



Raven Electronics Corporation
Specialized Communication Solutions 1968

NEXEDGE™ Recording Gateway

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Chapter 1 – Introduction

Contact Raven Electronics

Thank you for purchasing an M4x Product from Raven Electronics Corporation. Please contact us if you have any questions, concerns, ideas, or suggestions on how to improve this manual. We can be contacted at:

Raven Electronics Corporation
4655 Longley Lane, Suite 106
Reno, Nevada 89502
(775) 858-2400 Phone
Press 2 for Sales
Press 3 for Technical Support
(775) 858-2400 FAX
info@ravencomm.com
sales@ravencomm.com

Please contact us when installing your M4x Product for the first time or if you ever have any questions, comments, or concerns. We would love to hear from you.

We are the "Idea Shop" committed to solving engineering problems and exceeding expectations.

Note: Throughout this manual we reference various screens in the program. Depending on the revision of the software received with the shipment, there may be slight variations. This product is always evolving as is the documentation.

NOTE: THIS IS A SUPPLEMENTAL MANUAL AND SHOULD BE USED IN CONJUNCTION WITH THE BASE M4X MANUAL.

Raven Electronics' Warranty and Safety Information

Please be ESD protected before starting any procedures contained in this manual.



This warranty expressly precludes any liability by Raven Electronics Corporation for consequential damages however arising after delivery to the purchaser of the affected equipment, and is limited to the expressed warranty, excluding all implied warranties including merchantability. All equipment manufactured by Raven Electronics Corporation is warranted against defective materials and workmanship for a period of two (2) years from the date of delivery to the original purchaser or end-user. Liability under this warranty is limited to servicing, adjusting, repairing or replacing, as necessary, any equipment returned to the factory, transportation prepaid for that purpose. Factory examination must disclose a manufacturing defect. Repaired or replaced items will be returned to the purchaser surface freight prepaid within the continental USA. This warranty does not extend to any equipment which has been subjected to transportation damage, misuse, neglect, accident, improper installation, or any other circumstances reasonably beyond the control of Raven Electronics Corporation.

Beyond the warranty period, repairs will be billed to the purchaser at cost. In such cases, an estimate will be submitted for approval before repair is initiated. Repaired equipment will be returned to the purchaser with transportation charges collect, unless agreed to between the purchaser and Raven Electronics Corporation.

Quick Start Guide

M4x Blade Quick Start Guide

Thank you for purchasing the M4x Blade.

When unpacking your M4x Blade confirm the following items were received with your shipment.

- ◆ Software CD
This CD also includes the User Manual
- ◆ AC Power Supply Adapter
120/240 VAC, 12 VDC 1.5 Amp regulated
(Note: on units powered from a DC source, this item will not be included)
- ◆ Power Cord
(Note: on units powered from a DC source, this item will not be included)
- ◆ USB Cable

If any of these items are missing, please contact Sales at 775-858-2400, press 2.

Installing The M4x Software

Note: Install this software before plugging in the M4x Blade.

1. Uninstall old M4x Software before installing a new version.
2. Install the software by inserting the CD into the computer's CD Drive.
3. We recommend selecting "Easy Install" when prompted.
4. Follow the on-screen prompts to complete the installation.
5. Refer to the M4x User Manual included on the software disk for more detailed installation instructions, (especially if this version of software will be installed over a prior version of software).

Powering Up the M4x Blade

1. Connect the Power Cable into the AC Power Adapter.
2. Connect the AC Power Adapter to your AC power source (e.g. 3-pronged grounded wall outlet). The AC Power Adapter can be connected to a 100 to 240 VAC, 50-60 Hz, 0.5A source.
3. Connect the DC plug from the AC Power Adapter into the DC jack on the rear of the M4x Blade as shown in Figure 1.



Figure 1

LED Indicators

There are seventeen LED indicators on the front panel of the M4x Blade as shown in Figure 2.

There are two LEDs per Port. The first LED is Red (default is XMT (Output)). The second LED is Green (default is RCV (Input)).

There is a Power On LED which is also Green to let the user know the M4x Blade is powered on.

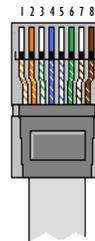


Figure 2

For more details regarding how the LEDs can be set to indicate COR (E-Lead) or PTT (M-Lead), please refer to the M4x User Manual.

M4x Port Pin Outs

On top of each M4x Blade, there are labels with pin out information for each port installed in the M4x Blade. Please note, the pin order is grouped for clarity.



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Note: E-Lead is COR, M-Lead is

MODULE 476-150	4-WIRE INTERFACE	MODULE 476-151	4-WIRE INTERFACE
PIN 1 } RCV			
PIN 2 } M.J.F.A.N			
PIN 3 } XMT			
PIN 4 } F.J.F.A.N			
PIN 5 } RCV			
PIN 6 } M.J.F.A.N			
PIN 7 } XMT			
PIN 8 } F.J.F.A.N			

MODULE 476-152	2-WIRE INTERFACE	MODULE 476-175	SMI	MODULE 476-178	RELAY
PIN 1 } 7W.B.F	PIN 1 } 7W.B.F	PIN 1 = NC	PIN 1 = NC	PIN 1 = RLY 1 NC	PIN 1 = RLY 3 NC
PIN 2 } M.J.F.A.N	PIN 2 } M.J.F.A.N	PIN 2 = NC	PIN 2 = NC	PIN 2 = RLY 1 COM	PIN 2 = RLY 3 COM
PIN 3 = NC	PIN 3 = NC	PIN 3 = NC	PIN 3 = NC	PIN 3 = RLY 1 NO	PIN 3 = RLY 3 NO
PIN 4 = NC	PIN 4 = NC	PIN 4 } P.C.T.T	PIN 4 = } P.C.T.T	PIN 4 = RLY 2 NC	PIN 4 = RLY 4 NC
PIN 5 = NC	PIN 5 = NC	PIN 5 = NC	PIN 5 = NC	PIN 5 = RLY 2 COM	PIN 5 = RLY 4 COM
PIN 6 = NC	PIN 6 = NC	PIN 6 = NC	PIN 6 = NC	PIN 6 = RLY 2 NO	PIN 6 = RLY 4 NO
PIN 7 } F.J.F.A.N	PIN 7 } F.J.F.A.N	PIN 7 = NC	PIN 7 = NC	PIN 7 = NC	PIN 7 = NC
PIN 8 } F.J.F.A.N	PIN 8 } F.J.F.A.N	PIN 8 = NC	PIN 8 = NC	PIN 8 = NC	PIN 8 = NC

MODULE 476-178	RELAY OPT - 02	MODULE 476-180	I/O	MODULE 476-777	VOIP
PIN 1 = RLY 1 COM	PIN 1 = RLY 5 COM	PIN 1 = UO 1	PIN 1 = UO 9	PIN 1 } E.T.U XMT	PIN 1 } J.W RCV
PIN 2 = RLY 1 NO	PIN 2 = RLY 5 NO	PIN 2 = UO 2	PIN 2 = UO 10	PIN 2 } E.T.U RCV	PIN 2 } M.J.F.A.N
PIN 3 = RLY 2 COM	PIN 3 = RLY 6 COM	PIN 3 = UO 3	PIN 3 = UO 11	PIN 3 } E.T.U C.H.I.N	PIN 3 } J.W XMT/PTT
PIN 4 = RLY 2 NO	PIN 4 = RLY 6 NO	PIN 4 = UO 4	PIN 4 = UO 12	PIN 4 } E.T.U C.H.I.N	PIN 4 } F.J.F.A.N
PIN 5 = RLY 3 COM	PIN 5 = RLY 7 COM	PIN 5 = UO 5	PIN 5 = UO 13	PIN 5 } E.T.U C.H.I.N	PIN 5 } F.J.F.A.N
PIN 6 = RLY 3 NO	PIN 6 = RLY 7 NO	PIN 6 = UO 6	PIN 6 = UO 14	PIN 6 } E.T.U C.H.I.N	PIN 6 } F.J.F.A.N
PIN 7 = RLY 4 COM	PIN 7 = NC	PIN 7 = UO 7	PIN 7 = UO 15	PIN 7 } E.T.U C.H.I.N	PIN 7 } F.J.F.A.N
PIN 8 = RLY 4 NO	PIN 8 = NC	PIN 8 = UO 8	PIN 8 = UO 16	PIN 8 } E.T.U C.H.I.N	PIN 8 } F.J.F.A.N

Starting the M4x Blade Software

1. Verify the M4x Blade is powered on
2. Connect the USB Cable to the M4x Blade as well as to the computer
3. Located on the Computer Desktop, select "M4x Setting" shortcut
4. Once the program is open, select "Actions" menu in the upper left are of the screen
5. Select "Connect"
6. Select "Local/USB"
7. On the right-hand side of the screen, a new box will appear
8. Press the "+" next to Communication System
9. Click on "Blade" and factory settings will appear

This screen will show the following:

- ◆ The M4x Blade Firmware Revision
- ◆ The Modules Installed / Firmware Revision
- ◆ Any enabled features

10. Click on the "+" next to Blade (and its Node Address)

The items that appear will allow you to access the port settings

11. Click on the "+" next to System Voting to create a Vote Group or Groups (an optional feature)
12. Click on the "+" next to System Bridging to create a Bridge Group or Groups

Please refer to the M4x User Manual for more detailed settings.

Configuring the M4x Analog 4-Wire Module

1. Click on the "+" just to the left of the Blade, if you haven't already from prior instructions. All ports populated will show a generic name until the user changes it.
2. Click on the port that you want to analyze or configure. The Port Status, along with the Transmit and Settings control buttons appear.
3. Press the Settings button in order to expand the settings screen.
4. Click through the tabs to see various settings.
5. When all changes have been made, click "Actions" menu and then "Save Settings to Firmware". This will save the settings to the M4x Blade. Please note: the "Save" button, only saves the changes on the computer and will not save the settings onto the M4x Blade.
6. After any changes have been made, please power cycle the M4x Blade by unplugging the unit and plugging it back in.

Configuring a Bridge

1. Configure the M4x Analog 4-Wire Module(s) before configuring a Bridge.
2. The M4x Blade allows multiple bridge configurations to be created on one blade.
3. Click "System Bridging" on the right side of the screen.
4. Drag various ports from the system components panel and drop them onto the Port Name boxes in the Bridge Configuration pop up box.
 - ◆ If Broadcast is NOT checked, the associated bridge group will be full conference.
 - ◆ If DTMF Bridge Group is enabled, the members of the bridge are now able to be cross-patched dynamically as remote users dial using DTMF-enabled devices.

Please refer to the M4x User Manual for more detailed settings.

5. Click the check box "Enabled" to enable the bridge.

Configuring SNR Voting (Advanced Feature)

1. Configure the M4x Analog 4-Wire Daughter Board(s) before configuring a Vote Group.
2. Click "System Voting" on the right side of the screen.
3. Follow the wizard that appears.
4. Click the "Add" button to enable the Voting group.

Performing an M4x Loop Back Test for a 4-Wire Analog Module

The M4x Loop Back Test enables users to perform basic tests for PTT and COR, XMT and RCV tones, as well as DTMF.

1. Click "Actions" on the Menu (upper left corner of screen)
2. Select "Loop-back Test"
3. Place the loopback cable firmly into a M4x Blade port to test.
4. Select the port to test (be sure the cable is in the same port)
5. Select the Loopback Tab
6. Select to Test All or the Specific Test and click Test
7. Testing status and Pass/Fail notifications will populate as the M4x Blade goes through the specified tests.

Thank you for choosing a Raven Electronics M4x Blade for your Communication needs, where we are the idea shop committed to solving engineering problems and exceeding expectations.

CHAPTER 2

Chapter 2 – NEXEDGE™ Recording Gateway

NEXEDGE™ is a digital radio system that utilizes industry standard protocols that are supported within the NXDN User Group. Currently, there is no specific hardware or software solution to provision for a centralized recording facility of NEXEDGE digital, over-the-air radio transmissions. Industry accepted recording solutions do not currently support the decoding of NEXEDGE digital metadata or voice frames.

Most audio recorders have been designed to support the native processing of RoIP packets from a number of industry suppliers including console systems. Using a Raven M4x as a gateway, we can now capture recovered voice audio from NXR receivers, copy the digital headers from the NXR VoIP frame into new G.711 packets and forward them to a TCP port on the recording device.

The solution involves the collection of audio from each radio repeater (NXR 700/800 series Kenwood stations) which will include data that will allow the sorting of the audio by time/date, radio ID, and group ID within the playback software.

Network Architecture

The system generally consists of a centralized audio recorder being fed packets of audio and control information over the customer network infrastructure. The feed of information is unicast RTP sessions between Raven M4x gateways and the Eventide recorders.

A simple station site consists of one repeater that the Raven M4x Mini Blade will interface to. Four wire audio will be recovered from the back of the NXR station (via the “control I/O” connector on the station) as individual subscribers talk over the air to other subscribers. In addition, the NXR station’s Ethernet port (or KTI-3) will be interface to the Raven M4x Ethernet port.

When a transmission from a subscriber is received at the station both four-wire audio and RTP packets will be output from the NXR receiver and captured by the Raven device.

All received transmissions from these subscribers are then repackaged into a standard G.711 audio stream with NEXEDGE™ group and unit ID metadata embedded into the stream. These packets are then forwarded to the user-defined voice logger/recorder for archiving.

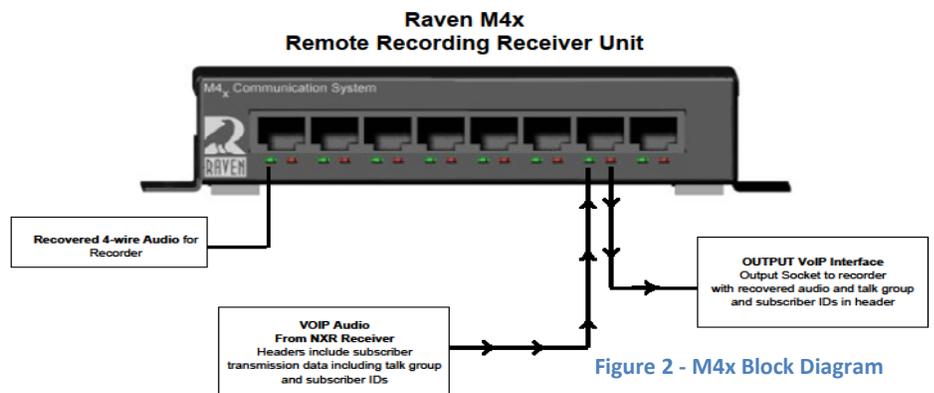


Figure 1- Note that an 8-port M4x Blade is shown. Most recording gateways will be 2-port "mini" blades.

CHAPTER 2

Kenwood Station Set Up (Trunking)

Using the KPG-109D programming interface find the Voice Recording Interface options and set the destination IP address of the Raven M4x Recording Gateway along with the desired TCP port number.

NXR Aux Input / Output

- AUX Output for Trunking Mode
 - TOR....Active during receive on TCH
 - TXS....Active during transmit on TCH



DB-25 Default Function

Pin	Terminal	Function	
		Conventional Mode	Trunking Mode
Pin 4	AUXI 1	Programmable Function Input 1	External Busy Input (for Cross Busy Function)
Pin 5	AUXI 2	Programmable Function Input 2	Remote System Standby External Input
Pin 6	AUXI 3	Programmable Function Input 3	Failure Channel Input
Pin 20	AUXIO 1	Programmable Function Input/Output 1	N/A
Pin 21	AUXIO 2	Programmable Function Input/Output 2	Receive Unlock [Active Low]
Pin 22	AUXIO 3	Programmable Function Input/Output 3	TOR [Active Low]
Pin 23	AUXIO 4	Programmable Function Input/Output 4	TXS [Active Low]
Pin 24	AUXIO 5	Programmable Function Input/Output 5	Transmit Unlock [Active Low]
Pin 25	AUXIO 6	Programmable Function Input/Output 6	Internal Busy Output

- Notice; These functions will be available for new FPU and new data file.

NOTE: Be sure AUXIO 3 is programmed and operating as it is required for gateway operation.

Radio/M4x Connections

RJ45 (M4x) to DB25 (Station) cable

STATION		M4x	
Pin	Signal Summary	Pin	Signal Summary
9	TX Audio input (voice)	4	TX-OUT +
19	TX Signal GND	5	TX-OUT -
11	RX Audio Output (voice) squelched	1	RX-IN +
12	RS Signal GND	2	RX-OUT 1
22	Programmable I/O - Receive Signal (Threshold)	7	E-LEAD (input)
7	Digital GND	8	E-LEAD GND

This connection must be made from the Control I/O DB25 on the station to the secondary Analog Port on the 476-777 VoIP Module (port 2 on a "mini" Blade).

The Ethernet port on the station should be either directly connected to the 476-777 VoIP Port on the M4x of through an Ethernet switch.

CONTROL I/O 25 pin D-sub Connector

Pin No.	Pin Name	I/O	Signal Type	Modification	Description/ Port Type
1	NC	-	Digital	Land short	RSSI
2	NC	-	-	No	-
3	NC	-	-	No	-
4	A11	I	Digital	No	Programmable Function Input 1/ CMOS
5	A12	I	Digital	No	Programmable Function Input 2/ CMOS
6	A13	I	Digital	No	Programmable Function Input 3/ CMOS
7	DG	-	GND	No	Digital GND
8	TD	I	Analog	No	TX Data Input (signaling)
9	TA	I	Analog	No	TX Audio Input (voice)
10	RD	O	Analog	No	RX Data Output (signaling)
11	RA	O	Analog	No	RX Audio Output (voice)
12	RXG	-	GND	No	RX Signal GND
13	SPM	I	Digital	No	Speaker Mute/ CMOS
14	BER_CLK	O	Digital	No	for Bit Error Rate Clock
15	EMON	I	Digital	No	External Monitor Switch
16	EPTT	I	Digital	No	External PTT Switch
17	SC	O	Digital	No	Squelch Control
18	BER_DAT	O	Digital	No	for Bit Error Rate Data
19	TXG	-	GND	No	TX Signal GND
20	IO1	I/O	Digital	No	Programmable Function I/O 1
21	IO2	I/O	Digital	No	Programmable Function I/O 2
22	IO3	I/O	Digital	No	Programmable Function I/O 3
23	IO4	I/O	Digital	No	Programmable Function I/O 4
24	IO5	I/O	Digital	No	Programmable Function I/O 5
25	IO6	I/O	Digital	No	Programmable Function I/O 6

CHAPTER 2

M4x Settings

All settings for the recording gateway occur via the internal web page on the M4x unit.

System defaults

IP Address: 10.1.1.253
Mask: 255.255.255.0
Username: Admin
Password: admin

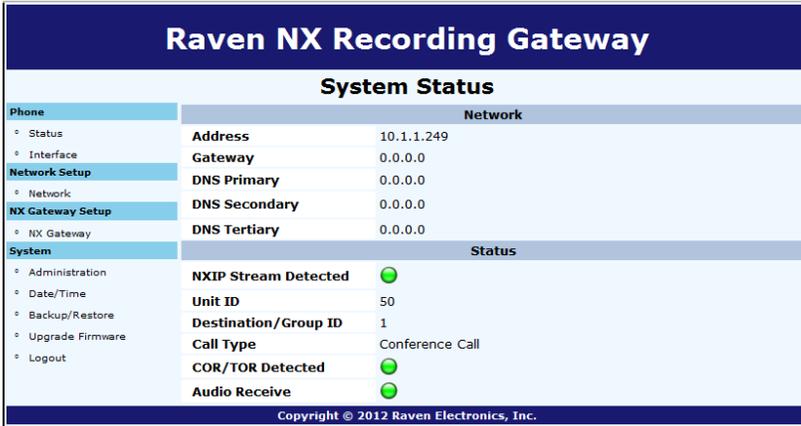
The screenshot shows the 'Raven NX Recording Gateway' web interface. The main heading is 'Gateway Configuration'. On the left, there is a navigation menu with the following items: Phone, Network Setup, NX Gateway Setup, and System. The 'System' menu is currently expanded, showing sub-items: Administration, Date/Time, Backup/Restore, Upgrade Firmware, and Logout. The main content area displays three configuration fields: 'Kenwood Repeater TCP Port Number' with a value of 50800, 'Recorder IP Address' with a value of 10.1.1.143, and 'Recorder TCP Port Number' with a value of 41000. A 'Save Changes' button is located at the bottom right of the configuration area. The footer of the page contains the text 'Copyright © 2012 Raven Electronics, Inc.'

Section	Parameter	Value
Network Setup	Kenwood Repeater TCP Port Number	50800
NX Gateway Setup	Recorder IP Address	10.1.1.143
NX Gateway Setup	Recorder TCP Port Number	41000

CHAPTER 2

Status Indicators

There are a number of status indicators that will help users verify operation. The primary status indication is found on the “Status” web page on the internal web server.



Port One (Ethernet I/O)	
LED	LED Operational Indicator
Green	RTP Packet Activity
Red	NXIP Packets Received
Port Two (Analog Input)	
Green	Audio Inbound
Red	COR/TOR Active

Front panel LED status indicators

Figure 3 - Status Web Page

Status Page Indication Descriptions	
Status Block	Signal Summary
NXIP Stream Detected	M4x has detected the presence of NX Console IP protocol from the NXR receiver. This MUST be active in order for RTP stream to activate to the voice recorder.
Unit ID	Originating call Unit ID.
Destination/Group ID	Call destination. If call type is broadcast, conference then this will be the destination Group ID. For individual calls this represents the destination Unit ID.
Call Type	Call types (see table in next section).
COR/TOR Detected	The TOR Signal is active indicating an inbound transmission. This MUST be active in order for RTP stream to activate to the voice recorder.
Audio Receive	Green indicates that audio is present on port two (from the NXR receiver) of the M4x.

CALL TYPES		
Value	Definition	Description
0	Broadcast call	Indicates a one-way group call
1	Conference Call	Indicates a two-way group call
3	N/A Reserved	N/A Reserved
4	Individual Call	Indicates an individual call
5	N/A Reserved	N/A Reserved
6	Interconnect Call	Indicates an interconnect call
7	Speed Dial Call	Indicates an interconnect call with speed dial
Notes		
<ol style="list-style-type: none"> If the call type is “Broadcast” or “Conference”, the destination ID is recognized as a “Group ID”. If call type is “Individual”, the destination ID is recognized as a Unit ID. If the group ID is 65535 then call type is an ALL GROUP CALL broadcast call For interconnect calls, destination ID will 65521 		

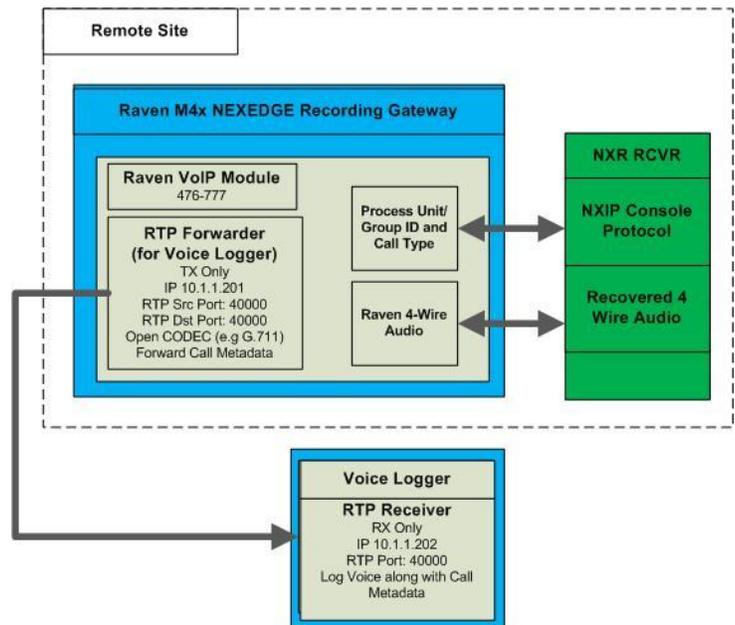
CHAPTER 2

Protocol Details

The Raven VoIP process is used as a protocol converter and audio injector. The VoIP module will extract the required information from the Kenwood RTP (NXDN) stream and export a revised RTP (G.711) packet in a protocol ready for recorder processing.

The headers on the inbound packets are copied and forwarded as part of the outbound packets, which are built according to the following description:

1. One Standard RTP Stream sent to the Recorder's IP Address on a Unique UDP Port for Each Repeater Output. (i.e. Site 1 Repeater 1 = Port 40000, Site 1 Repeater 2 = Port 40002, Site 2 Repeater 1 = 40004, etc)
2. RTP Stream would contain G.711 Unencrypted Audio
3. RTP Stream will increment Timestamp and sequence number normally as per the RTP Specs
4. RTP Stream will use a unique SSRC for each radio receiver
5. At the start of each transmission, a non G.711 packet will be sent as part of the stream. This packet will update the stream sequence number, but will not update the timestamp, instead it will reuse the timestamp for the first G.711 packet in the transmission
6. These non G.711 Packets will be sent with one of the reserved/dynamic codec numbers in the RTP Spec (e.g. 102)
7. These non G.711 packets will contain the normal RTP Header followed by a payload consisting of an ASCII Representation of the Talk Group followed by an ASCII Representation of the Radioid in canonical format embedded in a fixed length structure:
 - a. Bytes 0-1: Little-endian representation of the Source ID ("unit" or "radio" ID)
 - b. Bytes 2-3: Little-endian representation of the Destination ID
 - c. Byte 4: Call Type
8. At the end of the transmission a "STOP" packet will be sent by the Raven M4x 03:03:04:



The recorder will process each packet to place the audio into the correct talk group recording channel and place the Radio ID into the database field. Once the audio packets are processed, the logger client software can be used for live monitoring of talk groups, call research, call export, report generation and other functions within the recorder.