

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

ThingMagic Astra

875-0025-03 RevA

Astra Reader User Guide



Government Limited Rights Notice: All documentation and manuals were developed at private expense and no part of it was developed using Government funds.

The U.S. Government's rights to use, modify, reproduce, release, perform, display, or disclose the technical data contained herein are restricted by paragraph (b)(3) of the Rights in Technical Data--Noncommercial Items clause (DFARS 252.227-7013(b)(3)), as amended from time-totime. Any reproduction of technical data or portions thereof marked with this legend must also reproduce the markings. Any person, other than the U.S. Government, who has been provided access to such data must promptly notify ThingMagic.

ThingMagic, Mercury, Reads Any Tag, and the ThingMagic logo are trademarks or registered trademarks of ThingMagic, A Division of Trimble.

Other product names mentioned herein may be trademarks or registered trademarks of Trimble or other companies.

©2012 ThingMagic – a division of Trimble Navigation Limited. ThingMagic and The Engine in RFID are registered trademarks of Trimble Navigation Limited. Other marks may be protected by their respective owners. All Rights Reserved.d

ThingMagic, A Division of Trimble
One Cambridge Center, 11th floor
Cambridge, MA 02142
866-833-4069

03 Revision A
January 2012

Contents

Astra User Guide 6

Introduction 6

Regional Information 8

- Astra North America 8
- Astra Australia 8
- Astra Korea 8
- Astra India 9
- Astra Europe 9

Programming Interfaces 11

- MercuryAPI 11
- Demo Applications 11

Setting Up for Single Reader Operation 12

- Equipment Required 12
- Setup Procedure 13
  - Connecting the Optional Antenna to the Reader 13
  - Powering Up the Reader 15
  - Interpreting the Reader Indicator LED 16
  - Connecting Your PC to the Reader 17
  - Setting Up Your PC's TCP/IP Connection 17
  - Logging On to the Reader 21

Networking the Reader 24

- Setting Up the Network Hardware 24
  - Using Power Over Ethernet (PoE) 26
- Using DHCP 27
  - Automatic Hostname: Astra-xxxxxx 29
  - MAC Address 29
- Reader Discovery 30
  - Using mDNS 30
  - Reader Listing 30

Connecting to the Astra Serial Port 33
Using GPIO 34
Inputs 34
Outputs 34
Controlling the Reader 36
Using the Browser-Based Interface 36
Status Page 37
Query Page 38
Write Page 41
Settings Page 44
Restart Page 59
Diagnostics Page 50
Statistics Page 51
Firmware Upgrade Utility 52
Using Safe Mode 54
Forcing Astra to boot in safe mode 55
Reader RF Power 56
Reader RF Power Example 56
Setting the Reader RF Power 57
Mounting the Reader 58
Variables Affecting Performance 59
Environmental 59
Tag Considerations 60
Multiple Readers 60
Astra Specifications 61
Electrical 61
Environmental 61
Mechanical 62
Supported UHF Tag Protocols 62
User Memory 62
Compliance, Warranty, and IP Notices 63
Regulatory Compliance 63
Federal Communication Commission Interference Statement 63
Industry Canada 63
Appendix A: Astra Antenna Information 66
Authorized Antennas 66
Appendix B: Astra Dimensions 67

Appendix C: Advanced Administration 68
Changing the Web Interface uid/passwd 68
Changing console/root password: 69
Appendix D: Troubleshooting 70
Troubleshooting Table 70
Reset to the Default Configuration 70
Collecting Diagnostic Data for ThingMagic Support 71
Analyzing the Boot Logs 72

Astra User Guide



Introduction

This document assumes usage of an Astra with firmware version 4.1.21 or later.

This document explains how to set up the Astra Reader, how to configure it for network operation, and how to use the browser-based interface. See the corresponding *Astra Firmware Release Notes* for operational differences that what is in this User Guide specific to a firmware version.

Separate appendices contain specifications and antenna information that are specific to the Astra Reader.

Applications to control the Astra can be written using the high level MercuryAPI. The MercuryAPI supports Java and.NET programming environments for Astra. The MercuryAPI Software Development Kit (SDK) contains sample applications and source code to help developers get started demoing and developing functionality. For more information on the MercuryAPI see the *MercuryAPI Programmers Guide* and the *MercuryAPI SDK*, available on the ThingMagic website.

This document is broken down into the following sections:

- Regional Information - Provides regulatory information for each specific Astra model.
- Programming Interfaces - Describes the programming interfaces, including on-reader applications and where to find code samples.

- Connecting to the Astra - Describes the methods available for connecting to the Astra over the ethernet, WiFi and Serial Console interfaces.
  - Setting Up for Single Reader Operation - Connect using a direct ethernet connection from a Host PC to the Astra.
  - Networking the Reader - Connect over ethernet LAN or WiFi using DHCP or static IP settings.
  - Connecting to the Astra Serial Port - Connect to the Astra console for command-line interface access and troubleshooting.
- Using GPIO - Details the GPIO physical interface specs and how to control it via the MercuryAPI.
- Controlling the Reader - Describes the browser-based interface and the configuration and testing options available through it.
- Reader RF Power - Provideds guidelines and limitations for setting the RF Power of the Astra.
- Mounting the Reader and Appendix B: Astra Dimensions - Provides details of the physical dimensions of the Astra.
- Astra Specifications
- Compliance, Warranty, and IP Notices
- Appendix A: Astra Antenna Information - Lists the authorized Antennas and cables which can be used with the Astra-NA in FCC regions.
- Appendix C: Advanced Administration - Provides the steps for some advanced administration settings, such as changing reader passwords.
- Appendix D: Troubleshooting - Provides recommended debugging steps for common problems along with data to gather when submitting a problem case to ThingMagic support.

Regional Information

The Astra reader is currently available in four different regional hardware configurations:

Astra North America

Astra Korea

Astra India

Astra Europe

The only difference between the different hardware versions is the frequency range they support and, in some cases, confguration for specific subsets of regulatory compliance in that region. The regulatory support and configuration details, if any, for each is defined below. Each regional reader can be identified both through the Web Inteface Status Page and by the **Model Number** on the reader's labeling.

Astra North America

Model Number = **Astra-NA**

Astra-NA readers support *ACMA LIPD Class Licence Variation 2011 (No. 1)*. No special regulatory configuration is required.

Astra Australia

Model Number = **Astra-AU**

Astra-AU readers support *FCC 47 CFG Ch. 1 Part 15* regulations. No special regulatory configuration is required.

Astra Korea

Model Number = **Astra-KR**

Astra-KR readers support *KCC* regulations. No special regulatory configuration is required.

The first frequency channel (917,300kHz) of the KR2 region will be derated to +27dBm to meet the new Korea regulatory requirements. All other channels operate up to +30dBm. In the worst case scenario, each time the derated channel is used it will stay on that

channel for 400ms. The fastest it will move to the next channel, in the case where no tags are found using that frequency, it will move to the next channel after 10 empty query rounds, approximately 120ms.

Astra India

Model Number = **Astra-IN**

Astra-IN readers support the *Telecom Regulatory Authority of India (TRAI), 2005* regulations. No special regulatory configuration is required.

Astra Europe

Model Number = **Astra-EU**

Astra-EU readers support *ETSI EN 302 208-1 V1.1.1* (10-Channel with LBT Option) and *Revised ETSI EN 302 208-1 V1.2.1* regulations (4-Channel options).

The Settings Page allows you to configure the regulatory plan the Astra will use. The 4-Channel plans are the current plans which should be used for most applications. The 10-Channel is being made available for legacy installations.

Note

Switching between the 4-Channel plans and the 10-Channel plan requires a reboot. Switching between the two 4-Channels plans does not.

Revised ETSI EN 302 208-1 V1.2.1

When using the 4-Channel Mode with a custom channel list the Astra will operate differently, according to the regulatory specification, based on the number of channels used:

Single Channel Mode

If only a single channel is moved to the *RF Channels in Use* field, the Astra will occupy the set channel for up to four seconds, after which it will be quiet for 100ms before transmitting on the same channel again.?

Multi Channel Mode

If more than one channel is moved to the *RF Channels in Use* field,.the Astra will occupy one of the configured channels for up to four seconds, after which it may switch to the

next channel and immediately occupy that channel for up to four seconds. This mode allows for continuous operation, with no quiet periods.

ETSI EN 302 208-1 V1.1.1

When using the 10 Channel Mode the integrated antenna will always be used for LBT. This means that when configured for bistatic operation the external antenna will be the Transmit antenna and the integrated antenna will be the Receive and LBT antenna. This is the reverse of the Astra-NA and Astra-KR which use the integrated antenna for transmit.

Programming Interfaces

MercuryAPI

Applications to control the Astra reader, and all ThingMagic Reader products, can be written using the high level MercuryAPI. The MercuryAPI supports Java, .NET and C (for on-reader applications) programming environments. The MercuryAPI Software Development Kit (SDK) contains sample applications and source code to help developers get started demoing and developing functionality. For more information on the MercuryAPI see the *MercuryAPI Programmers Guide* and the *MercuryAPI SDK*, available on the ThingMagic website.

Demo Applications

The primary, “Quick Start”, demo for reading tags is the Query Page of the Web Interface.

For more advanced functionality, and also a starting place for building custom applications, a demo application which supports reading and writing is provided in the MercuryAPI SDK package. The executable for this example is included in the MercuryAPI SDK package (available on rfid.thingmagic.com/devkit) under */cs/samples/exe/Universal-Reader-Assistant.exe*.

See the Readme.txt in */cs/samples/Universal-Reader-Assistant/Universal-Reader-Assistant* for usage details.

Setting Up for Single Reader Operation

This section describes how to set up the Reader for Single Reader Operation using AC power.

Equipment Required

To set up Single Reader Operation, you need the equipment that comes enclosed with Astra Reader as well as some additional hardware.

The following equipment comes with Astra Reader:

- Astra Reader (540-0010-01 01)
- Ferrite Bead for the Ethernet cable (Fair-Rite 0443164151)

The additional hardware required includes:

- Optional External DC Power Supply with extension power cable (3m (10ft)) - If using DC Power
- A computer with a Java-enabled web browser
- An optional additional antenna

Note

To install the Astra Reader, no software is required.

To set up the Reader as part of a larger scale deployment that uses Power Over Ethernet (PoE), refer to Networking the Reader.

Setup Procedure

The steps required to set up and run the Astra Reader are:

1. Connecting the Optional Antenna to the Reader
2. Powering Up the Reader
3. Connecting Your PC to the Reader
4. Setting Up Your PC's TCP/IP Connection
5. Logging On to the Reader

Connecting the Optional Antenna to the Reader

The Astra Reader supports monostatic performance with one (integrated) antenna or with two (integrated and external) antennas. The power setting that you configure is applicable to both antennas. However, due to the additional RF loss in the cable, the performance is less on the external antenna.

Antenna Requirements

The performance of the Astra is affected by antenna quality. Antennas that provide good 50 ohm match at the operating frequency band perform best. Specified sensitivity performance is achieved with antennas providing 17 dB return loss or better across the operating band. Damage to the reader will not occur for any return loss of 1 dB or greater.

W A R N I N G !

Damage may occur if antennas are disconnected during operation or if the Astra.

W A R N I N G !

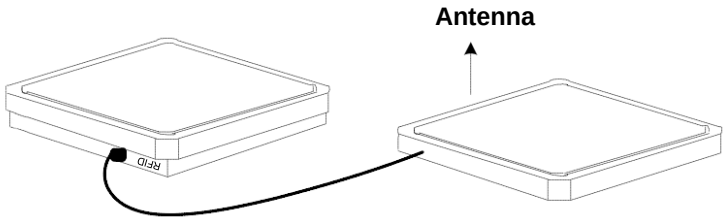
The Astra antenna ports may be susceptible to damage from Electrostatic Discharge (ESD). Equipment failure can result if the antenna or communication ports are subjected to ESD. Standard ESD precautions should be taken during installation to avoid static discharge when handling or making connections to the Astra reader antenna or communication ports. Environmental analysis should also be performed to ensure static is not building up on and around the antennas, possibly causing discharges during operation.

Antenna Detection

To minimize the chance of damage due to transmitting on open ports or antenna disconnection, the Astra supports antenna detection. Detection is performed automatically at startup and before RF operations. In order to be detectable antennas must present a DC resistance of ~10k Ohms or less.

Before you apply power to the Reader, you must connect antenna to the RFID port. When the Reader is powered on, the port that is not connected to the antenna is disabled. The integrated antenna is shown in *Figure 1*.

Figure 1: **Antenna Connection to the Astra Reader**



Bistatic Configuration

A checkbox on the Settings Page allows the Astra antennas to be used in Bistatic mode. When checked the two antennas will operate as a single logical antenna with the integrated antenna used for transmit and the external antenna for receive. If the external antenna is not connected and the *Antenna Mode* is set to *Bistatic* the Astra will not allow RF operations.

Note

Use only authorized antennas and cable. See Appendix A: Astra Antenna Information.

Powering Up the Reader

You can power up the Astra Reader using:

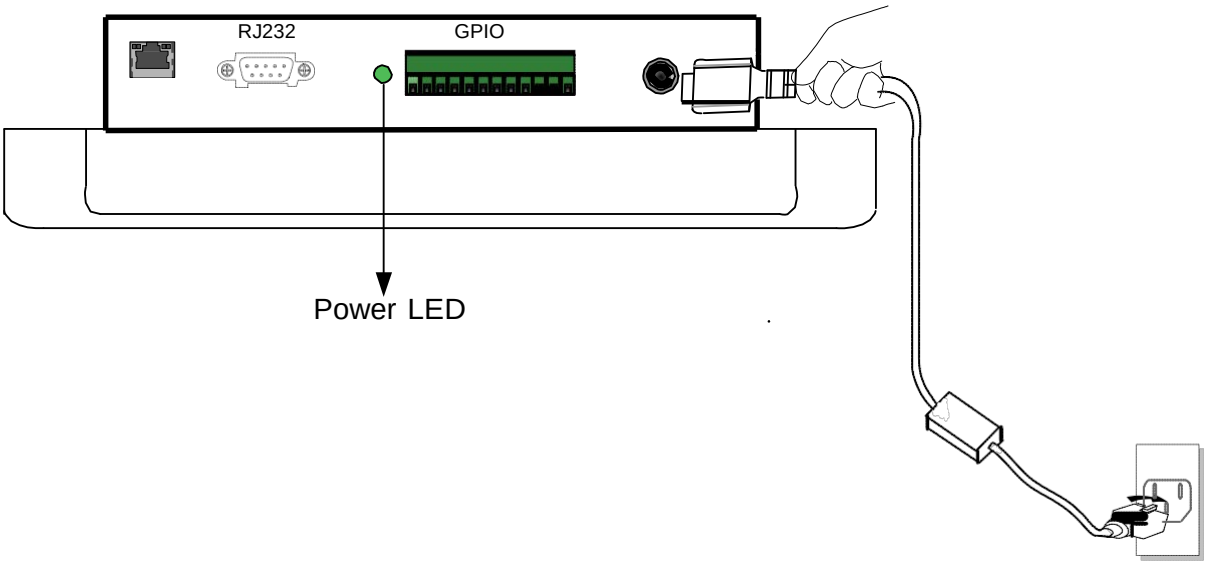
- DC power supply - *NOTE: Sold Separately*
- Power over Ethernet (PoE) - *NOTE: Required cable sold separately*

To power up the Astra Reader using a DC power supply:

1. Plug the power supply into the Reader's DC power input connector.
2. Connect the extension cord to the power supply and plug it into a 100-240VAC power outlet. The Reader immediately begins to power up.

   There is no on/off switch on the Reader. While the Reader is powering up, the power LED is solid amber. The Reader is ready for operation after approximately 60 seconds when the power LED changes to solid green, as shown in *Figure 2*.

Figure 2: **Powering Up the Astra Reader**



To power-up the Reader using PoE, see Using Power Over Ethernet (PoE).

By default, if both DC power supply and PoE are provided to the Astra Reader, the Reader will use only the DC power supply as the source of power. In this situation, if DC power is turned off, then the Reader requires a power cycle in order to function properly and use PoE (even if it is already plugged in).

Note

You can use the web interface to select whether to use DC power supply or PoE to power the Astra Reader.

Interpreting the Reader Indicator LED

The Astra Reader has one main multi-color LED that indicates Reader activity as shown in *Figure 2*. By observing the color and the state of the LED, you can determine the current operational status of the Astra Reader.

The colors displayed by the LED include:

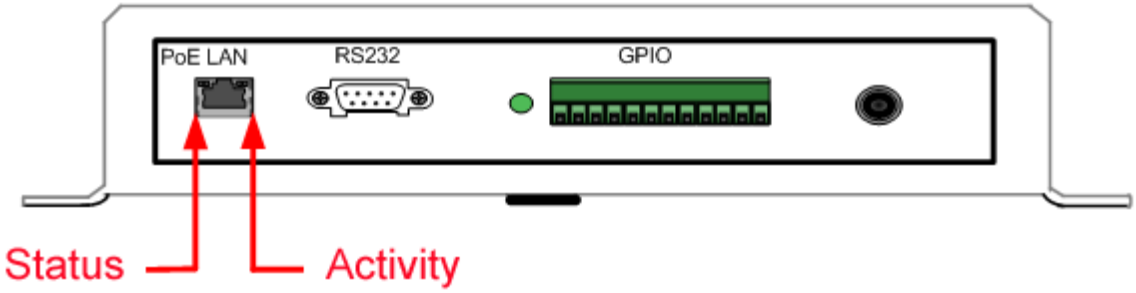
- Solid Amber: Indicates that the Reader is starting up.
- Solid Green: Indicates that the Reader has a valid IP address and is ready for operation.
- Blinking Green: Indicates that the RF field is ON and the unit is reading/writing tags.
- Blinking Amber: Indicates a failure in the Reader.

  a. Continuous Blinking Amber: In this state, the LED continuously blinks amber indicating that the Reader has failed to get a valid IP address.

  b. Alternate Blinking Amber: In this state, the LED alternately displays blinking amber and solid amber indicating that there is a failure in the RFID subsystem.

Additionally, when the Reader is connected to a PC or a network outlet, the two small LEDs adjacent to the Ethernet port indicate Network Status (left) and Network Activity (right), as shown in *Figure 3*.

Figure 3: **Network Status and Activity LEDs**

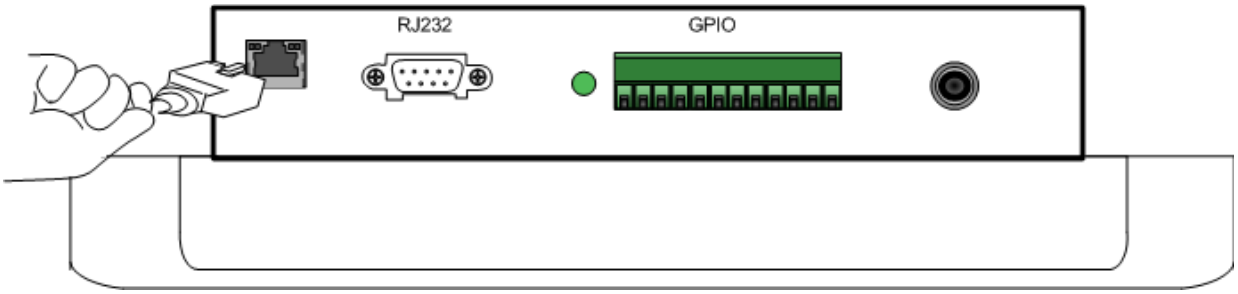


Connecting Your PC to the Reader

To connect your PC to the Reader:

1. Connect the provided Ethernet crossover cable to your PC.
2. Connect the other end of the Ethernet crossover cable to the Reader, as shown in *Figure 4*.

Figure 4: **Connecting the PC to the Astra Reader**



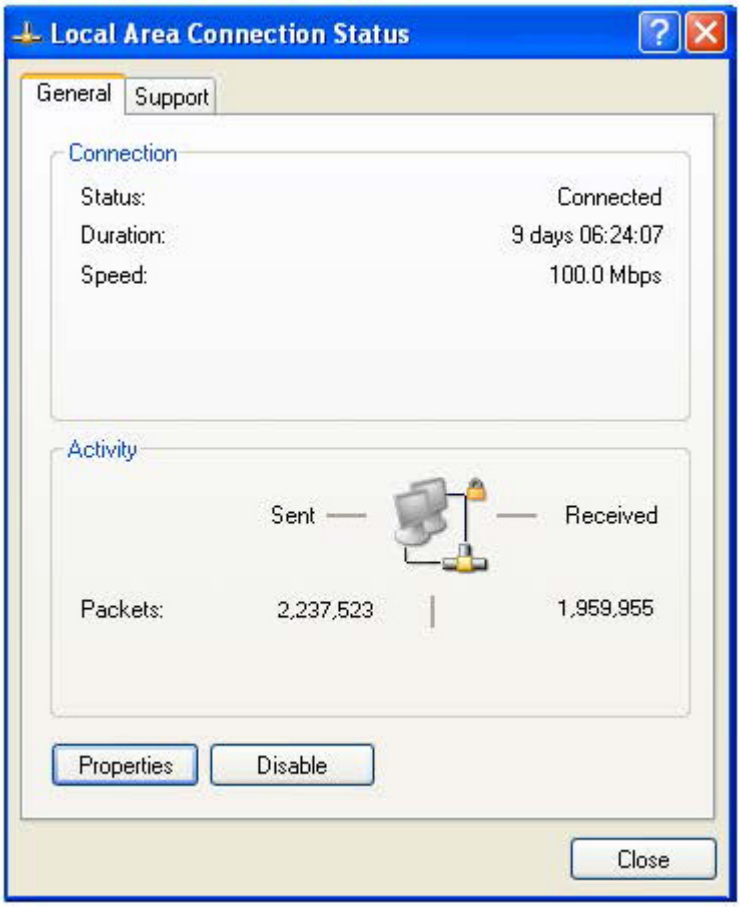
Setting Up Your PC's TCP/IP Connection

If you are using an operating system other than Windows XP, consult your network administrator regarding how to set up your PC’s TCP/IP connection.

If you are using Windows XP, perform the following steps to set up your PC's TCP/IP connection:

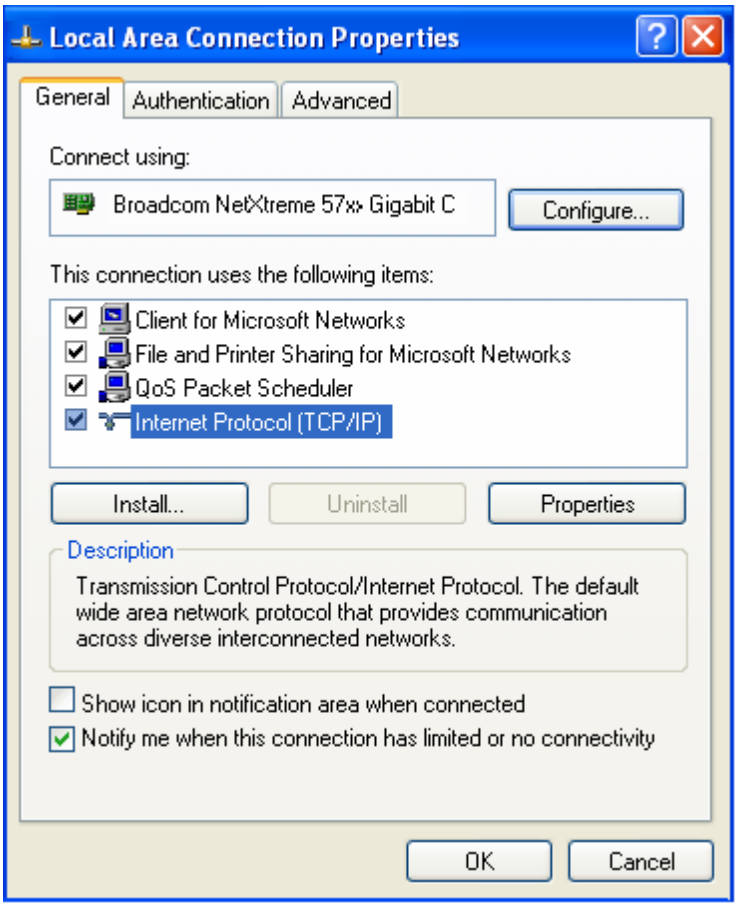
1. Select Start from the Start bar, and then select Control Panel.
2. Double-click the Network Connections icon.
3. Disable your PC's wireless connection.
4. Double-click the Local Area Connection icon.
   The Local Area Connection Status window appears, as shown in *Figure 5*.

Figure 5: **Local Area Connection Status Window**



5. Click the Properties button.
The Local Area Connections Properties window appears, as shown in *Figure 6*.

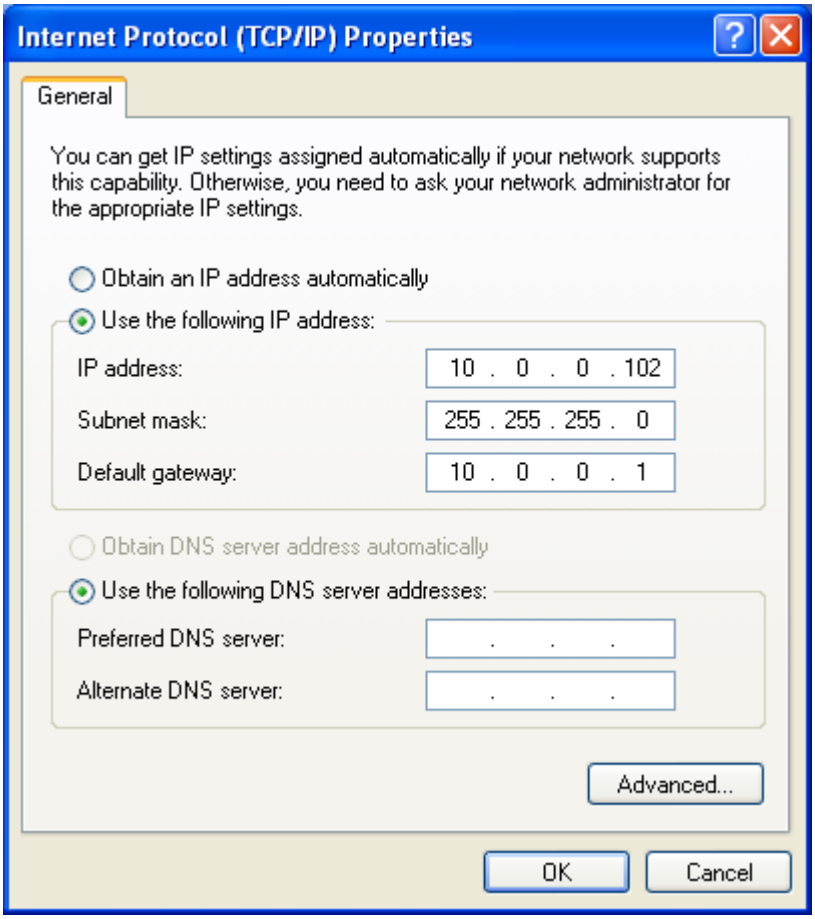
Figure 6: **Local Area Connection Properties Window**



6. Scroll down to the bottom of the list and select Internet Protocol (TCP/IP).

7. Click on the Properties button.
The Internet Protocol (TCP/IP) Properties window appears, as shown in *Figure 7*.

Figure 7: **Internet Protocol TCP/IP Properties Window**



8. Select the Use the following IP address: button.

Enter these settings:
IP address: 10.0.0.102
Subnet mask: 255.255.255.0
Default gateway: 10.0.0.1

9. Click OK to save and exit the window.

10. Click OK in the Local Area Connection Properties window.

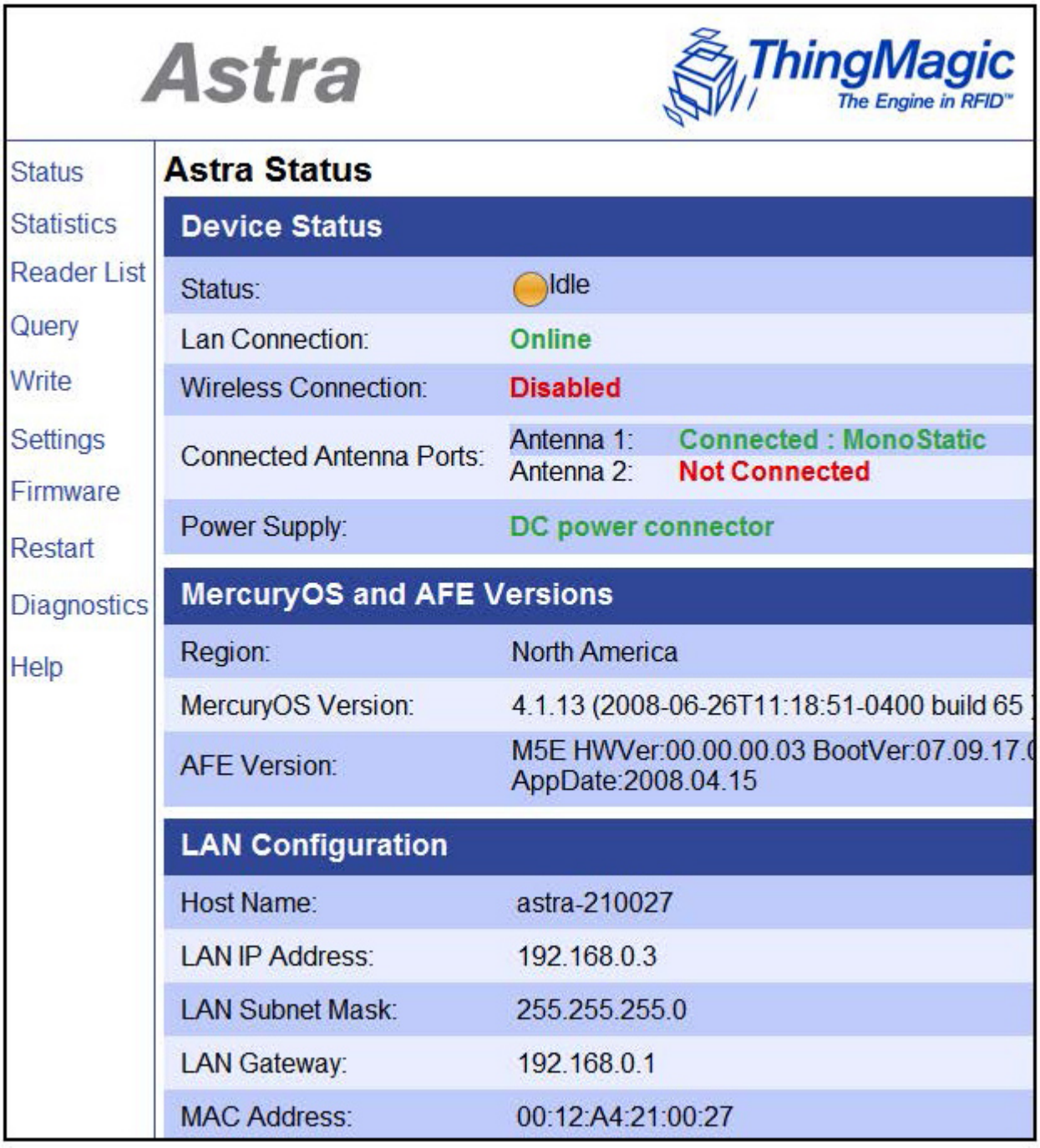
Logging On to the Reader

You may use any Java-enabled web browser to log on to the Reader.

To log on to the Reader:

1. Launch your web browser and log on to the Reader by entering the Reader's default IP address http://10.0.0.101/ in the address bar.
2. Press Enter.
   The Login dialog box appears.
3. Enter the following: Default user name: “web” Password: “radio” (all lower-case).
4. Click OK.
   The Reader displays its browser-based interface. The initial page that appears is the Status page, as shown in *Figure 8*.

Figure 8: Astra Status Page



5. Check the Connected Antenna Ports fields. If the text is green, it indicates that antenna is connected.

6. Do one of the following steps**:**

   - To connect the Reader to the network and log in remotely, see Networking the Reader.
   - To start reading tags and to control the Reader, see Controlling the Reader. This section guides you through all the available Reader functions including how to read and write tags, change settings, load firmware, and reboot the Reader in Safe Mode.

Networking the Reader

You can set up the Astra Reader to use either manual IP addressing or DHCP. By default, the Reader has automatic addressing enabled that boots up for a DHCP server.

DHCP can be used to automatically assign the Reader's IP address, subnet mask, default gateway, NTP Server, DNS server, and hostname. During the initial boot sequence, if the Reader does not get a DHCP-assigned IP address, the static IP address 10.0.0.101 is assigned by default. However, the Reader will periodically check to see if a DHCP server is available.

The following section explains how to set up your PC and Reader for automatic DHCP configuration. This section also explains how to manually configure the Reader without a DHCP server and how to use the ZeroConf protocol, Bonjour™, for subnet Reader discovery, without a DHCP server.

- Using DHCP
- Using mDNS

Setting Up the Network Hardware

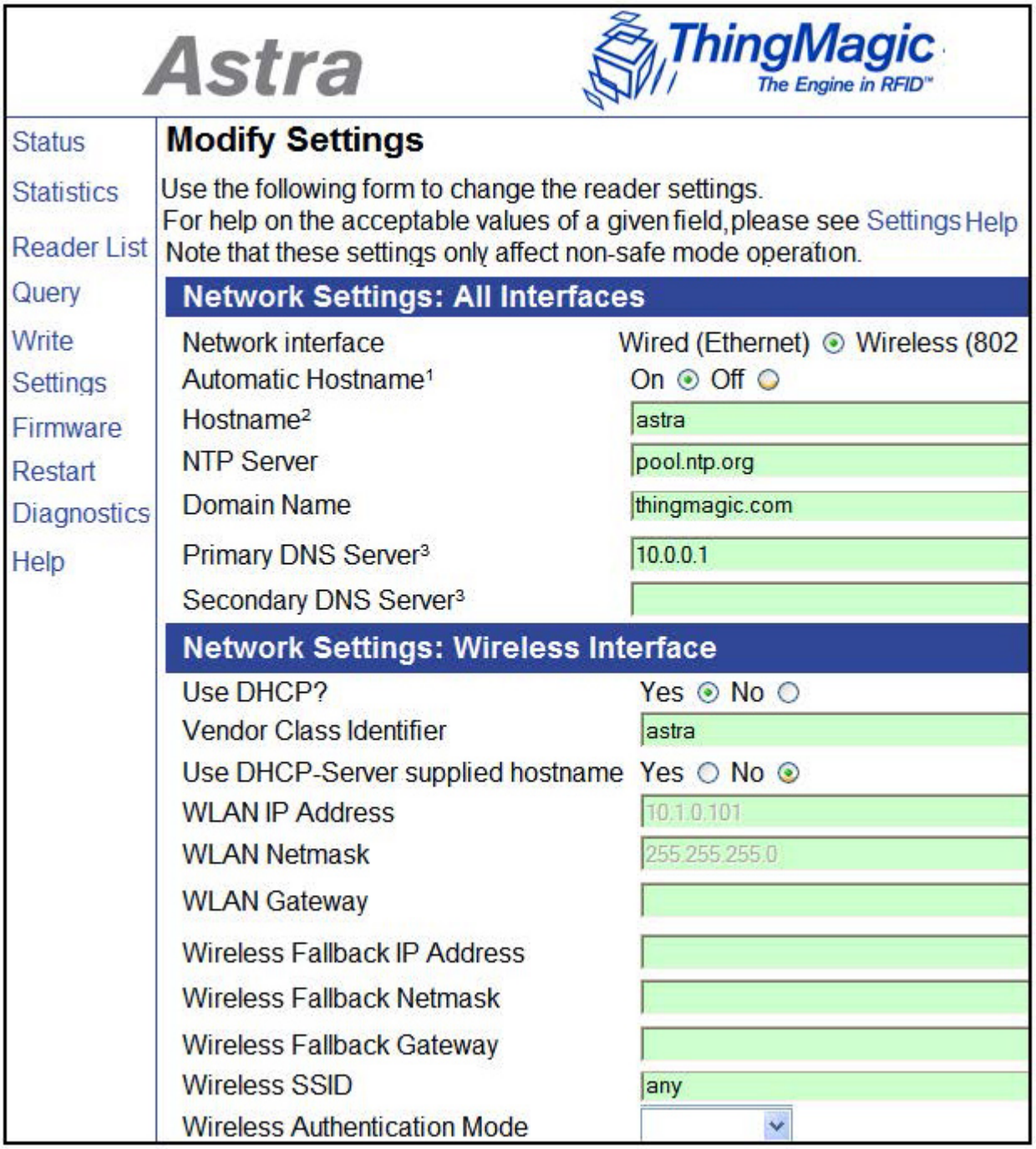
Whether you use DHCP or static network addressing, make sure that the network is connected before powering up the Reader. If the Reader does not automatically get the address from a DHCP server, then the static IP address 10.0.0.101, subnet mask 255.255.255.0, and gateway 10.0.0.1 is used.

Before setting up your network:

- Connect one end of the Ethernet cable to the Reader and the other end to the Ethernet switch or hub.
- Check that all antennas are securely connected, and then power-up the Reader.
- Connect your PC to the same network as that of the Reader.

Note

Some older 10baseT network hubs do not work properly with the Reader. If you encounter connectivity problems, we recommend using nothing below 10/100baseT hubs/switches.


Astra
ThingMagic
The Engine in RFID™
Status
Statistics
Reader List
Query
Write
Settings
Firmware
Restart
Diagnostics
Help
Modify Settings
Use the following form to change the reader settings.
For help on the acceptable values of a given field, please see Settings Help
Note that these settings only affect non-safe mode operation.
Network Settings: All Interfaces
Network interface
Wired (Ethernet)
Wireless (802
Automatic Hostname[1]
On
Off
Hostname[2]
astra
NTP Server
pool.ntp.org
Domain Name
thingmagic.com
Primary DNS Server[3]
10.0.0.1
Secondary DNS Server[3]
Network Settings: Wireless Interface
Use DHCP?
Yes
No
Vendor Class Identifier
astra
Use DHCP-Server supplied hostname
Yes
No
WLAN IP Address
10.1.0.101
WLAN Netmask
255.255.255.0
WLAN Gateway
Wireless Fallback IP Address
Wireless Fallback Netmask
Wireless Fallback Gateway
Wireless SSID
any
Wireless Authentication Mode

Using Power Over Ethernet (PoE)

Another way of powering up the Astra Reader is to use a single Ethernet cable that is connected to a Power over Ethernet (PoE) network. In this configuration, the power converter that is supplied with the Astra Reader is not used.

To power up the Astra Reader over a PoE network:

1. Connect one end of the Ethernet cable to the Astra Reader
2. Connect the other end to a certified PoE port.
   ThingMagic recommends using a PowerDsine 3006 or similar PoE Hub.

Note

You must use the Ferrite Bead included with the Astra Reader when powering-up the Reader over a PoE network. For proper operation, you must install the Ferrite Bead on the Ethernet cable at the end closest to the Astra Reader, as shown in *Figure 10*. For proper installation, the Ferrite Bead should not be more than two inches away from the connector

Figure 10: **Ferrite Bead**



W A R N I N G !

When using PoE as a power source, the PoE must be supplied by a UL Listed ITE device.

W A R N I N G !

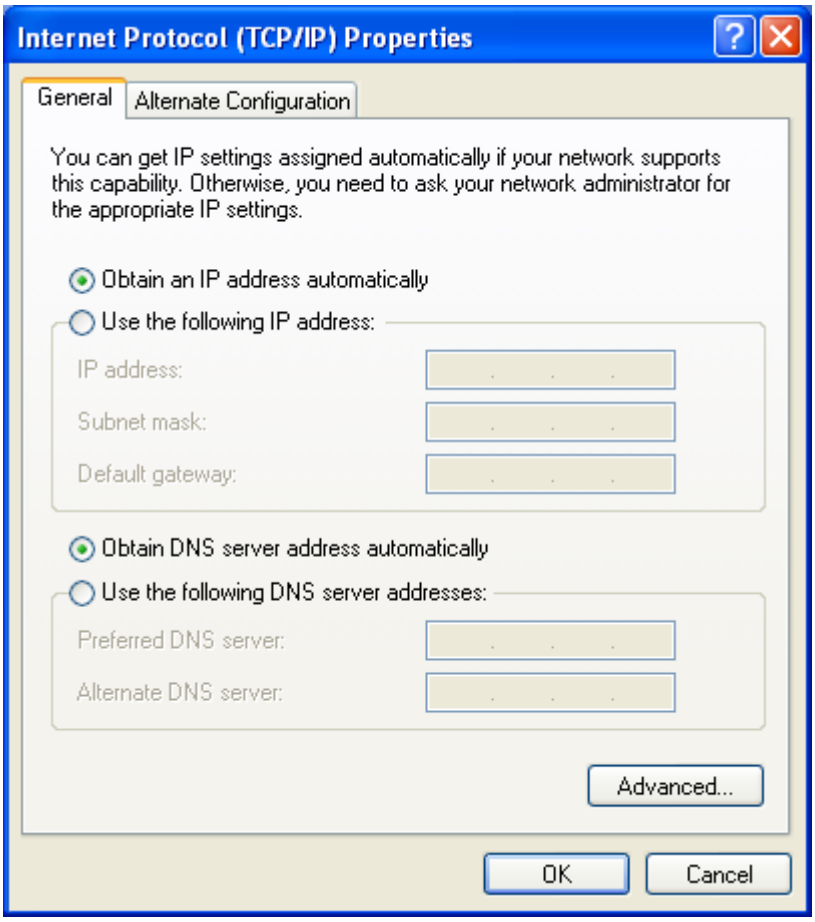
When using PoE as a power source the unit cannot be connected to an Ethernet network with outside plant routing, including a campus environment. The network must be contained within a single building.

Using DHCP

To use DHCP to automatically assign your PC's IP address to the Reader:

1. Select Start from the Start bar, and then select Control Panel.
2. Double click the Network Connections icon.
3. Disable your PC's wireless connection, if one exists.
4. Double click the Local Area Connection icon.
   The local area Connection Status window appears, as shown in *Figure 5*.
5. Click the Properties button.
   The Local Area Connection Properties window appears, as shown in *Figure 6*.
6. Scroll down to the bottom of the list and select Internet Protocol (TCP/IP).
7. Click on the Properties button.
   The Internet Protocol (TCP/IP) Properties window appears, as shown in *Figure 11*.

Figure 11: **Internet Protocol (TCP/IP) Properties Window**



8. Select the Obtain an IP address automatically button.
9. Click OK to save and exit the window.
10. Click OK, in the Local Area Connection Properties window.
11. Click OK, in the Local Area Connection Status window.
    The PC may take few minutes to save the new network settings.

Automatic Hostname: Astra-xxxxxx

At startup, the Reader, by default, generates an 'automatic hostname' by appending the last three bytes of its MAC address to its hostname, such as *astra-210027*.

Note

Your network must have properly configured DNS servers if you wish to connect to the Reader through its hostname. When using DHCP, the DHCP server periodically adds the hostname to the DNS server's database.

MAC Address

The Reader's MAC address is printed on a white label at the back of the Reader near the Ethernet port. You can also find the Reader's MAC address on the Status page.

The first six characters of the MAC address are ThingMagic's manufacturer's code. The last six characters of the MAC address are specific to the Reader and are used for automatic hostname addressing.

To log on to the Reader using the MAC address:

1. Obtain the Reader's MAC address, launch your web browser, and then log on to the Reader by entering its automatic hostname in the address bar, such as http://Astra-xxxxxx (the last six characters of the Reader's MAC address).
2. Press Enter.
   The Reader's Login dialog box appears.
3. Enter the following:
   User name: web
   Password: radio
4. Click OK.
   The Reader displays the Astra Status Page.
5. Check the Connected Antenna Ports fields. If the text is green, that antenna is connected.

Reader Discovery

You can find the available Readers on the network by using the Multicast DNS (mDNS) protocol (http://multicastdns.org/) and Reader Listing.

Using mDNS

To find Readers on a network, you can use any client or client API that allows discovery of services using mDNS (a part of the Zero Configuration Network Standard). One commone client implementing the Zero Configuration Network Standard is called BonjourTM, developed by Apple. Bonjour works on networks without a DHCP server and is included in the Apply Safari web browser (it must be selected during the Safari install).

After you have installed Safari the Bonjour icon appears under Bookmarks | Collections You can select the Bonjour tool to discover other Readers available on the network.

Note

Each ThingMagic Reader in the Bonjour frame is referenced by the domain name (ThingMagic) followed by the hostname (Astra) and the last six characters of the device's MAC address (such as 210027).

A device frame on the left side of the browser opens and lists the names of all active Bonjour devices available.

1. Double-click on the name of the Reader that you want to access. The Login dialog box for that specific Reader appears.
2. Enter the following:
   User name: *web*
   Password: *radio*
3. Click OK.
   The Reader displays the Status page of the selected Reader.

The list of Bonjour devices displayed on the screen is refreshed periodically so that new Bonjour-enabled devices appear as they come online.

Reader Listing

The Reader Listing Page allows you to find Readers including ThingMagic Astra, Mercury4, and Mercury5, that run on the network. It uses the same Multicast DNS(mDNS) protocol used by the Bonjour.

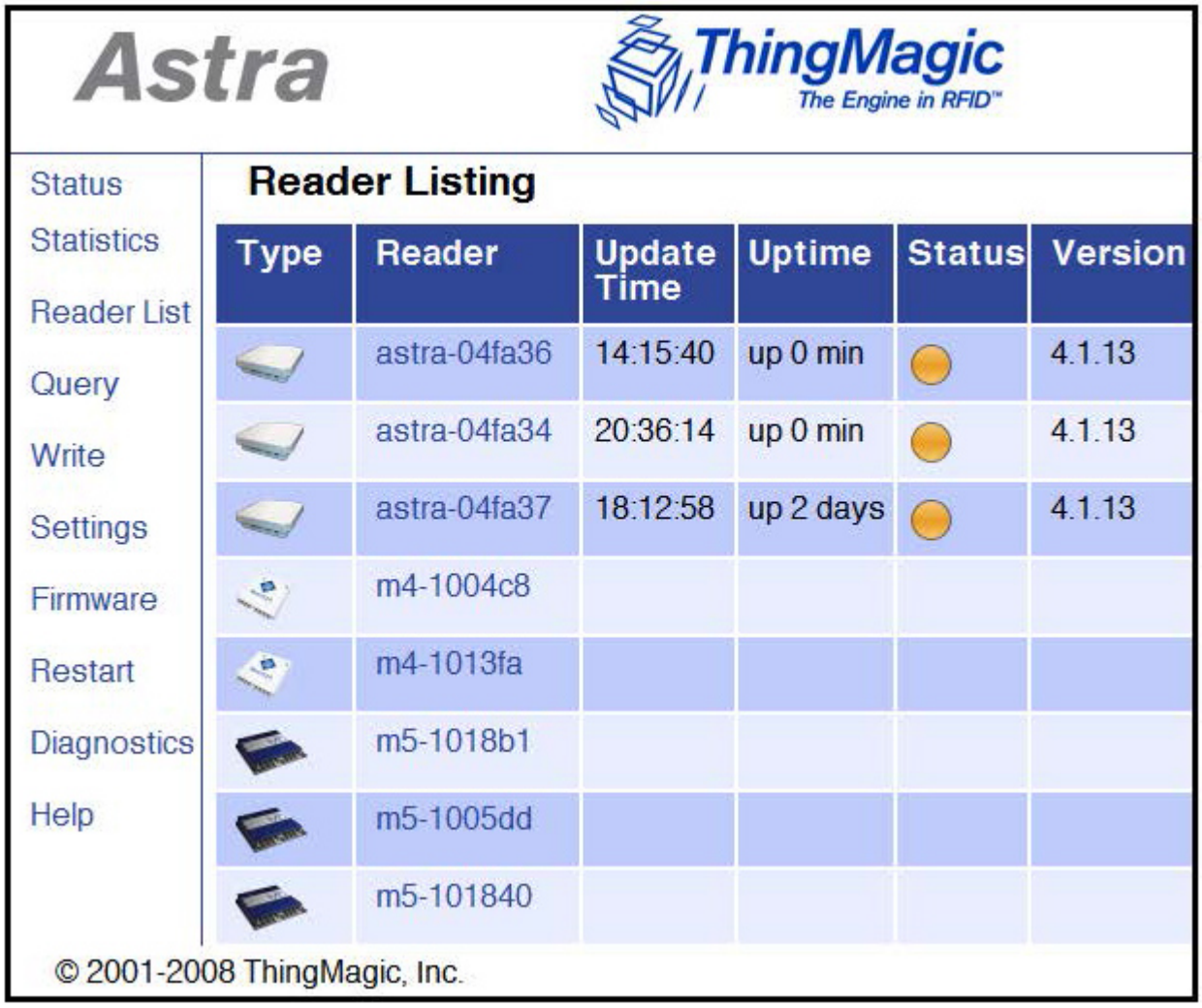
In the case of Reader Listing Page, no plugin is required and works in any browser. The Reader Listing Page contains a list of the Readers found on the network and additional information on each Reader including:

- A link to the Reader's web interface
- Reader's IP address
- Firmware version it is running
- Number of connected antennas
- Status information

To enable Reader Listing to discover Readers available on the network:

Click on the Reader List link in the navigation menu.
The Astra Reader Listing Page appears, as shown in the *Figure 12*.

Figure 12: Astra Reader Listing Page



Connecting to the Astra Serial Port

Astra supports communication over its serial port to enable you to:

- Access the boot logs.
- Access the console for emergency recovery into Safe Mode.

Before you connect to the Astra serial port, ensure that you have:

- A PC with a serial port.
- A serial terminal program.
- A serial cable.

Older PCs usually have a 9-pin serial port built in; however, modern PCs usually do not. If your PC does not have a serial port, you can add one. The easiest way to do so is by using a USB-to-serial adapter. Read the adapter's documentation for information about how to access the serial interface for your particular operating system (Windows often sees these adapters as "COM8" whereas Macintosh often sees them as "/dev/tty.usbserial0").

When you have completed setting up the serial port, you must set the following four parameters to allow the terminal program to talk to the Reader:

- Data Rate: 115200
- Parity: None
- Data Bits: 8
- Stop Bits: 1

The procedure for setting these parameters is different for each terminal emulation program. Check the documentation for your program for information on setting these parameters.

Once you have set up the serial connection, reboot the Reader, and the boot logs begin to display. If not, recheck the terminal program configuration and try again.

Using GPIO

The Astra Reader includes 12-pin GPIO screw terminal connector. This connector is used to support four opto-isolated general purpose inputs and four opto-isolated general purpose outputs. The values of the GPIO lines can be Get and Set using the RQL and the C-API interfaces. See the respective guide for more details.

There are four open-collector outputs and four open-collector inputs.

Note

Devices using the GPIO lines must be NPN type devices and require external power supply. .

Inputs

The four opto-isolated inputs support the following input levels:

V-low (Logic 0) = 0-0.8V

V-high (Logic 1) = 3-30V

5mA max current with 24V input

It is recommended that external devices guarantee a minimum pulse width of at least 100ms.

Outputs

The outputs sink up to 50mA, but do not source any power, external power is required. The GPIO output lines effectively act as a switch.

In addition to the Input and Output lines, pins 10 and 11 duplicate the information provided by the reader's activity LED indicating reader health and RF activity. RF activity can also be monitored in this connector. See the section Interpreting the Reader Indicator LED for information about Reader activity and status.

These are the pin-outs of the 12-pin terminal connector (Pin 1 is closest to the LED):

1. Isolated-GND
2. GPIO Input (*GPIO_3*)
3. GPIO Input (*GPIO_4*)
4. GPIO Input (*GPIO_6*)

5. GPIO Input (*GPIO_7*)
6. GPIO Output (*GPIO_0*)
7. GPIO Output (*GPIO_1*)
8. GPIO Output (*GPIO_2*)
9. GPIO Output (*GPIO_5*)
10. Amber LED - Output
11. Green LED - Output
12. Isolated-GND

Note: The values in parentheses indicate the enumeration used by the API and RQL for each GPIO line.

Controlling the Reader

The Reader uses RFID (Radio Frequency Identification) technology to read and write data stored on RFID Tag(s).

The Astra Reader provides four levels of access to RFID tag(s):

1. Browser-Based Interface
   A web browser controls high-level Reader operations through a Java Applet. See Status Page for information about how to access the browser-based interface.
2. MercuryAPI
   High-level APIs (Application Programming Interface) provide fine control over all aspects of the Reader.
   See the MercuryAPI Programmers Guide at http://rfid.thingmagic.com/devkit.
3. RQL
   An intermediate form of accessing the tags is available through the RQL (Reader Query Language) interface.
   See the Reader Query Protocol and RQL manual or download it from ThingMagic at http://rfid.thingmagic.com/devkit.
4. API
   Low-level APIs (Application Programming Interface) provide fine control over all aspects of the Reader.
   See the http://rfid.thingmagic.com/devkit.

Using the Browser-Based Interface

The Astra Reader browser-based interface communicates directly with the RFID Reader. It includes several tools that enable you to monitor Reader performance, change Reader settings, and upgrade Reader firmware.

You can run the browser-based interface from any PC on the network. Carefully configure the PC with an IP address and subnet mask compatible with the current operational settings of the Reader.

The Reader navigation menu provides access to the following pages:

- Status Page- Displays the current operational settings.
- Query Page- Allows the user to perform Anti-Collision RFID tag searches and to specify the constraints used in the search.

- Query Page- Allows the user to write tags; this is only applicable to tags that are editable.
- Settings Page- Allows the user to modify Reader configuration and network settings.
- Firmware Upgrade Utility- Upgrades the tag Reader with new firmware images provided by ThingMagic.
- Restart Page- Allows the user to restart the Reader through a "warm boot."
- Diagnostics Page- Provides the current operating settings and access to the status logs of the Reader.
- Statistics Page- Provides the statistics that are defined by the EPCglobal Reader Management Standard v1.0.1

To start the browser-based interface:

1. Exit all Reader applications on the network.

Note

Running another Reader application while using the browser-based interface may cause a Reader error. If this happens, reboot the Reader or restart it using the browser-based interface.

2. Start a Java-enabled web browser from any network-enabled PC.
3. Type the IP address of the Reader to which you want to communicate in the address field of the browser. You can also use Apple's Bonjour protocol to browse to it.
   A log-in dialog appears.
4. Enter the following:
   User name: "web"
   Password: "radio" (all lower-case).
5. Click OK.
   A navigation menu and the Status page appear in the browser, as shown in the *Figure 8*.

Status Page

The Astra Status Page, as shown in the *Figure 8*, indicates the connected antennas, software version, and LAN configuration of the Reader.

Note

Check to see that at least one antenna port is connected before performing any tag queries or tag write operations.

Query Page

Use the Astra Query Page to set up and run Anti-Collision Searches quickly, and to obtain immediate feedback. This is useful for debugging as well as for verifying performance after installation is completed.

If the Query page does not load and you do not see the Java logo, install the Java Runtime Environment for Windows and restart your PC.

Read Tags

The Query Page enables you to read tags and select an appropriate query.

To read tags:

1. Position one or more tags, in front of one of the antennas connected to the Reader.
2. Do one of the following:
   - Select an appropriate query from the drop-down list at the bottom of the screen next to the Query field.
   - Enter an RQL search statement.
     For example, select "fewer than 10 GEN2 tags" from the list.

Note

Reader performance is optimal when the most appropriate query is selected.

The RQL search statement in the Query field specifies which antenna is to be used, how long the query is to be run, and other read operation parameters. The query can be run once or continuously.

To initiate and stop a query:

1. Click the Start button at the bottom right of the Query Page.
   The Reader will continuously read the tags and display the tag data. Each row in this example shows sequential tag number, number of times tag was read, tag data, antenna, and protocol.
2. Click Stop to stop the tag search.

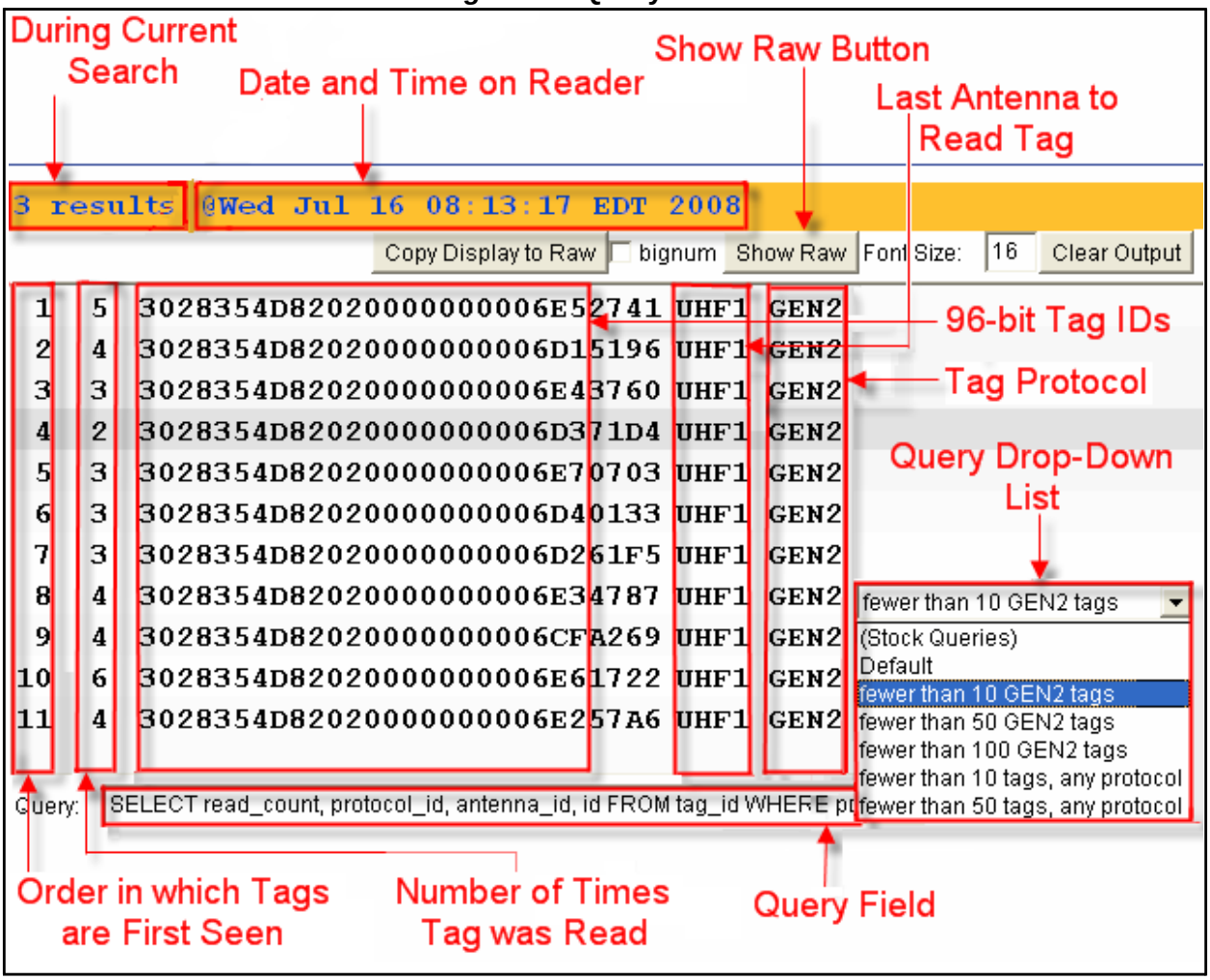
Note

You must click Stop to stop the query before exiting. Otherwise, the Reader will continue to transmit RF energy on its antennas.

Query Results

As shown in *Figure 13*, the displayed tag data contains useful information, including the tag number, number of times a tag is read, tag data, antenna, and protocol.

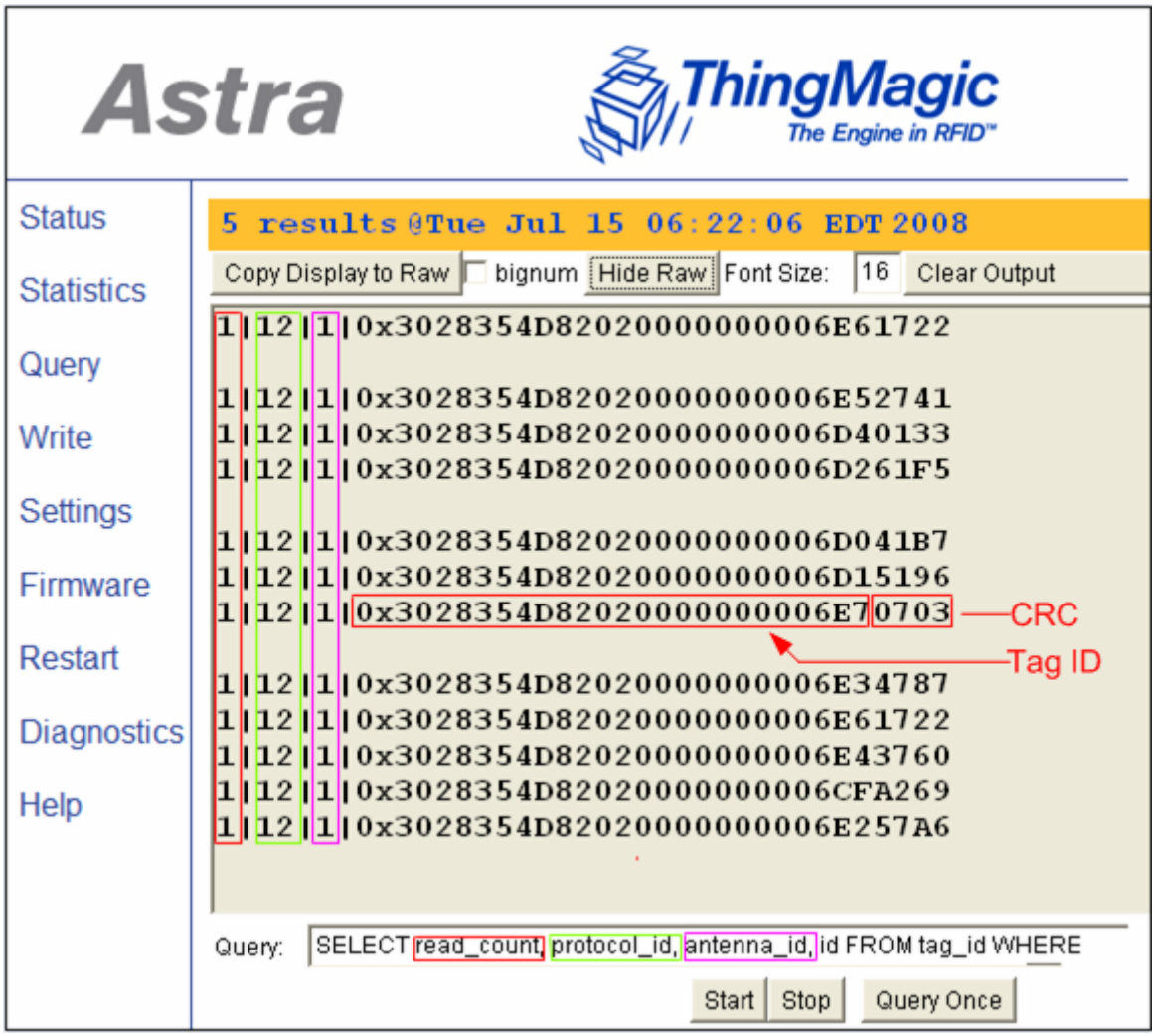
Figure 13: **Query Results**



Show Raw

The Show Raw button displays raw tag data on the Query page, as shown in *Figure 14*. This is the actual console output returned from the query. As shown in figure each row lists the Reader, protocol, antenna, tag ID, and CRC for each tag found. A space separates the groups of tags found during each query. You can easily copy and paste the raw data into other documents.

Figure 14: **Astra Raw Data Page**



Raw Tag Data

Depending on the fields included in the query, you can display a variety of tag data:

- id: Tag id (in hex) and trailing 4-digit (16-bit) CRC cyclical redundancy check.
- read_count: Number of times the tag was seen during the query.
- protocol_id: GEN2 = 12.
- antenna_id: From 1 to 2 depending on which antenna saw the tag.
- frequency: Frequency in KHz at which the tag was seen, in hop table.
- timestamp: Unix time in seconds and microseconds from 1-1-1970 when tag was seen. For example: 3004832.188394

Write Page

The Astra Write Page, as shown in *Figure 15*, enables you to replace the ID or data that is encoded on a tag.

Consider the following guidelines when writing to tags:

- Always place a tag 0.3-0.6m (1-2 ft) from the antenna when writing. The tag may be damaged if it is too close to the antenna.
- The ID to be written must match exactly the number of hexadecimal characters, (numerals from 0-9 and letters from A-F) specified by the tag's protocol. Example: 96-bit tag IDs are 20 hexadecimal characters long.
- The Clear Output button clears the data displayed.
- Place only one tag in the antenna's field when writing. If multiple tags are present, they may all be encoded with the same EPC data, or the write may fail unless the RQL query specified indicate a specific tag to be written to. See the RQL documentation for more information.

Figure 14: **Astra Raw Data Page**



Writing an ID to a Tag

To write an ID to a tag:

1. Click the Write link on the navigation menu.
   The Write page appears, as shown in *Figure 15*.
2. Type or paste in the middle pane a hexadecimal tag ID to be written to the tag in the RQL statement after tag_id =0x. For example: 16 hex characters for 64-bit tags, 20 characters for 96-bit tags, etc.
3. Click the Make Update button.
   A query designed to write the highlighted data to the tag appears in the center pane.
4. Place the tag 0.3-0.6m (1-2ft) from the antenna connected to port 1. Verify that no other tags are in the antenna's field.
5. Click the Submit Query button to write the data.
   If the write was successful, the new tag ID appears in the bottom pane.

Searching for a Tag

To search for a tag:

1. Click the Write link on the navigation menu to display Write Page.
2. Click the Make Select button. A query designed to read data from the antenna connected to port 1 appears in the center pane.
3. Place the tag to be read within the detection zone of the antenna.
4. Click the Submit Query button to find the selected tag type. Query results appear in the bottom pane. Note that the query can be run only once, unlike on the Query page.

Settings Page

The Astra Modify Settings Page enables you to change network and Reader security settings. The page is divided into seven sections:

- RFID Protocol Settings
- Network Settings: All Interfaces
- Network Settings: Ethernet Interfaces
- Boot Option Settings
- Reader Identification Settings
- Security Settings

Changing these parameters changes the settings the Reader uses on startup. Although boot options and network settings can be modified, be careful to use correct values or you may not be able to connect to the Reader without restarting in Safe Mode.

Note

Do not disconnect power until the save process is complete. Note that new RFID, network and security settings take effect after saving. Boot-related options are saved but DO NOT take effect until the Reader is restarted (see Restart Page). Therefore, to ensure that all new settings take effect, it is recommended that you restart the Reader after saving the new settings and after reconfiguring.

RFID Protocol Settings

The RFID protocol settings take effect on the Reader, immediately after saving the settings. A restart is not required for RFID protocol settings to take effect.

Table 1: **RFID Protocol Settings**

Setting	Description
UHF Power	This is the power setting for the antenna(s). The maximum is 30.0dBm.
Default RQL Query	This field contains the initial query that is run continuously when the Reader starts up.
Antenna Mode	When the optional external antenna is connected allows the two antennas to operate in a Bistatic Configuration.

Note

The Default RQL Query runs continuously at startup and thus a change to this setting requires a restart of the Reader

Network Settings: All Interfaces

Static network settings are ignored when in DHCP mode, and DHCP-related settings are ignored when in static IP mode. Please note that your network needs to have properly configured DNS servers, to connect to the Reader through its hostname. Usually when using DHCP, the DHCP server will add the hostname to the DNS server's database.

Table 2: **Network Settings: All Interfaces**

Setting	Description
Network Interface	Select Wired (Ethernet)
Automatic Hostname	Turning on automatic hostname will append the last six numbers (3 bytes) of the Reader's address to the text in the hostname field. For example, given a hostname of astra and a MAC Address of 00:12:A4:13:47:AC, the automatic hostname would be Astra-1347ac.
Hostname	This field contains the name of the Reader.
NTP Server	This field contains the address of any network time protocol server(s) (Optional).
Domain Name	This field contains the network domain name.
Primary DNS Server	This field allows the Astra Reader to resolve hostnames to IP addresses.
Secondary DNS Server	This field allows the Astra Reader to resolve hostnames to IP addresses.

Network Settings: Ethernet Interfaces

Table 3: **Network Settings: Ethernet Interface**

Setting	Description
Use DHCP?	If set to Yes, the Reader will automatically look for its LAN IP, Netmask, and Gateway addresses from a DHCP Server.
Vendor Class Identifier	This radio button enables 96-bit tag support. To optimize the Reader, keep this setting turned off unless it is needed.
Use DHCP Server- supplied Host- name?	If set to Yes, the manually supplied hostname (see Hostname) will be overridden by the hostname supplied by the DHCP Server.
LAN IP Address	If “Use DHCP?” is set to Yes, the LAN IP, Netmask, and Gateway values will be supplied by the DHCP Server. Default or manually entered addresses will be dimmed out and bypassed. If “Use DHCP?” is set to No, you should manually enter the LAN IP, Netmask and Gateway settings.
LAN Gateway	This is the gateway IP address for the local network, typically the IP address of a router.
LAN Netmask	This is the subnet mask IP address used to determine to which TCP/IP subnet the Reader belongs. Devices in the same subnet can be communicated with locally without going through a router.
Fallback IP Address	This network configuration will be used by the Reader if DHCP is enabled but fails to acquire an IP address.
Fallback Netmask	This network configuration will be used by the Reader if DHCP is enabled but fails to acquire an IP address.
Fallback Gateway	This network configuration will be used by the Reader if DHCP is enabled but fails to acquire an IP address.

Boot Option Settings

The boot option settings specify the location of downloadable firmware, configuration files and their optional parameters, and the location of a syslog server to which all Reader events may be sent.

Table 4: **Boot Option Settings**

Setting	Description
Boot Config Options	Optional parameters used when downloading a new configuration file to the Reader. -f : Force a downgrade if config file version is lower than that currently running on the Reader. -p : Preserve configuration settings under a wipe. -w : Wipe flash memory and settings. -a : Add the Reader's MAC address to the download filename.
Boot Config	URI to the tm.conf file to be downloaded on startup. Specify local:default for local tm.config file.
Boot Firmware Options	Same as Boot Config options. Used when downloading new firmware to the Reader.
Boot Firmware	URL to the firmware file to be downloaded at startup.
Syslog Host	Hostname for remote logging. All log levels in syslog are sent to this host.

Reader Identification Settings

The Reader identification settings show the user-defined identifier strings.

Table 5: **Reader Identification Settings**

Setting	Description
Reader Description	This is a user-defined identifier string to describe the Reader that gets echoed back verbatim via the web interface, SNMP, or RQL.
Reader Role	This is a user-defined identifier string to describe the Reader's role in a system that gets echoed back verbatim via the web interface, SNMP, or RQL.
Ant1 Description	This is a user-defined identifier string to describe the default Antenna 1 that gets echoed back verbatim via the web interface, SNMP, or RQL.
Ant2 Description	This is a user-defined identifier string to describe the optional Antenna 2 that gets echoed back verbatim via the web interface, SNMP, or RQL.

Security Settings

These settings control secure access to the Reader using a combination of SSH (Secure Shell), HTTPS, and secure RQL calls.

Table 6: **Security Settings**

Setting	Description
Secure Shell Only (disable telnet)	If Yes, the telnet server is disabled, and Reader access can only be performed via a secure shell (SSH).
Secure Web Only (disable standard http)	If Yes, the Reader will only respond to requests using https URLs.
Secure RQL Only (disable non-tunneled RQL)	If Yes, RQL no longer listens on Port 8080 for remote access. RQL is still accessible via an SSH tunnel.
SNMP Enabled	Enables access to the reader statistics as defined by the EPC Global Reader MIB via Simple Network Management Protocol (SNMP).
MDNS enabled	Enables reader discovery via Multicast DNS.

Restart Page

The Astra Restart Page enables you to activate reconfigured network Reader settings or to recover from a Reader error.

To restart the Reader:

1. Click the Restart link on the navigation menu.
   The Restart Reader page appears, as shown in *Figure 16*.

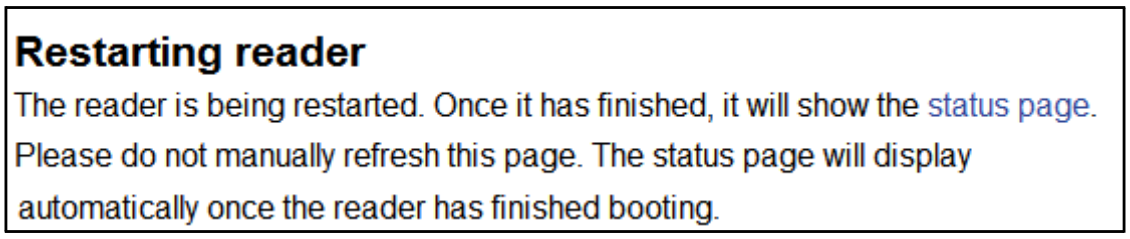
Figure 16: **Astra Restart Reader Page**



2. Click the Restart System button.

3. Click OK.
   The following message appears, as shown in *Figure 17* and remains on the screen until the Reader restarts.

Figure 17: **Restarting Reader**



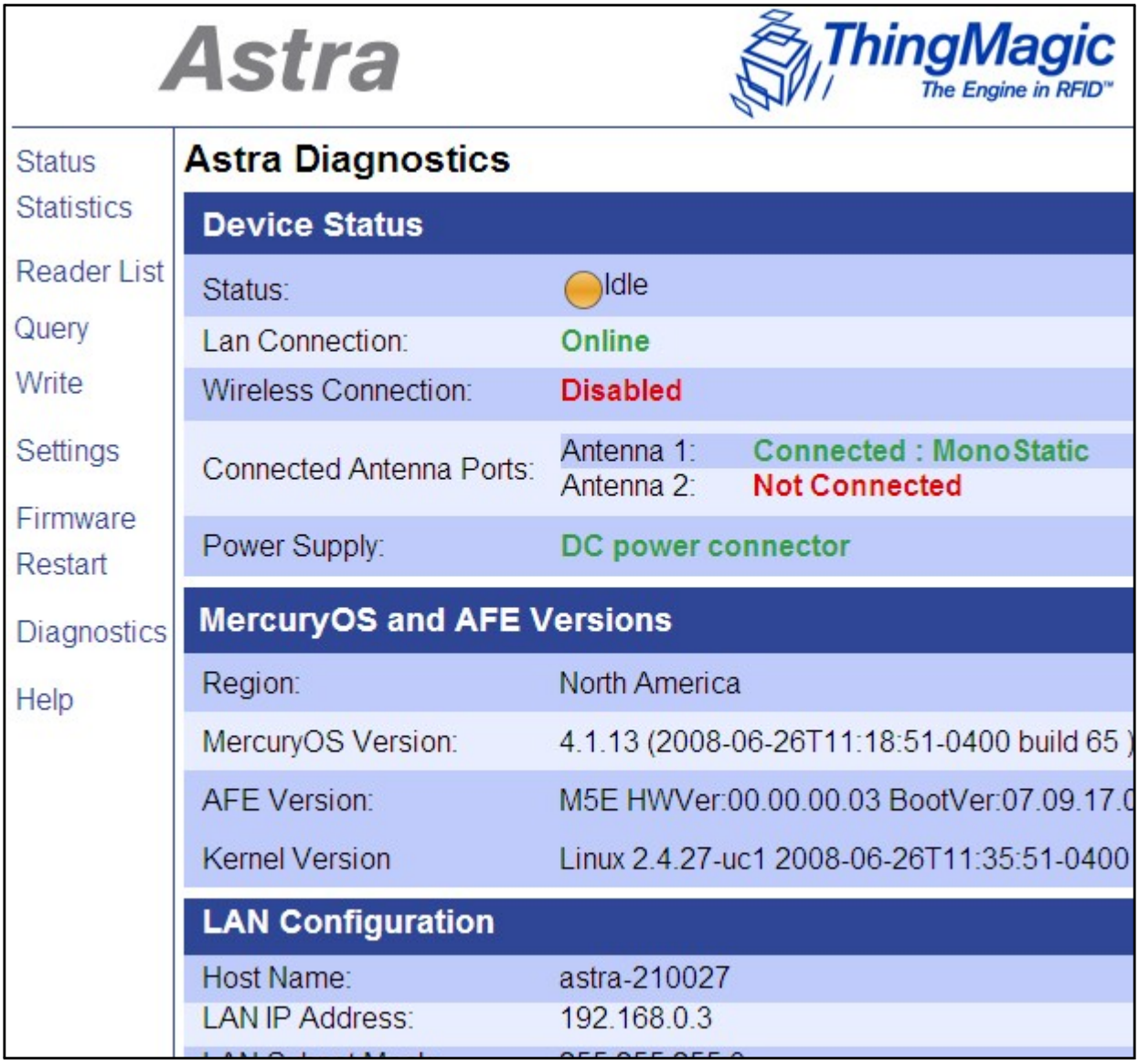
Note

It takes at least 60 seconds for the Reader to boot up. During this time the Power/ Heartbeat LED is solid green. When the LED begins blinking, the boot process is complete.

Diagnostics Page

The Diagnostics page, as shown in *Figure 18*, expands on information found on the Status Page, including the current settings of the Reader, comprehensive version information, and the current status of network interfaces.

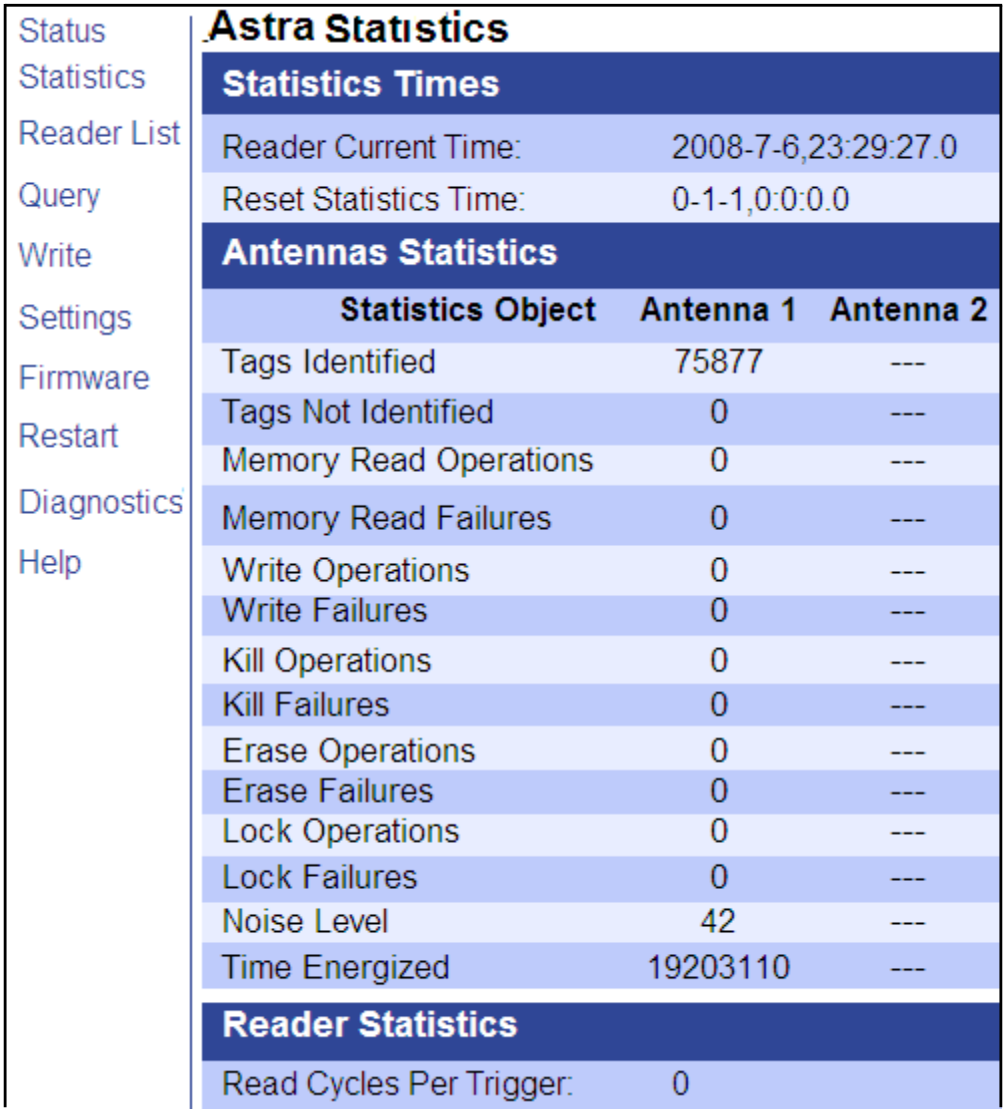
Figure 18: **Astra Diagnostics Page**



Statistics Page

The Statistics Page, as shown in *Figure 19*, displays the Astra Reader statistics. These statistics are defined by the EPCglobal Reader Management Standard v1.0.1, specifically, the statistics defined in sections *5.5 AntennaReadPoint* and *5.6 Source Object.* These sames statistics are available through the SNMP interface.

Figure 19: **Astra Statistics Page**



More information on these statistics can be found at the following URL:

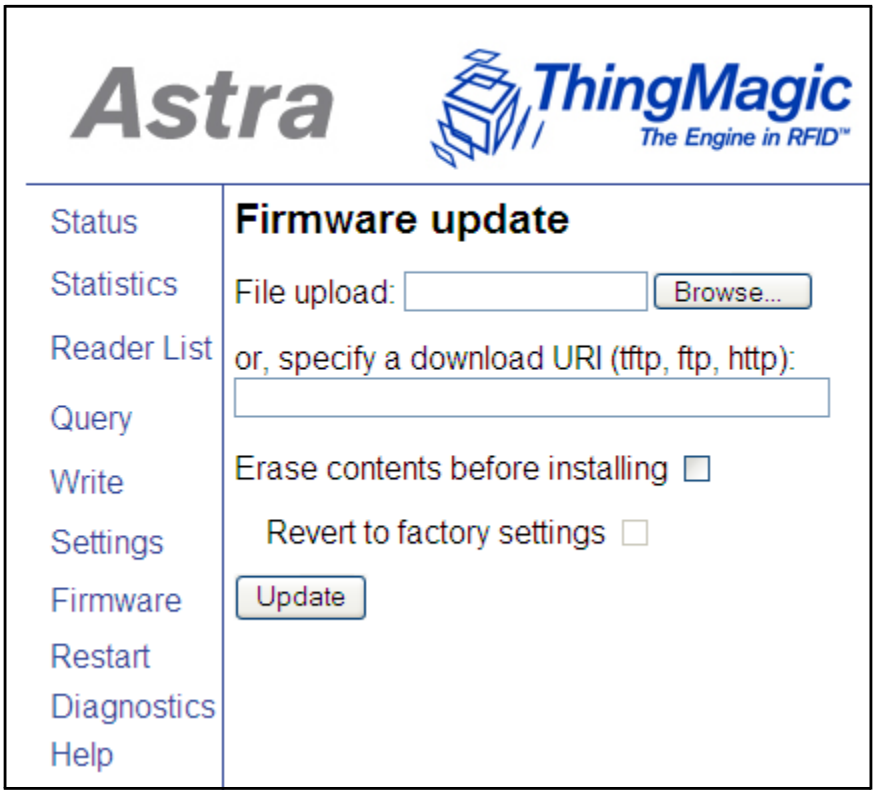
http://www.epcglobalinc.org/standards/rm/rm_1_0_1-standard-20070531.pdf

Firmware Upgrade Utility

Astra provides Firmware Upgrade Utility for updating the firmware.

1. Click the Firmware link on the navigation menu.
   The Firmware Update page appears, as shown in *Figure 20*.

Figure 20: **Astra Firmware Update Page**



2. Do one of the following:
   - In the File upload field, enter the complete URL network pathname of the firmware file.
   - Click Browse... to locate the firmware file.

C A U T I O N !

If you select the "Erase contents before installing" check box, you will erase all user-installed programs or files residing on the reader. DO NOT select this option if you wish to preserve any user programs residing on the reader.

C A U T I O N !

If you select the "Revert to factory settings" check box, you will erase any changes made to the reader's configuration settings and revert to factory default settings. If you select this option, the reader's current configuration settings will be erased. DO NOT select this option if you wish to preserve the reader's current configuration settings.

3. Click the Update button to download the new firmware to the reader.
   The status frame at the bottom of the page displays the progress of the update.

4. Restart the reader to activate the new firmware.
   The old firmware remains active until the Reader is restarted.

Note

If for any reason a firmware update fails, the device may restart in Safe Mode.

Using Safe Mode

There are two reasons to enter Safe Mode:

- To perform a firmware update for repairing a corrupted filesystem.
- To change settings that prevent the Reader from operating normally.

Note

Both of these tasks can be performed through the web interface.

Safe Mode is used to recover from errors that prevent the Reader from operating in normal mode. In Safe Mode the Reader is configured with a static IP address of 10.0.0.101. Safe mode uses the following network settings:

- IP Address: 10.0.0.101
- Hostname: Astra

Although the browser-based interface pages are displayed in red when operating in safe mode, the Reader is still functional though it cannot read or write tags. The web server, telnet server, and SSH (Secure Shell) server run in Safe Mode, however none of the RFID features are activated.

In most cases, after starting in Safe Mode, the Reader will need to be reconfigured for operation with the Reader application, after starting in Safe Mode.To communicate with the Reader in Safe Mode, your PC must have an IP address and subnet mask that are compatible with the Reader settings. You can then reconfigure the desired settings through the web interface. After you have completed the maintenance, restart the Reader to activate the changes.

Example compatible Host IP/subnet settings:

- IP address: 10.0.0.102
- Netmask: 255.255.255.0

Forcing Astra to boot in safe mode

To force the Astra Reader to boot into Safe Mode:

1. Connect to the Readers serial port
   (See Connecting to the Astra Serial Port.)

   Enter the following to log into the console
   Default UserID: *root*
   Password: *secure*

2. Type the command: *touch /tm/etc/safe-boot*

3. Click the Enter button.

4. Type the command: *reboot*

5. Click the Enter button.
   Reader reboots.

The Astra will now boot into Safe Mode and you can connect to it using the steps defined in Connecting Your PC to the Reader.

Reader RF Power

If you are using an external antenna during initial installation, you must properly configure to use the correct RF power to comply with FCC regulations. The software limit does not allow the power to be set higher than 30.0 dBm. Therefore this particular antenna configuration will comply with FCC regulations.

For the external antenna, the maximum RF power for compliance is determined from antenna gain and antenna cable loss using the following formula:

Pmax = 36 dBm - Antenna Gain + Cable Loss

Reader RF Power Example

The antenna provided by ThingMagic that is listed in Appendix A: Astra Antenna Information has the following features:

- Antenna that has a maximum gain of 6 dBi
- Cable that has a loss of 0.6 dB

Using the formula listed above, you have the maximum RF power is (36- 6 + 0.6) = 30.6 dBm. For more information about setting the RF power, refer to Setting the Reader RF Power.

Note

Be sure to read Compliance, Warranty, and IP Notices to maintain compliance with FCC regulations.

Setting the Reader RF Power

To set the Reader RF power:

1. Log on to the Reader using your browser.
   The Astra Status Page appears, as shown in the *Figure 8*.
2. Click on the Settings tab.
   The first field on the Settings page is UHF Power. Its factory default value is 30 dBm.
3. Enter the maximum setting based on your cable type, length, and antenna type.
4. Scroll down to the bottom of the Astra Modify Settings Page, and click Save changes button.
   The Settings Page will reload automatically after the settings have been saved.

Note

If the Status page does not appear after a minute, manually recycle the power on the Reader. After repowering, load the Settings Page again and check the new maximum RF power setting.

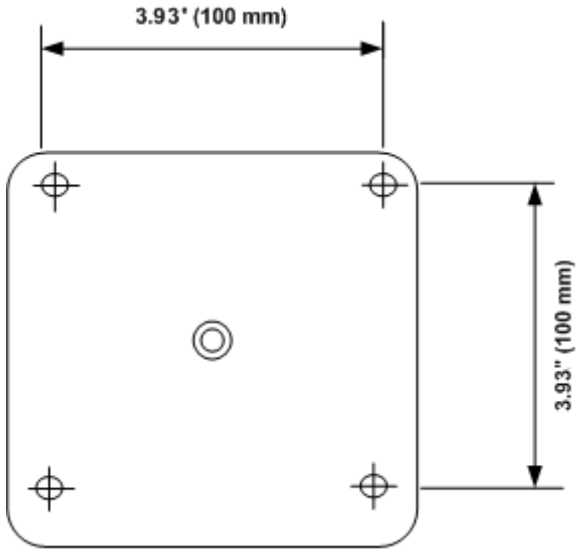
Mounting the Reader

See Appendix B: Astra Dimensions for mounting hole locations and dimensions.

When mounting the Astra Reader it is recommend to use an NRTL approved VESA 100 mount, following the standard mounting procedure of the VESA mount referencing the Astra mounting hole locations as shown in *Figure 21*.

Alternatively you can use the centered Tripod mounting hole for 1/4"- 20 screws. This is for use with tripods shorter than one meter.

Figure 21: **Mounting the Reader**



W A R N I N G !

To comply with FCC's RF radiation exposure requirements, the antenna(s) used for this transmitter must be installed such that a minimum separation distance of 25cm is maintained between the radiator (antenna) & user's/nearby people's body at all times and must not be co-located or operating in conjunction with any other antenna or transmitter.

Variables Affecting Performance

Reader performance may be affected by the following variables, depending on the site where your Reader is being deployed:

- Environmental
- Tag Considerations
- Multiple Readers

Environmental

Reader performance may be affected by the following environmental conditions:

- Metal surfaces such as desks, filing cabinets, bookshelves, and wastebaskets may enhance or degrade Reader performance.
- Antennas should be mounted far away from metal surfaces that may adversely affect the system performance.
- Devices that operate at 900 MHz, such as cordless phones and wireless LANs, can degrade Reader performance. The Reader may also adversely affect the performance of these 900 MHz devices.
- Moving machinery can interfere the Reader performance. Test Reader performance with moving machinery turned off.
- Fluorescent lighting fixtures are a source of strong electromagnetic interference and if possible should be replaced. If fluorescent lights cannot be replaced, then keep the Reader cables and antennas away from them.
- Coaxial cables leading from the Reader to antennas can be a strong source of electromagnetic radiation. These cables should be laid flat and not coiled up.

W A R N I N G !

The Astra antenna ports may be susceptible to damage from Electrostatic Discharge (ESD). Equipment failure can result if the antenna or communication ports are subjected to ESD. Standard ESD precautions should be taken during installation to avoid static discharge when handling or making connections to the Astra reader antenna or communication ports. Environmental analysis should also be performed to ensure static is not building up on and around the antennas, possibly causing discharges during operation.

Tag Considerations

There are several variables associated with tags that can affect Reader performance:

- Application Surface: Some materials, including metal and moisture, interfere with tag performance. Tags applied to items made from or containing these materials may not perform as expected.
- Tag Orientation: Reader performance is affected by the orientation of the tag in the antenna field. The ThingMagic antenna is circularly polarized, so it reads face-to but not edge-to.
- Tag Model: Many tag models are available. Each model has its own performance characteristics.

Multiple Readers

The Reader adversely affect performance of 900 MHz devices. These devices also may degrade performance of the Reader.

- Antennas on other Readers operating in close proximity may interfere with one another, thus degrading performance of the Readers.
- Interference from other antennas may be eliminated or reduced by using either one or both of the following strategies:
  - Affected antennas may be synchronized by a separate user application using a time-multiplexing strategy.
  - Antenna power can be reduced by reconfiguring the RF Transmit Power setting for the Reader.

Note

Performance tests conducted under typical operating conditions at your site are recommended to help you optimize system performance.

Astra Specifications

The following are the specifications for the Astra Reader.

Electrical

Reader

UHF operating frequency:

Astra-NA: 902-907 MHz and 915-928 MHz
Astra-EU: 865-870MHz
Astra-KR: 910-914MHz

Input voltage: 24Vdc, 2.0A or Power over Ethernet in both modes A and B (Supports 100m cable).

Optional External DC Power Supply

Input voltage: Nominal 100-240Vac, 50/60Hz

AC line current: Nominal 0.5A at 120V

Output voltage: Nominal 24Vdc, 2.5A peak

Note

If a DC Power supply is used it must meet the following criteria:
- Be UL Listed for US and Canada or certified to IEC 60950-1, 2nd Edition for other countries
- Meet the above operating specs
- The output must comply with SELV and LPS characteristics
- Have a maximum operating ambient temperature that meets or exceeds the intended Astra operating temperatures as covered under the UL Listing of the power supply.

Environmental

Operating Temperature: -20° to +60°C

Note

If an external DC power supply with a lower operating ambient temperature, as covered under the UL Listing of the power supply, is used then the operating ambient temperature of the Astra would be reduced accordingly.

Relative Humidity: 5 to 95% non-condensing

Mechanical

Reader

Length: 25.7cm (10.125 in)

Width: 25.7cm (10.125 in)

Depth: 7.62cm (3 in)

Weight: 1.8kg (4 lb)

Supported UHF Tag Protocols

EPC Class 1 GEN2

User Memory

64MB DRAM

32MB Flash

Compliance, Warranty, and IP Notices

Regulatory Compliance

EMC FCC 47 CFR, Part 15
Industrie Canada RSS-210

Federal Communication Commission Interference Statement

This equipment contains modules FCCID: QV5MERCURY5E and FCCID: TK4-WLM54GP23 (WiFi SKU only).This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Industry Canada

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.

This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed in Authorized Antennas table 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

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.

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.

To comply with IC RF exposure limits for general population/uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 25 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter.

Industrie Canada

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.

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s'il fait partie du matériel de catégorie I) 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 maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

Le fonctionnement de l’ appareil est soumis aux deux conditions suivantes:

1. Cet appareil ne doit pas perturber les communications radio, et

2. cet appareil doit supporter toute perturbation, y compris les perturbations qui pourraient provoquer son dysfonctionnement.

Pour réduire le risque d'interférence aux autres utilisateurs, le type d'antenne et son gain doivent être choisis de façon que la puissance isotrope rayonnée équivalente (PIRE) ne dépasse pas celle nécessaire pour une communication réussie.

Au but de conformer aux limites d'exposition RF pour la population générale (exposition non-contrôlée), les antennes utilisés doivent être installés à une distance d'au moins 25 cm de toute personne et ne doivent pas être installé en proximité ou utilisé en conjonction avec un autre antenne ou transmetteur.

Appendix A: Astra Antenna Information

Authorized Antennas

To comply with FCC requirements for RF exposure safety, a separation distance of at least 22 cm (8.7 inches) must be maintained between the radiating elements of the antenna and nearby people. You must also provide strain relief for all Reader connections.

The only antennas authorized by the FCC for use with the Astra Reader are listed in the table below. Detailed information on each antenna is available from their respective manufacturers.

Table 7: **Authorized Antennas**

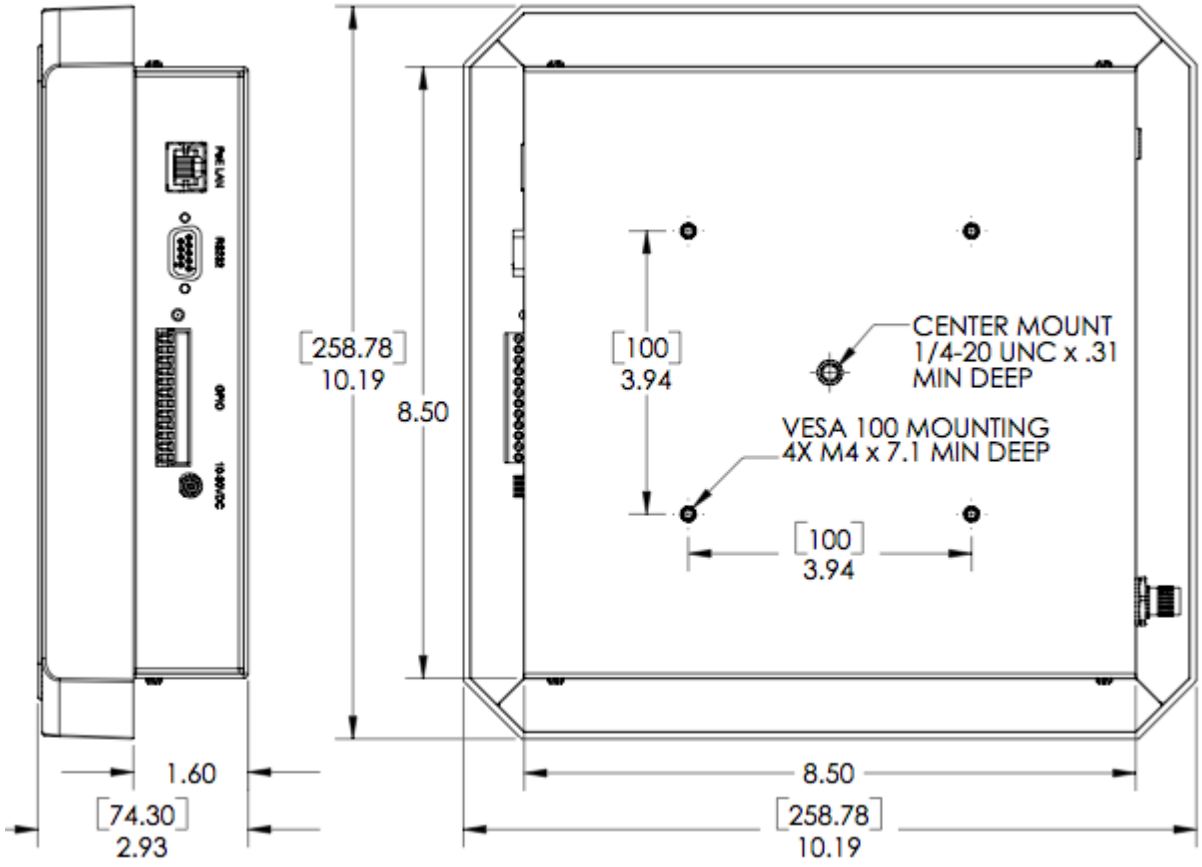
Item	Laird Monostatic
Model	S8658WPR-T-05 or S8658WPL-T-01
Gain	6 dBi max.
Connecto	Integral 72” cable with Reverse TNC

Note

IMPORTANT: No other antennas may be used with the Astra Reader without violating FCC regulations. It is the responsibility of the user to comply with this requirement.

Appendix B: Astra Dimensions

Figure 22: **Astra Dimensions**



Appendix C: Advanced Administration

Changing the Web Interface uid/passwd

This steps below describe how to add/change the User/Password for the Web Interface. This can also be done by Connecting to the Astra Serial Port and following these steps.

1. Connect to the reader using SSH or Telnet

```
> telnet [reader IP address]
User: root
Pass: secure
```

2. Use the httpPassword command:

   Usage: *httpPassword <filename> <realm> <username>*

   To create a new userid/password file:

```
[root@astra-21071f] $ cd /tmp
[root@astra-21071f] $ httpPassword -c users.db thingmagic rfid_user
New password:
Confirm password:
[root@astra-21071f] $ mv /tmp/users.db /etc/appWeb/users.db
```

To add a user to an existing file:

```
[root@astra-21071f] $ cd /tmp
[root@astra-21071f] $ cp /etc/appWeb/users.db /tmp/users.db
[root@astra-21071f] $ httpPassword users.db thingmagic another_user
New password:
Confirm password:
[root@astra-21071f] $ mv /tmp/users.db /etc/appWeb/users.db
```

Note: don't use "-c" when adding users as this creates a new password file.

3. Verify the file contains the new information

```
[root@astra-21071f] $ cd /etc/appWeb
[root@astra-21071f] $ cat users.db
1: another_user: thingmagic: d7828175fdbf4f733c356b50a6706b24
1: web: thingmagic: 92801793e4875ae8da987402c3dd468f
```

4. Reboot the reader; login

Note

In the steps above, for step 2 there are two different methods of creating a new user/password. The first creates a new user/password file which means it overwrites the existing file and deletes any existing user/passwords. That means web/radio will no longer work. In the second set of steps it adds user/passwords to

the existing users.db file, so it retains existing user/passwords. You should use one or the other depending on what you want to do with existing user/passwords.

Changing console/root password:

To change the root password, used by the command-line interface and console access, use standard linux "passwd [userid]" command.

```
[root@astra-21071f] $ passwd
Changing password for root
Enter the new password (minimum of 5, maximum of 8 characters)
Please use a combination of upper and lower case letters and num-
bers.
Enter new password:
Re-enter new password:
Password changed.
```

Appendix D: Troubleshooting

Troubleshooting Table

Table 8: **Common Problems and Solutions**

Problem	Path to Solution
Cannot connect to reader over network	• Check your network settings by Analyzing the Boot Logs to make sure you're trying the correct IP address. • If the settings are wrong, try to Using Safe Mode to get a known network configuration, • or Reset to the Default Configuration and start the configuration over.
Reader is not reading tags	• Verify LEDs are blinking according to Interpreting the Reader Indicator LED • If they are, indicating active RF, make sure tags are in range. • Check antenna cables • Try known good Gen2 tags • Increase Reader RF Power
Reader error LED stays on	Following Collecting Diagnostic Data for ThingMagic Support and send to support.
Read "Performance" is slow	Performance, as it relates to tag reading, is very usecase dependent. Typically, it comes down to whether you are trying to read lots of tags oncez or a few tags repeatedly. If the reader settings aren't correct for your usecase the performance will appear poor. • See the *MercuryAPI Programmer's Guide* | *Performance Tuning* section for details about settings. • Use the *Universal Reader Assistant* | *Options* | *Advanced ...* | *Gen2 Settings* to modify the settings for your usecase.

Reset to the Default Configuration

If you are experiencing a problem with the reader and are having difficulty pinpointing the cause, it is useful to return the reader to a known state. The easiest method of doing this is to reinstall the running version of firmware using the Firmware Upgrade Utility with "Revert to default settings" selected.

If you are not able to connect to the reader to reinstall firm you can try following the steps to Forcing Astra to boot in safe mode, forcing a known networking configuration on the reader, then resinstalling the firmware.

C A U T I O N !

If you select the"Erase contents..." and "Revert to default settings" check box, you will erase any changes made to the reader's configuration settings and revert to factory default settings. If you select this option, the reader's current configuration settings and any on-reader files and applications will be erased. DO NOT select this option if you wish to preserve the reader's current configuration settings

Collecting Diagnostic Data for ThingMagic Support

When experience problems connecting to the Astra or performing RF (reading, writing) operations it will be necessary to gather the following information to help diagnose the problem. This information will often be the first thing requesting when reporting a problem to ThingMagic support.

Collect the following:

1. **Boot Logs**: Follow the process for Connecting to the Astra Serial Port, reboot the reader and save the full output from the console.
2. **Diagnostics Status and Logs**: Save the contents of the Diagnostics Page and the output from the Diagnostics Page | *View Log* button.
3. **M6 Serial Number**: See the 2d barcode label.
4. **Controlling software**: any details about the software used to control the reader. LLRP based middleware, MercuryAPI app (what version and language), platform, etc.
5. **Physical Configuration**: any details available about the number and types of antennas connected, cables used, power supply, etc.
6. **Environment**: any details abou the physical environment its being used/tested in. Temperature, humidity, vehicle mounted, office, etc.

Analyzing the Boot Logs

One of the most common problems is due to incorrect or unexpected network configuration, resulting in not being able to connect to the Astra. The best way to start diagnosing a network problem is to understand what the Astra's network settings are after its powered up. This can be done by analyzing the boot logs.

Once you've follow the process for Connecting to the Astra Serial Port, reboot the reader and look at the output from the console. Once the boot process has completed the end of the log will look something like the following:

```
Setting up local network interface
Starting network interfaces
ixp0: negotiated 100baseTx-FD, link ok
Bringing ixp0 up
Using DHCP to bring up ixp0
```

This indicates the Wired interface (ixp0) is trying to start based on the provided configuration using DHCP. Common failures are not finding a DHCP address.

```
Setting up Bonjour
killall: dns-sd: no process killed
killall: mdnsd: no process killed
cat: /var/run/dropbear.pid: No such file or directory
Setting up ntp configuration file
20 Oct 18:21:12 ntpdate[1075]: step time server 216.144.229.211 offset
1319134848.470151 sec
Starting syslog
Starting klog
Running autoupdate
ixp0      Link encap:Ethernet  HWaddr 00:12:A4:21:07:1F
          inet addr:10.8.26.119  Bcast:10.8.27.255  Mask:255.255.254.0
```

This section shows the active network settings. In this case the wired interface "ixp0" is up and using IP Address=10.8.26.119/255.255.254.0. If failures occurred this might be using the Fallback setting (see Network Settings: Ethernet Interface) specified, or the default 10.0.0.101 IP address. It maybe useful to show this information to your IT administator for assistance.

```
          UP BROADCAST NOTRAILERS RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:33 errors:0 dropped:0 overruns:0 frame:0
          TX packets:11 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:256

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
[...snip...]
```

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP