SENTINEL-SENSE MPR-3014

MPR-3014WF-xM

Installation & Operation Manual

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FCC COMPLIANCE

This equipment has been tested and found to be in compliance with the limits for FCC Part 15, Class A digital device. 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 instruction manual, may cause harmful interference with 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.

The users are prohibited from making any change or modification to this product, any modification to this product shall void the user's authority to operate under FCC Part 15 Subpart A Section 15.21 regulations.

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.

The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

INDUSTRY CANADA COMPLIANCE

Operation is subject to the following two conditions: (1) this device may not cause interference and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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This device has been designed to operate with antennas described below, and having a maximum gain of 6 dBi. Antennas not as described or having a gain greater than 6 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms. AWID, model ANT-915CPS-A; 5.7 dBi Circular polarized antenna (Patch).

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

C AUTION:
Antenna should be positioned so that personnel in the area for prolonged periods may safely remain at least 23 cm (9 in) in an uncontrolled environment from the antenna's surface. Observe FCC OET Bulletin 56 "Hazards of radio frequency and electromagnetic fields" and Bulletin 65 "Human exposure to radio frequency electromagnetic fields."

Table of Content

NOTE: READ AND USE THIS MANUAL.

FAILURE TO FOLLOW THE INSTALLATION (SET UP) GUIDE MAY RESULT IN POOR PERFORMANCE OR EVEN CAUSE PERMANENT DAMAGE TO THE READER, THUS VOIDS THE PRODUCT WARRANTY.

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1. INTRODUCTION

AWID's Sentinel-Sense MPR-3014 WinCE mono-static reader family MPR-3014WF-xM consists of two versions of multi-antenna Radio Frequency IDentification (RFID) readers each with an on-board WinCE.

Reader Versions
MPR-3014WF-QM-NA (WinCE, Fixed, Quad-Ant, Mono-static & North America)
MPR-3014WF-OM-NA (WinCE, Fixed, Octal-Ant, Mono-static & North America)

I/O Interface
One unique configuration for the MPR-3014WF-xM readers is the possibility of having RS-232 interface and Ethernet interface simultaneously present at the reader data input ports. To arbitrate possible data collision, the reader determines that local entry always dominates. Therefore, when both Ethernet commands and serial commands are present, serial command will dominate. This arbitration process is automatic and transparent to the user.

MPR-3014WF-xM are long-range (12 to 25 feet, tag dependent) readers with general purpose digital I/O (GP I/O – four (4) inputs four (4) outputs) that work with all leading passive UHF passive tags. Each of these readers comes with a unique combination of long read range, small size, and low power consumption. Its primary applications are asset management & tracking, and fleet management applications.

The MPR-3014WF-QM-NA reader is delivered with the following components and accessories:
>   MPR reader – MPR-3014WF-QM-NA , firmware Ver. 5.XXN
>   Antenna – 4 EA ANT-915-CPS-A
>   Cable – 4 EA RTC08/16/24 (coax cable – 8/16/24 feet, Reverse TNC)

The MPR-3014WF-OM-NA reader is delivered with the following components and accessories:
>   MPR reader – MPR-3014WF-OM-NA, firmware Ver. 5.XXN
>   Antenna – 8 EA ANT-915-CPS-A
>   Cable – 8 EA RTC08/16/24 (coax cable – 8/16/24 feet, Reverse TNC)

In order to control the MPR-3014WF-xM readers you will need the following:

- PC running Windows[1] 98 or higher, CD-ROM drive, Network connection
- Host software (AWID's demo software or your own custom software).
- RFID Tags (EPC C0, C1 Gen 1 & 2, ISO Type B, EPC V1.19 Rev.2)

1.1. SPECIAL FEATURES

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[1] Though MPR-3014WF-xM can also be controlled from a non-Windows programming platform, AWID demo and FW upgrade programs are applications to run in Windows.

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- Multi-Protocol: EPC C0, C1 Gen 1 & 2, ISO Type B, EPC V1.19 Rev.2
- Thin passive tags with long-range performance
- High performance circular polarized antenna
- TCP/IP and four each optically isolated GP I/O
- Splash proof design for indoor or outdoor applications

1.2. MODEL NUMBER ASSIGNMENT

Multi-Antenna Readers: MPR-3014WF-**x**M-**YZ**

MPR – Multiple-protocol RFID
WF – WinCE, Fixed-location
x – Number of antenna
M – Mono-static
YZ – Two letter web address for country/regional code

EXAMPLES:
MPR-3014WF-QM-TW for WinCE, fixed, 4-monostatic ant, Taiwan
MPR-3014WF-OM-SG for WinCE, fixed, 8-monostatic ant, Singapore

2. SPECIFICATIONS

Common RF Specifications (North America Versions only)
Transmit frequency...902-928 MHz (ASK)
Receiver frequency..902-928 MHz (ASK)
Hopping channels...50 Channels
Channel spacing...500 kHz or 200kHz
Hopping sequence...Pseudo random
Protocol language ………………………………EPC C0, C1 Gen 1 & 2, ISO Type B, EPC
V1.19 Rev.2
Read range ....Depends on type & size of labels used
Output power...1.0 Watt into 6 dBi antenna
Antenna configuration ……………………………..1 to 8 antennas

Stationary Reader (MPR-3014WF-xM-NA)
Operating temperature range ....-20° C to +65° C (-4° F to 149° F)
Color..Black
Output data formats...TCP/IP or Serial
GP I/O 4-input, 4-output
Peripheral Interface ....Ethernet, Serial, USB
Dimension..11 x 7.4 x 2.75 inches (28 x 19 x 7 cm)
Weight ....2,172 g (4.78 lb)
Input voltage ....12 VDC
Input current ....12VDC 3.3 amp

2.1. CHANNEL FREQUENCY TABLE

Frequency range: 902 ~ 928 MHz

Minimum number of frequency channels: 50

CH	902~928	MHz	CH	902~928	MHz	CH	902~928	MHz	CH	902~928	MHz	CH	902~928	MHz
0	902.75	MHz	10	907.75	MHz	20	912.75	MHz	30	917.75	MHz	40	922.75	MHz
1	903.25	MHz	11	908.25	MHz	21	913.25	MHz	31	918.25	MHz	41	923.25	MHz
2	903.75	MHz	12	908.75	MHz	22	913.75	MHz	32	918.75	MHz	42	923.75	MHz
3	904.25	MHz	13	909.25	MHz	23	914.25	MHz	33	919.25	MHz	43	924.25	MHz
4	904.75	MHz	14	909.75	MHz	24	914.75	MHz	34	919.75	MHz	44	924.75	MHz
5	905.25	MHz	15	910.25	MHz	25	915.25	MHz	35	920.25	MHz	45	925.25	MHz
6	905.75	MHz	16	910.75	MHz	26	915.75	MHz	36	920.75	MHz	46	925.75	MHz
7	906.25	MHz	17	911.25	MHz	27	916.25	MHz	37	921.25	MHz	47	926.25	MHz
8	906.75	MHz	18	911.75	MHz	28	916.75	MHz	38	921.75	MHz	48	926.75	MHz
9	907.25	MHz	19	912.25	MHz	29	917.25	MHz	39	922.25	MHz	49	927.25	MHz

2.2. INPUT AND OUTPUT INTERFACES & CONNECTOR PIN ASSIGNMENT

2.2.1. General Purpose Input/Output

Terminal block – MPR-3014WF-xM 4 inputs & 4 outputs (optically isolated)

Pin #	Function description	Pin #	Function description
1	Output 1	6	Input Common
2	Output 2	7	Input 4
3	Output 3	8	Input 3
4	Output 4	9	Input 2
5	Output Common	10	Input 1

The four general-purpose inputs that use photo diodes are used to accept TTL input commands. Each input requires 15 mA and 5V to activate. The four outputs are solid state relays, with 0.03 uA off-state leakage current and the ability to sink 120 mA at a breakdown voltage of 400V DC. All four outputs are protected with reverse clamping diodes, and ready to drive inductive loads. The floating arrangement eliminates any ground loop considerations.

2.2.2. RS-232

Pin#	Function description	Pin #	Function description
1	DCD	5	GND
2	RXD	6	DSR
3	TXD	7	RTS
4	DTR	8	CTS

2.3. MEASURING READ DISTANCE

Make sure you know the tag types. For instance, EPC tags must be pre-programmed to be read. In certain readers and tags, the user must also be mindful of the tag's orientation and the reader's antenna orientation, what mounting surface the tags are designed for and how the tags are supposed to be mounted. Any departure from its intended purpose will drastically affect the reader's ability to energize the tag and its read range.

When measuring the reader's read range, make sure that the tag is properly oriented to the reader antenna, and for optimum performance, be sure the operator's finger is not within three (3) inches of the tag's antenna surface.

3. INSTALLATION PROCEDURE

This section provides installation and operation information for MPR-3014WF-xM readers.

3.1. PARTS LIST

Verify that all items listed below are present before starting the installation.

a. Sentinel-Sense MPR-3014WF-xM   Qty=1
b. ANT-915-CPS-A   Qty=1~4 or 8
c. RTC08/16/24   Qty=1~4 or 8
d. Documentation & Demo Program CD   Qty=1
e. 827-06W – Reader mounting bracket (Optional)
f. 12 VDC wall plug power supply unit (AWID P/N PS12-3.3AR) Qty=1

3.2. PREPARATION FOR INSTALLATION

3.2.1. Bench Top Verification

It is always a good idea to verify system operation before committing to a full-scale installation. The following are the necessary steps to test reader's operation in a static environment.

- Connect reader to Network with a network cable at the TCP/IP port
- Connect the power jack from the wall plug power supply to reader
- Load the demo program CD onto (installation) PC and launch the demo program. Try Connect after filling in the IP address of reader and then some commands.

3.2.2. Aiming of Antenna

Antenna Pattern for MPR-3014WF-xM
MPR-3014WF-xM comes with a set of (up to 4 or 8) antennas each circular polarized to ensure reading tag with random orientation. Most circular polarized antenna has a horizontal to vertical differential of up to 3 dB, this will cause the antenna pattern to deviate from a true circle. AWID's antenna has a horizontal to vertical differential of typically less than 0.5 dB, making the antenna pattern as near to a circle as possible.
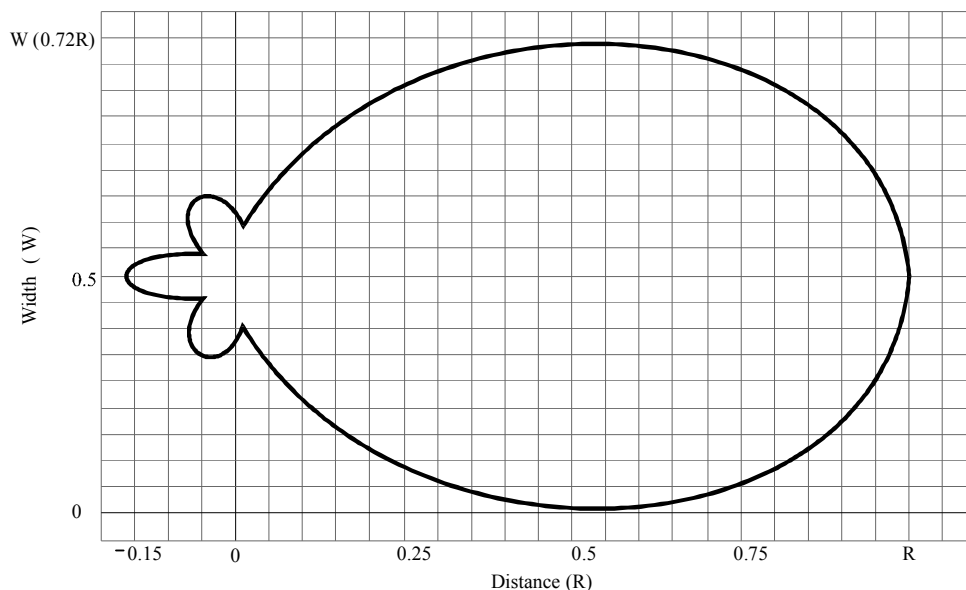

Figure 1 MPR-3014WF Antenna Pattern

- Antenna pattern measurements represent both horizontal and vertical polarized planes of the read area transmitted by the reader.

- In the drawing above, R = approximately 12 feet to 15 feet for MPR-3014WF-xM antenna with Alien free space tags.

- Antenna pattern can be affected by RFI and other environmental conditions.

3.3. INSTALLATION STEPS

- Check to ensure that all connections are secure. Make sure all wires through the cable clamps are anchored properly; avoid dangling wires that may become safety hazard.
- Mount the Reader using the four threaded mounting holes to fasten the reader on the desired mounting surface. Connect antenna(s) to reader with antenna cable(s).
- Mount or place antenna(s) at desired location(s). In cases where antenna aiming is critical, please order antenna-mounting bracket (P/N 827-06W) from AWID. This mounting bracket provides pan/tilt adjustment for the reader.

4. Notes on Software Programming and System Operation

4.1. SET UP AND SYSTEM OPERATION

4.1.1. Setting Up MPR-3014WF-xM

Power up with the 12-V power supply unit, connect to Network through the Ethernet port with an RJ-45 cable.

4.1.2. Running a Custom Software Application or the AWID Demo Program

If AWID Demo Program is not used, it is expected user will launch a Custom Software Application developed using the MPR 3014 Protocol and/or *RFID Anywhere* API to send to reader the commands as specified.

4.1.3. Operating Modes

Typical operating modes for MPR-3014WF-xM can be grouped into the following modes:

Search Mode

This mode is used when operator or user is not certain which family of tags is placed on the items to be tracked. Since most tags are deterministic in nature, the reader must cycle through each and every protocol, issue a protocol specific inquiry, to hail and to wait for a response from tags of that specific protocol. Therefore, if there are many different protocols, for an untrained observer, the reader response will become sluggish.

Mixed Mode

This mode assumes the user is aware of the types of protocol in use, and furthermore, the user made a determined effort to operate the reader in a mixed protocol mode. In this mode, the user can decide how many and which specific protocols to be selected. Once Mix Protocol Mode is selected, the reader will routinely cycle through each protocol, dwell long enough for the reader to wait for a response and then move onto the next protocol. It should be noted that in a mixed protocol mode, the tag must have sufficient time to respond to the reader, and therefore, it can only be used on a conveyor belt arrangement, with specific speed restrictions.

Single Protocol Mode

Single protocol is the normal mode of operation, where the protocol type is known and many tags are expected to pass through the readers.

4.2. USERS NOTE

o **FOR SYSTEM INTEGRATORS AND/OR SOFTWARE DEVELOPERS**

System Integrators and/or Software developers should get familiar with *RFID Anywhere* API and/or the MPR-3014 Protocol specifications for developing applications that control MPR-3014 readers.

o **FOR CUSTOM SYSTEM USERS**

For custom system user, please refer to your host software user guide for information regarding system and software operations

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○ **FOR DEMO SOFTWARE USERS**

If you are using the AWID demonstration software application which is .NET based with easy-to-follow GUI operations, simply fill in the IP address of MPR-3014WF-xM installed then click "Connect" should get you started.

5. Appendix

5.1. SAMPLE GPIO APPLICATION

Shown in diagram below is an example of applying such external devices as stack lights, photo eyes, etc. to GPIO ports.