



FX7500 RFID READER INTEGRATOR GUIDE



FX7500 RFID READER INTEGRATOR GUIDE

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Warranty

For the complete Motorola hardware product warranty statement, go to:
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Revision History

Changes to the original manual are listed below:

Change	Date	Description
-01 Rev A	11/2013	Initial release

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ABOUT THIS GUIDE

Introduction

This Integrator Guide provides information about installing, configuring, and using the FX7500 RFID readers and is intended for use by professional installers and system integrators. The FX7500 readers provide real time, seamless tag processing for EPC Class1 Gen2 compliant tags.

✓ **NOTE** Screens and windows pictured in this guide are samples and may differ from actual screens.

Configurations

This guide includes the following FX7500 RFID reader configurations:

- FX7500-42320A50-US: 4-Port FCC
- FX7500-22320A50-US: 2-Port FCC
- FX7500-42325A50-WR: 4-Port Worldwide
- FX7500-22325A50-WR: 2-Port Worldwide

Chapter Descriptions

Topics covered in this guide are as follows:

- [Chapter 1, Quick Start](#) provides a Quick Start tag reading demonstration.
- [Chapter 2, Getting Started](#) provides an overview of RFID technology/components and a description of the FX7500 reader and features.
- [Chapter 3, Installation and Communication](#) provides information on installing and setting up the FX7500 readers.
- [Chapter 4, Administrator Console](#) describes how to connect to the reader and how to use the web-based Administrator Console to configure and manage FX7500 readers.
- [Chapter 5, Installation Examples](#) provides sample setups and describes how to apply these to a user installation.
- [Chapter 5, Troubleshooting](#) describes FX7500 readers troubleshooting procedures.
- [Appendix A, Technical Specifications](#) includes the technical specifications for the reader.
- [Appendix B, LLRP and RM API Extensions](#) provides references to Low Level Reader Protocol (LLRP) and Reader Management (RM) extensions for the FX7500 reader.
- [Appendix C, FTP Firmware Upgrade](#) provides reader firmware upgrade information on using the web-based **Administrator Console** and an FTP or FTPS server running a host computer.
- [Appendix D, Static IP Configuration](#) describes three methods of setting the static IP address on an FX7500 RFID Reader.
- [Appendix E, RF Air Link Configuration](#) describes how to select air link configuration from a set of available air link profiles.
- [Appendix F, Connecting Wi-Fi and Bluetooth Dongles](#) describes how to connect to a wireless network using a USB Wi-Fi dongle on the FX7500, and how to connect to a peer device over Bluetooth using a USB Bluetooth dongle.

Notational Conventions

The following conventions are used in this document:

- “RFID reader” or “reader” refers to the Motorola FX7500 RFID readers.
- *Italics* are used to highlight the following:
 - Chapters and sections in this and related documents
 - Dialog box, window, links, software names, and screen names
 - Drop-down list, columns and list box names
 - Check box and radio button names
 - Icons on a screen

- **Bold** text is used to highlight the following:
 - Dialog box, window and screen names
 - Drop-down list and list box names
 - Check box and radio button names
 - Icons on a screen
 - 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 reader.

- *FX7500 RFID Reader Quick Start Guide*, p/n MN000070A01
- *FX Series Reader Software Interface Control Guide*, p/n 72E-131718--xx
- *RFID Demo Applications User Guide*, p/n 72E-160038-01
- *Application Guide for Motorola Enterprise Mobility Devices*, p/n 72E-68902-xx
- *RFID3 API*
- *EPCglobal Low Level Reader Protocol (LLRP) Standard*

For the latest version of these guides and software, visit: <http://www.motorolasolutions.com/support>.

Service Information

If you have a problem using the equipment, contact your facility's technical or systems support. If there is a problem with the equipment, they will contact the Motorola Solutions Global Customer Support Center at: <http://www.motorolasolutions.com/support>.

When contacting Motorola Solutions support, please have the following information available:

- Serial number of the unit
- Model number or product name
- Software type and version number.

Motorola responds to calls by e-mail, telephone or fax within the time limits set forth in support agreements.

If your problem cannot be solved by Motorola Solutions support, you may need to return your equipment for servicing and will be given specific directions. Motorola 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 you purchased your business product from a Motorola Solutions business partner, contact that business partner for support.

CHAPTER 1 QUICK START

Introduction

This chapter provides a Quick Start setup demonstration.

Quick Start Demonstration

The Quick Start demonstration offers a simple, temporary way to quickly set up the reader and read tags. The demonstration includes:

- [Step 1, Setup on page 1-1](#)
- [Step 2, Connecting to the Reader on page 1-2](#)
- [Step 3, First Time / Start-Up Login on page 1-3](#)
- [Step 4, Set Region on page 1-4](#)
- [Step 5, Read Tags on page 1-6](#)

Step 1, Setup

For information on complete component kits available from Motorola, see [Appendix A, Technical Specifications](#).

1. Unpack the reader. See [Unpacking the Reader on page 3-1](#).
2. Set up the reader and tags on a desktop.
3. Connect the antenna to antenna Port 1. See [Figure 1-1](#).
4. Connect the Ethernet cable to the Ethernet port. See [Figure 1-1](#).
Connecting the reader to a subnet that supports DHCP is recommended. This Quick Start procedure is not guaranteed to work if DHCP is disabled in the reader and if the reader is connected directly to a PC.
5. Connect the AC power supply to a power outlet and connect to the power port. See [Figure 1-1](#).

✓ **NOTE** This step is not required for networks supporting Power-over-Ethernet (POE).

- Wait for the green power LED to stay lit. See [System Start-up/Boot LED Sequence on page 3-11](#) for boot-up details.

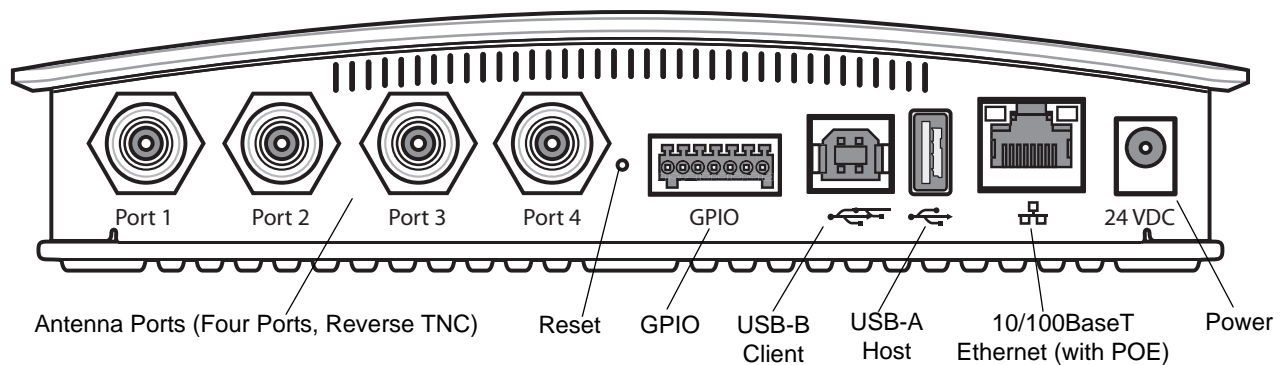


Figure 1-1 FX7500 RFID Reader Rear Panel Connections

Step 2, Connecting to the Reader

To connect via host name:

- Open a browser. Recommended browsers are IE10 (disabling Compatibility View is recommended), Chrome v29, and FireFox 24.
- Enter the host name, printed on the host name label on the reader, in the browser (e.g., `http://fx7500cd3b0d`) and press **Enter**. The **User Login** window appears and the reader is ready.

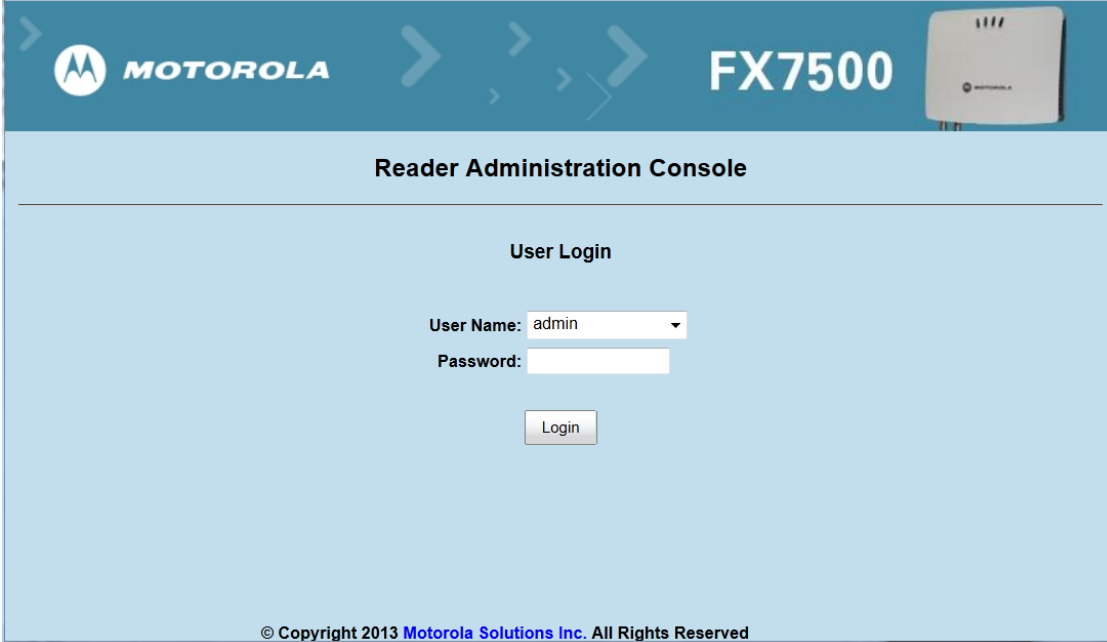
- ✓ **NOTE** Connect the reader to a network that supports host name registration and lookup to ensure the network can access the reader using the host name. For instance, some networks can register hostnames through DHCP. When first connecting to the reader, it is recommended to keep DHCP enabled in both the PC and in the reader, although it is not guaranteed that hostname will work all the time. Use the host name printed on the reader label, or construct it using the reader MAC address on the bottom of the reader. The host name is a string with the prefix FX7500, followed by the last three MAC address octets. For example, for a MAC address of 00:15:70:CD:3B:0D, use the prefix FX7500, followed by CD, 3B, and 0D, to create the host name FX7500CD3B0D. Enter `http://FX7500CD3B0D` in the browser address bar to access the reader.

To connect using the USB port for network connection, see [Motorola USB RNDIS Driver on page 3-6](#). The default USB RNDIS IP address for the reader is 169.254.10.1

Step 3, First Time / Start-Up Login

When starting the reader for the first time:

1. In the **User Login** window, enter **admin** in the **User Name:** field and enter **change** in the **Password:** field.



The screenshot shows the Motorola FX7500 Reader Administration Console. At the top, there is a blue header with the Motorola logo on the left, the text 'MOTOROLA' in the middle, and 'FX7500' on the right next to a small image of the device. Below the header, the main area is light blue and contains the text 'Reader Administration Console' centered. Underneath, there is a 'User Login' section with a 'User Name:' dropdown menu set to 'admin', a 'Password:' text input field, and a 'Login' button. At the bottom of the console, there is a copyright notice: '© Copyright 2013 Motorola Solutions Inc. All Rights Reserved'.

Figure 1-2 User Login Window

- ✓ **NOTE** Contact Motorola Solutions support if you forget the user ID and password. See [Service Information on page xi](#).
2. Click **Login**. The **Region Configuration** window appears.
 - ✓ **NOTE** The Region Configuration window does not appear for US reader configurations. For these models, the Administrator Console main window appears. See [Figure 4-1 on page 4-2](#).

Step 4, Set Region

Set the region of operation. **Setting the unit to a different region is illegal.**

- ✓ **NOTE** Region configuration is not available for readers configured to operate in the United States region (under FCC rules). In this case, skip this step.

1. In the **Configure Region Settings** window, select the region from the drop-down menu.

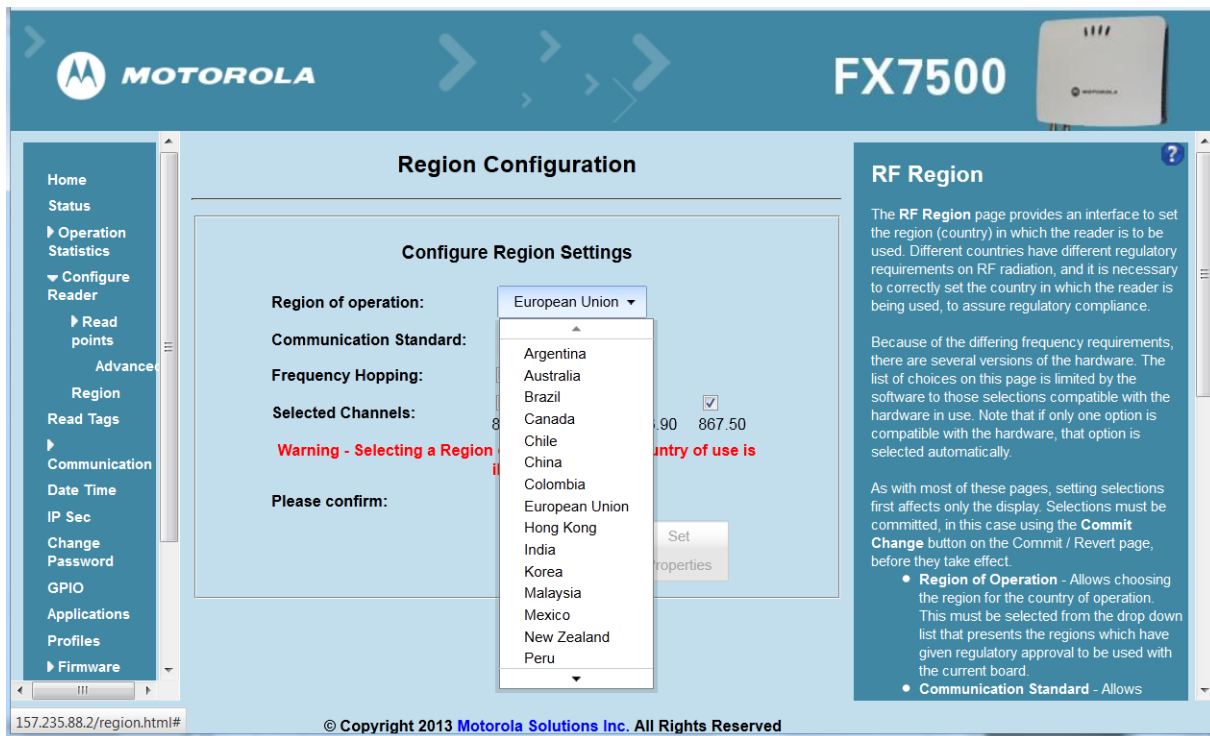


Figure 1-3 *Selecting the Region*

2. Select the **Communication Standard**, if applicable.
3. Select **Frequency Hopping**, if applicable.
4. Select the appropriate channel(s), if applicable.
5. Select the **I understand** check box.

6. Select **Set Properties** to complete the region selection. The **Operation Successful** window appears.

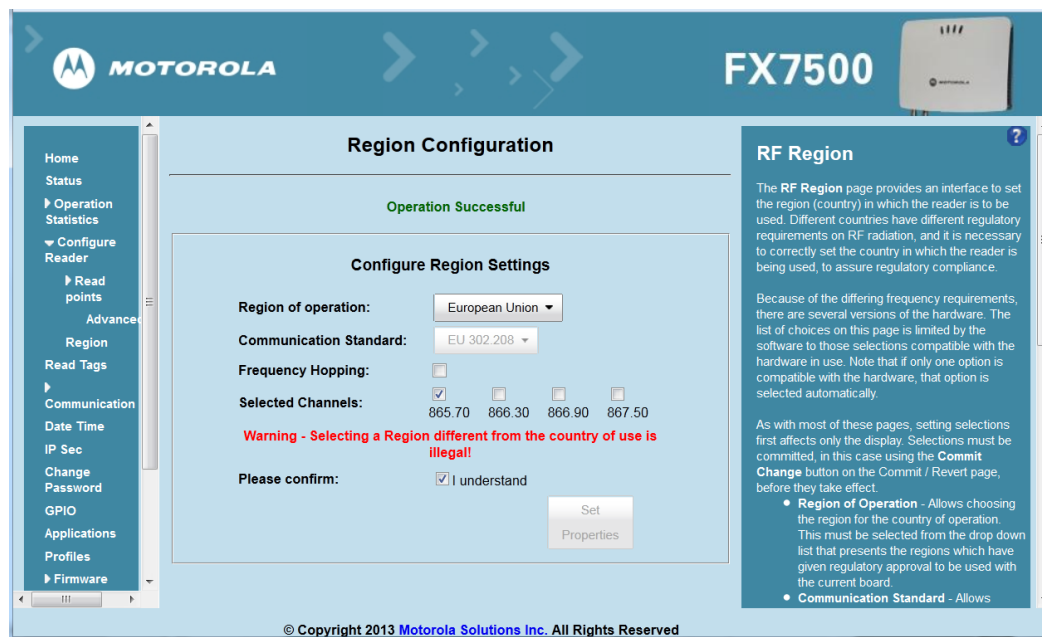


Figure 1-4 Region Configuration, Operation Successful Window

7. Select **Commit/Discard**.

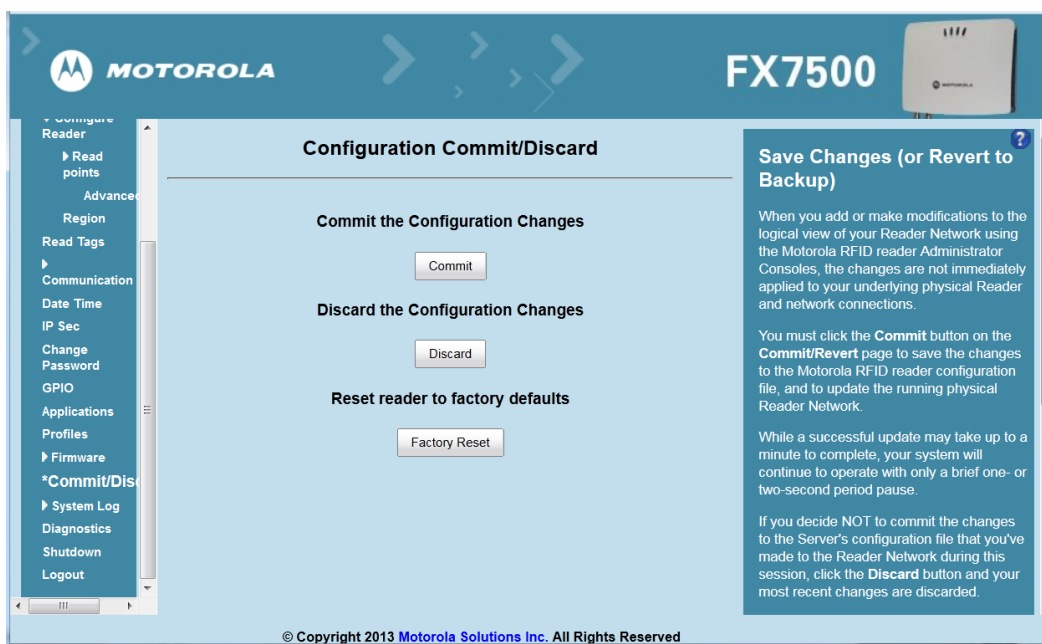


Figure 1-5 Commit/Discard Window

8. Click **Commit** to save the new region configuration and apply these changes to the reader configuration file, or click **Discard** to discard the region configuration changes. When the commit completes, the **Commit Successful** window appears.

Step 5, Read Tags

Select **Read Tags** to view the **Reader Operation** window.

- ✓ **NOTE** Enable Java JRE support on the browser for this page to function properly.
- ✓ **NOTE** For security reasons browsers may block the **Read Tags** page. Look for a pop window that can be hidden behind the browser or at the bottom of the screen (the taskbar in Windows) and allow the applet to run.
- ✓ **NOTE** With older browsers, when upgrading/downgrading the FX7500, close the browser and re-open it to clear the old version of files cached. If the java cache for applets is on, clear the cached applet before starting the browser to use the **Read Tags** page.

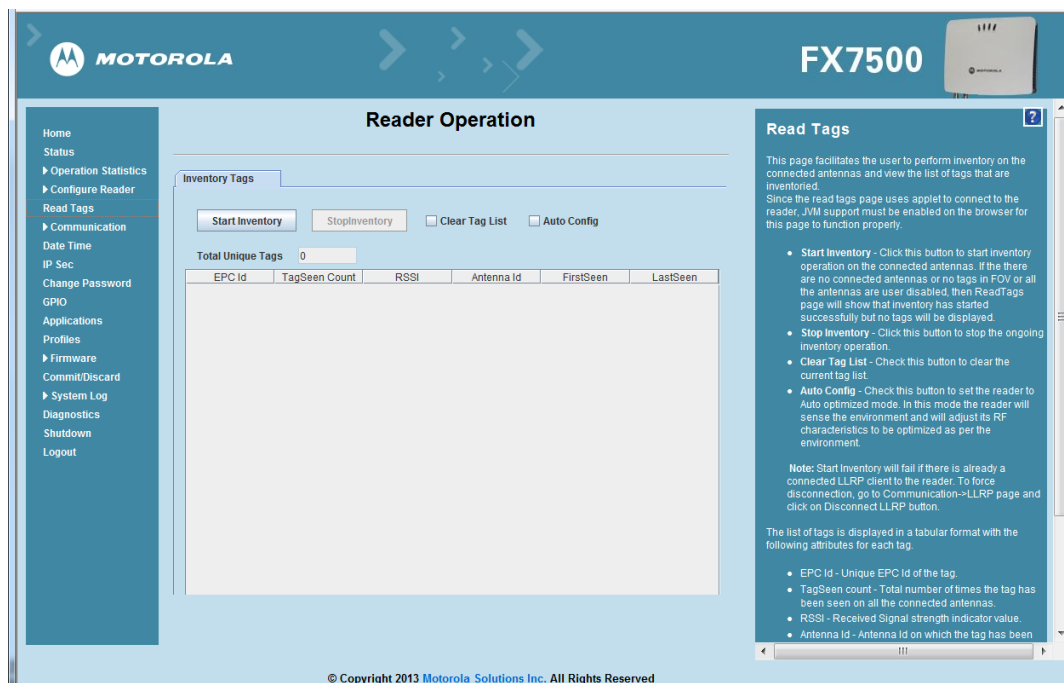


Figure 1-6 Read Tags Window

- Click **Start Inventory** to initiate an on-demand scan on the connected antennas that are enabled.
- Click **Stop Inventory** to stop the inventory operation.
- Select the **Clear Tag List** check box to clear the current tag list.

The list of tags appears in a table with the following attributes for each tag:

- **EPC Id:** Unique tag EPC ID.
- **TagSeen Count:** Number of times the tag is identified on the specific antenna.
- **RSSI:** Received Signal Strength Indication.
- **Antenna Id:** Antenna ID on which the tag is seen.
- **FirstSeen** time stamp: UTC time (in microseconds) when the tag was first seen.
- **LastSeen** time stamp: UTC time (in microseconds) when the tag was last seen.

CHAPTER 2 GETTING STARTED

Introduction

This chapter provides an overview of RFID technology and components, and describes the FX7500 reader and its features.

RFID Technology Overview

RFID (Radio Frequency Identification) is an advanced automatic identification (Auto ID) technology that uses radio frequency signals to identify *tagged* items. An RFID tag contains a circuit that can store data. This data may be pre-encoded or can be encoded in the field. The tags come in a variety of shapes and sizes.

A typical RFID system consists of transponders (called tags), readers, and antennas. To read a tag the 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 modulate the carrier signal. The reader interprets the modulated signal and converts the data to a format for computer storage. The computer application translates the data into an understandable format.

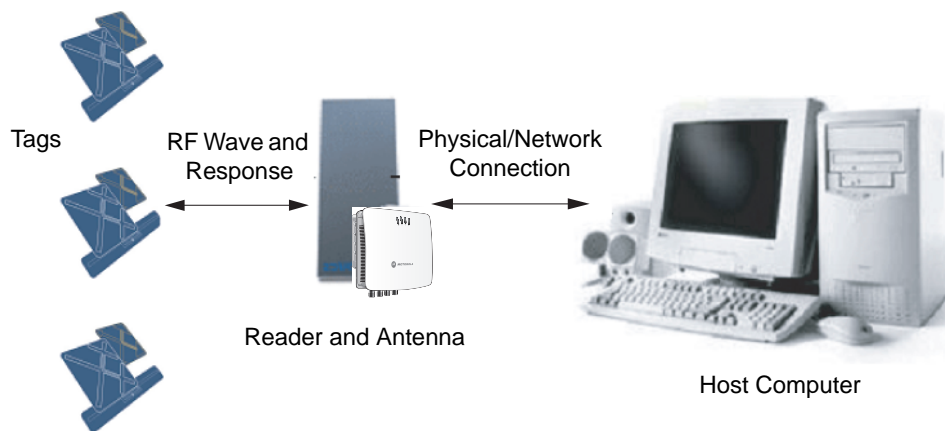


Figure 2-1 *RFID System Elements*

RFID Components

Motorola RFID solutions offer low cost, long read range, and a high read rate. These features provide real time, end-to-end visibility of products and assets in the factory, distribution center, retail outlet, or other facility. A typical Motorola RFID system consists of the following components:

- Silicon based RFID tags that attach to retail products, vehicles, trailers, containers, pallets, boxes, etc.
- Different antenna types to support applications such as dock door (area antennas) and conveyor.
- Readers power and communicate with the tags for data capture and provide host connectivity for data migration.

Tags

Tags contain embedded chips that store unique information. Available in various shapes and sizes, tags, often called **transponders**, receive and respond to data requests. 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: the RFID reader generates an RF field that powers the tag. Passive tags are much lighter, less expensive, and have a much longer life than active tags.

Antennas

Antennas transmit and receive radio frequency signals. A **read point** is the RF range of an antenna.

Readers

Readers communicate with the tags and can transfer the data to a host computer. Readers also provide features such as filtering and tag writing. FX7500 readers read Gen2 (dense reader mode) RFID tags.

FX7500 RFID Readers

The Motorola FX7500 RFID readers are intelligent, C1G2 UHF RFID readers with RFID read performance that provides real-time, seamless EPC-compliant tags processing. FX7500 RFID readers are designed for indoor inventory management and asset tracking applications in large scale deployments. The readers can host third-party customer-driven embedded applications.

FX7500 RFID readers are based on Motorola's strategic FX7500 reader platform and are easy to use, deploy, and manage. The readers offer a variety of options for connecting to corporate networks using Ethernet or USB connections. Features include:

- ISO 18000-6C standard (EPC Class 1 Gen 2)
- Dense reader mode capability
- Enterprise-class performance
- Application-specific setup for ease of installation
- Power over Ethernet (POE) to eliminate the need for a power drop
- SSL/SSH based security for secure data transmission
- Linux operating system
- Support for custom or third-party applications
- Feature set for event and tag management
- Support for NXP custom commands over LLRP
- Radio mode support via LLRP v1.0.1

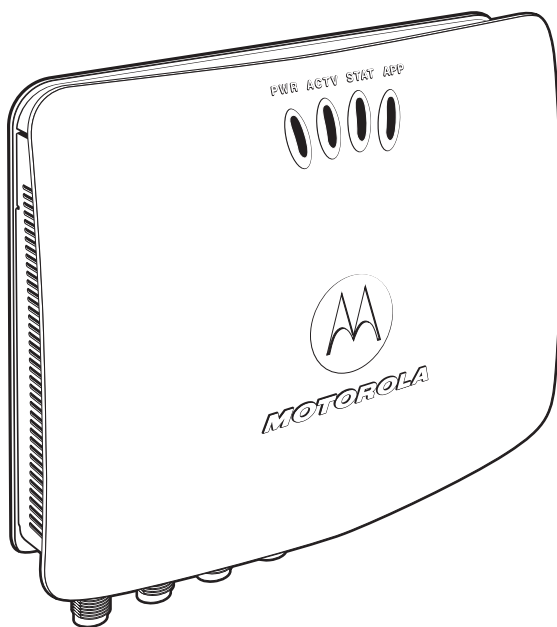


Figure 2-2 FX RFID Reader

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

FX7500 RFID reader configurations include either two or four monostatic antenna ports. The monostatic ports are used only with monostatic antennas.

Versions and Kits

FX7500 RFID readers are available in a 2-port or 4-port version, individually (reader and mounting bracket) or in a kit that includes the reader, mounting bracket, an antenna, and a power supply. For detailed kit information, see [FX7500 Kits on page A-1](#).



WARNING! For Mounting in Environmental Air Handling Space (EAHS): Do not install the Mounting Bracket, Antenna, Cables, PSU, and PoE (Power Injector) in the EAHS unless they are suitable for use in EAHS per UL 2043.

FX7500 RFID Reader

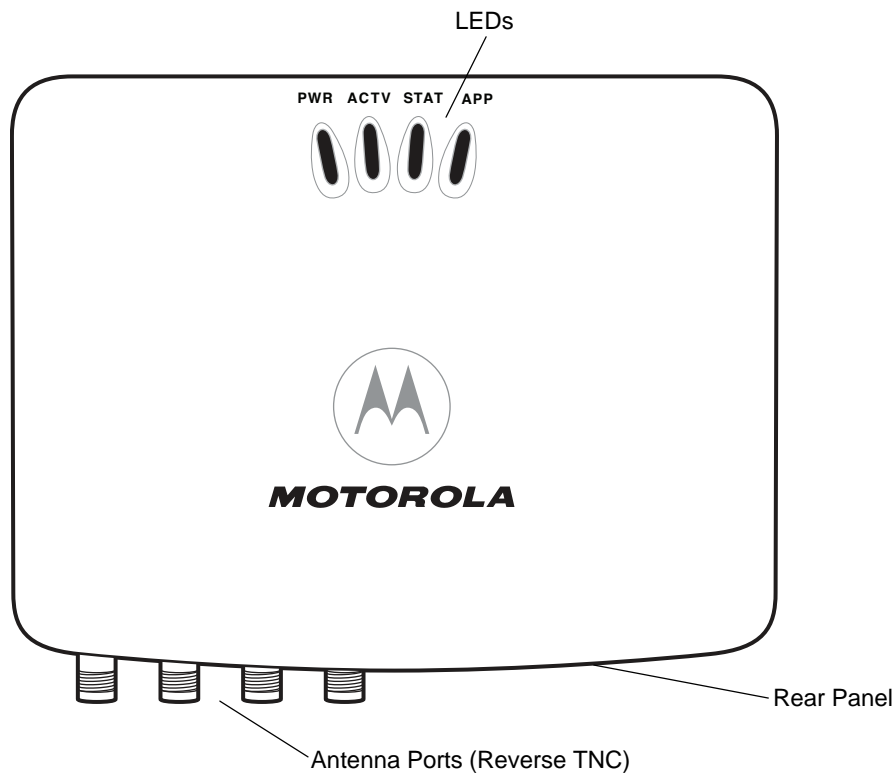


Figure 2-3 FX7500 RFID Reader

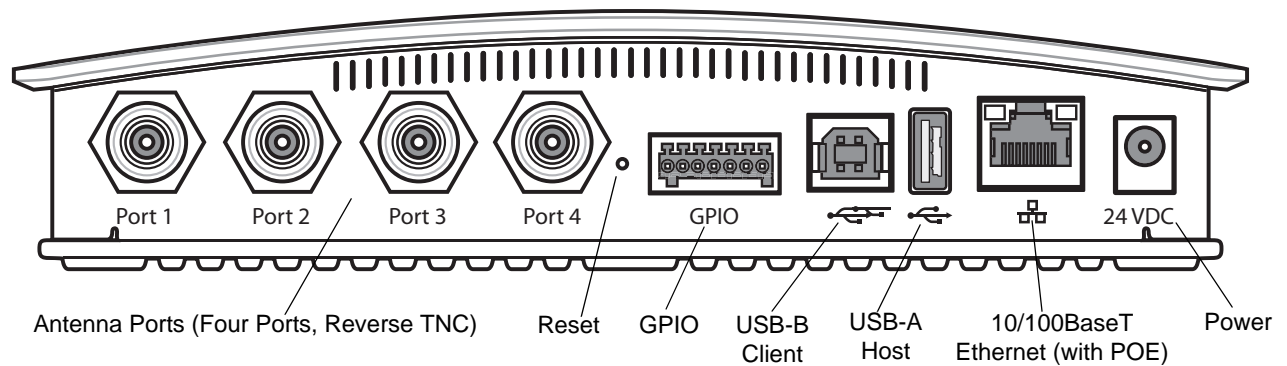


Figure 2-4 FX7500 RFID Reader Rear Panel Connections



CAUTION Use only parts provided with the FX7500 RFID readers, or Motorola approved/recommended parts. Substituting other cables or parts can degrade system performance, damage the reader, and/or void the warranty.

FX7500 RFID Reader Rear Panel

Table 2-1 Rear Panel Descriptions

Port	Description
Antenna Ports (Reverse TNC)	Two port version: Connect up to two antennas. Four port version: Connect up to four antennas. See Table A-1 on page A-2 for the maximum antenna gains and RF output powers for both US/Canada and EU. See Connecting Antennas on page 3-4 for connection information.
Reset	To reset the reader insert a paper clip into the reset hole, press and hold the reset button for not more than 2 seconds. This resets the reader, but retains the user ID and password.
GPIO	Insert a DE15 serial cable to connect to external devices. See GPIO Interface Connection on page 3-9 for more information.
USB Client	The USB client port supports (by default) a network mode of operation. This enables a secondary network interface as a virtual adapter over USB. Use Visual Studio to use the USB port for development. Use a remote display tool to access the Windows CE graphical interface. Advanced users can create a custom communication protocol on the USB port. See USB Connection on page 3-6 for connection information.
USB Host	Use the USB host port to connect USB devices such as WiFi / Bluetooth over USB dongles and flash memory drives.
10/100BaseT Ethernet	Insert a standard RJ45 Ethernet cable to connect to an Ethernet network with or without POE capability, or to a local computer. See Ethernet Connection on page 3-5 for connection information.
Power	DC connector connects to a Motorola approved power supply AC adapter (varies depending on the country). Maximum power 24 VDC, 1.2 A. See Powering the Reader on page 3-10 for connection information.

FX7500 RFID Readers LEDs

The reader LEDs indicate reader status as described in [Table 2-2](#). For the LED boot up sequence see [System Start-up/Boot LED Sequence on page 3-11](#).

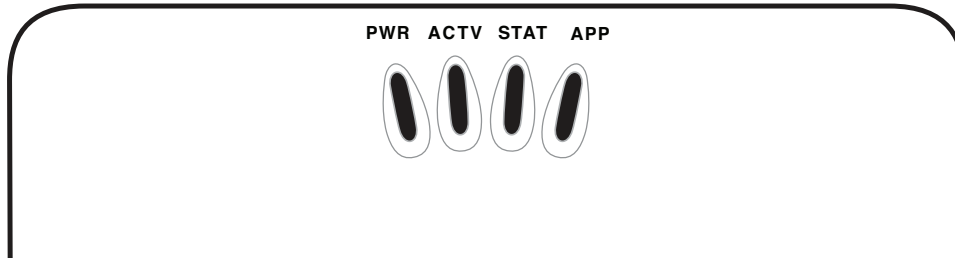


Figure 2-5 FX7500 RFID Readers LEDs

Table 2-2 LED Indications

LED	Function	Color/Status	Description
PWR	Power	Off Amber Solid Red Flashing Amber Solid Green Solid	Reader is powered off Booting Firmware upgrade Application initialization after booting Reader is powered on and operational
ACTV	Activity	Off Amber Flashing Green Flashing	No RF operations On for 500 mSec indicates another tag operation On for 500 mSec indicates a tag is inventoried or read
STAT	Status	Off Red Solid Red Flashing Green Flashing	No errors or GPIO events Firmware update failure On for 500 mSec indicates an error in RF operation On for 500 mSec indicates a GPI event
APP	Application	Green/Red/Amber	Controlled through RM

FX7500 RFID Reader Features

Configuration and Upgrading

Use the **Administrator Console** to reconfigure the reader. See [Chapter 4, Administrator Console](#). The reader can also accept new firmware and configuration updates.

Tag Management

The **Administrator Console** provides the **Read** tags feature. See [Read Tags on page 4-21](#). Use client applications based on Motorola EMDK (Enterprise Mobility Development Kit) such as Power Session, or LLRP (EPCGlobal Low Level Reader Protocol) for additional tag management operations such as **Write**, **Lock**, **Filtering**, **Event Management** and **Kill**.

Device Management

Quick Backup and Recovery

Use a web browser to back up and restore reader configuration by downloading the configuration XML file. Use the **Administrator Console** to download the file to the reader.

SNMP Integration

The reader can send real time notification of specific events and failures to an SNMP server.

Logging

The reader keeps a log of all system-related activities for security and troubleshooting. The log includes time-stamped system activities such as login attempts and hardware failures. Use the log to pinpoint problems, to facilitate quick resolution, and to identify administrators who may require additional training to prevent future problems. See [System Log on page 4-42](#).

Connection Options

The FX7500 provides flexibility for connecting to networks through an Ethernet connection or the USB client port. The reader's primary network interface is Ethernet. The Ethernet interface accesses each reader from anywhere on the network using the unique host name or IP address.

Additionally, the USB client port supports (by default) a **Network** mode of operation. This enables a secondary network interface as a virtual adapter over USB. The interfaces co-exist and if the Ethernet connection fails, the application can switch to USB using a specific IP and can control the reader.

See [Communications Connections on page 3-5](#). To use the USB port for network connection, see [Motorola USB RNDIS Driver on page 3-6](#).

CHAPTER 3 INSTALLATION AND COMMUNICATION

Introduction

This chapter includes the following FX7500 RFID reader installation and communication procedures:

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CAUTION FX7500 RFID readers must be professionally installed.



WARNING! For Mounting in Environmental Air Handling Space (EAHS): Any cables used to interconnect to other equipment must be suitable for use in EAHS as per UL2043.

Unpacking the Reader

Remove the reader from the shipping container and inspect it for damage. Keep the shipping container, it is the approved shipping container and should be used if the reader needs to be returned for servicing.

Mounting and Removing the Reader



WARNING! When installing the antenna ensure a minimum separation distance of 9.1 in (23 cm) between the antennas and all persons.

Mounting Tips

Mount the reader in any orientation. Consider the following before selecting a location for the FX7500 reader:

- Mount the reader indoors, in operating range and out of direct sunlight, high moisture, and/or extreme temperatures.
- Mount the reader 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 reader within 15 feet of the antennas.
- Ensure that power can reach the reader.
- The recommended minimum horizontal mounting surface width is 7 1/2 inches. However, the unit can mount on surfaces as narrow as 6 inches (in locations where unit overhang is not an issue). For vertical mounting the unit can mount on a surface as small as 6 inches by 6 inches.
- Mount the reader onto a permanent fixture, such as a wall or a shelf, where it is not disturbed, bumped, or damaged. The recommended minimum clearance on all sides of the reader is five inches.
- Use a level for precise vertical or horizontal mounting.

Mounting Using the Mounting Plate



WARNING! For Mounting in Environmental Air Handling Space (EAHS): Do not install the Mounting Bracket in the EAHS.

1. Position the mounting plate on a flat surface (wall or shelf). Position the release tab on the top. See [Figure 3-1](#).
2. Mark the hole locations using the mounting plate as a guide. See [Figure 3-1](#). Remove the mounting plate and drill holes (appropriate for the surface material) at the marked locations.



NOTE For wood surfaces, drill two 1/8" diameter by 7/8" deep holes. For drywall/masonry surfaces, drill two 3/16" diameter by 7/8" deep (min) holes and install using the provided anchors.

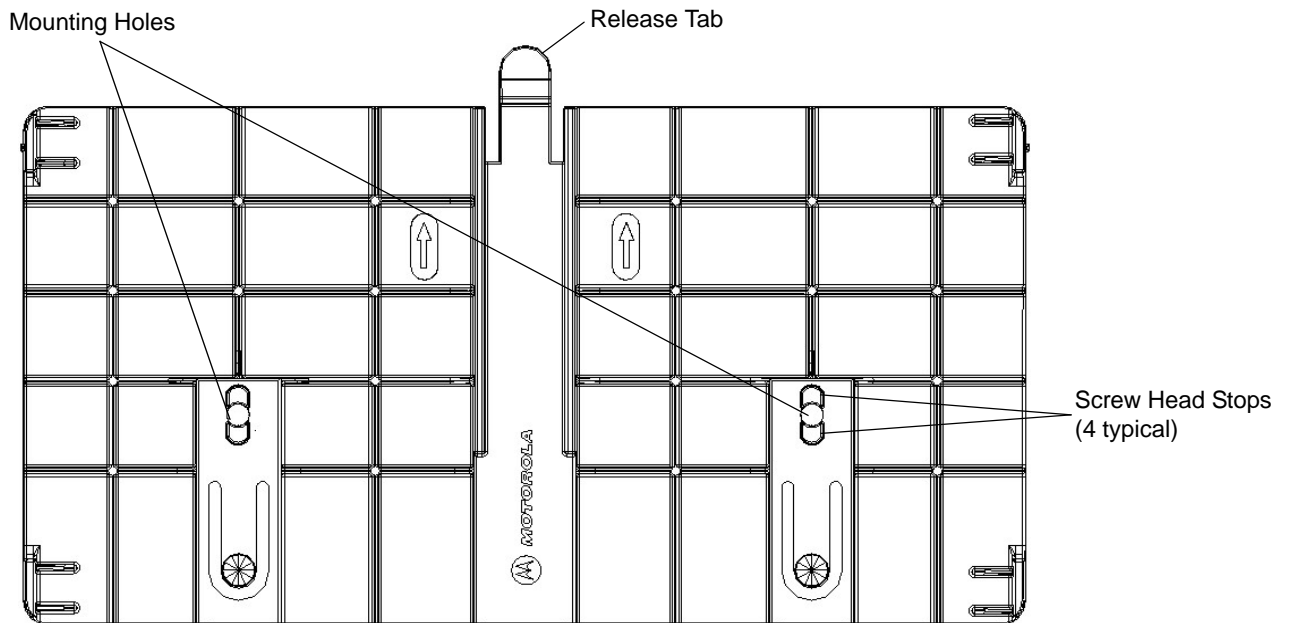


Figure 3-1 Mounting Plate, Front

3. Reposition the mounting plate over the mounting holes and secure using the supplied fasteners (as appropriate for the surface material).

✓ **NOTE** Mount the reader with the cable connections up or down, depending on the installation requirements.



CAUTION Use a hand screw driver to install the mounting plate (do not use a power driver). Do not use excessive torque, and tighten the screws so that they are just snug on the screw head stops (see [Figure 3-1](#)). If the reader does not engage the mounting plate, loosen the screw(s) 1/8 to 1/4 turn and try again.

4. Position the reader by aligning the markers on the metal base plate and the wall bracket, with the key-slot holes over the mounting screws. Gently slide the reader down to lock into place.
5. To remove the reader, press the release tab and slide the reader up while gently pulling out.

Direct Mounting (Without the Mounting Plate)



CAUTION Not using the mounting plate can affect read performance at elevated temperatures. Also, if not using the mounting plate, secure the reader to prevent it from coming off of the mounting screws.

To mount the unit without using the mounting bracket:

1. Use the mounting bracket as a template to locate the holes, or locate and mark the holes on 4 3/16" centers, +/- 1/32".
2. For wood surfaces, drill two 1/8" diameter by 7/8" deep holes on 4.192" centers. For drywall/masonry surfaces, drill two 3/16" diameter by 7/8" deep (min) holes on 4.192" centers and install using the provided anchors.
3. Position the reader with the key-slot holes over the mounting screws and gently slide the reader down to lock into place.
4. Adjust the screw head height to assure a snug fit. Or if the screws are accessible from the back, use machine screws with a lock washer/nut and tighten the nut (from the back) to secure the reader.

Connecting Antennas



WARNING! When installing the antenna ensure a minimum separation distance of 9.1 in (23 cm) between the antenna and all persons.



CAUTION Power off the reader before connecting antennas. See [Powering the Reader on page 3-10](#). Never disconnect the antennas while the reader is powered on or reading tags. This can damage the reader.

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

Maximum antenna gain (including any cable loss) cannot exceed 6 dBiL.

When mounting the antennas outside the building, connect the screen of the coaxial cable to earth (ground) at the entrance to the building. Perform this in accordance with applicable national electrical installation codes. In the U.S., this is required by Section 820.93 of the National Electrical Code, ANSI/NFPA 70.



WARNING! For Mounting in Environmental Air Handling Space (EAHS): Do not install Antennas and Antenna Cables in the EAHS unless they are suitable for use in EAHS as per UL 2043.

Table 3-1 Antenna Gain and Radiated Power

FX7500	US	EU
Max Conducted RF Power at Antenna Input	+ 30.0 dBm	+29.2 dBm
Max Antenna Gain Allowed	+ 6dBiL	+ 5.5 dBiL
Max Radiated Power Allowed	4W EIRP	2W ERP
Antenna Type	Circularly Polarized Plate	N/A

To connect the antennas to the reader (see [Figure 3-2](#)):

1. For each antenna, attach the antenna reverse TNC connector to an antenna port.
2. Secure the cable using wire ties. Do not bend the cable.

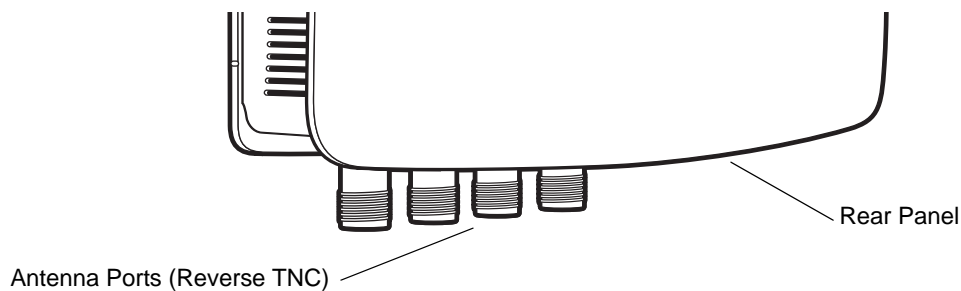


Figure 3-2 FX7500 RFID Reader Antenna Connection

Communications Connections

Use a standard Ethernet connection, a standard POE, or POE + Ethernet connection to connect the FX7500 reader to a host or network.

Ethernet Connection

The reader communicates with the host using an Ethernet connection (10/100Base-T Ethernet cable). This connection allows access to the **Administrator Console**, used to change reader settings and control the reader. With a wired Ethernet connection (10/100Base-T cable), power the FX7500 reader using either the reader Motorola AC power supply, or by Power-Over-Ethernet through the Ethernet cable.

Ethernet: Power through AC Outlet

The FX7500 reader communicates to the host through a 10/100Base-T Ethernet cable and receives power through a Motorola AC power supply.

1. Route the Ethernet cable.
2. Route the power cable.
3. Terminate the Ethernet cable according to [Table A-2 on page A-4](#).
4. Connect the Ethernet cable to the LAN port on the FX7500 reader. See [Figure 2-4 on page 2-5](#).
5. Connect the other end of the Ethernet cable to the host system LAN port.
6. Connect the Motorola AC power supply to a wall outlet.
7. Insert the power supply barrel connector into the FX7500 reader power port. See [Figure 2-4 on page 2-5](#).
8. Verify that the unit booted properly and is operational. See [System Start-up/Boot LED Sequence on page 3-11](#).
9. On a networked computer, open an internet browser and connect to the reader. See [Connecting to the Reader on page 4-3](#).
10. Log in to the **Administrator Console**. See [Administrator Console Login on page 4-6](#).

Ethernet: Power through Standard POE or POE+

The POE installation option allows the FX7500 reader to communicate and receive power on the same 10/100Base-T Ethernet cable.

1. Insert the POE Ethernet connector on the RJ45 Ethernet cable into the reader 10/100BaseT Ethernet port. See [Figure 2-4 on page 2-5](#).
2. Connect the other end of the cable to an Ethernet network with POE capability.
3. Verify that the reader booted properly and is operational. See [System Start-up/Boot LED Sequence on page 3-11](#).
4. On a networked computer, open an internet browser and connect to the reader. See [Connecting to the Reader on page 4-3](#).
5. Log in to the **Administrator Console**. See [Administrator Console Login on page 4-6](#).



CAUTION Do not connect to PoE networks outside the building.

To connect to a network that is not POE capable:

1. Terminate the Ethernet cable according to [Table A-2 on page A-4](#).
2. Connect the Ethernet cable to the FX7500 reader 10/100BaseT Ethernet port. See [Figure 2-4 on page 2-5](#).
3. Connect the other end of the Ethernet cable to a POE power injector.
4. Connect a patch cable from the POE power injector to the host system LAN port.
5. Verify that the unit booted properly and is operational. See [System Start-up/Boot LED Sequence on page 3-11](#).
6. On a networked computer, open an internet browser and connect to the reader. See [Connecting to the Reader on page 4-3](#).
7. Log in to the **Administrator Console**. See [Administrator Console Login on page 4-6](#).

USB Connection

The USB client port supports (by default) a **Network** mode of operation. This enables a secondary network interface as a virtual adapter over USB. The interfaces co-exist and if the Ethernet connection fails, the application can switch to USB using a specific IP and can control the reader. To use the USB port for network connection, install the [Motorola USB RNDIS Driver](#) on the Windows XP PC or follow the instructions to install the Microsoft RNDIS driver for Windows 7 below.

To connect the FX7500 to the host PC, insert a USB cable into the USB client port on the reader. See [Figure 2-4 on page 2-5](#). Connect the other end of the cable to a USB port on the host PC.

Motorola USB RNDIS Driver

To use the USB port for network connection, install the Motorola USB Remote Network Device (RNDIS) driver and enable the driver on the FX7500. The Motorola RNDIS driver supports 32-bit version operating systems Windows XP, Windows Vista, Windows 7, and Windows Server 2008. For Windows 7 32-bit and 64-bit systems, it is recommend to use Microsoft RNDIS driver (see [Microsoft RNDIS Driver for Windows 7 on page 3-7](#)).

To install the RNDIS driver on the host.

1. Download the installer file **Motorola RNDIS.msi** from <http://www.motorolasolutions.com/support> to the host PC.
2. Select this file on the host PC to install the host side drivers for using the USB Remote Network Device Interface on the FX7500.
3. Connect a USB cable between the host and the reader. The **Welcome to the Found New Hardware Wizard** screen appears.
4. Select the **No, not this time** radio button and click **Next**.
5. Select the default option **Install Software Automatically (Recommended)**.
6. In the Hardware Installation pop-up window, select **Continue Anyway**.
7. Select **Finish** to complete the installation. This assigns the host an auto-configured IP address. The network is now ready to use and the reader's IP address is fixed to 169.254.10.1.

Microsoft RNDIS Driver for Windows 7

If using Windows 7:

1. After connecting a USB cable between the PC and reader, the RNDIS driver automatically installs. If it does not, right-click on **Computer** and select **Manage**. From **System Tools**, select **Device Manager**. Under **Other Devices**, look for an entry for RNDIS with an exclamation icon indicating that the driver was not installed.

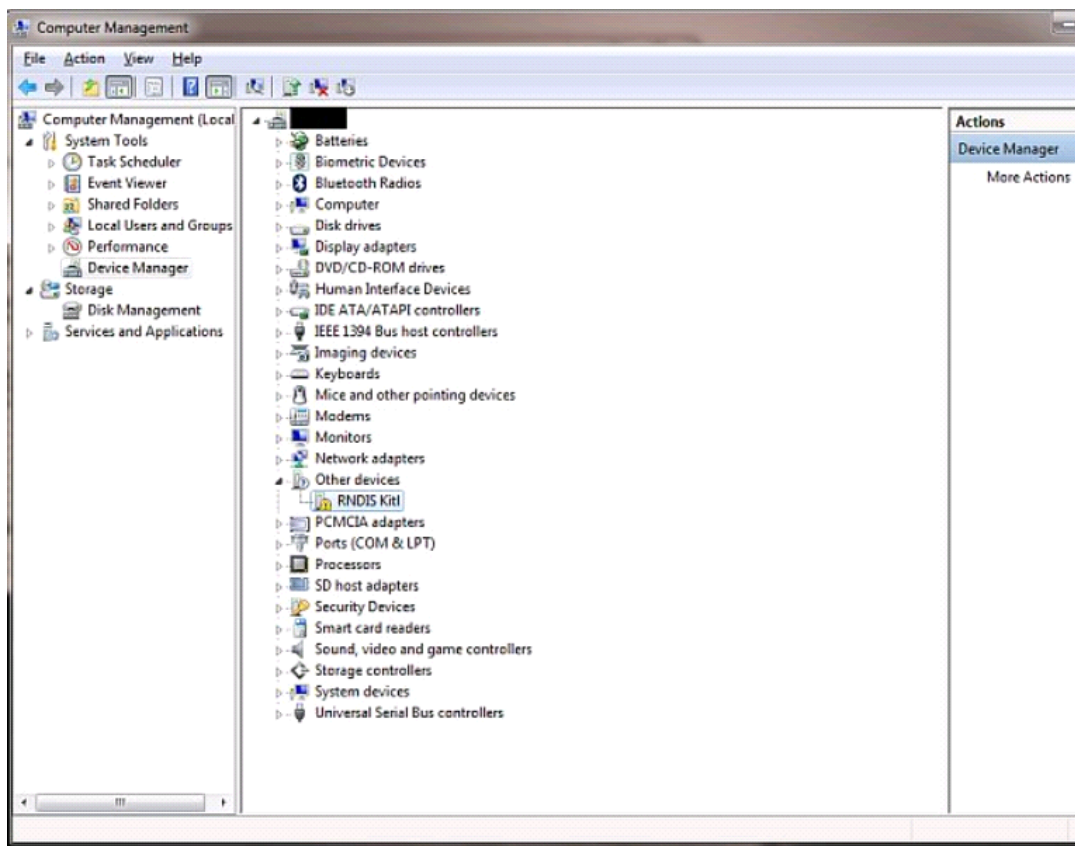


Figure 3-3 Computer Management Window

2. Right-click the icon and select **Update Driver Software**. Search for the device driver software by clicking on **Browse my computer for driver software**.
3. Select **Let me pick from a list of device drivers on my computer**.

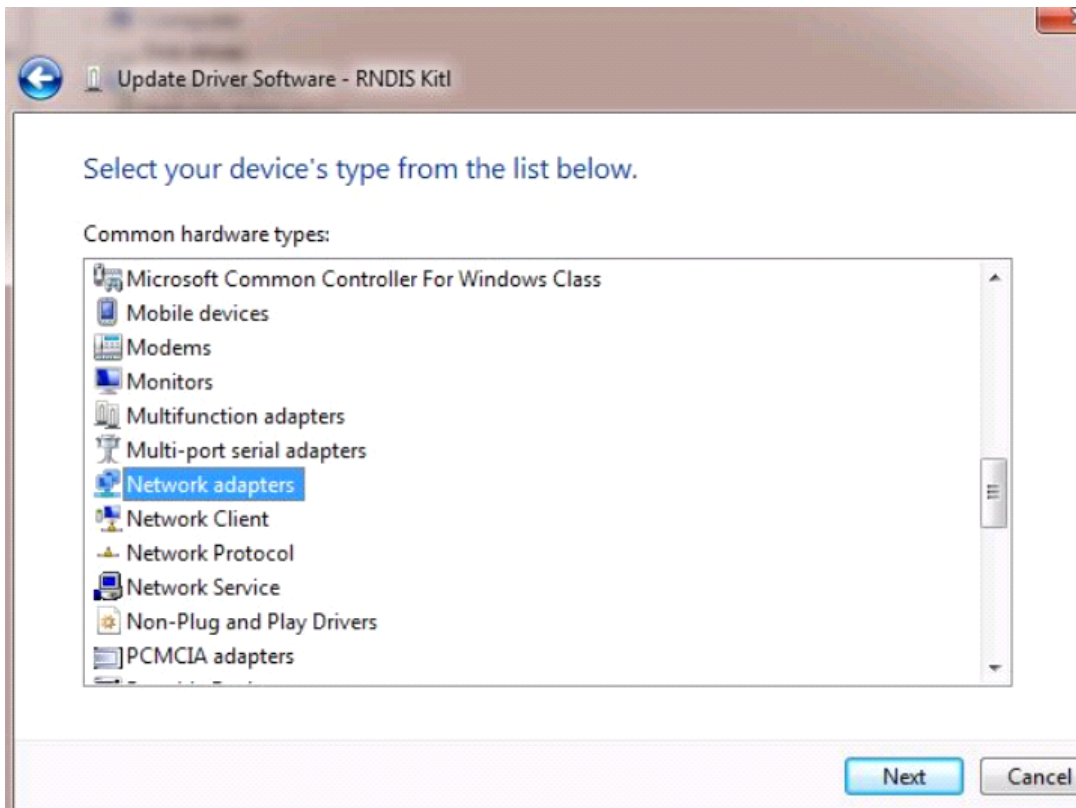
4. Select **Network adapters**.

Figure 3-4 *Selecting Device Type*

5. Select **Microsoft Corporation** from the manufacturer list.
6. Under **Network Adapter**, select **Remote NDIS Compatible Device**, and click **Next**.

After installation, the PC recognizes the reader as an RNDIS device. The PC obtains the IP address 169.254.10.102, and the reader is reachable at the IP address 169.254.10.1.

Sample Implementation

This implementation assumes that only one FX7500 reader is connected to a host PC via USB. This feature does not function with multiple readers connected to the host. Motorola recommends disabling any other network interface on the PC.

Use an application that uses RFID3 APIs such as Power Session, or use an LLRP application to connect to the reader to read tags.

1. The primary RFID server connects to the FX7500 via the Ethernet interface.
2. The host PC connects to the FX7500 via the USB port. An application on the host PC monitors communication between the primary RFID server and FX7500 reader.
3. When the application on the host PC detects a communication failure between the primary RFID server and the reader, it connects to and controls the reader using the USB virtual interface.

- The FX7500 listens on the USB virtual interface on a fixed port (49152) as well as on the standard LLRP port (5084). To enable this, select the **Allow LLRP Connection Override** check box in **Configure LLRP Settings** console window.

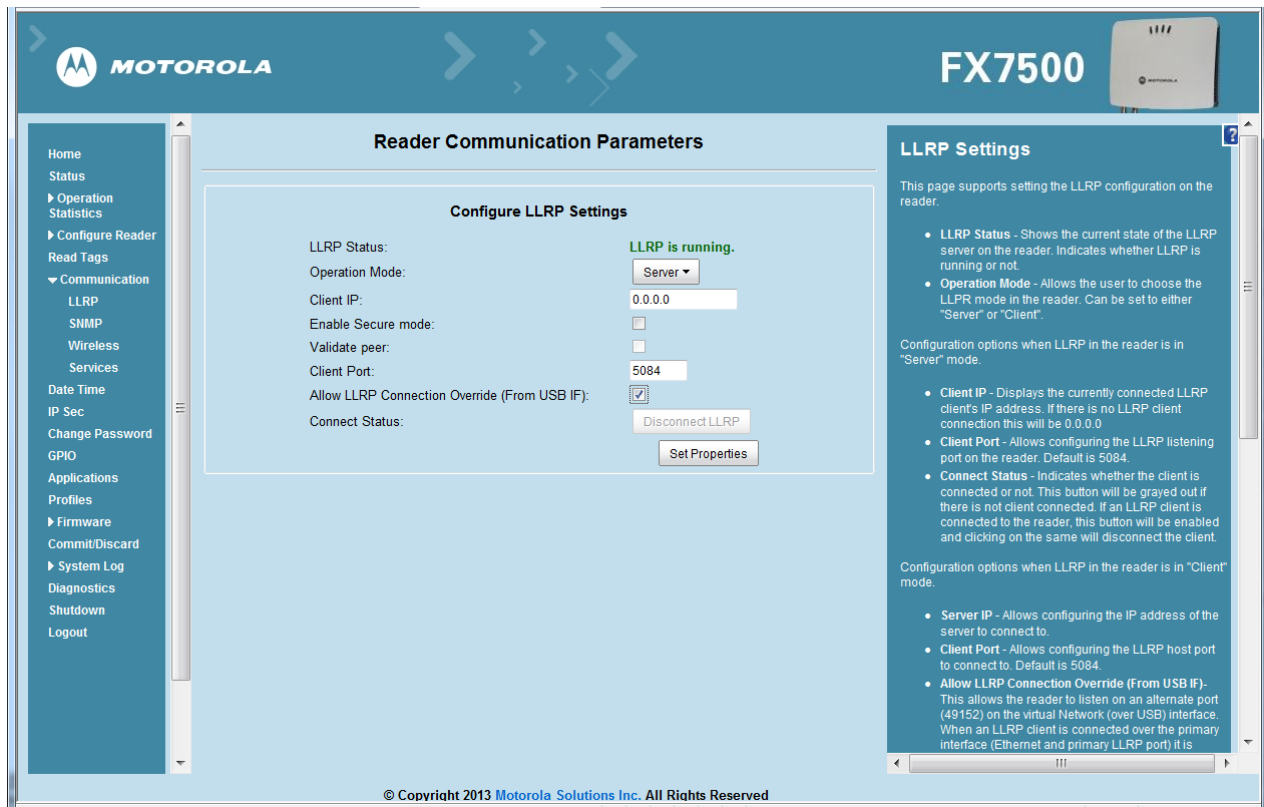


Figure 3-5 Communication / Configure LLRP Settings Window

Only one LLRP session can be active on the reader, either through the primary Ethernet interface or through the virtual network over USB interface.

If connection is active on one interface, a subsequent connection attempt on a second interface disconnects the first. The second connection attempt always prevails and creates a new session.

GPIO Interface Connection

This pluggable terminal block type allows connecting individual wires independently. A single connector accommodates both inputs and outputs. See [Table A-5 on page A-6](#) for pinout information.

GPIO signals allow some flexibility. Inputs are pulled up within the reader to +5 VDC and can be shorted to ground to pull them low. This allows driving them directly via simple relay or switch contacts. Alternatively, 5V logic can drive inputs. In the logic low state, the current sourced from the reader is approximately 3 mA, so standard gates in most logic families can drive them. Current flow in the high state is negligible. When the equipment uses an external +24 VDC power supply, a +24 VDC connection is provided. This output is not available when an external 24 VDC supply is not present.

- ✓ **NOTE** Do not connect the +24 VDC output directly to either general purpose input that tolerates voltages in excess of 5V but is designed to operate optimally within the range of 0 to +5 VDC.

The general purpose outputs are open-drain drivers, pulled up to 5V. Each output can withstand voltages up to +30 VDC but should not be driven negative. For best results use the +24 VDC supply as a source of external current and use the outputs directly to drive 24V relays, indicator lamps, etc., wired between the 24V supply

and individual general purpose outputs. Although each output can sink up to 1A, the maximum current that can be drawn from the internal 24V supply is 1A, so use an external power supply if the current requirement exceeds this. Note that the state of the general purpose outputs is inverted, e.g., driving a GPO line high at the processor pulls the corresponding output low.

Powering the Reader



CAUTION Connect the antennas before supplying power to the reader.



WARNING! For Mounting in Environmental Air Handling Space (EAHS): Do not install Power Supplies and PoE (Power Injector) in the EAHS unless they are suitable for use in EAHS as per UL 2043.

Powering the Reader via AC Power Supply

The Motorola approved AC power supply connects to the power port on the FX7500 reader using a locking connector (see [Figure 2-4 on page 2-5](#)). The power supply is compatible with:

- 120V 60 Hz (North America)
 - 230V 50 Hz (International excluding Japan)
 - 100V 50/60 Hz (Japan).
1. Insert the power supply barrel connector into the reader power port (see [Figure 2-4 on page 2-5](#)). Rotate the connector to lock it in place.
 2. Apply power to the power supply. The green Power LED stays on to indicate the reader is powered and ready. See [System Start-up/Boot LED Sequence on page 3-11](#).

To power down the reader, unplug the power supply from its power source. The green Power LED turns off to indicate that the device is off and the system is not operational. Remove the connector from the reader power port.

Powering the Reader via Power-over-Ethernet (POE)

Connect the reader to either a standard POE or POE+ injectors.

1. Insert the POE Ethernet connector on the RJ45 Ethernet cable into the reader 10/100BaseT Ethernet port. See [Figure 2-4 on page 2-5](#).
2. Connect the other end of the cable to an Ethernet network with POE capability. See [System Start-up/Boot LED Sequence on page 3-11](#).

To power down the reader, remove the Ethernet cable from the network. The green Power LED turns off to indicate that the device is off and the system is not operational. Remove the connector from the 10/100BaseT Ethernet port.

LED Sequences

System Start-up/Boot LED Sequence

See [Figure 2-5 on page 2-6](#) for LED locations. During system start-up:

1. All LEDs turn on for a few seconds when power is applied to the reader.
2. All LEDs turn off and the PWR LED turns amber.
3. The PWR LED turns green to indicate successful RFID application initialization.
4. When the sequence completes, the green PWR LED remains on and all other LEDs are off.

PWR LED Sequence to Indicate IPv4 Status after Booting

After the RFID application initializes:

1. The PWR LED turns green for 5 seconds to indicate success (following the sequence from [System Start-up/Boot LED Sequence](#)).
2. The reader checks the eth0 IPv4 address and indicates the IPv4 status using the LEDs:
 - If the reader has a DHCP address, the PWR LED blinks green for 3 seconds.
 - If the reader has static IP address, the PWR LED blinks amber 3 seconds.
 - If the reader has an IP address from zero-configuration networking algorithm, the PWR LED blinks red for 3 seconds.
 - If the reader doesn't have valid IP, the PWR LED blinks amber and green using a 90-second timeout to indicate that it is waiting to acquire an IP address.
 - If it obtains a valid IP within the timeout period, the reader indicates the status as described above.
 - If the timeout expires before the reader obtains an IP, the PWR LED stops blinking.
3. The PWR LED again turns solid green.

Reset to Factory Defaults LED Sequence

Holding the reset button for 8 seconds resets the reader to the factory default configuration.

1. All LEDs turn on as usual when you press and hold the reset button.
2. The PWR LED blinks amber when the reset button is held.
3. The PWR LED blinks green fast 5 times to indicate that the reader detects a reset operation.
4. Release the reset button to reset the reader to factory defaults.

LED Sequence for Software Update Status

1. The PWR LED blinks red during the software update process.
2. After reset, the STAT LED blinks red if the radio module requires a firmware update.

Reading Tags

After the reader powers up, test the reader. See [System Start-up/Boot LED Sequence on page 3-11](#).

1. Enable tag reading using the web-based **Administrator Console** (see [Read Tags on page 4-21](#)) or control the reader through a real-time application such as Power Session.
2. Present a tag so it is facing the antenna and slowly approach the antenna until the activity LED turns green, indicating that the reader read the tag. See [Figure 2-5 on page 2-6](#). 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.