Stationary Reader

(Part# RDR-MP-001)

User's Manual

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Contents

Section 1. Introduction

This *User's Manual*, designed for the Matrics, Inc. RFID system user, describes the Stationary Reader (Part# RDR-MP-001) and how to install it.

Document Conventions

The following conventions are used in this *User's Manual*:

CONVENTION	DESCRIPTION
Hyperlink	Click marked text to immediately move to information (or web site). Example: http://www.matricsrfid.com
1. Numbered list	Provides step-by-step procedures for performing an action
• Bulleted list	Provides grouped information, not procedural steps

Acronyms and Abbreviations

The following acronyms and abbreviations are used in this *User's Manual*:

ACRONYM	DEFINITION
IC	Integrated Circuit
OOK	On Off Keyed
RFID	Radio Frequency Identification
TBD	To Be Determined

Disclaimer

While Matrics has committed its best efforts to providing accurate information and timely updates to this *User's Manual*, we assume no responsibility for any inaccuracies that may be contained herein, and we reserve the right to make changes to this *User's Manual* without notice.

Section 2. System Description

Matrics develops and markets Radio Frequency Identification (RFID) that is effective and affordable by offering a combination of low cost, long read range, and a very high read rate unmatched by other RFID systems. A typical Matrics RFID system consists of three components:

- Silicon-based RFID tags,
- Reader network components (readers, antennas, cables, power supplies, CAT3 cable termination blocks, etc.), and
- Your choice of Host/PC controller with system management software.

RFID Tags

Tags can be purchased as thin, flexible smart label inlays that can be incorporated into standard laminated paper or plastic to create inexpensive stick-on or embedded labels. Matrics smart labels can uniquely identify items up and down the supply chain, such as products in-process, pallets, boxes, trays, and totes.

With an innovative approach that removes the circuit complexity from the integrated circuit (IC), Matrics UHF tags are simple and inexpensive to produce. The ultra lean chip design requires low power and consequently produces powerful read ranges. Each chip is extremely secure and tamper-proof, because the unique ID is programmed very early in the manufacturing process and cannot be altered.

Reader Network Components

The Matrics RFID Reader provides all of the RF and control functions required to power and communicate with Matrics passive RFID tags. It sends digital data to the tag (through one antenna at any given time) on a pulse width modulated On Off Keyed (OOK) transmitter signal, demodulates the identification signal received from the tag, and then sends the data to a host control device.

The Matrics Reader system is structured to allow for flexibility in system configurations and in the arrangement of read points to optimize coverage at a low overall cost. In its maximum configuration, a single Reader can support a total of thirty-two (32) lower performance antennas [with eight (8) lower performance antennas attached to each of up to four (4) multiplexers attached to a Reader], or four (4) high performance antennas attached directly to a Reader. Any combination (up to the maximum) of high performance antennas (directly attached to the Reader) and lower performance antennas (attached to the Reader via multiplexers) can be implemented.

The system also employs a unique, patented reader-driven interrogation protocol that allows up to one thousand (1,000) tags to be read each second. This powerful read rate supplies the muscle to overcome interference in noisy environments, and to guarantee acceptable read rates at each read point when large numbers of antennas are multiplexed together.

Readers can be powered either locally or through the network cable in the event there is not a local power source near by, and to minimize overall network infrastructure costs.

Section 3. Specifications and Diagrams

Reader Specification

The following table provides the specifications for the Reader:

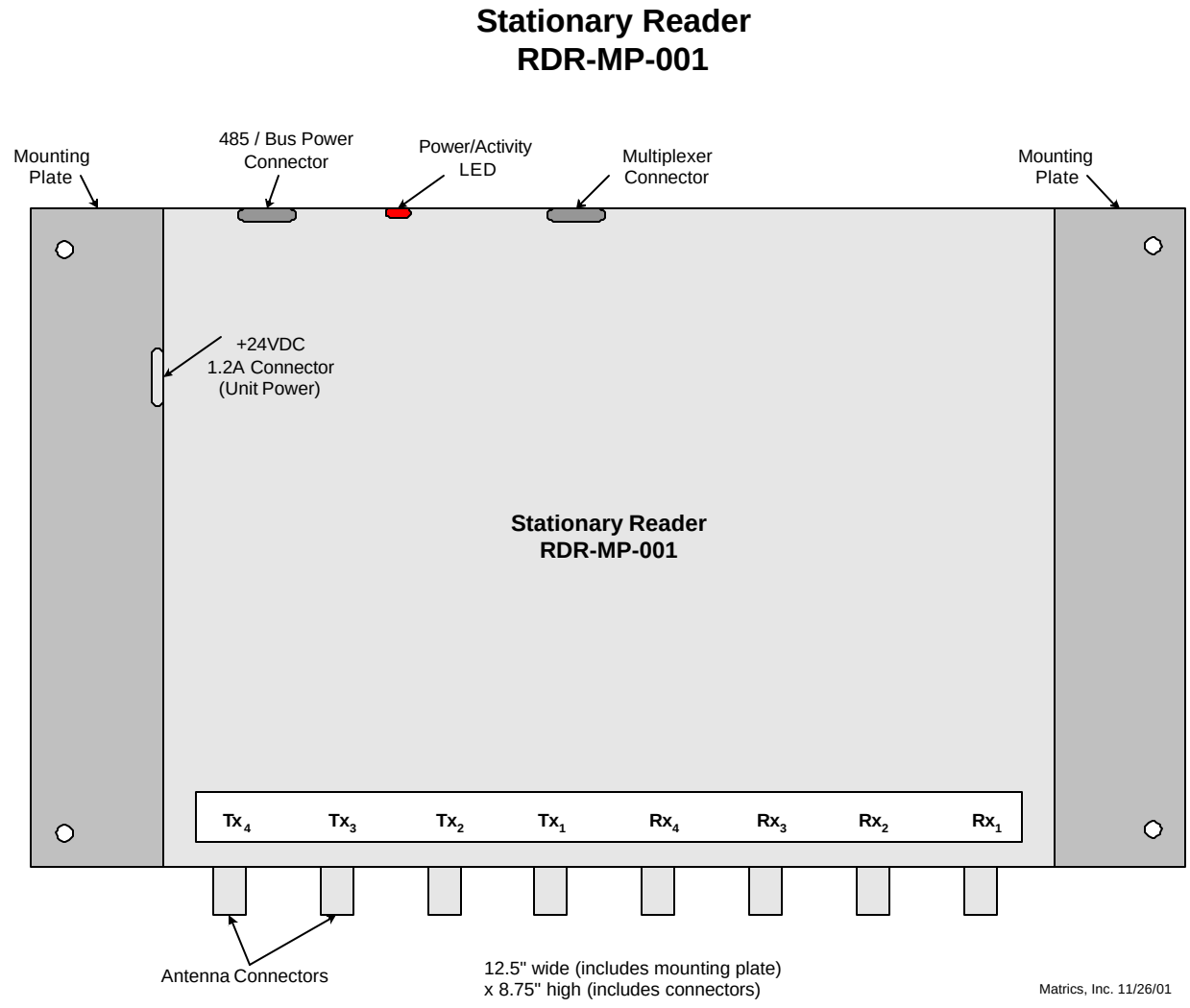
CHARACTERISTIC	DESCRIPTION
Name/Part Number	Stationary Reader, RDR-MP-001
Operating Frequency	UHF band, 902-928 MHz, frequency hopping
System Architecture	Point-to-multipoint reader network
Dimensions	12.5” wide (includes mounting plate) x 8.75” high (includes connectors) x 1.5” deep
Simultaneous Reading Capability	Up to 1000 tags per second
Operating Temperature	Operational: 0° to +50° C Storage: -20° to +70° C
Communications Interface	RS485, 232400 bps, no flow control, no parity, 8 data bits, 1 stop bit
Inputs/Outputs	4 dual coax antenna mini-UHF connectors, 1 RJ45 host comm., 1 2.5 mm power, 1 RJ14 multiplexer
Power Supply	+24 VDC, 1.2A (unregulated)
Power Consumption	30 watts operational, 1 watt standby
RJ45 Pin Assignments (host communications)	Pin 1: Tx+ Data Pin 2: Tx- Data Pin 3: Power Return and Ground Pin 4: +24VDC Pin 5: +24VDC Pin 6: Power Return and Ground Pin 7: Rx- Data Pin 8: Rx+ Data
Multiplexer connection	Pin 1: Clock+ Pin 2: Clock- Pin 3: +12V Pin 4: +12V Pin 5: Tx- Data Pin 6: Tx+ Data

Antenna Specification

The following table provides the specifications for the antenna:

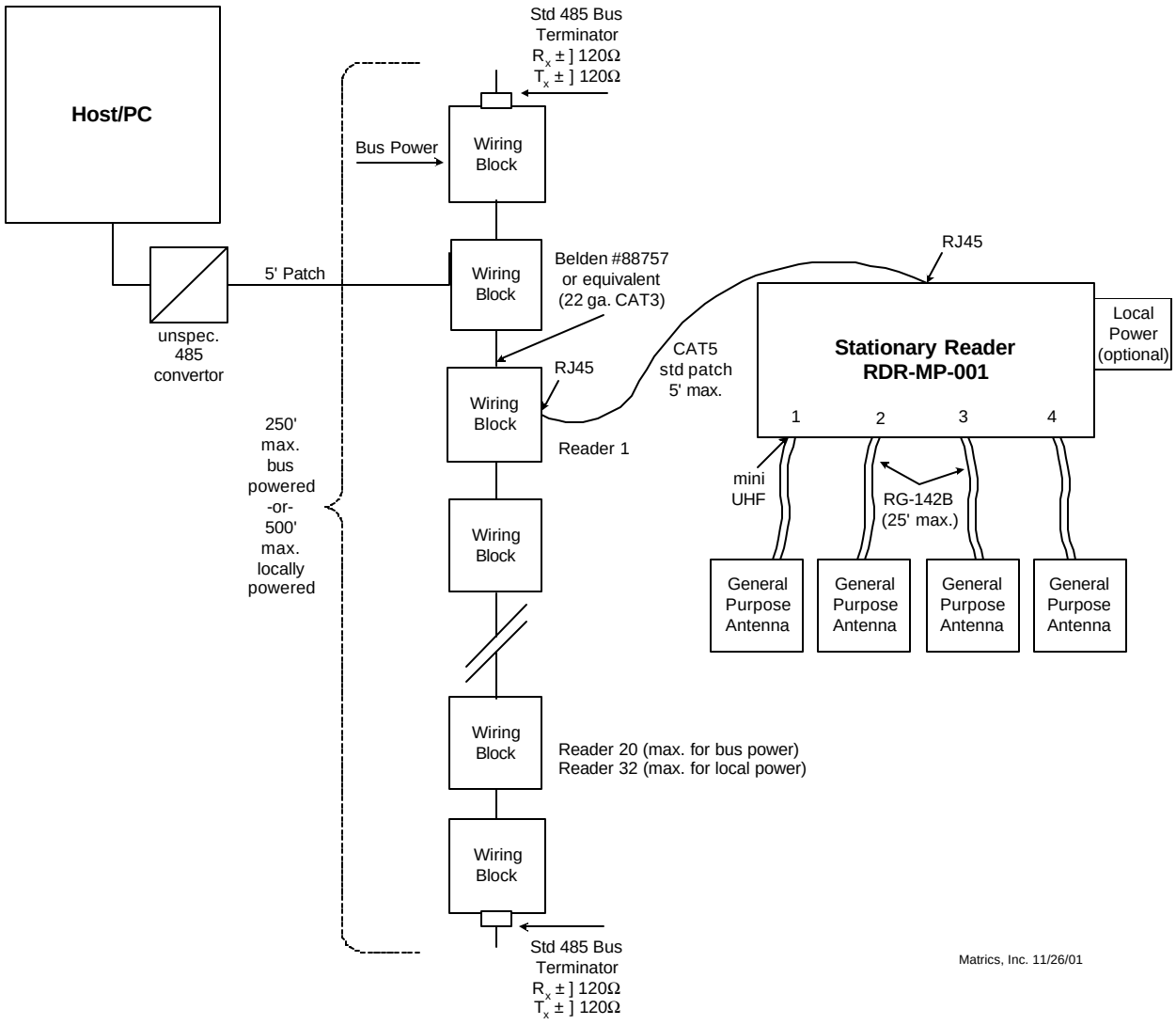
CHARACTERISTIC	AT 915 MHz
Name/Part Number	General Purpose Antenna, RAN-GP-001
Input Standing Wave Ratio (VSWR)	1.25
Isolation -db	-37
3db Beam Width	60°
Gain in dbd/linear	6

Reader Diagram



Connections Diagram

Functional System Connections



Section 4. Installation

Check that you have everything you need before you proceed with the installation. In addition to this *User's Manual*, you should have received the following items in your package:

- One Matrics Stationary Reader (Part# RDR-MP-001)
- Wall mount Power Supply (optional)
- Mounting equipment
- CAT5 jumper cable
- CAT3 cable termination block ("wiring block")
- Utility software.

Contact Matrics (refer to the "Contact Us" section in this *User's Manual* for more information) if any of the above-listed items arrived damaged or are missing from your package.

LEDs and Connectors

The following table describes the Reader's hardware. It lists the front and back panel's connectors, etc., and specifies the electrical inputs and outputs:

ITEM	DESCRIPTION
Power/Activity LED	LED is red when the Reader is powered On and receiving power. The light blinks when commands are correctly received from the Host/PC.
RS485 / Bus Power Connector	Connect to Host/PC and bus power.
RJ14 Connector	*For future use.*
+24VDC 1.2A Connector (Unit Power)	The power supply should be plugged into a wall outlet and into the DC power connector.
Mini-UHF Antenna Connectors	Connect to external antennas.

Installation Procedure

The Reader installation consists of the following steps:

1. Mount your antenna(s) in a location chosen for optimum operation. Make sure that you follow the FCC guidelines for antenna placement. The antenna should be at least two (2) meters from any unsuspecting personnel.

2. Mount the Reader on a wall near your antenna(s) locations.

> **CAUTION:** The Reader must reside indoors, in operating range, and out of direct sunlight, high moisture, or extreme temperatures.

3. Cable to connect the external antenna(s). Maximum cable length is 25'.

4. Cable to connect the Reader to the Host/PC.

5. Power On the Reader.

6. Configure the Reader using the Utility software provided in your package. Follow the prompts to change your Readers' factory-assigned xFF address to a unique address for communicating with your Host/PC.

Section 5. Cautions, Notes, and Approvals

Matrics products are approved (or approval pending) by the appropriate regulatory agencies:

- Federal Communications Commission (FCC), Part 15
- Underwriter Laboratory, UL 294

Note: 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 *User's 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 or her own expense.

> **CAUTION:** Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Information to the User: 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.

> **WARNING:** This device must be installed in a location that is not accessible to the general public. Install the device so that the antenna is at least two (2) meters from unsuspecting personnel. Failure to install this device as described will result in a failure to comply with FCC rules for RF exposure and is discouraged.

Disclaimer: Operation of any radio transmitting equipment, including this product, may interfere with the functionality of inadequately protected medical devices. Consult a physician or the manufacturer of the medical device if you have any questions. Other electronic equipment may also be subject to interference.

Section 6. Limited Warranty

Matrics warrants its products to the original purchaser to be free of defects in workmanship and material for a period of ninety (90) days from date of receipt. Matrics' sole and complete responsibility under this warranty is expressly limited to repair or replacement of the defective product.

Replacement products may be new or reconditioned. All products that are replaced shall become the property of Matrics The warranty for replacement products is the same as the equivalent newly purchased product.

Any tampering or modification to the product, or subjecting of product to abnormal electrical, mechanical, or environmental abuse will void this product warranty.

Section 7. Troubleshooting

In the event you encounter a problem with your Reader, refer to the following table for possible solutions:

PROBLEM	POSSIBLE CAUSE	SOLUTION
The Power/Activity LED doesn't light.	The AC outlet may not be working or may be controlled by a wall switch.	Plug a different electrical appliance into the outlet and turn it on. If the appliance doesn't work, plug the Reader into a different outlet.
The Power/Activity LED is on but doesn't blink.	The Reader isn't communicating with the Host/PC, -or- The Host/PC isn't communicating with the Reader.	Check that your Host/PC's port settings are configured properly. Make sure that you used the Utility software to change the Reader's factory-assigned xFF address to a unique address for communicating with your Host/PC. Check to ensure proper network cabling (including terminators at both ends.) Verify communications at a fixed 230,400 rate.

Section 8. Contact Us

For general and technical assistance, contact Matrics at:

Tel: 410.872.0300
Monday-Friday 8:30 a.m. – 5:00 p.m. EST
Fax: 410.872.0700

http://www.matricsrfid.com/

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