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Model: ARX-900

Manual

AiRocks Pro

ARX-900

Digital Wireless Audio Repeater

User Guide

PRELIMINARY

February 12, 2015

CONTENTS

Introduction

1 AiRocks Pro Overview

AiRocks Pro is a revolutionary new digital wireless audio system designed to provide significantly extended coverage area and ultra-reliable audio distribution for pro-audio sound reinforcement applications. AiRocks Pro is typically used in large indoor or outdoor venues to distribute audio from a main mixer board to multiple powered speakers distributed over a wide area. Based on a novel "repeater" or "transceiver" multi-hop audio technology, AiRocks Pro can be used to go around obstacles, such as buildings, trees, or other obstructions, or to dramatically extend the coverage area compared to traditional wireless audio products.

Figure 1 AiRocks Pro ARX-900

1.1 Traditional Wireless Audio

Traditional wireless audio equipment consists of a "transmitter" and a "receiver" which send analog audio from point A to point B. This type of network is called a "point-to-point" network. Most wireless microphones, wireless in-ear devices, and wireless instrument equipment are point-to-point products.

Some newer wireless audio products provide the ability to send a signal from a single transmitter to multiple receivers. This type of network is called "point-to-multipoint" and can be effective if all receivers are within the transmission range of the transmitter. However, since the FCC limits the amount

of power that each transmitter can radiate, the effective range of this type of system is somewhat limited.

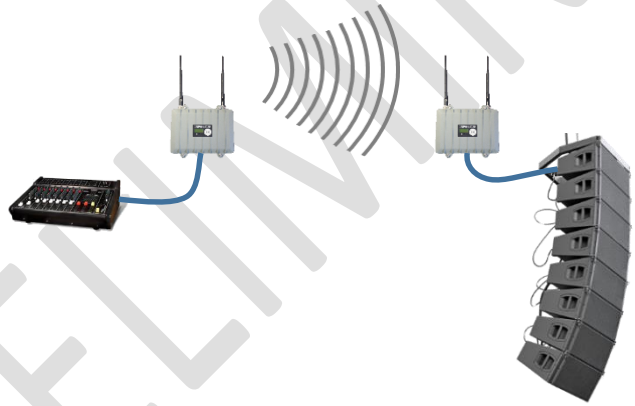
Also, some of these newer devices include what are called “transceivers”. These devices give a single unit the ability to be manually configured as EITHER a transmitter OR receiver, but not both simultaneously.

1.2 THE AIROCKS PRO REPEATER

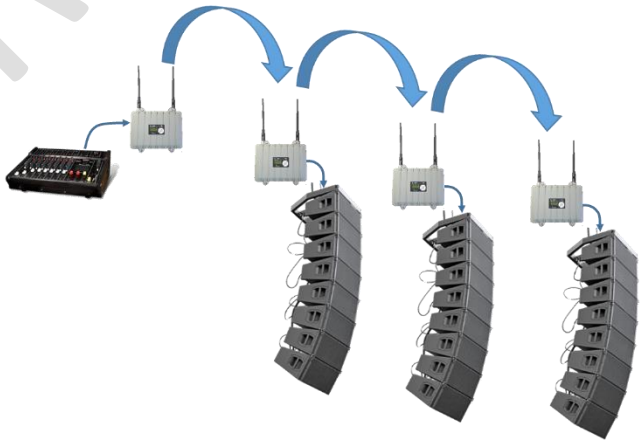
AiRocks Pro is the world’s first digital wireless audio “**repeater**”. Each AiRocks Pro unit includes BOTH a transmitter AND a receiver operating **simultaneously** in the same unit. A signal that is received by an AiRocks Pro unit is immediately re-transmitted on a different frequency to other AiRocks Pro units within its transmission range. When AiRocks Pro units are positioned in a “line” (linear fashion) they form what is called a “multi-hop” wireless audio network. The range of this type of network is theoretically “unlimited”, however, practical considerations (such as path obstructions and interference) can limit the actual size of the achievable coverage area.

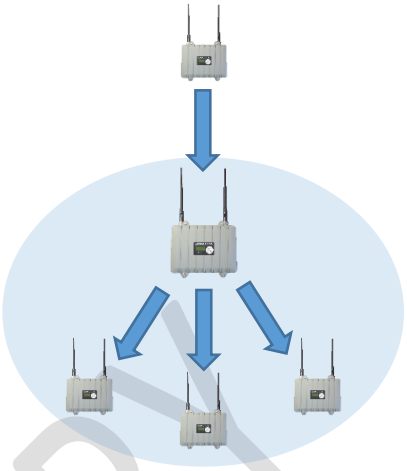
1.3 THE AIROCKS PRO NETWORK

An AiRocks Pro ***network*** consists of a single Master and one or more Relay units. A network can be as simple as a single Master and one Relay:



Or the network can consist of one Master and up to 100 Relay units operating in a multi-hop configuration:





Each AiRocks Pro unit can be configured to operate either as the network "Master" unit or as a "Relay" unit (all AiRocks Pro units are identical and include the same hardware and software). The number of Relay units is limited by both the practical considerations mentioned above, as well as network "polling" when using the AiRocks Pro Network Management System (NMS) discussed below.

In an AiRocks Pro network, each AiRocks Pro Relay unit receives an audio transmission from a single "upstream" unit, and then re-transmits that same signal to one or more downstream units. Thus, each AiRocks Pro unit creates its own point-to-multipoint sub-network. The input to each sub-network is the signal received by the single uplink AiRocks Pro unit. Therefore, *an AiRocks Pro **network** is a group of one or more sub networks all of which emanate from a single network Master*. Networks can be as simple as one Master unit and one Relay unit in a point-to-point configuration, or as complex as hundreds of units with multiple "branches" and "sub-networks".

If there is a failure of one of the upstream AiRocks Pro units, the downstream units automatically begin scanning for any other AiRocks Pro transmission within range. If an acceptable signal is found, it then becomes the input signal for that sub-network, or any newly created sub-networks. Thus an automatic switchover is accomplished without the need for manual intervention.

An AiRocks Pro network creates an extensive "cloud" of ultra-reliable wireless audio for both small and large venue sound reinforcement applications. AiRocks Pro operates in the license-free 900 MHz frequency band and includes fully automatic channel scanning and selection with automatic link monitoring and optimization, so there is no need for complex frequency coordination or intermodulation calculations.

AiRocks Pro units are designed to be very simple to install. When initially powered up, an AiRocks Pro unit enters the Relay operating mode (unless it was previously configured as a Master unit) and begins scanning for an upstream signal. When a signal is found, the unit begins sending the received analog audio out to the connected speaker via an XLR connector. It also begins relaying the digital wireless signal, on a different frequency, to any downstream units within range. Front panel controls allow the installer to manually configure many of the operating parameters, as well as monitor several key functions such as received signal level, and audio level and activity.

1.4 Network Overview

An AiRocks Pro network can operate in one of two modes: ***Managed*** or ***Unmanaged***.

1.4.1 Unmanaged Network

An unmanaged network is simply an AiRocks Pro network that does not use the Network Management System. If the user wishes to merely deploy one or more Relay units in a small network, this can be done by simply plugging the units in and turning on the power. The AiRocks Pro units function fully automatically and autonomously. Front panel controls give the user full control of configuration parameters and monitor functions.

1.4.2 Managed Network

A managed network is one that employs the AiRocks Pro Network Management System (NMS) application. Use of the NMS is strictly optional, but highly recommended since it can give valuable information for configuring the network for optimum performance in the presence of interference, range, or obstruction limitations of the venue. The NMS gives a graphical view of everything that is happening in the network and can help quickly diagnose problems that arise during an event.

Note: The ARX-900 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 driver installation process can take up to 30 seconds. Be patient while this process takes place. It will only occur when the ARX-900 is first connected to the USB port.

1.5 Equipment Overview and Features

The AiRocks Pro system consists of the ARX-900 Wireless Audio Repeater and an optional ARX-900-BOB "breakout box". The BOB is essentially an extender for the IO ports on the ARX-900 as well as a remote AC or DC power injector. Below is a diagram of the typical Master configuration.

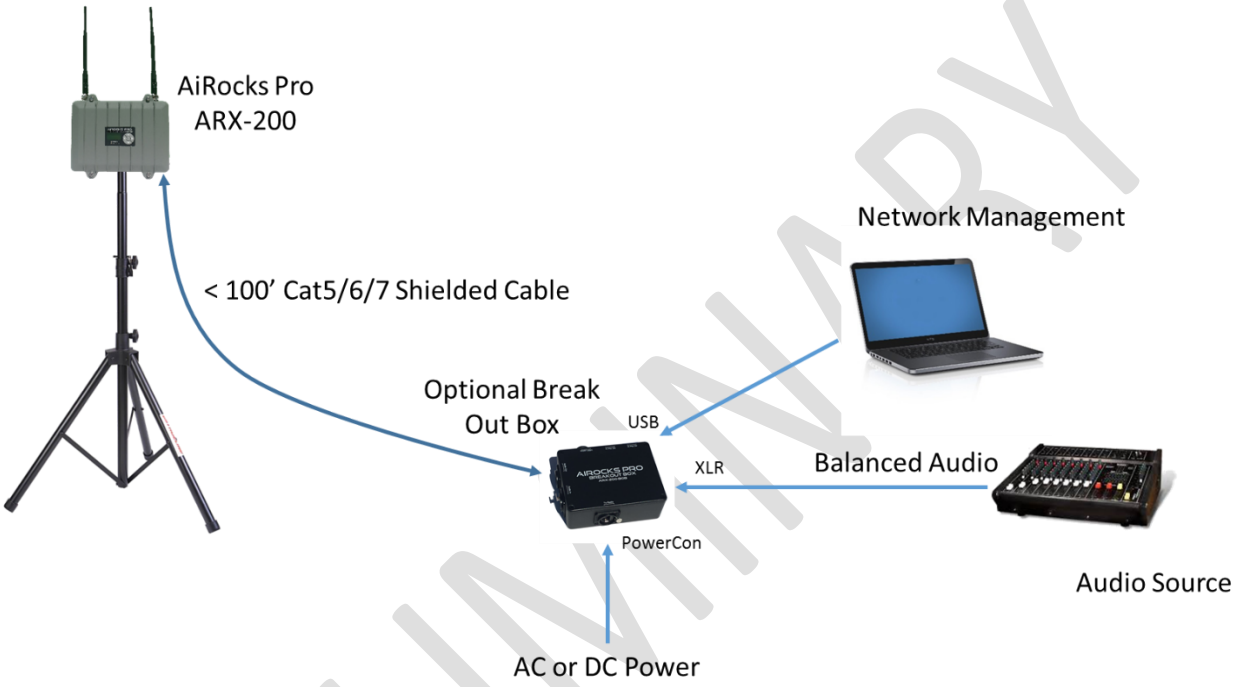


Figure 2 - Typical Master Location Setup

1.5.1 AiRocks Pro ARX-900 Wireless Audio Repeater

The ARX-900 is enclosed in a weather resistant outdoor enclosure and includes a sealed pushbutton front panel interface with an LCD display. The user can configure the unit from either the front panel, via the USB port of the BOB, or over the air by using the Network Management System.

Figure 3 - AiRocks Pro ARX-900 Wireless Audio Repeater

Audio Out Audio In To/From BOB AC Power

1.5.2 Key Features of the AiRocks Pro System

The AiRocks Pro system is the most feature-rich pro-audio wireless system on the market. These powerful features give the user a broad array of tools for managing the system in every the most challenging venues.

1.5.2.1 Multi-Hop Transceiver Architecture

The AiRocks system is the world's first "multi-hop transceiver" architecture targeting the pro-audio market. As mentioned earlier, traditional wireless audio systems include separate, inflexible transmitters and receivers with a transmit range limited by their FCC allowable transmit power. The AiRocks transceiver architecture gives vastly superior range and coverage of large outdoor venues by virtue of its "multi-hop" transmission technology.

1.5.2.2 Automatic Link Optimization (ALO)

The AiRocks system includes a novel feature called Automatic Link Optimization (ALO) which continuously monitors the quality of the link between units (Master->Relay or Relay->Relay) and automatically selects a new transmission channel if the interference level is too high. If the Packet Error Rate (PER) of a link exceeds a user-settable limit, the downlink unit will temporarily go off-line, perform a scan of the local interference environment, determine which of the local channels contains the least interference, sort the channels by best-to-worst, then send the sorted list of channels to its current uplink node. If ALO is enabled in the uplink node, the uplink unit will change it transmit channel to one of the most desirable channel in the list received from the down link node. Thus, if interference appears after the initial installation has taken place, the links continue to self-optimize to avoid any new or transient local interference. The entire ALO scan and optimization takes approximately 2 seconds during which the audio output from the unit is muted.

1.5.2.3 Powerful Network Management System

The AiRocks system includes a powerful Network Management System (NMS) which gives the user a broad array of tools for monitoring and controlling the network. NMS is built into every ARX-900 unit and provides a two-way control channel the gives the user a window into the detailed performance of any remote unit from one central location. Critical functions such as Receive Signal Strength Indicator (RSSI or receive signal level), Packet Error Rate (PER), Remote Spectrum Analysis (RSA), Audio Level, Audio Delay, can all be monitored AND controlled from the NMS GUI screen.

1.5.2.4 Network Security

The AiRocks Pro system implements network security through the use of Globally Unique IDs (GUID), which are similar to MAC addresses in Ethernet network equipment. If the GUID has not been registered in the NMS database, the unit will not be granted access to the network audio or control information.

1.5.2.5 Automatic or Manual Channel Selection

The AiRocks system is easily deployed by virtue of its automatic transmit and receive channel selection functions. In the Automatic Channel Selection mode the unit will automatically scan for an uplink AiRocks transmission. If found the unit will begin receiving the signal and immediately scan its local RF spectrum for the most desirable downstream channel. Once found, the Relay unit will begin sending the signal it has received from its uplink source to any downstream units within range. For venues with very closely spaced AiRocks units (due to speaker placement) a Manual Channel Selection mode is available which gives the user full control over selection of TX and RX channels.

1.5.2.6 Remote Spectrum Analyzer (RSA)

The AiRocks Pro system includes a Remote Spectrum Analyzer function that allows the user the scan the local RF environment ***of any remote unit*** and plot results of the scan on a Spectrum Analyzer graph in the NMS Relay Monitor Window. Thus, the network operator can keep track of any potential interference at any remote Relay location.

1.5.2.7 Electronic Selection of Audio Connector Configuration

Instead of using hardware jumpers, the AiRocks Pro system uses electronic configuration of audio input and output connector settings. The configuration can be changed either from the front panel of the unit or via the NMS remotely over the air. If the configuration of a unit is inadvertently left in the wrong position during deployment, the setting can be changed over the air by the operator from the NMS screen.

1.5.2.8 Flash Memory Storage of Configuration Settings

All critical user configuration settings are store in flash memory so that when power is lost and restored, the last set configuration is re-established.

1.5.2.9 Weather Resistant Enclosure

The AiRocks Pro is housed in a sturdy aluminum weather resistant enclosure that is designed to withstand rain and dust encountered in the most hostile outdoor venues.

1.5.3 AiRocks Pro ARX-900-BOB Breakout Box

The ARX-900-BOB is an optional remote connector interface that duplicates audio interfaces, AC power connection, and USB interface of the ARX-900 repeater. The BOB also includes a DC (battery) power input connector to facilitate field deployment when AC power may not yet be available. The BOB allows the ARX-900 to be place up to 100 feet away (i.e. on a pole to raise it above any obstructions in a venue to provide better line-of-site to other nodes). The interconnection between the ARX-900 and the BOB is a standard 8-conductor Ethernet cable. The main I/O connector is a Neutrik Ethercon (NE8FDV) which can accommodate standard RJ45 terminations or the Neutrik NE8MC Cable Connector Carrier, which provides a rugged termination for harsh environments.

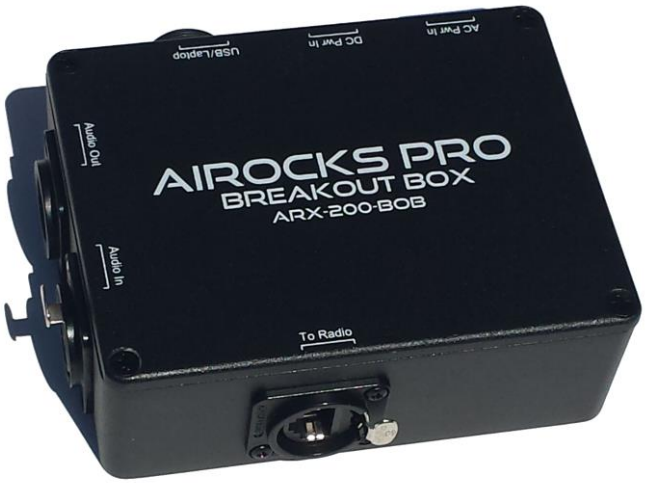


Figure 4 - ARX-900-BOB Breakout Box

2 AIROCKS ARX-900 CONFIGURATION AND OPERATION

The AiRocks ARX-900 Wireless Audio Repeater includes numerous features and operating modes which are described in this section.

2.1 FRONT PANEL CONFIGURATION AND DISPLAY

The ARX-900 can be configured from the front panel by using the 5-key navigation switch. The resulting modes and settings are displayed on the LCD. Below is a summary of the front panel menu functions.

2.1.1 Top Level Menu

Master	Select Master Mode
Relay	Select Relay Mode
System	Select System Configurations Functions

This top-level menu allows the operator to configure the unit to Master or Relay operating mode, or to select System Configuration Functions.

2.1.2 System Configuration Functions

System Configuration		
	Channel Select Mode	
	Auto	
	Manual	
	MSP Firmware Version	
	DSP Firmware Version	
	Physical ID (PID)	
	Startup Screen (Default)	
		Receive Signal Monitor
		Audio Level Monitor
		Net ID Monitor
		PID Monitor

2.1.2.1 Channel Select Mode

Channel Select Mode allows the user to select either fully automatic transmit and receive channel selection, or manual channel selection. It is important to keep in mind ***that several automatic functions will be disabled when Manual Channel Select mode is selected*** (i.e. Automatic Link Optimization, automatic channel scanning for an uplink transmission, and automatic selection of optimum downlink TX frequency). However, Manual channel selection may be helpful in difficult RF environments.

2.1.2.2 MSP Firmware Version

Displays the currently installed version of the MSP (microprocessor) firmware.

2.1.2.3 DSP Firmware Version

Displays the currently installed version of the DSP firmware.

2.1.2.4 Physical ID

Allows the user to assign a "physical ID" (PID) to an ARX-900 unit. The PID will show up on a spectrum analyzer graph so that one can uniquely identify the transmission of the specific PID when the NMS is not used in the network. When the NMS is used, the Net ID of the unit appears on the spectrum analyzer graph.

2.1.2.5 Startup Screen

The display defaults to the selected screen after power up and after key pad timeout. The factory default screen is Receive Signal level.

2.1.3 Master Mode configuration functions

Master Mode	
*	Master Transmit Channel
	Master Transmit Power
*	Master Receive Channel
	Master Audio Connector

2.1.3.1 Master Transmit Channel

Displays and controls the current downstream transmit channel. In Auto Channel Select Mode the transmit channel is automatically selected when the unit scans for an available channel with the least local interference during power up. In Manual Channel Select Mode the transmit channel is selected by the user.

2.1.3.2 Master Transmit Power

Displays the current transmit power. Power can be adjusted from ~0dbm to ~+20dbm. It is recommended to keep the power at its maximum level (+20dbm).

2.1.3.3 Master Receive Channel

Displays the current receive uplink control channel (UCC). In Auto Channel Select Mode the receive channel is automatically selected when the unit scans for an available channel with the least local interference during power up. In Manual Channel Select Mode the receive channel is selected by the user.

2.1.3.4 Master Audio Connector

Displays the current Audio Input Connector configuration. Choices include Balanced Mono, Un-balanced Mono, and Stereo. See section Audio Connector Configuration for additional details.

2.1.4 Relay Mode configuration functions

Relay Mode	
*	Relay RX Channel
	Relay RX Signal
	Relay TX Enable
*	Relay TX Channel
	Relay TX Power
	Relay Audio Signal Monitor
	Relay Audio Gain
	Relay Audio Delay
	Relay Audio Connector
	Relay Net ID

2.1.4.1 Relay Receive Channel

Displays and controls the current receive channel. In Auto Channel Select Mode the receive channel is automatically selected when the unit scans for and finds a transmission from an uplink unit. In Manual Channel Select Mode the receive channel is selected by the user.

2.1.4.2 Relay Receive Signal Level (factory default)

If the unit has found a signal, this function displays the current receive signal level. The receive signal display range is approximately -95dbm to 0dbm. It is desirable to keep this signal level greater than one bar (-70dbm). This is the factory default screen that appears after power up.

2.1.4.3 Relay Transmit Enable

Displays and controls the current setting for the TX Enable function. This function can be used to disable the "transceiver" functionality of the ARX-900 so that the unit is "receive only". ***Keep this function in mind when troubleshooting what appears to be a non-functioning unit. The unit will not "relay" a signal to downstream units if TX is disabled.***

2.1.4.4 Relay Transmit Channel

Displays and controls the current setting for the downstream transmit channel. In Auto Channel Select Mode the transmit channel is automatically selected when the unit scans for an available transmit channel with the least local interference during power up. In Manual Channel Select Mode the transmit channel is selected by the user.

2.1.4.5 Relay Transmit Power

Displays the current transmit power. Power can be adjusted from ~0dbm to ~+20dbm. It is recommended to keep the power at its maximum level (+20dbm) unless two units are placed very near each other.

2.1.4.6 Relay Audio Signal Monitor

Displays the average audio signal level received by the unit. It is desirable to keep the audio signal in the middle of the display during normal operation since this will give the best dynamic range of the Digital-

to-Analog Converter (DAC) in the receiver. The audio level can be manually controlled at the input of the Master unit and by the Relay Audio Gain function (below).

2.1.4.7 Relay Audio Gain

Displays the controls the audio gain in the receiver's audio path. The settings range from -15db to +20db. The factory default setting is 0db gain.

2.1.4.8 Relay Audio Delay

The ARX-900 can add delay into the audio path to help compensate for speaker placement in a large venue. Up to 500mSec of delay per hop (Relay location) can be added. The delay can be applied either in a "cumulative" fashion (the delay of each hop is added to the relayed signal), or "non-cumulative" fashion (the delay is added only to the local node but not to the relayed signal). This gives the user a great deal of latitude in tuning the delay within the venue.

2.1.4.9 Relay Audio Output Connector Configuration

This function gives the user control of the configuration of the audio output connector configuration (see the Audio Connector Configuration section). The selectable configurations include Balanced Mono, Unbalanced Mono, and Unbalanced Stereo.

2.1.4.10 Relay Network ID

When used in a Managed Network, this function displays the Network ID that has been assigned by the Network Managements System. In Unmanaged mode the Network ID is 0.

2.2 Audio Input and Output Connector Configurations

As a convenience to the user, the ARX-900 can accommodate three different audio input and output connector configurations. Each of the configurations can be selected electronically (no hardware jumpers) and can accommodate balanced mono, unbalanced mono, and stereo audio input and output signals. This is accomplished internally by the use of switched audio connections as shown below. These audio configurations are selectable via the front panel or via the NMS. The NMS gives the user the ability to switch configurations remotely over the air.

Input and Output connector configurations are completely independent of each other so that, for example Balanced Mono can be used on the input, while Unbalanced Stereo is used on the output. Input and Output connector configurations are stored in flash memory so that the same configuration will be selected if power is lost and then restored.

Since the ARX-900 can only operate in one mode at a time (Master or Relay), the Audio Input connector and Audio Output connector share the same audio path (Audio+ and Audio-) and are therefore connected in parallel.

2.2.1 Audio Input Connector Configurations

2.2.1.1 Balanced Mono Audio Input Connector Configuration (factory default)

The Balanced Mono audio input configuration is shown below. In this mode the audio input signal clips at +11.2dbu (~2.8Vrms, 4Vpk).

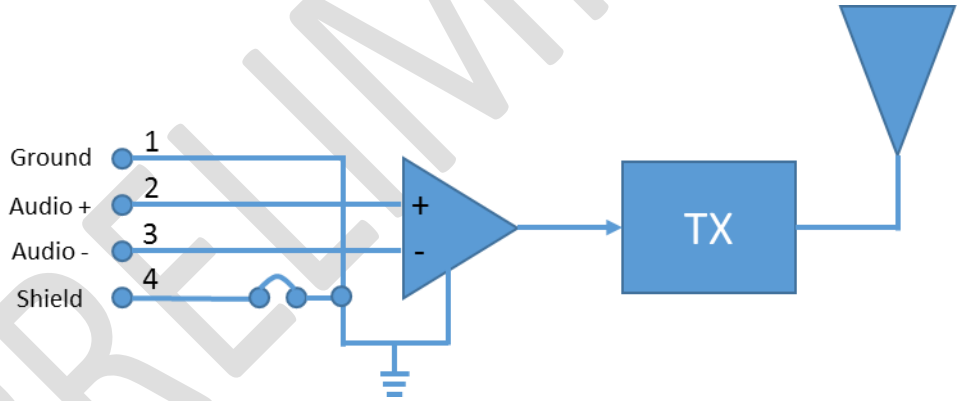


Figure 5 Balanced Mono Audio Input Connector Configuration

2.2.1.2 Unbalanced Mono Audio Input Connector Configuration

The Unbalanced Mono Audio Input configuration is shown below. In this mode the audio input signal clips at +5.2dbu (~1.4Vrms, 2Vpk).

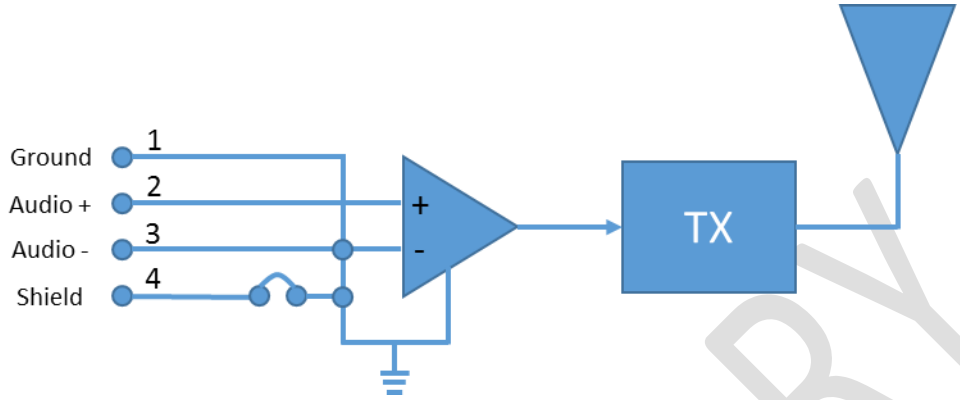


Figure 6 Unbalanced Mono Audio Input Connector Configuration

2.2.1.3 Unbalanced Stereo Audio Input Connector Configuration

The ARX-900 transmits a single mono audio channel over the air, but allows a user to apply a stereo audio source to the XLR audio input connector. In order to preserve all of the audio information in the stereo signal, the left and right channels of the stereo audio signal are combined (mixed together) in the audio chain to create a single audio channel for transmission. In this mode the audio input signal clips at +5.2dbu (~1.4Vrms, 2Vpk). The input channel configuration is shown below.

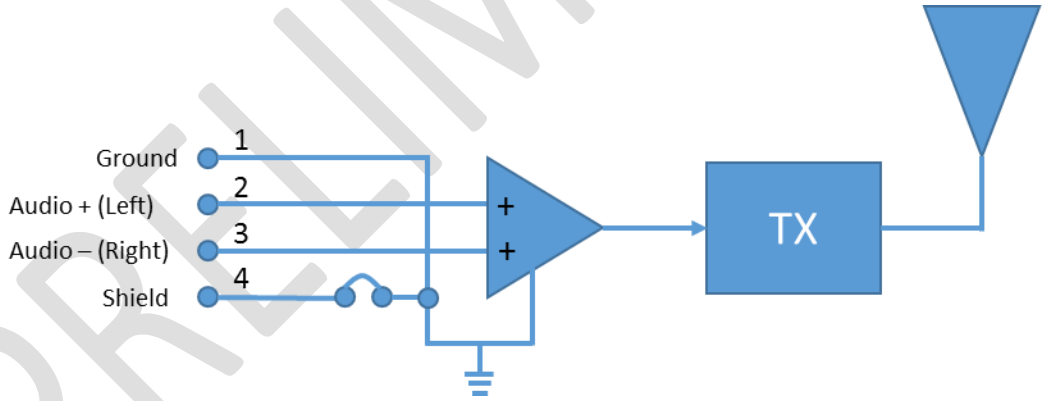


Figure 7 Unbalanced Stereo Audio Input Connector Configuration

2.2.2 Audio Output Connector Configurations

2.2.2.1 Balanced Mono Audio Output Connector Configuration (factory default)

The Balanced Mono audio output connector configuration is shown below. In this mode the audio output signal clips at +8.2dbu (~2Vrms, 2.8Vpk).

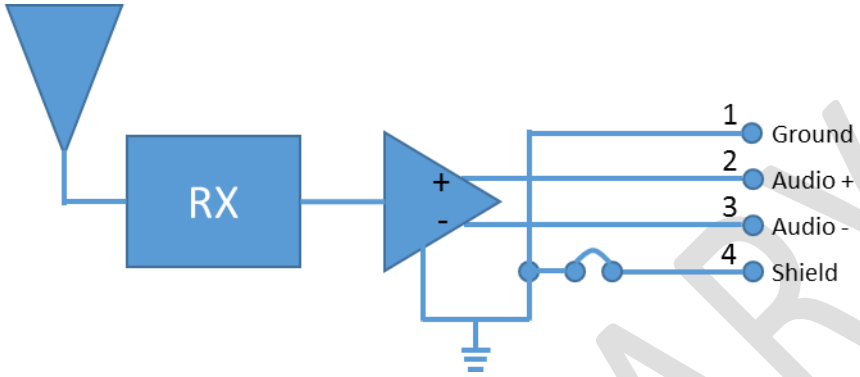


Figure 8 Balanced Mono Audio Output Connector Configuration

2.2.2.2 Unbalanced Mono Audio Output Connector Configuration

The Unbalanced Mono audio output connector configuration is shown below. In this mode the audio output signal clips at +2.2dbu (~1Vrms, 1.4Vpk).

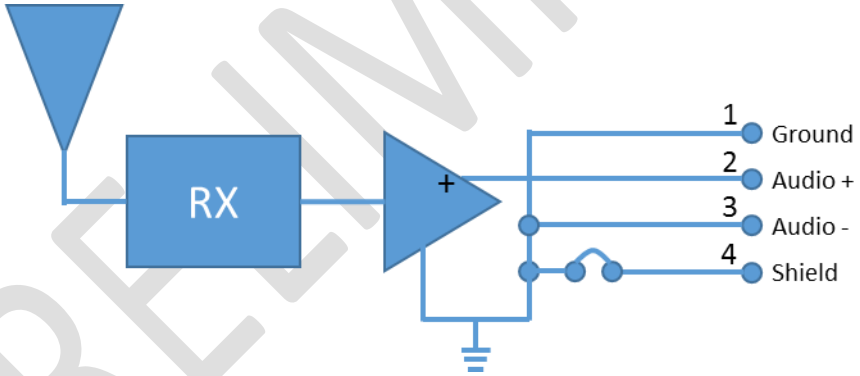


Figure 9 Unbalanced Mono Audio Output Connector Configuration

2.2.2.3 Unbalanced Stereo Audio Output Connector Configuration

As a convenience to the user, the ARX-900 provides a “stereo” audio output configuration that applies a single mono audio signal equally to both the Audio+ and Audio- output pins on the XLR output connector (reference to ground). This allows the user to “split” the mono signal and send the same signal to the Right and Left input channels of a stereo (2 channel) power amplifier. In this mode the

audio output signal of each channel clips at +2.2dbu (~1Vrms, 1.4Vpk). The Stereo Audio Output Connector configuration is shown below.

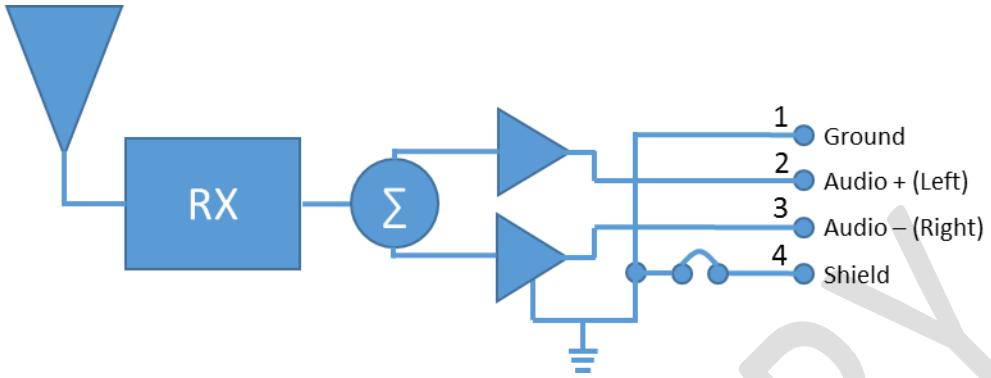


Figure 10 Unbalanced Stereo Audio Output Connector Configuration

3 EQUIPMENT INSTALLATION AND OPERATION

3.1 INSTALLING THE ARX-900 MASTER AND RELAY UNITS

To install and operate the ARX-900 you must be an experienced audio professional with a knowledge of applicable RF spectrum regulations. The FCC deems that it is the responsibility of the operator to know, understand, and abide by the rules.

The ARX-900 is designed to be installed by professional audio engineers, technicians, and network operators who have an in-depth understanding of wireless radio technology and who are knowledgeable in local regulations including building and wiring codes, safety, channel, power, outdoor/indoor restrictions, and license requirements. It is important to follow the installation and configuration instructions in this document in order to comply with the rules and restrictions imposed by the FCC and other government bodies who regulate the airwaves. The ARX-900 has passed certain FCC mandated testing using the equipment listed in this document, including the antennas. Use of other antennas or amplifying devices not listed in this document may violate these FCC regulations.

The ARX-900 is designed to be mounted in a vertical orientation for optimum results and to comply with FCC certification requirements.

The ARX-900 should be mounted as high as possible above any obstructions to achieve optimum performance. Direct line-of-sight to other ARX-900 units is important, but not necessary. Distances of more than 1000 feet can easily be achieved with a properly installed unit. The unit includes a pole mount which gives the user a variety of installation options.

The recommended mounting location of the ARX-900 is on a pole, such as a speaker stand, that allows it to be mounted 10 feet or more off the ground. Obstructions, such as people, trees, building, or other solid structures, can affect the quality of the radio transmission, and hence the achievable range of the unit for reliable, error-free operation. However, since the ARX-900 operates in the unlicensed 900 MHz band, direct line of sight is not required.

Interference in the 900 MHz band will also affect network performance. The range of each link is dependent upon, not only the transmit path, but also the level of interference in the area. The ARX-900 system is designed to avoid interference and co-operate in the presence other 900 MHz systems. Additionally, the Network Management System provides the user with several tools to detect and avoid interfering signals.

3.1.1 Installing the Master Unit

Install the Master unit as high as possible, and with best possible line of sight to the first Relay unit. Typically, a Breakout Box (ARX-900-BOB or “BOB”) will be used to allow the Master to be mounted at a significant distance from the network operator position and main audio source. The BOB provides an input for the Master audio source, as well as AC or DC power inputs, and a USB interface for the Network Management System.

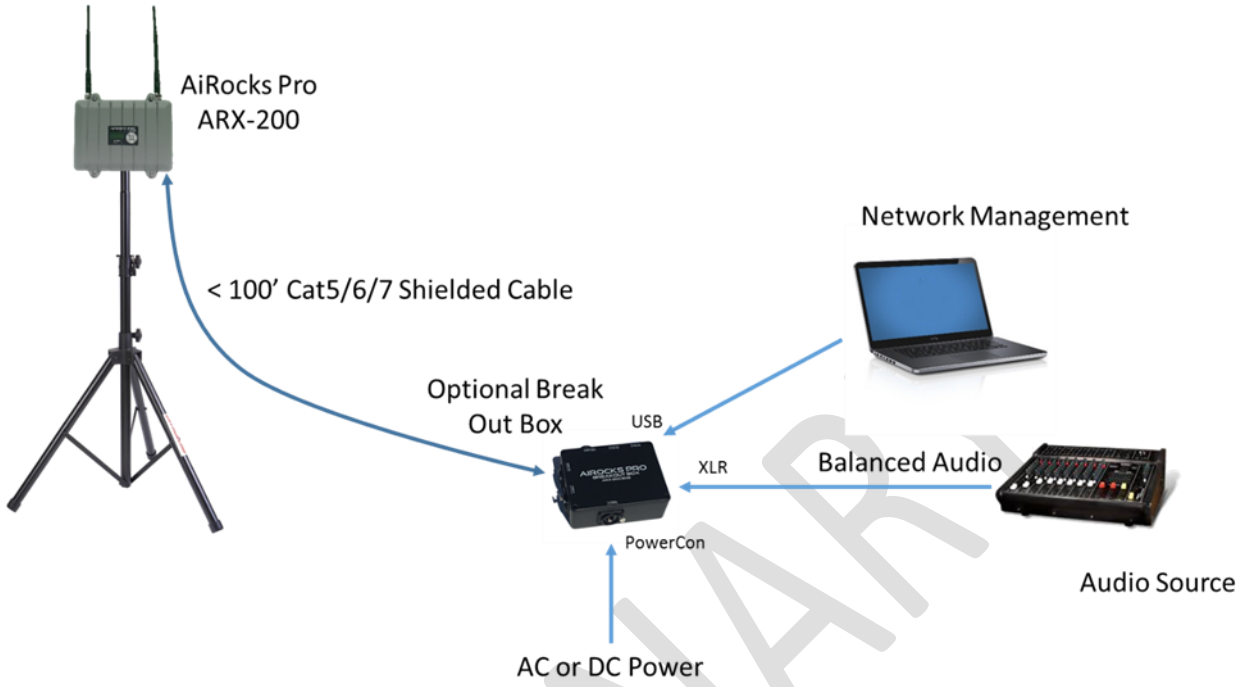


Figure 11 – Typical Master Unit Installation Configuration

- Once all cables are attached, apply AC or DC power to the BOB.
- Start the NMS application. The Master unit should appear in the Welcome Screen.
- Switch the NMS to the Master operating mode by selecting the Master tab on the NMS screen.
- The Master unit is now transmitting and any Relay units in the area will attempt to join the network. See the Network Management System section for further details on managing the network.
- Note that the audio connectors on the ARX-900 are still active even when the BOB is used. For example, and audio cable could be directly attached to the ARX-900 while power and USB cables could be connected to the BOB.
- The USB port on the BOB is powered by the attached USB port on the PC. Therefore, it is not mandatory to apply AC or DC power to the BOB if AC power is applied directly to the ARX-900.

Note: The ARX-900 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 ARX-900 is first connected to a specific USB port. This same initial installation process will occur for each USB port to which the BOB is attached.

3.1.2 Installing Relay Units

Install Relay units as high as possible, and with best effort line-of-sight to either the Master unit, or to the closest uplink Relay unit. The included mounting bracket provides several mounting options. Typically a BOB is NOT used with a Relay unit since Relay units are normally mounted close to the powered speaker to which it is providing audio. However, a BOB can be used if desired.

Figure 12 Typical Relay Installation

- Once the audio and power cables are attached to the Relay unit, apply AC power.
- The front panel display should show that the unit is in the Relay mode and will default to monitoring the received signal level. If not, press the navigation switches on the unit's front panel to select the Relay mode.
- If the Master unit is transmitting, and the Relay unit is set to Auto Channel Selection mode, the Relay unit will automatically tune to the uplink signal and the green RF Signal LED will illuminate. If audio is being sent by the Master, the Audio Signal LED will also illuminate.
- If the NMS is not being used (Unmanaged Network) the RF Signal LED will constantly illuminated while the signal is being received.
- If the NMS is connected to the Master, the RF Signal LED on the Relay unit will blink until the NMS has assigned it a network ID. Once a network ID is assigned, the RF Signal LED will be constantly illuminated and the LCD display will show the network ID number.

3.1.3 Environmental Considerations

The AiRocks Pro is housed in a sturdy aluminum weather resistant enclosure that is designed to withstand rain, dust, and the rough handling encountered in the most hostile outdoor venues. ***However, the unit is "weather resistant", NOT "weather proof" and is NOT designed for permanent outdoor installations.*** The AiRocks Pro system was designed for mobile production companies to be used in temporary installations in outdoor venues. It therefore uses commonly available XLR, PowerCon, and RJ-45 connectors which are not "sealed" to water intrusion, similar to the design of most powered speakers. However, when properly mounted in a vertical orientation, rain water will not penetrate these connector entry points (similar to the International Protection standard, IP63, which states "Water falling as a spray at any angle up to 60° from the vertical shall have no harmful effect"). If additional weather protection is desired, an ARX-900-BOB Breakout Box can be used with Relay units to route audio and power connections to a remote, weather-protected location. An optional Ethernet cable is available which includes the Neutrik NE8MC connector carrier that can provide additional protection to moisture and physical abuse.

4 NETWORK MANAGEMENT SYSTEM

4.1 NMS OVERVIEW

The AiRocks Network Management System (NMS) is a PC-based application that give the user a broad array of tools for configuring, operating, and diagnosing the AiRocks network. The NMS connects via USB to the Master unit and communicates over the air with all 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 unit from a central location.

Figure 13 NMS Welcome Screen

As mentioned earlier, AiRocks networks can either be “Managed” or “Unmanaged”. A Managed network is one which includes the use of the Network Management System. 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 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.

4.2 GUIDS AND REGISTRATION

Each AiRocks 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 "Stage Left" or "Middle Tower" can help keep track of where units are deployed in the venue.

During (or prior to) network deployment each AiRocks unit must be physically connected to the NMS USB port to become "registered" with the NMS. During the registration process the NMS captures the GUID and gives the user the opportunity to enter a friendly name. Once the unit is registered in the database this information can be used to (optionally) provide network security by allowing only registered units to participate in the network.

> ***Note: The ARX-900 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 ARX-900 is first connected to a specific USB port. This same initial installation process will occur for each USB port to which the BOB is attached.***

If AiRocks units are not registered prior to deployment they will appear as "unregistered" nodes in the NMS network map if the network security is "Open" (see Network Security section below). At this point the unit can be registered "over the air" by the network operator if desired (however, if network security is "Secure", these nodes will not appear on the network map).

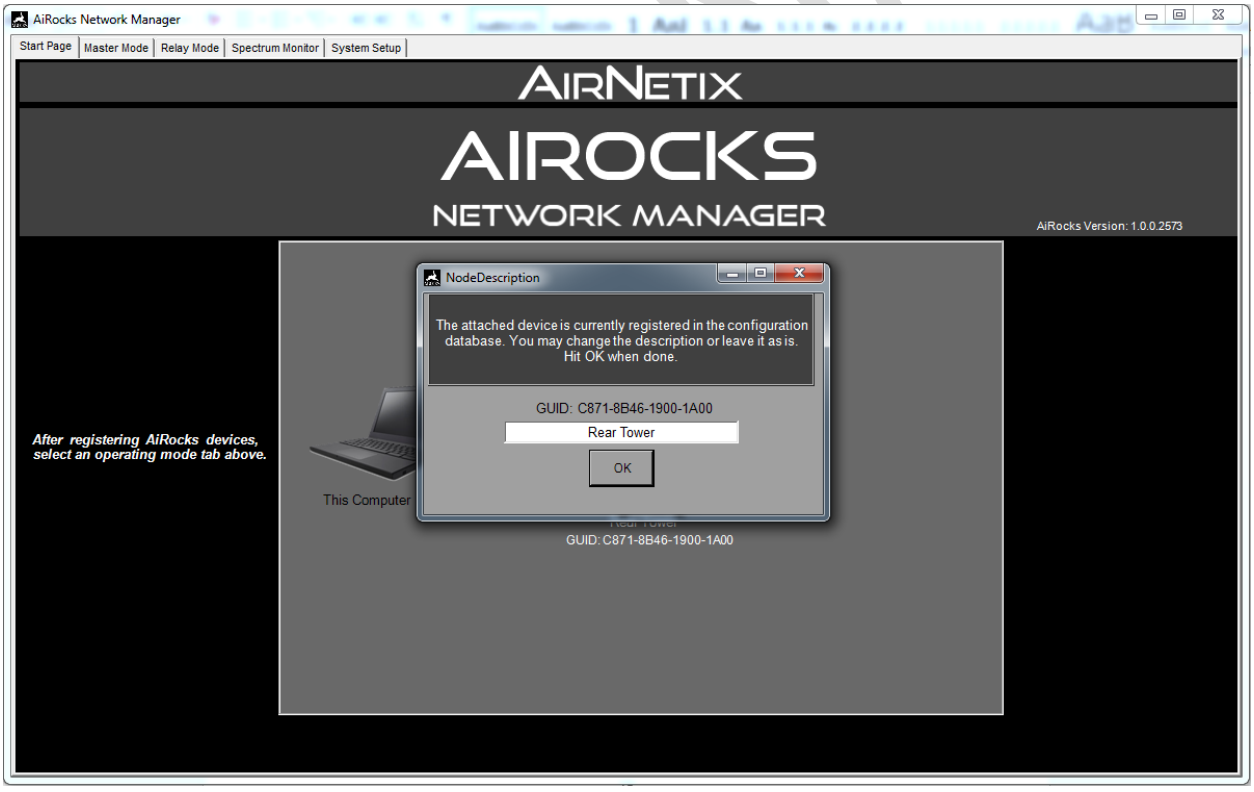


Figure 14 Registering a Node

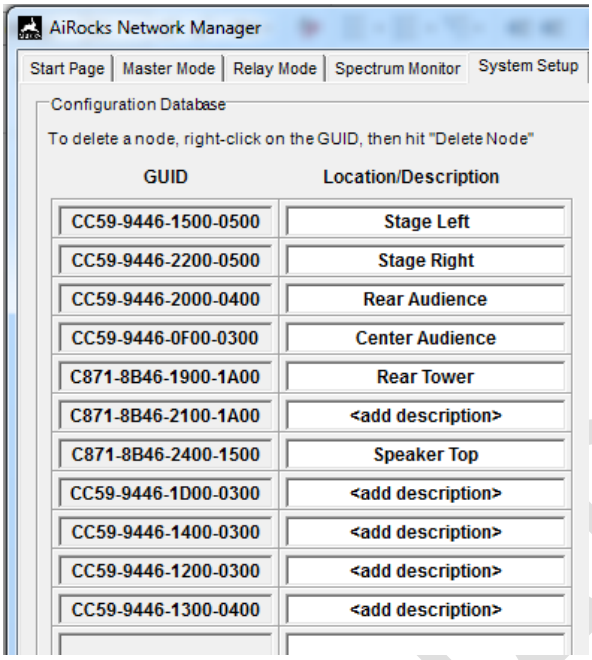


Figure 15 NMS Database

4.3 NETWORK SECURITY

AiRocks networks can operate as either **Open** networks or **Secure** networks.

4.3.1 Open Networks

Open networks are networks in which any AiRocks unit can "participate" in the network, regardless of whether or not it has been registered in the NMS database. During initial deployment, the network operator may wish to configure the network as Open to facilitate the deployment process, but then switch to "Secure" once the event begins.

4.3.2 Secure Networks

Secure networks are networks in which only "registered" AiRocks units can participate in the network. If a network is Secure, AiRocks units that are not registered in the NMS database will not be able to receive a signal and will provide no audio to the audio output port.

4.4 Master Mode Operation

An AiRocks network has only one Master unit. The Master is located near the main audio source and transmits its 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.

4.4.1 Master Mode Screen

After registering units using the Welcome screen (shown above), the network operator selects the "Master Mode" tab at the top of the NMS screen. The NMS then switches to the Master Mode window shown below.

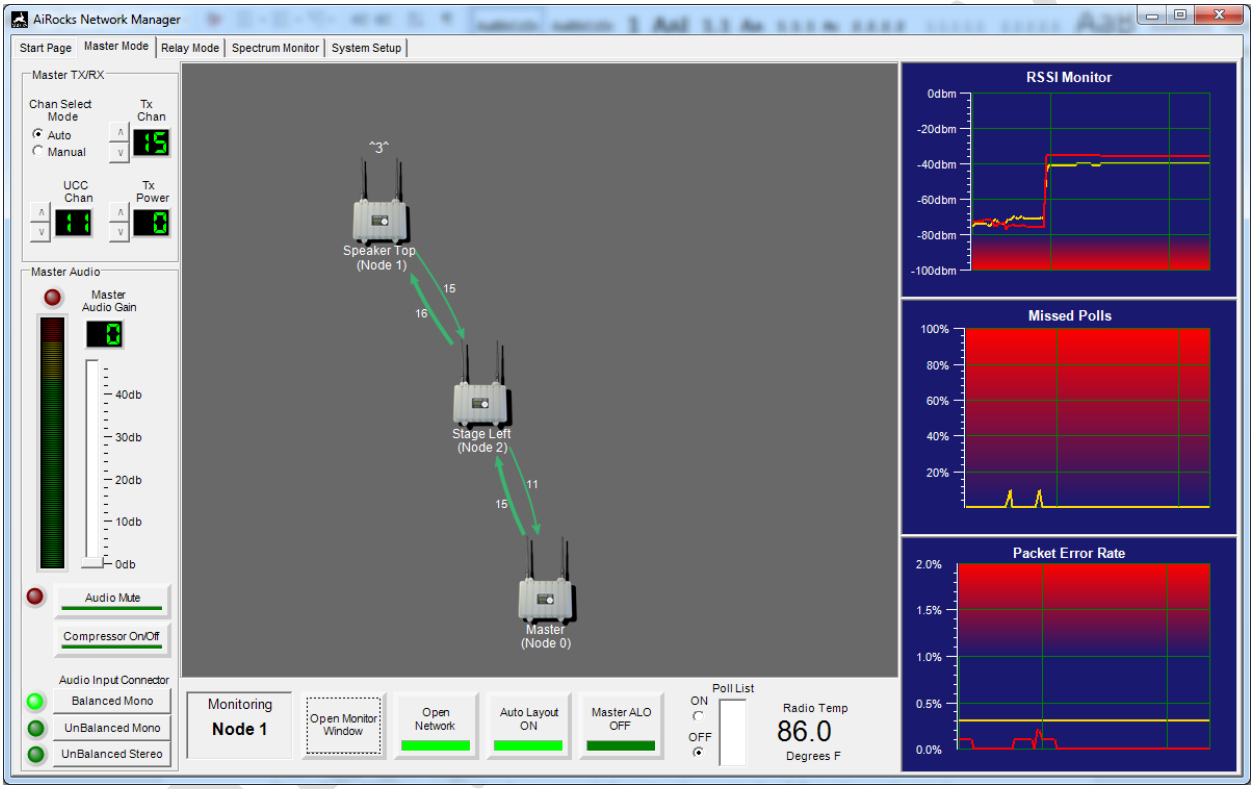


Figure 16 - Master Mode screen

Any Relay unit that has been powered ON 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. In the example screen above, one Relay unit named "Stage Left" has joined the network and is receiving its signal from the Master unit. The outbound link from the Master is using channel 15 (large arrow from Master to Relay), and the inbound Uplink Control Channel (UCC) link is using channel 11 (small arrow from "Stage Left" to Master). A second relay unit named "Speaker Top" is receiving the relayed signal from "Stage Left" on channel 16 and is using channel 15 as the UCC.

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 hitting the "Open Monitor Window" button at the bottom of the screen.

4.4.1.1 Network Map

The center of the Master screen shows a network map of all active nodes. The Master node will always appear at 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 venue. For larger networks the user can (using the 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.

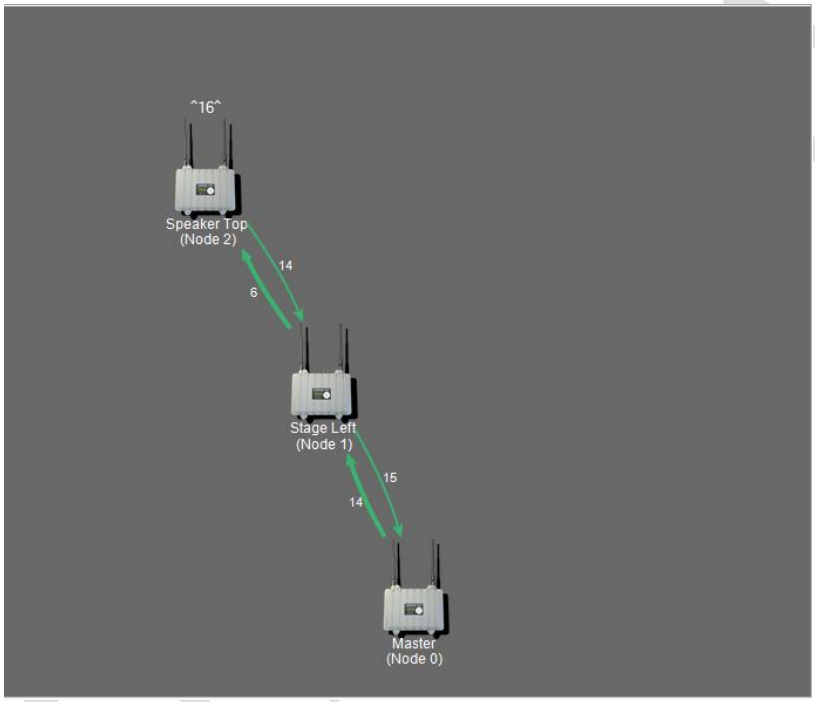
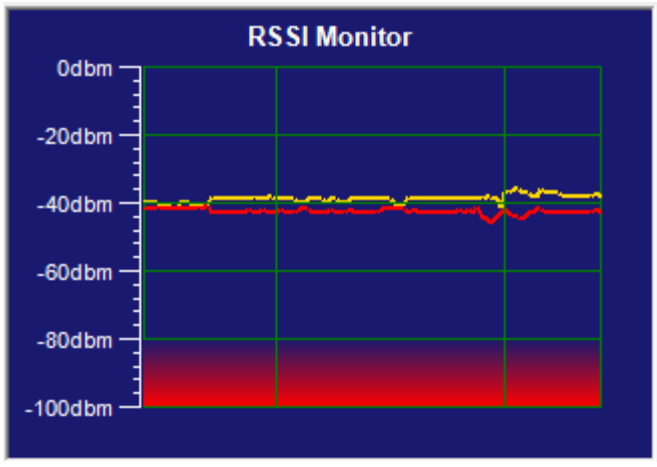


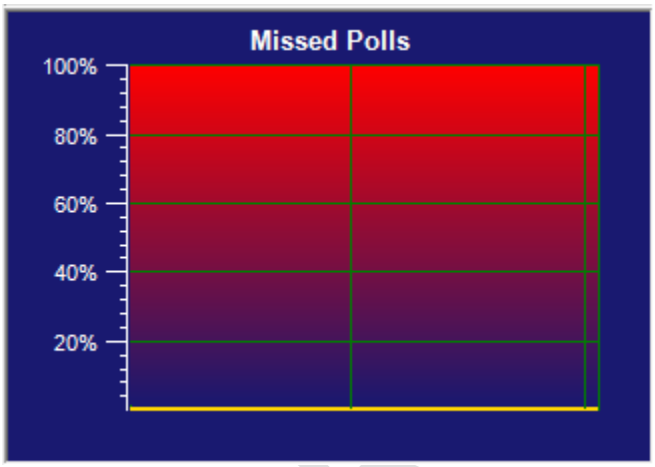
Figure 17 Master Network Map

4.4.1.2 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 node. The signal from Antenna 1 is shown in red, while the signal from Antenna 2 is shown in yellow. The ARX-900 automatically selects the strongest signal.

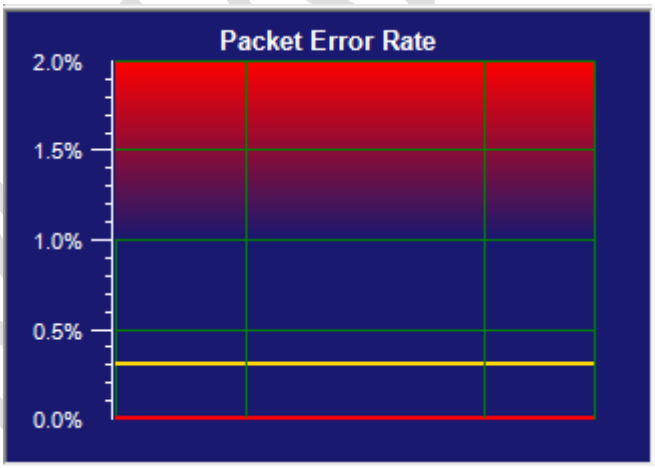


4.4.1.3 Missed Polls Plot



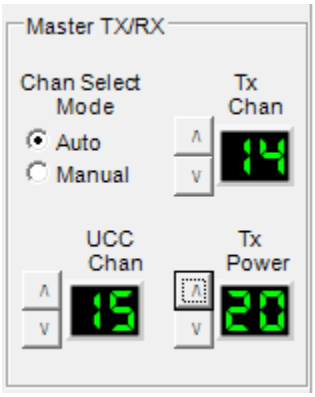
This plot will show the percentage of polls that have not been answered by the selected node. Poll responses are measured over a six second interval. After 100% missed polls over the six second interval, the NMS considers the node disconnected and removes the node from the active poll list. A few sporadically 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.

4.4.1.4 Packet Error Rate (PER) Plot



This plot shows the Packet Error Rate of the selected node. Since any dropped packets cause a dropout of the audio signal, the PER should be very low if not zero. The red line indicates the PER while the yellow line indicates the PER threshold. The PER threshold is the user-selected point at which the ALO function initiates a channel change request of its uplink source node.

4.4.1.5 Mater TX/RX Functions



The function in this section of the Master screen include:

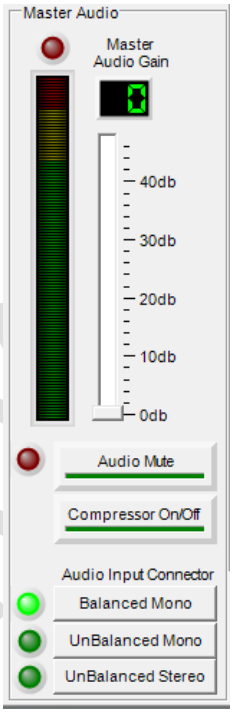
- Channel Select Mode – Select either fully Automatic channel selection, or Manual channel selection for the Master Node.
- Transmit Channel – Channel used by the Master's downstream transmission to Relay nodes.
- UCC (Uplink Control Channel) – Channel used by the Master to receive uplink control information from Relay units.
- Transmit Power – The output power level of the transmit signal sent from the Master. It is recommended to leave this set to +20dbm.

4.4.1.6 Master Audio Functions

The function in this section of the Master screen include:

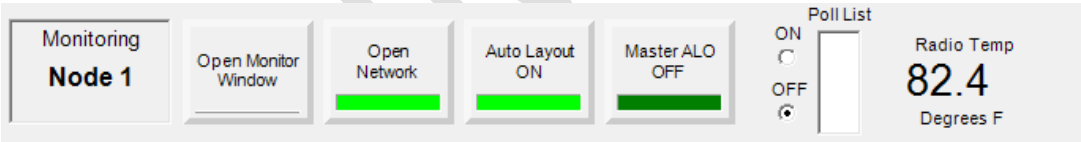
- Master Audio Gain – The audio input gain setting for the Master audio input signal.

- Audio Mute – The Audio Mute function will mute the audio sent from the Master so that the entire network will be silent.
- Compressor On/Off – The Master audio input passes through an audio compressor which can be used if the input audio is highly variable (i.e. live announcer using microphone). This function can help avoid clipping, but also reduces the dynamic range of the audio signal.
- Audio Input Connector – Allows the user to select the appropriate audio connector configuration (see Audio Connector Configuration section for details).



4.4.1.7 Lower Screen Functions

The function in this section of the Master screen include:

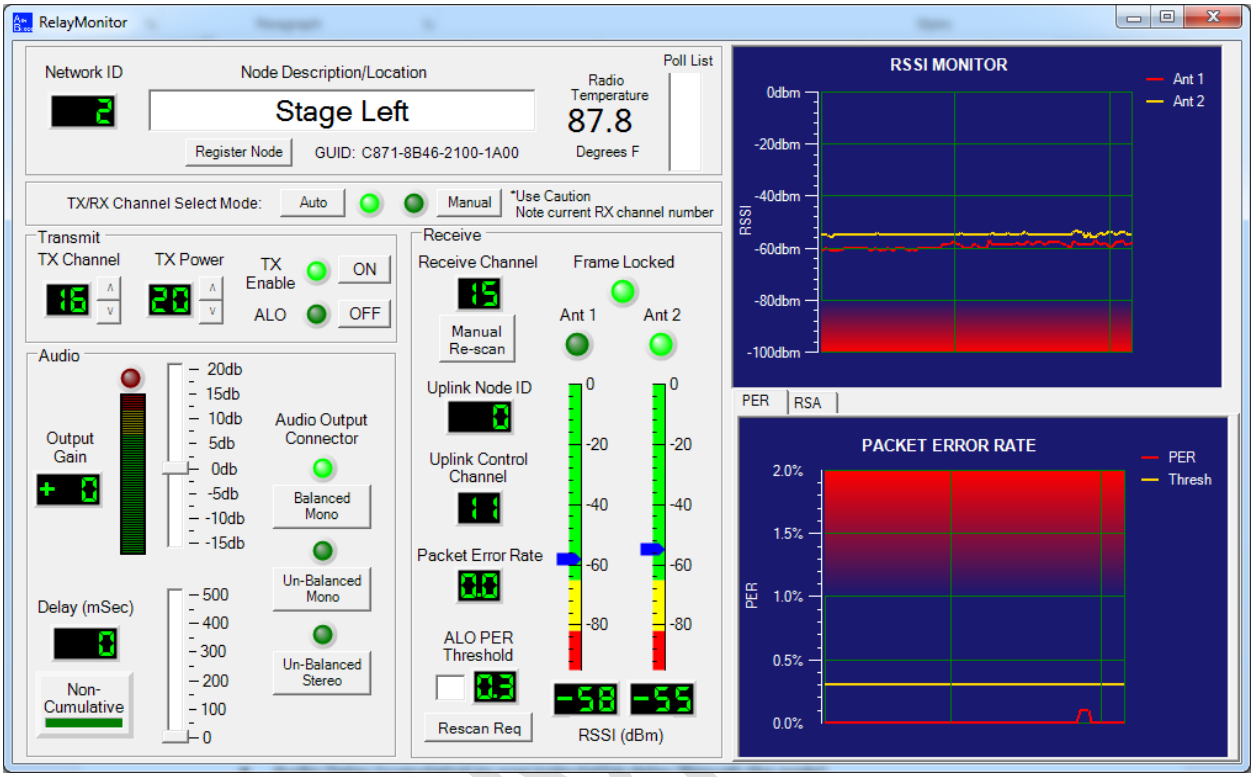


- Monitoring Node X – Indicates which node is selected and being monitored in the graphical plots on the right side of the screen.
- Open Monitor Window – When clicked, will open a Relay Monitor Window of the selected node. Select (click on) a node on the Network Map, then hit Open Monitor Window to display the Relay Monitor window of the selected node.
- Open/Secure Network – Open networks allow unregistered nodes to participate in the network. A Secure Network will only allow registered nodes to participate in the network. In an Open network, unregistered nodes text will appear in red. Registered nodes text appear in white.
- 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 venue. This may help the user keep track of the node locations more easily.

- Master ALO (Automatic Link Optimization ON/OFF – In general is it best to deactivate ALO on the master node since any change in transmit channel will affect the entire network. However, during initial deployment it may be helpful to enable Master ALO so that the optimum transmit channel can be found.
- Poll List – Shows the Network ID of which downstream nodes are being directly polled by the Master. Enabling the Poll List will cause the NMS to send and receive additional polling information to each Relay node so that the operator can view the nodes being polled by any Relay node in the network. Caution should be used when enabling the Poll List since it will cause a doubling of polling traffic on the network control channel, which may slow the poll responses and cause the network updates to appear sluggish. The larger the network, the more impact the additional poll traffic will have.
- Radio Temperature – Displays the internal temperature of the ARX-900. The ARX-900 can withstand internal temperatures from 0 degrees Fahrenheit to 160 degrees Fahrenheit.

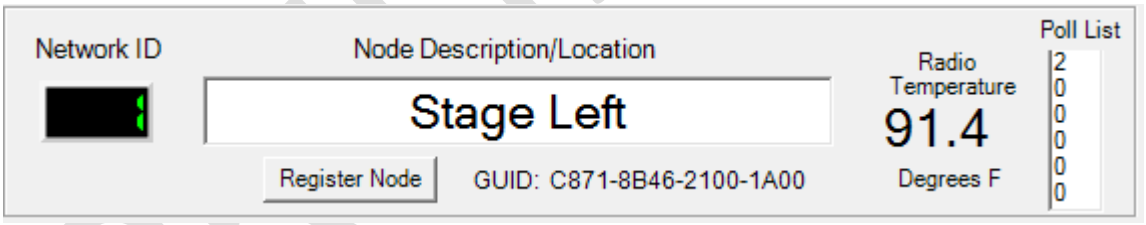
4.4.2 Relay Monitor Window

Once a Relay Monitor window has been opened, the network operator has full monitor and control capability over the remote Relay node.



4.4.2.1 Top Section

The top section of the Relay Monitor window includes the following functions:

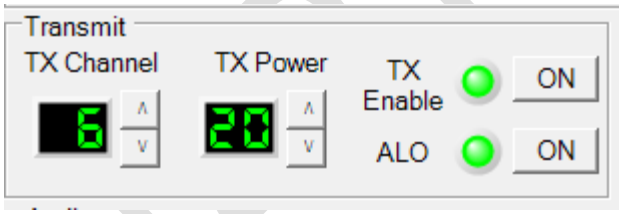


- Network ID – This is the ID number assigned to the Relay node by the NMS.
- Node Description/Location – “Friendly name” assigned by the network operator and registered in the NMS database.
- Register Node – Allows the operator the register the node “over the air” after the node has been deployed.
- GUID – Globally Unique ID embedded into the hardware of the ARX-900.
- Radio Temperature – Internal temperature of the Relay unit.
- Poll List – List of downstream nodes being polled by the Relay unit.

4.4.2.2 TX/RX Channel Select Mode

This control allows the operator to remotely select between Auto and Manual channel selection for the Relay node. ***Care must be taken when using Manual channel selection mode since the Relay unit will not automatically scan for a signal if its source signal channel is changed.*** When selecting Manual channel selection, the user should make a note of the channel currently selected for the Relay unit so that the unit can be "recovered" (i.e. manually changing the transmit channel of its uplink node to coincide with the manually selected receive channel of the "lost" downlink node).

4.4.2.3 Transmit Section



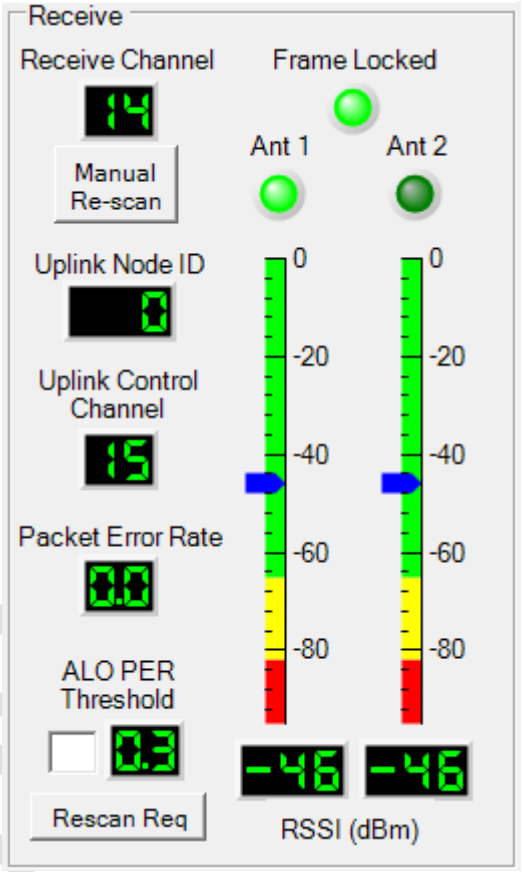
The Transmit section of the Relay Monitor Window includes the following functions:

- TX Channel - The channel currently used for the downstream transmit signal of the Relay unit.
- 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 off the downstream re-transmission of the unit's received signal, thus making the unit a "receive-only" node. This may be desirable in densly packed venues when not all units are needed to provide adequate RF coverage.
- ALO (Automatic Link Optimization) – Enables or disables ALO on the selected Relay node. It is best to leave ALO enabled at least during initial deployment so that transient interference can be avoided. The operator may decide to selectively or unilaterally disable ALO during the event.

4.4.2.4 Receive Section

The receive section of the Relay Monitor Window includes the following functions:

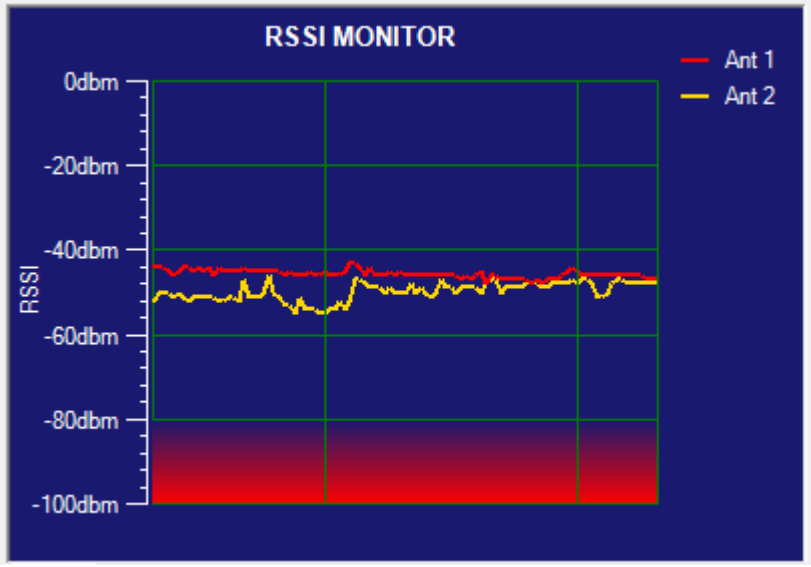
- Receive Channel – Indicates the receive channel of the Relay node.
- Manual Re-scan – Allows the operator to manually initiate a re-scan of the RF spectrum for a downstream signal from an uplink node. This may be desirable when a stronger downlink signal is available than the one currently being received by the Relay node.
- 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.
- ALO PER Threshold – Automatic Link Optimization Packet Error Rate Threshold. Indicates the PER threshold at which the Relay node initiates an ALO re-scan and channel change request of the uplink node. The user can change this threshold by entering a new number in the text box. Values can range from .1 – 2%.
- Rescan Req – Allows the user to manually initiate an ALO re-scan and channel change request of the uplink node. Note that during an ALO sequence the downstream nodes will not be receiving a transmission from the selected Relay node and must reacquire its signal.
- Frame Locked LED – Indicates that the Relay node is currently locked to the incoming transmission of the uplink node.
- Ant1, Ant2 LEDs – Indicate which antenna is currently being used by the receive section of the ARX-900. (During transmission, Ant1 and Ant2 are used on each alternate packet transmitted for special diversity).
- RSSI – Receive Signal Strength Indicator – Shows the real-time receive signal level for each antenna. The ARX-900 automatically selects the stronger of the two signals.

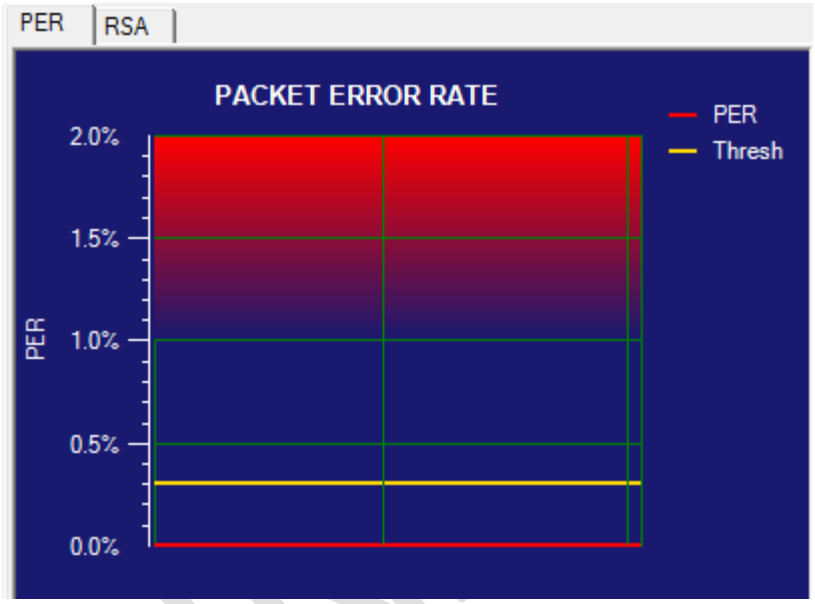
4.4.2.5 RSSI Plot

Displays a real-time plot of the current receive signal level on each antenna. Antenna 1 is plotted in red, and Antenna 2 is plotted in yellow. The ARX-900 automatically selects the stronger of the two signals.



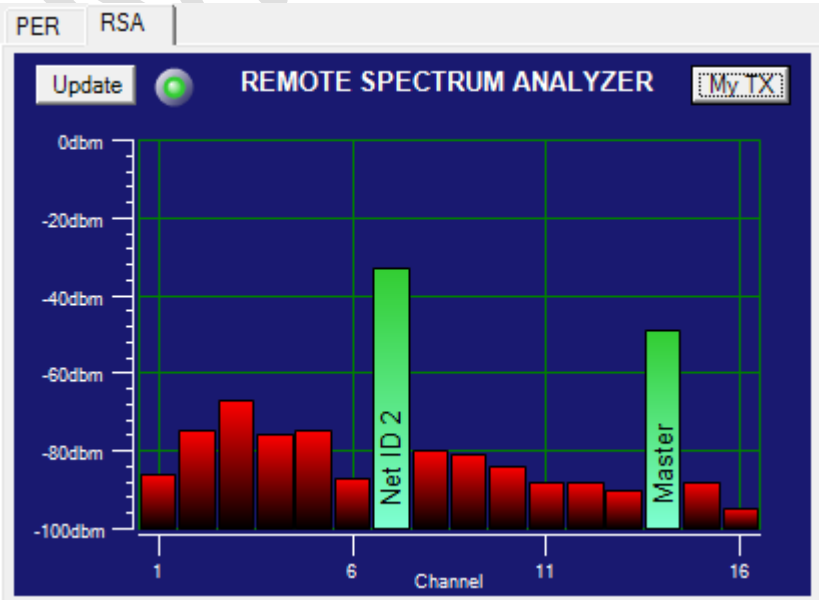
4.4.2.6 PER/RSA Plots

The PER plot (left-hand tab of this window) shows a real-time view of the Packet Error Rate of the selected Relay unit. The red line indicates the PER while the yellow line indicates the PER threshold used by the ALO function.



4.4.2.7 RSA (Remote Spectrum Analyzer) Plot

The RSA plot (right-hand tab of this window) shows the result of an RF scan of the local RF spectrum at the remote Relay location. When the RSA tab is selected the NMS will automatically initiate the RF scan, which takes about six seconds, and plot the results on this graph. The user can also display the selected Relay's own uplink and downlink transmission channels by clicking the "My TX" button in the upper right. Clicking the "Update" button will initiate another RF spectrum scan.



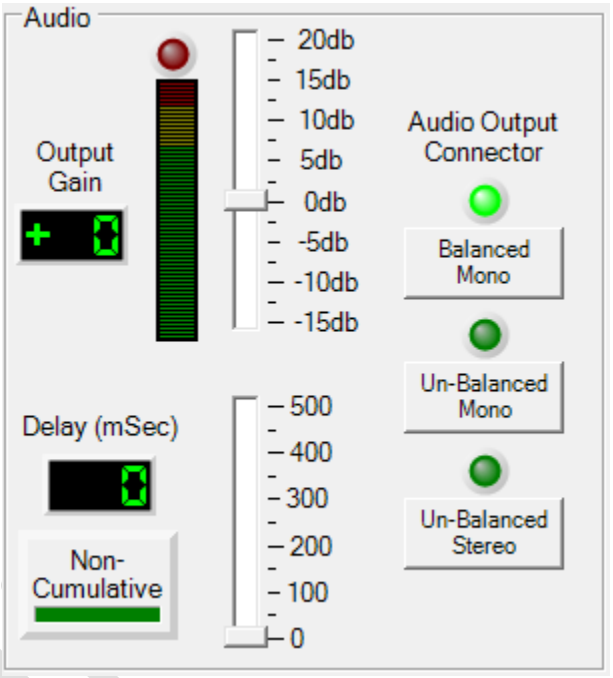
The RSA function is very helpful during deployment to keep an eye on interference and AiRocks signal levels in the location of the remote Relay node.

NOTE: Performing the scan causes the Relay unit to temporarily stop receiving the RF signal from its uplink source, which in turn causes any downstream nodes to lose their uplink signal for the duration of the scan. RSA should NOT be performed during the event.

4.4.2.8 Audio Section

The Audio Section of the Relay Monitor window includes the following functions:

- Output Gain – Gain setting for the audio output of the XLR output connector of the selected Relay node.
- Delay – Audio delay added to the audio signal as it leaves the Relay unit (0 – 500 milliseconds).
- Cumulative/Non-cumulative – Selects whether the audio delay is added only to the audio signal sent out of the local XLR connector (non-cumulative), or whether the delay is also added to the RF signal relayed to a downstream node (cumulative).
- Audio Output Connector – Selects the configuration of the XLR audio output connector (see Audio Connector Configurations section for details).



4.5 SPECTRUM ANALYZER MODE SCREEN

Any AiRocks unit can be used as a Spectrum Analyzer when not being used as a Master or Relay unit. In fact, it may be desirable to dedicate an AiRocks unit as a Spectrum Analyzer for an event to give an added measure of security knowing where the interfering sources are, and to monitor the transmission of the Master and nearby Relay unit(s).

The screen below shows the Spectrum Analyzer mode. Transmissions from the Master and any Relay units are shown in green. Interference is shown is red. The spectrum is divided into 10 discrete channels which are used by the ARX-900. 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.

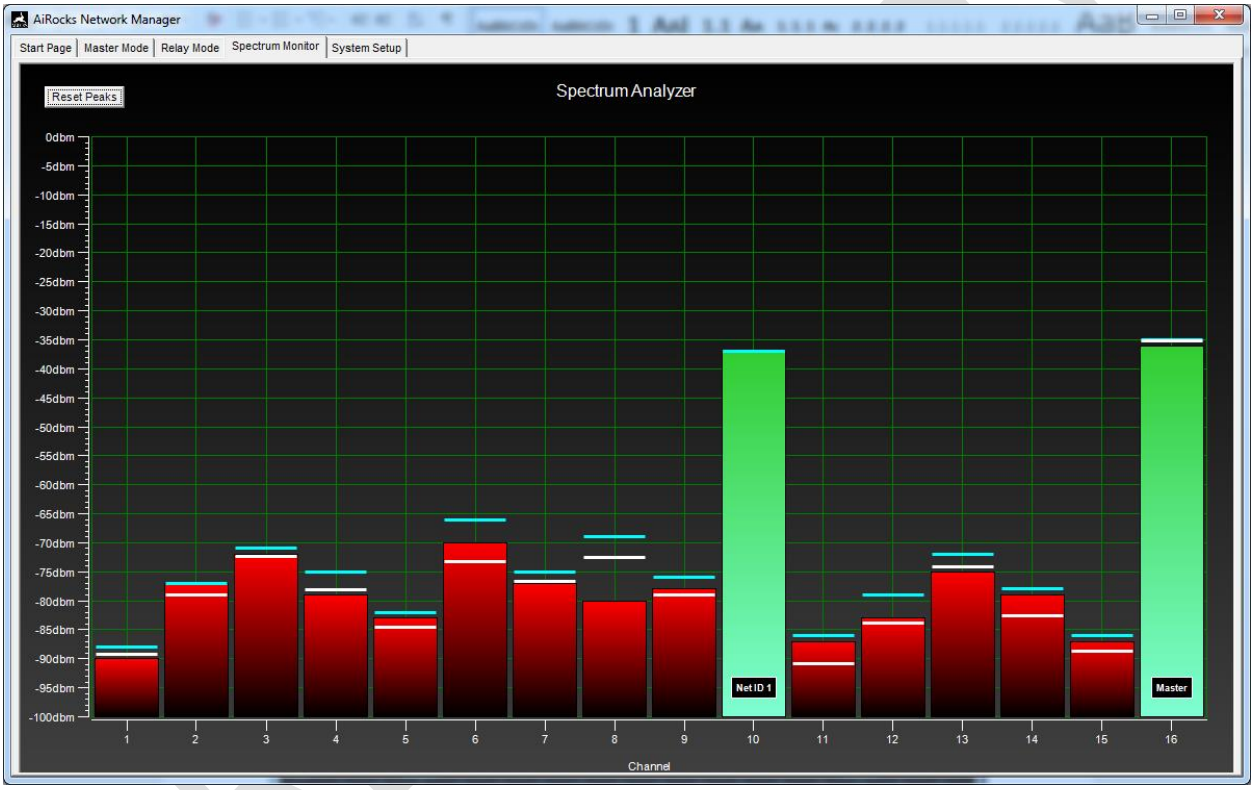


Figure 18 Spectrum Analyzer Mode

4.6 RELAY MODE SCREEN

This screen is used when the operator wishes to directly attach to a Relay unit within the network. The screen gives the same information and controls of the Relay Monitor window discussed above.

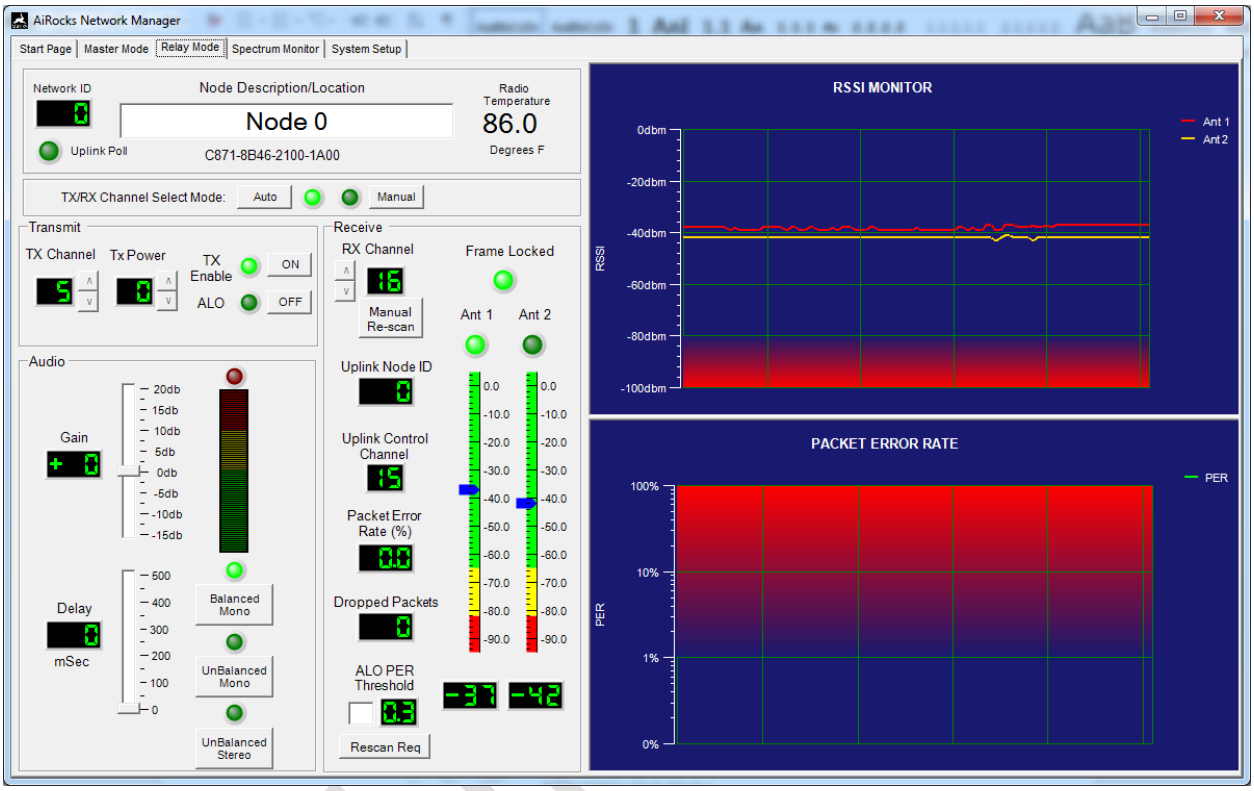
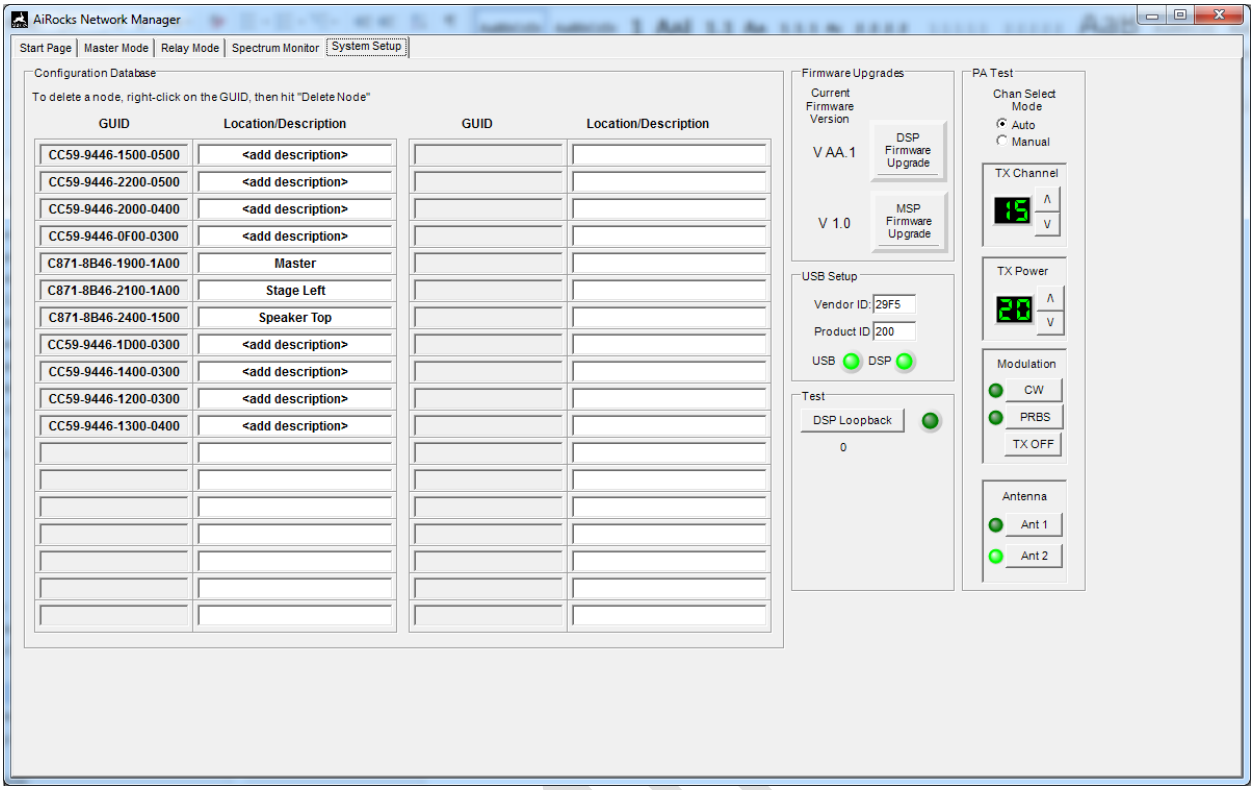


Figure 19 Relay Mode Window

4.7 SYSTEM SETUP SCREEN

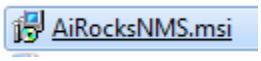
The System Setup Screen displays the NMS Configuration Database entries of each of the registered nodes and their user-assigned friendly name. To delete node entries from the database, right-click on the node and hit delete.

This screen also gives the user access to firmware upgrades for the MSP and DSP processors. Care must be taken when performing firmware upgrades not to remove power or the USB cable during the process.



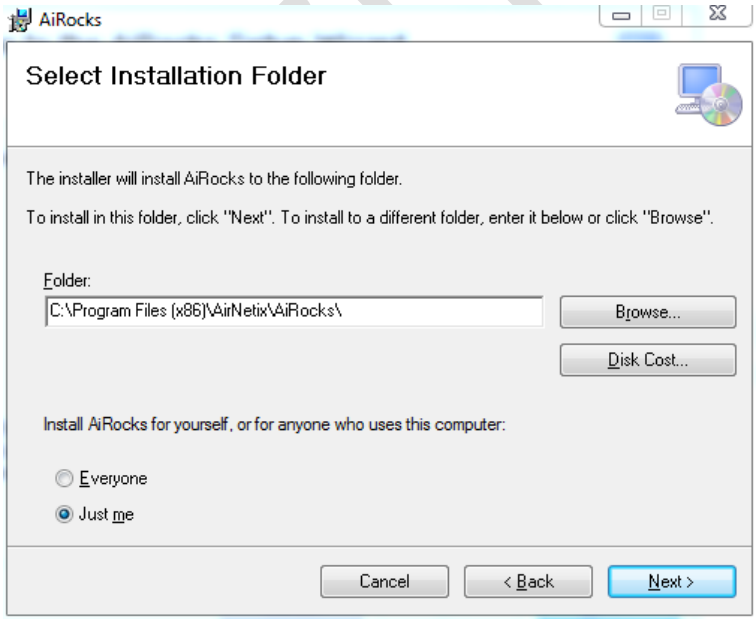
4.8 INSTALLING THE NETWORK MANAGEMENT SYSTEM APPLICATION

To install the AiRocks NMS click on the AiRocksNMS.msi icon.

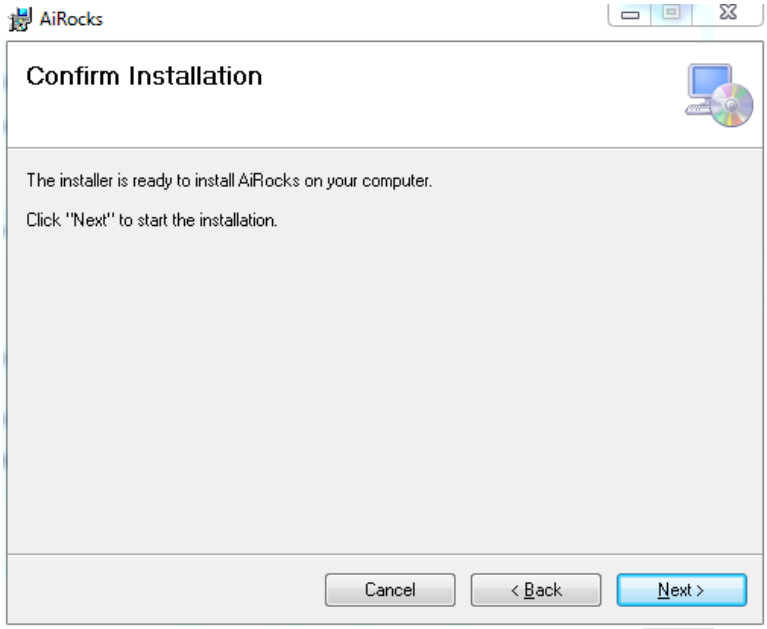


A welcome screen will appear. Click Next.

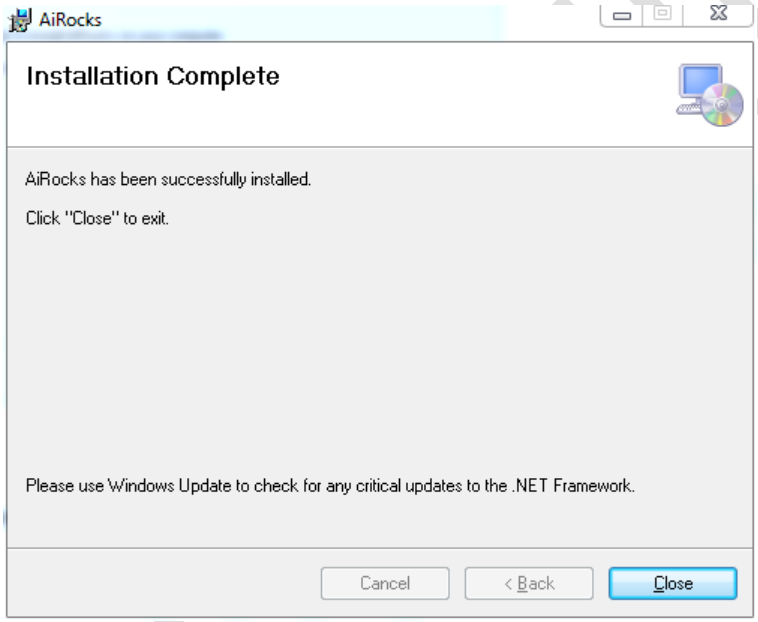
The following screen gives you the opportunity to change the installation location folder. Leave this at the default folder location.



Click Next to confirm installation.



After installation, click Close.



To begin using the NMS, click the AiRocks NMS icon on your desktop.

4.9 Deploying and Managing a Network

Deploying an AiRocks network is similar to deploying any other RF network. It takes careful planning and close attention to interference sources, path distances, and link-of-sight positioning. The AiRocks Network Management System gives the operator a variety of tools to accomplish the planning and successful deployment of a well performing network. By using these tools the network operator can establish a strategy for deployment in even the most challenging venues.

4.9.1 Node Registration

Register each AiRocks unit in the NMS database

It is recommended that you register each AiRocks unit in the NMS database before deployment. During this process, and with knowledge of the venue layout, “friendly names” can be assigned to each unit. This will help keep track of the location of each unit, especially if names like “Rear Tower” or “Stage Right” are used.

4.9.2 Channel Selection Mode

Decide on whether Auto or Manual Channel Selection is to be used.

By far the simplest way to deploy an AiRocks network is to leave all Relay units in the “Auto” channel selection mode with ALO (Automatic Link Optimization) enabled on all Relay units. This will allow Relay units to automatically select the best channels for both transmitting and receiving. Additionally, ALO will help avoid any interference that is “transient” in nature, or interference that appears after the initial installation has taken place.

However, fully automatic channel selection may not always be the best choice. For example, if Relay units are close together in a “dense” deployment, it may be desirable to manually choose channels for each Relay unit based on the receive signal level of the nearest uplink. It may also be desirable to disable the Transmit function of some Relay units if there is no need for their transmit signal (i.e. no downstream nodes). This way there is no crowding into the channels showing the least local interference.

4.9.3 Frequency Scan

Perform a frequency scan of the local RF environment.

Use the Spectrum Analyzer screen to determine the level of RF interference in the local area. In most cases there will be some level of interference in some portion of the band. However, in most outdoor environments this interference will be limited to one or two sections of the band, and/or will be much lower in level than indoor environments. With 10 available channels, AiRocks typically has no problem finding suitable RF spectrum in most venues.

4.9.4 Mounting Position

Mount the AiRocks units in an optimum position

As mentioned earlier, it is best to establish good line-of-sight between nodes. People, trees, buildings, and any other solid object can affect useable range of the AiRocks units.

4.9.5 Deployment Sequence

Deploy units in sequence

It is helpful to set up and turn on the Master unit before beginning the deployment of Relay units. This will allow you to check signal and interference levels as you deploy Relay points. It is also helpful to deploy Relay units starting closest to the Master and working your way “downstream”, while checking receive signal level and interference at each Relay location.

4.9.6 ALO and RSA

Check ALO and RSA functions.

Once you have finished deploying Relay units, use the NMS to double check ALO and Remote Spectrum Analyzer functions. Keep in mind that manually initiating an ALO re-scan will cause all downstream nodes from that point on to re-scan and re-acquire an uplink signal. This exercise should NOT be done during the event.

The same can be said for RSA (Remote Spectrum Analyzer). It is a good idea to perform a few RSA scans during deployment to keep an eye on the local spectrum conditions at each Relay point. But, as mentioned above, performing an RSA will take the unit off-line for ~.5 seconds causing all downstream nodes to re-scan and re-acquire in uplink signal. RSA should NOT be performed during the event.

4.9.7 DC Power

Use DC battery pack if AC is not available

AirNetix offers an optional DC battery pack which will allow you to position Relay units in the field before AC power is available (a common problems in large outdoor deployments). The DC battery pack will power the AiRocks unit for up to 12 hours and will allow the installer to fully test the unit transmit and receive functions.

5 SYSTEM SPECIFICATIONS

ARX-900 System Specifications		
Audio		
Frequency Response	20Hz to 20KHz +/- .5db	
Max Input Level (Master mode)	+11.25dbu	Balanced Mono
	+5.22dbu	Unbalanced Mono
	+5.22dbu	Unbalanced Mono
Max Output Level (Relay mode)	+8.2dbu	Balanced Mono
	+2.2dbu	Unbalanced Mono
	+2.2dbu	Unbalanced Mono
System Gain	-3db	Input and output clip at same audio level with 0db gain settings
Noise Floor	-80dbu	
Input and Output Connectors	XLR balanced or unbalanced	Input and Output
Delay	~33 mSec	Base delay per hop
	0 – 500 mSec	User added delay per hop
RF		
Frequency Band	902 – 928 MHz ISM Band	
Operating Channels	10 channels @ 2 MHz intervals	Carrier center frequency from 906 to 924MHz
Max output power	+20dbm	
Range	>1000 feet typical	Unobstructed Line of Sight
Antennas	2 ea. 2dbi dipole Optional single 14dbi Yagi	RX Spatial diversity
Antenna Connectors	N-type	
Regulatory Approvals	FCC Part 15.247	FCC ID: 2AB8BARX900
	Industry Canada RSS-210	IC: 11944A-ARX900
AC Power		
Input Voltage Range	80-305VAC or 110-430VDC	
Input Frequency	47-440Hz	
Max Input Current	70mA / 45mA typ.	
DC Power		
Nominal Input Voltage	+12VDC	
Maximum Input Voltage	+17VDC	
Minimum Input Voltage	+10VDC	
Power Consumption	2 Watts	
Environmental		

	Water and dust intrusion	Water falling as a spray at any angle up to 60° from the vertical shall have no harmful effect.	Weather resistant design to IP65 specification
	Operating Temperature	0 to 65 degrees C	
		32 to 150 degrees F	

*Specifications are subject to change without notice.

6 FCC STATEMENTS

Warning: Changes or modifications to this device not expressly approved AirNetix, LLC could void the user's authority to operate the equipment.

6.1 CLASS A DEVICES:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

6.2 RF EXPOSURE AND SAFETY INFORMATION

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

7 INDUSTRY CANADA SPECIFIC STATEMENTS:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

This radio transmitter **11944A-ARX900** has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio **11944A-ARX900** a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maxi mal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

- 2 dBi dipole - N-Male Connector
- 14 dbi Yagi – N-Male Connector

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisat eur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage es t susceptible d'en compromettre le fonctionnement.