M200/D200/J200 Reader



RF Code™
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User Manual

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The user of this system is cautioned that any changes or modifications to this system, not expressly approved by RF Code, Inc., could void the warranty.

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

RFCode is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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

RFCode, Inc.
9229 Waterford Center Blvd. #500
Austin, TX 78758
Telephone: 1-512-439-2200

Industry Canada Compliance Statement
This Class A digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

Avis de conformité à la réglementation d'Industrie Canada
Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

The system is design to operate with RFCode R100 RFID Tags – Whose operating frequency is 433.92 MHz which have been certified or are in the certification process. These R100 devices comply with part 15 of the FCC rules. Operation is subject to the following two conditions:
(1) these devices may not cause harmful interference, and
(2) these devices must accept any interference received, including interference that may cause undesired operation.

a. FCC ID: P6F2005433 for beacon intervals greater than, or equal to 10 seconds.
b. FCC ID: P6F433MHZ for the security tag with beacon intervals less than 10 seconds.

CE Compliance

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures. This equipment complies with the requirements relating to electromagnetic compatibility, EN 55022 class A, the essential protection requirement of Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility.

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RF Code, Inc.
9229 Waterford Centre Blvd.
Suite 500
Austin, TX 78758
www.rfcode.com

Introduction

The 433 MHz M200 and the 303 MHz D200 and J200 fixed readers interpret and report the radio frequency messages emitted by RF Code tags at distances up to 1,000 feet (with optional custom antenna configurations). Tag transmissions can be processed in real-time to quickly locate and identify tagged assets or personnel in defined areas. The 200 line of readers are compatible with wired and wireless networks for rapid integration into an organization's IT infrastructure. With a modular design and low price, M200, D200, and J200 Readers provide an economical solution to a wide variety of asset tracking problems. RF Code's patented communication protocols allow for very high tag densities. Large populations of tags can be monitored using a single reader. The M200/D200/J200 reader's maximum sensitivity (maximum range) depends upon the installation, location and antenna configuration. This manual provides the instructions for the M200/D200/J200 Reader setup and operation.

Features

Some of the features included of the M200/D200/J200 Reader are:

- Instantaneous Tag Reporting
- Software-Configurable Range Control Settings
- Small Footprint and Flexible Mounting Options
- Serial (RS232) Interface
- Direct API Interface Available
- Wired Ethernet Communications (Wireless Ethernet is optional)
- High Throughput Performance Supports Large Tag Populations
- Patented Anti-Collision Technology to Manage High RF Densities
- Dual Channel Receiver Provides Tag Signal Reception Diversity
- Optional Antenna Configurations for Customized Coverage Zones
- Standard 110/220 Power Supply and optional Power over Ethernet (PoE)

Contents

The M200/D200/J200 Reader System package contents are:

- M200, D200 or J200 Reader
- Power Supply for the Reader
- 2 ¼-wave helical antennas
- Reader Configuration Utility CD
- Printed Reader User Manual

Hardware

The Reader is housed in a 5 x 5 x 1.5 inch (12.7 x 12.7 x 3.81 cm) metal chassis and contains the internal components of a RFID Reader combined with connections to allow for both Ethernet and serial port connectivity.

LED Indicators

Three LEDs are mounted on the front of the M200/D200/J200 Reader.

- On-Ready LED – This LED indicates the Reader has power applied through an external power adapter.

- Tag Activity LED – This LED is used for two purposes: (1) to show the status of the Reader while in standby mode and (2) to show Tag detections while in operation.
  1. **Operating –** The Tag Activity LED flashes intermittently, indicating the Reader has read one or more Tags each time it flashes. Because the Reader can decode Tags faster than the light can be turned on and off, a single flash may indicate more than one Tag being decoded.
  2. **Standby Mode –** The Tag Activity LED turns on and off at a distinctive rate that indicates the Reader is in standby mode.

- Unlabeled LED – This LED is used for a feature that is not implemented in this version of the Reader.

Data Connections

Several connections are housed on the back of the M200/D200/J200 Reader.

- Ethernet – RJ-45 Ethernet jack. The Ethernet connection has a link-state "LINK" LED and collision "COL" LED such as those found on common Ethernet network connections. The LINK light stays solid when there is no network activity and flashes when activity is present.
- Power – A plug allows for connection to both AC and DC power sources. Power requirements are 12 to 28 VDC and 9 to 20 VAC.
- Serial – DB-9 RS-232 Serial port.

Antennas

Each M200/D200/J200 Reader comes with two ¼-wave helical antennas. These antennas provide a tag read-range of approximately 100 meters. The reader's maximum sensitivity (maximum range) depends upon the operating environment. The operating read-range is software configurable and can be adjusted for near and long-range searches.

Environmental Limits

The M200/D200/J200 Reader is approved for use within the temperature ranges set forth below.

- **Operation**: -20 to +70 degrees Celsius.
- **Storage**: -40 to +80 degrees Celsius.

Upgrade Firmware

The M200/D200/J200 Reader has the ability to be updated as new firmware is released. To upgrade the firmware, launch the Reader Configuration Utility, found on the RF Code Reader Utilities and SDK CD. For information regarding this process, please refer to the RF Code Reader Configuration Utility User Manual also located on the CD. Firmware can also be upgraded by downloading the latest version at the following support site:

http://www.rfcode.com/support_downloads



It is vital these updates be obtained directly from RF Code or its authorized source, since these files define the operation of the Reader and if defective, the files will render the Reader inoperable.

Tag Orientation

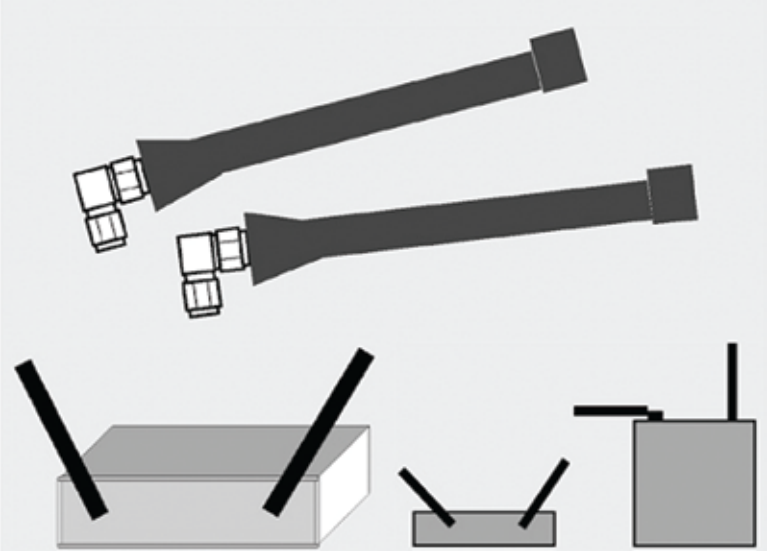
Wherever possible, RF Code tags should be placed in the same orientation (plane) in order to optimize the Reader's ability to receive transmissions from the tag. The tags should not be placed closer than ½ inch in proximity to one another.

Other tag warnings are:

- Tag transmissions, signal propagation and read-range are all diminished when tags are mounted very close to the ground.
- Read-range will vary when tags are mounted to metal objects; The signals will NOT penetrate solid metal.
- Care should be taken when mounting tags near metal racks, rails or conveyor belts.
- Tag performance is diminished near water; signals are not propagated through water.

Antenna Orientation

Figure 1 Various Antenna Positions



Each antenna post supplies an RF signal to the two parallel radio receivers in the M200 (D200, J200) Reader. Antenna input impedance is 50 ohms nominal.

Both the type of antennas used and the Reader range setting determine the effective read range. The normal Reader-range features are defined using ¼-wave helical antennas. These antennas are appropriate for most Reader applications. Optional antennas that offer diverse receiving properties or extend the range of the Reader are available for the M200/D200/J200 Reader. Contact your Reader distributor for more information.

The M200/D200, J200 Reader has two receiver channels that can operate independently or jointly to provide Tag signal diversity reception. The Reader can operate with one antenna on either antenna post, but the benefit of receiver diversity reception is obtained with both antennas attached.

To achieve the best receiver diversity:

- **Antenna Angle from Reader** – It is desirable to have the antennas positioned at different angles from the Reader.
- **Antenna Angle from Each Other** – Antennas should be at 90-degree angles relative to each other. It may be necessary to experiment with antenna positions to achieve optimum coverage.
- **Height** – As a rule, the higher a Reader is positioned above the ground or floor, the better the Reader's detection range.



Do not allow antennas to overlap. Keep the antennas separated. Allowing the antennas to overlap reduces the effectiveness of each antenna.

To minimize RF interference:

- **Separation** – Maintain a 4-to-6-foot separation between the Reader antennas and potential RF radiators such as computers, monitors, printers and electronic office equipment. The local radio environment can limit the Reader's effective range.
- **Height** – Do not operate the Reader on or close to the floor or ground. Grounded and reflective metallic structures around the Reader and/or tags affect the system performance. For best results, the Reader should be mounted as high as reasonably possible.



Readers should not be positioned close to ceilings as they act as ground planes.



Low loss SMA coaxial extension cables may be used to separate the antennas from the Reader.

Getting Started

To install and setup the M200/D200/J200 Reader perform the following steps:

1. Attach provided Power supply cord to the Reader and to an available electrical outlet.

2. Attach an Ethernet cable to the Ethernet port of the Reader and to an available network port.

   For initial configuration, the Reader must be attached to a network port that is on the same subnet as the PC that you are using to connect to the Reader with.

3. Connect to the Reader through a Network or Serial Port using the RF Code Reader Configuration Utility provided on the Reader Configuration Utility (Please refer to the **Reader Configuration Utility User Manual** for instructions on using the Reader Configuration Utility).

   Once you have connected to the Reader with the Reader Configuration Utility, you can:

   - Change the IP address of the Reader
   - Upgrade the firmware
   - Apply security settings

   To obtain data or create a customized data transmission for the Reader please refer to the **Reader API** document available on the Reader Configuration Utility CD.

4. Attach the provided ¼-wave helical antennas ensuring proper steps have been taken to maximize desired read-range through antenna orientation (Please refer to the **Antenna Orientation** section of this document).

This is a brief list of potential problems that may be encountered while using the M200/D200/J200 Reader. If the problem cannot be resolved using this list, refer to "Obtaining Service & Support" section.

SYMPTOM - There are no tags being read at the reader.
CONDITION - The reader power light is off.
REMEDY - Plug in the Reader power supply.
REMEDY - Turn on the reader power switch.

SYMPTOM - There are no tags being read at the reader.
CONDITION - The reader power light is on.
CONDITION - The reader detect light is turning on and off at a regular interval.
REMEDY - The Reader is in standby mode and needs to be configured and enabled for operation.

SYMPTOM - There are no tags being read at the reader.
CONDITION - The Reader has power but is unresponsive to system communications or remote restart commands.
REMEDY - Verify the LAN is connected and the Client Bridge can be "Pinged".
REMEDY - Verify that the Reader is connected to the LAN by a wired cable or by wireless but not by both. If connected by a wired LAN, remove the wireless card from the Reader.

SYMPTOM - There are no Tags being read at the Reader. The Reader has been configured, enabled and is communicating.
CONDITION - The Reader power light is on.
CONDITION - The Reader detect light is not flashing.
CONDITION - The system is receiving the "status" message from the Reader.
REMEDY - Verify the antennas are attached to the Reader and/or move the Tags closer to the Reader.
REMEDY - Change the range setting on the Reader to a longer range to see the available Tags.
REMEDY - Verify the communication medium between the Reader and the computer is operational.
REMEDY - Verify that the configured group code is the same as the Tags being read.
REMEDY - Verify the computer program is set up correctly to receive TagIDs.

SYMPTOM -TagIDs do not drop off the computer display when the Tags are moved away from the Reader.
CONDITION - The antenna(s) are installed on the Reader.
REMEDY - Verify that the data communication path from the Reader to the computer is functional.
REMEDY - Change the Reader's range setting to a shorter range.

SYMPTOM -All the indicator lights on the Reader turn off and back on again.
REMEDY - If the Reader is not in operation or off-line, the watchdog timer inside the Reader periodically power-cycles the whole Reader. This is normal operation.

Limited Standard Warranty Terms

RF Code warrants its products to be free from defects in materials and workmanship for a period of 1 year (12 months) for hardware and software from the date of purchase from RF Code. Its obligation under this warranty is limited to repairing or replacing, at its own sole option, any such defective products. This warranty does not apply to equipment that has been damaged by accident, negligence, or misapplication or has been altered or modified in any way. This warranty applies only to the original purchaser (end-user) and is not transferable.

Standard Warranty Limitations

Except as provided herein, the entire liability of RF Code and its suppliers under this limited warranty will be that RF Code will use reasonable efforts to repair or replace, without charge, all defective Products returned to RF Code by Customer, all as more particularly described in the End User Warranty. Except for the express warranties STATED HEREIN, RF Code makes no other representations or warranties and RF Code hereby disclaims, all other warranties, express, implied, statutory, or otherwise, including without limitation, any warranty of merchantability, non-infringement of third party intellectual property rights, fitness for a particular purpose, performance, satisfactory quality, or arising from a course of dealing, usage or trade practice.

Obtaining Service & Support

For in-warranty service, customers have several options. Customers having difficulty with RF Code products should attempt to solve those problems through RF Code's Technical Support Problem Escalation Process:

First, contact the RF Code representative or other distributor from whom the RF Code product was purchased for information on how to obtain local support.
Second, contact the RF Code Customer Support via e-mail.
Third, contact the RF Code Customer Support via the Support Line.

For product returns, the support engineer will give you a return material authorization (RMA) number. No returns will be accepted without an RMA number. If the warranty expired, there is a charge for repair or replacement per RF Code's out-of-warranty policy. For full details of the RF Code RMA policy, please review the "RF Code Warranty, RMA, and Extended Warranty Policy" document.

RF Code Customer Support

RF Code Customer Support gives entitled customers and partners the ability to contact RF Code about installation and usage-related questions as well as make defect inquiries about eligible products that are covered under RF Code warranty agreements. A team of technical specialists can be contacted electronically or via phone.

The Support Line is available to provide General Support during normal business hours: Monday through Friday, 8:00am to 5:00pm Central time, excluding national holidays.

E-mail: **support@rfcode.com**
Support form: **http://www.rfcode.com**
Voice: **512.439.2244** or toll-free at **866.830.4578**


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