XG2/XG200 Radio
Installation Manual

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Operational and Safety Warnings

Antenna Connection and Lightning Arrestor

The warranty requires that the radio must not be powered-up without an antenna connected. The warranty also requires that a lightning arrestor be installed.

RF Exposure

The equipment described herein emits radio frequency (RF) energy and requires professional installation. Although the power emitted is two watts or less, care should be taken to use the radio equipment properly to avoid the concentrated radio frequency energy near an antenna, especially a directional antenna (for example, a *yagi* antenna). No person should be within 130 centimeters (53 inches) of the antenna when the radio is transmitting. This includes indoor, outdoor and mobile use of the radio equipment.

FCC Part 15 Compliance

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE CONDITION THAT THIS DEVICE DOES NOT CAUSE HARMFUL INTERFERENCE.

NOTE: the manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

NOTICE

Adapt4, Inc. assumes no responsibility for any errors that may appear in this document, nor does it make any commitment to update the information contained herein. However, questions regarding the information contained in this document are welcomed.

Adapt4, Inc. also reserves the right to make changes to the specifications of the XG2 Series and to the information contained in this document at any time without notice.

This manual is not all inclusive of our products and services. The software and procedures discussed herein are continuously evolving just as are the requirements of our customers. Its format is informal, and hopefully will stimulate as many questions as it answers. Copies of cut sheets, engineering data, customer lists, installation guides, and test procedures are all available for further information.

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1 Overview

1.0 Brief System Description

The XG2 is a multi-mode radio for the SCADA, telemetry, framed-video surveillance and similar applications for 10-200 kb/s communications. The XG2 operates in smart-serial, IP, mesh, and DFS (Dataflow Systems compatibility) modes. The radio operates in several FCC-licensed bands, depending on the model number. The factory-set bands include:

- 217-220 MHz

The XG2 contains a built-in field installation tool to configure the radio via a web browser, typically on a laptop computer. The installation tasks that may be performed via the web browser include the following::

- Radio configuration – channel center frequency, data rate/channel width, and operating mode.
- Network configuration – IP address of the radio.
- Port configuration – baud rate, frame format and serial protocol.
- Radio firmware update – update the radio firmware from files stored on the laptop.

Similarly, the above functions may be done over-the-air.

The above list of capabilities is a brief outline of the tasks of installing the radio. More details will be given below.

Table 1.0-1 provides an equipment list needed to support XG2 Installation.

Table 1.0-1: Items Needed to Connect Radio to Computer

1. Laptop with:
   - Windows 98 or later, Apple MAC or Linux operating system
   - Ethernet port
   - 128 MB RAM
   - SVGA display or better
   - Internet browser (Internet Explorer, Mozilla Firefox, Safari; others TBD)
2. Ethernet cable
   - Cross-over (if directly connected), straight-through (if connected via hub)

Figure 1.0-1 illustrates an *XG2* radio network, which is comprised of three XG2 radio Remote Sites and a Base Station (Hub). The Remote Sites are further comprised of an antenna, the *XG2* radio and end-user equipment. The end-user equipment is attached to the radio via Ethernet and/or RS-232 serial cables.

The Base Station comprises an antenna (typically omnidirectional), an *XG2* Base Station Radio, Ethernet and optional RS-232 serial cabling from the radio into a shelter or building. These cables

connect to user host equipment. In addition, the Ethernet cable allow connection to the *XG2* radio web page to Network Operators.

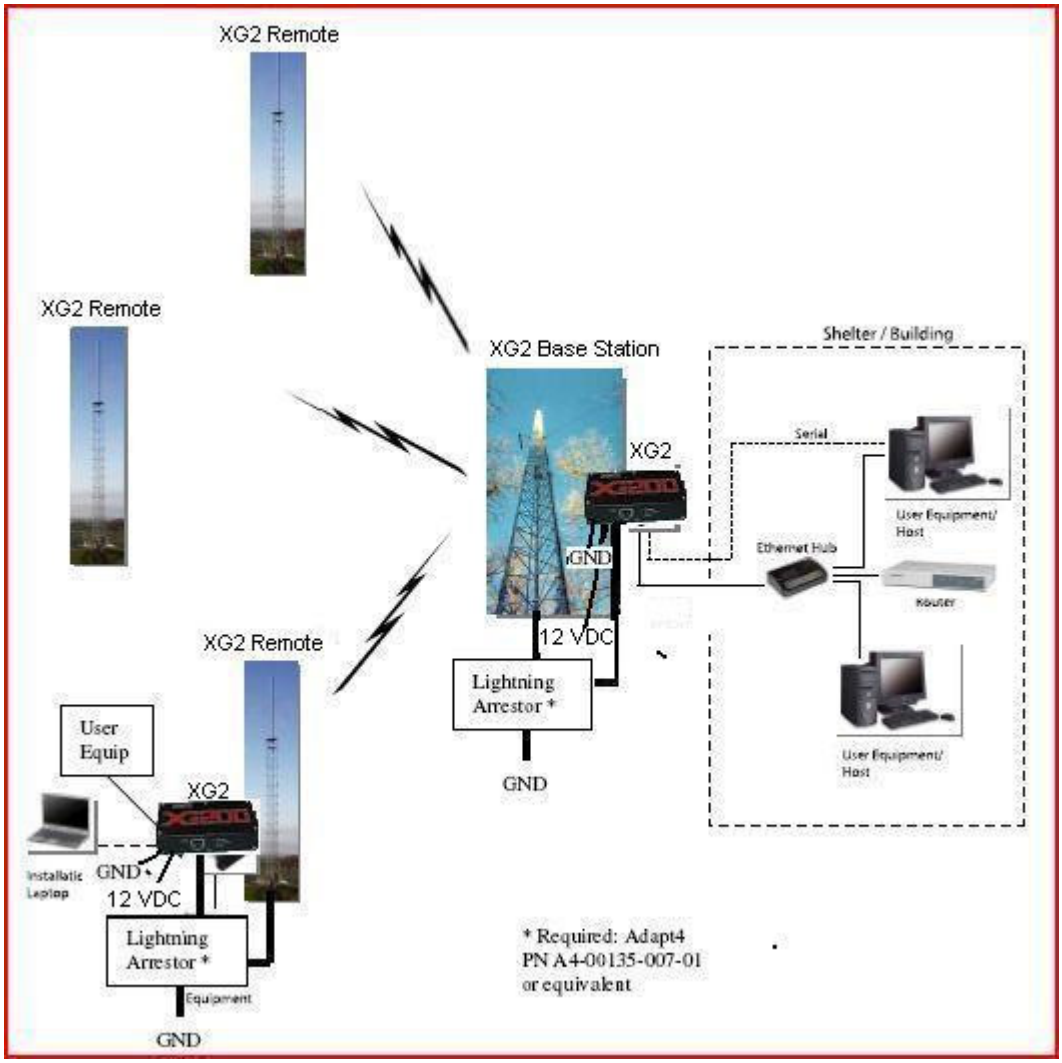

Figure 1.0-1: XG2 Radio Network

The XG2 radio must be installed in a weather-proof box, such as a NEMA box..

> **Warning: the radio was designed for mounting in a weather-proof box. Failure to properly deploy the radio will void the warranty.**

1.1 Front Panel Indicators and Connectors

Figure 1.1-1 and Table 1.1-1 illustrate and describe the front panel indicators and connectors of the XG2.

Figure 1.1-1 XG2 Front Panel Indicators and Connectors

Table 1.1-1: Front Panel Indicators and Connectors

Remote and Base Station Radio		
Indicator	State	Meaning
Power LED	Green	The radio is powered
RF Activity LED	Red/Flashing	Packet transmitted over-the-air
	Amber/Flashing	Packet received over-the-air
Fault LED	Green	Radio is operational
	Red	Radio is faulted
RJ-45 Ethernet		
--Green LED	Dim solid	Radio powering up
	Flashing	Transmitting on Ethernet port (from radio to user device)
--Amber LED	Solid	Ethernet link indicator
	Flashing	Receiving on Ethernet port (from user device to radio
Connector	Type	Use
Ethernet Connector	RJ-45	User interface and radio configuration
Serial Port	DB9-F	RS-232 User interface Pin 2: Rx Data Pin 3: Tx Data Pin 5: Signal Ground
Antenna Port	BNC	RF port for antenna
Power		12 VDC, Tx: 1.5A, Rx 0.3A

2 Installation

2.0 Installation Process

The Field Installer installs XG2 radios using the steps described in sections 2.1 through 2.5. XG2 radios are shipped from the factory with setting appropriate for the customer. The most common field changes will be frequency, node number, and IP address. The radio that will be used as the base station requires additional configuration; see **Appendix A**.

2.1 Connect laptop to radio

Connect: The laptop communicates with the XG2 radio via an Ethernet cable. Use a crossover cable for a direct connection or a straight-through cable via an Ethernet hub. You may have to set your Ethernet port IP address to a static address so that you can talk to the radio. By default, the radio's address is 10.255.0.1. As an example, you can set your laptop to 10.255.0.80 and set the brower's URL to http://10.255.0.1. If the radio's IP address has been changed, you will similarly set the laptop's IP address to an address in the same subnetwork. You can press the **reset** button through a hole in the case as you apply power to set the IP address back to the default 10.255.0.1 until the next reset. Note: for Microsoft Windows computers, you change the IP address via the Control Panel/Network Connections dialog.

Browse the radio: start the browser and connect to the radio web page. As described above, the default URL is: http://10.255.0.1

Login: the web page consists of four page links across the top: Home, Radio, Identity, Serial Port and Firmware. See Figure 2.1-1. Click on one of the links to bring up the login screen. See Figure 2.1-2. The default password is: **admin** with a blank user name

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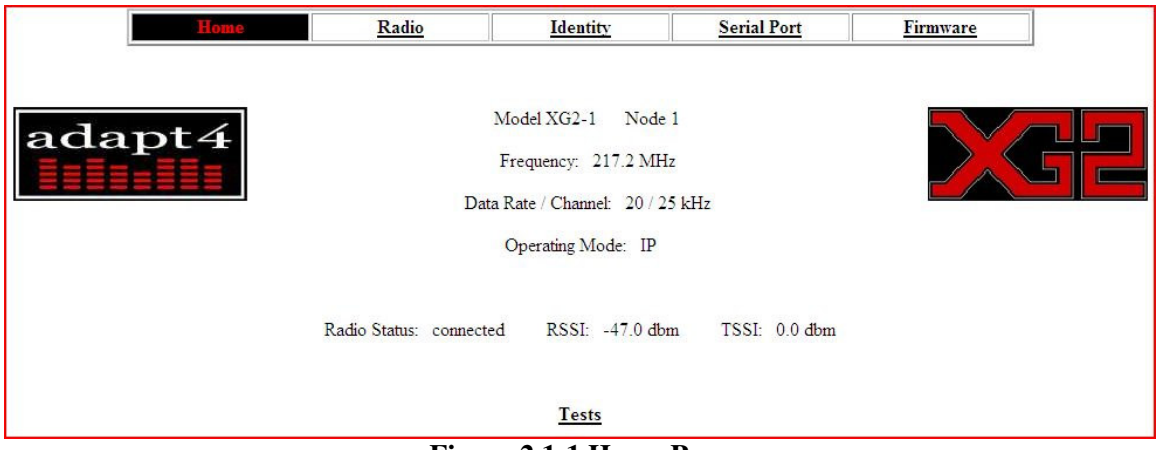

Figure 2.1-1 Home Page

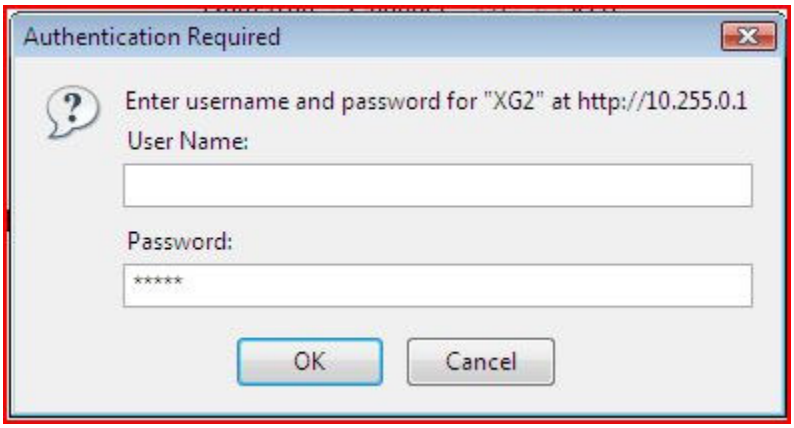

Figure 2.1-2 Login Pop-Up Window

2.2 Configure Radio

Click on the **Radio** link. See Figure 2.2-1. First, select the **Operating Mode,** using the drop-down menu. The contents of the menu are overlain on the lower right portion of the figure. The **Raw Serial** selection is used only for bit-error-rate testing, not for user data. **Raw DFS** mode is used for Data Flow Systems compatibility and is only available on XG200 models. (See the XG200 application note.)

Smart serial requires the user equipment to control media access, i.e., when each radio takes its turn to transmit. In **IP mode**, the XG2 radio acting as the base station controls media access. Both smart serial and IP modes allow communication of serial data and IP (Ethernet) data. **Mesh mode** is not yet available at this.

Important: all radios in a network must have the same operating mode, channel and frequency.

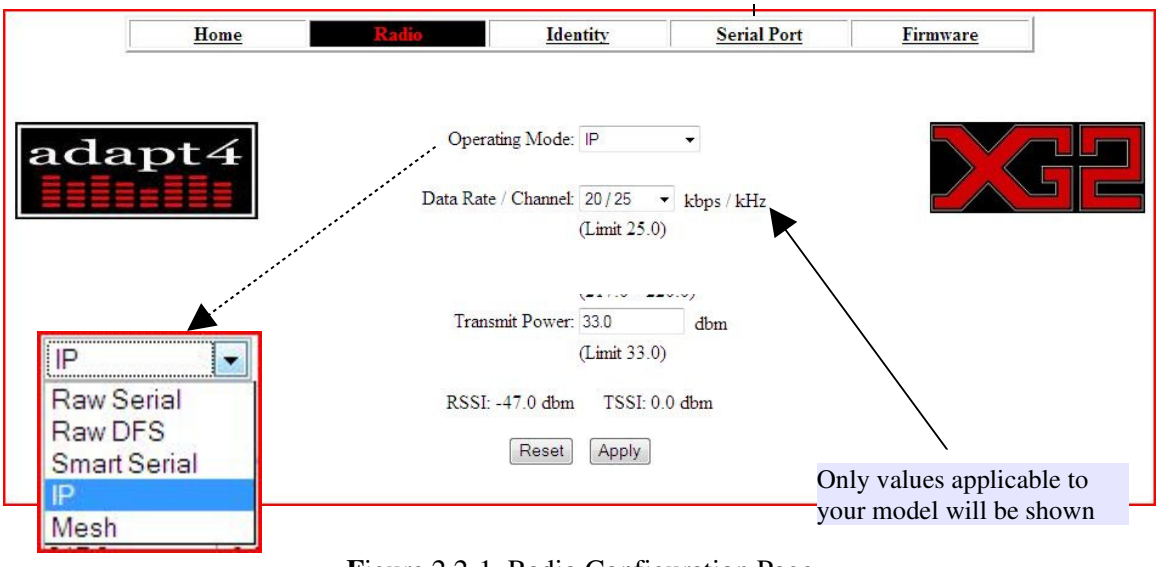

Figure 2.2-1 Radio Configuration Page

Data Rate/Channel: set the other-the-air data rate/channel rate via the drop-down menu. The available values are shown in the overlay in the lower-right corner of the figure. The values are in kilobits/sec and kilohertz. For example, the first selection is a 4.8 kb/s link with a 6.25 kHz channel bandwidth. **Frequency**: select the center frequency of the desired FCC-licensed channel in MHz. In the example given, the band is the 217-200 MHz band. Other bands will appear on the screen for XG2 radios designed for other bands. The **Transmit Power** sets the desired output power level in dBm; the range is limited to regulatory and radio limits..

2.3 Identity Page

Click on the **Identity** to set the XG2 radio's Node and IP address. See Figure 2.3-1. First, select **Node Number**, which is an integer value determined by a network administrator. The Node Number is a site ID. Select the site's IPv4 IP address and mask, also determined by a network administrator, or 0 (zero) for automatic selection (DHCP). A common practice is to make the node number identical to the last octet of the IP address. The **Gateway** is typically an IP address of a network router at the Base Station, used to route packets on and off the network. The default gateway is normally 0 except on the Base Station. The **Serial Base Station** and **IP Base Station** links lead to screens used only if configuring the radio as a base station; see **Appendix A**.

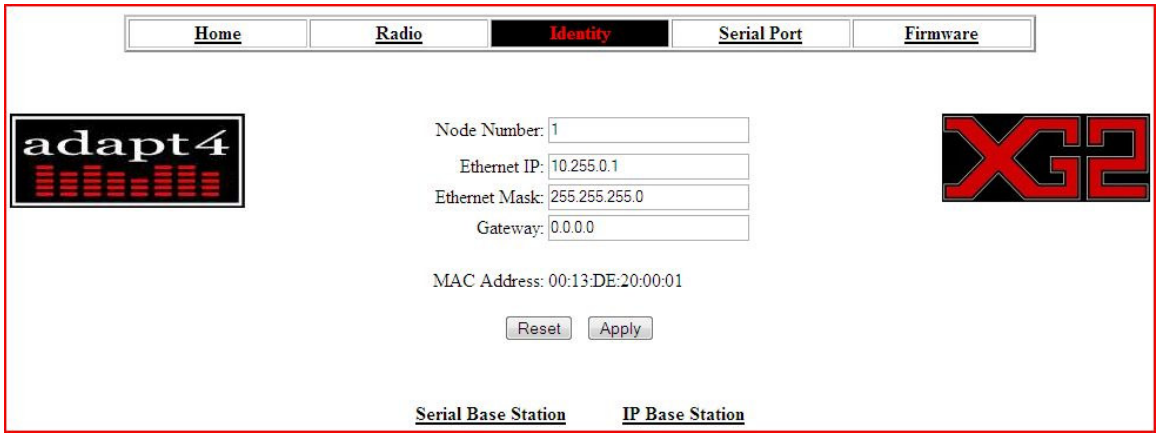

Figure 2.3-1 Identity Page

2.4 Serial Port Page

Click on the **Serial Port** link. See Figure 2.4-1. This screen enables the setting of the serial port setting. The Baud Rate drop-down menu selects baud rates from 4800 to 230400 bits/sec. The frame parameters may be selected via radio buttons for 8 or 7 bits-length none/odd/even parity, and one/two Stop Bits. Select the serial protocol using the **Protocol** drop-down menu, illustrated in the lower right of the figure.

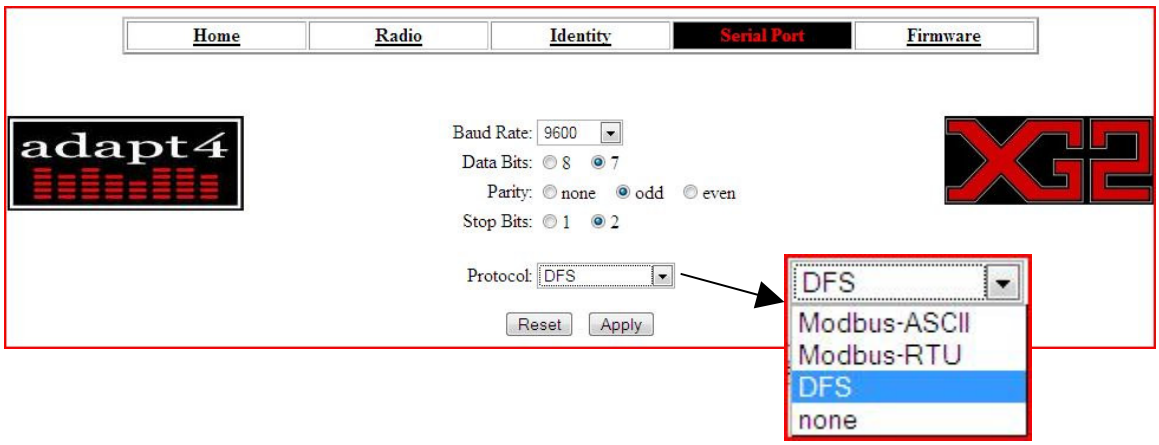

Figure 2.4-1 Serial Port Page

2.5 Upload new firmware to radio

Click on the Firmware link to display. See Figure 2.5-1. From this page, you can upload new firmware and a new file bundle. Firmware is the radio's operational software. A File Bundle is a collection of code and images comprising the radio's web page. The these items may be downloaded from the http://download.adapt4.com web site. Browse to the firmware or file bundle to upload and press **Submit**.

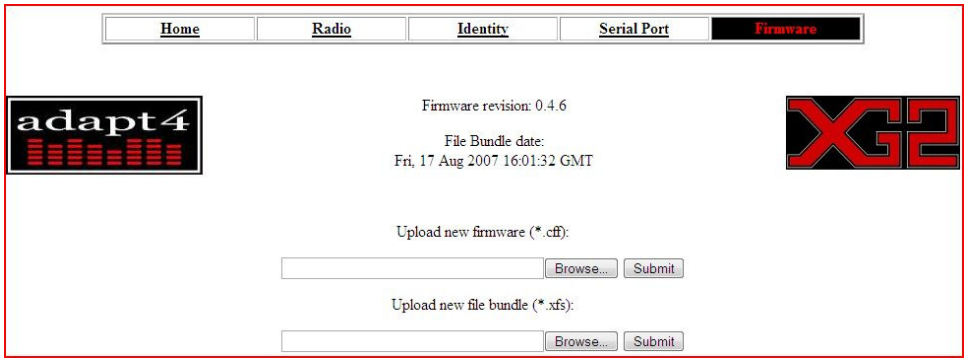

Figure 2.5-1 Firmware Page

Appendix A. Configuring a Base Station

This appendix describes how to configure an XG2/XG200 as a base station (central station). Refer to section 2.3 and figure 2.3-1 to see how to get to the base station configuration screens.

For **serial base stations**, click the **Serial Base Station** link link, which will display the screen shown in Figure A1-1.

First, select **Node Number**, which is an integer value determined by a network administrator. The Node Number is a site ID. Select the site's IPv4 IP address and mask, also determined by a network administrator, or 0 (zero) for automatic selection (DHCP). A common practice is to make the node number identical to the last octet of the IP address. The **Gateway** is typically an IP address of a network router at the Base Station, used to route packets on and off the network. The default gateway is normally 0 except on the Base Station. Click the **Apply** button.

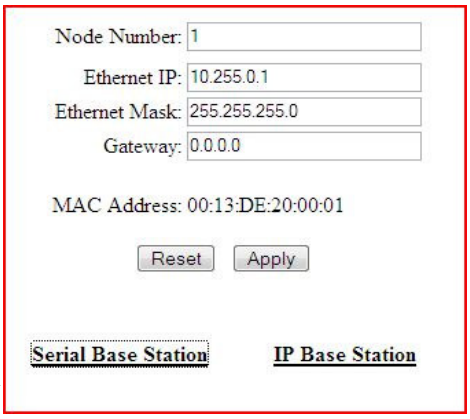

Figure A1-1 Serial Base Station

For **IP base stations**, click the **IP Base Station** link link, which will display the screen shown in Figure A1-2. Fill in the **Base Station Name** and the **Highest Node Number** assigned to any remote site.

For **fixed** networks, fill in the first row of the table for the base station IP address (**Network IP**), the **Size** of the network (the number of hosts in the IP address, typically 256 for a Class D network), and the **Gateway** IP address. Click the **Apply** button.

For mobile networks (or any network with multiple base stations), also fill an additional row for each additional base station in the network. Click the **Apply** button.

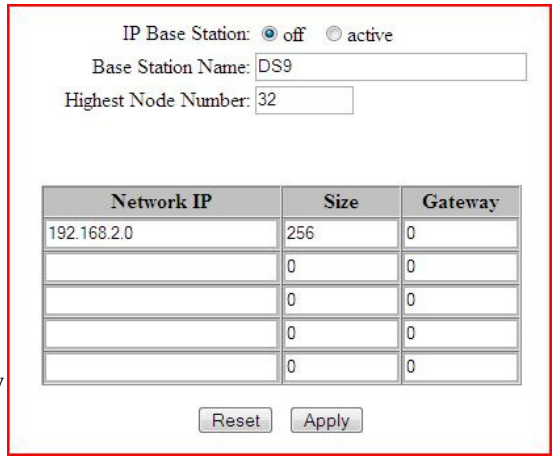

Figure A1-2 IP Base Station(s)

The **Reset** button may be used to clear the field entries.

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