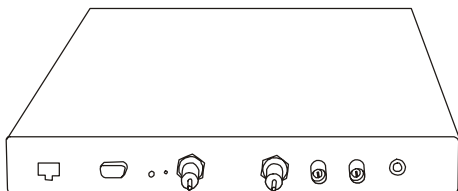




Mercury 3 RFID Reader

Installation and Service Guide



The Mercury 3 RFID Reader uses RFID (radio frequency identification) technology to read data stored on RFID tags and labels. The RFID Reader operates as an SQL (structured query language) server, providing tag data in response to requests from another application. A separate software application may be used to direct its operation and provide a user interface.

The RFID Reader supports UHF (ultra high frequency) and HF (high frequency) antennas which are available separately. The reader provides two UHF and two HF antenna ports and transfers data to a computer through an Ethernet port.

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About this Guide

This installation and service guide explains how to install the Mercury 3 RFID Reader and use the browser-based interface.

Use the instructions provided with the antennas to install and service the antennas.

If you need assistance...

Call the RFID support line at 1-800-543-9740.

Before You Begin

Installation Requirements

- The RFID reader is shipped with a certified limited power source with a cable length of 1.8m (6ft).
- Use only authorized antennas and cables to maintain FCC approval (see Authorized Antennas on page 2).
- In order to comply with FCC requirements for RF exposure safety, a separation distance of at least 22cm (8.7in.) needs to be maintained between the radiating elements of the antenna and the bodies of nearby persons.
- Antennas must be mounted within 3.6m (12ft) cable distance of the reader.
- Provide strain relief for all reader connections.
- A shielded Ethernet cable must be used to communicate with other devices.
- Multiple readers and antennas can be used in combination to enhance detection at specific locations provided the software application is able to synchronize antenna operation.

Performance Considerations

RFID reader performance may be affected by external factors including:

- Tag variables
- Environment

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

Tag Variables

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

- Application surface — Some materials interfere with tag performance including metal and moisture. Tags applied to items made from or containing these materials may not perform as expected.
- Tag orientation — Reader performance is affected by the orientation of the tag in the antenna field.
- Tag model — many tag models are available. Each model has its own performance characteristics.

Environment

RFID Reader performance may be affected by the following:

- Metal surfaces such as desks, filing cabinets, book shelves, and waste baskets may enhance or degrade reader performance.

Mount antennas as far as possible from metal surfaces that are adversely affecting system performance.

- Devices that operate at 900MHz such as cordless phones or wireless LANs can interfere with reader performance.

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

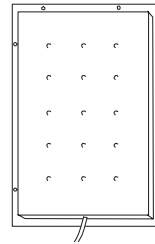
- Antennas operating in close proximity may interfere with one another, degrading reader performance.

Interference from other antennas may be eliminated or reduced by using either one or both of the following strategies:

- Affected antennas may be synchronized by a separate user application using a time-multiplexing strategy.
- Antenna power can be reduced by reconfiguring the RF Transmit Power setting for the reader.

Authorized Antennas

IDANTM1000-915L

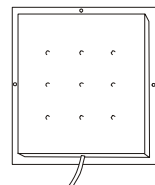


IDANTM1000-915L is a linear polarized antenna that reads data from 915MHz tags. It has a read range of up to 3.6m (12ft) from the antenna. Coverage area of up to 7.3m (24ft) may be achieved by using two antennas, one on each side of the opening.

The antenna is shipped with 3.6m (12ft) of cable and an appropriate connector for the RFID reader.

A mounting bracket suitable for attaching the antenna to a standard 1/4 inch–20 thread stud is included.

IDANTM1000-915C

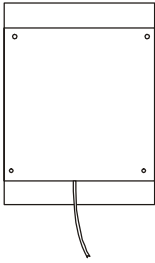


IDANTM1000-915C is a circular polarized antenna that reads data from 915MHz tags. It has a read range of up to 1.8m (6ft) from the antenna. Coverage area of up to 3.6m (12ft) may be achieved by using two antennas, one on each side of the opening.

The antenna is shipped with 3.6m (12ft) of cable and an appropriate connector for the RFID reader.

A mounting bracket suitable for attaching the antenna to a standard 1/4 inch–20 thread stud is included.

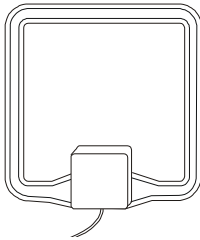
IDANTM1000-915S



IDANTM1000-915S reads data from 915MHz tags. It has a read range of up to 1.5m (5ft) from the antenna and is designed for installation on retail or warehouse shelves. The antenna has a particularly wide beam.

The antenna is shipped with 3.6m (12ft) of cable and an appropriate connector for the RFID reader.

IDANTM1000-1356T

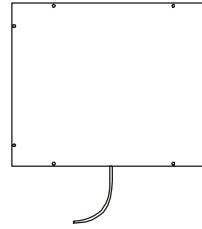


IDANTM1000-1356T reads data from 13.56MHz tags. It has a read range of up to 0.3m (1ft.) from the antenna. Coverage area of up to 0.6m (2ft) may be achieved by using two antennas, one on each side of the opening.

The antenna is shipped with 3.6m (12ft) of cable and an appropriate connector for the RFID reader.

A mounting bracket suitable for attaching the antenna to a standard 1/4 inch–20 thread stud is included.

IDANTM1000-1356P



IDANTM1000-1356P reads data from 13.56MHz tags. It has a read range of up to 0.3m (1ft.) from the antenna. Coverage area of up to 0.6m (2ft) may be achieved by using two antennas, one on each side of the opening.

The antenna is shipped with 3.6m (12ft) of cable and an appropriate connector for the RFID reader.

Mounting Hardware

Mounting brackets designed to attach an antenna to a standard 1/4 inch–20 thread stud can be mounted to any of the following camera mounts:

ADMC1361	Wall mount – black
ADMC1362	Wall/ceiling mount – beige
ADMC1365	“J” type ceiling mount – beige
ADMC1366	Wall/ceiling mount – gray
ADCM100T	“T” bar mount – chrome

Installation

The following parts are provided with the reader:

Part	Qty.	Part Number
Dual-Frequency RFID Reader	1	0101-0064-01
Power Supply	1	5605-0013-01
UHF Dummy Load Terminators	2	0304-2844-01
Installation and Service Guide	1	8200-0222-01
Regulatory Information for the User	1	8200-0222-03
Anchor, Plastic, 10-12, 1"L, w/screw	2	2880-0098-01

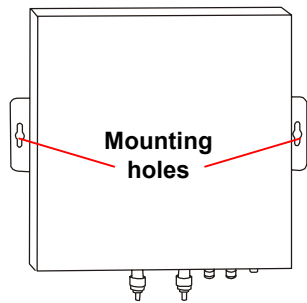
IMPORTANT: Be sure the user receives *Mercury 3 RFID Reader Regulatory Information for the User*, 8200-0200-03.

Install the Reader

The reader can rest on a shelf or it can be mounted on a wall.

To mount the reader on a wall:

1. Hold the reader in its mounting location and mark the position of the mounting screws (2).



2. Drill holes for the screws and install wall anchors if required. If wall anchors are required use 6.3mm (1/4in.) drill bit.
3. Insert the screws and tighten until almost flush with the wall.
4. Slip the reader over the screws and slide down to lock the screws in the keyhole openings.
5. Tighten the screws.

Install the Antennas

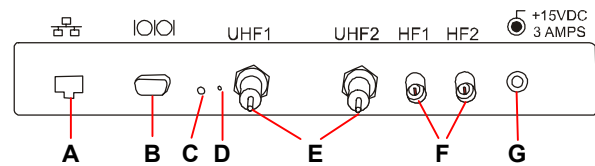
The antennas can be mounted directly to a variety of surfaces. Follow the installation instructions provided with the antennas.

Connect the Reader



WARNING: Each UHF antenna port **MUST** be connected to an antenna or a dummy load terminator before powering the reader. Failure to follow this warning may cause irreparable damage to the reader.

One to four antennas can be connected to the reader.



A = RJ-45 Ethernet port **E = UHF antenna ports**
B = Not available for use **F = HF antenna ports**
C = Safe mode button **G = DC power input**
D = Power/Heartbeat LED

1. Connect required UHF antennas to antenna ports **UHF1** and/or **UHF2**.

IMPORTANT: Never power the reader without an antenna or a dummy load terminator connected to each UHF antenna port.

2. Connect required HF antennas to antenna ports **HF1** and/or **HF2**.
3. Verify that all antennas and/or terminators are securely connected.
4. Plug the transformer provided with the reader into the DC power input connector. Then connect the transformer to a power outlet.

Wait for at least 60 seconds for the reader to boot up. The Power/Heartbeat LED is solid green while the reader boots. When the LED begins blinking, the boot process is complete and you may now connect to the reader.

5. Connect the reader to the network by plugging an Ethernet cable into the Ethernet port.

Or...

Connect the reader to a PC (personal computer) by plugging a crossover Ethernet cable into the Ethernet port.

Configure the Reader

In some cases, the application software may provide support for reader configuration. If so, follow the instructions provided with the application.

The following procedure describes how to configure the reader directly from a network PC using the browser-based interface.

The reader is shipped with the following default network configuration:

IP Address: 10.0.0.101
Subnet Mask: 255.0.0.0
Gateway: 10.0.0.1

You must know the IP address and subnet mask settings for the network environment in which the reader will be running.

1. Exit any reader applications that are running on the network.

IMPORTANT: Running another RFID reader application while using the browser-based interface may cause a reader error. If this happens, reboot the reader or restart the system using the browser-based interface.

2. Verify that the RFID reader is operational. The green Power/Heartbeat LED must be blinking.
3. Start a Java-enabled web browser from any network-enabled PC.

This PC must be configured with an IP address and subnet mask compatible with the reader default settings. For example: IP address 10.0.0.10, net mask 255.0.0.0.

4. Browse to...

http://10.0.0.101

The EPC/Multi-Band Reader browser-based interface is displayed.

5. Click the **Network** link in the navigation menu. The Network Settings page appears.
6. Enter the required network settings in the IP Address, Subnet Mask, and Gateway fields. Then, click the **Save** button.
7. Click the **Restart** link in the navigation menu. The Startup Settings page appears.

8. Verify that the settings shown are correct. Then, click the **Restart System** button.

It may take several seconds for the reader to restart. If the IP address was changed, you must type the new address in the browser address field to communicate with the reader.

9. Once the system restarts, the RFID reader is ready to receive commands from the network.
10. Use the Query page of the browser-based interface to verify antenna operation.
11. Close the browser window. Start the RFID reader application on the network.

Service

Using the Browser-Based Interface

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

A navigation menu provides access to the following:

- Current Operational Settings page
- Query page
- Radio Settings page
- Network Settings page
- Firmware Upgrade page
- Startup Settings page
- Help page

The browser-based interface can be run from any PC on the network. However, it must be configured with an IP address and subnet mask compatible with the current operational settings of the reader.

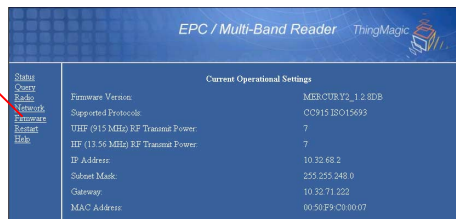
To start the browser-based interface:

1. Exit all RFID reader applications on the network.

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

2. Start a Java-enabled web browser from any network-enabled PC.
3. Type the IP address of the reader you want to communicate with in the Address field of the browser.
4. A navigation menu and the Current Operational Settings page appear in the browser.

Navigation menu



Current Operational Settings Page

The Current Operational Settings page shows the current settings of the reader. These settings are also displayed at the bottom of the Startup Settings page.

Current Operational Settings	
Firmware Version:	MERCURY2_1.2.8DB
Supported Protocols:	CC915 ISO15693
UHF (915 MHz) RF Transmit Power:	7
HF (13.56 MHz) RF Transmit Power:	7
IP Address:	10.32.68.2
Subnet Mask:	255.255.248.0
Gateway:	10.32.71.222
MAC Address:	00:50:F9:C0:00:07

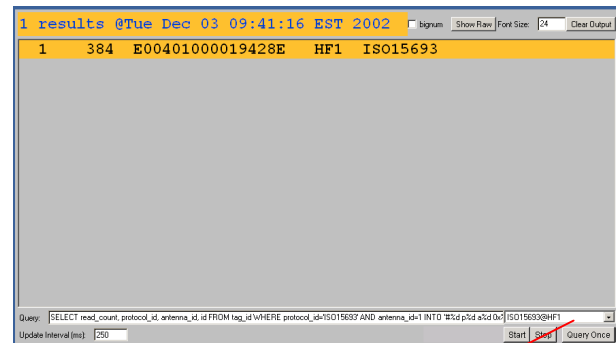
1. Click the **Status** link in the navigation menu to display the Current Operational Settings page.
2. Close the browser window if you are finished using the browser-based interface.

Query Page

Use the Query page to monitor reader performance. The Query page is useful for verifying performance when installation is complete and for troubleshooting performance issues.

The Query field includes a drop-down list (at the right of the screen) that enables you to specify the operating mode. The operating mode specifies the tag protocols and antenna ports to be used in conjunction with the Query page.

Note: The selected settings DO NOT affect reader performance associated with other applications.



Operating mode drop-down list

The following operating modes are available for use with the Query page:

Selection	Description
CC915	CC915 protocol tags using both UHF antenna ports
CC915@UHF1	CC915 protocol tags using UHF port 1
CC915@UHF2	CC915 protocol tags using UHF port 2
ISO15693@HF1	ISO15693 protocol tags using HF port 1
CC915+ISO15693 @ {U,}HF1	CC915 and ISO15693 tags using both UHF ports and HF port 1
ISO15693	ISO15693 protocol tags using both HF antenna ports
ISO15693@HF2	ISO15693 protocol tags using HF port 2
CC915+ISO15693	CC915 protocol tags using both UHF antenna ports and ISO15693 protocol tags using both HF antenna ports
CC915+ISO15693 @ {U,}HF2	CC915 and ISO15693 tags using both UHF ports and HF port 2
ALL	All protocols using all ports

1. Click the **Query** link on the navigation menu. The Query page appears.
2. Select the operating mode from the pull-down list.
3. Click the **Start** button to begin reading tags.
Tag data is displayed. Each entry shows sequential tag number, number of times tag was read, tag data, antenna, and protocol.
4. Click **Stop** to stop the tag search.

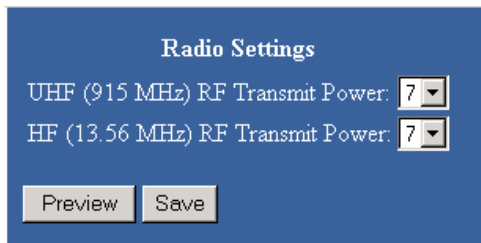
IMPORTANT: You MUST stop the query before exiting the browser-based interface or the reader will continue to poll antennas.

The Query page provides additional options that enable you to control the data that is gathered and how it is displayed:

- **Bignum** checkbox (when checked) displays the total number of unique tags read. The total is displayed in large red numbers directly over the tags read list.
- **Show Raw** button displays raw tag data on the Query page. Each entry shows reader, protocol, antenna, and tag data.
- **Hide Raw** button stops the display of raw tag data.
- **Clear Output** button clears the data displayed.
- **Query Once** button initiates a single search cycle after clicking **Start**.

Radio Settings Page

Use the Radio Settings page to change antenna transmit power.



1. Click the **Settings** link on the navigation menu. The UHF Settings page appears.
2. Use the drop-down list to select the desired RF Transmit Power level for UHF and HF antennas. The power level affects the read range of the reader.

Valid settings for UHF antennas are 0 (no power/no read range) through 7 (highest/longest read range). The default RF Transmit Power level for UHF antennas is 7.

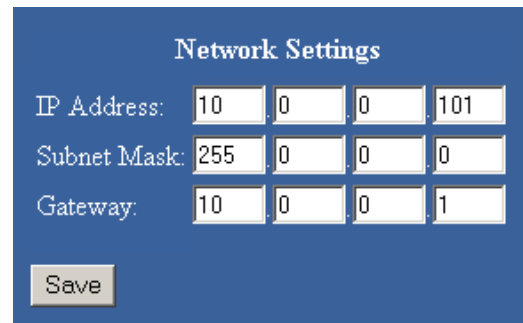
Valid settings for HF antennas are 0 (no power/no read range) through 10 (highest/longest read range). The default RF Transmit Power level for HF antennas is 10.

3. Click the **Preview** button to try out new settings without saving them.
4. Click the **Save** button to make the settings permanent. The changes will take effect immediately.

WAIT until you see the confirmation message "New settings saved." Changes are not permanent until you see this message.

Network Settings Page

Use the Network Settings page to change network settings.

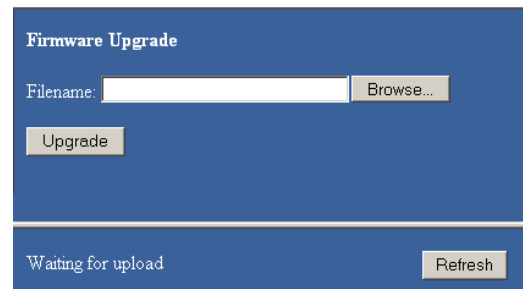


1. Click the **Network** link on the navigation menu. The Network Settings page appears.
2. Enter the required settings.
3. Click the **Save** button to save the new settings.

The new settings DO NOT take effect until the reader is restarted by using the Startup Settings page or by rebooting the reader (see Rebooting the Reader on page 8).

Firmware Upgrade Page

Use the Firmware Upgrade page to download new firmware to the reader.



1. Click the **Firmware** link on the navigation menu. The Firmware Upgrade page appears.
2. Place the cursor in the Filename field and type the complete network pathname of the firmware file or click the **Browse** button to locate the new firmware file.
3. Click the **Upgrade** button to download the new firmware to the reader.

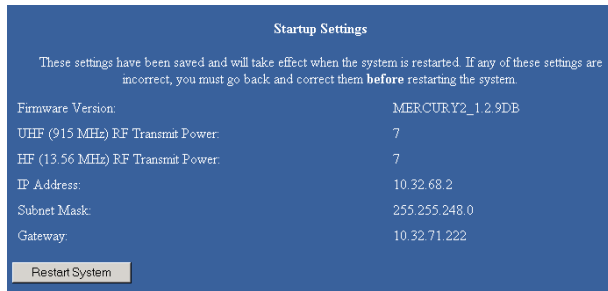
The status frame at the bottom of the page displays the progress of the upgrade if the web browser supports automatic page reload. Click the **Refresh** button to update the status bar if the web browser does not support automatic page reload.

Downloaded firmware IS NOT implemented until the reader is restarted using the Startup Settings page.

If an error occurs during the firmware upgrade, use Safe Mode to recover.

Startup Settings Page

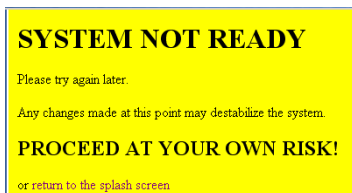
Use the Startup Settings page to review settings and to restart the reader.



1. Click the **Restart** link on the navigation menu. The Startup Settings page appears.
2. Verify that the settings displayed are the new settings you want to implement.
3. Click the **Restart System** button to restart the reader and allow saved changes to take effect. This may take several minutes.

If the new settings change the IP address of the reader, use the new IP address in the address field of the browser to restore communication with the reader using the browser-based interface.

Note: A warning screen may be displayed (see below) if you click a link on the navigation menu before the restart is complete. To resume communication with the reader, re-enter the IP address of the reader in the browser address field.



4. Close the browser window if you are finished using the browser-based interface.

Help Page

Use the Help page to view descriptions of system operations.

Rebooting the Reader

Use this procedure to recover from a reader error.

1. Disconnect power from the reader.
2. Re-connect reader power.

Wait for at least 60 seconds for the reader to boot up. The Power/Heartbeat LED is solid green while the reader boots. When the LED begins blinking, the boot process is complete.

Using Safe Mode

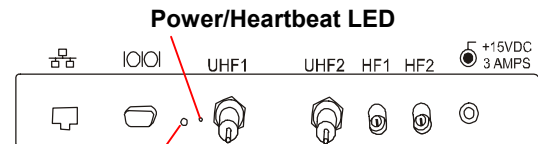
Use the Safe Mode button on the reader connector panel to recover from errors that disable the reader.

Safe mode operation restores factory default settings as follows:

Firmware Version: factory installed version
UHF (915 MHz) RF Transmit Power: 7
HF (13.56 MHz) RF Transmit Power: 7
IP Address: 10.0.0.101
Subnet Mask: 255.0.0.0
Gateway: 10.0.0.1

Although the browser-based interface pages are displayed in red when operating in Safe mode, the reader is fully functional. In most cases, the reader will need to be reconfigured for operation with the reader application after starting in Safe mode.

1. Disconnect power from the reader.
2. Depress and hold the Safe Mode button while restoring power to the reader. Keep the Safe Mode button depressed until the reader boots completely (the green Power/Heartbeat LED blinks).



Safe Mode button

3. Factory-default settings are restored.
4. Use the browser-based interface to configure the reader for use with your system.
5. Use the Startup Settings page to restart the reader so the configuration changes take effect. Once the restart is complete, the reader is no longer in Safe Mode.

Specifications

Electrical

RFID Reader

UHF operating frequency 902–928MHz
HF operating frequency 13.56MHz
Input voltage 15Vdc, 3.0A

Separate Power Supply

Input voltage Nominal 100–240Vac, 50/60Hz
Ac line current Nominal 0.5A at 120V
Output voltage Nominal 15Vdc, 4.2A peak
certified limited power source
Class 2

Environmental

Operating temperature: ... 0° to 40°C (32° to 104°F)
Relative humidity: 0 to 90% non-condensing

Mechanical

Length 26.5cm (10.4 in.)
Width 26.6cm (10.4 in.)
Width (including mounting bracket) . 30.5cm (12 in.)
Height 3.8cm (1.5 in.)
Weight 1.4kg (3 lbs)

Supported Tag Protocols

915 MHz (Alien EPC)
13.56 MHz (Philips I-Code 2, ISO 15693)

Declarations

Regulatory Compliance

EMC 47 CFR, Part 15
Safety UL 60950
Can/CSA C22.2 No 60950

REGULATORY PRODUCT NAME: RFID TM1

FCC COMPLIANCE: This equipment complies with Part 15 of the FCC rules for intentional radiators and Class A digital devices when installed and used in accordance with the instruction manual. Following these rules provides reasonable protection against harmful interference from equipment operated in a commercial area. This equipment should not be installed in a residential space as it can radiate radio frequency energy that could interfere with radio communications, a situation the user would have to fix at their own expense.

EQUIPMENT MODIFICATION CAUTION: Equipment changes or modifications not expressly approved by ThingMagic LLC, the party responsible for FCC compliance, could void the user's authority to operate the equipment and could create a hazardous condition.

IMPORTANT USER INFORMATION: In order to comply with FCC requirements for RF exposure safety, a separation distance of at least 22 cm (8.7in.) needs to be maintained between the radiating elements of the antenna and the bodies of nearby persons.

Other Declarations

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