AirNetix

streetsounds
Music for Your Main Street

Network Management System

User Guide

4/1/2021

V1.0

1 Contents

1 The StreetSounds Network

StreetSounds is a digital wireless audio system designed to provide "Music on Main Street" in a city, town, park, church, or other outdoor venue. StreetSounds remote speaker units are designed for permanent outdoor installation. A typical StreetSounds network consists of a single Master transmitter and one or more Remote speaker units (i.e. STS-170-205J). The Master transmitter can either be "fixed" (permanently mounted) or "mobile" (battery power portable unit). A laptop provides a platform for controlling and monitoring the remote speaker units via the Network Management System (NMS) application software.
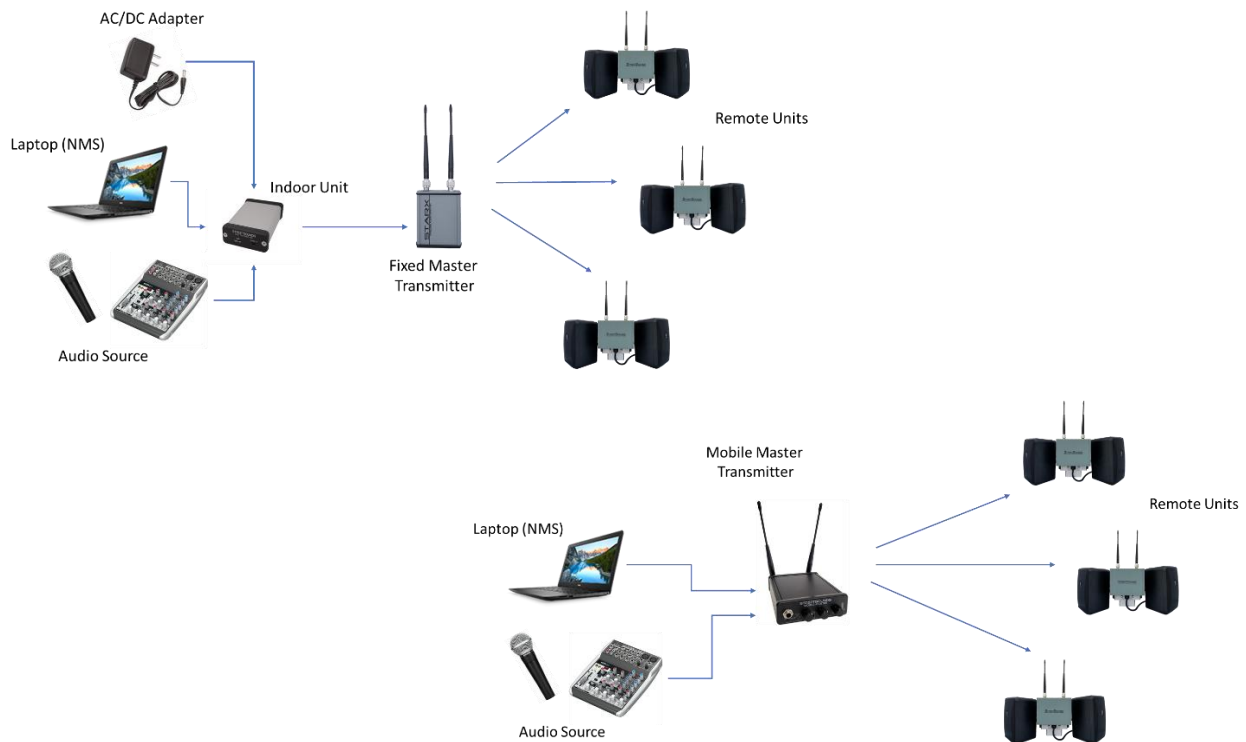
2 NMS Overview

The StreetSounds Network Management System (NMS) is a PC-based application (Windows 7 or 10) that gives the user a broad array of tools for configuring, operating, and diagnosing the StreetSounds network. The NMS connects via USB to the Master unit and communicates over the air with all remote ("Relay") units in the network. The communications with the Relay units is bi-directional so that the NMS is able to monitor AND control each remote unit from a central location.

StreetSounds networks can operate with or without the NMS ("Managed" or "Unmanaged" network). However, when there is no NMS, there is no visibility into the network for troubleshooting or control.

When a Relay unit "joins" a managed network it is assigned a unique Network ID. This allows the NMS to independently address each Relay unit to monitor its critical parameters (such as received signal strength, packet error rate, transmit power, audio level, etc.) and to control certain functions such as output audio volume or setting audio delay through the units. A network map gives the user a graphical representation of the network topology showing which Relay units are communicating with each other, and on which frequencies.

2.1   GUIDs and Registration

Each StreetSounds unit has a unique, fixed (in hardware) 16-digit hex number assigned to the unit during manufacturing (similar to a MAC address in a LAN network). This is called the Globally Unique ID, or GUID. The GUID is used by the NMS to create a database that allows the network operator to assign a "friendly name" to each unit during deployment. Names such as "Karen's Deli" or "Pole #1" can help keep track of where units are deployed in the network.

During network deployment each StreetSounds unit must be "registered" with the NMS. During the registration process the NMS captures the GUID and gives the user the opportunity to enter a friendly name.

Note: The StreetSounds Master transmitter USB interface uses a standard HID driver which is built into the PC's operating system. Therefore, no custom USB drivers need to be installed. The initial driver

installation process can take up to 30 seconds. Be patient while this process takes place. It will only occur when the Master is first connected to a specific USB port

Note: The StreetSounds Network Management System can run on a Windows 7 or 10 operating system. It also requires Microsoft .NET Framework 4 or greater. The NMS will not run on a Mac.

If StreetSounds units are not registered prior to deployment they will appear as "unregistered" nodes in the NMS network map. At this point the unit can be registered "over the air" by the network operator. Remotes that are not registered will not appear in the Master Summary screen.

3   Master Mode Operation

A StreetSounds "network" has only one Master transmitter unit*. The Master is located near the main audio source and transmits its audio signal to all Relay units within its transmission range. The NMS is connected to the Master via a USB connection from the PC or laptop on which the NMS resides.

When first started, the NMS will be in the "Master" mode indicated by the top row of tabs on the NMS window, and the "Master Map" tab will be selected. If connected via USB to a Master transmitter, the

NMS will automatically begin communicating with the Master.
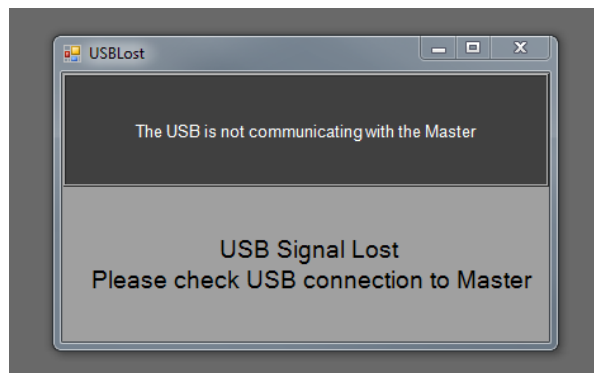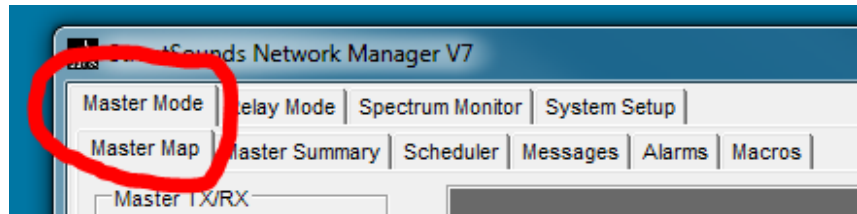
If the NMS is unable to communicate with the Master, a "USB Lost" screen will appear. This can be caused by several factors include a partially inserted, or defective USB cable, or in the case of a STARX Fixed Master, an improperly terminated or grounded CAT5 cable. This situation must be corrected before the NMS can be used.

Note: Multiple Master units can be used in "parallel" networks that can operate in the same general vicinity of each other but carry different audio channels. The NMS can only control one "network" at a time.

Once properly connected to the Master, any Relay unit that has been powered ON, and is within range, will attempt to connect to the Master. Once successfully connected, the Relay unit has "joined" the network and the NMS can be used to monitor and control its functions.

3.1   Registering Nodes

When new nodes are first connected to the Master, they will appear as "Un-registered" nodes on the Master Map screen (below). In order for the NMS to control these units, they must be "registered" in the NMS database.
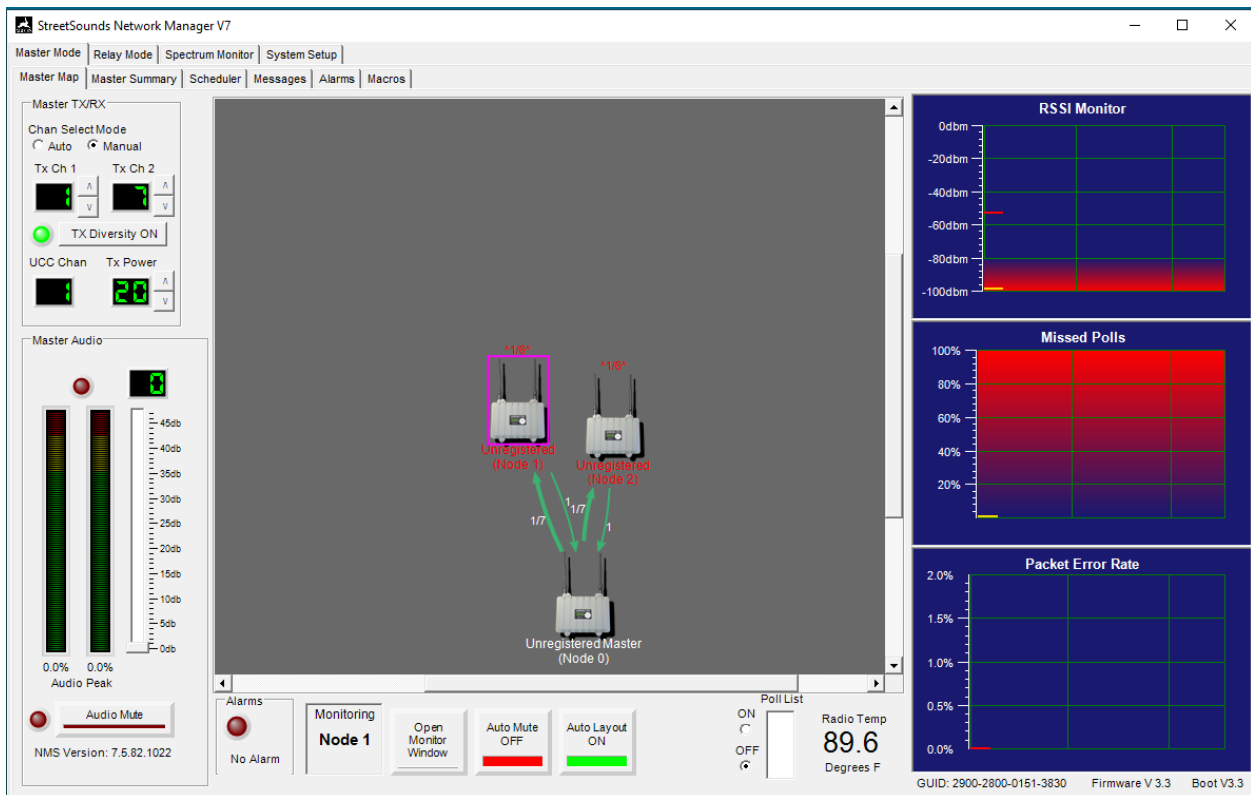
To register a node, either double-click on an unregistered node, or highlight a node, then click on Open Monitor Window on the lower portion of the Master Map screen. This will bring up a Relay Monitor window (below). In the Node Description/Location text box, enter a "friendly name" for the remote, such as "Central Deli" or "Pole #5". This will help keep track of which remote unit is being controlled or monitored.

After entering a friendly name, click on the "Register Node" button below the text box. This will store the name on the NMS configuration database. Do this for each node in the network.
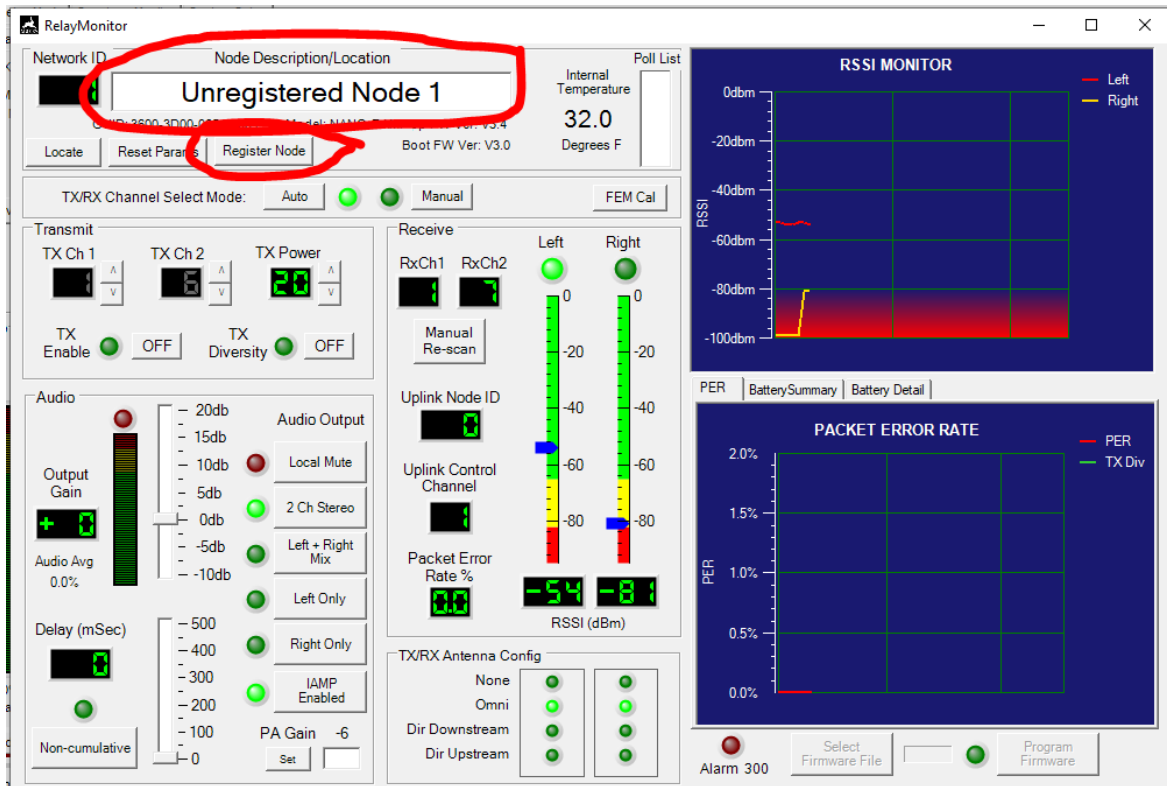
After nodes are registered their friendly name will appear below the node on the Master Map screen.
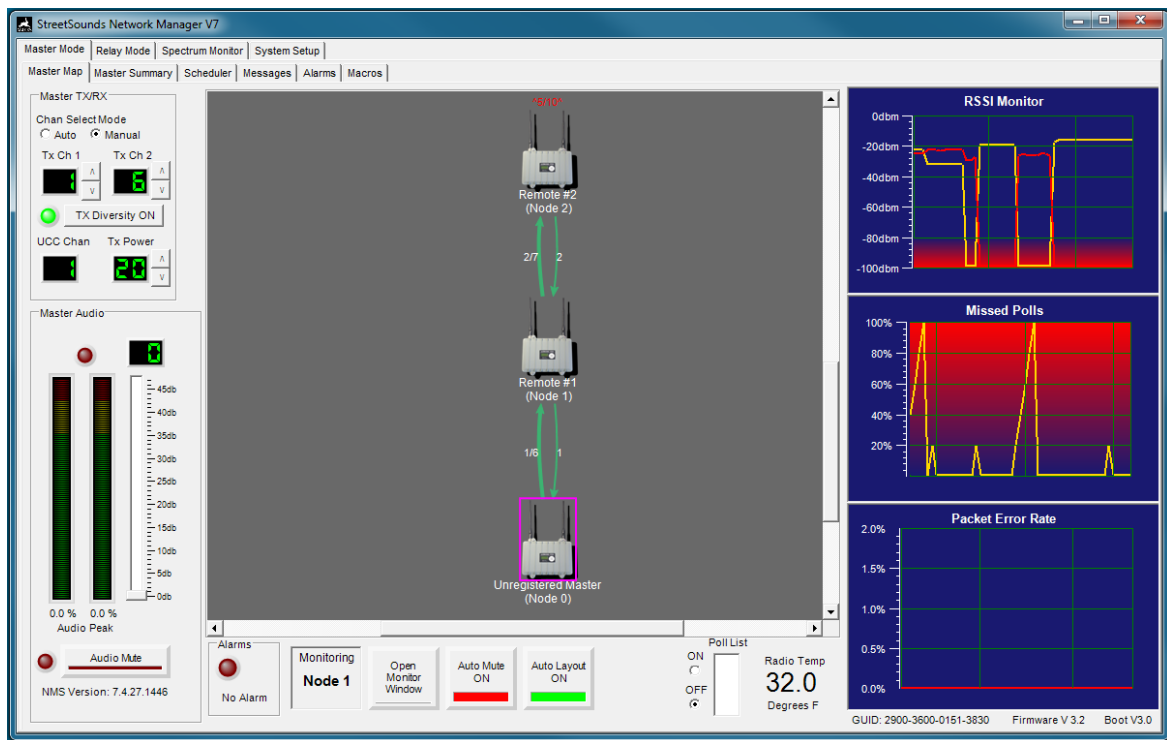
In the example screen above, one Relay unit named "Remote #1" has joined the network and is receiving its signal from the Master unit. The outbound link from the Master is using channels 1 and channel 6 (large arrow from Master to Relay), and the inbound Uplink Control Channel (UCC) link is using channel 1 (small arrow from "Remote #1" to Master). A second relay unit named "Remote #2" is receiving the relayed signal from "Remote #1" on channel 2 and channel 7 and is using channel 2 as the UCC channel.

The network operator can now get additional detail on any Relay by opening a Relay Monitor Window. This is done by highlighting the desired node in the network map and then clicking on the "Open Monitor Window" button at the bottom of the screen, or by double-clicking on the desired node.

3.2 Master Map Screen

The Master Map screen is the first tab on the left when in the Master Mode of NMS. The center area of the Master Map screen shows a network map of all active nodes.
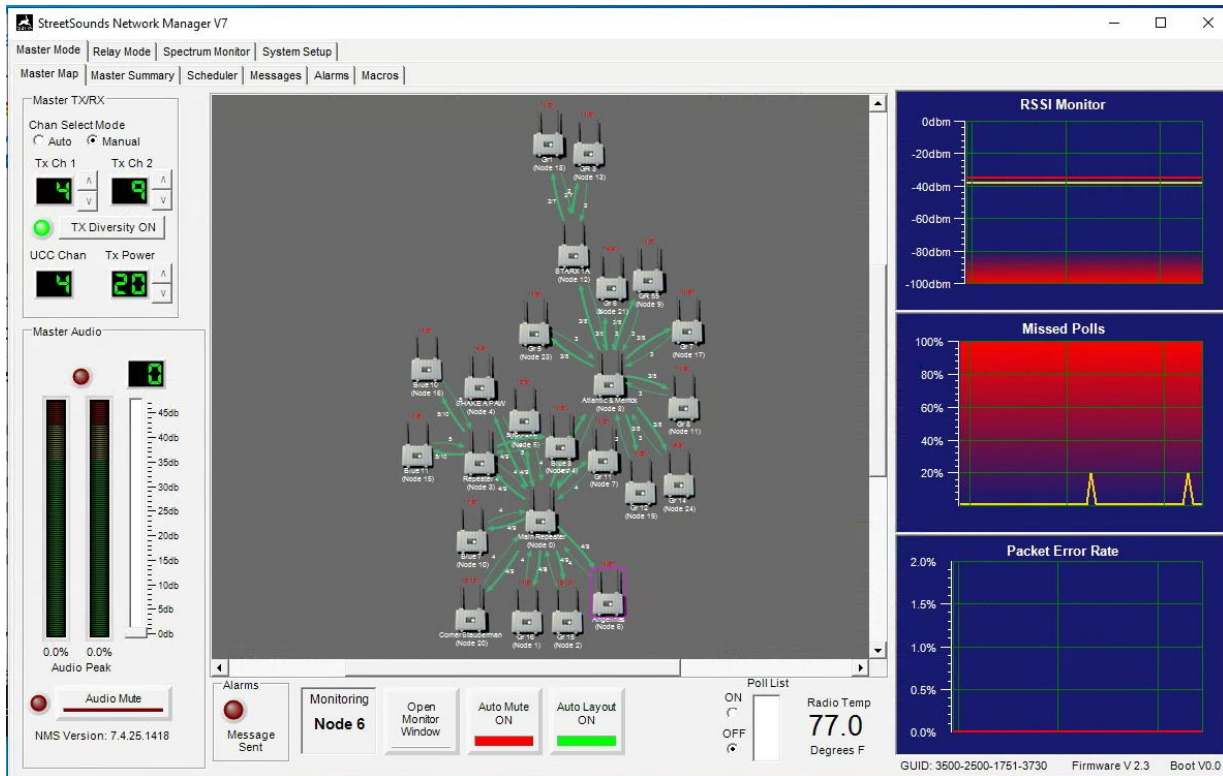

The Master node will always appear toward the bottom of the screen unless the user drags the node to a different location. If Auto Layout is ON, the nodes will automatically be realigned. If Auto Layout is OFF, the user can move the nodes to any location or configuration he chooses. This may be helpful for keeping track of physical node locations in the network. For larger networks the user can (CTL + mouse wheel) scroll out so that the nodes appear smaller and more nodes fit within the network map. Clicking on a Relay node will "select" the node. Once a node has been selected the user can then click the "Open Monitor Window" at the bottom of the screen to bring up a detailed "Relay Monitor Window" of the selected node. The Master node is always assigned Node 0.
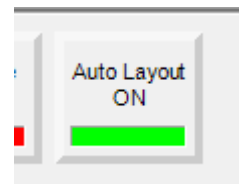
3.2.1 Master Map - RSSI Plot

The RSSI (Receive Signal Strength Indicator) plot appears at the top right section of the Master screen. This plot shows the receive signal level of the selected (highlighted) node on the Master Map screen. The signal from the Left Antenna port is shown in red, while the signal from Right Antenna port is shown in yellow. The remote unit automatically selects the strongest signal.
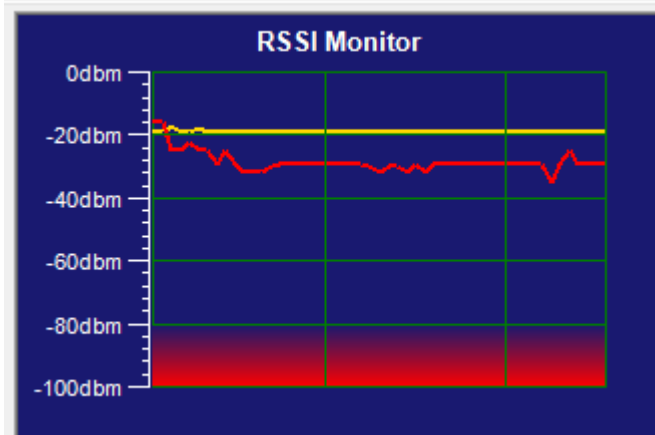
3.2.2 Master Map - Missed Polls Plot

This plot will show the percentage of polls that have not been answered by the selected node. Poll responses are measured over a six second interval. After 100% missed polls over the six second interval, the NMS considers the node disconnected and removes the node from the active poll list. A few sporadically missed polls are acceptable for good network performance. However, a significant number of missed polls can be a result of poor link quality and the operator should consider changing the operating channel to one with less interference or moving nodes closer together.
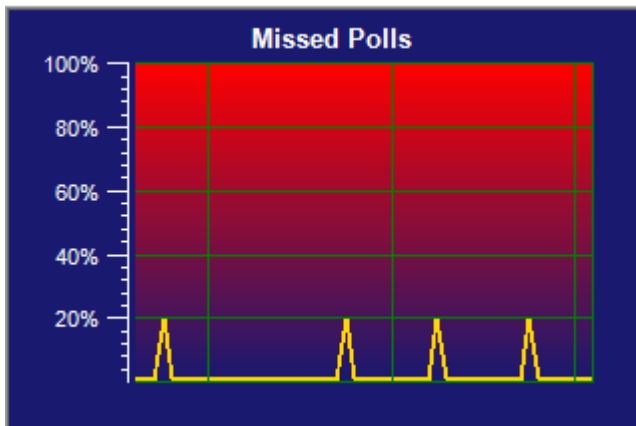
3.2.3 Master Map - Packet Error Rate (PER) Plot

The PER plot shows a real-time view of the Packet Error Rate of the selected Relay unit.

Since the StreetSounds RF links employ transmit diversity, a remote unit can drop the first (primary) packet transmitted from its uplink, but still receive the second (redundant) packet.

The green spike in this graph indicates that the first packet was missed (dropped), but the second packet was received. Thus, no audio dropout would occur.

11

However, if both the primary and secondary packets are missed, a red spike would be plotted proportional to the percentages of dropped packets. PER in excess of .1% to .5% could produce audible dropouts in the output audio. Therefore, care must be taken to reduce this packet loss by reorienting antennas, identifying and reducing interference, or moving the remote to a different location.

3.2.4   Master Map - Master TX/RX Functions

The functions in this section of the Master screen include:

- Channel Select Mode – Select either fully Automatic channel selection, or Manual channel selection for the Master Node.
- Transmit Channel #1 – Channel #1 used by the Master's downstream transmission to Relay nodes.
- Transmit Channel #2 – Channel #2 used by the Master's downstream transmission to Relay nodes if TX Diversity is enabled.
- TX Diversity – Used to avoid local interference by transmitting on two channels simultaneously. Leave TX Diversity ON at all times for the most reliable network performance.
- UCC (Uplink Control Channel) – Channel used by the Master to receive uplink control information from Relay units.
- Transmit Power – The output power level of the transmit signal sent from the Master. It is recommended that you leave this set to +20dbm.
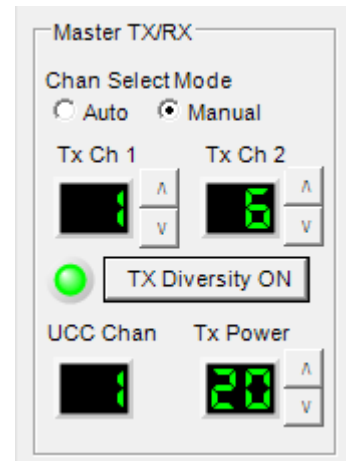
3.2.5   Master Map - Master Audio Functions

The functions in this section of the Master screen include:

- Master Audio Gain – The audio input gain setting for the Master audio input signal. For best noise performance, leave this setting at 0db unless the incoming audio signal is too low. When using the Mobile Master this volume defaults to +10db to provide enough gain for a microphone. It is desirable to keep the audio level on the lower half of the LED display.
- Audio Mute – The Audio Mute function will mute the incoming audio from audio source so that no audio is sent to any remote.

12
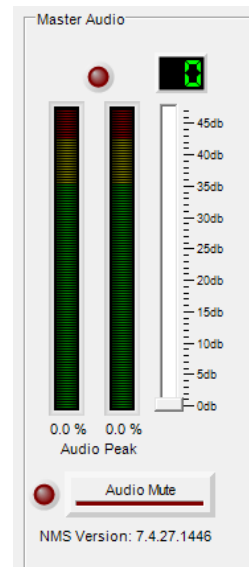
3.2.6　Master Map - Lower Screen Functions
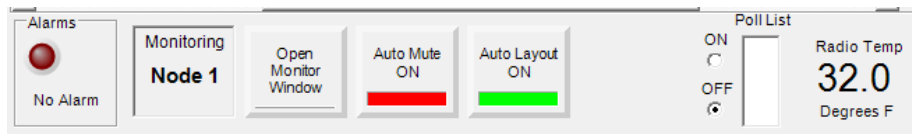
The function in this section of the Master screen include:

- Alarms – Indicates that a pending alarm is active.
- Monitoring Node X – Indicates which node is selected and being monitored in the graphical plots on the right side of the screen.
- Open Monitor Window – When clicked, will open a Relay Monitor Window of the selected node. Select (click on) a node on the Network Map, then hit Open Monitor Window to display the Relay Monitor window of the selected node.
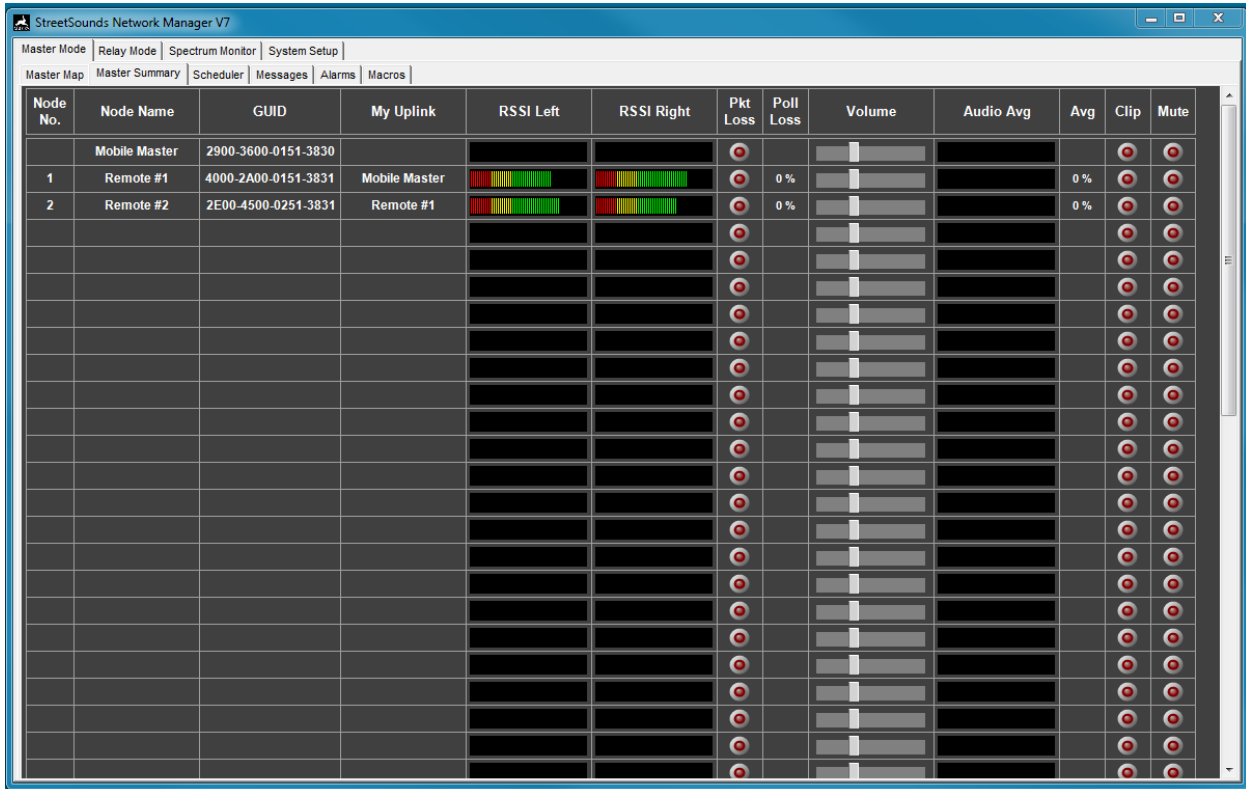- Auto Mute ON/OFF – Auto Mute is a safeguard to prevent the Master from transmitting audio if the NMS cannot communicate with the Master via the USB connection. For daily background music where the Scheduler controls muting or un-muting of remotes, if the NMS cannot send the mute/un-mute signal, the music may/will continue to play after hours. To prevent this from happening, enabling Auto Mute will cause the Master transmitter to mute its input if it is not being polled by the NMS/laptop. HOWEVER, WHEN USING A MOBILE MASTER FOR OUTDOOR EVENTS WITH NO LAPTOP CONNECTED, REMEMBER TO TURN AUTO-MUTE OFF. IF NOT THE MOBILE MASTER WILL AUTOMATICALLY MUTE AFTER BEING DISCONNECTED FROM THE NMS FOR ~20 SECONDS.
- Auto Layout ON/OFF – When Auto Layout is on, nodes that appear in the network map are automatically placed in relation to the nodes with which they are communicating. The user can drag the master or any relay nodes to a more convenient location on the screen, but the physical proximity will be automatically maintained. When Auto Layout is OFF, the user can manually drag the nodes to a position that more closely emulates the actual physical location of the nodes in the network. This may help the user keep track of the node locations more easily. Poll List – Shows the Network ID of which downstream nodes are being directly polled by the Master. This is typically used for factory debugging.
- Radio Temperature – Displays the internal temperature of the Master transmitter. Some versions of the Master transmitter (i.e. Mobile Master) will not include a temperature sensor and will thus read 32.0 degrees F (0 deg C).
- Poll List is used for factory debugging and should be left OFF.

3.3　Master Summary Screen

The Master Summary screen is a summary view of all active & registered nodes in the network. A remote that is not registered will not show up on this screen.


This screen includes the following information:

- Node No. – Arbitrary network node ID assigned by the NMS when the remote "joins" the network.
- Node Name – Friendly name assigned by the operator when the node is registered in the database.
- GUID – Globally Unique ID of the remote hardware, similar to a MAC address.
- My Uplink – Indicates the uplink node name of the unit transmitting the signal this node is receiving.
- RSSI Left/Right – Received Signal Strength Indicator (RSSI) of each active antenna port. If one antenna is disabled, its RSSI will be blank.
- Pkt Loss – Indicates the percentage of dropped packets on the RF link received by this node. Dropped packets generally also mean audio dropouts are present. If packet loss is minimal, the dropout may not be audible due to a "packet loss concealment" algorithm in the firmware.

3.4　Master Scheduler Screen

The Scheduler Screen allows the network operator to mute or un-mute the AUDIO OUTPUT of remotes based on time of day, day of week, Zone, or manually. (The Scheuler has no effect on the AUDIO INPUT

to the Master. Input audio is manually muted on the Master Map screen using the "Audio Mute" button).
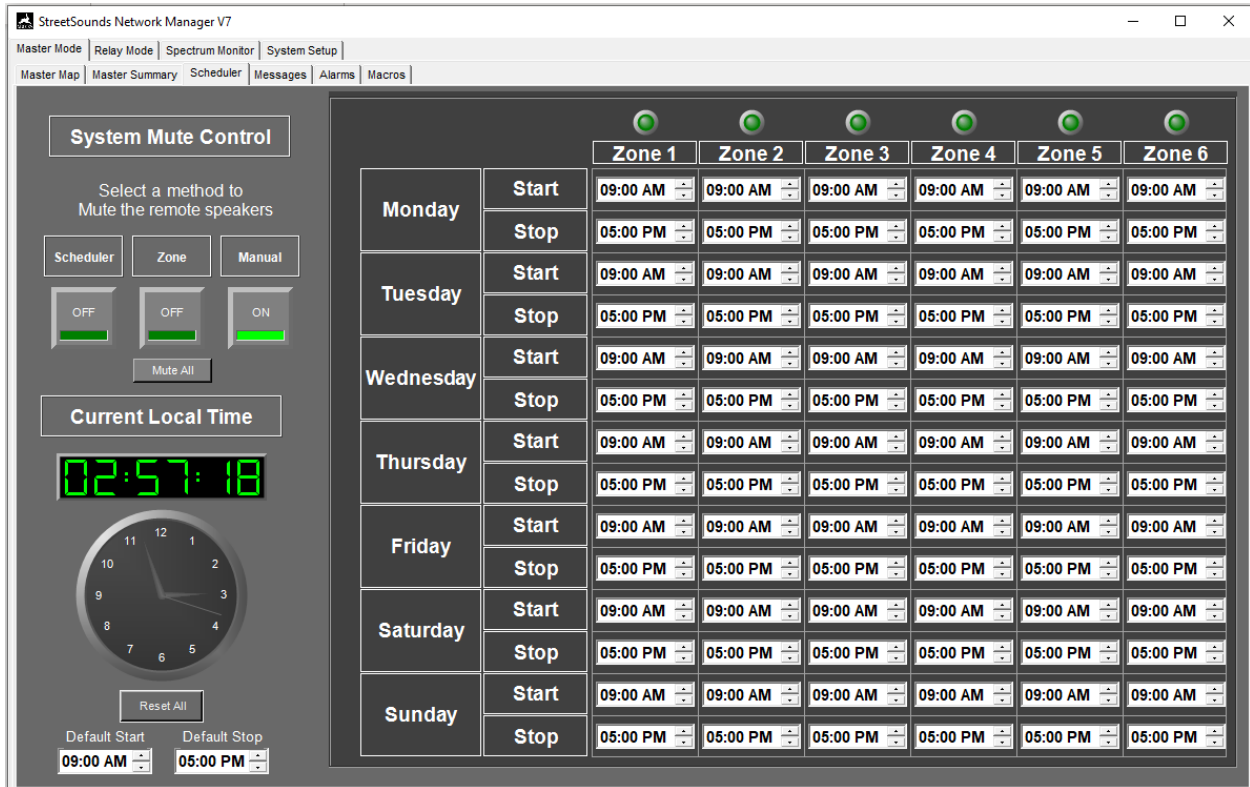
3.4.1 Scheduler - Manual Mode

When set to "Manual", any remote can be individually muted or un-muted by clicking on the red LED in the Master Summary screen associated with the specific remote,
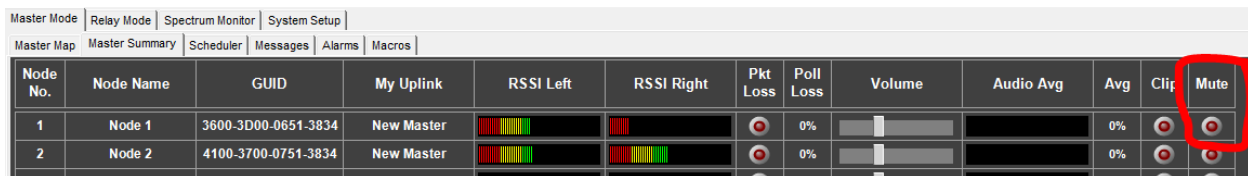
or by clicking on the "Local Mute" button in its Relay Monitor screen.
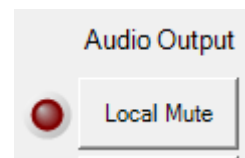
3.4.2 Scheduler - Zone Mode

When set to "Zone" and entire Zone of remotes can be maually muted or un-muted as a group. This is also a "manual" process and not run by time of day.

3.4.3 Scheduler - "Schedular" Mode

However, when set to "Scheduler" mode, all muting and un-muting is controlled by the Scheduler software and **manual muting is disabled**. In the Scheduler screen shown below, all remotes will be un-muted at 9:00 AM every day. Similarly, all remotes will be muted at 5:00 PM every day.

To change a start or stop time, either enter the new time directly in the text box, or click on the up/down arrows. TO MAKE SURE THE NEW TIME TAKES EFFECT, hit TAB to move the cursor to the next text box so that the new value is stored in the NMS.

To change ALL times in all zones and all days, enter a new value in either the Default Start time (lower left of screen) or Default Stop time, then hit Reset All. All times will then reflect the new time.

N*OTE: If a user attempts to mute or un-mute a remote while the Scheduler is enabled, the Scheduler will dictate the mute-state of the remote, and will override the manual mute command of the user.*

3.5   Master Messages Screen

The Messages screen allows the operator to play pre-recorded "messages" (commercials, promos, special songs) at a specified time-of-day and day-of-week. Up to five different messages can be played at different times-of-day and days-of-week based on the input of this screen.

Note: The Messages function is designed to work with audio that is being streamed with either a Google Chrome or Internet Explorer browser. It will NOT work with an external hardware streaming device.

Note: The scheduler must be enabled, and a web-based audio player must be in the process of playing music for a message to play.

Note: Messages must be in a .wav format to be played.

When Enabled, the Messages begin played will slowly fade-out the streaming audio, and fade-in the message audio. Once the Message has ended, the streaming audio will be faded back in.

Note: If the Message is stopped before it plays completely, the "Windows Volume Mixer" may not have faded in and will prevent the streaming audio from playing through the system. If this happens, right click on the Windows speaker icon and select "Open Volume Mixer", then re-adjust the "Google Chrome" volume control to is max value.
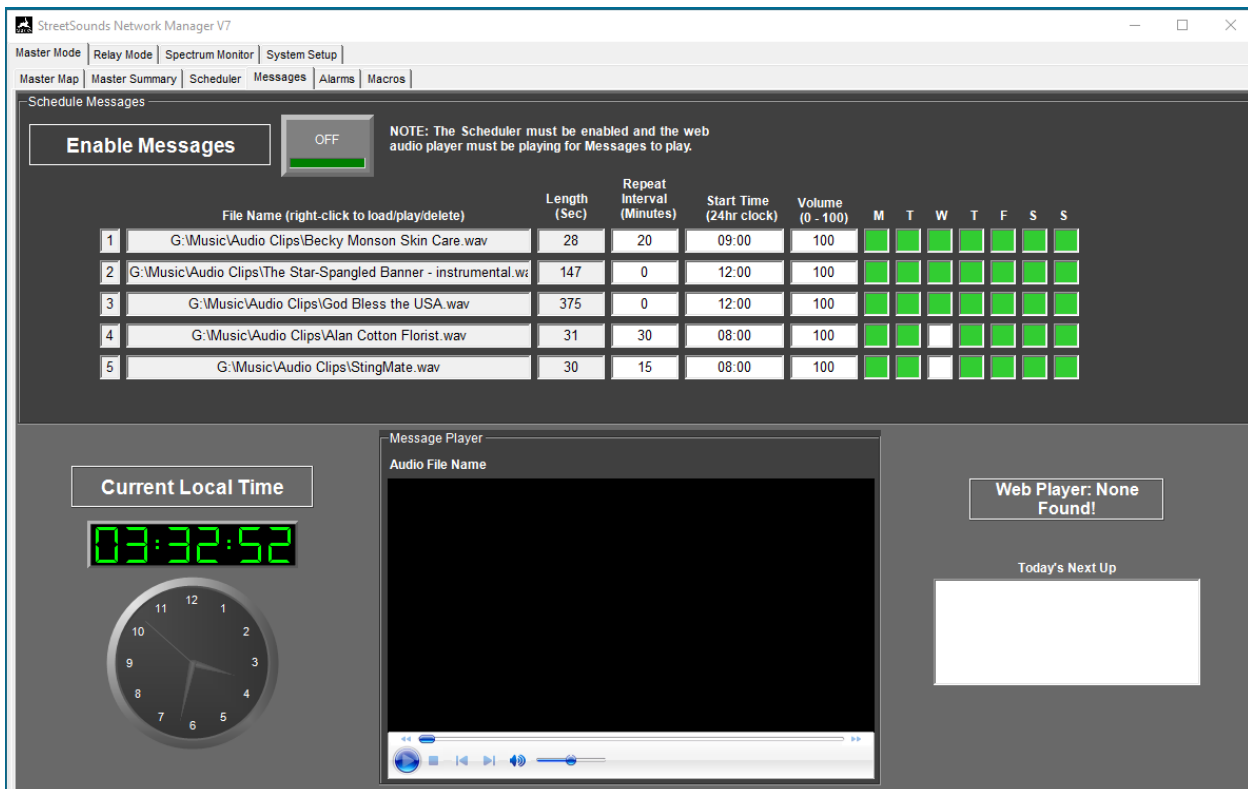
Messages are loaded into a specific row by right-clicking on a row and selecting "Load". Once loaded, the message can be played manually by right-clicking on the message name and selecting "Play".

Caution: Hitting "Play" will play this audio over the StreetSounds network if the laptop audio output is connected to the StreetSounds transmitter.

Similarly, a message can be deleted by right-clicking on the message name and selecting "Delete".

The Length of the message is set automatically when the message is loaded.

The "Repeat Interval" is the number of minutes that elapse before playing the message again. For example, entering "20" means that the message will repeat every 20 minutes.

"Start Time" is the time of day the when the message begins playing, and is repeated every Repeat Interval minutes after that. The "Start Time" is expressed as a 24hour clock time (i.e. 6PM = 18:00).

"Volume" is a percent of full scale audio volume. If one of your messages is recorded at a much higher volume than others, you could set this number to 50%. Normally this number should be left at 100%.

The Day-of-Week matrix lets you select specific days for certain messages. Click on a Day-of-Week box to enable (green) or disable (grey) playing a message on that day.
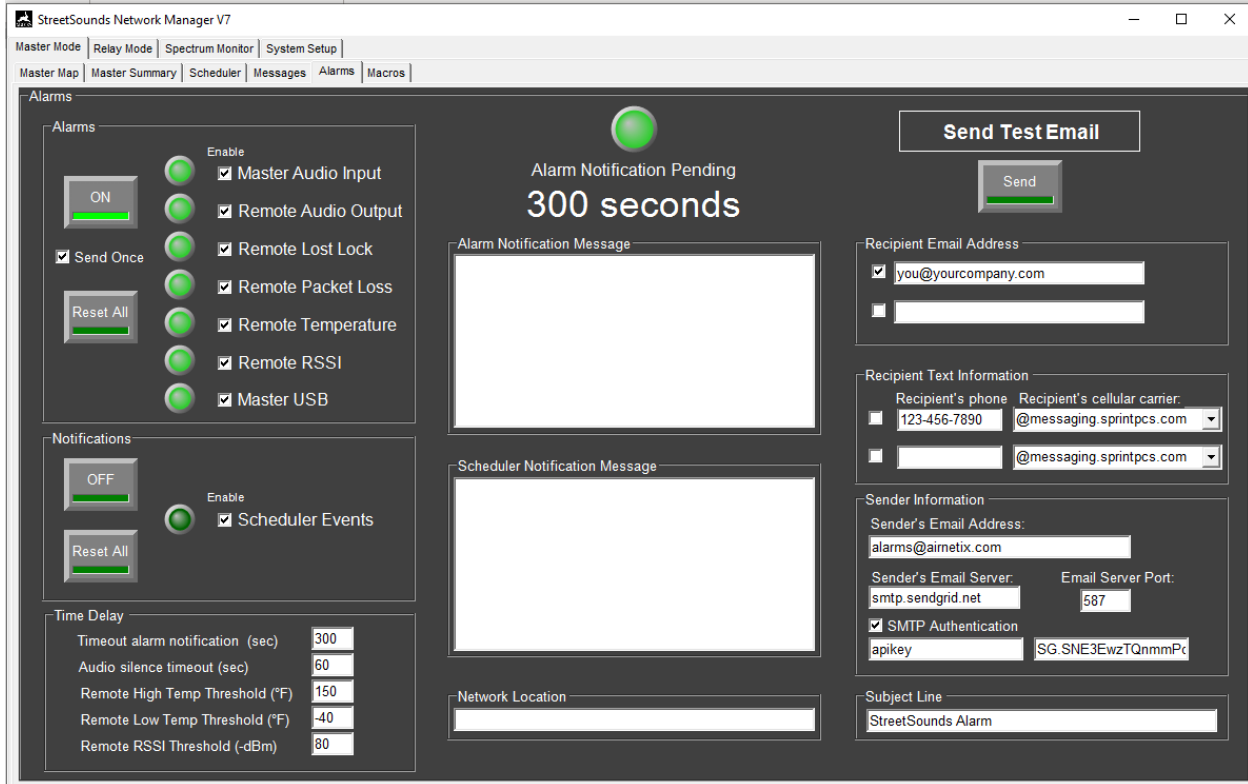
"Today's Next Up" shows you which message is queued to be played next.

A special song (i.e. National Anthem, etc.) can be played once per day at a specific time of day by setting the Repeat Interval to zero and selecting the desired time of day.

3.6 Master Alarms Screen

The Alarms Screen gives the operator full control over configuring the many alarms available in the NMS.

Prior to enabling alarms you should decide how you want to handle them. If you would like for the alarms to be sent via email, set up the Recipient Email Address. You can enter two different email address if desired. Click on the check-box to activate each one. You can Send a Test Email to test that the email system is working.

You can also choose to send alarms via text message. Set the Recipient Text Information for up to two recipients. Each must be enabled separately. Sending a Test Email will also send a test Text Message.

Enter the Sender's Email Address so that when they are received, it will be apparent where the emails are coming from.

YOU DO NOT NEED TO CHANGE THE SENDER'S EMAIL SERVER, SERVER PORT, OR SMPTE AUTHENTICATION. The are set up to use a free email forwarding service.

You can optionally enter a subject line and Network Location into the appropriate text box.

Once you have configured the email and text notification information, you can enable the Alarms. If there are alarms occurring in the network they will begin to show up in the Alarm Notification Message text box. You can enable or disable specific alarms depending on what is happening in the network. For

19

example, if you know you always drop packets at one or more remotes, you can disable Remote Packet Loss alarm.

Below is a list of alarms:

- Master Audio Input – Audio into the master is below ~1% of full scale.
- Remote Audio Output – Audio out of a remote is below ~1% of full scale.
- Remote Lost Lock – The remote has lost lock with the Master.
- Remote Packet Loss – The remote is experiencing >0% packet loss.
- Remote Temperature – The internal temperature of the remote unit is outside the temperature bounds in the Settings section.
- Remote RSSI – the RSSI of the remote unit is below the threshold level in the Settings section.
- Master USB – the Master has lost is USB connection during the alarm window.

The "Timeout Alarm Notification" period is the delay between when an alarm occurs and when the notification is sent via email or text. The default is 300 sec (5 minutes).

Alarms will be sent continuously after a Timeout Alarm Notification time-out period, unless the "Send Once" check-box is checked. If checked, the alarm email will be sent only once. It is then incumbent on the network operator to log into the NMS and clear the alarms that have occurred. Otherwise new, perhaps more serious alarms will be queued up and will not be sent.

"Audio Silence Timeout" is the delay between when the audio drops below ~1% full scale, and when the alarm is detected. This helps ignore normal gaps that may occur in audio (songs). The default value is 60 seconds.

"Notifications" are indications that a non-Alarm event has occurred, such as Scheduler events. These are shown on the Scheduler Notifications Message window. Each time a Scheduler event occurs, it will be posted in this window, and sent along with Alarms in the next email or text message. These Notifications can be enabled or disabled separately from Alarms.

3.7　Relay Monitor Window

The Relay Monitor Window gives the network operator complete visibility and control of a remote node.
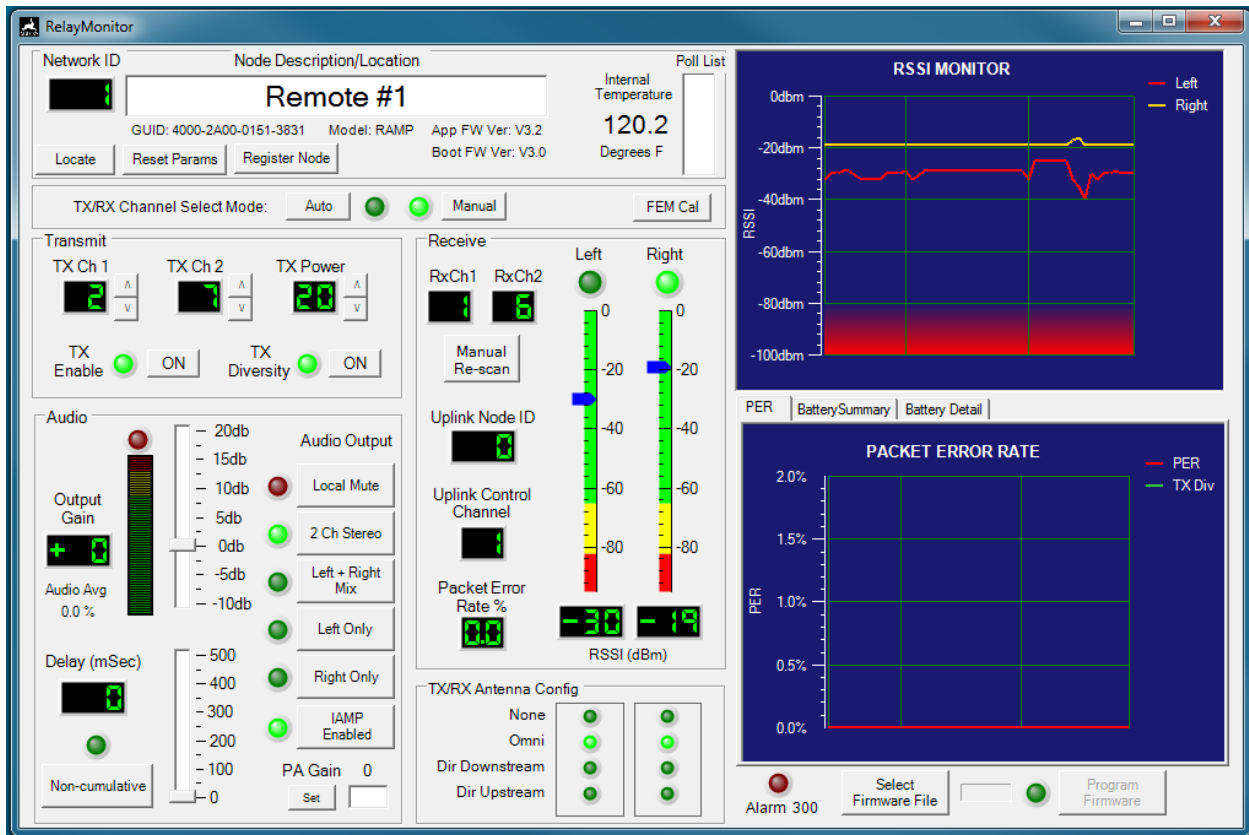
3.7.1　Relay Monitor - Top Section Functions
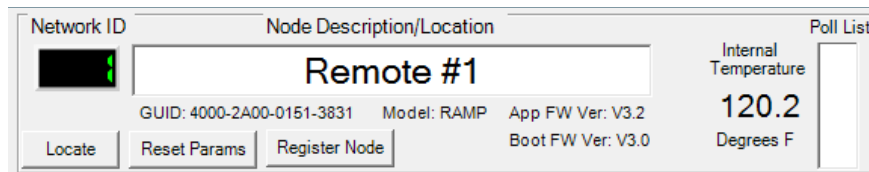
The top section of the Relay Monitor window includes the following functions:

- Network ID – This is the arbitrary network ID number assigned to the Relay node by the NMS.
- Node Description/Location – "Friendly name" assigned by the network operator and registered in the NMS database.
- GUID – The GUID of the remote hardware.
- Model – The model type of the remote node (RAMP = radio/amplifier).

- APP FW Ver – The firmware version of the application firmware in the remote unit.
- Boot FW Ver – The BOOT firmware version of the remote unit.
- Internal Temperature – The internal temperature reading of the remote unit in deg F.
- Poll List – The poll list of downlink nodes connected to this node. Typically used for factory debugging and is normally blank.
- Locate – When clicked, this remote will emit a loud tone though its speakers for ~2 seconds. This helps identify which node is which during network deployment in case the remote unit has not yet been registered in the NMS database. NOTE: **This tone is LOUD**.
- Reset Params – Allows the operator the reset the remote units operating parameters to Factory Default values. Factory default parameters include:
  - Operating Mode – Relay
  - Channel Select Mode – Auto
  - TX Enable – Disabled
  - TX Diversity - Disabled
  - Audio Volume – 0db
  - Delay – 0ms
  - Audio Output – 2Ch Stereo
  - IAMP (internal audio amplifier) Enabled
  - TX/RX Antenna Config – Left: Omni, Right: Omni
- Register Node – When clicked the node's Friendly name and GUID are registered in the NMS database.

3.7.2   Relay Monitor - TX/RX Channel Select Mode

This section allows the network operator the set the remote into "Auto" or "Manual" channel sect mode.

In Auto mode the remote will scan for the strongest signal it detects and lock to that channel. If the transmission stops, the remote will automatically re-scan for another active transmission. Once locked onto a channel, the remote will typically not re-scan if another, stronger signal becomes present. Thus, when deploying a network it is important to make sure the remote is locked on to the strongest signal available. This is part to "optimizing" the network. Once a network is optimized, the remote unit should be set to Manual.

The "FEM Cal" function is only used for factory calibration and debugging and should not be changed by the operator.

3.7.3   Relay Monitor - Transmit Section

When a StreetSounds unit is configured as a "repeater", its transmitter can be enabled to transmit on a specific frequency to other units "downstream". The Transmit section of the Relay Monitor Window includes the following functions:
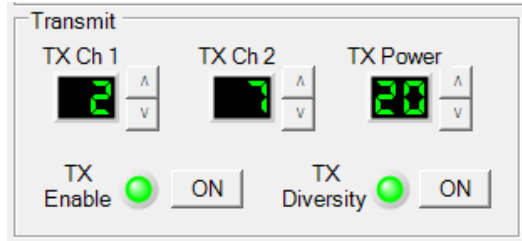
- TX Channel #1 - The channel currently used for the primary downstream transmit signal of the Relay unit.

- TX Channel #2 - The channel currently used for the secondary (redundant) downstream transmit signal of the Relay unit when TX Diversity is enabled.

- TX Power – Downstream and upstream transmit output power of the Relay unit. It is best to leave this setting at +20dbm.

- TX Enable – This controls allows the operator to turn on or off the downstream "repeated" signal of the unit's received signal. When disabled, the remote unit is a "receive-only" unit. When enabled, the remote unit is a "repeater" and other downstream units can lock onto this transmission.

- TX Diversity – Enables the remote unit to transmit on two alternating channels (TX Ch1 & TX Ch 2) in order to enhance the performance of the RF link. This should be left in the ON position at all times.

3.7.4   Relay Monitor - Receive Section

The Receive section of the Relay Monitor Window includes the following functions:
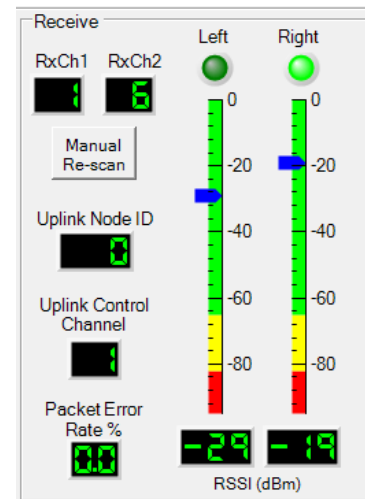
- Receive Channel #1 – Indicates the primary receive channel of the Relay node.

- Receive Channel #2 – Indicates the secondary (redundant) receive channel of the Relay node if Transmit Diversity has been enabled in the upstream node.

- Manual Re-scan – Allows the operator to manually initiate a re-scan of the RF spectrum for a downstream signal from an uplink node. This may be desirable when a stronger downlink signal is available than the one currently being received by the Relay node. A Manual Re-scan can only be initiated when the unit is in Auto Channel Select mode.

- Uplink Node ID – Indicates the Network ID of the uplink node currently communicating with the selected Relay node.

- Uplink Control Channel – Indicates the uplink control channel being used for uplink control information.

- Packet Error Rate – Indicates the percentage of packets that were dropped over the past six second interval.

- Left/Right LEDs – The LEDs Indicate which antenna port is currently being used by the receive section of the remote unit. If both antenna ports are enabled, the remote unit will automatically select the antenna port with the strongest received signal. If only one antenna port is enabled, its LED will always be ON.
- RSSI – Receive Signal Strength Indicator – Shows the real-time receive signal level for each antenna.

3.7.5 Relay Monitor - RSSI Plot

Displays a real-time plot of the current receive signal level on each antenna. Left antenna port is plotted in red, and Right antenna port is plotted in yellow. The remote unit automatically selects the stronger of the two signals when both antennas are enabled.
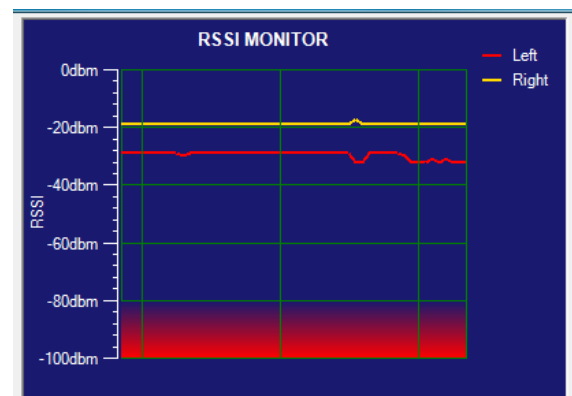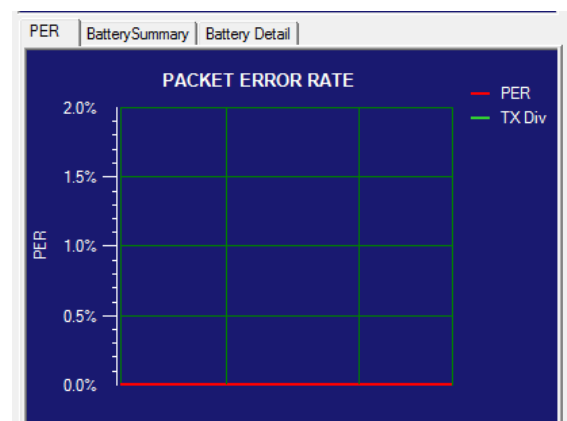

3.7.6 Relay Monitor - PER Plots

The PER (Packet Error Rate) plot (left-hand tab of this window) shows a real-time view of the Packet Error Rate of the selected Relay unit.

Since the StreetSounds RF links employ transmit diversity, a remote unit can drop the first (primary) packet transmitted from its uplink, but still receive the secondary (redundant) packet.

A green spike in this graph indicates that the first packet was missed (dropped), but the second packet was received. Thus, no audio dropout would occur.


However, if both the primary and secondary packets are missed, a red spike would be plotted proportional to the percentages of dropped packets. PER in excess of .1% to .5% could produce audible dropouts in the output audio. Therefore, care must be taken to reduce this packet loss by reorienting antennas, identifying and reducing interference, or moving the remote to a different location.

3.7.7   Relay Monitor - Audio Section

The audio functions in this section include:

- Output Gain – The is the audio gain from the remote's received signal to the output of the audio section of the receiver. This gain is typically left at 0db but can be changed to enhance the audio coverage at one remote location instead of the entire network.
- Audio Avg – This is the time-filtered average of the audio output signal level.
- Delay – A delay of up to 500 mSec ** can be added to the output audio signal. This is useful in "time-alignment" of the audio wave front with live music.
- Non-Cumulative – For large live event venues, delays can be "concatenated" (added together) as the signal travels downstream through a repeater node. This allows the operator to "dial in" up to 500 mSec per "hop" (repeater).
- PA Gain - If the remote unit is a StreetSounds RAMP, there is an additional gain element in the Internal Audio Amplifier (IAMP), called PA Gain. Additional output gain or attenuation (+10db to -20db) can be added through this control if desired for gain balancing.
- Audio Output – Selects the output mode of the audio section.
   - Local Mute – Manually mutes the output of the selected remote unit.
      - *NOTE: if the Scheduler is Enabled, the manual Local Mute is overridden by the Scheduler settings.*
   - 2Ch Stereo – The audio output consists of a separate Left channel audio out of the left speaker and Right channel audio out of the right speaker. This setting has the best audio quality.
   - Left + Right Mix – Mixes the Left and Right channel and sends the same mix out of both speakers.
   - Left Only – The Left channel audio is sent out of both speakers.
   - Right Only - The Right channel audio is sent out of both speakers.
- IAMP Enabled – In a StreetSounds RAMP, this indicates whether the internal audio amplifier (IAMP) is enabled or disabled. A red flashing LED indicates a failure of the IAMP, or that the IAMP is muted.
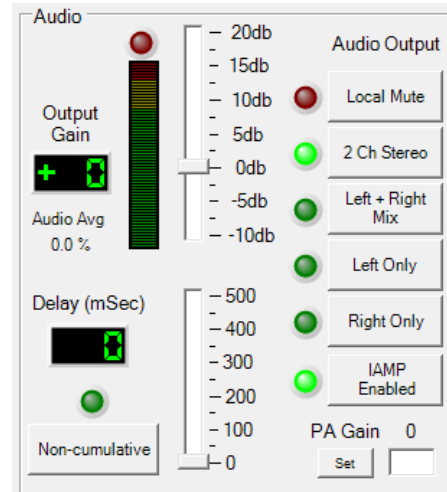
3.7.8 Relay Monitor - TX/RX Antenna Config

The antenna ports on a StreetSounds unit can be configured as follows:
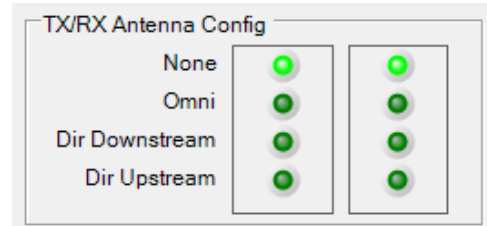
- None – No antenna is present on the port.
- Omni – An omnidirectional antenna is present on the port.
- Dir Downstream – Directional antenna is present on the port and is configured as a "downstream" antenna function.
- Dir Upstream – A directional antenna is present on the port and is configured as n "upstream" antenna.

These antenna configurations offer a great deal of flexibility in how the remote unit is used in the network and allow the remote unit to be optimized for the following functions:

1. Receive-only with an omnidirectional antenna on either the right, left, or both antenna ports.
2. Receive-only with a directional antenna on either the right, left, or both antenna ports.
3. Repeater with an omnidirectional upstream antenna and a directional downstream antenna.
4. Repeater with a directional upstream antenna and an omnidirectional downstream antenna.
5. Repeater with a directional upstream antenna and a directional downstream antenna.

3.7.9 Relay Monitor - Lower Right Section

This section includes the following functions.

- Alarm – When flashing, indicates that an alarm is "pending" which will be sent at the end of a timeout period. When not flashing, indicates that an alarm has been sent.
- Select Firmware File – Lets the network operator select a firmware upgrade file to be sent to this remote unit. See "Firmware Upgrade" section for details.

4 Spectrum Monitor Screen

The StreetSounds Master transmitter can be configured as a "Spectrum Monitor" to scan the RF spectrum in the area for interference.

The screen below shows the Spectrum Monitor mode. The spectrum is divided into 10 discrete channels which are used by the StreetSounds network. The blue horizontal indicator lines show peak signal levels in the channel, while the white indicators show a 10 second average of the signal power in the channel. These indicators can be reset by pressing the "Reset Peaks" button in the upper left.

This sample scan below shows very little interference in the area near the Master (~-90 dbm).

The scan below shows significant interference in the area which may cause dropouts.
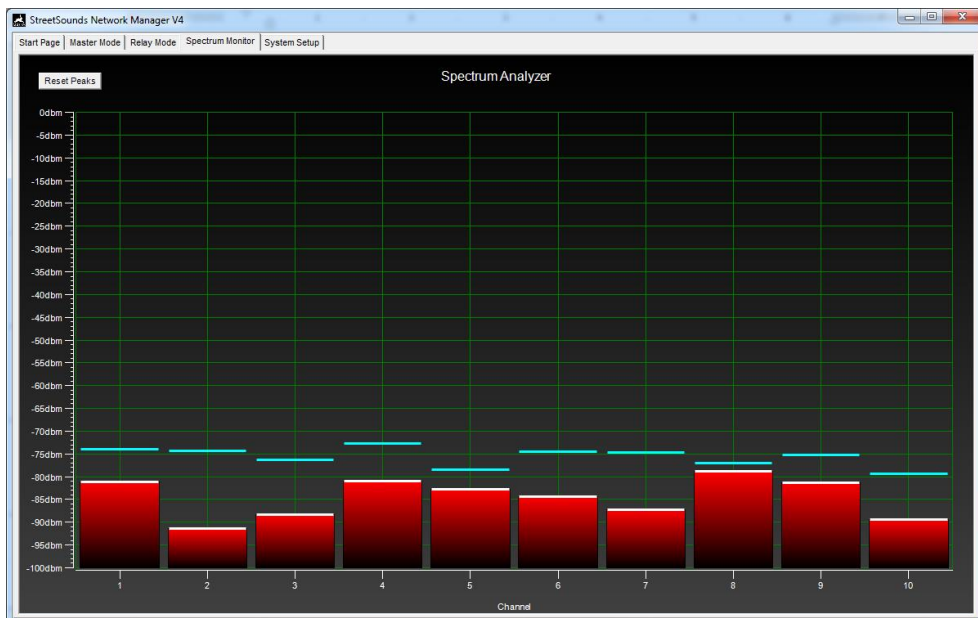
The next scan shows another StreetSounds transmitter nearby that is transmitting on channels 1 & 6. The StreetSounds transmissions show up as green bars, while interference shows up as red bars.
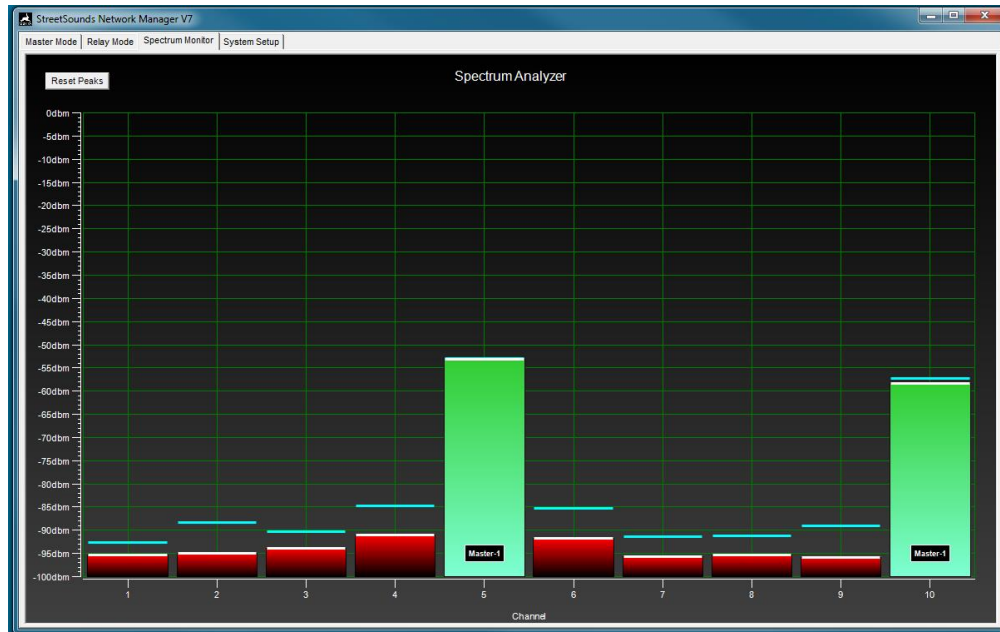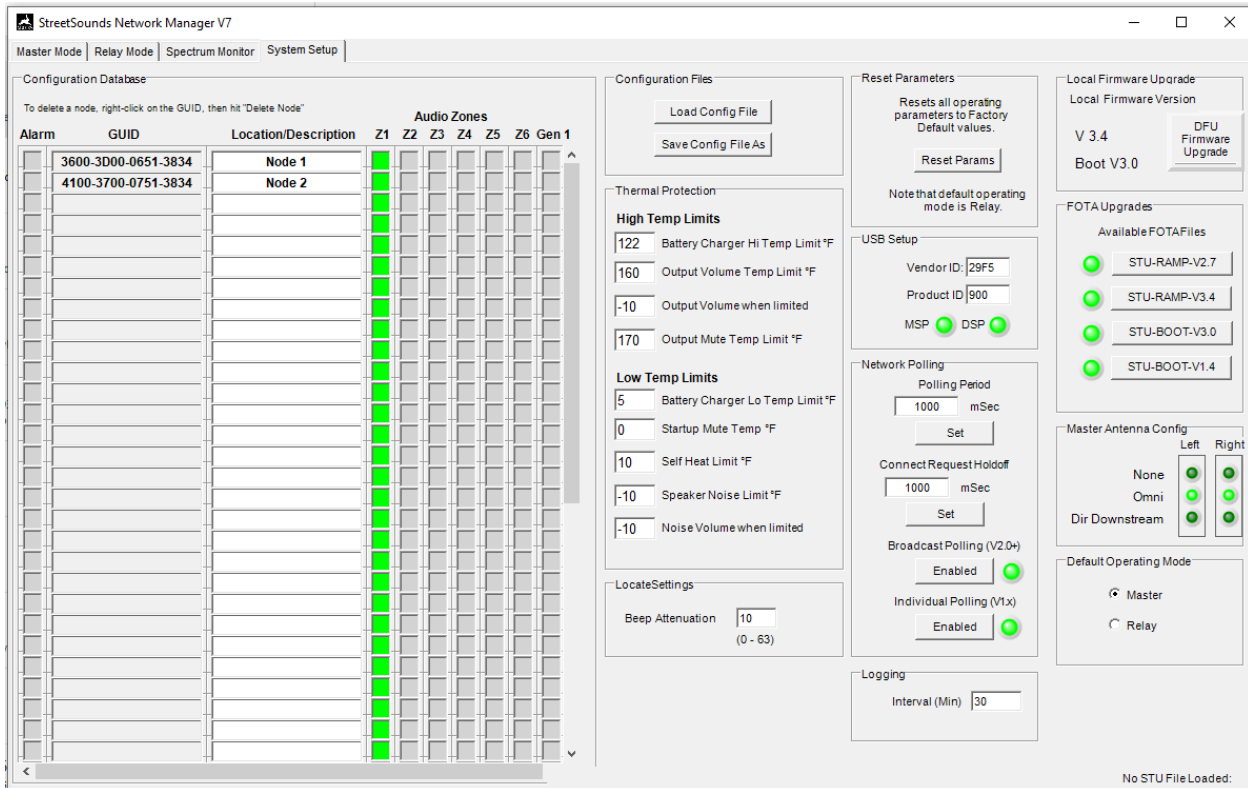
5   Relay Mode Screen

During special events a Fixed Master can be reconfigured to be a Relay unit (repeater) that receives the transmission from a Mobile Master on the street, and relays the signal back out to the rest of the network. To put the Fixed Master into Relay mode, click on the "Relay Mode" tab as shown below. Initially set the Channel Select Mode to Auto so that the Fixed Master can receive the signal from the Mobile Master. Once the Fixed Master has acquired the Mobile Master signal, set the channel select to Manual. Then make sure to enable TX mode on the appropriate channels normally used by the Fixed Master.
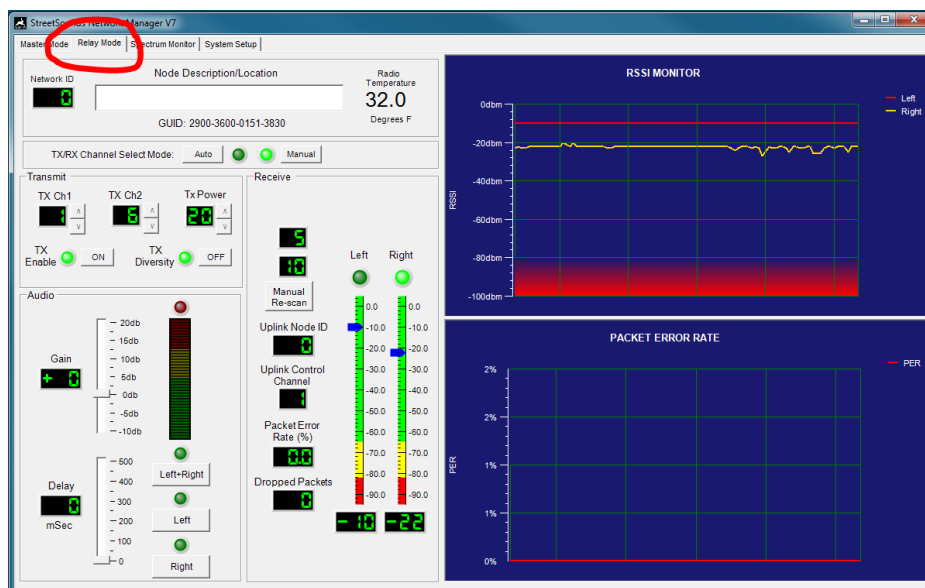
6 System Setup Screen

The System Setup Screen displays the NMS "Configuration Database" entries of each of the registered nodes and their user-assigned friendly name. To delete node entries from the database, right-click on the node and hit delete.

6.1 System Setup Screen – Configuration Database

Each remote registered in the database can be set to be part of one of six Zones. These Zones are merely "groups" of remotes that are treated similarly by the Scheduler. The Scheduler turns a Zone ON or OFF (un-mute or mute) based on time-of-day and day-of-week (see Scheduler section). Clicking on a Zone will enable that remote to participate in the associated Zone (green color). Click on another zone to move the remote to the selected zone.

The "Gen1" box allows first generation remote units (STS-70) to be mixed with current generation products in a single network and configuration file. Any Gen1 device in the network must be identified by clicking on this box. Otherwise the Gen1 device will not operate correctly with current generation devices.

Configuration Database files can be loaded and saved by clicking the "Load Config File" or "Save Config File" buttons. It is a good idea to occasionally save your config file as a back up in a safe location.

6.2   System Setup Screen – Master Antenna Configuration

"Master Antenna Config" allows the network operator to configure various antenna types for use at the Fixed Master Transmitter location. The Left and/or Right antennas can be disabled (None), set to Omni directional (Omni), or "Directional Downstream" (i.e. Yagi).

IT IS IMPORTANT TO HAVE AT LEAST ONE ANTENNA CONFIGURED FOR TRANSMITTING THE OUTBOUND (Downstream) SIGNAL.

If only one antenna is configured for transmission, both the primary and secondary (redundant) packets are transmitted through that antenna. If two antennas are configured, the primary packet is sent via the Right antenna, and the secondary packet is sent via the Left antenna.

6.3   System Setup Screen – Firmware Upgrades.

"Local Firmware Upgrade" allows the operator to upgrade the firmware of the attached device (normally the Fixed Master or Mobile Master). See Firmware Upgrade section for more details.

"FOTA Upgrade" (Firmware Over-the-Air) allows the operator to upgrade the firmware of a remote unit "over the air" without having to physically connect to the remote. See Firmware Upgrade section for more details.

7   Deploying and Configuring a Network

8   Installing the NMS application software

9   Firmware Upgrades

9.1   Upgrading the Master Transmitter Firmware via USB
9.2   Upgrading Remote Firmware "Over The Air" (FOTA)