WirelessGRID-300

High Capacity Outdoor Backhaul Radios For Point-to-point Links

Product Manual And Installation Guide

WirelessGRID-300 MIMO Outdoor Wireless Bridges

Revision 2.04

4/19/2011 12:40 PM

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AIRAYA Corp.

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Note: *AIRAYA will provide fee-based service for up to three years following discontinuance of any product from the active AIRAYA price list. Under the one-year warranty, internal and external power supplies, and fans are covered by a standard one-year warranty from date of purchase.*

Regulatory Information

and Industry Canada Guidelines

The radiated output power of the AIRAYA WirelessGRID-300 Wireless Bridge is far below the FCC radio frequency exposure limits. Nevertheless, the device shall be used in such a manner that the potential for human contact during normal operation is minimized. It is the responsibility of the installer and users of the WirelessGRID-300 to guarantee that the antenna(s) operates at least 150 centimeters (59 inches) for Point to Point operation and at least 20 centimeters (7.87 inches) for Point to Multipoint operation while operating in the 5.8 GHz band and at least 200 centimeters (78.7 inches) while operating in the 4.9 GHz band from any person. This is necessary to insure that the product operates in accordance with the Federal Communications Commission's RF Guidelines for Human Exposure.

The WirelessGRID-300's antennas may NOT be replaced at any time. They are designed to comply with the maximum EIRP limits specified by the FCC and Industry Canada. Modifications to the WirelessGRID-300, unless expressly approved by AIRAYA, could void the user's authority to operate the equipment.

FCC ID: QDE-GRID-3X3-PS IC: 4433A-GRID3X3PS

IC Warning message:
Operation of this device 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.

If the antenna is detachable (ie. selectable by the user, can be change. Otherwise it calls integrated), needs to include 7.1.4 and 7.1.5 in the manual:

7.1.4 has statement for detachable antenna.

"This device has been designed to operate with the antennas listed below, and having a maximum gain of 29 dB. Antennas not included in this list or having a gain greater than 29 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms."

7.1.5 has additional statement for detachable antenna.

"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 permitted for successful communication."

FCC Warning message:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum 200 cm for the 4.9Ghz band usage, 150cm for 5.8Ghz Point-to-Point operation and 20cm for 5.8 Ghz Point-to-Multipoint between the radiator and your body. This transmitter must not be collocated or operating in conjunction with any other antenna or transmitter unless authorized to do so by the FCC.

Contents

Introduction

AIRAYA WirelessGRID-300 series wireless bridges have been designed to provide transparent, high-speed data communications between two or more locations.

The WirelessGRID-300 utilizes detachable antennas and is an outdoor radio product, with external antenna connections. The product requires installation by a certified professional installer, only.

WirelessGRID-300 firmware will not allow the end user to change or modify the country code settings of this product. The availability of specific channels and/or operational frequency bands are country dependent and are programmed in firmware to match the intended destination, by AIRAYA Corp. factory personnel only. The US Country Code setting will only allow operation in the 5.725-5.850 GHz band for 20 & 40 MHz wide channels. The PS Country Code will allow operation in the 5.725-5.850 GHz band for 20 & 40 MHz wide channels, while also allowing the use of 4.940-4.990 GHz band with bandwidths of 5, 10, 15 & 20 MHz wide channels.

This solution offers proven, fast, reliable, and secure wireless connectivity with considerable cost savings compared to wired alternatives. Utilizing proprietary 4.940-4.990 & 5.725-5.850 GHz technology, the WirelessGRID-300 bridge can easily replace an Ethernet or multiple T1 connections or seamlessly integrate into a newer 1000/100 Mbps Ethernet Local Area Network (LAN).

Package Checklist

Each WirelessGRID-300 bridge comes in either one or two cartons, depending on the model ordered, and contains the following components:

- ✓ Two outdoor units with either two (2) or three (3) N-type Female Connectors
- ✓ Pole mounting hardware and brackets
- ✓ Two indoor injector units and full range power supplies for remote power
- ✓ Two 48 VDC .4 Amp power bricks
- ✓ Two UV-protected outdoor-rated cables (length specified by part number) or Bulkhead fittings for Gigabit remote PoE power cables.

Please register your product online at: **www.airaya.com** in the support/ product registration section of our web site. **Note:** Free technical support is only available to registered users of AIRAYA equipment.

Please inform your dealer if there are any incorrect, missing, or damaged parts. If possible, retain the carton and original packing materials for repacking purposes in case you need to return a radio bridge for repair.

Hardware Description

Ethernet Compatibility

WirelessGRID-300 wireless bridges can be attached directly to 10BASE-100/1000 BASE-TX (twisted-pair) Ethernet LAN segments. These segments must conform to the IEEE 802.3 specification.

Each WirelessGRID-300 bridge functions as an Ethernet node and performs layer 2 bridging by moving packets from a network in one building to a network in another building.

Radio Characteristics

WirelessGRID-300 bridges utilizes a radio modulation technique known as Orthogonal Frequency Division Multiplexing (OFDM) capable of operating in the4.940-4.990 & 5.725-5.850 GHz bands. Data is transmitted over a radio channel at signaling rates up to 300 Mbps in 5.8 GHz band and 130 Mbps in the 4.9 GHz band.

Antenna Options for 5 GHz Operation

The outdoor version of the WirelessGRID-300 bridge uses FCC certified antennas to achieve a maximum operating range up to 30 miles under FCC rules in the 5.8 GHz band. When using antenna in the 4.9 GHz band, an antenna gain greater than 26 dBi, will require the user to reduce the radio output power by the amount of gain above 26 dBi.

This device has been designed to operate with the antennas listed below in the 5.8 GHz band only, and having a maximum gain of 29 dB. Antennas not included in this list or having a gain greater than 29 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

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 permitted for successful communication.

4.9 Ghz Band Antenna Operation

Antenna Gain	Max Transmit Power	EIRP	Antenna Type
29 dBi	23.00	52.00 dBm	Grid /Dish Parabolic Antennas
23.5 dBi	24.96 dBm	48.46 dBm	Dual Polarized Antenna
23 dBi	24.96 dBm	47.96 dBm	Patch Antenna
17 dBi	24.96 dBm	41.96 dBm	Vertically Polarized Sector Antenna
10 dBi	24.96 dBm	34.96 dBm	Omni Directional Antenna

5.8 Ghz Band Antenna Operation

Antenna Gain	Max Transmit Power	EIRP	Antenna Type
29 dBi	24.96 dBm	53.96 dBm	Grid /Dish Parabolic Antennas
23.5 dBi	24.96 dBm	48.46 dBm	Dual Polarized Antenna
23 dBi	24.96 dBm	47.96 dBm	Patch Antenna
17 dBi	24.96 dBm	41.96 dBm	Vertically Polarized Sector Antenna
10 dBi	24.96 dBm	34.96 dBm	Omni Directional Antenna

Outdoor Nema4 Enclosure

The metal enclosure of WirelessGRID-300 bridge has been designed for maximum durability for outdoor use in a range of weather conditions. They are watertight and meet NEMA/EEMAC Type 4 and IP66 specifications.

Cabling and Cable Bulkhead Fittings

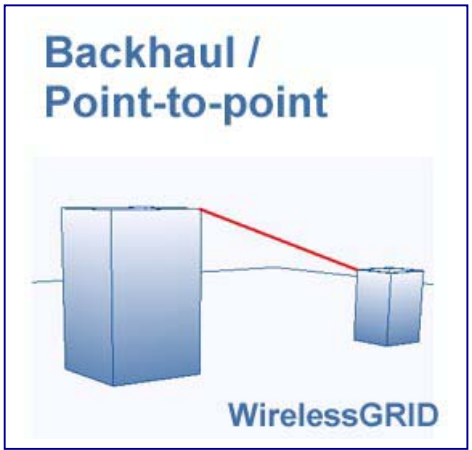
The outdoor version of the WirelessGRID-300 bridge includes Category 5e cables designed for outdoor applications. This cable supports DC Power Over Ethernet for easy installation. The bulkhead fitting is an IP67-rated Ethernet Fitting for use in outdoor applications.

Remote PoE Power

Gigabit Power Over Ethernet (IEEE802.3AF) is an integral part of the WirelessGRID-300 bridge. The injector is capable of providing power at the full distance specified by the IEEE 802.3 Ethernet specification (100 meters).

Backhaul / Point-to-point Architecture

Figure 1. This diagram illustrates a typical use scenario of a WirelessGRID-300 bridge interconnecting two networks in separate facilities.



For complete information on model numbers, please refer to the ordering guide located on the AIRAYA website.

System Requirements

Before installing the WirelessGRID-300 bridge, be sure you have the following items on-hand:

- ✓ An AC power outlet (100 to 240 V, 50 to 60 Hz) to supply power to the indoor injector units on both sides of the wireless link
- ✓ An outdoor unit mast with a 1 to 4 inch (25.4 to 101.6 mm) diameter
- ✓ An available RJ-45 (UTP) port on a 1000/100 Mbps Ethernet switch or router
- ✓ Web browser or telnet (CLI) application for software configuration

The WirelessGRID-300 bridge has been designed to withstand normal handling procedures, but reasonable precautions should be taken during installation, particularly with regard to static discharge.

- Make sure that you are adequately grounded by touching the bare metal surface on the back of a computer or networking device before installing the indoor and outdoor units.
- Avoid moving around the work area in order to eliminate static charge buildup.
- If possible, do not work on a carpeted area.

Hardware Installation

Connecting the Indoor Injector Unit

Figure 5. Network and outdoor connection views

The indoor injector unit connects your company network to the outdoor portion of the WirelessGRID-300 bridge and delivers both data and power. The indoor portion of the remote power system features the following LED status indicators:

LED	Indication
Power Brick LED (green)	Power source is active and supplying 48 volts to the indoor injector unit
Injector 48V out (green)	Power Over Ethernet is active and the injector is hot at the 48V Out+ Signal port

Before you mount the indoor Injector unit at a fixed location, consider the following requirements to determine optimal placement:

- The cable length from the Ethernet switch or router to the outdoor unit must not exceed 328 feet (100 meters).
- Placement must allow for easy access to disconnect the indoor injector unit from the AC outlet if necessary.

Follow these steps to install the indoor injector unit:

1. Connect the *To Network* port on the indoor injector unit to your 1000/100 Mbps Ethernet switch or router using a straight-through Category 5 UTP cable.

2. Connect the power brick to the *48 VDC In* power socket on the indoor injector unit and then plug the power brick into the wall power receptacle. **Warning**: Use only the power adapter supplied with the WirelessGRID-300 bridge in order to prevent damage.

3. You are now ready to apply power to the outdoor unit. Connect the *48V OUT + Signal* port to the outdoor unit using the included (black) Category 5e cable attached to the outdoor unit. The *48V OUT* LED will light to indicate that the indoor injector unit is active and outputting 48 volts, .4 amps to the *48V OUT + Signal* port.

TIP

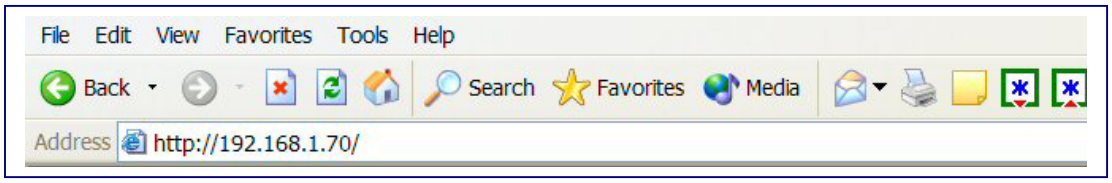
After applying power to the outdoor unit, the link light on your network connection (Switch or Router Port) should be on.

Software Configuration

You can configure the network, radio, and security parameters of the WirelessGRID-300 bridge using the built-in WirelessGRID-300 Network Management System (NMS). This web-based configuration utility greatly simplifies the setup process by allowing you to access all parameters and settings through a single, consistent user interface.

Getting Started

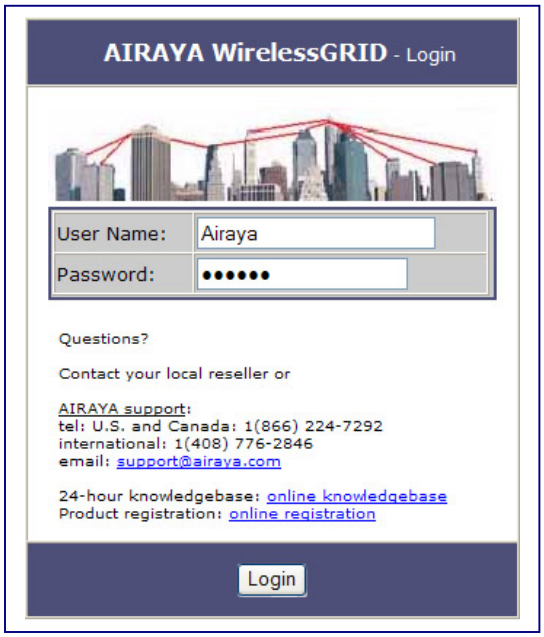
The factory default IP address of the WirelessGRID-300 bridge is *192.168.1.70*. Type that string into the address field of your browser and press the *Return* key to load the WirelessGRID-300 NMS.



You will be prompted for a User Name and Password. Refer to the next section for information about default settings.

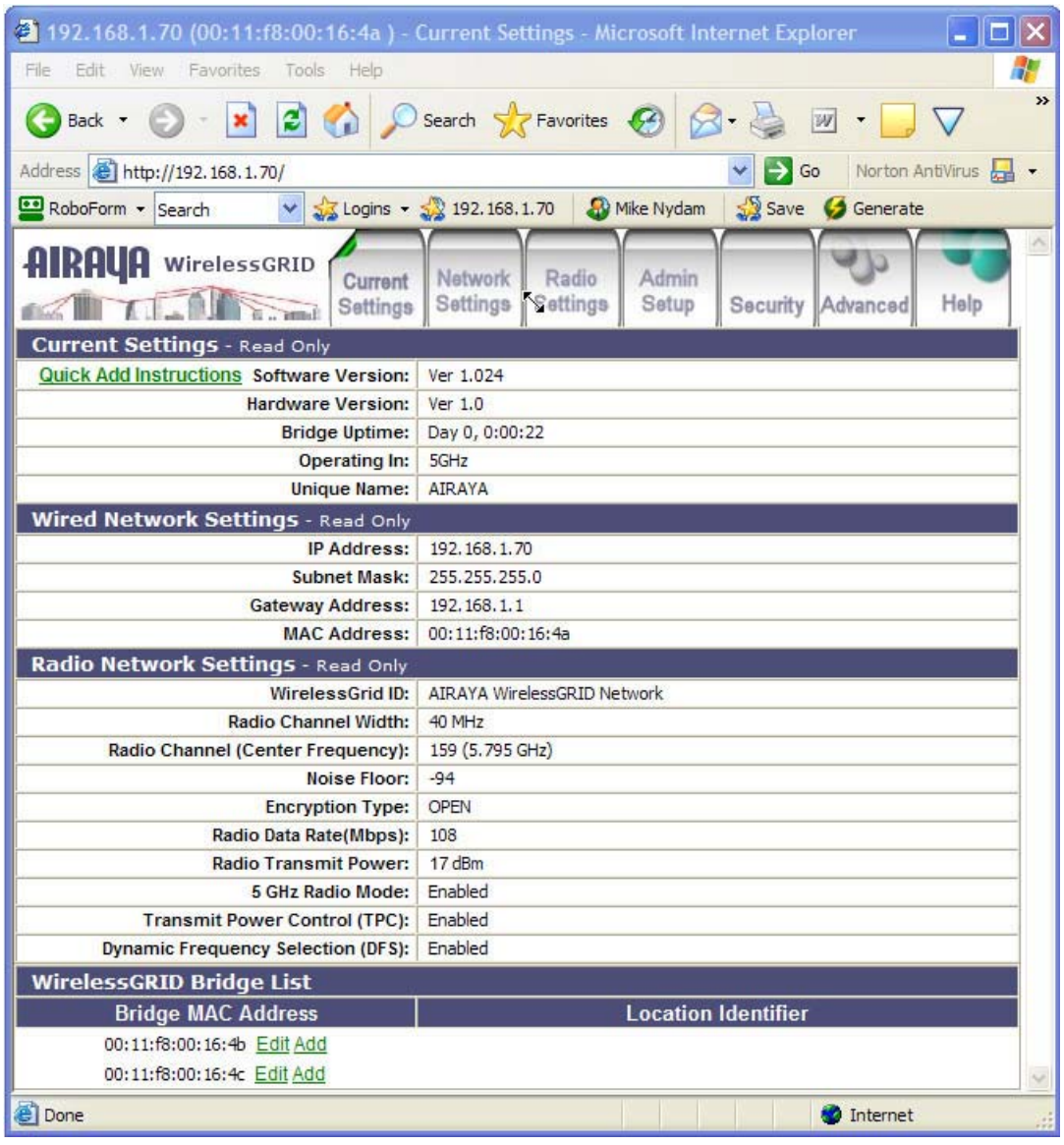
Logging into the WirelessGRID-300 Web-based NMS

The WirelessGRID-300 bridge requires you to enter a user name and password to gain access to the configuration utility. The default **User Name** and **Password** is "Airaya."



Once logged in, you can access all available WirelessGRID-300 configuration options. The web interface is organized into tabs that allow you to access screens that let you view and change bridge parameters.

Tabs include *Current Settings, Network Settings, Radio Settings, Admin Setup, Advanced, Authorized Bridges, Data Encryption, Active Bridges, Station Stats, Download Updates* and screen-specific *Help*.



The following sections describe the entries in each area of the Current Settings screen:

Current Settings

Quick Add Instructions – Step-by-step instructions to set up and add a new bridge to a WirelessGRID-300 network.

Software Version – Current software (firmware) version installed on the bridge.

Hardware Version – Current hardware version of the bridge you're connected to.

Bridge Uptime – Amount of time the bridge has been active since the last reboot.

Operating In – Specifies the general frequency range of bridge operation.

Unique Name – A unique identifier with up to 32 characters, which is commonly used as a location identifier. Control characters are not allowed in this field.

Wired Network Settings

IP Address – IP address of the bridge. The IP address for each bridge must be unique, so please check with your network administrator for the correct IP address assigned to your device.

Subnet Mask – Current subnet mask of the bridge you are working with. The subnet mask allows networking software to determine which parts of the IP address specify the network address and which parts specify the host address.

Gateway Address – Current gateway address of the bridge you are working with. IP packets destined for other subnets are automatically sent to the default gateway, which routes traffic to the correct network.

MAC Address – Unique Ethernet address of bridge you are working with.

Radio Network Settings

WirelessGRID-300 ID – Displays a unique network ID. All bridges in a WirelessGRID-300 network are required to use the same WirelessGRID-300 ID.

Radio Channel Width – Current channel width (measured in Megahertz) of the bridge.

Radio Channel (center frequency) – Current channel and center frequency of the bridge.

Noise Floor – Measurement of ground floor noise level calculated at startup of bridge.

Encryption Type – Data encryption type selected for bridge (e.g. Open, AES).

Radio Data Rate – Current radio data rate setting. Available options for data rates are based on channel size.

Radio Transmit Power – Current radio transmit power setting.

5 GHz Radio Mode – Current mode (e.g. enabled, disabled).

Transmit Power Control (TPC) – Current status of TPC (e.g. enabled or disabled).

Dynamic Frequency Selection (DFS) – Current status of DFS (e.g. enabled or disabled).

WirelessGRID-300 Bridge List

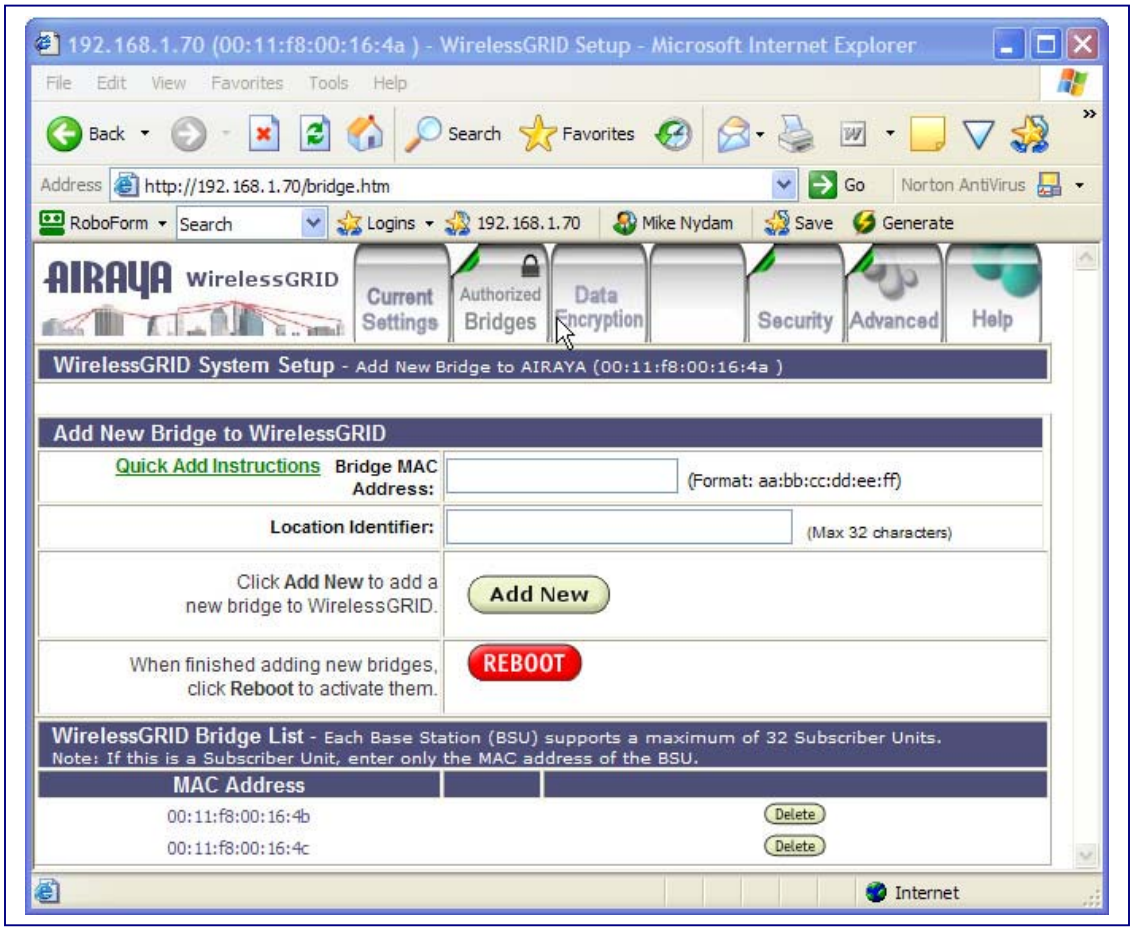
Authorization List of all bridges allowed to associate and communicate with the bridge you are working with.

Bridge MAC Address – MAC address of bridge configured to access a WirelessGRID-300 network. This entry is required for each bridge allowed in the WirelessGRID-300 network.

Edit or **Add –** Links that you can select to update or add new bridges to authorized WirelessGRID-300 bridge list.

WirelessGRID-300 System Setup Tab

The *WirelessGRID-300 System Setup* screen is used to add or delete remote **Bridge MAC addresses** from the authorized bridge list. Each bridge contains a WirelessGRID-300 authorization list, and all bridges require reciprocal entries to communicate.



The *Add New Bridge to WirelessGRID-300* section of the screen contains the following entries:

Quick Add Instructions – Step-by-step instructions to set up and add a new bridge to a WirelessGRID-300 network

Bridge MAC Address – The MAC address of a remote bridge you want authorized to connect to the bridge you are working with. You must enter this information in the proper format. Backhaul/Point-point bridges and subscriber units can accept 1 entry.

Location Identifier –*This feature is not enabled at this time.*

TIP

Each bridge contains a WirelessGRID-300 authorization list, and all bridges require reciprocal entries to communicate. Subscriber units and point-to-point bridges support one WirelessGRID-300 list entry.

Follow these steps to add a bridge to the WirelessGRID-300 authorization list:

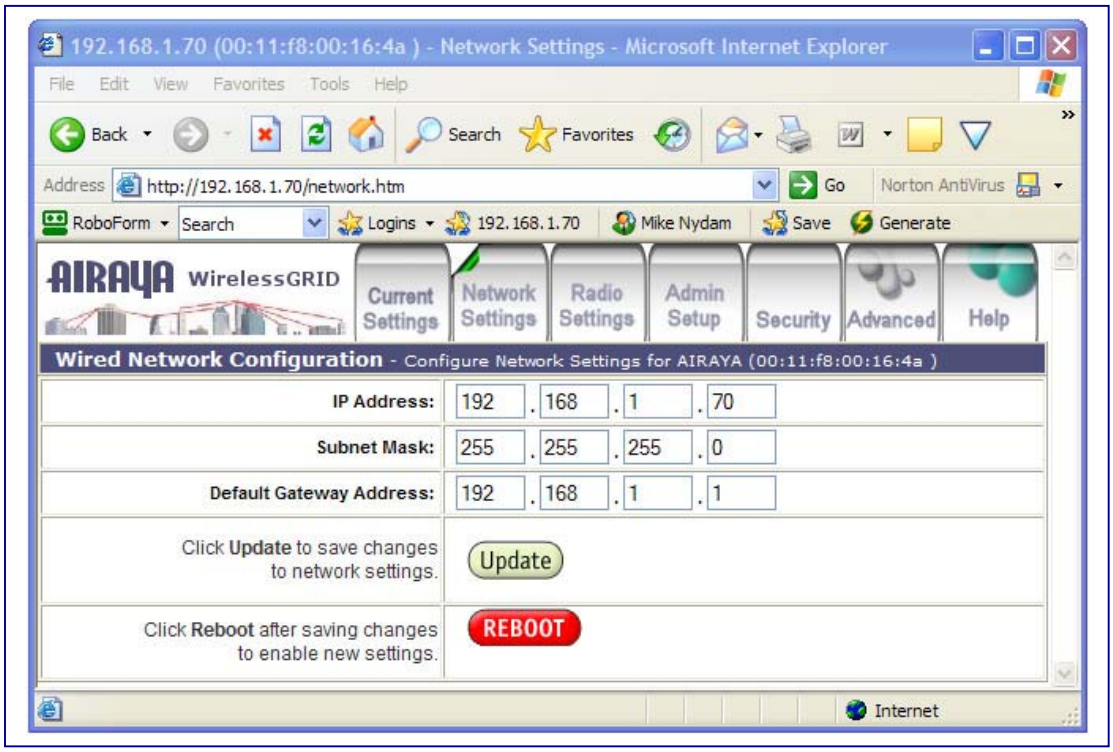
1. Enter the **MAC Address** of a new bridge.
2. Press **Add New** to include the new bridge in the WirelessGRID-300 list.
3. Confirm that the new entry was entered correctly by reviewing the list at the bottom of the page.
4. If the device is a base station, continue adding bridges until you are finished.
5. Press **Reboot** to cycle power and enable new settings.

Follow these steps to remove a bridge from the WirelessGRID-300 list:

1. Press **Delete**.
2. On the next screen, press **Delete** to confirm or **Cancel** to return to the WirelessGRID-300 list screen without removing the entry.

Network Settings Tab

The *Network Settings* screen is used to modify your wired network **IP Address**, **Subnet Mask**, and **Default Gateway Address**.



The screen includes the following entries:

IP Address – The IP address of the bridge you are working with. The IP address for each bridge must be unique; check with your network administrator for the correct IP address assigned to this device. *Default IP address: 192.168.1.70.*

Subnet Mask – The subnet mask allows networking software to determine which parts of the IP address specify the network address and which parts specify the host address. *Default Subnet Mask: 255.255.255.0*.

Default Gateway Address – IP packets destined for other subnets are automatically sent to the default gateway, which routes the traffic to the correct network. The gateway address must be specified following the same convention as the IP address. *Default Gateway Address: 192.168.1.1.*

TIP

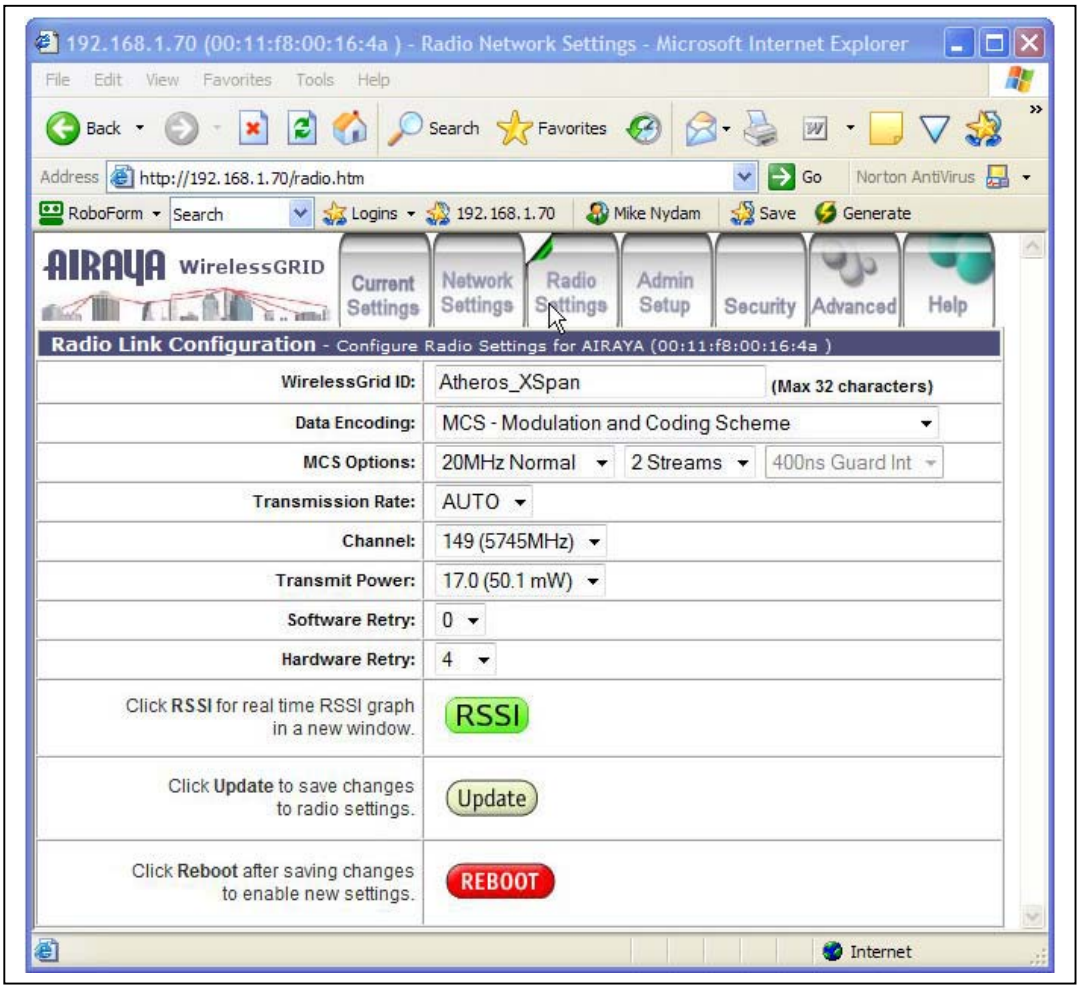
If you want to return to the WirelessGRID-300 NMS after updating network settings, enter the new IP address in your web browser and follow the log in procedure.

Follow these steps to update network settings:

1. Update the IP Address.
2. Update the Subnet Mask.
3. Update the Gateway Address.
4. Press **Update** to save changes.
5. Press **Reboot** to cycle power and enable new network settings.

Radio Settings Tab

The *Radio Settings* screen is used to define the **WirelessGRID-300 ID**, **Country Code**, **Wireless Mode**, **Radio Frequency**, **Data Rate**, and **Transmit Power** settings of a bridge.



The following parameters can be modified on the *Radio Settings* screen:

WirelessGRID-300 ID – The WirelessGRID-300 ID provides a unique network ID for each WirelessGRID-300 network. Enter a number or address with up to 32 characters. *Default WirelessGRID-300 ID: "AIRAYA WirelessGRID-300 Network"*

NOTE

WirelessGRID-300 radios do not use or broadcast SSID's. Sniffing programs do not have access to WirelessGRID-300 wireless networks.

Data Encoding – Data encoding allows you to select the type of radio transmission you would like to use. Changing Data Encoding will change available MSC Options and available Data Streams, Radio Frequency (center channels), and Data Rate options for your bridge.

Wireless Mode – Select the desired channel size for your AIRAYA WirelessGRID-300 bridge. WirelessGRID-300 bridges are capable of operating on 20 or 40 MHz wide channels.

NOTE

When you have finished updating the **Wireless Mode**, make sure to press **Update** to view revised Radio Frequency, and Data Rate settings.

Radio Frequency – Select the desired frequency of operation from the drop-down menu. The radio frequencies that appear are dependent on the Country Code enabled and Wireless Mode specified.

Transmission Rate – Select the desired Transmission (Signaling) Rate from the drop-down menu. The Transmission (Signaling) Rates that appear are dependent on the Wireless Mode specified.

Transmit Power – Select the desired Transmit Power option from the drop-down menu. This option is dependent on the Country Code and Radio Frequency specified.

Follow these steps to update the radio network settings.

NOTE

You must press **Update** after each radio parameter change. Radio parameters are interdependent, so each will change with every selection you make.

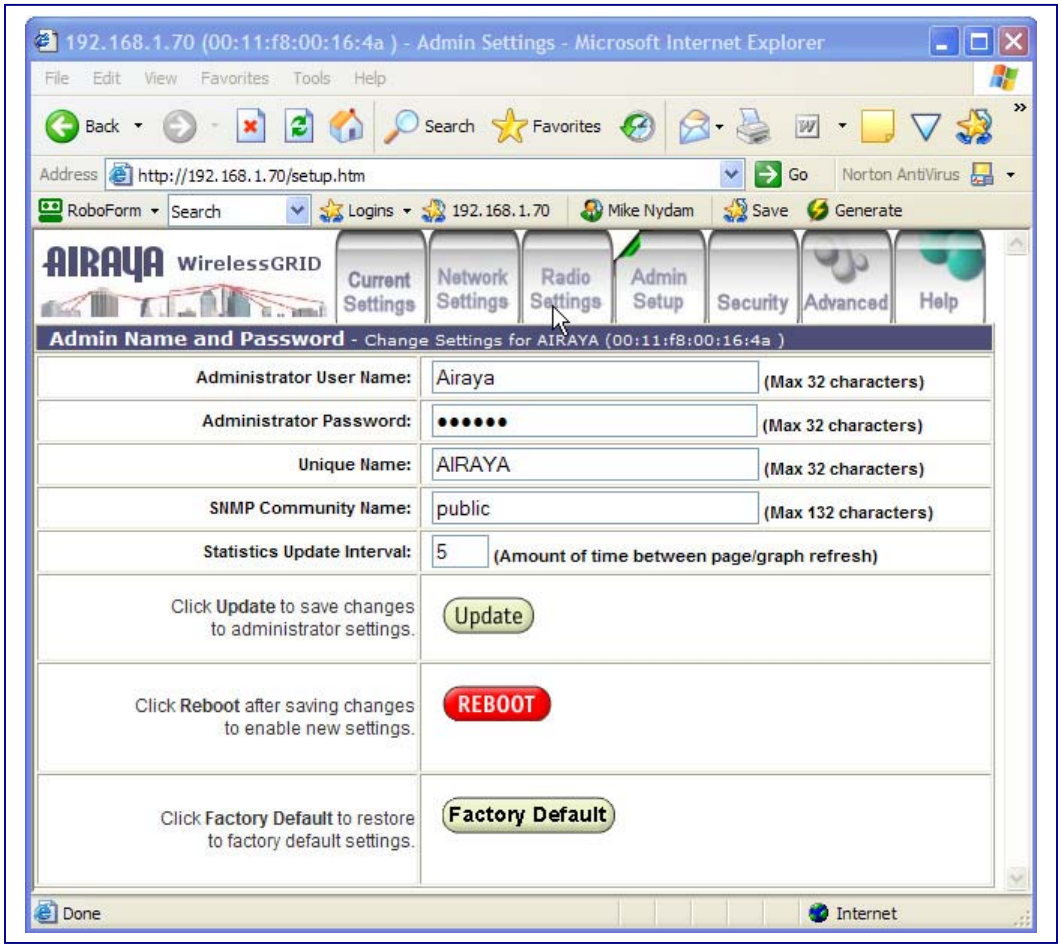
1. Update the WirelessGRID-300 ID.
2. Select the MCS Mode
3. Select Wireless Mode
4. Select Radio Frequency
5. Select Data Rate
6. Select Transmit Output Power
7. Press **Reboot** to cycle power and enable new radio settings.

NOTE

All bridges in the WirelessGRID-300 network require the same **MCS Mode**, **WirelessGRID-300 ID**, **Wireless Mode**, and **Radio Frequency** settings to send and receive information correctly.

Admin Setup Tab

The *Admin Setup* screen is used to modify the Administrator **User Name** and **Password** for the WirelessGRID-300 NMS, as well as the **Unique Name** and **Statistics Update Interval** settings, described below:



Administrator User Name – Create a new user name by typing over the contents of this field. *Default Administrator User Name: Airaya.*

Administrator Password – Create a new password by typing over the contents of this field. *Default Password: Airaya*

Unique Name – A 32 character string used to identify the bridge. *Default Unique Name: AIRAYA (All capital letters.)*

SNMP Community Name – SNMP string used by SNMP monitoring programs to access the system. Default: public

Statistics Update Interval – This value sets the page refresh rate for the remote bridge statistics screen and graph. Default interval: *5*

Factory Default button – This button clears all parameters and resets the bridge to factory default settings.

SECURITY TIPS

- ✓ To ensure that only authorized users gain access to the WirelessGRID-300 NMS, AIRAYA recommends that you change the Administrator User Name and Password from their factory default settings.
- ✓ When selecting a new password, do not use a term that can be easily guessed, such as your name. Random combinations of numbers and characters are much safer to use, though harder to remember.

Follow these steps to update administrator login settings:

1. Update the **Administrator User Name**.
2. Update the **Administrator Password**.
3. Write down your new login settings and keep them in a safe place for future reference.
4. Press **Update** to save settings.
5. Press **Reboot** to cycle power and enable new settings.

Follow these steps to update **Unique Name, SNMP Community Name,** and **Statistics Update Interval** settings:

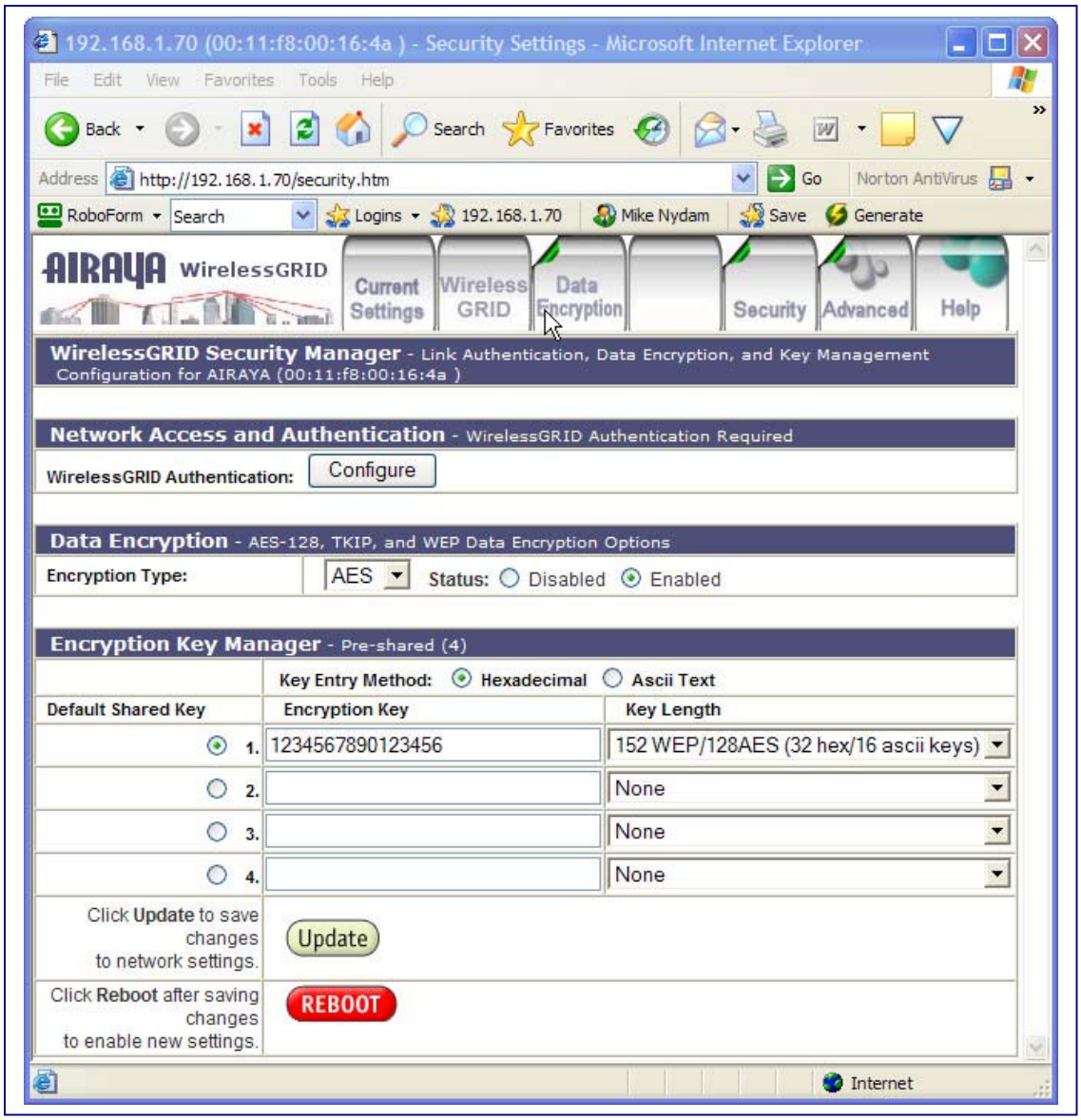
1. Update the **Unique Name**.
2. Update the **SNMP Community Name**
3. Update the **Statistics Update Interval** value.
4. Press **Update** to save your new settings.
5. Press **Reboot** to cycle power and enable new settings.

Follow these steps to reset the bridge to factory defaults:

1. Press **Factory Default** button to reset bridge to AIRAYA default settings.
2. When prompted, press **Reset** to restore default settings or **Cancel** to keep current settings.
3. Press **Reboot** to cycle power and restore factory defaults.

Security Tab – Data Encryption

The *Security* screen provides a link to the WirelessGRID-300 Authorized Bridge List. All bridges in a WirelessGRID-300 network require entry into the authorized Bridge list. This screen is also used to enter or update data encryption settings for the bridge. The following sections describe the entries of each area on this screen.



WirelessGRID-300 Authentication

Click **Configure** to add, edit, or delete bridge MAC addresses from the authorized bridge list.

NOTE

Refer to the section on the *WirelessGRID-300 System Setup* tab for detailed instructions on how to add, edit, or delete bridge MAC addresses.

Data Encryption

Encryption Type – WirelessGRID-300 bridges support AES data encryption. *Default Setting: Open (Not enabled).*

***128-bit AES* –** WirelessGRID-300 bridges support hardware-based embedded 128-bit AES encryption. Enter 16 ascii or 32 hexadecimal digits.

Status – The status button indicates the current state of encryption on your bridge. *Default: Disabled.*

Disabled **–** No data encryption is enforced on your bridge.

Enabled **–** Data encryption is enforced on your bridge.

Follow these steps to enable **Data Encryption** on the bridge:

1. Select an **Encryption Type** (AES).
2. Change the **Status** to reflect the proper status.
3. Press **Update** to save settings.
4. Press **Reboot** to enable new security settings.

Encryption Key Manager

Pre-Shared Key Configuration – When you select Pre-Shared Key for encryption, you may enter up to four default shared-keys in the Encryption Key Manager. Please note: When encryption is enabled, all bridges require an identical Key Entry Method, Encryption Key, and Encryption Key Length.

Key Entry Method – You can use hexadecimal digits or ASCII text to enter each key. Click on the "key length" drop-down menu to view lengths for each type of key.

Default Shared Key **–** Select the default pre-shared key you want to enable.

Encryption Key **–** Enter up to four pre-shared encryption keys.

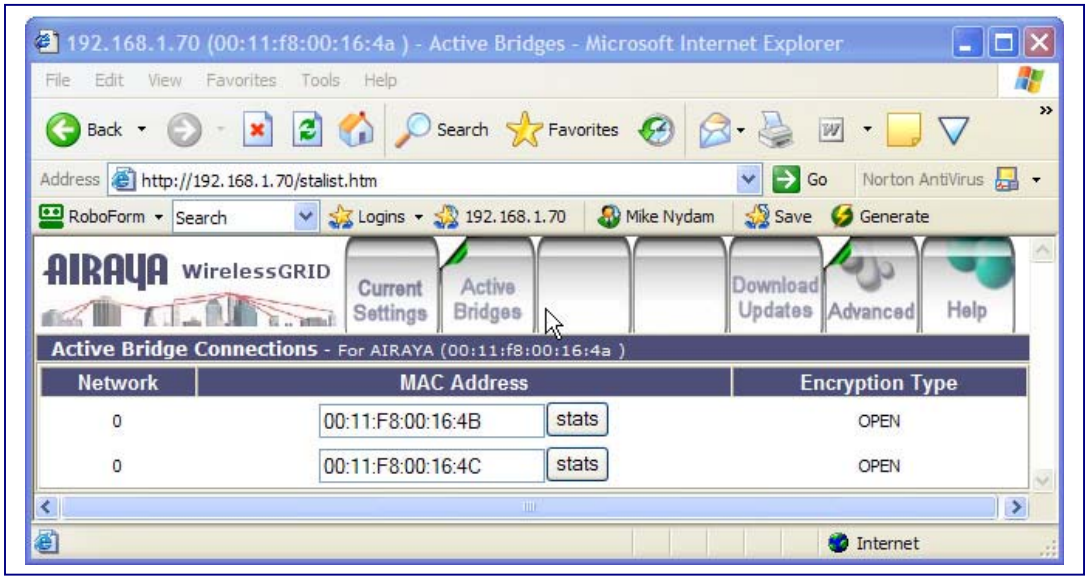
Key Length **–** Specify the length of the pre-shared encryption keys.

Use the following steps to add a **Pre-Shared Key** to the Key Manager on the main security screen:

1. Select a **Key Entry Method** (hexadecimal or ASCII text).
2. Select a **Default Shared Key**.
3. Enter up to four shared **Encryption Keys.**
4. Specify the **Encryption Key Length** based on the Encryption Key just entered.
5. Press **Update** to save settings.
6. Press **Reboot** to enable new security settings.

Active Bridge Status Tab

This screen is used to view the current status of all authorized remote bridges for the (local) bridge that you are logged into.



This screen provides the following data:

Network – All remote bridges have a value of "0".

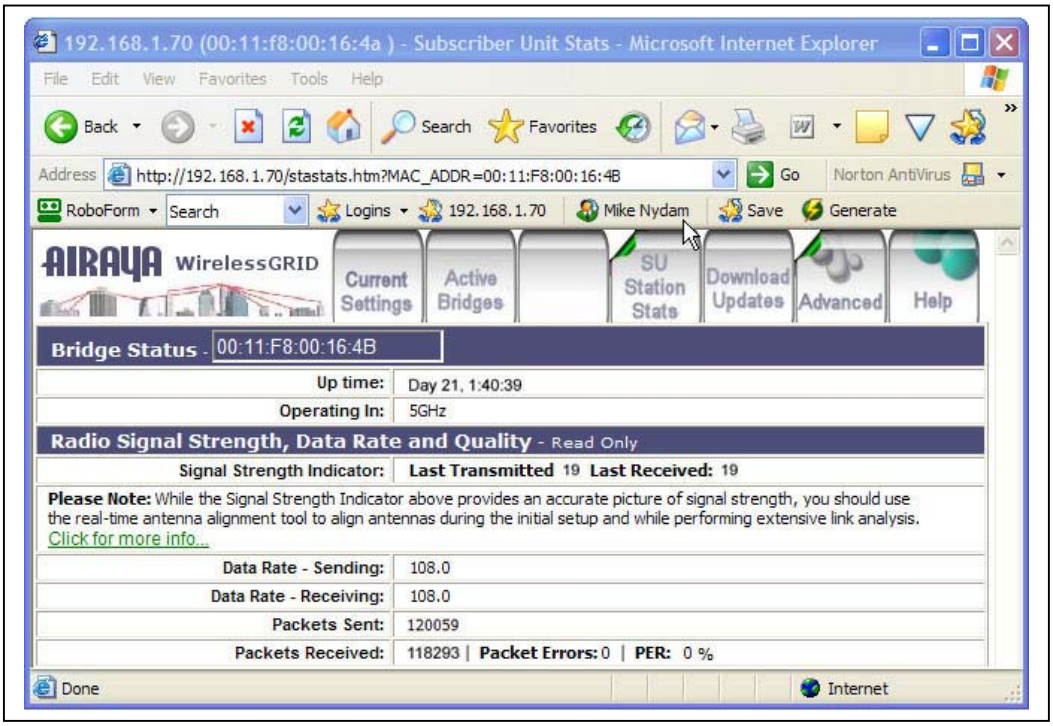
MAC Address – MAC Address of each authorized remote bridge in network.

Stats button – Displays the remote bridge statistics screen for the MAC address you select. Press **stats** to open the remote bridge statistics screen.

Encryption Type – Displays the current data encryption settings for remote bridges

Remote Bridge (SU Station) Statistics Tab

This screen is used to view the current statistics of a remote bridge communicating with the (local) bridge you are logged into.



NOTE

Tip: To allow WirelessGRID-300 bridges to monitor their own signal strength and packet error rates and dynamically adjust data rates, you can set *Data Rate* on the **Radio Settings** tab to "Best". This will allow the bridge to monitor signal strength on a packet-by-packet basis, adjusting data rate accordingly. If signal strength is not optimum, the radio will adapt and change to a lower modulation, which in turn lowers the radio data rate, but provides a higher effective TCP/IP data rate by increasing radio receiver sensitivity and reducing the packet error rate. This adaptive data rate ability provides for better overall quality and reliability of the link.

Tip: When running time sensitive applications such as VoIP and/or VideoIP cameras, setting bridges to specific data rates reduces latency and improves performance on these systems.

This screen provides the following data:

Bridge Status

Uptime. Elapsed time the bridge has been up and since the last power cycle.

Operating In. Specifies the general frequency range remote bridge is operating in.

Signal Strength, Radio rates, and Quality:

Signal Strength Indicator. Signal Strength is a good indicator of overall network quality. Lower values (below 15) indicate a bridge will only be able to communicate at low data rates. Higher signal strength values (above 15) indicate the bridges have the ability to run at faster data rates.

Last Transmitted. Signal Strength values (measured in dBm) for the last packets transmitted. Signal Strength is a good indicator of how your link will run. When "best" data rate is selected low values indicate the local and remote bridges are operating in a slower mode.

Last Received. Signal Strength values (measured in dBm) for the last packets received.

Data Rate - Sending. Displays the current radio data rate being used to send data from the bridge you are attached to, to the remote bridge.

Data Rate - Receiving. Displays the current radio data rate being used to receive data from the remote bridge.

Packets Sent. Indicates the total number of packets transmitted since the bridge has been up.

Packets Received. Indicates the total number of packets received since the bridge has been up.

Receive Packet Errors. Indicates the total number of receive packets errors generated since the bridge has been up.

Receive Packet Error rate (PER). Percentage of receive packet errors to packets received since the bridge has been up.

Firmware Update Tab

Periodically, AIRAYA releases firmware updates that fix known issues and enhance the functionality of WirelessGRID-300 bridges. The latest WirelessGRID-300 firmware release can be located in the support section of the AIRAYA website at the following URL:

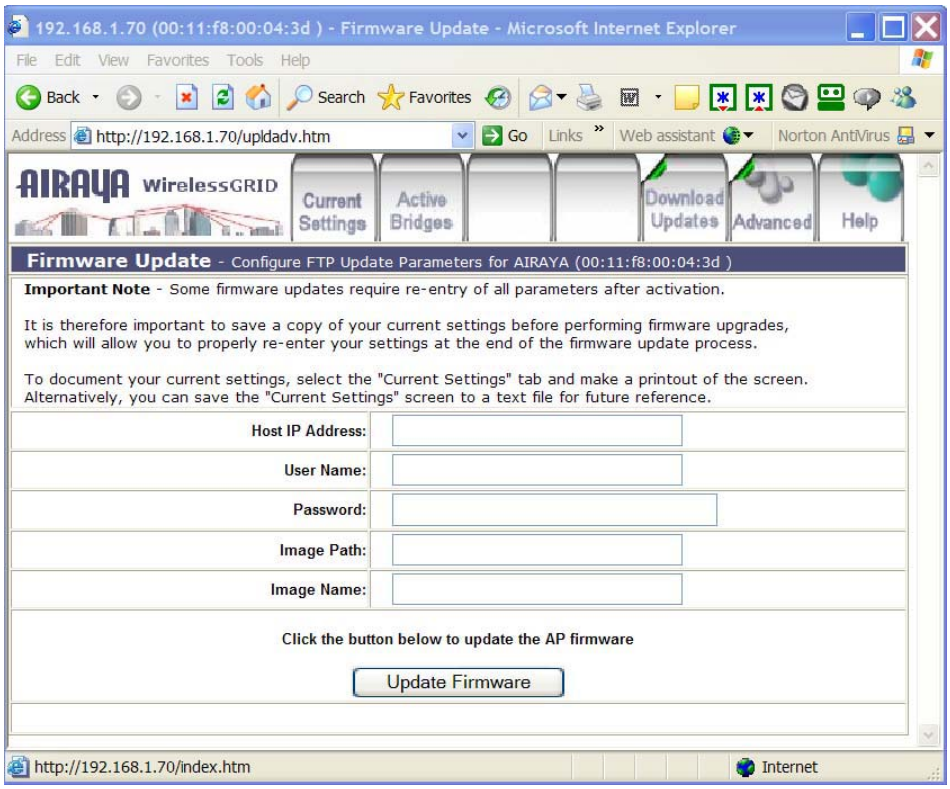
http://www.airaya.com/products/productdb/_product_support.asp

If you are unsure whether you need an upgrade, please contact AIRAYA customer support (support@airaya.com) and a representative will help you.

WARNING!

Some configuration parameters can be overwritten during the bridge firmware upgrade process. As a safeguard, save a copy of your current settings before performing the upgrade. This will allow you to re-enter your settings if necessary. To document your settings, you can either select the *Current Settings* tab and copy the screen to a text file or print the screen. You should follow this procedure for each bridge that you plan to upgrade.

The following screen shows the settings used for upgrading bridge firmware:



Settings include:

Host Name – The IP address of FTP server where new firmware is located.

User Name – Authorized User Name for accessing the FTP server.

Password – Valid Password for accessing the FTP server.

Image Path –Path to firmware image on the FTP server. If firmware image is located in the root directory of your FTP server, leave this field empty.

Image Name – Filename of firmware image.

Update Firmware –Button to start upload procedure for new firmware.

Follow these steps to update a bridge with new firmware image:

1. Enter the IP Address of your FTP server in the **Host Name** field.
2. Enter your authorized *User Name* for accessing the FTP Server in the **User Name** field.
3. Enter your *Password* for accessing the FTP Server in the **Password** field.
4. Enter a valid *path* to the firmware image on the FTP server in the **Image Path** field. If firmware image is located in the root directory of your FTP server, leave this field empty.
5. Enter the *filename* of the firmware image you are using to update the bridge in the **Image Name** field.
6. Click on **Update Firmware** button to load new firmware image into bridge.
7. Press **Reboot** to enable new key settings.

Help Tab

The AIRAYA online help system provides useful information about all parameters and menus available in the WirelessGRID-300 NMS and configuration utility. Select the *Help* tab on any screen and the appropriate topics will appear in a pop-up style browser window.

Appendix A – Bench Test Procedure

This WirelessGRID-300 bench test guide is designed to provide a new AIRAYA installer with insight and understanding of how to setup, test and verify the functionality of a WirelessGRID-300 link before performing a field installation. Utilities for testing network communication, configuring bridges, aligning antennas, and measuring throughput are discussed. Answers to common questions and troubleshooting tips are noted throughout the document for your convenience.

While performing a bench test, antenna alignment is not critical as antennas are close together and the signal strength (RSSi) utilities will always show a strong signal. As in all field installations, bench tests should be performed with antennas correctly polarized, either vertically or horizontally, and pointing at each other, at a distance of no less than 15 feet apart.

To obtain optimal throughput and link reliability, signal strength readings should be above 18 for all bench tests. Very high signal strength values (RSSi above 50) are common in bench tests and will not damage radios; however, measured TCP/IP throughput results may be lower.

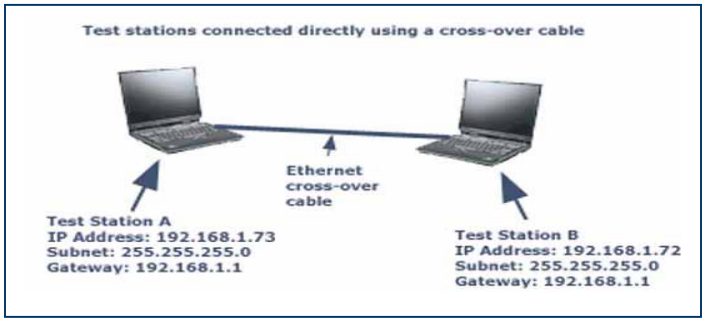
Bench test Procedure

Step 1. Setup a wired Ethernet network between test stations

1. Configure 2 test stations so that their network IP addresses are in the same range and can communicate with each other via Ethernet. If you are not familiar with IP addresses, please contact AIRAYA for the name of a qualified network installer in your area.

2. Verify your test network setup by using an Ethernet crossover cable directly connected between the two test stations, or by connecting the 2 stations using a switch, hub or router using straight-through Ethernet cables.

To verify your wired network setup is working properly, run a continuous ping between test stations A and B. To do this, open a DOS or CMD window on test station A, then type the following at the command prompt: **ping 192.168.1.72 –t** and on station B, type **ping 192.168.1.73 -t** Note: **-t** runs a continuous ping.



If you receive ping responses from both test stations, the network IP configuration and physical wiring is working properly between the 2 test stations using Ethernet. If you cannot ping both test stations, check your Ethernet cable connections and test station network settings to verify they are configured properly.

NOTE

If ping does not work between 2 wired test stations, it will not work between 2 test stations connected by a WirelessGRID link.

When ping works properly with wired test stations, go to Step 2.

Step 2. Setup wired Ethernet network connections to bridges

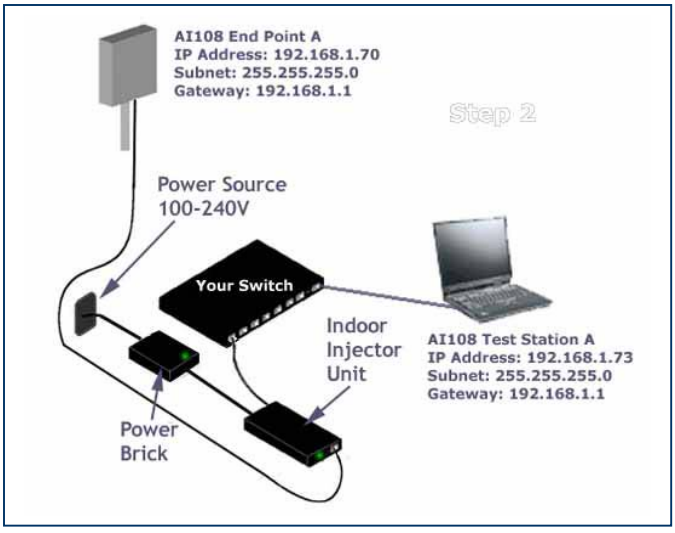
Connect directly using straight-thru cables, or through network switches or routers using straight-thru Ethernet cables.

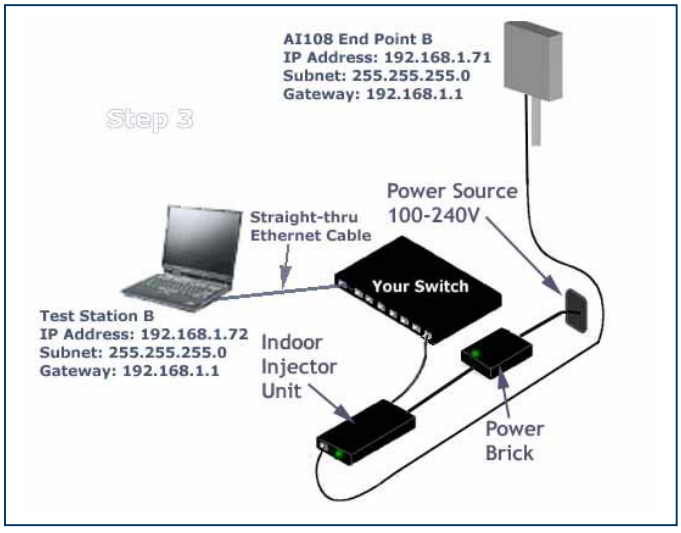
NOTE

WirelessGRID products shipped as complete kits have one bridge factory-configured with IP address 192.168.1.70, and one bridge factory-configured with IP address 192.168.1.71. Both bridges have a default subnet mask of 255.255.255.0

1000 Mbps full duplex (gigabit) ports are best from connecting bridges to wired Ethernet networks.

Example IP Configuration of test stations and outdoor bridges with default configuration parameters:





1. Start a continuous ping from test Station A to bridge end point A. To start a continuous ping using the factory default IP settings of the bridge, type the following into a DOS or CMD window on test station A:

Ping 192.168.1.70 –t (leave this ping window running so you can see ping results easily)

2. If there is no response, try IP address 192.168.1.71, or cycle the power on bridge end point A.

Note
Check that the Ethernet link light is on at test station A if connected directly to bridge A with straight-thru cable, or on the switch/router port that bridge A is plugged into if connected with a straight-though Ethernet cable.
If the Ethernet link light is on and you cannot ping bridge A, then re-check IP address and

After ~45 seconds, you should see ping responses from 192.168.1.70 (bridge A). If you see ping responses on test station A, you have an IP network connection between test station A and bridge A.

If you can ping bridge A, you can open the HTTP configuration utility and network management system (NMS) using a web browser. You will not be able to ping across the link to bridge B until WirelessGRID-300 bridge list authorization entries are made in both bridges. (See step 3)

3. Setup the Ethernet network connection between bridge B and test station B using the same procedure described above, then verify that the test station B to bridge B setup is correct.

After verifying that <u>both</u> bridges and their respective test stations can communicate via Ethernet, go to step 3.

Step 3. Setup bridge software configuration for bridge

After verifying that <u>both</u> bridges and their respective test stations can communicate via Ethernet, you will need to setup and verify bridge configuration so they will be able to communicate over the radio link. The configuration given here will be a minimal configuration for test purposes; for more detailed configuration information, please refer to the product manual.

NOTE
Factory default administrative User Name and Password are **Airaya** with an uppercase **A**
As a security measure, the WirelessGRID http configuration utility and network management systems (NMS) will timeout if left open with no activity for 3 or more minutes. You will need to re-login to again access the utility.

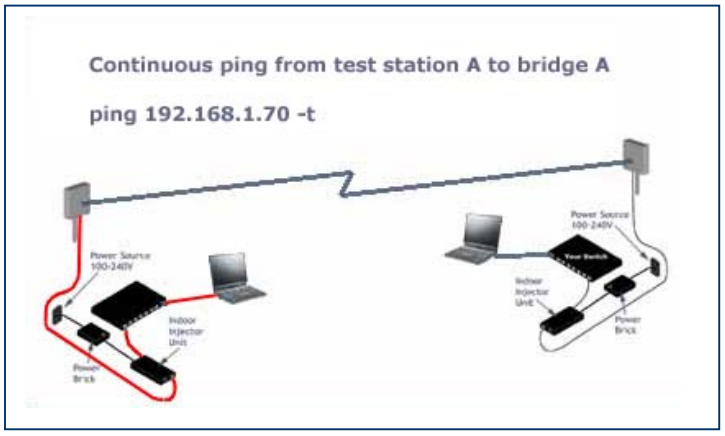
1. On each test station, open an **http** session by entering the bridge IP address into the address field of your web browser. The correct format is: http://192.168.1.70, or whatever the bridge's IP address has been set to.

2. Login using the default Administrator name and password. Each test station should now be displaying the "Current Settings" screen.
3. Record the IP address and MAC address of each bridge. You can also enter a Unique Name under the Admin *Setup* tab to help in identifying bridges. It is common to use this field to enter 32-character location identifiers.

Bridge	IP Address	MAC Address	Unique Name
A			
B			

4. Under **WirelessGRID-300 Bridge List**, on bridge A, click "Add" and enter bridge B's MAC address in the "Bridge MAC Address" box, using the xx:xx:xx:xx:xx:xx format. Click "Add New."
5. On bridge B, use the same procedure above to add bridge A's MAC address.
6. On the "Data Encryption" tab, make sure "Encryption Type" is disabled.
7. On each bridge, click on the "Reboot" button on either the Network Settings or Radio Settings tab to enable new WirelessGRID-300 Bridge List settings.
8. On each bridge, reopen the http interface and verify that entries were correctly saved by reviewing the "Current Settings" screen.

After verifying that <u>both</u> bridges have the proper WirelessGRID-300 Bridge List settings, go to step 4.

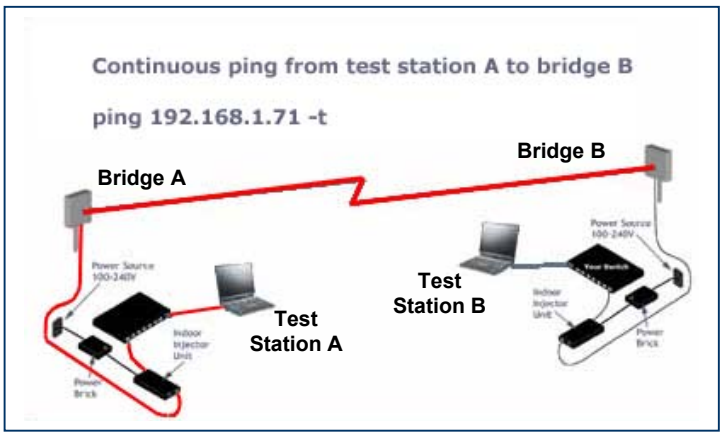


Step 4. Test network connectivity across a WirelessGRID-300 link

After verifying that <u>both</u> bridges and their respective test stations can communicate via Ethernet, and confirming new WirelessGRID-300 bridge list entries were saved, the following ping tests should be done.

NOTE

After rebooting bridges, the radio link should be established within one minute. If TPC and DFS are enabled, this process may take up to two minutes.



To verify network connectivity across a WirelessGRID-300 link, you should use test station A to do the following:

Ping 192.168.1.70 -t to ping bridge A

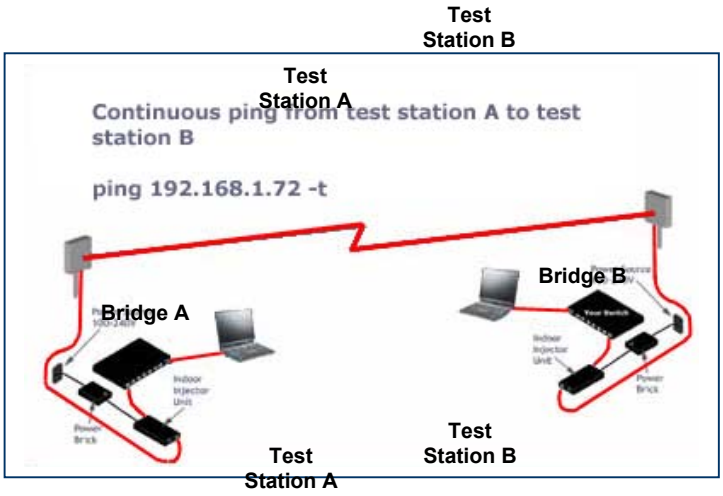
Ping 192.168.1.71 -t to ping bridge B across the wireless radio link

Ping 192.168.1.72 -t to ping test station B across the wireless link

If all ping tests are successful, then you have a properly configured WirelessGRID-300 link. Go to Step 5.

Troubleshooting tips for pinging across a link:

If you do not get a ping across the two end points from test station A to test station B;



You may have a power problem

- Verify that each bridge is connected to a power source with the proper input voltage.

You may have an Ethernet network cable problem at one end

- Verify all physical connections. You should have an Ethernet link light on the switch, router, or computer connected to each bridge.

You may have an http configuration error

- Verify the configurations of both bridges using the http NMS. Bridge A should have an entry in its WirelessGRID-300 Bridge List for the MAC address of the bridge B, and bridge B should have an entry in its WirelessGRID-300 Bridge List for the MAC address of the bridge A - without correct MAC addresses (bridge authorization) in each side of the link, the bridges will not communicate or let traffic pass.

NOTE

When doing a **Multipoint bench test**, it is best to setup the base station as bridge A, and the first subscriber unit as bridge B using the procedure in Step 3. To test additional subscriber units, use this procedure for each new subscriber unit, repeating the ping test for bridge B one at a time. Use different IP addresses for each new subscriber units. (E.g. Ping 192.168.1.74 -t for subscriber two, and so on) This will simplify diagnostics. Once all subscriber units (SU) respond to this test and you have verified that each subscriber has a different IP address, you can power up all SU's and each one should be ping-able.

Step 4a. Check throughput of WirelessGRID-300 link (optional)

To check the throughput of a WirelessGRID-300 link, use an FTP program or some other type of throughput measuring utility to check the speed of your link. If you don't know what program to use to test link throughput, AIRAYA can provide you with a traffic generating program and shareware throughput monitoring utility at no charge. A link to

these utilities can be found on the main page of the AIRAYA support section of website. http://www.airaya.com/products/productdb/_product_support.asp

If you are planning to do meaningful throughput tests, you will need a minimum of 2 test stations with at least 1.6GHz processors and Windows XP, 2000, or the Linux operating system. Windows 95, 98, ME TCP/IP stacks limit TCP throughput and cannot be used to accurately test throughput on an AIRAYA WirelessGRID-300 link.

AIRAYA's internal bench test results can be found at the following web address: http://www.airaya.com/products/WirelessGRID-300_testdata.html

NOTE

If you use 100/10 Mbps Ethernet to communicate with a WirelessGRID bridge, you **will not** get maximum throughput, and packet errors may occur between the bridge and your 100/10 Mbps Ethernet device. AIRAYA recommends 1000 Mbps Ethernet switches or routers to maximize throughput. Throughput tests will not work if Step 4 above has not been finished successfully.

Step 5. Field deployment of WirelessGRID-300 bridges

It is a good idea for you to become familiar with the product before installing it for the first time. AIRAYA recommends you perform a bench test before deploying any units to the field.

The bench test and verification process can also be performed in the field, but it is generally much easier to configure the units on the bench before setting them up in the field.

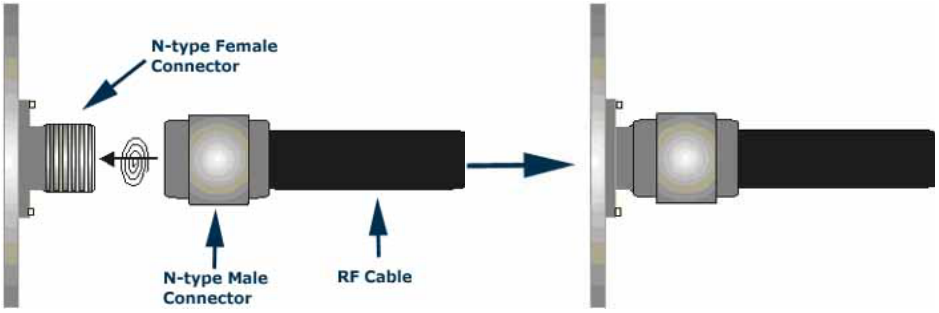
Changes in field-deployed bridges include but are not limited to the following:

1. IP Addresses to match your network
2. Change the administrative user name and password to prevent un-authorized access the administrative interfaces
3. Location-specific unique names entries to help in identifying units in the field
4. Encryption enabled if you want your data encrypted as it travels across your new WirelessGRID-300 system.

Appendix A: Weatherproofing RF Cable Connections

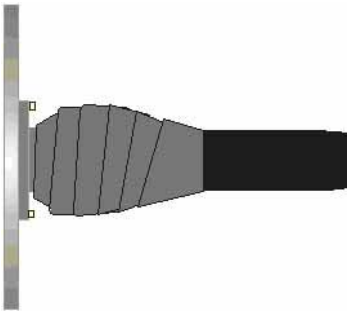
Step 1. Connecting Cable Assembly to Antenna or Enclosure

Attach RF cable assembly to antenna/enclosure by fastening the N-type male connector to the N-type female connector. Notes: Ensure both connectors are clean and dry. Hand-tighten firmly.



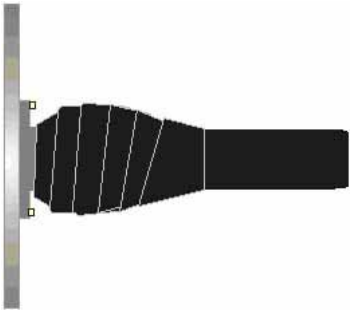
Step 2. Sealing the Connector Assembly

Tightly wrap the connectors with 2 layers of rubber tape (butyl). Notes: Rubber tape should seal entire connection and extend 1 inch beyond antenna connector/cable assembly. 3M 3339 tape works very well in this application.



Step 3. Covering Rubber Tape with Electrical Tape

Tightly wrap the rubber tape with 2 layers of electrical tape. Note: Electrical tape should extend 1 inch beyond rubber tape to ensure full coverage.



How to Get Help

AIRAYA offers several customer support options to assist you with difficulties you might experience with your WirelessGRID-300 wireless bridge:

Worldwide Web Support

The AIRAYA web site (www.airaya.com) provides quick and easy answers to common technical questions. You'll find a complete *Knowledgebase*, a variety of technical documents, product manuals and literature, and other helpful information. Most materials can be found in the support area.

Contacting AIRAYA

Contact your AIRAYA distributor or dealer before you call AIRAYA. They are familiar with your needs and will generally be able to provide you with the fastest and most comprehensive support. If they are unavailable or unable to answer your questions, then contact AIRAYA directly by one of the methods listed below.

Before contacting our technical support team, please create a copy of the "Current Settings" tab using your web browser and the instructions in this manual. If you are not able to run the web-based configuration utility, then write down any error messages you see on-screen and contact AIRAYA at the appropriate support number list above.

AIRAYA Contacts

Phone	(866) 224-7292 (U.S.) (408) 776-2846 (international)
Skype	AIRAYA_Support
Fax	(408) 776-3339
E-mail	support@airaya.com
Web site	www.airaya.com

IMPORTANT NOTE

Free support is only available to registered users. Register via the AIRAYA web site (www.airaya.com) in the support section. Support is available 24 hours a day.