle (L or H) represents the state of the low noise amplifier. H - the amplifier is operational, L - the amplifier is not running, in order to avoid signal compression when the units are close to each other. The lower digits show the Received Signal Strength value (0 - 750 possible) of the signal received from this unit.

	In this view both Matrix and RSSI are On. To view complete network picture both Matrix and RSSI should be on.

TECHNICIAN - DEBUG LEVEL

This menu options enable setting the level of the debug operation.
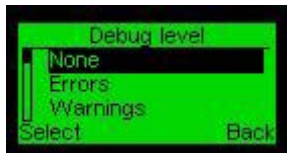
Select one of the following options:

None – no debug

Errors – show errors only

Warnings – show warnings only

Info – show information only

All – show all of the above

TECHNICIAN - COMPILATION DATE

This menu option shows the date of the last compilation.

TECHNICIAN - ABOUT

This screen shows firmware versions.

HID (Hardware ID) is the unique unit identification number.

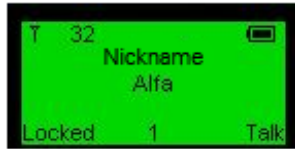**NID** (Network ID) is the unique unit identification number.*

SW is the software version of the unit.

HW is the hardware version of the unit.

- The radio can operate with devices of the same NID.

LOCK/UNLOCKING THE KEYPAD

To Lock/Unlock the keypad, press "*" and then "#".

When the keys are locked, the **PTT** button remains active.

MAINTENANCE

The maintenance concept for the Pathmaker radio consists of removal and replacement of faulty parts such as the antenna, battery, belt clip, earphone, or USB cable at the organizational level. The radio has no serviceable parts. Do not disassemble the device. Radios requiring repair must be returned to General Dynamics for repair.

The Pathmaker radio assembly kit, part number 01-P42559K001 consists of the following replaceable parts:

Table 8 - Replaceable Parts

Description	Part Number
Assembly, Pathmaker Radio	01-P42558K001
Antenna, 2dB 2.4GHz Omni Direction	85-P42580K001
Battery, Pathmaker	60-P42581K001
Belt Clip, Pathmaker	42-P42582K001
User Documentation, Pathmaker Network Radio	99-P42565K

Preventive Maintenance

Preventive maintenance consists of inspection of the radio's surfaces, contacts, and connectors for damage or contaminants.

Clean the unit's exterior using a clean, lint-free cloth moistened in a solution of mild household detergent and water. Follow this by wiping down with a clean, lint-free cloth moistened in clean water, and then wipe dry. Never use harsh detergents, chemical cleaning agents, abrasive compounds, or bristle brushes to clean the unit.

Preventive maintenance also includes charging the battery to ensure it retains a charge.

Corrective Maintenance

Corrective maintenance consists of observing a symptom, determining probable cause, and then taking corrective action. The table below can be used as a troubleshooting guide to correct common problems.

Troubleshooting Guide

Symptom	Probable Cause	Corrective Action
Radio will not power up.	Dead or low battery.	Replace or recharge battery.
	Defective radio.	Replace radio.
Cannot receive from any other radios in network.	Volume setting too low.	Adjust volume.
	Incorrect channel setting.	Set to proper channel.
	Out of range.	Check Matrix view. Position radio in range with another radio in network.
	Defective radio.	Replace radio.
Can send/receive messages by only one radio in network.	Radio is in Private mode.	Set radio to Broadcast or Group mode.
Can send messages to some radios in network but not all.	Radio is in Group mode.	Set radio to Broadcast mode.
Radio drops out of network.	Out of range.	Check Matrix view for other radios. If none are present, position radio in range with another radio in network. If other radios are present, radio may be defective.
	Defective radio.	Replace radio.
Voice is not heard in distant unit.	Transmitting unit "mic sensitively" =0	Change "mic sensitively">0 (menu→setting→Accessibilt→ mic sensitivity
	Receiving unit is in mute	Change volume level in receiving unit
	Talk mode is not defined correctly (private, group etc.)	Change talk mode
	RF connectivity problem	Check if Antenna icon exists., Check matrix status and verify Line of Sight between every 2 units
	Defective battery.	Replace battery.
	PTT is disabled.	Technician > PTT ON/OFF/Auto
	Defective PTT	Replace radio
	Listen Mode is enabled.	An "L" is displayed near upper right corner of main screen. Technician > Listen Mode ON/OFF

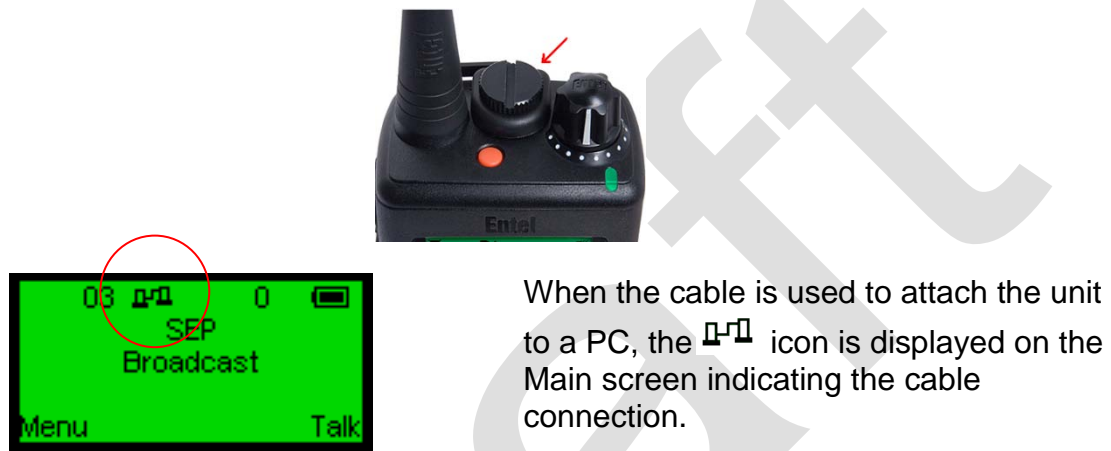| Symptom	Probable Cause	Corrective Action
Can't see unit ID on main screen.	Unit ID turned off.	Technician > Show ID ON/OFF
Power Button will not turn radio off.	Keypad is locked. "Locked" is displayed in lower left of screen.	Press * then # to unlock or lock. Technician > Key Locked ON/OFF
Cant see GPS coordinates	GPs is not enabled.	Settings > GPS Setup Set GPS ON/OFF
Can't find Prioritize mode in Talk screen	Commander is off.	Technician > Commander ON
Panic button doesn't work	Emergency mode is off	Technician > Emergency ON/OFF
None of the keypad keys work.	Keypad is locked.	Press * then # to unlock or lock.
Battery does not charge. Charger LED green.	Defective charger.	Replace charger
Battery does not charge. Charger LED red.	Defective battery.	Replace battery.
Battery does not charge. Charger LED blinking red.	Defective charger.	Replace charger.
Battery does not charge. Charger LED amber.	Battery not seated properly.	Reseat battery.

Repair Parts

Description	Part Number
Antenna, 2dB 2.4GHz Omni Direction	85-P42580K001
Battery, Pathmaker	60-P42581K001
Belt Clip, Pathmaker	42-P42582K001
Assembly, Pathmaker Radio	01-P42558K001
Cable, Pathmaker USB Data	30-P42577K001
User Documentation, Pathmaker Network Radio	99-P42565K

ACCESSORIES

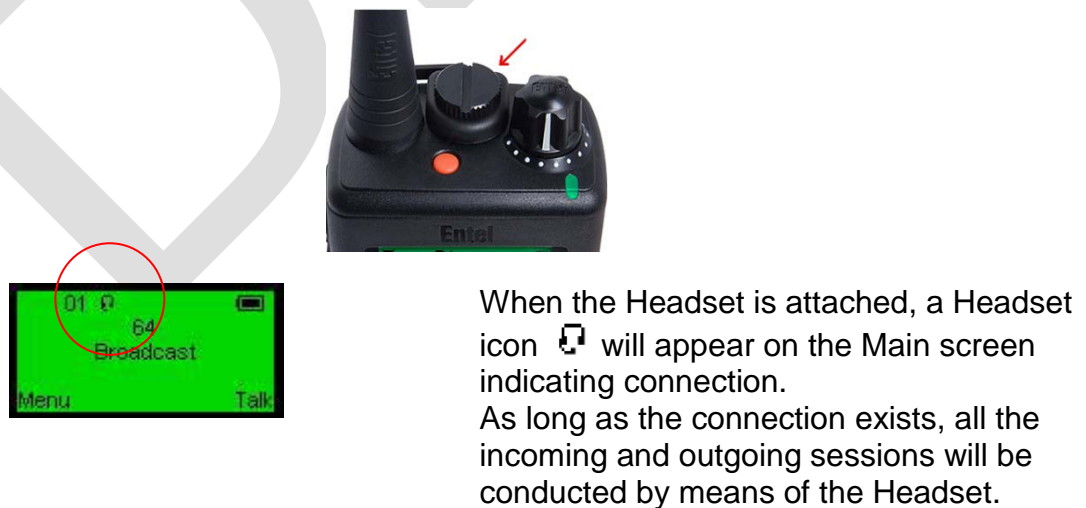## USB/RS-232 Communication Cable

The communication cable is used to interface with various digital devices (PC, Gateways etc.).

The serial cable communication connection is illustrated below.

When the cable is used to attach the unit to a PC, the ᴒᴒ icon is displayed on the Main screen indicating the cable connection.

Headset

The Headset kit is connected to the accessory connector of the unit as follows:

When the Headset is attached, a Headset icon will appear on the Main screen indicating connection.
As long as the connection exists, all the incoming and outgoing sessions will be conducted by means of the Headset.
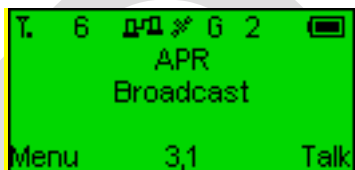
GATEWAYS

Gateways are optional and are documented separately. Please refer to the documentation supplied with the gateway for setup and system integration information. The following section applies only after the integration process has been completed and the radio has established contact with a gateway.

Many of the screens shown below are not be available unless the radio has been integrated with a gateway.

Gateway - GSM GW

This mode enables you to send and receive conventional telephone calls using the radios. Any radio in the network can place a call t by dialing the desired telephone number by using the keypad.

Similarly, any conventional telephone is able to place a call directly to any radio in the network. To do so, callers must know the telephone number of the GSM Gateway and the Unit ID of the desired radio.

The GSM Gateway icon [G] displays on the Main screen upon making the connection.

The radio's network ID number is shown to the right of the Gateway icon. In this example it is 2.

When in a GSM gateway configuration, you can place a call from a radio by dialing the called party's phone number as you would from a conventional telephone. After the number is dialed, press and release the P2 shortcut key to place the call.

To answer an incoming call, press and release the P1 shortcut key.

To end a call, press and release the P3 shortcut key.

When in a call, use the PPT key just as you would when using the radio in the voice mode. That is, push to talk and release to listen.

Callers from conventional telephones must dial the GSM Gateway's telephone number. Upon connection, callers will be prompted to also enter the target radio's Unit ID number.

Gateway - Analog GateWay

In this mode you can use the gateway to communicate with other devices. Radios connect to the Analog Gateway over-the-air.

The Multi-GW unit defines which units in the Pathmaker network will receive the analog network session and defines which Pathmaker network sessions will be transmitted to the analog network.

• When the [A] icon is present on the general screen of the unit, in "Talk" mode of the unit will appear additional talk mode "Analog GW".

• Use regular broadcast call in order to perform a voice call to the analog network.

• Management of the Multi GW unit can be done from the Pathmaker Suite application remotely.

• Only one session to/from analog network can be done at a time.

Gateway - IP Gateway

Enables the connection between different networks via TCP/IP.
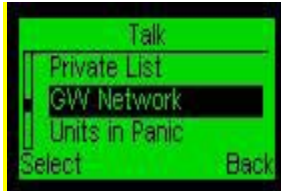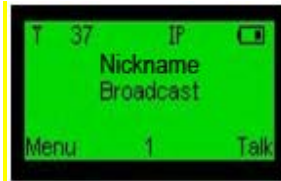
The connection will be acknowledged automatically and the IP gateway icon will display on the **Main** screen.

To view your IP Networks list, select the **GW Network** option in the Talk Modes screen. Afterwards, connect to one of the networks.

ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations

BER	Bit Error Rate
CDMA	Code Division Multiple Access
EMI	Electro-magnetic Interference
FB	Feedback
FEC	Forward Error Correction
FSK	Frequency-shift keying
GPS	Global Positioning System
GPRS	General packet radio service
GSM	Global system for mobile communications
GW	Gateway
HW	Hardware
IEC	International Electrotechnical Commission
LED	Light emitting diode
LCD	Liquid Crystal Display
MIL-STD	Military Standard
PC	Personal computer
PDA	Personal digital assistant
PSTN	Public Switched Telephone Network
PMR	Private mobile radio
PTT	Push-to-talk
RF	Radio frequency
RSSI	Receive Signal Strength Indication
SATCOM	Satellite Communications
SMS	Short Message Service. Text messages.
SW	Software
Tetra	Terrestrial trunked radio
TCP/IP	Transmission control protocol/Internet protocol
TX	Transmit
UHF	Ultra high frequency
VHF	Very high frequency
WiFi	Wireless Fidelity
WiMax	Worldwide Interoperability for Microwave Access