Raven Electronics Corporation
Specialized Communication Solutions 1968

NEXEDGE™ Recording Gateway

Rev A1 January 2012

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 CONJUNTION 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)).

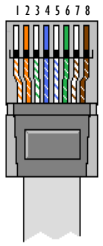
There is a Power On LED which is also Green to let the user know the M4x Blade is powered on.

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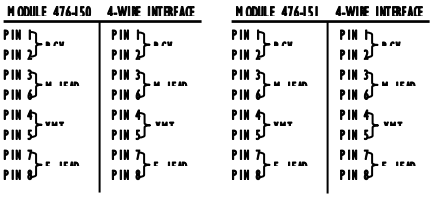
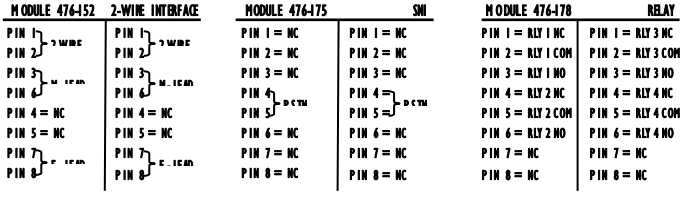
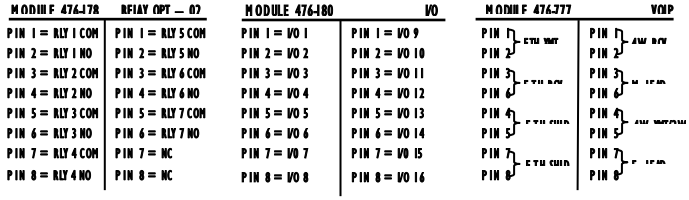
Note: E-Lead is COR, M-Lead is







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 – 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.

This feature within M4x was designed to work specifically with Eventide ATLAS and NexLog families of audio recorders.

The Eventide ATLAS and NexLog families of 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 gate we, we can now capture recovered voice audio from NXR recieverss, 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. The Eventide recorders utilize a SQL database that allows a researcher to find calls by date, time, talk group, or radio ID using the query interface.

Note: Currently this M4x configuration has been tested with receivers set up in <u>conventional mode</u> only. Trunked radio scenarios are currently being tested and this document will be updated accordingly.

Network Architecture

The system generally consists of a centralized Eventide 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 Eventide recorder for archiving.

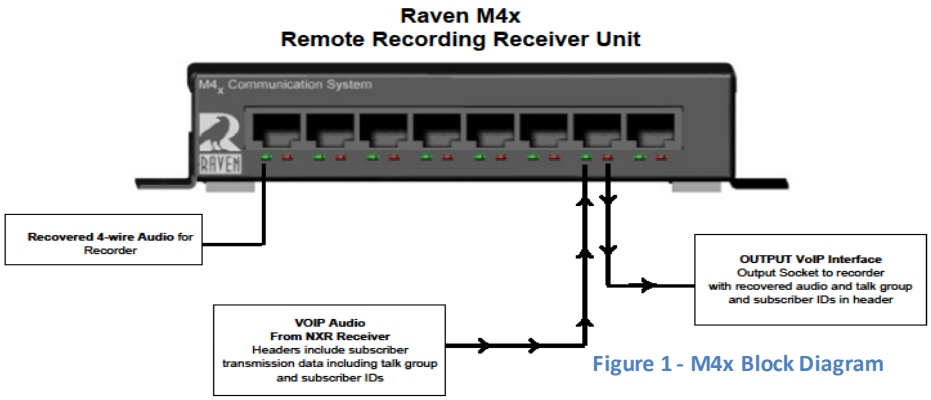


Figure 1 - M4x Block Diagram

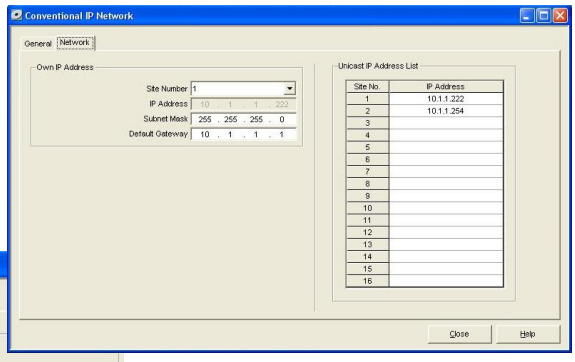
Kenwood Station Set Up (Conventional Mode)

Station set up in conventional mode is straight forward. Channel set up on stations should be set up with an operation mode of either RF Link or Repeat and the convention IP network option enabled.

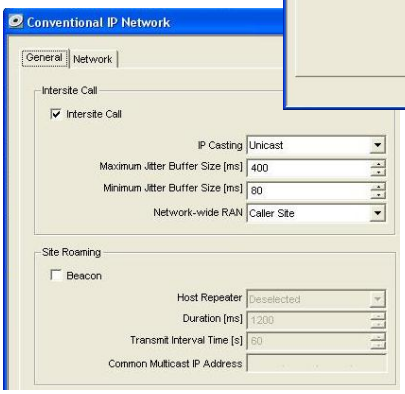
It is assumed that subscribers and the repeater will be set up with the appropriate group call information.

The site list in the "Network Settings" should include both the Raven M4x site as well as the local repeater site.

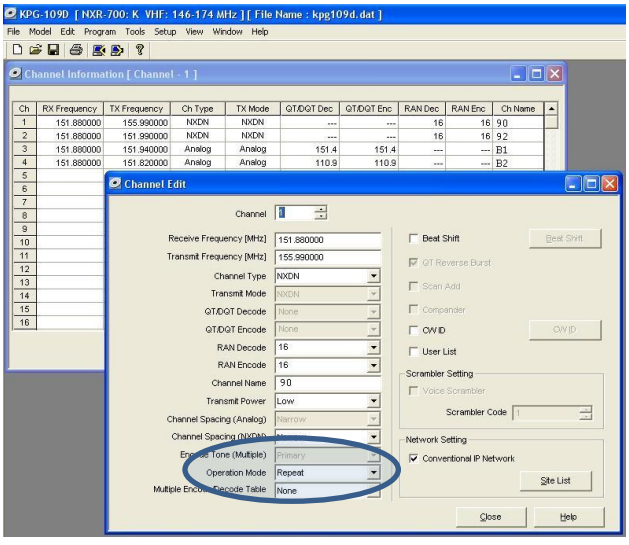
Set up your Convention IP Network Sites. Site 1 is always the station IP address. Any of the other 15 sites should reflect the IP address of the Raven M4x Blade.

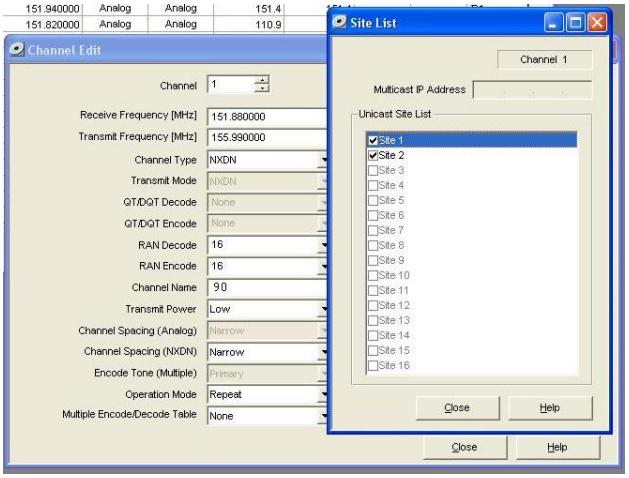


Under Conventional IP Network make sure "Unicast" is the IP casting method.



Operation mode should be set to either Repeat or RF Link.





In the "Network Settings" on the channel Select both the local repeater site (site 1) and the M4x

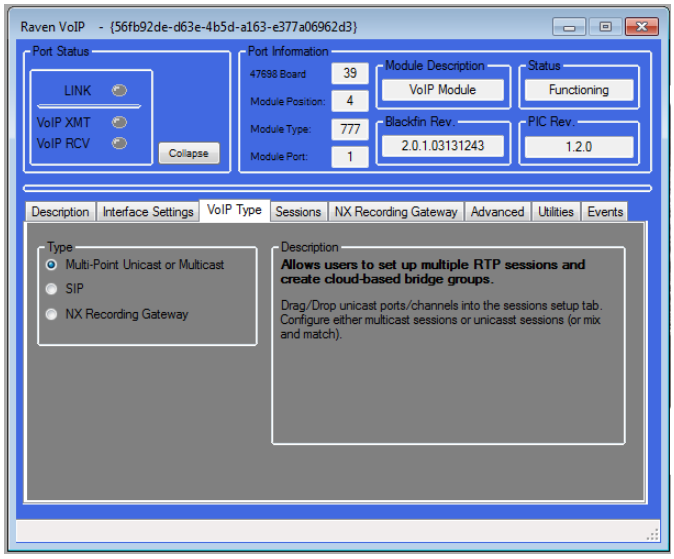
M4x Software Settings

Please refer to the main user's manual for all additional settings and operation of the M4x software. Please be cautious when manipulating settings other than those shown in this manual. Certain settings in the M4x software can impact operation of the recording gateway.

The M4x Software requires only that you set the mode to "NX Recording Gateway" and then identify the recording device on the network and the port number for that device.

In the VoIP Settings screen select "NX Recording Gateway" in the "Type" area of the screen.

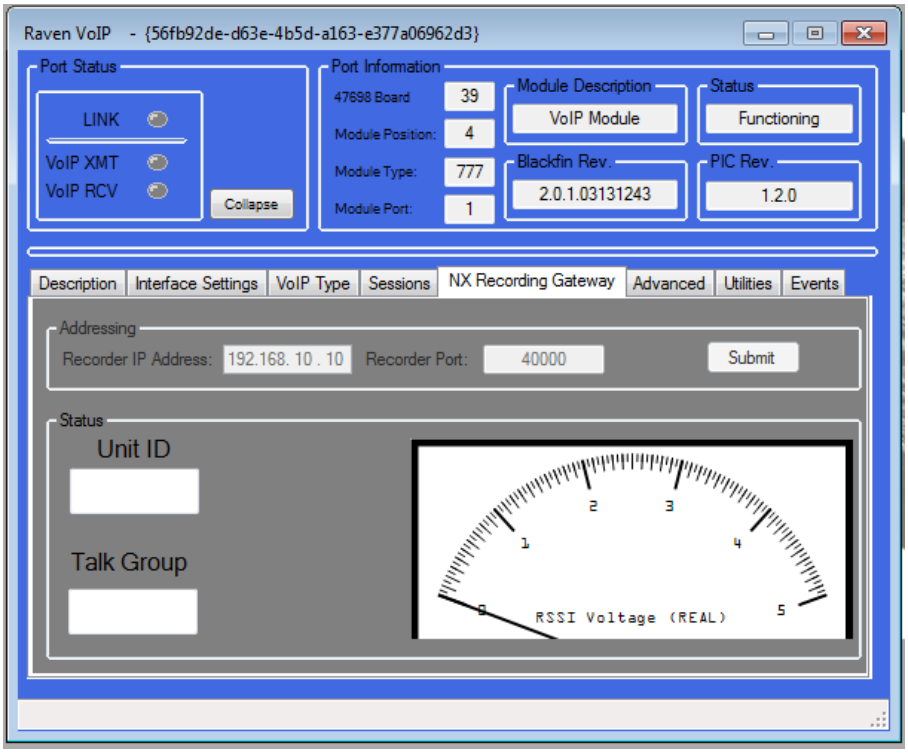
By doing so you may be presented with a "Reboot" option. Acknowledge that you want to change the type by confirming the boot operation.



Once the module has rebooted you can configure the IP address and the port in the NX Recording Gateway setup tab.

For each M4x Blade that is configured, be sure to change the Recorder Port number (which should always be an even number). This identifies each station in the recording query software.

The status block of this screen will provide real time status of the capture during over the air transmissions. The RSSI voltage may not work for you if you have not installed the I/O option on the M4x Blade. This is reference only information anyway that is not necessary for recording gateway operation.



CHAPTER 2

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
20	Programmable I/O - Receive Signal (Threshold)	7	E-LEAD (input)
7	Digital GND	8	E-LEAD GND

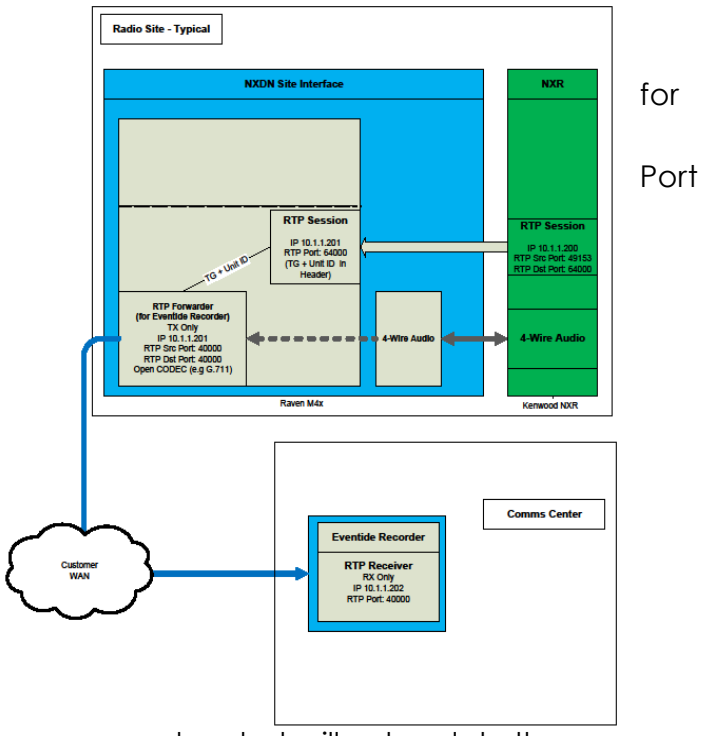
This connection must be made from the Control I/O DB25 on the station to the secondary Analog Port on the 476-777 VoIP Module (port 2 on a "mini" Blade or port 8 on a 8-channel Blade).

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

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 Eventide processing.

The headers on the inbound packets are copied and forwarded as part of the outbound packets, which are built according to Eventide's requirements here:



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 = 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 transmission
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 (eg 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 unit (radio) ID
    b. Bytes 2-3: Little-endian representation of the talk group ID
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 Eventide MediaWorks client software can be used for live monitoring of talk groups, call research, call export, report generation and other functions within the recorder.