XR400 RFID Reader

Integrator Guide

symbol®
The Enterprise Mobility Company™

XR400 RFID Reader Integrator Guide

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symbol®
The Enterprise Mobility Company ™

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Introduction

This *Integrator Guide* provides information about installing, configuring, and using the XR400 RFID Reader. The XR400 is a multi-protocol RFID reader providing real-time, seamless tag processing for all EPC-compliant tags: Class 0 (Read Only), Class 0 (Read/Write, also known as Class 0+), and Class 1 (Read/Write).

Chapter Descriptions

Topics covered in this guide are as follows:

- *Chapter 1, Getting Started* provides an overview of RFID technology and components, and a description of the XR400 Reader and its features.
- *Chapter 2, Installation and Communication* provides information on installing the XR400 and setting it up for communication.
- *Chapter 3, Administrator Console* describes how to use the web-based Administrator Console to configure and manage the XR400 reader.
- *Chapter 4, Maintenance and Troubleshooting* describes how to use the reader maintenance console to perform low-level reader maintenance tasks, and how to upgrade the reader with new firmware and FPGA versions. It also includes troubleshooting tips.
- *Appendix A, Specifications* lists the hardware specifications and reader interface details.

Notational Conventions

The following conventions are used in this document:

- *Italics* are used to highlight the following:
  - chapters and sections in this and related documents
  - dialog box, window and screen names
  - drop-down list and list box names
  - check box and radio button names
  - icons on a screen.
- **Bold** text is used to highlight the following:
  - key names on a keypad
  - button names on a screen.
- Bullets (•) indicate:
  - action items
  - lists of alternatives
  - lists of required steps that are not necessarily sequential.
- Sequential lists (e.g., those that describe step-by-step procedures) appear as numbered lists.

Related Documents and Software

The following documents provide more information about the XR400 RFID Reader.

- *XR400 Quick Reference Guide*, p/n 72-71466-xx
- *DC200 Portal Integrator Guide*, p/n 72E-71772-01
- *RFID API Programmer Guide*, p/n 72E-71803-xx
- *TagVis Programmer Guide*, p/n 72E-71804-xx
- *ReaderComm5DLL Developer Guide*, p/n 72E-71805-xx

For the latest version of this guide and all guides, go to: http://www.symbol.com/manuals.

Service Information

If you have a problem with the equipment, contact the *Symbol Support Center* for your region. See page x for contact information. Before calling, have the model number, serial number and several bar code symbols at hand.

Call the Support Center from a phone near the scanning equipment so that the service person can try to talk you through the problem. If the equipment is found to be working properly and the problem is symbol readability, the Support Center will request samples of bar codes for analysis at our plant.

If the problem cannot be solved over the phone, you may need to return the equipment for servicing. If that is necessary, you will be given specific directions.

Note

Symbol Technologies is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty. If the original shipping container was not kept, contact Symbol to have another sent to you.

Symbol Support Center

For service information, warranty information or technical assistance contact or call the Symbol Support Center in:

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Symbol Technologies, Inc.
One Symbol Plaza
Holtsville, New York 11742-1300
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1

Getting Started

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Introduction

The XR400 is a ready-to-connect network element that offers a variety of options for connecting to corporate networks via Ethernet or serial connections. A Setup Wizard facilitates reader configuration.

RFID Technology

Radio Frequency Identification (RFID) is an advanced automatic identification (Auto ID) technology that uses radio frequency signals to identify "tagged" items. A typical RFID system consists of transponders called tags, readers, and antennas, which function as follows:

- An RFID tag contains a chip that can store a limited amount of data. This data may be pre-encoded or can be encoded in the field. Tags come in a variety of shapes and sizes.
- A reader sends out radio frequency waves using attached antennas. This RF field powers and charges the tags, which are tuned to receive radio waves. The tags use this power to transmit data back to the reader, which the reader converts to a format for computer storage. The computer application translates the data into an understandable format.

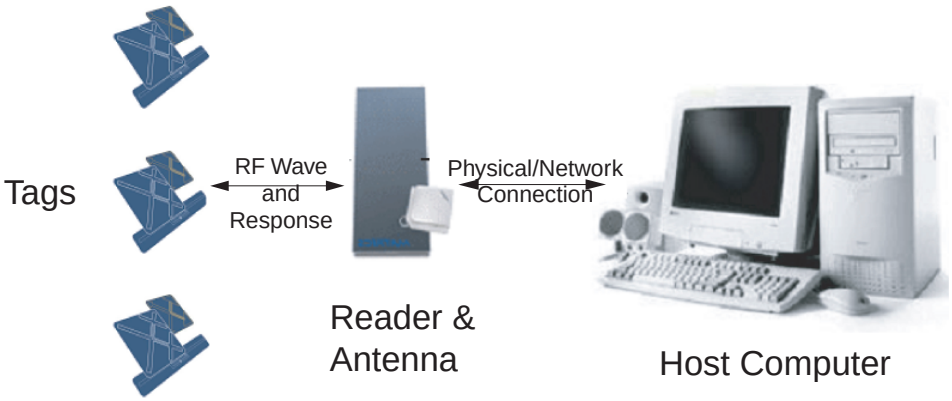

Figure 1-1. RFID System Elements

RFID Components

Symbol's Radio Frequency Identification (RFID) solutions offer low cost, long read range, and a very high read rate, providing real-time, end-to-end visibility of products and assets in the factory, distribution center, retail outlet, or other facility. A typical Symbol RFID system consists of the following components:

- Silicon-based RFID tags that can be attached to vehicles, trailers, containers, pallets, boxes, etc.
- Different types of antennas to support applications such as dock door (area antennas), conveyor and, in the future, Smart Shelf (Shelf Antennas)
- Readers that power and communicate with the tags for data capture and provide host connectivity for data migration.

Tags

Tags contain embedded chips that store information unique to the objects to which they are applied. Available in various shapes and sizes, tags, often called *transponders*, receive and respond to requests for their data. Tags require power to send data, and are available with two power options:

- Active Tags: typically powered by light-weight batteries and have limited life.
- Passive Tags: powered by the reader's RF field. Passive tags are much lighter, less expensive, and have a much longer life than active tags.

Antennas

Antennas transmit and receive radio frequency signals under the control of a reader. Antennas do not perform processing. A *read point* is the RF range of an antenna.

Readers

Readers are devices that provide a means for communicating with the tags and transferring their data to a host computer. Readers also provide features such as filtering, parity checks, and tag writing.

The XR400 RFID Reader

The Symbol XR400 is an intelligent, multi-protocol reader that provides real-time, seamless tag processing for all EPC-compliant tags: Class 0 (Read Only), Class 0 (Read/Write, also known as Class 0+), and Class 1 (Read/Write). Class 0 and Class 1 protocols are run in the Ultra-High Frequency range (~900MHz).

The XR400 offers a variety of options for connecting to corporate networks via Ethernet or serial connection. A Setup Wizard simplifies configuration.

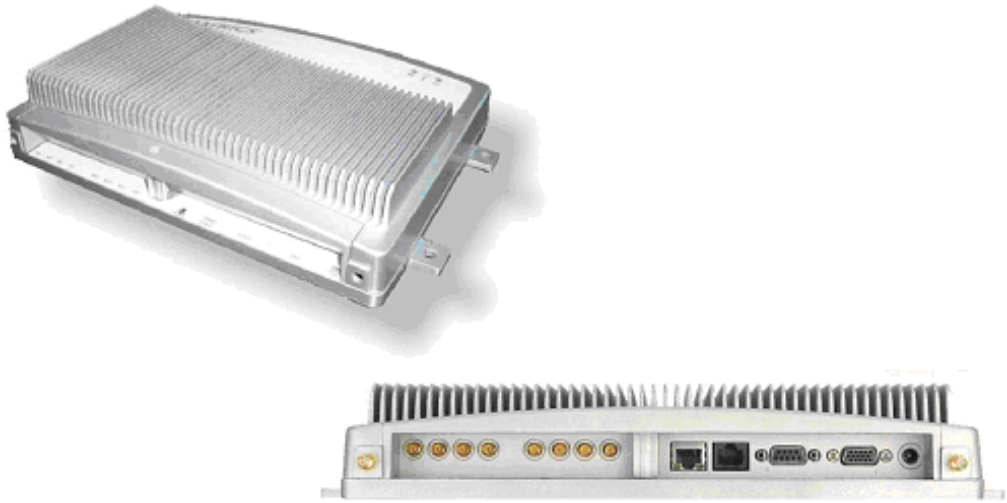

Figure 1-2. XR400, Top and Side Views

The XR400 provides a wide range of features that enable implementation of complete, high-performance, and intelligent RFID solutions.

Multiple Connection Options

The XR400 provides flexibility for connecting to networks via Ethernet or serial connection. Because each XR400 is identified by its unique IP address, it is accessible from anywhere on the network. The XR400 can also be configured to obtain its IP Address from a DHCP server, automating the IP address and default Gateway configurations.

Flexible Read Point Configurations

Connect up to eight antennas (four transmit and four receive) to a single XR400. This decreases the per-read-point cost. Logically combine antennas to create a single, “wide” read point with a much greater range than that of a single antenna.

Configuration and Upgrading

The XR400 is easy to reconfigure for an application via the Setup Wizard. The XR400 can also accept new firmware and configuration under host control.

Tag Management Features

Ad Hoc Querying

Use ad hoc querying to send a query about tag visibility. The XR400 replies with either “Tag(s) Visible,” “Not Known” (never seen or imported), or “Not Visible” (previously seen but now missing, with last seen timestamp).

Tag Filtering

Use tag filtering to apply filters during read operations. A filter can include or exclude a tag based on the specified bit pattern. The XR400 offers two types of filtering:

- Pre-Processing: The XR400 restricts its ability to read tags as directed by the include or exclude filtering specification.
- Post Processing: The XR400 reads all tags it sees, and applies its filters before it reports these tags to the host computer.

Tag List

Use the tag list feature to send information about tags from the host to the reader. The host can purge the tag list to remove this information from the reader when it’s not needed.

Event Management

Event Notification

Use event notification to receive notification about certain events. For example, receive immediate notification of a tag visibility change, or bundle all notifications and receive them later.

Exception Notification and Heart Beat Notification

The XR400 supports sending exception notifications via SNMP. The "heart beat" notification feature sends periodic messages that indicate whether or not the reader is functional.

Device Management

Quick Backup and Recovery

To back up and restore reader configuration, use any Web browser to download the configuration XML file, then download the file to the reader using the Reader Administrator console.

SNMP Integration

The XR400 can send real-time notification of specific events and failures to the SNMP server.

Security Features

Trusted Hosts

The XR400 allows specifying the IP addresses of hosts that are allowed to connect to the reader. Use this security feature to prevent unauthorized network hosts from communicating with the reader.

User Level Security

The XR400 recognizes three access levels to assign to users:

- *View* - view reader configuration settings.
- *Edit* - view and edit configuration settings.
- *Maintenance* - view and edit configuration settings, and perform administrative tasks such as updating reader firmware.

Use this feature to assign different access levels to users, allowing them to perform necessary tasks without compromising security.

Logging

The XR400 keeps a log of all system-related activities for security and troubleshooting. Use the log, which includes time-stamped system activities such as good and bad tag reads, login attempts, hardware failures, and other events, to pinpoint problems to facilitate quick resolution, and to identify administrators who require additional training to prevent future problems.

LED Indicators

The XR400 LEDs indicate reader status as described in Table 1-1.

Table 1-1.

LED	Description
Green	Reader is powered on
Red	Error condition or non-operational mode, e.g., boot-up
Yellow	Successful tag read

2

Installation and Communication

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XR400 Parts

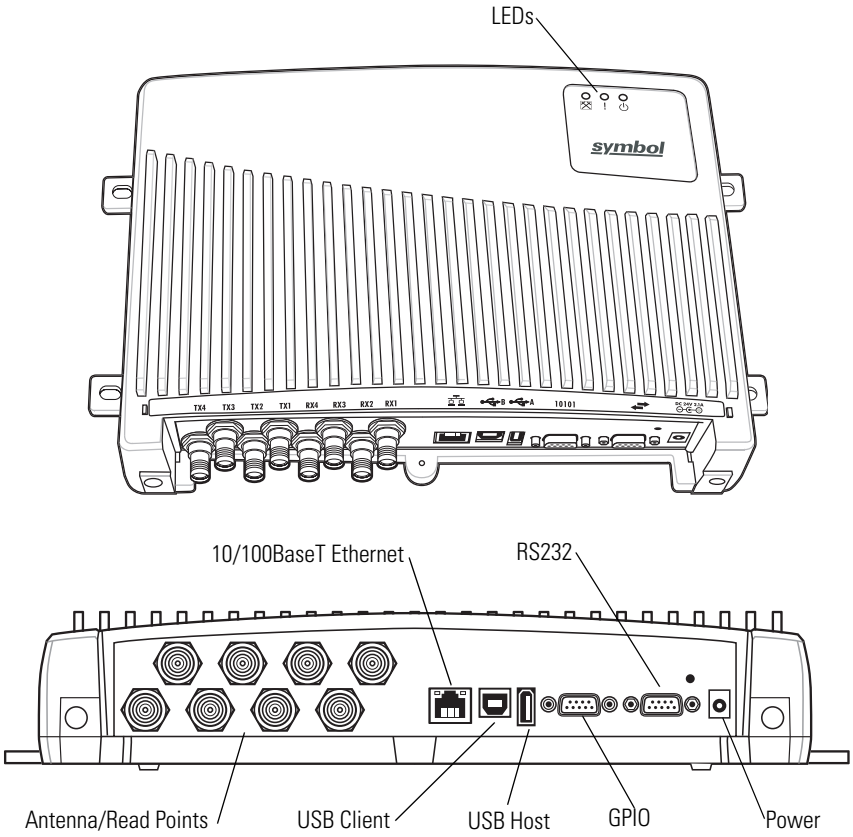

Figure 2-1. XR400 Parts

CAUTION

Use only the parts provided with the XR400 reader or recommended by Symbol. Substituting other cables or parts can degrade system performance, damage the reader, and/or void the warranty.

XR400 Ports

The following table lists the ports available on the XR400.

Table 2-1. XR400 Port Descriptions

Port	Description
Antenna/Read Points	Connect up to eight antennas (four transmit, four receive)
10/100BaseT Ethernet	Insert an RJ45 Ethernet cable for connection to an Ethernet network or an Ethernet card on a host PC.
USB Client	Insert a USB cable for USB client connection to a host device.
USB Host	Insert a USB cable for USB host connection to a client device.
GPIO	Insert a DB15 serial cable for connection to the DC200 Portal. The XR400 controls the DC200 LEDs and motion sensor.
RS232	Insert a DB9 serial cable for RS232 connection to a host PC.
Power	Connect a 24 V 1.2 A power supply. The power supply's DC connector connects to an AC adapter that varies depending on the country.

Installing the XR400

Mounting Tips

Consider the following before selecting a location for the XR400 Reader:

- Mount the XR400 indoors, in operating range, and out of direct sunlight, high moisture, or extreme temperatures.
- Mount the XR400 in an area free from electromagnetic interference. Sources of interference include generators, pumps, converters, non-interruptible power supplies, AC switching relays, light dimmers, and computer CRT terminals.
- Mount the XR400 within 15 feet of the antennas.
- Ensure the XR400's power cord can reach the power source outlet.
- Mount the XR400 onto a permanent fixture, such as a wall or a shelf, where it won't be disturbed, bumped, or damaged. Allow a minimum of five inches of clearance on all sides of the XR400.

WARNING

When installing the antenna, ensure a minimum separation distance of 23 cm between the antenna and human beings.

Mounting the XR400

1. Position the XR400 on the wall or shelf, ensuring five inches of clearance on all sides of the XR400.
2. Using the pre-drilled holes at the corners of the XR400 as a guide, drill four holes in the wall or shelf for mounting the reader. For mounting dimensions, see *Table A-1 on page A-3*.
3. Secure the XR400 to the wall or shelf using four 1-inch long #10 screws.

Connecting Antennas to the XR400

CAUTION

Power off the XR400 before connecting the antennas. Never disconnect the antennas while the XR400 is powered on or reading tags (when the yellow LED is lit). Doing so can damage the reader.

Do not turn on the antenna ports from a host to which antennas are not connected.

1. Attach the N-Male plug (large end) of an antenna connector cable to antenna 1.
2. Attach the DIN 1.0/2.3 jack connectors (small ends) of the cable to the TX_1 and RX_1 connectors on the XR400.
3. Secure the cable using wire ties. Do not bend the cable.

Repeat these steps to connect antenna 2 to Tx_2/Rx_2, antenna 3 to TX_3/RX_3, and antenna 4 to TX_4/RX_4.

Portal Setup

In portal situations such as dock doors, ensure the TX from one side of the portal faces the TX of the opposing antenna. Similarly, ensure the respective RXs face each other, as shown in Figure 2-2.

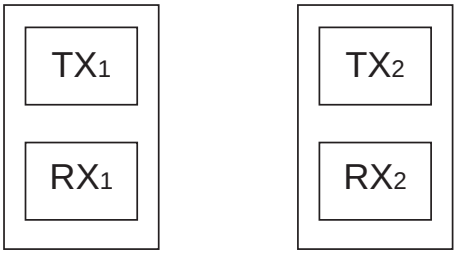

Figure 2-2. Portal Alignment

Powering the XR400

CAUTION

Connect the antennas before supplying power to the XR400.

To power on (and off) the XR400:

1. Connect the 24 VDC power supply (provided) to the XR400's unit power port.
2. Plug the power supply into a 24 V power outlet. The green Power LED on the XR400 lights to indicate the device is powered on.
3. To power off the XR400, unplug the power supply from the power outlet. The green Power LED turns off to indicate that the device is powered off and the system is not operational.

Verifying Hardware Functionality

Power On Test

The red Error LED lights when power is supplied to the XR400, then turns off. The green Power LED lights when the reader completes power-up and is operational.

Read Test

After the XR400 powers up, test the read range to verify that it meets requirements.

1. Enable polling using the Web-based XR400 Administrator Console**.** See *Scan Control on page 3-5*.
2. Control the XR400 through a real-time application such as TagVis. Refer to the *TagVis User Guide*.
3. Present a tag so it is facing the antenna.
4. Walk slowly toward the antenna until the XR400 lights the yellow Read LED to indicate that it detected and read the tag. The distance between the tag and the antenna is the approximate read range.

Note

For optimal read results, do not hold the tag at an angle or wave the tag, as this can cause the read distance to vary.

Connecting the XR400 for Communication

Connect the XR400 to a host or network via Ethernet, RS232, RS422, or USB Client.

Ethernet Connection

The XR400 communicates to the host via a 10/100Base-T Ethernet cable and receives power via a Symbol AC power supply. Ethernet connection allows access to the XR400's Administrator Console, used to change reader settings.

To connect the XR400 via Ethernet:

1. Connect the RJ45 Ethernet cable to the wired Ethernet port on the XR400. See *Figure 2-1 on page 2-3*. Ensure the Ethernet cable is terminated according to *Table A-2 on page A-5*.
2. Plug the other end of the Ethernet cable into the host system's LAN port.

   If not connecting to an Ethernet network, connect one end of an Ethernet crossover cable (not provided) to the Ethernet card on the computer, and the other end to the TCP/IP port on the XR400.
3. On a networked computer, open an Internet browser and enter the IP address of the XR400 (the default IP address of the XR400 is 192.168.127.254).
4. Log in to the XR400 Administrator Console. If desired, change settings for the XR400, such as the IP address. See *Chapter 3, Administrator Console*.

RS232 Connection

Serial communication allows accessing the reader's Administrator Console using terminal software in order to change reader settings. Use this method of administration rather than the Web-based method in the following situations:

- When the IP address of the reader is unknown.
- When the reader obtains IP address via DHCP but you need to know the IP address.
- When crossover cables are not available and you need to change the IP address of the reader as per the network's addressing scheme.
- Other situations when reader administration is necessary without connecting to the Web-based Administrator Console.
- The Web-based Administrator Console is disabled.

To connect the XR400 via RS232:

1. Connect an DB9 serial cable to the XR400's RS232 port. See *Figure 2-1 on page 2-3*. Ensure the cable is terminated according to *Table A-3 on page A-5*.
2. Plug the other end of the cable into the host computer.
3. On the host computer, launch a terminal emulation program (such as HyperTerminal) and configure it as follows:
   - Terminal Type: VT-100
   - Port: COM 1-4 (depending on the COM port used)
   - Terminal Settings:
     38400 bps transfer rate
     8 data bits
     no parity
     1 stop bit
     no flow control
     no hardware compression
4. After establishing a connection with the XR400, type *AdvancedReaderConsole* on the host computer and press Enter.

5. Enter *admin* as the username and *change* as the password. These are the default settings. You cannot change the password from the serial console. To change the password (or create a new user account) use the Web-based Administrator Console.

   The host displays the *Current Configuration* menu:

```
Current Configuration:
   Serial Number              : redacted
   MAC Address                : redacted

   1 -- DHCP                  : ON
   2 -- IP Address            : 192.168.127.254
   3 -- IP Port               : 3000
   4 -- Network Mask          : 255.255.255.0
   5 -- Gateway               : 192.168.1.1
   6 -- DNS Host              : 192.168.1.1
   7 -- HTTP Server is        : ON
   8 -- HTTP Port is          : 80
   9 --  Telnet Server        : Enabled
   10 --  FTP Server          : Enabled
   11 -- Watchdog             : Disabled
   12 -- Trusted Hosts Only   : OFF
   13 -- Commit Change
   14 -- Discard Change
   15 -- Exit
   16 -- Reboot
   17 -- Show system log
   18 -- Trace system log     : OFF


Select the menu number to change the item value:
```

6. To change a setting, enter the menu number, press **Enter**, then enter the new configuration value. For example, to change the IP address, enter **2** to select IP Address, then press **Enter**. Enter a new IP address value.
7. Enter **9**, then press **Enter,** to apply the change.

Reading Tags

To read tags while communicating with the host serially, connect the XR400's RS-422/485 interface to a serial port on the host computer. Symbol provides an RS485-to-USB SeaLevel converter box and cable which connects the reader to the host's USB port for serial communication.

To connect the reader to a host computer and read tags in real time, connect through TCP/IP and use a real-time application such as **TagVis**. Refer to the *TagVis Developer Guide*, or the user guide provided with the application.

3

Administrator Console

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Managing the XR400

The XR400 includes a Reader Administrator Console used to manage and configure the reader. Use a Web browser on a host PC to access the XR400's Administrator Console.

1. To access the Administrator Console, enter the IP address of the XR400 in a web browser. The Console's login window appears.

Figure 3-1. Console Login

2. If this is the first visit to the Console, enter the username *admin* and the password *change*. A second window prompts to change the password. Enter and confirm the new password, then click **Change**. Use this new password for subsequent visits to the Console.

   The Console's main menu window appears.

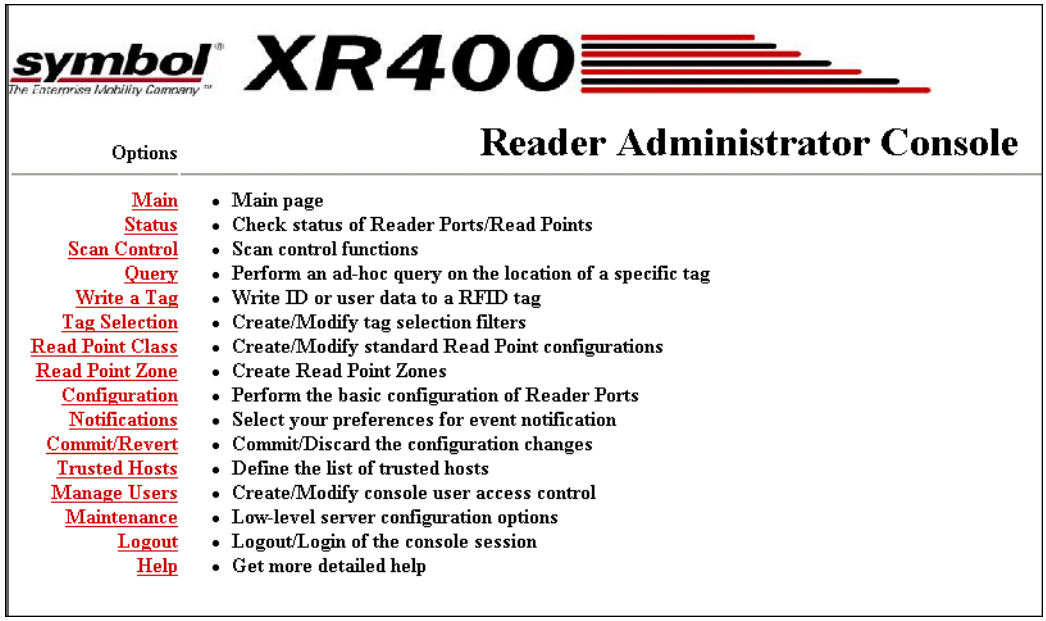

Figure 3-2. Console Main Menu

Status

Click **Status** on the Console main menu to view the *Reader Status* window, which displays information about read points and the XR400's kernel.

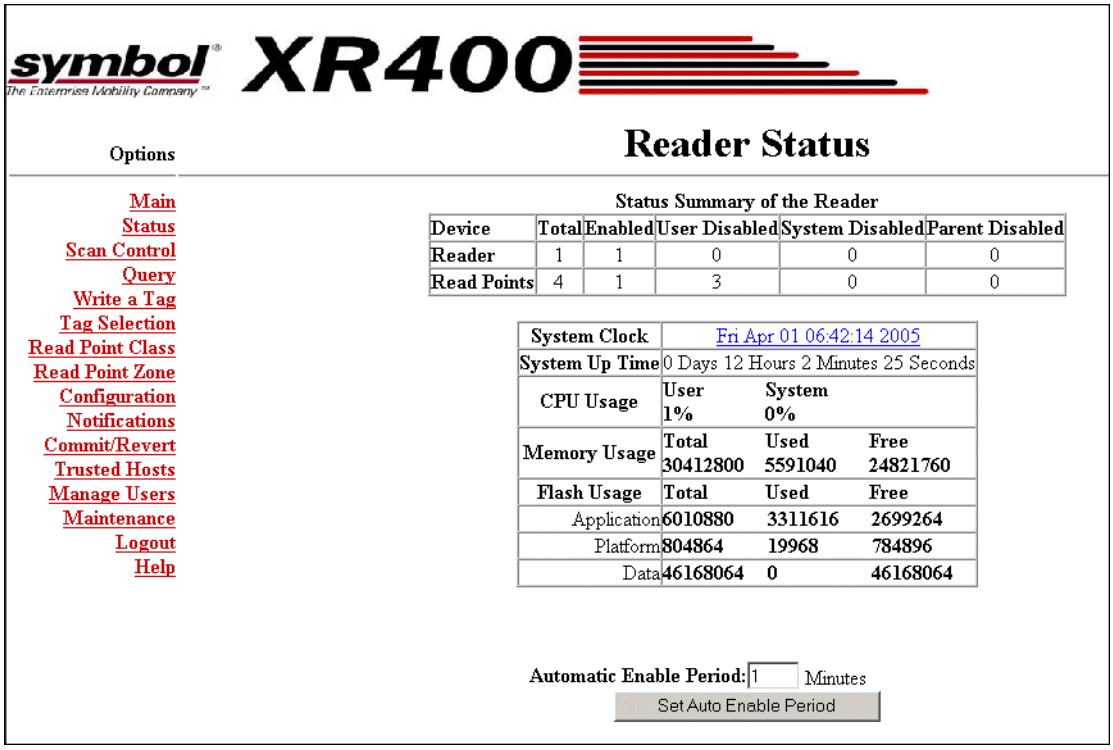

Figure 3-3. Reader Status Window

Table 3-1 describes the elements in the *Reader Status* window.

Table 3-1. Reader Status Window Elements

Item	Value Format	Description
Reader and Read Points		
Total	Number	Number of readers connected. Since a single reader is connected to the Administrator Console, this number is always 1
Enabled	Number	Total number of readers enabled for reading. Since a single reader is connected to the Administrator Console, this number is always 1 or 0 (if the reader is disabled).
User Disabled	Number	Number of user-disabled readers / read points. This value is always 1 or 0. For information on how to disable readers, see *Renaming, Enabling, and Disabling the Reader on page 3-23*.
System Disabled	Number	Number of system-disabled readers / read point. If a device becomes non-operational, the system disables it, but allows other system components to continue to operate. This value is always 1 or 0.
Parent Disabled	Number	Devices dependent on a non-operational parent device are marked Parent Disabled. For example, when a reader is system-disabled, its read points are marked parent disabled.

Table 3-1. Reader Status Window Elements (Continued)

Item	Value Format	Description
Reader Information		
System Clock	"[Weekday] [Month] [Day of the Month] [Hour:Minute:Second] [Year]	Time of the reader system clock. Click on this to change the time of the reader system clock.
System Up Time	"[Number of Day] [Number of Hour] [Number of Minute] [Number of Second]	The length of time that the reader has been running.
Memory Usage	Number of bytes	Total amount of device memory, and amount of memory in use and available.
Flash Usage	Number of bytes	Total amount of flash memory, and amount of memory in use and available. Also broken down by flash partitions (application, platform, and data).
Automatic Enable Period	Minutes	After the specified number of minutes the system attempts to enable any degraded device that was system-disabled.

Scan Control

Click **Scan Control** on the Console main menu to view the *Scan Control* window, which allows initiating an on-demand scan and enabling / disabling polled read points. For periodic read points, the window displays when the next scan is scheduled.

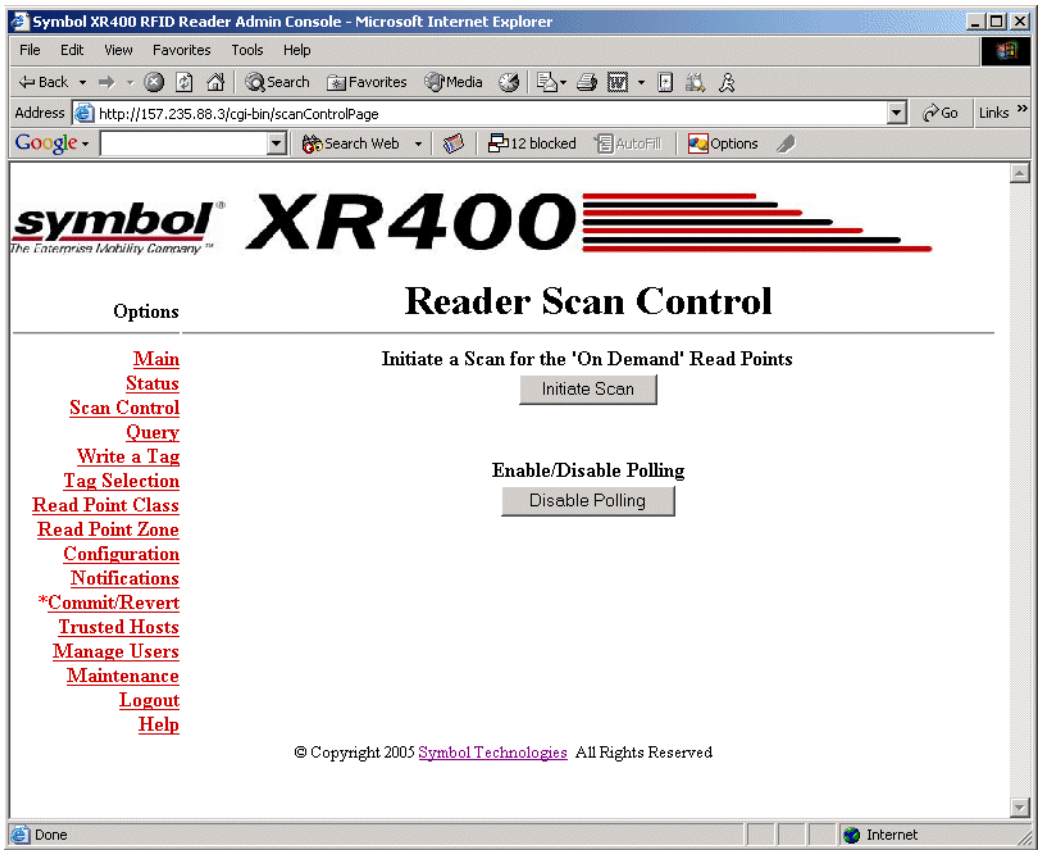

Figure 3-4. Scan Control Window

To initiate a scan for on-demand read points click **Initiate Scan**.

To enable or disable polling for polled read points click **Enable Polling** or **Disable Polling**.

Scheduling a Periodic Scan Read Point

To schedule a periodic scan for a read point, modify the read point class setting:

1. Click **Read Point Class**.

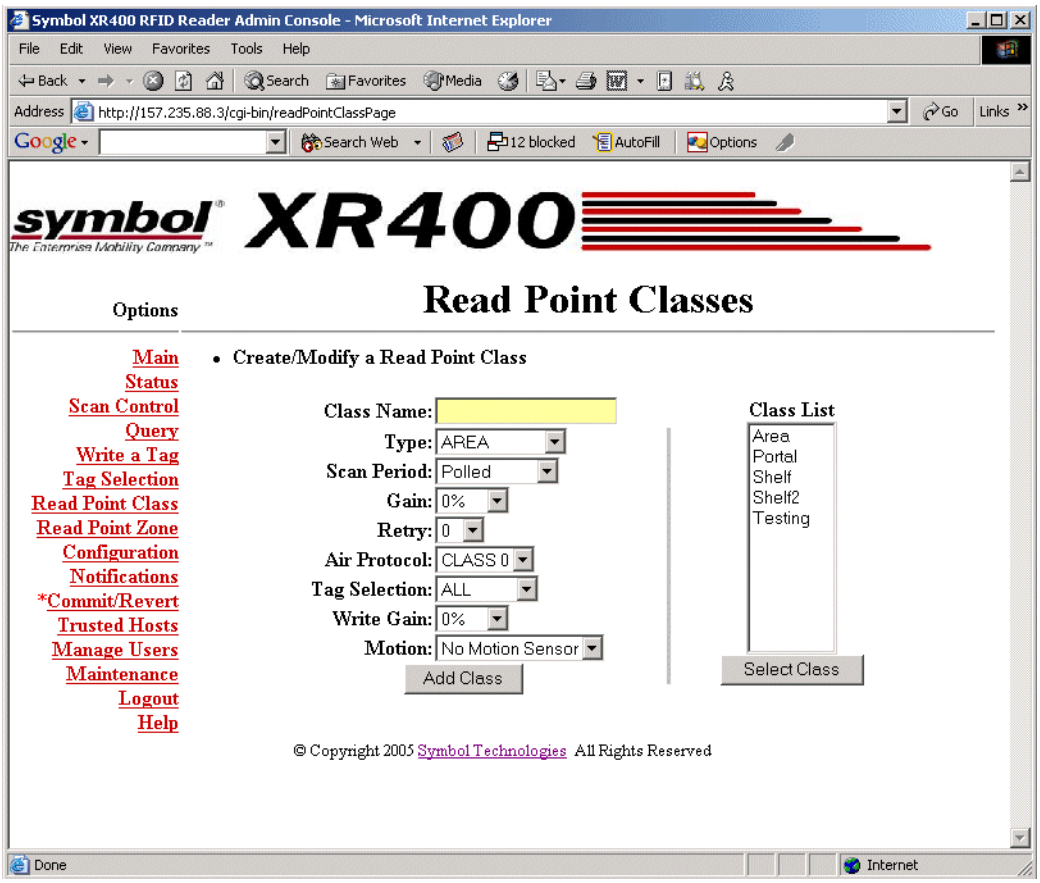

Figure 3-5. Read Point Classes Window

2. Enter a name for the read point class in the *Class Name:* field.
3. Select the antenna type from the *Type:* drop-down list. Options are *AREA* (long range), *COMBINED* (for when operating on portals or areas where multiple read points cover the same space), *SHELFv1* (existing short range shelf type), or *SHELFv2* (next-generation short range shelf type).
4. In the *Scan Period:* drop-down list select how often to scan a read point for tags. Options are:
   - **On Demand**: Only scan read points when the user initiates a scan request.
   - **Polled**: Scan read points continuously.
   - **Periodic**: Select the time interval for which to scan read points.
5. In the *Gain:* drop-down list select the gain (a percentage) to designate the antenna's power setting for reading RFID tags.
6. Select how many times to repeat the read command when performing a scan from the *Retry:* drop-down list.
7. Select the type of tags to read from the *Air Protocol:* drop-down list. Options are *CLASS 0, CLASS 1*, or *ALL*.
8. Select a filter from the *Tag Selection:* drop-down list to specify which tags to read. See *Query on page 3-10* for information on creating filters.
9. In the *Write Gain:* drop-down list select the gain (a percentage) to designate the antenna's power setting for writing RFID tags.

10. Select which motions sensors, if any, are used from the *Motion:* drop-down list.
11. Click **Add Class**. The new class appears in the *Class List*.
12. Click **Commit / Revert**. See *Committing / Discarding Changes on page 3-27*.
13. Click **Configuration**. The Configuration window displays a list of antennas (read points).

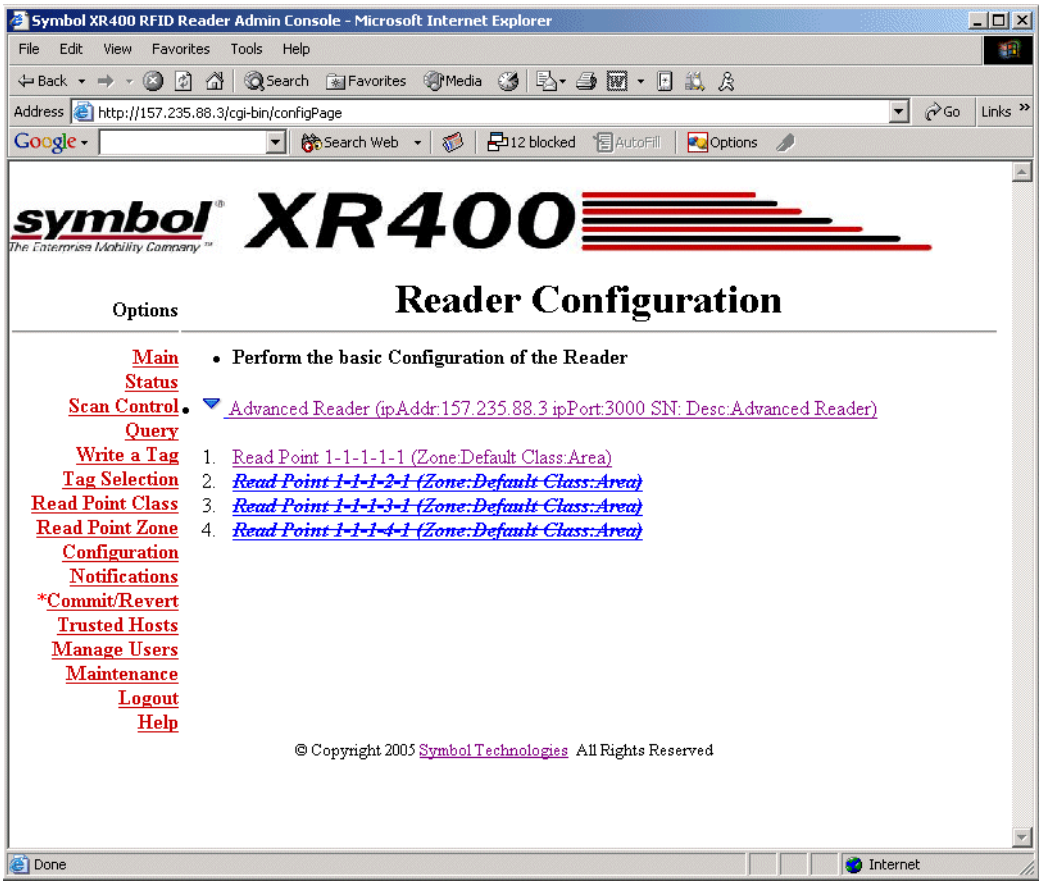

Figure 3-6. Reader Configuration Window

14. Select the read point on which to schedule periodic scans. The following window provides details about the read point.

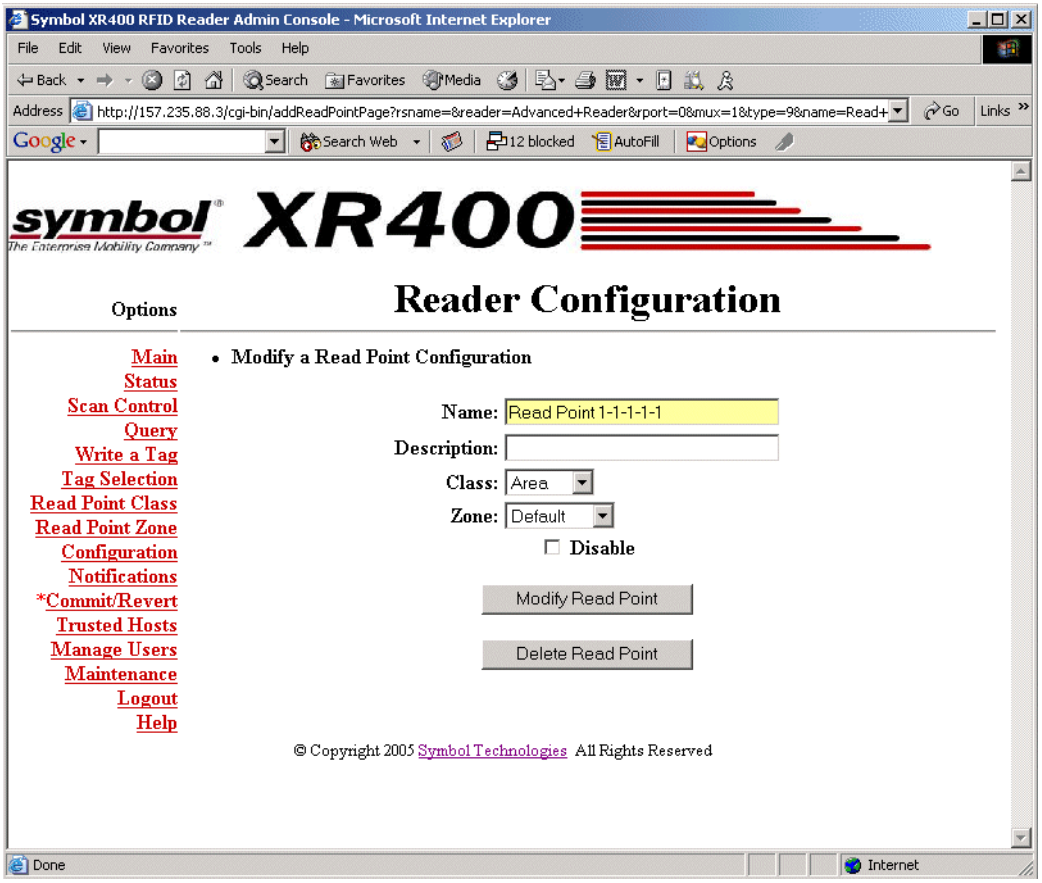

Figure 3-7. Read Point Configuration Window

15. Select the new read point class from the *Class:* drop-down list. This associates the read point with the new read point class.
16. Click **Modify Read Point**, then **Commit/Revert** to apply the changes. See *Committing / Discarding Changes on page 3-27*.

17. Click **Scan Control** to open the *Scan Control* window. This window indicates when the next periodic scan is scheduled.

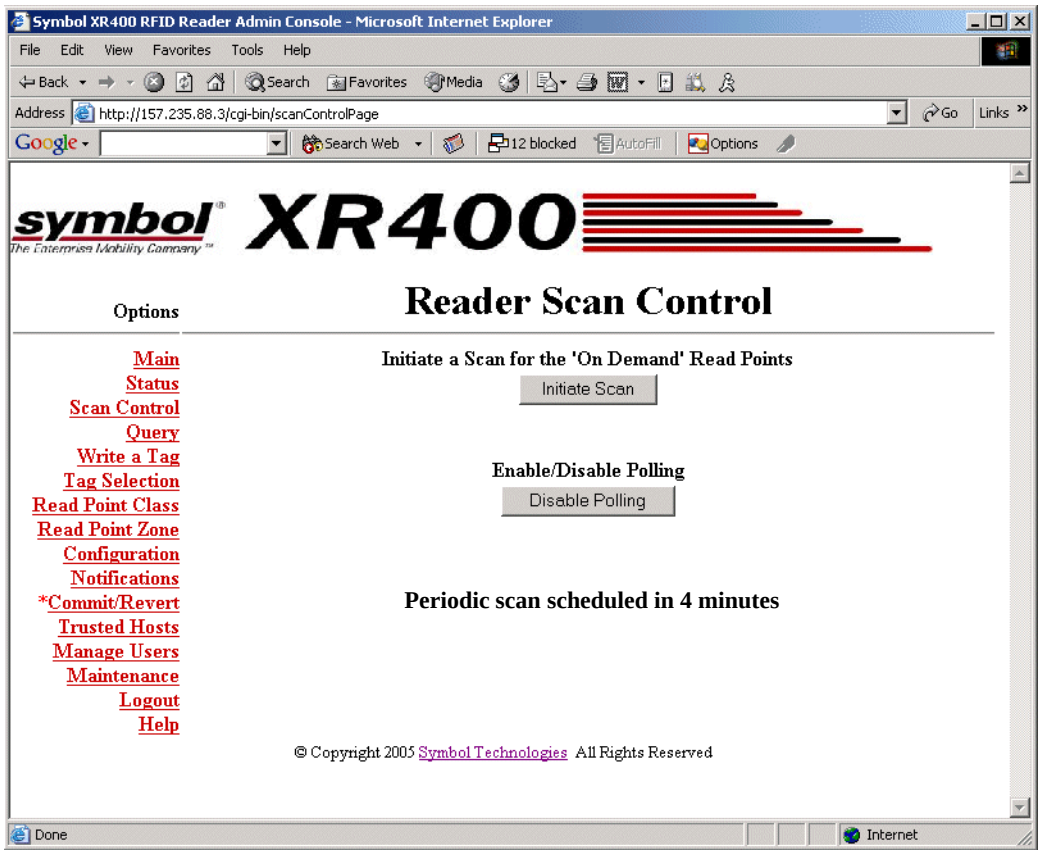

Figure 3-8. Reader Scan Control Window

Query

Use the query feature to read tags and get their status information. The reader replies with one of the following tag status indications:

- The tag is not known to the system. (The tag was never seen or imported.)
- The tag is not visible to the system. (The tag is known to the system, but is currently not visible to any read point.)
- The tag is visible at one or more read points. (A list of read points where the tag can be seen displays.)

The tag ID and the type of the tag is required to query a tag. To obtain the tag ID and type of all tags the reader is reading:

1. Enable polling at the reader and configure read point classes as polled classes.
2. Open a new browser window and enter the following URL: http://[Reader IP Address] /cgi-bin/dataProxy?oper=queryTags XML containing the tag ID and type of all tags being read appears.

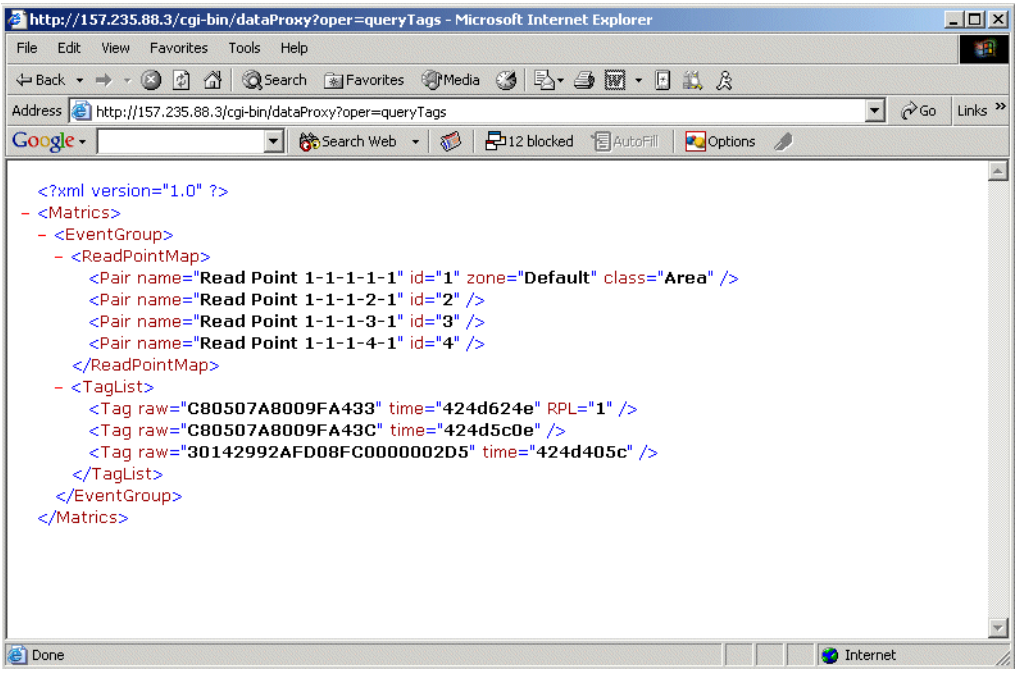

Figure 3-9. Query Tags XML Window

3. Note the ID and type of the tag to query.
4. Open the Administrator Console and click **Query**.
5. Enter the type and ID from Step 3 in the *Type:* and *Id:* fields.

6. Click **Submit Query**. The XR400 responds with the read point of the antenna that is reading the tag.

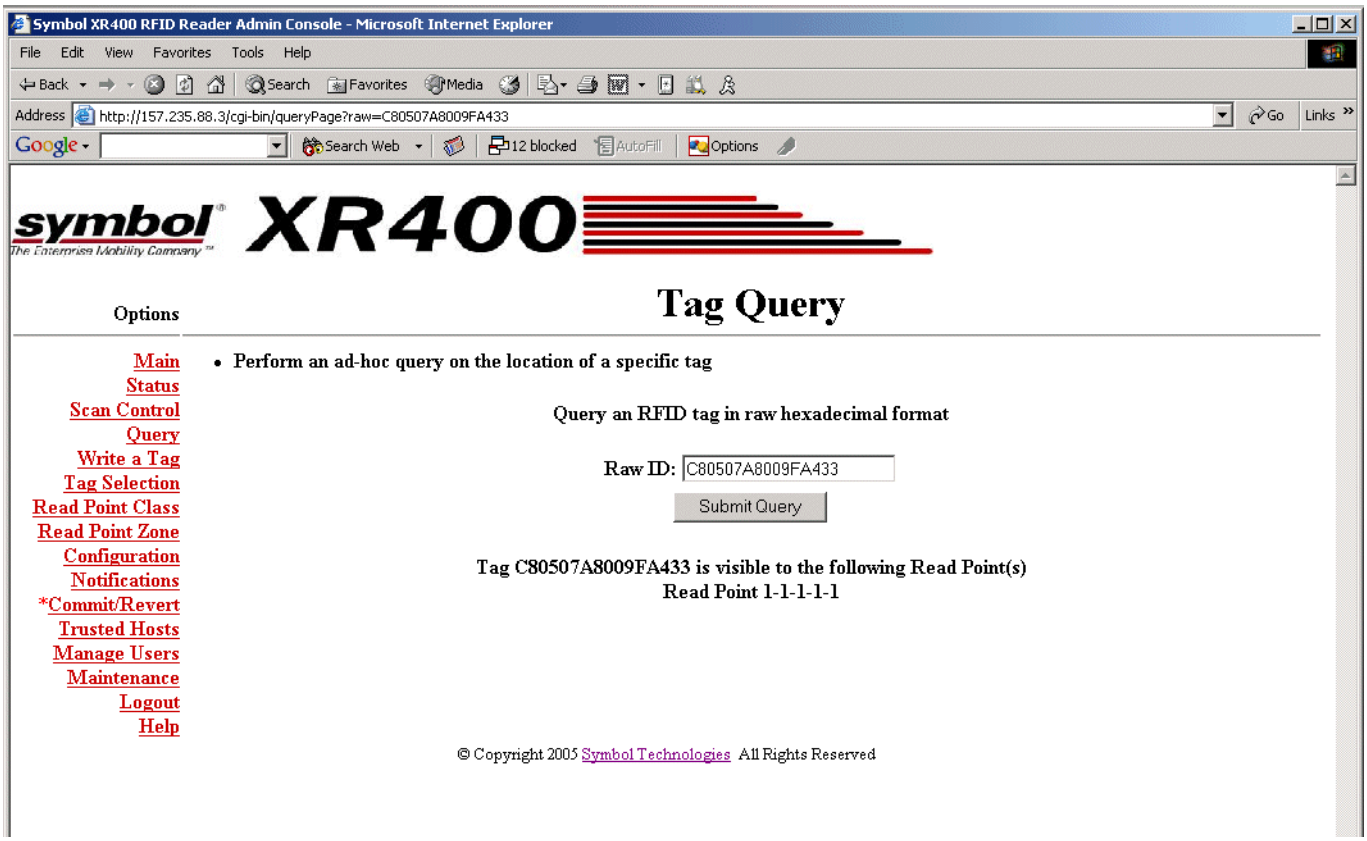

Figure 3-10. Tag Query Window

Writing a Tag

Use the *Write a Tag* option to perform the following with a R/W tag:

- Write, erase, and/or lock the tag ID.
- Write, erase, and/or lock the user data.
- Write or lock a kill code.
- Kill a tag.

To write a tag:

1. Click **Write a Tag**.

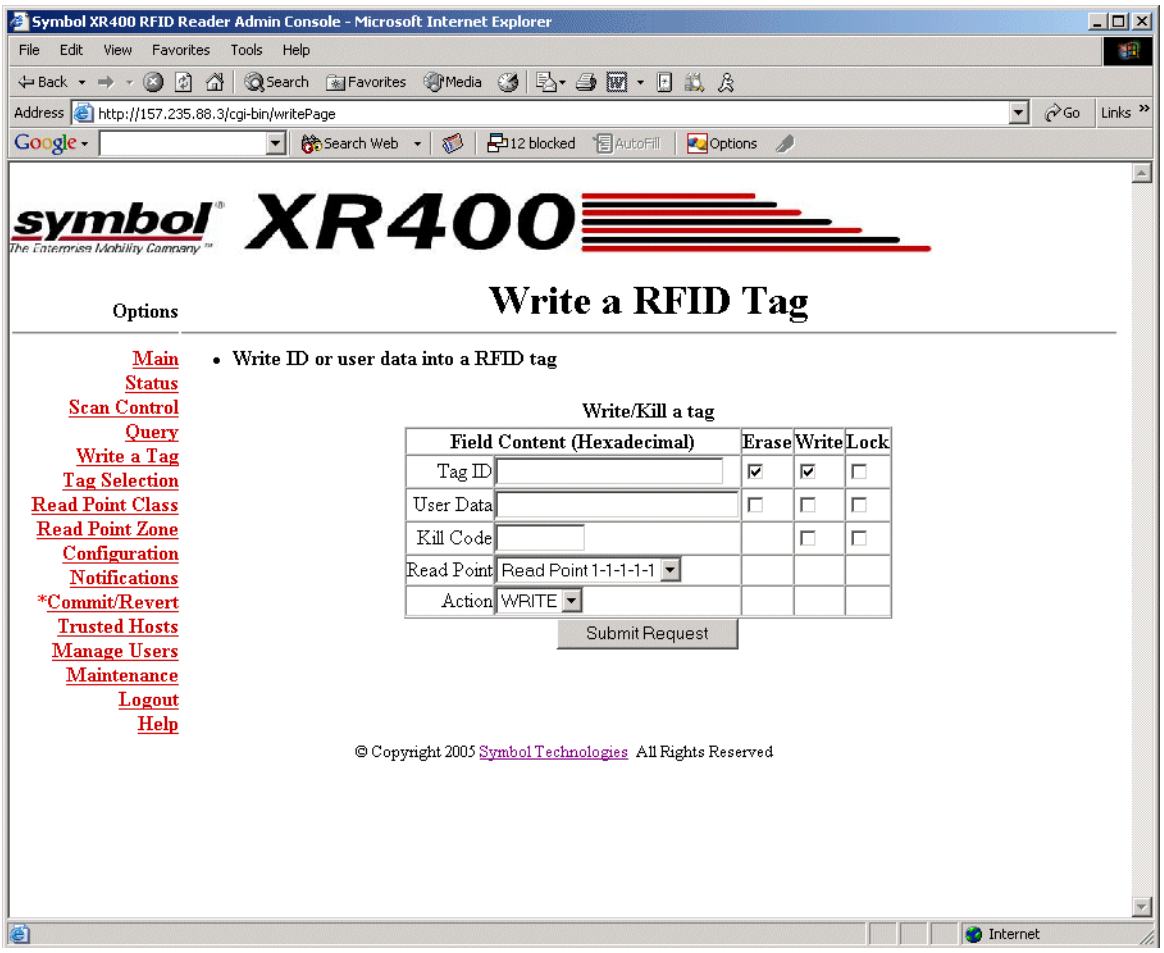

Figure 3-11. Write an RFID Tag Window

2. Enter the *TagID* to write on the tag. If the tag already contains an ID, select the *Erase* and *Write* checkboxes next to the *Tag ID* field to overwrite it.

   To disable changes of the tag ID select the *Lock* checkbox next to the *Tag ID* field.
3. Enter the data to write on the tag in the *User Data* field. If the tag already contains user data select the *Erase* and *Write* checkboxes next to this field to overwrite it.

   To disable changes of the user data select the *Lock* checkbox next to the *User Data* field.

4. To write a kill code, enter six hex digits in the *Kill Code* field. To lock the kill code select the *Write* and *Lock* checkboxes.
5. Select the antenna port to use for the write operation from the *Read Point* drop-down list.
6. Select whether to write information on a tag or kill a tag from the *Action* drop-down list.

Writing Tips

Before writing to tags consider the following tips:

- Locking a tag ID and/or user data prevents further erasing and writing the tag ID and user data on this tag.
- After writing and locking the kill code, the kill code is required to kill the tag.
- Killing a tag voids it for all read and write operations, rendering it useless for future operations.

Filtering

The XR400 allows setting filters based on rules and then associating the filters with a specific read point. This prevents the reader from reporting specific tags. Filtering out tags involves the following steps:

- Creating a filter rule
- Creating a filter and associating it with the rule
- Associating a filter to a read point class
- Associating a read point class to an antenna.

The following sections describe these processes.

Creating a Filter Rule

To create a filter rule:

1. Click **Tag Selection**.

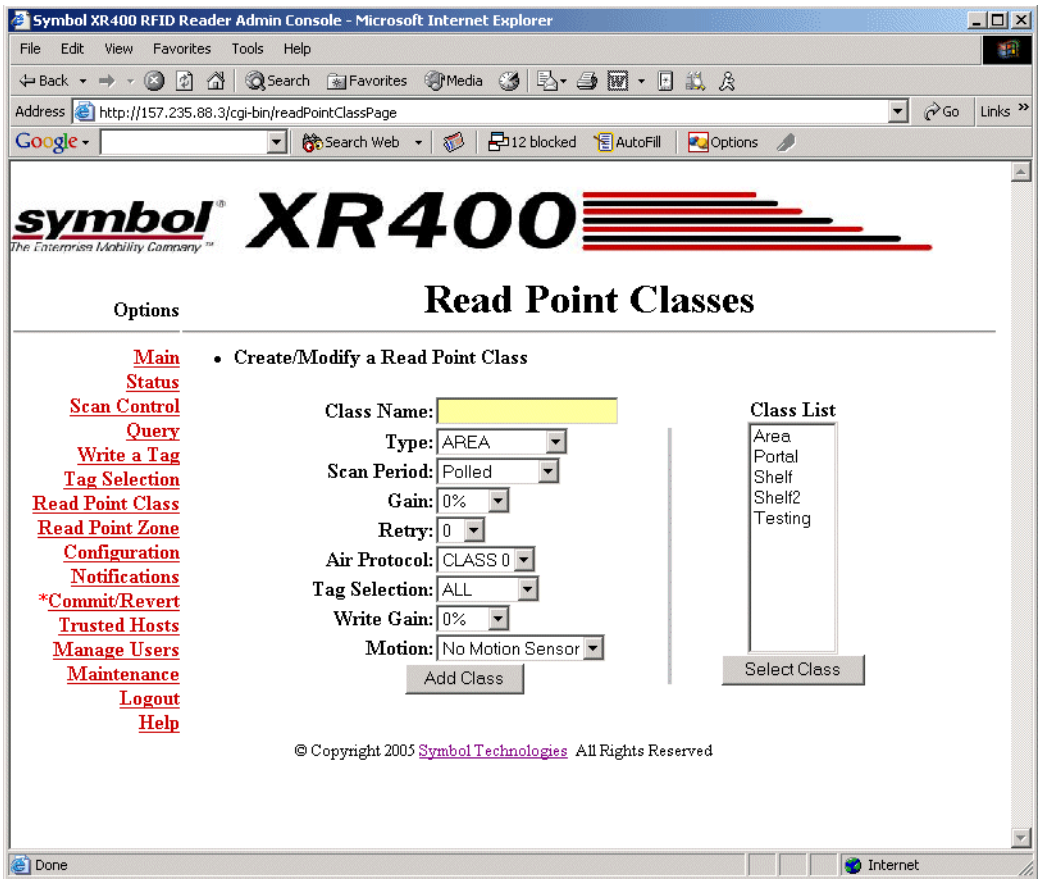

Figure 3-12. Tag Selection Filter Window

2. Click **Create A New Rule**.

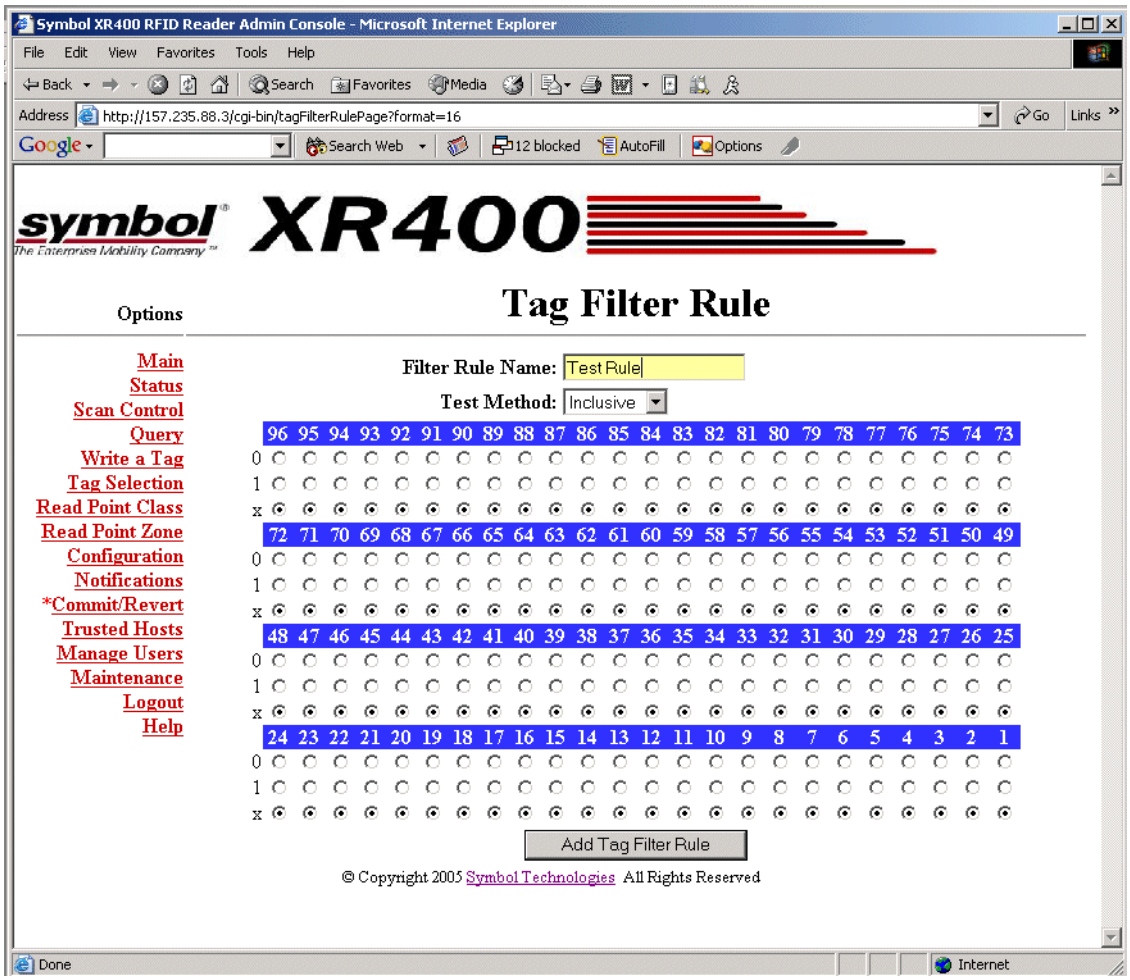

Figure 3-13. Tag Filter Rule Window

3. Choose the values for specific bits on which to base the filter.
4. Enter a name for the rule in the *Filter Rule Name:* field.
5. Select an option from the *Test Method* drop-down list. *Inclusive* indicates that all tags matching the rule are reported. *Exclusive* indicates that all tags matching the rule are not reported.
6. Click **Add Tag Filter Rule** to return to the *Tag Selection Filter* window. The new rule appears in the *Tag Filter Rule List*.
7. Enter a name for the filter in the *Name:* field.

8. Click **Create a New Filter**.

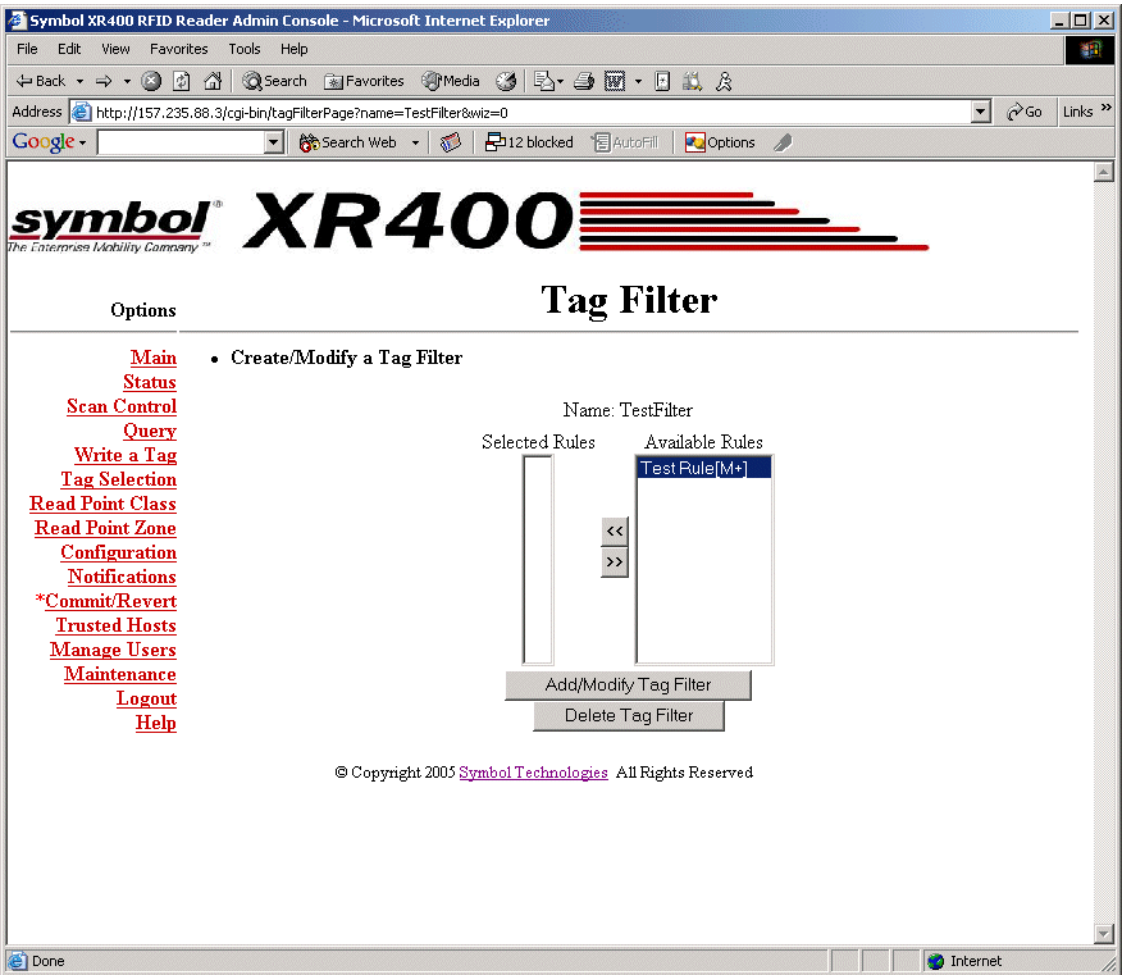

Figure 3-14. Tag Filter Window

9. Select the new rule from the *Available Rules* list and click **<<**. The rule moves to the *Selected Rules* list, adding it to the filter.
10. Click **Add/Modify Tag Filter**. The *Tag Selection Filter* window appears with the new filter in the *Tag Filter List*.
11. Click **Commit/Revert** to apply the changes. See *Committing / Discarding Changes on page 3-27*.

12. Click on **Read Point Class**.

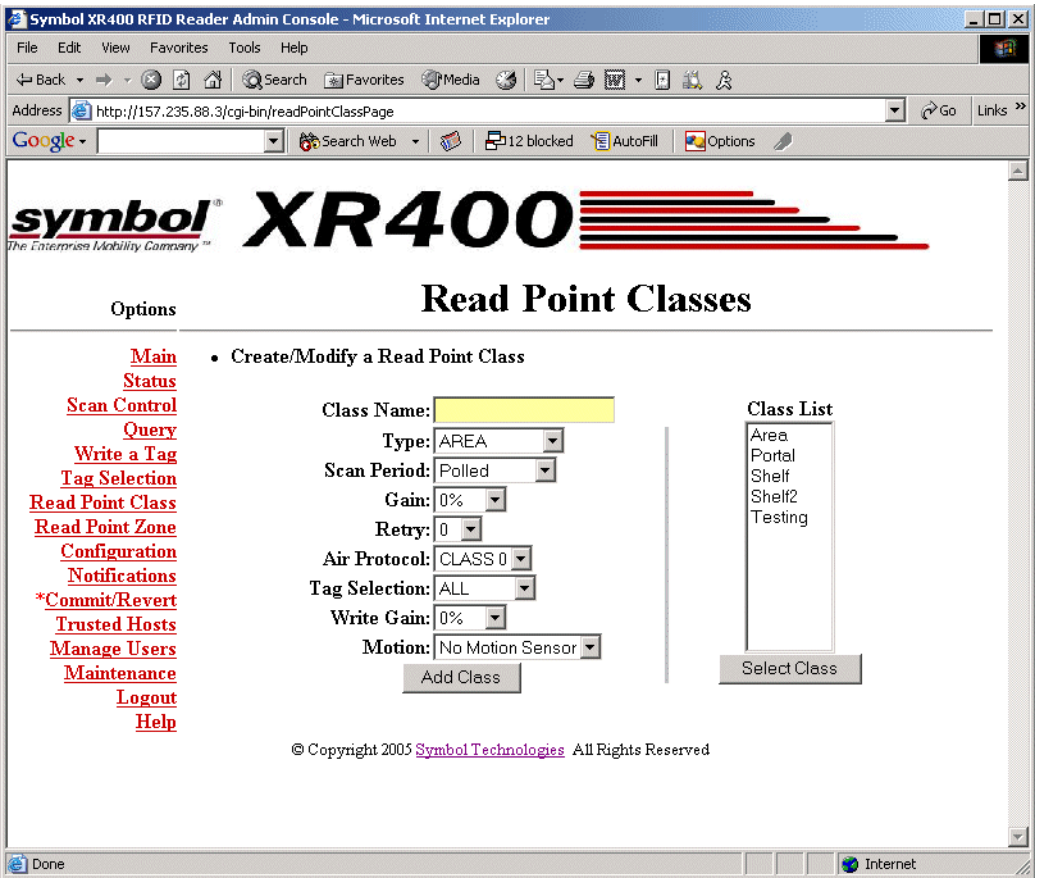

Figure 3-15. Read Point Classes Window

13. Enter a class name in the *Class Name:* field.
14. Select settings for the class from the drop-down lists. See *Scheduling a Periodic Scan Read Point on page 3-6*.
15. Select the new filter from the *Tag Selection* drop-down list.
16. Click **Add/Modify Class**.
17. Click **Commit/Revert** to apply the changes. See *Committing / Discarding Changes on page 3-27*.

18. Click **Configuration**.

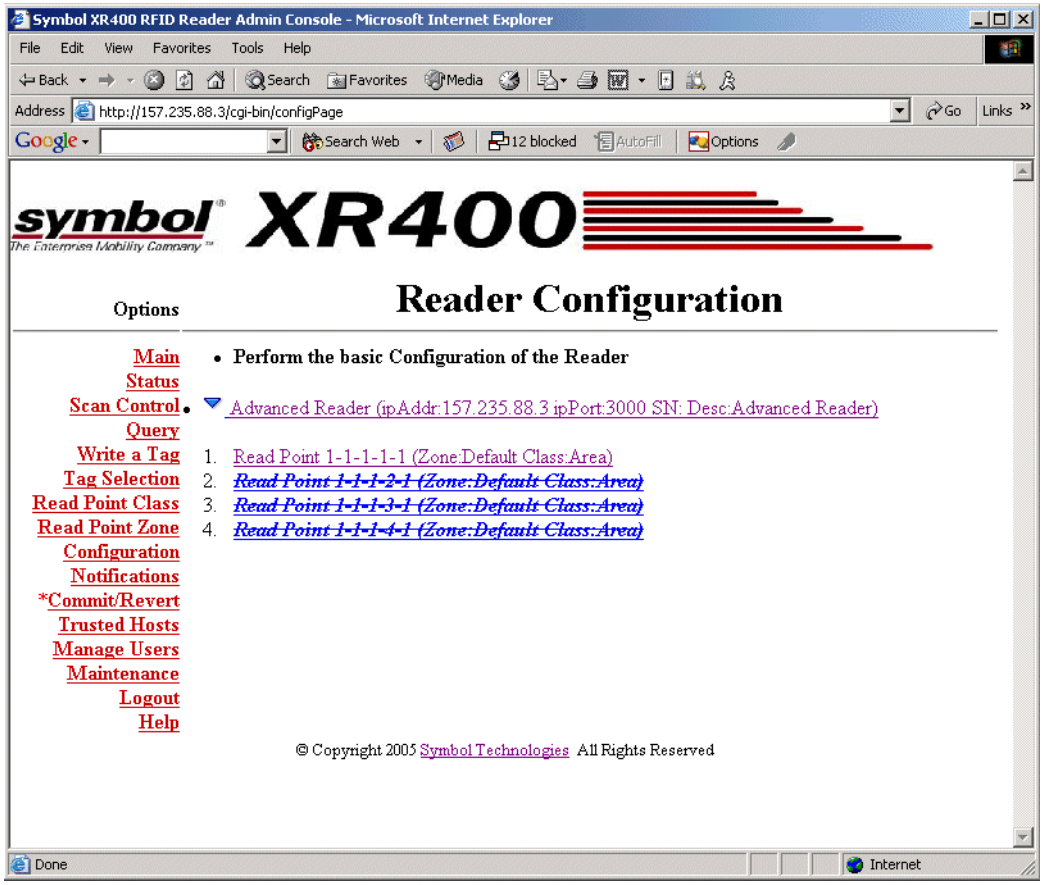

Figure 3-16. Selecting a Read Point

19. Select the read point with which to associate the new filter.

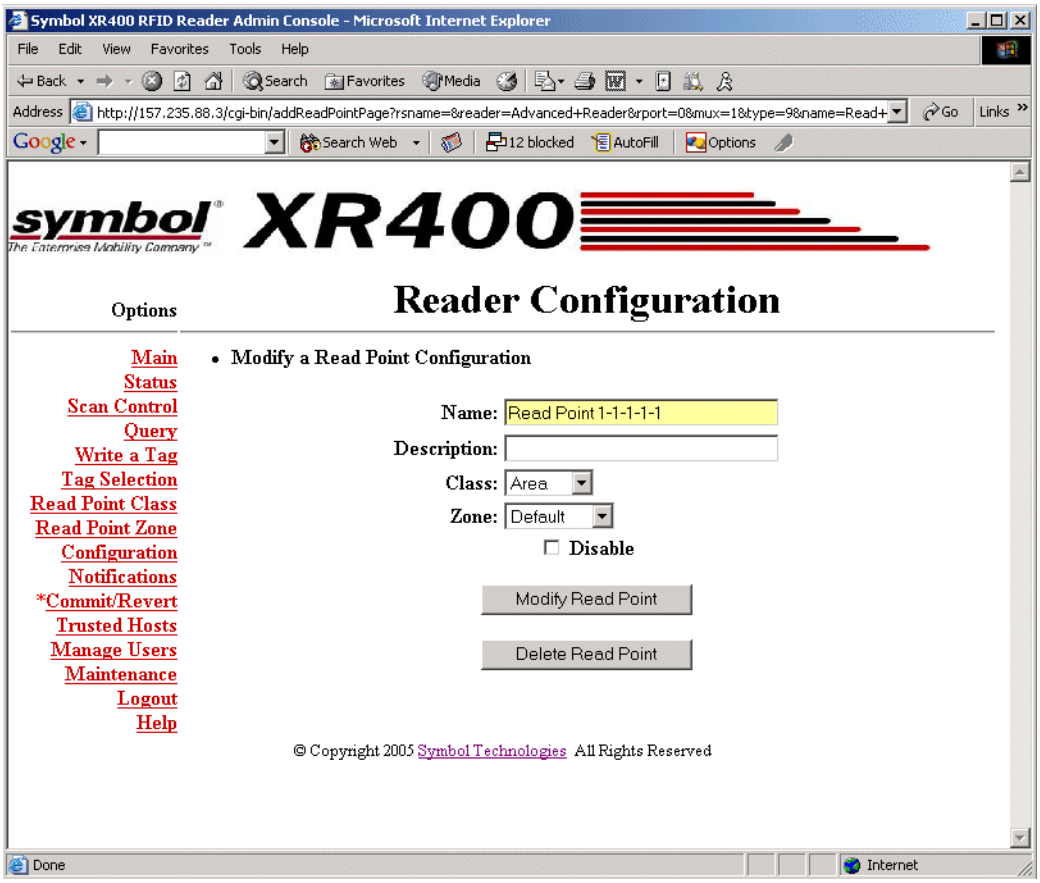

Figure 3-17. Modifying Read Point Configuration

20. Select the new class which contains the new filter from the *Class* drop-down list.
21. Click **Modify Read Point**. The Reader Configuration window displays the new read point class associated with the selected antenna. The selected read point of the reader now reports tags as per the selected rule.

Read Point Classes

Read point classes are a set of configuration parameters assigned to one or more read points (antennas). Create a read point class in one of two ways:

- Create a new read point class by defining the class.
- Use an existing read point class as a template, copy it, change its settings, and save the new class with a different name.

The XR400 includes several read point classes to use as templates. To create a new class based on one of the existing classes:

1. Click **Read Point Class**.

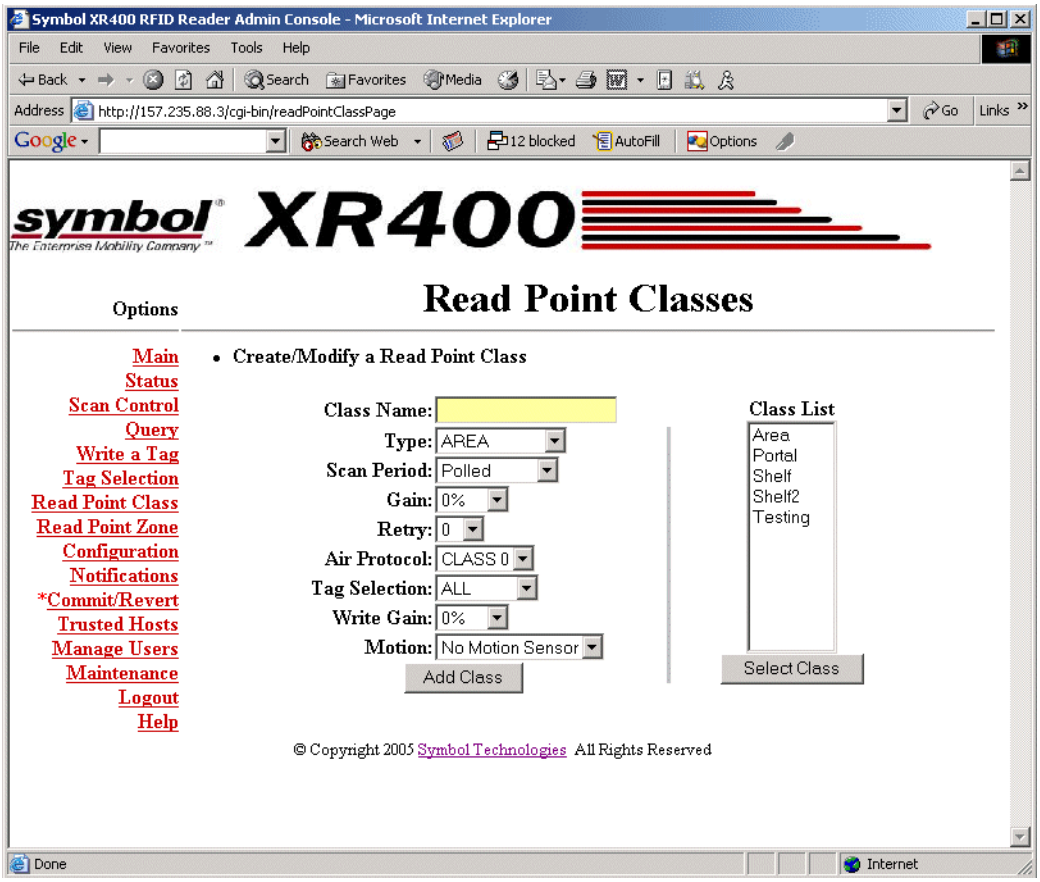

Figure 3-18. Creating a New Read Point Class

2. Select a class from the *Class List* and click **Select Class** to display the settings of this class.
3. Enter a new name in the *Class Name:* field.
4. Select settings for the class from the drop-down lists. See *Scheduling a Periodic Scan Read Point on page 3-6*.
5. Click **Add Class**.

Read Point Zones

Read point zones provide a logical way of grouping one or more read points on the same reader or across readers. A read point zone facilitates arbitrary user aggregations of read points.

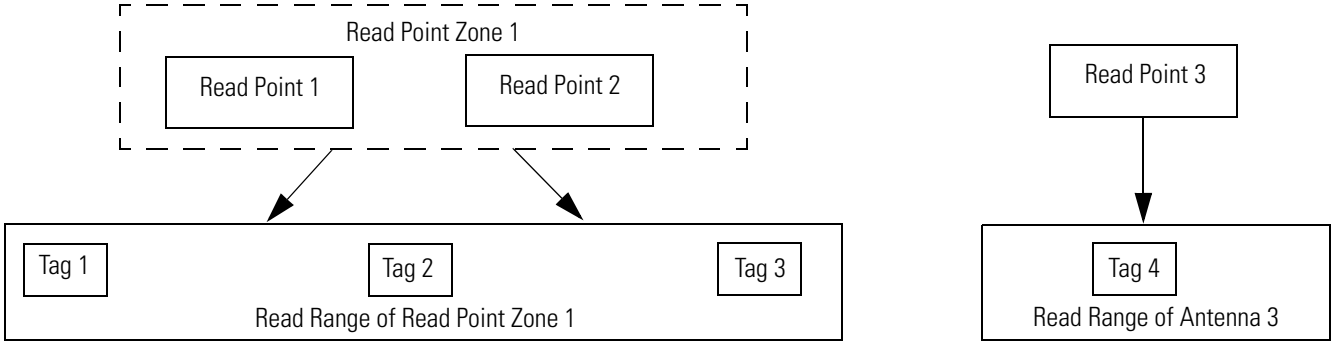

Figure 3-19. Read Point Zone Diagram

In Figure 3-19 Read Point 1 and 2 are logically grouped using Read Point Zone 1. Tags read by either read point are reported as read by Read Point Zone 1. Similarly, read point class names can also facilitate aggression. This section describes how to configure and administer read point zones.

Adding and modifying Read Point Zones

To create a zone:

1. Click **Read Point Zone**.

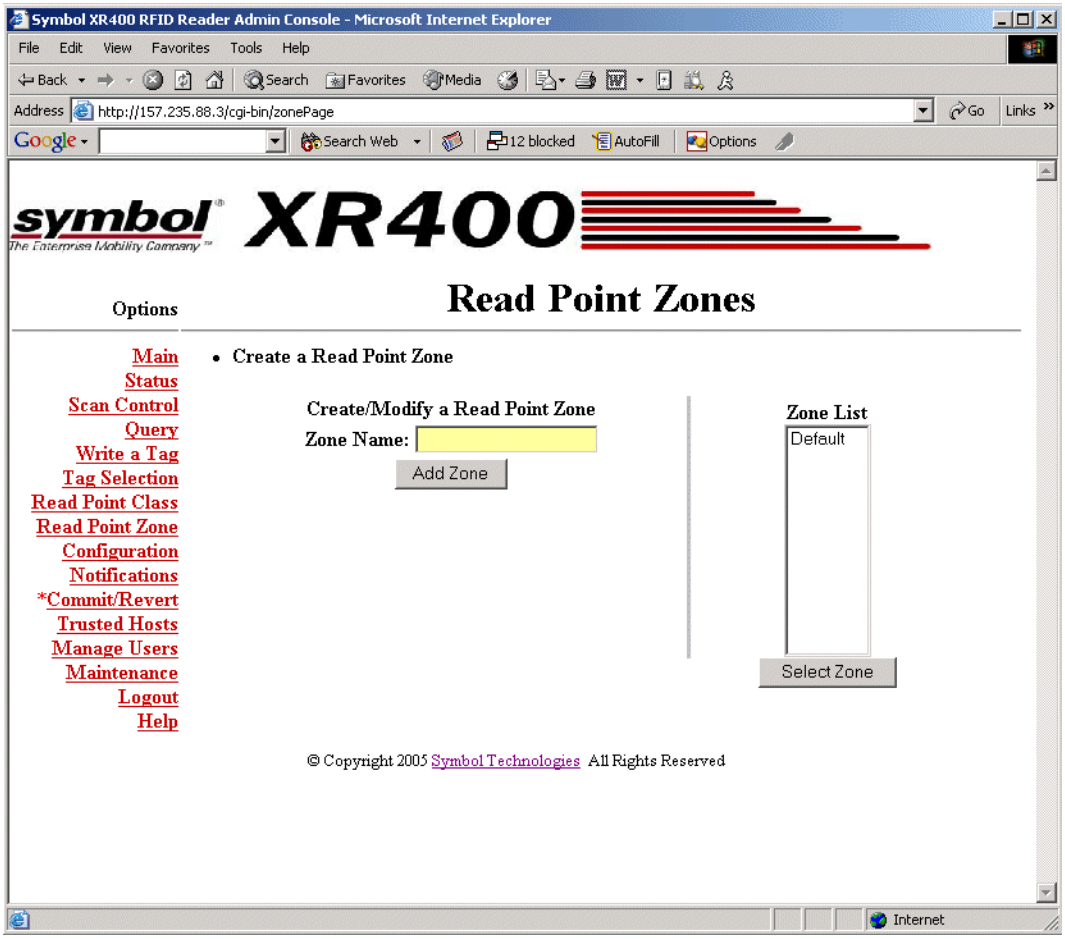

Figure 3-20. Read Point Zone Diagram

2. Manage read point zones as follows:
   - To add a zone, enter a name for the zone in the *Zone Name:* field and click **Add Zone**.
   - To change the name of a zone, select the zone name from the *Zone List* and click **Select Zone**. Enter a new name for the zone in the *Zone Name:* field and click **Modify Zone** to update the *Zone List*.
   - To delete the zone being modified, click **Delete Zone**.

Renaming, Enabling, and Disabling the Reader

Assign a new name and description to the XR400 to use later to identify readers on the network. If desired, disable the reader for all future operations.

To rename or disable a reader:

1. Click **Configuration**.

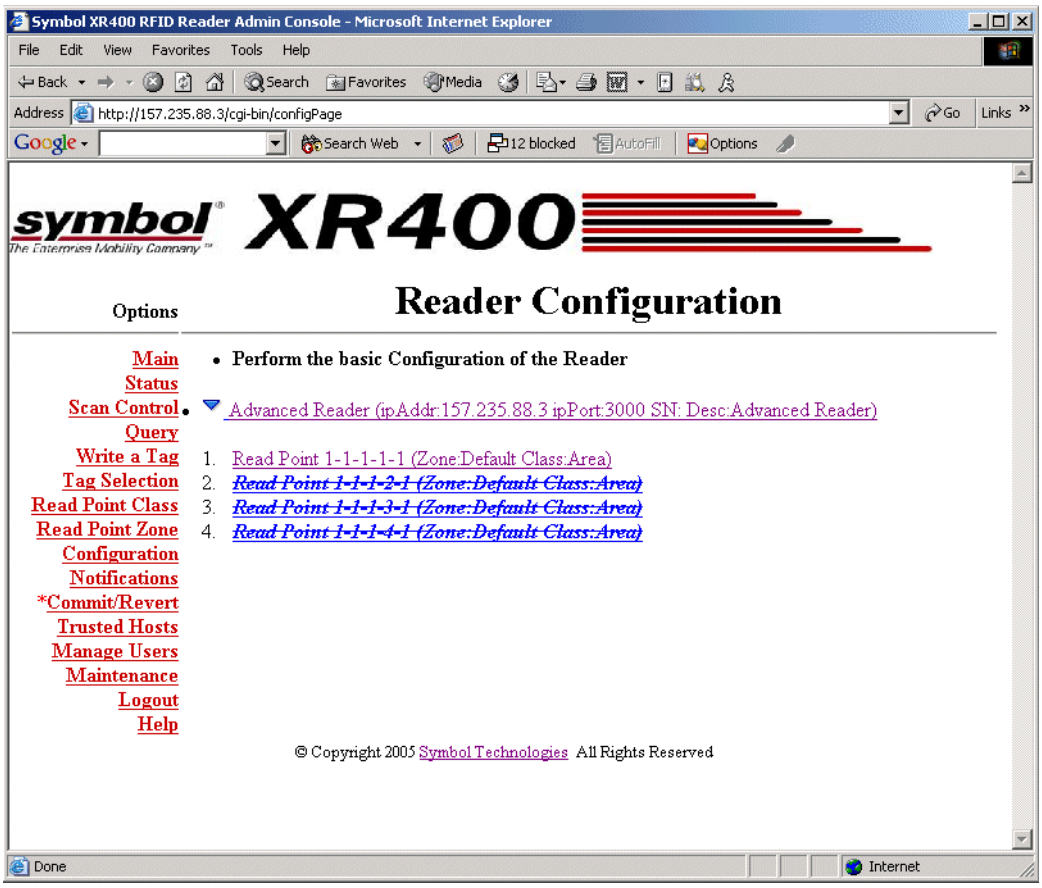

Figure 3-21. Reader Configuration Window

2. Select the reader to modify.

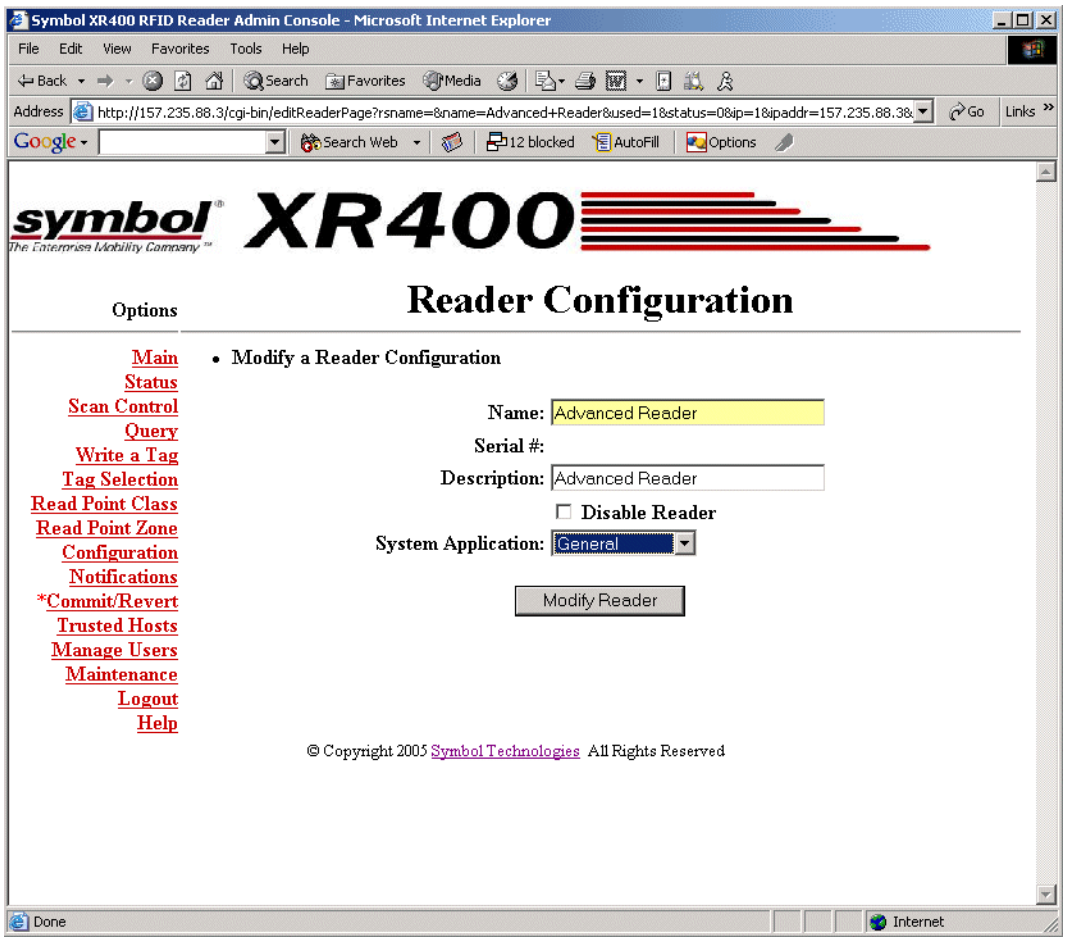

Figure 3-22. Modify Reader Configuration Window

3. To modify the name and description of the reader, enter this information in the *Name:* and *Description:* fields. Note that the serial number cannot be modified.
4. To disable the reader, select the *Disable Reader* checkbox.
5. Click **Modify Reader**.

Configuring Individual Read Points

The *Reader Configuration* window also allows configuring and managing read points connected to the reader. To manage an antenna:

1. Select the specific read point from the *Reader Configuration* window, shown in Figure 3-21.
2. Clicking on a specific read points opens up the following window that allows you to associate that read point with a class and a read point zone.

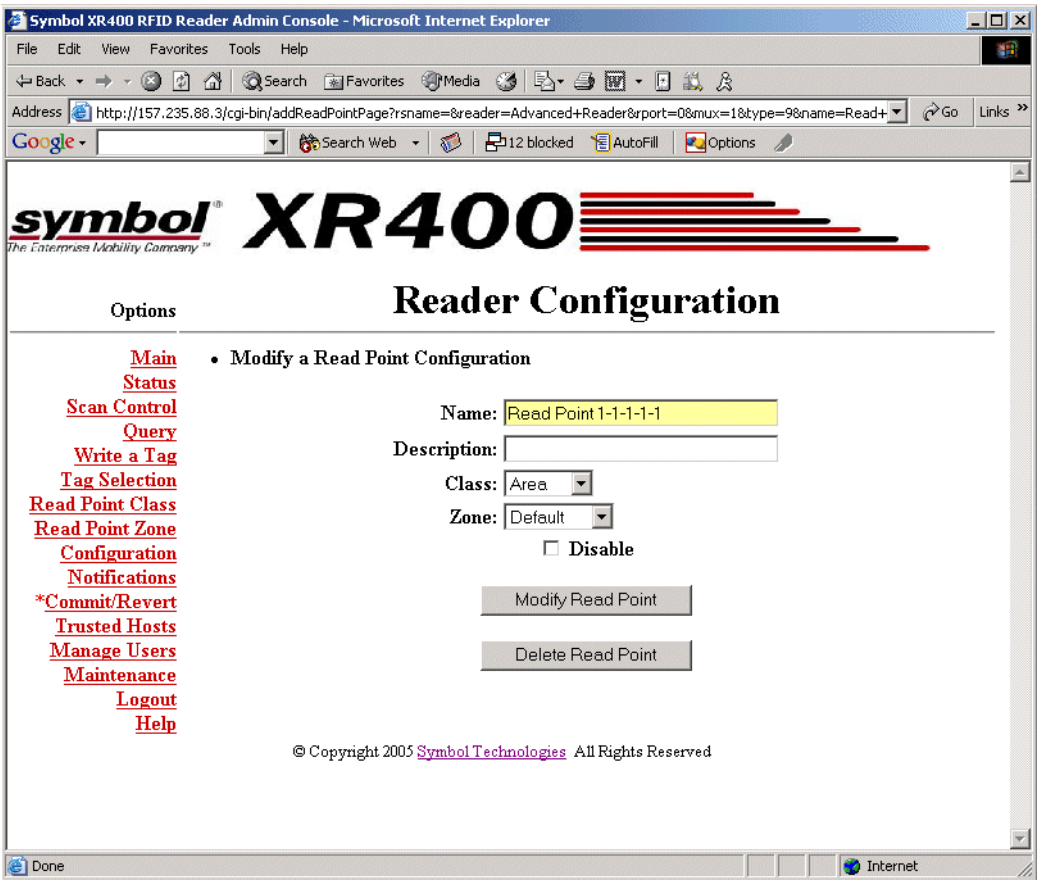

Figure 3-23. Modify Read Point Configuration Window

3. If desired, enter a new name and description in the *Name:* and *Description:* fields.
4. Select an associated read point class and zone from the *Class:* and *Zone:* drop-down lists.
5. Click **Commit/Revert** to save the changes. See *Committing / Discarding Changes on page 3-27*.

Event Notification

The XR400 reader provides notification when particular events occur. Select the events to subscribe to using the *Event Notification* window. Select whether to receive event notifications, and select from three different types of events:

- Visibility events
- Threshold events
- Network status events.

Visibility Events

These events occur when tag visibility changes. There are three types of visibility events:

- **New tag event**: occurs every time the XR400 reads a new tag.
- **Tag not visible event**: occurs when the system knows about the tag but the tag is no longer visible.
- **Visibility changed event**: a generic event that occurs when the read point that read the tag changes.

Threshold Event

Threshold events occur when the number of visible tags drops below or rises above a threshold specified via a tag list notification reply.

Network Status Event

Network status events indicate a change in reader status, e.g., a problem with the reader. There are two types of network status events:

- Device
- Program.

Device events can indicate whether the status change is reported for device or in association with a parent device. For example for a disabled reader, the reader receives a 'user/disable' status notification, and the read point(s) associated with the reader receive a 'user/disable/parent' notification.

Similarly, if a device fault occurs for the reader, all corresponding events for the device fault also occur for each read point associated with that reader. After correcting the fault, enabling the reader also enables 'parent disabled' devices associated with it.

Exception Events

Exception events provide the same type of information available via SNMP, but using XML. An exception event provides information when a device goes off-line, polling is turned off, etc. Select this option if there is no SNMP support, but you require notification if the device/program changes state.

The *Event Notification* window provides the following parameters:

- Host Notification: web-based notifications of events are sent to this link. Typically this is the URL of the web server which is running an application which can trap and display these notifications.
- Send SNMP Trap To: This is the IP address of the SNMP server to which to send event traps.

Committing / Discarding Changes

To apply reader configuration modifications made using the Reader Administrator Console, click **Commit/Revert** to save these changes and notify the reader to update its configuration file, which updates the physical reader configuration. While a successful update can take several seconds, the system continues to operate with only a one or two-second period where no polling occurs.

To save changes when using the Reader Administrator Console:

1. Click **Commit/Revert**.

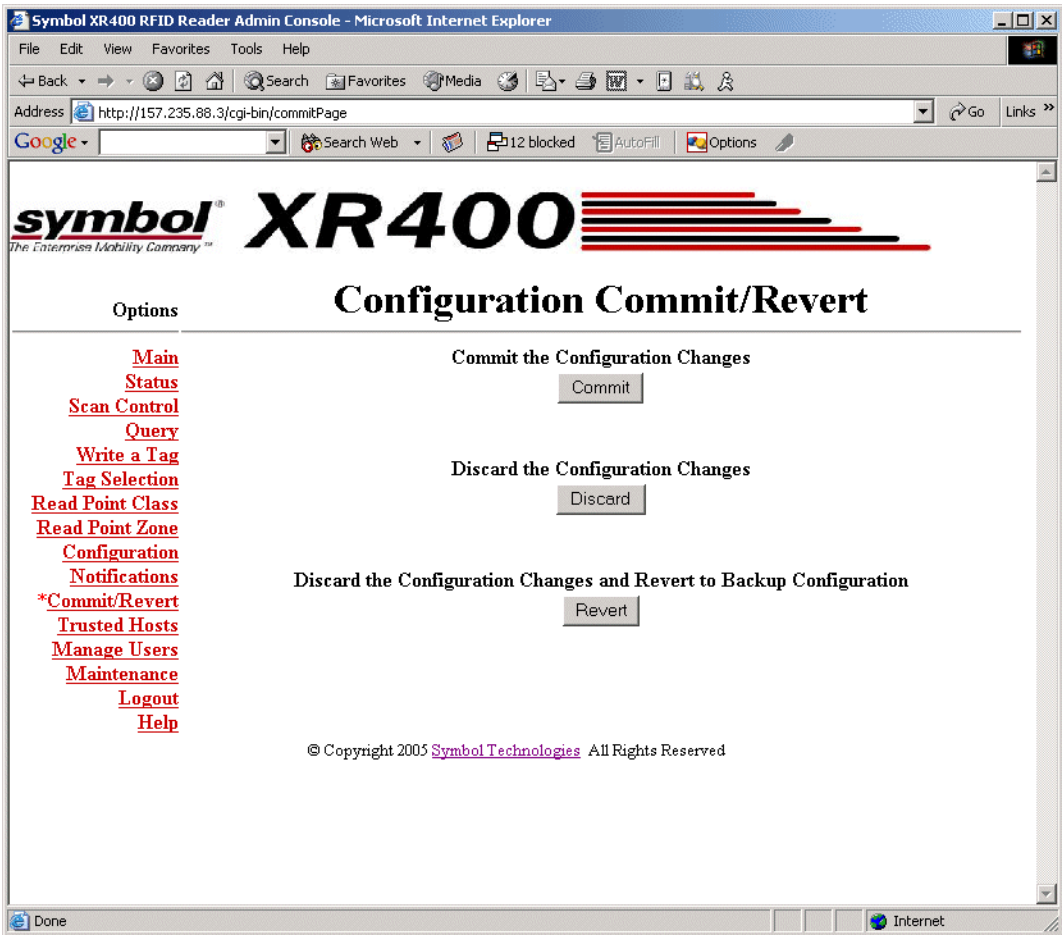

Figure 3-24. Commit/Revert Window

2. Click **Commit** to save a new configuration and apply changes to the reader's configuration file.
3. Click **Discard** to discard changes made to the reader configuration during this session.
4. Click **Revert** only if a saved backup configuration exists to discard current changes and revert reader configuration to the backup configuration.

Managing Trusted Hosts

Trusted hosts are authorized computers with which the reader is allowed to communicate. Enable this feature to allow only computers listed in the trusted host list to access the Administrator Console. This allows administrators to restrict unauthorized hosts from accessing the reader even if they are on the same network as the reader. When disabled (the default), the reader logs the IP addresses of any computers that attempt to access the reader to provide a history of attempted accesses.

To manage trusted hosts:

1. Click **Trusted Hosts**.

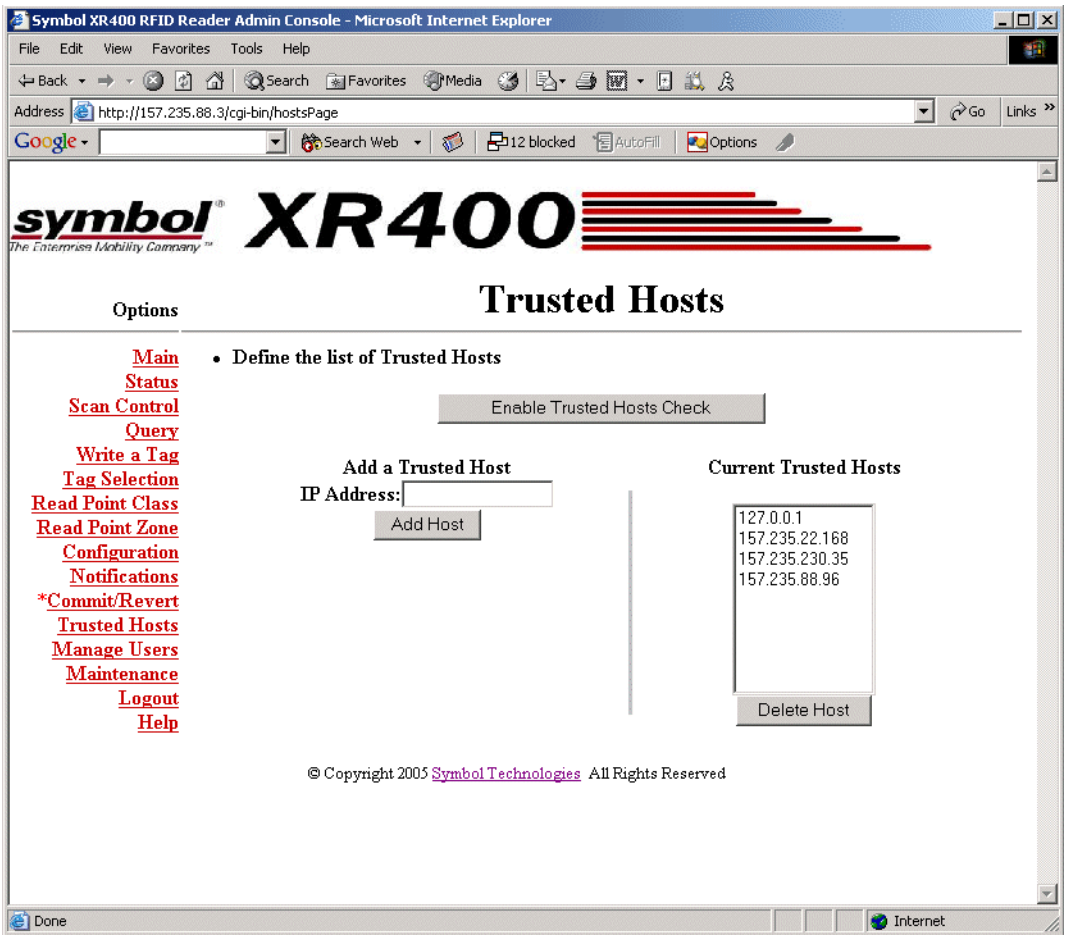

Figure 3-25. Trusted Hosts Window

2. To add a trusted host to the list, enter the IP address in the *IP Address:* field, then click **Add Host**.
3. To delete a trusted host, select the host's address from the *Current Trusted Hosts* list, then click **Delete Host**.
4. Click **Enable Trusted Host Check** to prevent computers not in the trusted host list from accessing the reader.
5. To allow all hosts in the network to access the reader, click **Disable Trusted Host Check**.

Managing Users

To add or modify users in order to grant rights and permissions:

1. Click **Manage Users**.

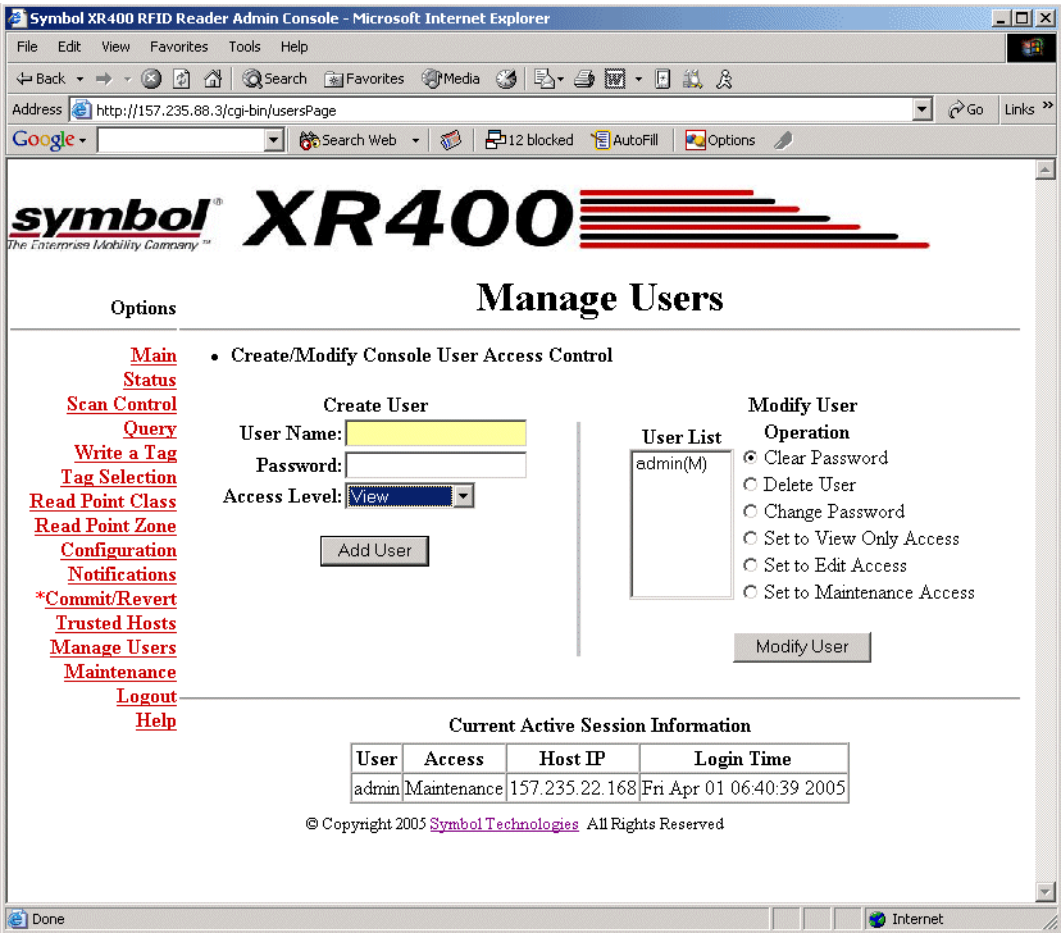

Figure 3-26. Manage Users Window

2. Enter the name of the new user in the *User Name:* field.
3. Enter a password to assign to the user in the *Password:* field.
4. Select an option from the *Access Level:* drop-down list for the new user:
   - **View:** Allows the user to connect to the Administrator Console and view reader settings.
   - **Edit:** Allows the user to make configuration changes excluding tasks such as updating the firmware.
   - **Maintenance:** This provides administrator privilege, and allows the user to access all functionality of the Administrator Console.

User Maintenance

To modify the access level or other account parameters and settings for an existing user:

1. Click **Manage Users**.

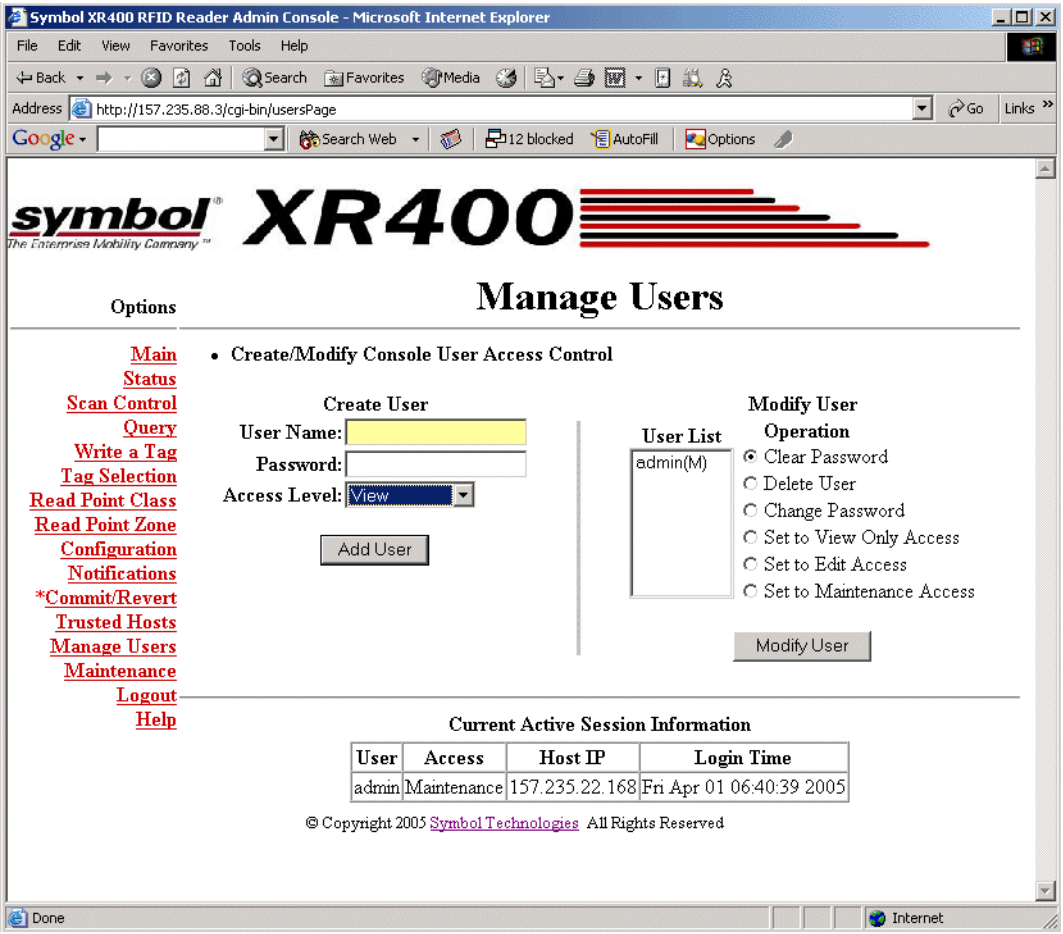

Figure 3-27. Modifying Users Window

2. To assign the default password (*change*) to a user, select the user from the *User List*, select the *Clear Password* radio button, and click **Modify User**.
3. To delete the user, select the user from the *User List*, select the *Delete User* radio button, and click **Modify User**.
4. To assign a new password to the user, select the user from the *User List*, select the *Change Password* radio button, and click **Modify User**. In the window that appears, enter the old user password, then enter and confirm the new password.
5. To change the access level of the user, select the *Set to View Only Access*, *Set to Edit Access*, or *Set to Maintenance Access* radio button. Note that you can not grant an access level higher than your own.

4

Maintenance and Troubleshooting

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Introduction

Use the *Maintenance* option in the Administrator Console to perform low-level reader maintenance tasks.

Reader Maintenance - Changing Communication Settings

The XR400 provides typical configuration settings that make the reader a plug-and-play device. The Administrator Console allows customizing these communication parameters. For example, it enables changing the default IP address of the reader when the network does not have a DHCP server.

To change the reader's communication settings:

1. Open a web browser.
2. In the address bar enter the reader's URL (http:// followed by the reader's IP address) and press **Enter**.
3. Log in using your administrator username and password to access the reader's Administrator Console.
4. Click **Maintenance**.

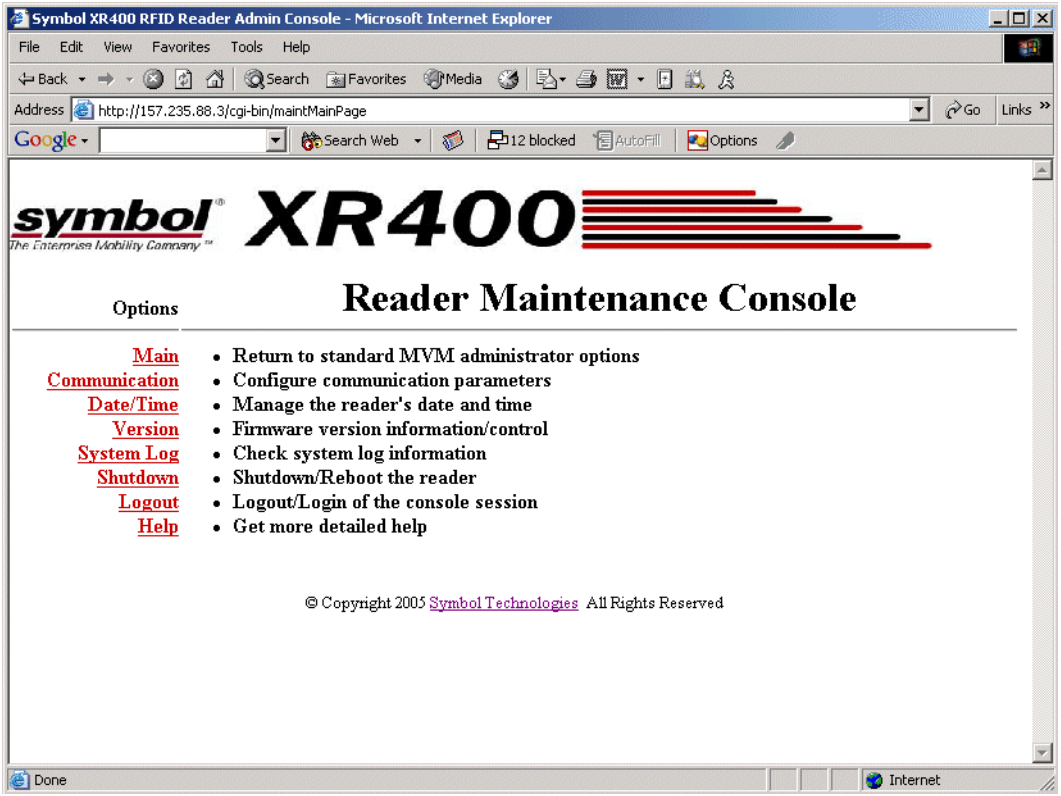

Figure 4-1. Maintenance Console Main Menu

5. Click **Communication**.

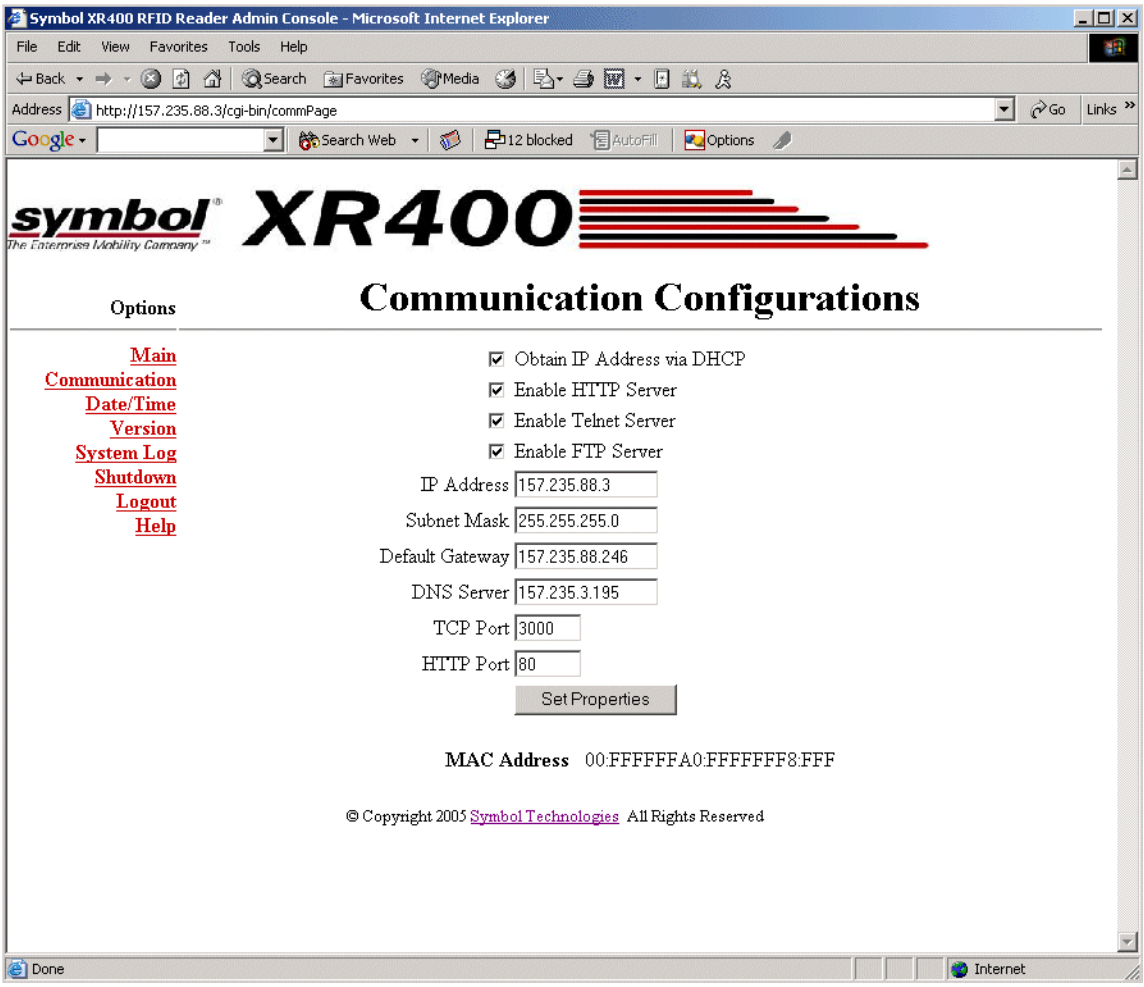

Figure 4-2. Communication Configuration Window

6. Change communication-related settings as desired by entering information in the text boxes or using the drop-down lists. See Table 4-3 for descriptions of available options.
7. Click **Set Properties**.
8. Click **Main** to return to the Administrator Console main window.
9. Click **Commit / Revert**.
10. Click **Commit** to save the changes or **Discard** to discard the changes. See *Committing / Discarding Changes on page 3-27*.

Table 4-1. Communication Configuration Options

Setting	Description	Possible Values
Obtain IP Address via DHCP	The Dynamic Host Configuration Protocol server running on networks can assign a dynamic IP address to the host and readers. Contact the system administrator to find out if the network supports DHCP.	Checked (enabled) / unchecked (disabled)
Enable HTTP Server	Select whether to enable the web interface.	Checked (enabled) / unchecked (disabled)
Enable Telnet Server	Select whether to enable Telnet to the reader.	Checked (enabled) / unchecked (disabled)

Table 4-1. Communication Configuration Options (Continued)

Setting	Description	Possible Values
Enable FTP Server	Select whether to enable the FTP server on the reader.	Checked (enabled) / unchecked (disabled)
IP Address	If manually assigning an IP address to the reader, check with the system administrator to ensure the IP address is valid in the network.	IP address to assign to the reader
Subnet Mask	A mask used to determine to what subnet an IP address belongs.	IP address dynamically assigned or user-entered
Default Gateway	The reader uses this IP address to access another network.	Depends on network configuration
DNS Server	The reader uses the Domain Name System (DNS) IP address to translate domain names.	Depends on network configuration
TCP Port	The port used for TCP/IP communication.	User-entered Default: 3000
HTTP Port	The port used for communication over HTTP.	User-entered Default: 80

Setting Date and Time

To set the reader's date and time:

1. Select *Date/Time* in the *Communication* window.

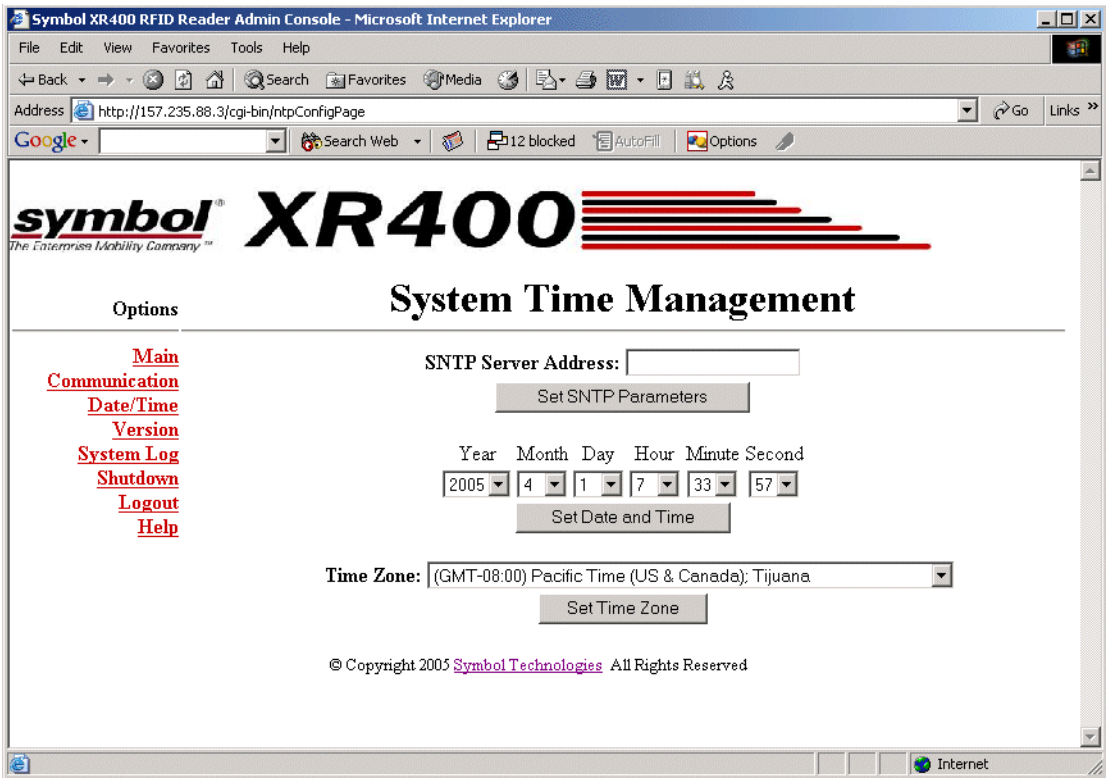

Figure 4-3. System Time Management Window

2. To synchronize the reader's clock with a particular SNTP server, enter the server's address in the *SNTP Server Address:* field and click **Set SNTP Parameters**.

Note

SNTP (Simple Network Time Protocol) is an Internet standard protocol (built on TCP/IP) that assures accurate synchronization to the millisecond of computer clock times in a network of computers.

3. To set the reader's system time manually, use the drop-down lists to select units of time, then click **Set Date and Time**.
4. Use the *Time Zone:* drop-down list to set the reader's time zone, then click **Set Time Zone.**

Getting Firmware Version Number

The *Version Control* window displays the current firmware version and allows upgrading to new firmware. To view this window, select *Version*.

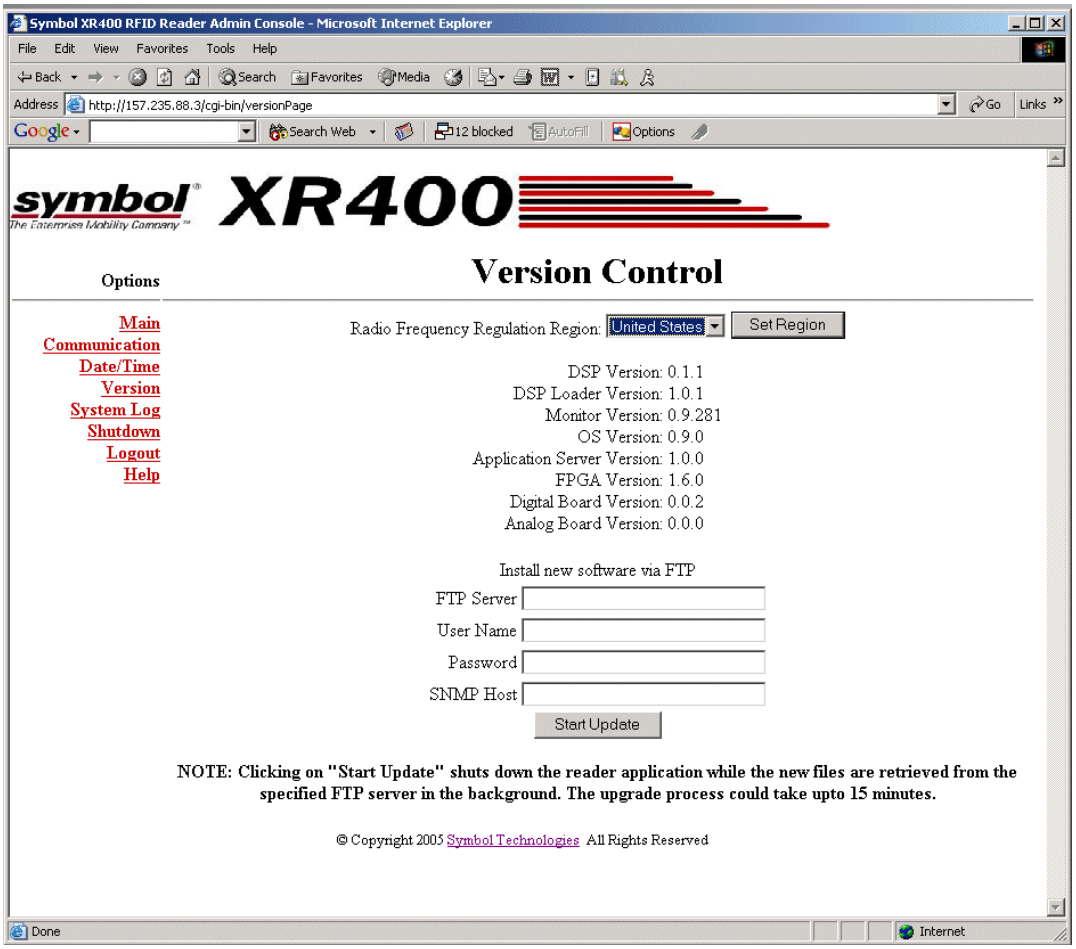

Figure 4-4. Version Control Window

See Table 4-2 for version control parameter descriptions.

Table 4-2. Version Control Parameters

Access Level Setting	Description
Radio Frequency Regulation Region	Select a Radio Frequency Regulation region for the XR400 and click **Set Region**.
DSP Version	The version of the DSP firmware.
DSP Loader Version	The version of the DSP loader.
Monitor Version	The version of the monitor utility.
OS Version	The version of the operating system build.
Application Server Version	The version of the application software.
FPGA Version	The version of the FPGA image.
Digital Board Version	The version of the reader's digital board.
Analog Board Version	The version of the reader's analog board.

Updating Firmware

Before updating firmware using a local image file, perform the following:

- Acquire the new image(s) from Symbol, which can include the monitor partition, the OS partition, the platform partition, the application partition, the data partition, and the partition table.
- Obtain the utility OsUpdate.exe, FlashUpdateUtility.dll, and the Response.txt file from Symbol. The Response.txt file contains the list of files to be updated.
- Obtain FTP server access to upload the images from the host PC, and download images from the reader.
- Upload the image file(s) to the FTP server.

Use the *Version Control* window to update firmware by downloading the software to the reader from an FTP server. To update the firmware version:

1. Click **Maintenance** from the main menu.
2. Click **Version**. See Figure 4-4 for the *Version Control* window.
3. In the *FTP Server* field, enter the IP address of the FTP server that contains the image file to download.
4. Enter the username and password in the *FTP User Name* and *Password* fields.
5. In the *SNTP Host* field, enter the SNMP host address to which the SNMP traps are sent while the new files are downloading to the reader.
6. Click **Start Update**. The XR400 application software first downloads the OsUpdate.exe, FlashUpdateUtility.dll, and Response.txt files, starts OsUpdate, and shuts down.
7. OsUpdate downloads the files specified in Response.txt to RAM, then writes them to flash.
8. The reader reboots. If an error occurs during file transfer, the reader reboots without writing the files to flash.

Monitoring Logs

Network administrators can use logs for auditing and troubleshooting the XR400. XR400 supports two types of logs:

- **System Log** - includes the log information generated by the reader's internal instructions. This is a circular queue which can hold a maximum of 200 records.
- **Access History** - provides a history log for access to this reader. This log records every successful access to the reader through the web interface. This is also a circular queue which can hold a maximum of 20 records.

Backing Up the Configuration

The reader supports the following backup configuration functions:

- Rolling back maintenance errors and restoring the reader to a particular date and time.
- Pushing reader-specific changes made to the config.xml file to multiple readers, simplifying multi-reader management.
- General configuration backup that can be restored when required, such as hardware replacement.

TTo back up the reader's configuration:

1. Open the browser and enter the URL http://[Reader IP address]/Config.xml.

   For example, if the reader’s IP address is 192.168.127.254, enter:

   http://192.168.127.254/Config.xml

An xml file similar to the following appears, depicting the current reader configuration.

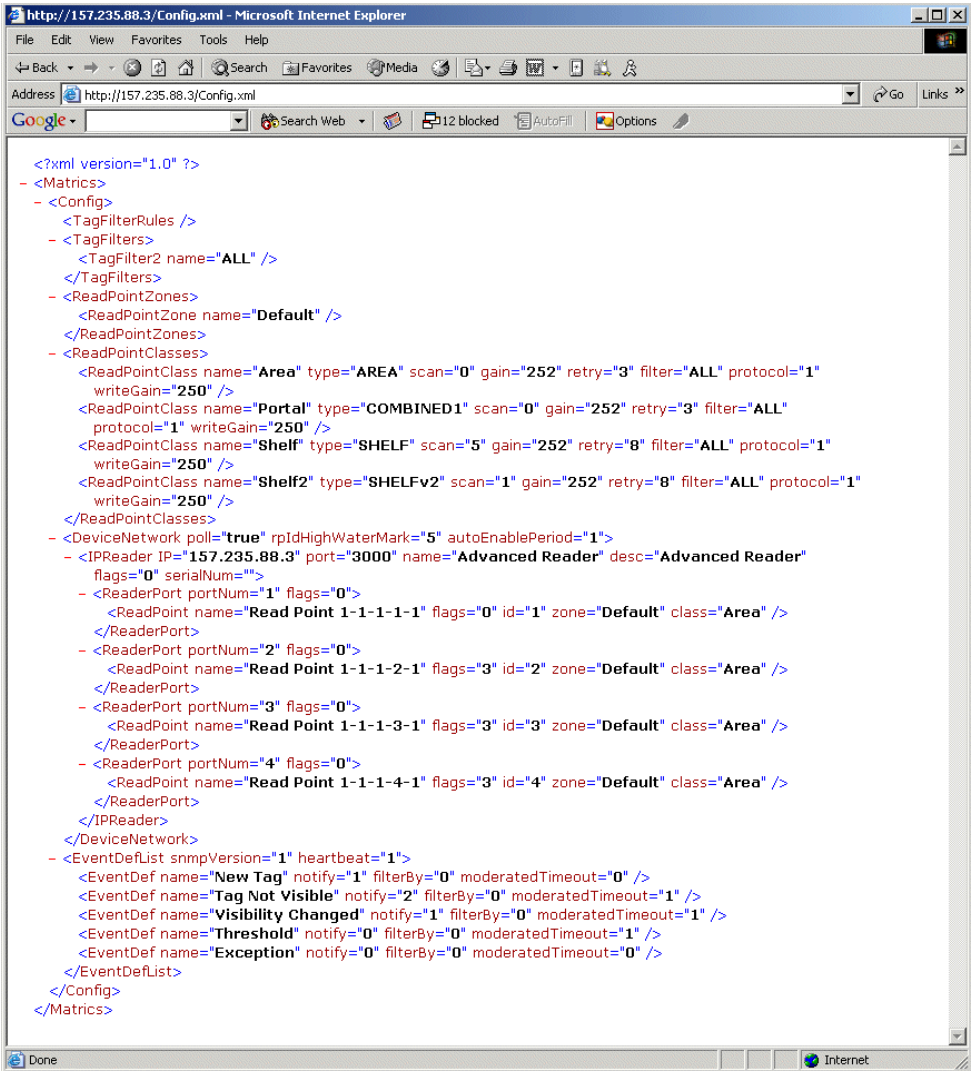

Figure 4-5. Sample Reader Configuration XML File

2. Save the XML file with a naming / date convention that facilitates recognizing the reader and the date of the backup. Most browsers allow saving xml files to the hard disk. In Internet Explorer, select *File - Save As…*
3. Click **Save** and use Windows Explorer to verify that the file is saved correctly.

Logging Out from the Console

Before closing the browser, log out of the console. Click **Logout** from either the maintenance menu or the main menu. If unsaved changes are pending, the *Commit / Revert* window appears. See *Committing / Discarding Changes on page 3-27*.

If you forget to log out or leave your browser idle, the session automatically logs out.

Troubleshooting

Table 4-3. Troubleshooting

Problem	Possible Causes	Possible Solutions
XR400 error LED lights after the reader has been in operation.	The CPU cannot communicate with the DSP and cannot reload the DSP firmware to it.	Refer to the system log for error messages.
XR400 error LED stays lit on powerup.	An error occurred during the powerup sequence.	If the web interrface is available, refer to the system log for the cause of the error, otherwise refer to the debug messages from the serial console.
Cannot connect to the reader.	Username and password is unknown.	The default username is **admin** and the default password is **change**. To change the username and password, see *Connecting the XR400 for Communication on page 2-6*.
XR400 is not reading tags.	The tag is out of its read range.	Move the tag into the read range. See *Read Test on page 2-5*.
Cannot access the Administrator Console.	The reader's IP address is unknown.	See *Connecting the XR400 for Communication on page 2-6* to view the reader's IP address.
Cannot log in to the terminal-based Administrator Console.	The web-based Administrator Console is in use for that reader.	Log out of the web-based console and restart the terminal software to re-attempt log in.
Certain real-time applications are no longer functional.	You changed the node address, IP address, or other reader configuration parameter(s) using the Administrator Console, and the application expects the previous configuration.	Update the settings within the application. Refer to the application's manual.
	Polling is enabled.-**	Some real-time applications require disabling polling. Refer to the application's manual, and if required, disable polling using the Scan Control feature of the Administrator Console. See *Scan Control on page 3-5*.
	The user closed the browser without logging out of the Administrator Console, so other applications cannot connect to the reader.	Log out of the Administrator Console.

Note

If problems still occur, contact the distributor or call the local *Symbol Support Center*. See *page x* for the telephone numbers.

A

Specifications

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Ethernet Connections A-5
RS232 Port Connections A-5
GPIO Port Connections A-6

Technical Specifications

The following table summarizes the reader's intended operating environment and general technical hardware specifications.

Table A-1. Technical Specifications

Feature	Description
Physical Specifications	
Dimensions	8.75" H x 11.75" W x 2" D (22.23 cm H x 29.85 cm W x 5.08 cm D)
Mounting Dimensions (Mounting Holes)	4.75" H x 12.73" W (12.05 cm H x 32.30 cm W)
Weight	~ 6 lbs (2722 g)
Base Material	Aluminum, Silver; Die-cast
LEDs	Power (Green), Activity (Yellow), Error (Red)
Power	+24vDC @ 1.2 amps
Environmental Specifications	
Environmental Sealing	IEC 529 IP54
Operational Temperature	IEC 60068-2-1/2/14 32° to +131° F (0° to +55° C)
Storage Temperature	IEC 60068-2-1/2/14 -4° to +158° F (-20° to +70° C)
Humidity	EC 60068-30/56 5-95% non-condensing
Vibration	IEC 60068-2-6
Connectivity	
Network	RS422/485 via RJ45 connector 10-BaseT Ethernet via RJ45 connector RS232 console management via DB15 connector. Control I/O Port (6, user programmable) via DB9 connector.
RF Conductors	Reverse TNC
Read Points (Channels)	4 read points (transmit and receive). Individual antennas can be combined logically into a single "wide" read point.
Compliance Information	
Safety	EMI/RF Emissions
Regulatory	Region 1, FCC Part 15
Operational Specifications	
Frequency	UHF band, 902-928 MHz
Method	Frequency Hopping Spread Spectrum (FHSS)
Power Output	Up to 30 dBm (only 1 Watt Part 15)
Air Link Protocol	EPC global: Class 0, Class 0+, and Class 1
Tag Communication	Interleaved
Tag Buffering	Local or steaming

Table A-1. Technical Specifications (Continued)

Feature	Description
Synchronization	Network Time Protocol (NTP)
IP Addressing	Static or dynamic (DHCP)
Host Interface Protocol	XML or byte stream
Network Management	
Protocol	SNMP
Configuration	Via setup wizard
Event Management	Auto reported events user controlled thresholds, damping and filtering
Administrative Management	Security / privilege controls, change tracebility
Tag Management	ID-based selection ability user defined association to tag IDs Taglist management features for reconciliation and visibility
Connectors	
RJ45 Connector	10/100Base-T Ethernet
DB9 Connector	RS232 console (management)
DB15 Connector	Control I/O Port (6 input and 6 output with some programmable control to change the mix)
RS422/RS485 Connector	Connect to host PC
Reverse TNC Antenna Connectors	Connect to external antennas (4 Transmit and 4 Receive.)

Cable Pinouts

Ethernet Connections

Table A-2. Ethernet Connector: RJ45 10-Pin

Pin	Description
Pin 1	Reserved/Do not use
Pin 2	TXD (+)
Pin 3	TXD (-)
Pin 4	RXD (+)
Pin 5	Reserved/Do not use
Pin 6	Reserved/Do not use
Pin 7	RXD (-)
Pin 8	Reserved/Do not use
Pin 9	Reserved/Do not use
Pin 10	Reserved/Do not Use

RS232 Port Connections

Table A-3. RS232 Connector: DB9 9-Pin

Pin	Description
Pin 1	NC
Pin 2	Tx
Pin 3	Rx
Pin 4	NC
Pin 5	Ground
Pin 6	NC
Pin 7	NC
Pin 8	NC
Pin 9	NC

GPIO Port Connections

Table A-4. GPIO Port: 15-Pin

Pin	Description
Pin 1	Ground
Pin 2	Output4
Pin 3	Output2
Pin 4	Output0
Pin 5	Input4
Pin 6	Input2
Pin 7	Input0
Pin 8	Ground
Pin 9	Output5
Pin 10	Output3
Pin 11	Output1
Pin 12	Input5
Pin 13	Input3
Pin 14	Input1
Pin 15	Vcc +5V power supply

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What topics need to be added to the index, if applicable?

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What topics do you feel need to be better discussed? Please be specific.

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