22 October 2018

To: **Our Honored Clients**

From: **John T. Armstrong**
              MonsoonRF, Inc.

Subject: **Set up and Operation of the Lantern™ Readers.**

Introduction

Whether you're just 'trying us out' or are a venerable expert with the Lantern™ Rain™ RFID readers, this document will allow you to quickly set up and begin reaping the benefits of RFID. As a minimum, after reading this document, you will need to be comfortable setting up and operating our Lantern Products.

Rain™, and specifically Fixed Infrastructure RFID is the 'Last Mile' in IoT (Internet of Things). Like all communications infrastructure, the last mile is frequently the most critical for acceptance, and that is why MonsoonRF has introduced a commodity reader with near zero installation cost. If you're using one of our Lantern T™ readers, for example, snap it into a lighting track and it will power up and look for a host SSID on a 'WiFi' router.

If you are installing many Lantern™ readers, you may have requested a specific SSID and password configuration. If you are evaluating a unit, and purchased the Evaluation Kit (EVK), the Server provided is already set up to engage the Lantern Readpoints, and you will be able to exercise the Reader through a Web Portal or an SSH connection to the Server. If you've purchased an evaluation unit without the EVK, you can still get in touch with the Reader using its own Web Host. Simply point a Browser to the Reader IP address and you will be presented with a simple reader control webpage, allowing you to control the features of the reader and to read tags.

This document will take you through the basic steps necessary to get into communication with the readers and to begin reading tags. Examples in this document are provided using Applications from both Linux/Ubuntu and from Windows. These examples cover the principle 'easy' interfaces to the Lantern Products. Directly accessing the internal drivers and running 'native' is possible, but beyond the scope of this document. In this document, we describe controlling the Readpoint through its Web Host and using a Terminal Window. To use the Readpoint Web Host, you will need the Reader IP address to enter it into your browser's address bar. For the Port controlled method, you will need the reader address and knowledge of the functions activated, and these are discussed in this document.

All MonsoonRF Lantern™ products communicate using TCP/IP protocols, and are identified by the LAN interface MAC address and the Reader Board Serial number. The first step, then is to determine what IP addresses your network has assigned to your Readpoints. This document covers procedures to capture the IP addresses of each of your Readpoints.

Online Documentation

MonsoonRF maintains an online Public support site which can be found at
http://support.monsoonrf.com/

This site provides access to informative videos, RFID Regulations, Useful Applications, a Client portal (sign in required) and Product Manuals.

All public documentation on the Lantern™ products can be found online at
http://support.monsoonrf.com/Manuals/

Standard Configurations

Before discussing the procedures to communicate with our products, we briefly review, below, the range of our products. Each product is designed for a specific set of applications, and may have sensors, lights, and other features that can be selected, in addition to the primary 'Read Tags' function.

Lantern T Series

The Lantern™ T series provides Readpoints in a Tracklight. The ultimate "Plug n Play" RFID. The purpose of this configuration is to provide an easily installed, visually unobtrusive Readpoint in a location using Track Lighting.

The Lantern T derives power from the track, communicates wirelessly, and functions the light ON or OFF remotely using any of the communications modes discussed below.
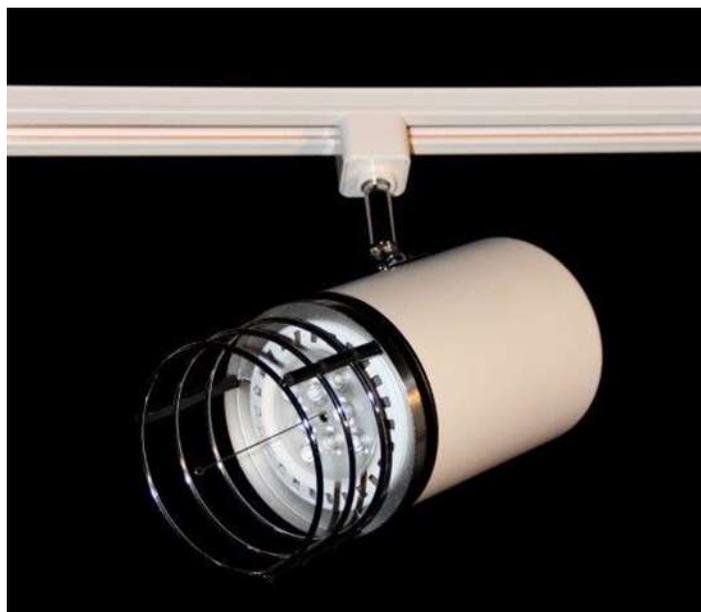
Lantern F (T8) Series

Available First Quarter of 2019, the Lantern™ T8 (formerly F) series provides Readpoints in a configuration suitable for replacing lamps in standard 'Fluorescent' fixtures. Any fixture able to house T8 or T12 bulbs will work. The purpose of this configuration is to provide an easily installed, visually unobtrusive Readpoint in a location using fluorescent tubes or LED replacement T8 or T12 tubes.

The Lantern T8 derives power from the Fluorescent Light Fixture, communicates wirelessly, and functions the light ON or OFF remotely using any of the communications modes discussed below.

Photo Unavailable.

Lantern E Series

Available second quarter of 2019, the Lantern™ E series is an 'Edison' base lamp, Readpoint – "If you can change a lightbulb, you can install RFID readpoints.

The Lantern™ E series provides Readpoints in an 'Edison' base lamp. The ultimate "Plug n Play" RFID - "If you can change a lightbulb, you can install RFID." The purpose of this configuration is to provide an easily installed, visually unobtrusive Readpoint in a location using standard 'screw in' light sockets.

The Lantern™ E derives power from the lamp socket, communicates wirelessly, and functions the light ON or OFF remotely using any of the communications modes discussed below.

Photo Unavailable.

Lantern AA1B Series

The Active Antenna Lantern™ AA1B series provides Readpoints incorporate a Proximity Sensor. The AA1 Series is available with a variety of mounting options. The tracklight mount is shown below. The purpose of this configuration is to comply with Human safety requirements [cf. OET Bulletin 65] for readers installed and operating in uncontrolled areas.

The Lantern™ AA1B derives power from the Ethernet PoE (802.11af) connection, communicates privately over Ethernet, and functions the sensor ON and OFF remotely using any of the communications modes discussed below.

Lantern AA1 Series Antenna

The Active Antenna Lantern™ AA1 series provides simple Readpoints available with a variety of mounting options. The tracklight mount is shown below. This Readpoint is suitable for installation and use in controlled, as defined in the Human safety requirements [cf. OET Bulletin 65].

The Lantern™ AA1 derives power from the Ethernet PoE (802.11af) connection, communicates privately over Ethernet, uses any of the communications modes discussed below.

The appearance is the same as the AA1B above.

Lantern AA1D Series

The AA1D series of MonsoonRF readers consists of an AA1 Readpoint with a second antenna port, so that with a second passive antenna it can illuminate a larger area. In one configuration, the second antenna is mounted with the AA1 on a bracket that is then attached to a structural support.

Photo Unavailable.

Ethernet Communication

All readers are shipped with DHCP enabled and will respond to any host providing DHCP addresses. Issuing a connection request to port 10000 will cause the unit to send MAC addresses, IP address, Firmware Revision Level, and the Reader Serial Number. The readers can be set modified to use a Fixed Address, but this procedure should be performed by a qualified technician and is beyond the scope of this manual. All MonsoonRF Lantern™ products

communicate using TCP/IP protocols, and are identified by the LAN interface MAC address and the Reader Board Serial number.

For convenience the MAC Address is visible on the exterior of the Lantern™ products, either on the back panel of the AA1, Lantern T8, and Lantern E series, or on the WiFi dongle of the Lantern T.

WiFi Communication

MonsoonRF Lantern™ products that are WiFi equipped (Lantern T™ for example) the MAC Address is printed on the Dongle. If the marking comes off, or the user would like to change the Dongle, the MAC address is easily determined by plugging it into a Computer USB port. In Windows 10, open Settings – WiFi – Hardware Properties

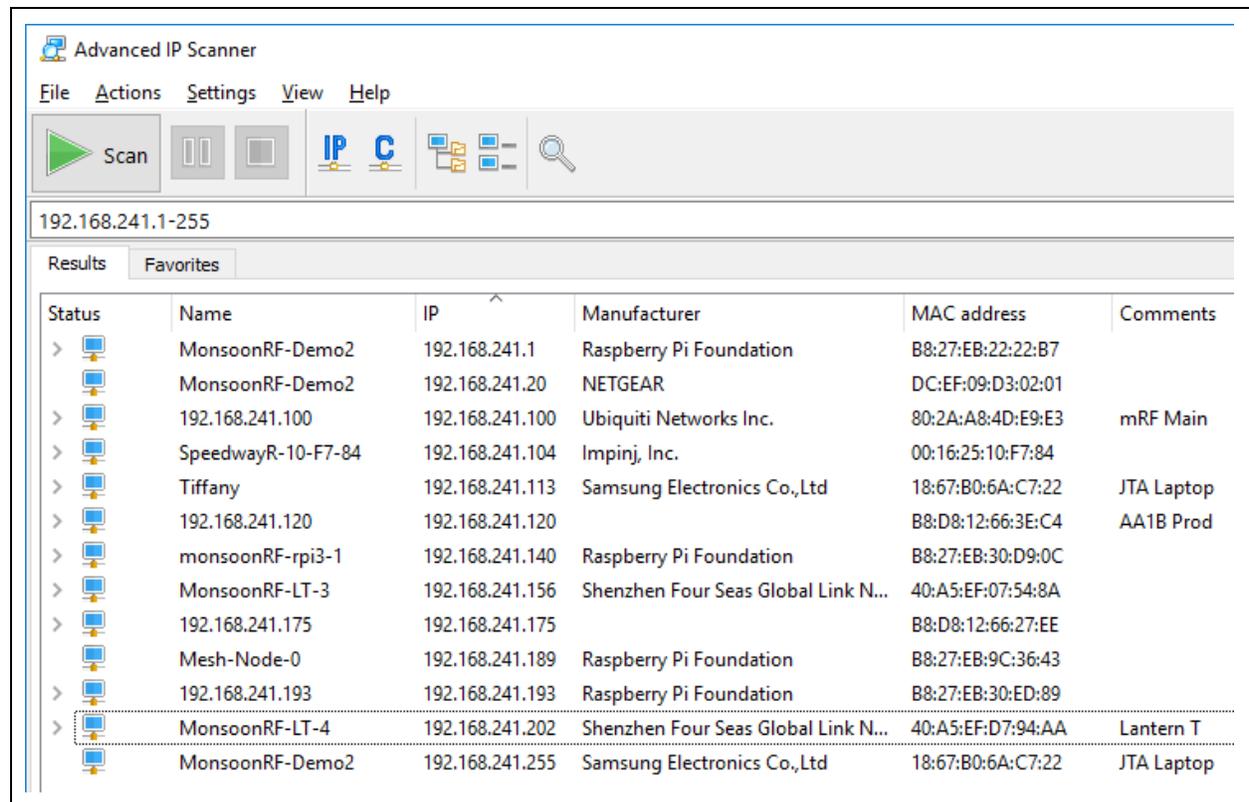This information will be used to locate a specific reader.

If you have a 'stand-alone' reader (you didn't purchase an Evaluation Kit with a Server, or arrange for a specific SSID and login, the Reader will come configured to look for and SSID MonsoonRF-Demo2 with the Login Password MonsoonRF.

In the event you wish to wire Ethernet to the Lantern T, a TCP to USB adapter can be used, and all the port mapped reader functions will be available.

Using Advanced IP Scanner (Windows) or arp-scan (Linux) locate the IP address associated with the Reader(s).

```
pi@MonsoonRF-Demo2:~ $ arp-scan -I br0 -l

Interface: br0, datalink type: EN10MB (Ethernet)

Starting arp-scan 1.8.1 with 256 hosts (http://www.nta-monitor.com/tools/arp-scan/)

192.168.241.100      80:2a:a8:4d:e9:e3      (Unknown)

192.168.241.104      00:16:25:10:f7:84      Impinj, Inc.

192.168.241.120      b8:d8:12:66:3e:c4      (Unknown) {Lantern AA1B in examples}

192.168.241.140      b8:27:eb:30:d9:0c      (Unknown)

192.168.241.156      40:a5:ef:07:54:8a      (Unknown)

192.168.241.202      40:a5:ef:d7:94:aa      (Unknown) {Lantern T in examples}
```

Advanced IP Scanner

File   Actions   Settings   View   Help

▶ Scan   ❚❚   ■   IP   C   🖥   🖥   🔍

192.168.241.1-255

Results | Favorites

Status	Name	IP	Manufacturer	MAC address	Comments
> 🖥	MonsoonRF-Demo2	192.168.241.1	Raspberry Pi Foundation	B8:27:EB:22:22:B7	
🖥	MonsoonRF-Demo2	192.168.241.20	NETGEAR	DC:EF:09:D3:02:01	
> 🖥	192.168.241.100	192.168.241.100	Ubiquiti Networks Inc.	80:2A:A8:4D:E9:E3	mRF Main
> 🖥	SpeedwayR-10-F7-84	192.168.241.104	Impinj, Inc.	00:16:25:10:F7:84	
> 🖥	Tiffany	192.168.241.113	Samsung Electronics Co.,Ltd	18:67:B0:6A:C7:22	JTA Laptop
> 🖥	192.168.241.120	192.168.241.120		B8:D8:12:66:3E:C4	AA1B Prod
> 🖥	monsoonRF-rpi3-1	192.168.241.140	Raspberry Pi Foundation	B8:27:EB:30:D9:0C	
> 🖥	MonsoonRF-LT-3	192.168.241.156	Shenzhen Four Seas Global Link N...	40:A5:EF:07:54:8A	
> 🖥	192.168.241.175	192.168.241.175		B8:D8:12:66:27:EE	
🖥	Mesh-Node-0	192.168.241.189	Raspberry Pi Foundation	B8:27:EB:9C:36:43	
> 🖥	192.168.241.193	192.168.241.193	Raspberry Pi Foundation	B8:27:EB:30:ED:89	
> 🖥	MonsoonRF-LT-4	192.168.241.202	Shenzhen Four Seas Global Link N...	40:A5:EF:D7:94:AA	Lantern T
🖥	MonsoonRF-Demo2	192.168.241.255	Samsung Electronics Co.,Ltd	18:67:B0:6A:C7:22	JTA Laptop

Note – in some cases, when reading from bridged subnet, the MAC addresses will not be reported. In that case, click on the ">" to show the hyperlink to the reader, open it and the Web Host landing page will display the MAC Address.

Command and Control

Port Controlled

The readers can be controlled from a simple terminal program running on any platform. This document provides examples from Windows Subsystem for Linux (Ubuntu) and from a windows terminal Application Device Terminal.

Windows 10 Pro comes with Window Services for Linux, and it can be activated from Add/Remove Windows Components. WSL Packages are available online at https://docs.microsoft.com/en-us/windows/wsl/install-win10 . Once installed, it is possible to access a Linux terminal window from Windows PowerShell, by typing "bash" and Return/Enter at the command prompt.

It is also possible to use Windows XP HyperTerminal, or the popular Application PUTTY in Telnet mode.

The terminal Application must be able to talk to the TCP/IP (Internet Address) on a specified port number.

Information

Basic Reader information and control may be obtained by addressing the Lantern™ IP address and a specific port. Information includes Manufacturer, Type, Software Version, MAC Address, current IP Address, Antenna numbers and the RF module serial number.

Port 10000 – Information on Reader – Lantern T

username@computername:~$ nc 192.168.241.202 10000
Mfr: Monsoon RF
Type: Lantern-T
Version: 180807-387
MAC: 40:a5:ef:d7:94:aa
IP: 192.168.241.202
Antennas: 1
Module SN: MRF-01-CS-18-A-M000190

Port 10000 – Information on Reader – AA1B

username@computername:~ $ nc 192.168.241.120 10000

Mfr: Monsoon RF

Version: 180925-387

Type: AA1B

MAC: b8:d8:12:66:3e:c4

IP: 192.168.241.120

Antennas: 1

SerialNum: MRF-01-CS-17-A-000104

Port 10001 Reader Reset/Help Menus

username@computername:~$ nc 192.168.241.202 10001

MonsoonRF Reader Control

cmd> ?

Valid commands:

QUIT quit EXIT exit q -- exit command processor

RESET reset -- hard reset reader module

STOP stop -- stop reader driver task

HELP help -- this text

cmd>

Port 10005 -Lamp Function ON/OFF (Not available on AA1 series)

username@computername:~$ nc 192.168.241.202 10005

OFF

on

ON

off

OFF

q

username@computername:~$

Serial (Direct to Reader) Communication and Diagnostics

There are times when it is desirable to connect directly to the underlying reader hardware. In the case of IMPINJ INDY (R2000) based readers, or PHYCHIPS RED5 readers, factory supplied applications packages INDY TOOLS or RED UTILITY, respectively, can be used to reset

Regulatory Regions of operation or to calibrate or recalibrate the device. In some cases, these Application packages allow diagnostics including temperature and RF power measurements.

To use this feature, the computer that the Application is running on must be able to assign a COM port to the IP Address and port number 10002. Instructions for the Applications can be found on our support website or contacting the Reader Manufacturer directly.

Port 10002 Typical

Open a virtual port mapping service – HW VSP3 for example.

HW VSP is a software tool, which adds to the operating system a virtual COM port, (COM 3 for example) and redirects the data from this port through the TCP/IP network to another hardware interface, defined by IP address and port number.

On a Windows 10 or earlier platform, the software creates a SERVICE (HW_VSP3s_Service) that can be found using the Computer Management suite (Computer Management - Services and Applications – Services - HW_VSP3s_Service) The service can be turned on or off from here.

With the service ON, the Lantern™ IP address and port number 10002 can be assigned to a local COM port (COM3 for example).
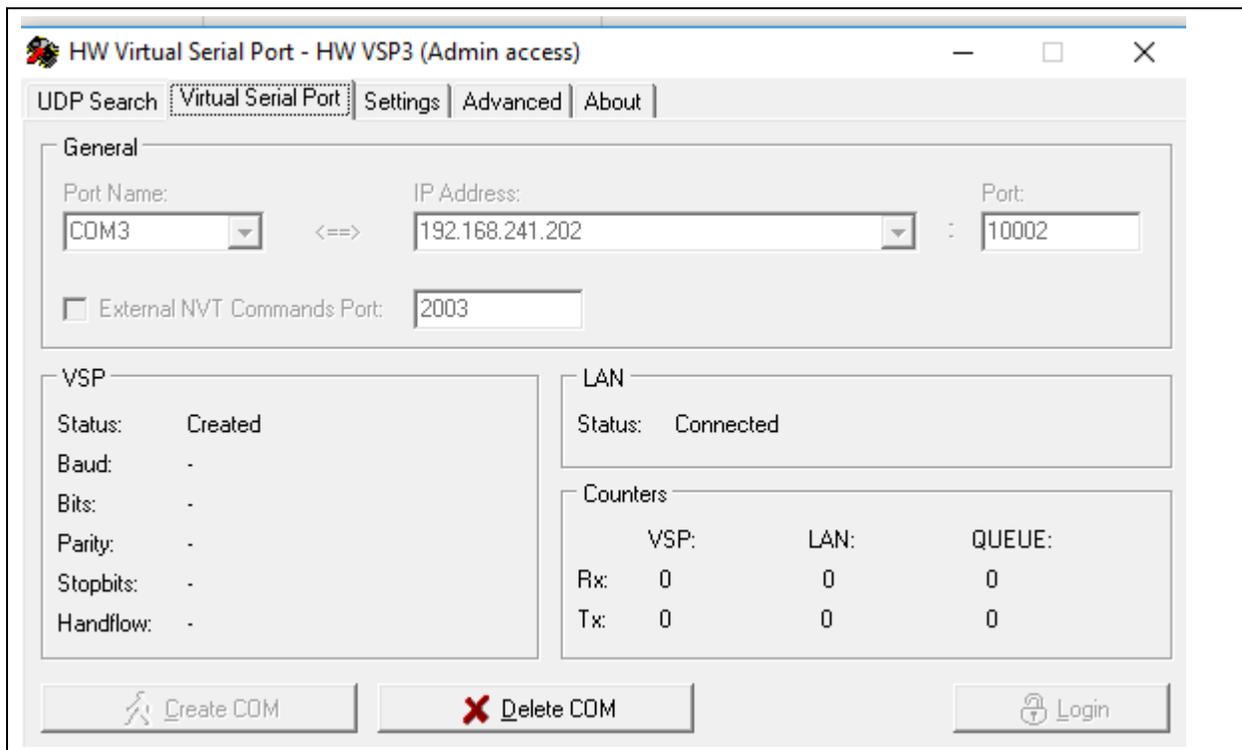
Then launch the Application

Once started, follow the OEM manufacturer's interface program (Indy Tools for Impinj or RED Utility, for example) documentation for using the readers.

After use, and closing the Reader Application, it is a good idea to disconnect the virtual com port releasing the port. If this is not done, other Applications programs attempting to communicate to the reader may fail.

MonsoonRF Connect

The simplest access to reading tags is to use the "Connect" feature. This feature is analogous to the Licensed Impinj Connect™ utility, except that the MonsoonRF approach is to use Port mapping to activate and to control settings on the Connect feature.

The ports used are 1415ns where s is the EPC Gen2 specific Tag Session setting, 0,1,2,3 corresponding to Tag Read Sessions S0, S1, S2, and S3; n is a separator to other reader functions, such as temperature or distance, along with the Session number.

Ports 14150 to 14153 – Read tag data: Antenna number, EPC, and RSSI (dBm)

username@computername:~$ nc 192.168.241.202 14150

1,050831120000000000000943,-48.8

1,050831120000000000008ff,-48.8

1,050831120000000000000974,-51.0

1,050831120000000000000096d,-56.4

1,050831120000000000000929,-46.3

 [Control]-c to stop]

Ports 14160 to 14163 – The readings of 1415x and Temperature Readout

Temperatures are sent as a false Antenna Number (99) and Tag EPC number (ffffff) and Temperature in Celsius. The range is listed in mm.

```
username@computername:~$ nc 192.168.241.120 14160
99,ffffffffffffffffffffffff,27.0,0
1,050831120000000000000946,-48.8,2118881183
1,05083112000000000000091e,-49.8,2118881187
1,0508311200000000000008c4,-61.8,2118881193
1,050831120000000000000926,-54.8,2118881197
```

Using grep (Linux), the Temperature Readings can be viewed without the TAG EPC data. Temperature is in degrees Celsius.

```
username@computername:~$ nc 192.168.241.120 14180 | grep ffff
99,ffffffffffffffffffffffff,31.0,0
99,ffffffffffffffffffffffff,33.0,0
99,ffffffffffffffffffffffff,33.0,0
99,ffffffffffffffffffffffff,36.0,0
99,ffffffffffffffffffffffff,36.0,0
99,ffffffffffffffffffffffff,37.0,0
99,ffffffffffffffffffffffff,37.0,0
99,ffffffffffffffffffffffff,37.0,0
```

Ports 14170 to 14173 – The readings of 1415x and Sonic Range Finder

```
username@computername:~$ nc 192.168.241.120 14170
1,050831120000000000000902,-62.4,2118983433
1,050831120000000000000921,-56.4,2118983437
1,05083112000000000000092c,-49.8,2118983441
1,05083112000000000000092a,-48.8,2118983445
1,0508311200000000000008ee,-54.8,2118983451
1,050831120000000000000930,-50.4,2118983460
1,050831120000000000000958,-51.6,2118983464
1,e2806810000003901989e64,-63.0,2118983469
1,050831120000000000000972,-53.0,2118983473
```

Ports 14180 to 14183 – Sonic Range Finder and Temperature

```
username@computername:~$ nc 192.168.241.120 14180
99,ffffffffffffffffffffffff,31.0,0
1,05083112000000000000009d4,-49.8,2119094695
1,0508311200000000000000094a,-51.6,2119094699
1,0508311200000000000000092a,-48.8,2119094705
1,050831120000000000000948,-49.8,2119094709
1,050831120000000000000943,-58.3,2119094713
1,050831120000000000000932,-62.4,2119094717
1,050831120000000000000955,-52.3,2119094724
1,0508311200000000000008f2,-66.8,2119094729
```

WEB Interface

Each MonsoonRF Readpoint has a built in WEB Host. When you are on the same TCP/IP subnet, addressing (pointing your browser to) the Readpoint IP address will bring you to the Readpoint landing page.

Landing Page

The landing page has links that activate and control the reader, as well as links to support documentation and the MonsoonRF Inc. website.

The Readpoint landing page is specific to the readpoint capability. It shows "lamp ON/OFF" for Readpoints that have visual illumination means (LED) and Proximity Sensor On/OFF on readers that have that feature.

MONSOONRF

enLIGHTening RFID

MonsoonRF Inc.
7740 Garvey Ave, Unit D
Rosemead, CA 91770

www.MonsoonRF.com

support.MonsoonRF.com

Reader Info:

```
Mfr: Monsoon RF
Type: Lantern-T
Version: 180807-387
MAC: 40:a5:ef:d7:94:aa
IP: 192.168.241.202
Antennas: 1
Module SN: MRF-01-CS-18-A-M000190
```

- Turn Light On
- Turn Light Off

- Reset Reader Module

- Read Tags Session 0
- Read Tags Session 1
- Read Tags Session 2
- Read Tags Session 3

Reader Info:

```
Mfr: Monsoon RF
Version: 180925-387
Type: AA1B
MAC: b8:d8:12:66:27:ee
IP: 192.168.241.175
Antennas: 1
SerialNum: MRF-01-CS-18-A-000183
```

- Reset Reader Board

- Read Tags Session 0
- Read Tags Session 1
- Read Tags Session 2
- Read Tags Session 3

- Read Tags Session 0 with range sensor
- Read Tags Session 1 with range sensor
- Read Tags Session 2 with range sensor
- Read Tags Session 3 with range sensor

Read Tags

The basic function of "Read Tags" has been augmented to include managing features (see below). If your reader just shows "Read Tags", selecting this button will cause a new webpage to open, and after a delay of several seconds, a report of the tags read. To enforce simplicity, exercising "Read Tags" from the Web Host will cause the reader to read tags for (typically) 1 cycle – approximately 15 seconds, and then to report them all at once to the Web Host which will generate a key file.

Options

The only "option" currently available from the Reader Web Host is "Reset Reader Board". This is useful if the reader stops reporting tags but is otherwise communicating. Resetting the reader board refreshes the serial port, freeing up data transfer.

Actuate Special Features

Download configuration and Tag Info

The MAC Address of the WiFi adapter dongle is on a label on the dongle itself. This will be useful in identifying the reader IP on a network using an IP Scan Tool (Windows) or arp-scan (Linux).

The Lantern-T is configured to look for an SSID of <u>MonsoonRF-Demo2</u> using a password of <u>MonsoonRF</u>.

Set up an account on an existing WiFi router with this SSID/Password, and the reader will connect.

After that, log into the reader Website by entering the IP assigned by the router into a browser on a machine also on the MonsoonRF-Demo2 Access Point or on a network bridged to it.
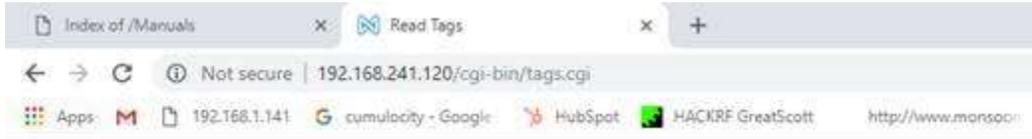
Follow the prompts. The landing page has options (hot links) for pages allowing configuration and for reading tags.
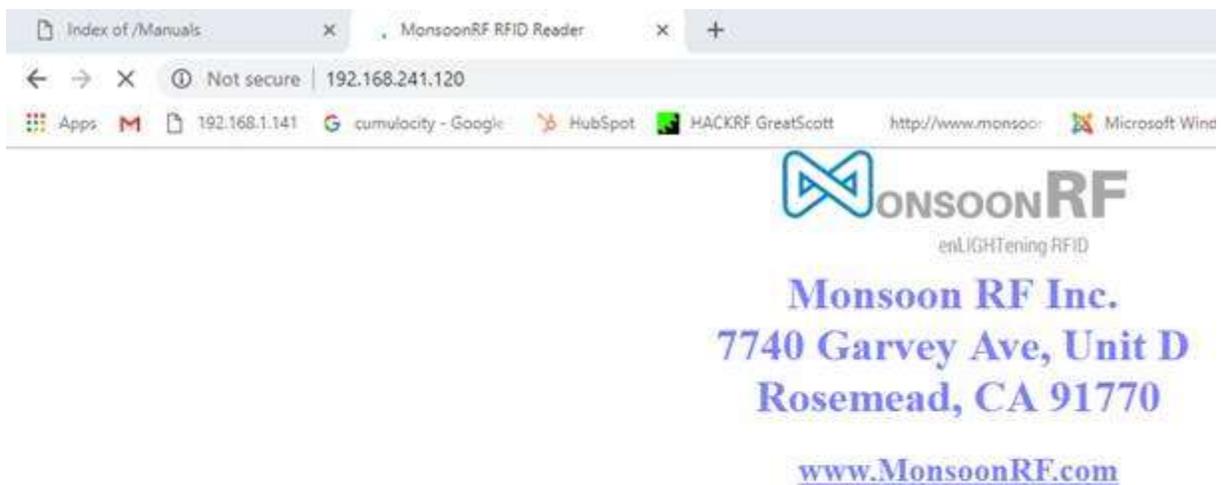
Reader Info:

```
Mfr: Monsoon RF
Version: 180925-387
Type: AA18
MAC: b8:d8:12:66:3e:c4
IP: 192.168.241.120
Antennas: 1
SerialNum:
```

Read Tags

Read Tags

```
1,050831120000000000000958,-49.8
1,050831120000000000000090f,-64.3
1,050831120000000000000957,-57.6
1,050831120000000000008c4,-62.4
1,050831120000000000000982,-60.8
1,050831120000000000000974,-50.4
1,0508311200000000000008e2,-58.3
1,0508311200000000000098f,-61.8
1,050831120000000000000090e,-48.8
1,050831120000000000000966,-48.8
1,050831120000000000000927,-59.9
1,050831120000000000000097a,-57.0
1,05083112000000000000094c,-55.8
1,050831120000000000000926,-54.8
```

===============

Once connected you can also use the Connect features using an Ubuntu/Linux text window or a Windows Serial Communications App (Device Terminal). Enter the reader IP address and the Connect Port number. If you want to read tags, and the reader IP number is 192.168.241.120, you would enter:

"nc 192.168.241.120 14150" (to read tags using Session 0)

The pattern is "nc 192.168.241.1 1415x" where x is the Reader Session identifier (S0, S1, S2, and S3).

(Note – the IP Address window above is hiding the final "120" in 192.168.241.120)

If it is not possible to reconfigure a WiFi router to include a guest SSID of MonsoonRF-Demo2, the reader can be connected to an Ethernet running DHCP by plugging in a TCP/IP to USB adapter in place of the WiFi dongle. The MAC Address on the adapter will be seen by the network and then, either using a browser or Serial Communications App, follow the instructions above.

I hope this will suffice to get you started. The full manual will be up on the support site shortly (as soon as it is proofed)