# RFID 7204

## USER GUIDE

v1.2

neology
mobility [re]imagined.

**Neology Toll RFID Reader 7204 User's Guide**

October 18, 2021

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Patent: Neology.com/patent

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# PREFACE

## Intended audience

This document is intended for those who wish to setup and operate the Neology Toll RFID Reader 7204. Before attempting to install, configure, and operate this product, you should be familiar with the following:

- Windows-based software installation and operation
- Device communication parameters including ethernet and serial communications
- RFID reader configuration including antenna placement
- Basic digital input/output control

## What's in this guide

The information in this guide is presented as follows:


Chapter 1 - Reader Overview

Description of the Neology Toll RFID Reader 7204 hardware and software

Chapter 2 - Hardware Installation

Mechanical and electrical installation instructions

Chapter 3 - Software Installation

How to install the Microsoft Windows RST application

Chapter 4 - Quick Start

How to test the reader and operate deployed readers

Chapter 5 - Reader Startup Tool (RST)

This chapter describes the RST and how to setup readers on the network

Chapter 6 - Reader Test Tool (RTT)

This chapter describes the RTT and how to test reader functionality.

Chapter 7 - Reader Diagnostics Tool (RDT)

This chapter describes the RDT and tools for analyzing reader performance.

### Chapter 8 - Reader Configuration Tool (RCT)

This chapter describes the RCT and the various functions you can perform with this embedded reader application.

### Chapter 9 - Configuring Digital Inputs and Outputs

This chapter describes how to setup the reader's digital inputs and outputs.

### Chapter 10 - Specifications

This chapter detailed mechanical, electrical, and environmental specifications for the Neology Toll RFID Reader 7204.

### Appendix A – Safety Information

All users must read this section before installing or operating this reader.

### Appendix B – Error Handling

This appendix lists Neology Toll RFID Reader 7204 errors and warnings. Corrective actions are provided where applicable.

### Appendix C – Reader Maintenance

This appendix provides instruction for performing any reader maintenance activities.

## What's New in this Version

Version 1.0.7 updates the reader specification for input current.

## Conventions used in this manual

The following conventions are used in this manual:

| | |
|---|---|
| **Bold courier** | font indicates code entered by the user. |
| **(values)** | within parentheses indicate parameters. |
| (values) | in italics indicate user defined variables. |
| (n) | indicates a variable number used in a function that can apply to several different devices such as antennas or I/O ports. |

IMPORTANT — Indicates a hazardous situation which, if not avoided, could result in death or serious injury

WARNING — Indicates a hazardous situation which, if not avoided, could result in death or serious injury

CAUTION — Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury or property damage.

HIGH VOLTAGE — This yellow symbol indicates that the device is susceptible to Electrostatic Discharge and appropriate precautions must be taken to avoid equipment damage.

RADIATION — This yellow symbol indicates that susceptiblity to RF Exposure.

NOTE — Indicates a situation which, if not avoided, could result in property damage.

TIP — Indicates best practices.

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# 1 READER OVERVIEW

# 1 READER OVERVIEW

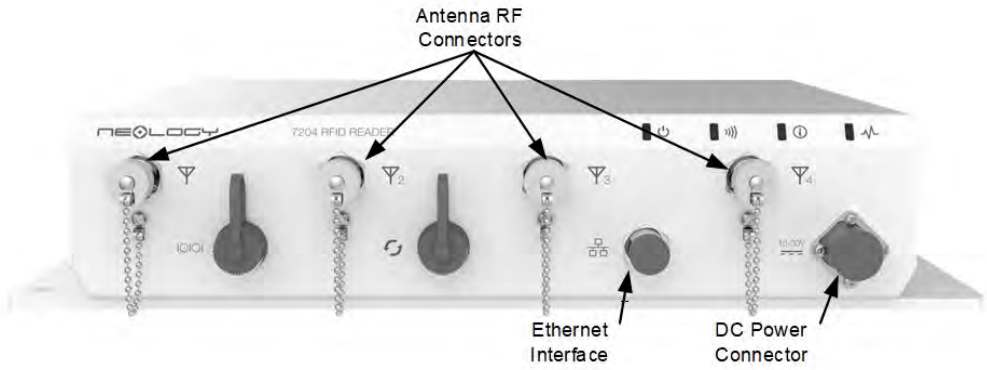
## 1.1 READER HARDWARE

The 7204 is a multi-protocol, multi-regional Radio Frequency Identification (RFID) System that operates in the 860 – 930 MHz UHF band. At the factory, the reader is configured to operate within a specific regulatory region (for example: FCC Part 90).

Figure 1 Neology 7204 UHF Reader

As shown in the following figure, the 7204 supports four monostatic antennas. The reader is also equipped with ethernet and other digital interfaces.

Figure 2 Neology 7204 Power and I/O Connections




## 1.2 READER SOFTWARE

The 7204 reader ships with two software applications for configuring and controlling the reader.

### 1.2.1 Reader Startup Tool (RST)

Prior to deployment, use the Reader Startup Tool (RST) to configure the reader from

Windows.

RST allows for:

- Viewing readers connected to the network
- Modifying reader settings
- Reading tags
- Reviewing tag data
- Performing diagnostics

Detailed information on the RST is provided in Chapter 5, "Reader Startup Tool (RST)" (pg. 31) .

### 1.2.2 Reader Configuration Tool (RCT)

After deployment, use the _Reader Configuration Tool (RCT) for configuring and managing the reader. The RCT application is embedded on reader.

RCT allows for:

- Accessing readers connected to the network via Web browser
- Modifying reader settings
- Reading tags
- Reviewing tag data
- Performing diagnostics
- Upload and deploy software updates

Detailed information on the RCT is provided in Chapter 8, "Reader Configuration Tool (RCT)" (pg. 54) .

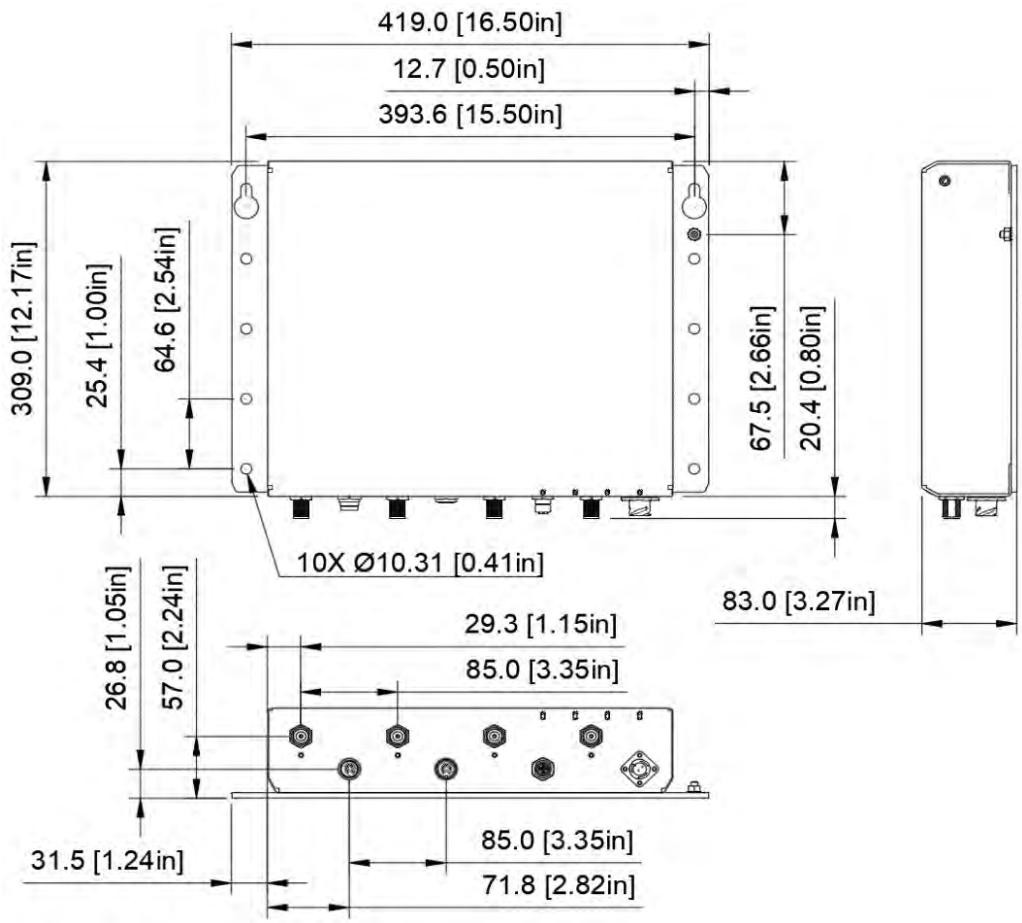
# 2 HARDWARE INSTALLATION

# 2 HARDWARE INSTALLATION

## 2.1 MECHANICAL INSTALLATION

The 7204 may be mounted to a pole, wall, or other load-bearing surface. There are two mounting flanges, one on each side of the reader, for securing the unit to a structure. The target structure should handle a static load, at minimum, of 12.0 pounds (5.44 kg) for the reader, plus additional support for any live loads that may bear on the surface in the operating environment.

Figure 3 7204 Mechanical Dimensions and Mounting Hole Locations: mm[in]




When installing the 7204 reader assembly on the mounting surface, refer to 0, "7204 Mechanical Dimensions and Mounting Hole Locations: mm[in]" (pg. 12) as you perform the following:

### Mounting the Reader

1 **Prepare the mounting surface**

The flanges accept 10 mounting bolts in total. The hole pattern should match

Figure 3. The 2 keyhole slots at the rear of the unit allow the reader to slide over 2 bolts that have been pre-anchored to the mounting surface. The reader can then be locked into position against the longitudinal slot.

2 **Position the reader**

The top of the assembly should face the open air with the base and flanges facing the mounting surface. Align the 2 keyholes over the 2 bolts that you had previously installed. Slide the unit forward over the bolts, pushing it until the base of the unit is flush with the surface. With the unit flush, and the bolts through the keyholes, slide the reader parallel to the surface away from the center of the holes until the bolts fit snuggly into the longitudinal slots.

3 **Secure the reader**

Install bolts through the remaining 8 standard holes, hand-tightening each until the reader is secured against the mounting surface. Finally, tighten down the 2 bolts installed through the keyhole slots.

4 **Install ground**

Connect to earth ground from the reader in accordance with local code.

5 **Connect to network**

Attach the data communications cable to the Network Interface connector and hand-tighten.

6 **Connect to power**

Attach the power cable to the power connector and twist to lock in place.

7 **Connect sync cables**

Attach the optional synchronization cabling as required.

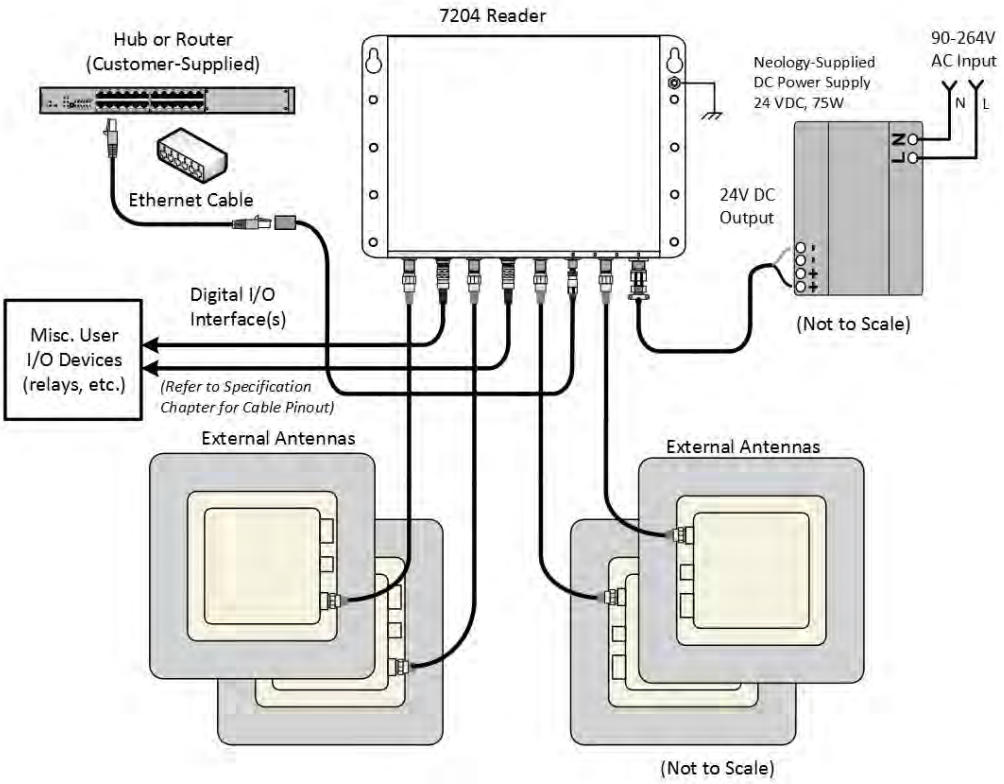
8 **Connect antennas**

Attach the antenna cables to the correct RF connector, see figure 0, "7204 Electrical Connections” (pg. 14) .

## 2.2 ELECTRICAL INSTALLATION

A general installation diagram is shown in the following figure.

Figure 4 7204 Electrical Connections




NOTE

*Modifications and Regulatory Requirements*

The 7204 is designed to meet the regulatory requirements in jurisdictions where the reader is offered. Unauthorized modifications to the unit may void the authority granted by the FCC to operate the reader in their locale.

IMPORTANT

*Prevent Damage to Ports*

7204 signal ports may be susceptible to damage from Electrostatic Discharge (ESD). Use proper ESD precautions to prevent damage when handling or making connections to the 7204 reader signal ports. Equipment failure can result if the antenna or communication ports are subjected to ESD.

### 2.2.1 Connecting and Configuring the Ethernet Port

Ethernet access to reader is provided via the unit's Network Interface Connector. At

the installation site, the hub or router must be connected to this connector via an ethernet cable.

The reader uses DHCP to obtain its IP address and related information by default. The reader will boot with an IP address in the `169.254.x.x` subnet if a DHCP server is unavailable on the network.

In the absence of other readers on the same network, and if no other network traffic is observed which references `169.254.1.1`, the reader will select that address; otherwise, it will select a random address on the `169.254.x.x` subnet.

IP address settings can be changed using RST. Refer to the 5.4, "View or Change the Reader's Network Settings" (pg. 35) .

### 2.2.2 Connecting the External Antenna

The 7204 supports four external monostatic antennas. Connect the antenna to antenna port **1**. Connect additional antennas to Ports 2–4 as needed.

Refer to Chapter 7 in the 7204 User's Guide for specific information regarding the external antenna and antenna cable.

NOTE

The 7204 UHF Reader is equipped with four (4) RF ports. RF ports must be properly terminated with a 50 Ohm load or a functional UHF monostatic antenna before applying power if the reader has been configured to use the antenna port. Never power up the reader unless the appropriate loads or antennas are connected. Always disconnect power to the reader before removing an antenna or load from an RF port.

The sum of all system losses between the reader and antenna should be limited to 3 dB. The sum of system losses and the gain of the antenna must be properly configured in the reader.

7204 signal ports may be susceptible to damage from Electrostatic Discharge (ESD). Use proper ESD precautions to prevent damage when handling or making connections to the 7204 reader signal ports. Equipment failure can result if the antenna or communication ports are subjected to ESD.

### 2.2.3 Connecting Digital Inputs/Outputs

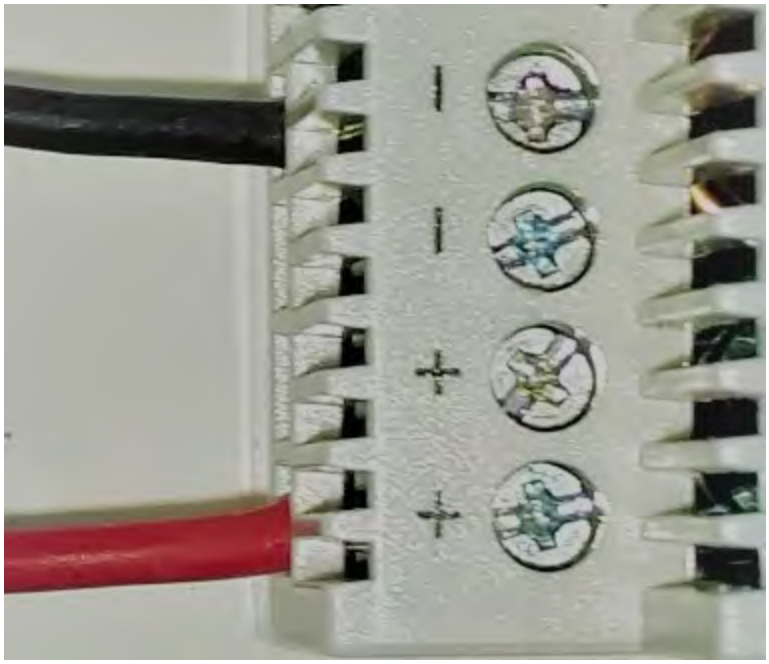
The 7204 is equipped with a general purpose digital input/output (I/O) port that provides four differential input signals and four differential output signals. The digital inputs can be used as general purpose inputs or to trigger the reader for tag reading. These inputs can be configured to provide an external read trigger from proximity sensors, photo switches, or other devices. A line conditioner may be required to convert a single ended signal to the differential signal input required by the reader, depending on the specific peripheral capabilities.

The digital outputs can be used as general purpose outputs, to indicate tag reading activity, or to indicate the reader is transmitting (RF On). A line conditioner may be required to convert the differential signal output of the reader to an open collector, single ended signal, depending on the specific peripheral needs. For detailed information on configuring the digital inputs and outputs refer to Chapter 9, "Configuring Digital Inputs and Outputs" (pg. 91) .

### 2.2.4 Connecting the Power

The 7204 operates on 18-30 VDC provided through the power connector.

The power connections to the Neology power supply are as follows.



Connect the power supply to the reader cable as shown and connect the power supply to your 100–240 Vac, 50-60 Hz power source. Allow 45 seconds for the reader to initialize.

If DC power is disconnected from the reader, wait a minimum of 30 seconds before reapplying power.

# 3

# SOFTWARE INSTALLATION

# 3 SOFTWARE INSTALLATION

## 3.1 INSTALLING READER STARTUP TOOL (RST, RTT, RDT)

The Neology Toll RFID Reader 7204 is shipped with a Microsoft Windows application called **Reader Startup Tool** (RST), which include the **Reader Test Tool** (RTT), and **Reader Diagnostic Tool** (RDT). You can use this application to initially configure your reader as well as read and display transponder data.

*Before you start…*

If RST has been previously installed, any customizations made to the standard macro files will be lost in an upgrade.

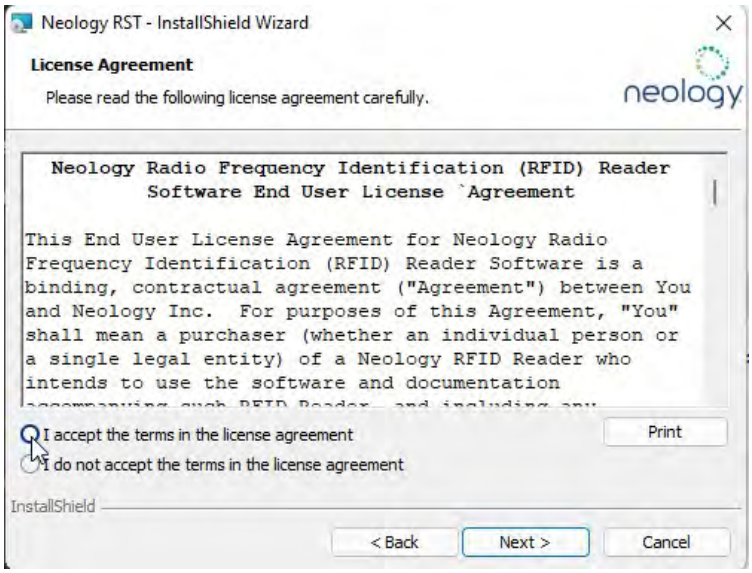
In order to preserve your settings, the customized files should be renamed, or stored into a unique directory.

### Install RST

1 Load your product CD and double-click the `RST Setup.exe` installer.

2 The installation wizard will launch. Press **Next>**

3 Read the License Agreement. Select **I accept the terms…** and press **Next>.**




4 Select "Complete" as the **Setup Type**. Press **Next>**.

5 Press **Install**.

6 After the installation completes, press **Finish.**

TIP

*Windows 7 Setup*

If you have a Windows 7 operating system, your firewall may block UDP traffic and consequently RST may not discover your readers. Perform the following to configure your system:

Configure Microsoft Firewall

1 Log into your computer as Administrator.

2 Navigate to the Control Panel and select **Control Panel → System and Security**.

3 Select **Allow a program through Windows firewall**.

4 Scroll down the list and locate **Startup Tool**, check it, and press **OK**.

5 If Startup Tool is not in the list, press **Allow another program**.

6 Locate **Startup Tool**, check it, and press **OK**.

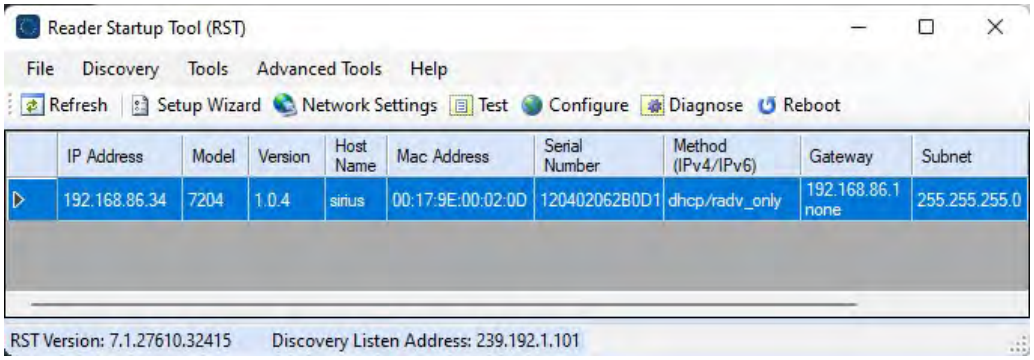
7 Restart RST and it should discover readers.

Configure Third-Party Firewalls

1 Log into your computer as **Administrator**.

2 Set your firewall to allow RST to receive UDP traffic on port `50000` and `50001`.

## 3.2 INITIAL CONFIGURATION




To begin using your reader, open the RST application.

### Open the Reader Startup Tool

1 From your Windows desktop, select:

**Start→Programs→Reader Startup Tool (RST)**

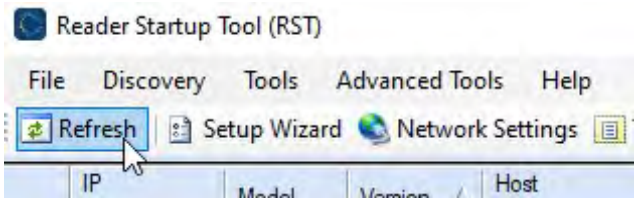
*Firewall*

If this is the first time starting the RST application, you may receive a Windows Security Alert. This warning indicates that the firewall is blocking the RST application.

If the warning window is hidden under the RST windows, collapse the RST window.

2 Press Unblock.

3 Press **Refresh** on the RST.

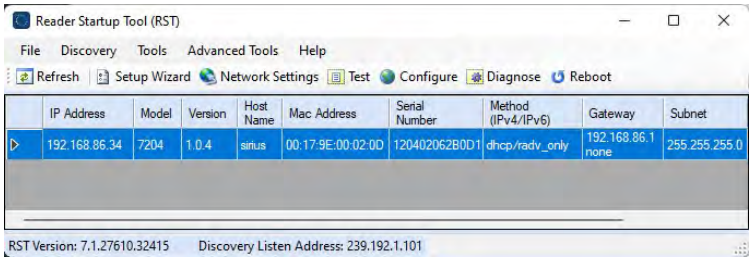



4 The RST main page will display any readers currently connected to the network.

To configure a specific reader, perform the following:

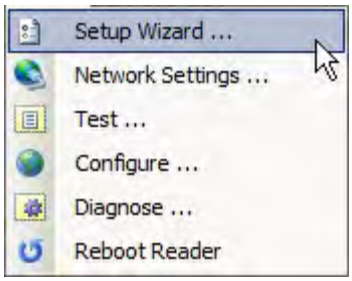
### Reader Setup

5 Select the reader on the main RST page by clicking the button to the left of the reader Mac address.

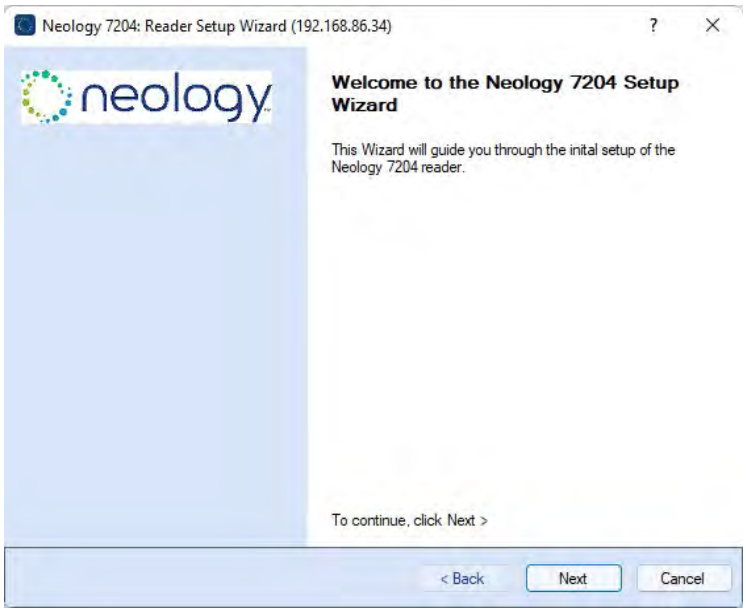



6 Press the

button on the RST tool bar or select **Setup Wizard** from the **Tools** pull-down menu.

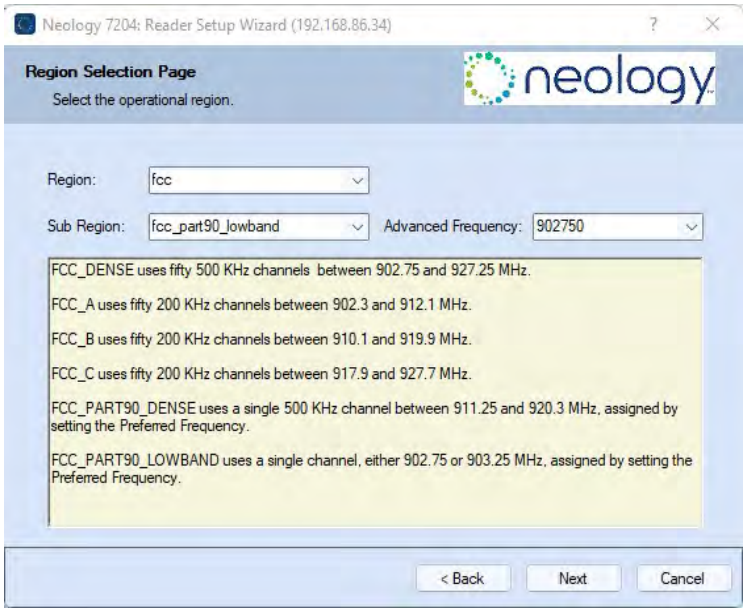



7 The Reader Setup Wizard (RSW) is displayed.

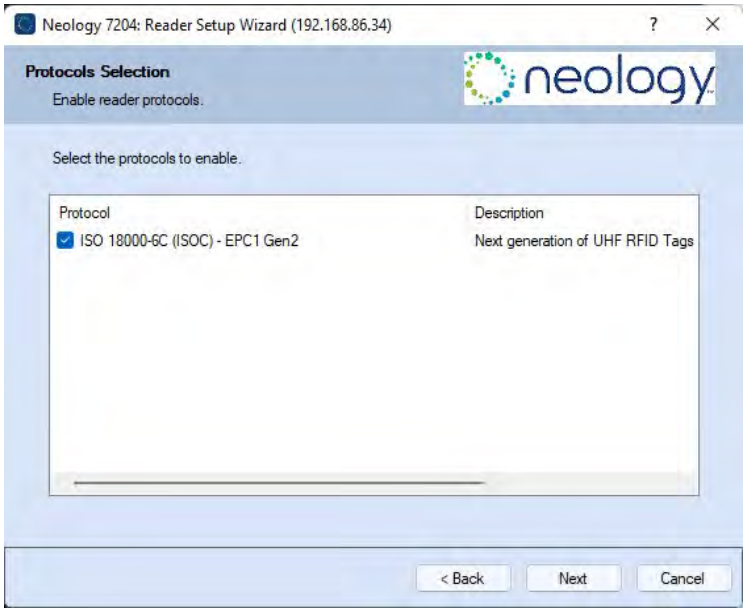


8 Press **Next>**, if prompted, enter the Login (**admin**) and Password. If this is the first time configuring your reader, enter: `readeradmin`. After entering your Login and Password, press **Next>**

9 Select the Region and Sub Region and press **Next>**.

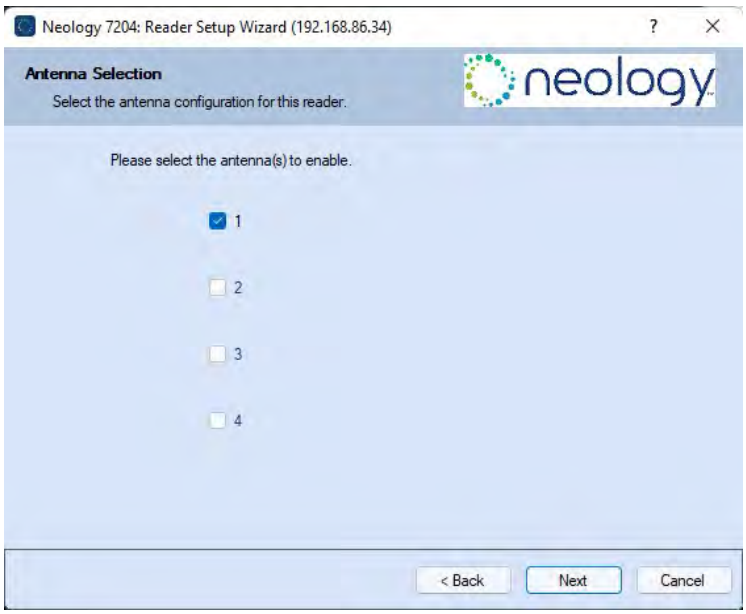



10 Select the protocol of the tags you will be reading and press **Next>**.

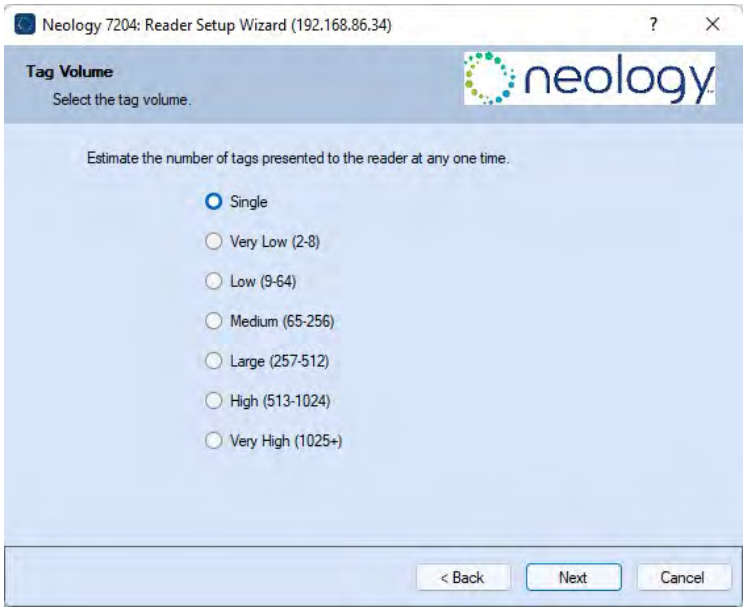


The list of available protocols depend on the product SKU.

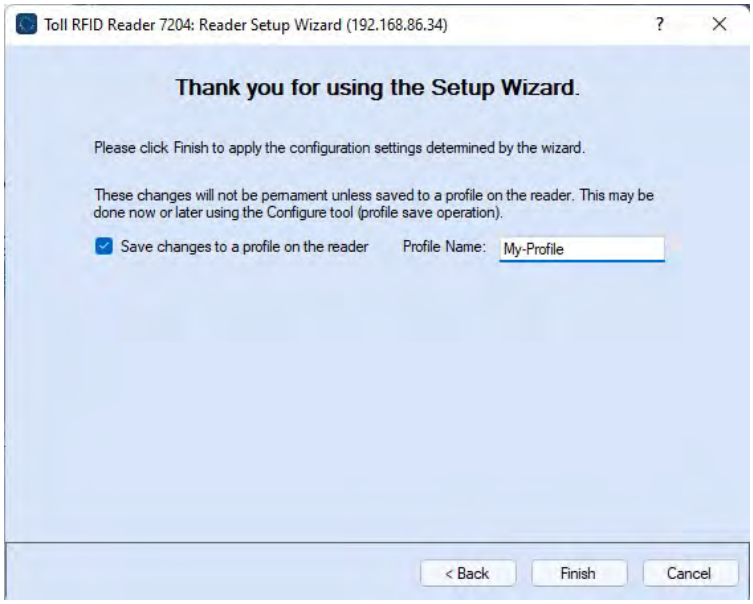
11 Select the antennas you will be installing and press **Next>**.




12 Estimate the number of tags that will be presented to the reader at any one time and press **Next>**.



13 Select **Save changes to a profile…**, enter a **Profile Name**. The profile name must not include any spaces, use underscores or dashes instead.




It is highly recommended that you save the reader setup as a profile for backup. The configuration of the most recently saved profile will be automatically restored after a reboot or power cycle.

Press **Finish** to complete the initial reader setup.

# 4

# QUICK START

# 4 QUICK START

The Neology Toll RFID Reader 7204 can be operated either from the **Reader Test Tool** (RTT) application or by logging directly into the reader's embedded **Reader Configuration Tool** (RCT).

## 4.1 READ A TRANSPONDER WITH RTT

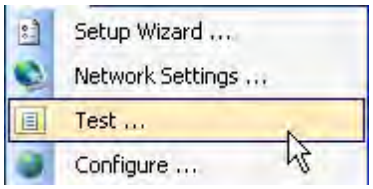
To operate the reader from RTT, perform the following:

1 **Open RST**.

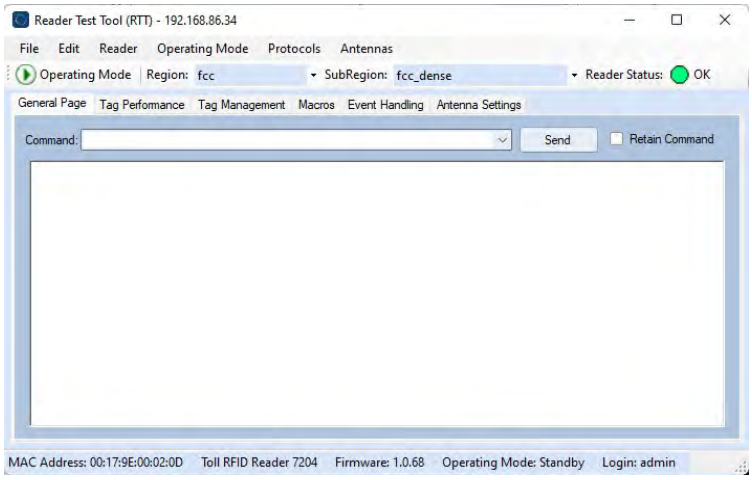
From your Windows desktop, select: **Start→Programs→Neology→Reader Startup Tool (RST)**

2 **Select a reader**.

Press Test on the RST tool bar or select **Test** from the **Tools** pull-down menu.




The **Reader Test Tool** (RTT) is displayed.




3 **Login to the reader.**

From the pull-down menu select **Reader→Login...**. For administrator login, select **admin**. The initial password (**Pwd**) is `readeradmin`.

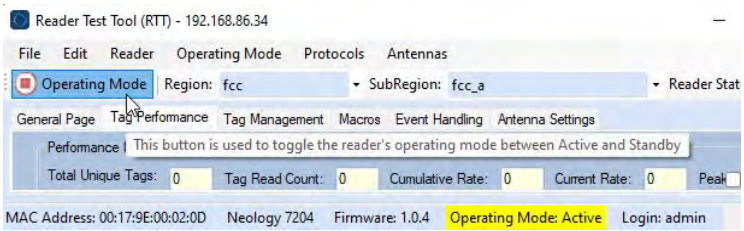
> Refer to the **Neology Toll RFID Reader 7204 Protocol Reference Guide** for instructions on how to use the `reader.set_pwd` command to change the password.

4 Switch to the **Tag Performance** tab.

Click on the second tab from the left, just after **General Page**.

5 Switch the **Operating Mode** to **Active**.

Click on the **Operating Mode** button, just above the **General Page** tab.




Clicking the **Operating Mode** button, toggles the reading activity on and off.

When in **Standby**, the button shows.

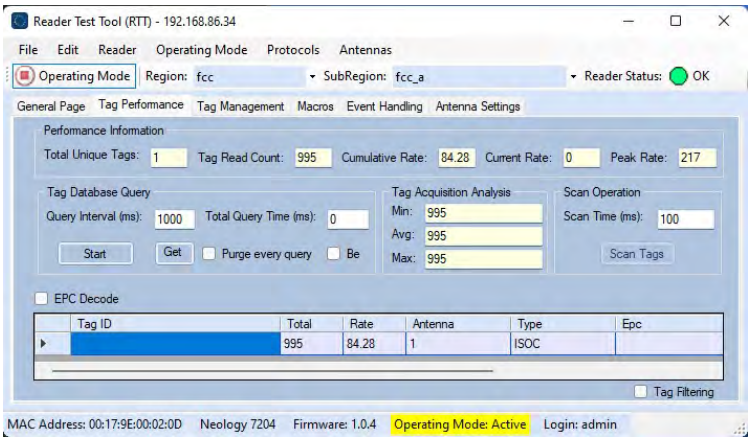
When, **Active**, the button shows.

Standby or Active **Mode** is also reflected in the **Status Bar** at the bottom of the **RTT** window.

6 **Place transponder in front of antenna**.

7 **Verify transponder is read and displayed**.

Under the **Tag Database Query** pane, click **Start**.



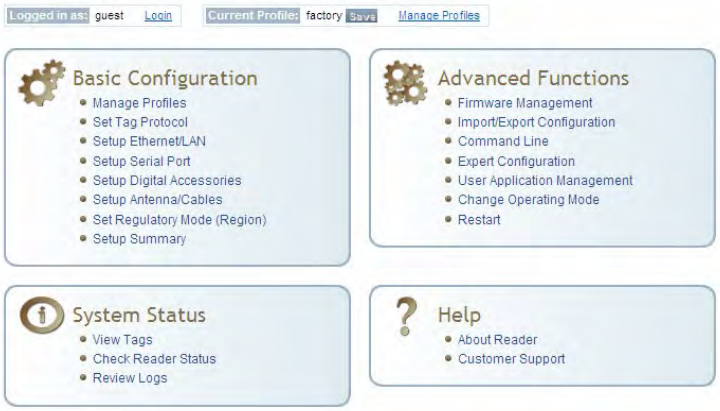

The transponder information will be display in the **Performance Information** pane at the top of the page and in **Tag ID** table at the bottom.

## 4.2 READ A TRANSPONDER WITH RCT

Once your readers are deployed, you can access them directly using the embedded **Reader Configuration Tool** (RCT).

To access a particular reader, perform the following:

1. Enter the reader's IP address into your web browser, press the Configure button on the RST tool bar or select **Configure** from the **Tools** pull-down menu.
2. The reader's RCT interface is displayed.




3. Log into the reader. Press **Login** for the login screen.

4. The default login is **guest**. If you need administrator privileges, login as **admin** and enter `readeradmin` as the password.
5. Press **Submit**.
6. Select **Basic Configuration →Setup Antenna/Cables** to configure the antennas, gain, and power settings.
7. Select **Advanced Functions →Change Operating Mode** to verify the reader is in the proper mode.
8. Select **Basic Configuration →Set Tag Protocol** to verify the reader is configured for the proper tag protocol.

9 Press **System Status →View Tags** to view tag data.

| Tag ID | Protocol | Antenna | Repeat Counts | First Read Time | Last Read Time |
|---|---|---|---|---|---|
| 0x030402080000000000016335 | ISOC | 4 | 25 | 2009-06-02T21:08:54.865 | 2009-06-02T21:08:57.178 |
| 0x030402080000000000016336 | ISOC | 3 | 12 | 2009-06-02T21:08:54.954 | 2009-06-02T21:08:57.045 |
| 0x030402080000000000016337 | ISOC | 4 | 25 | 2009-06-02T21:08:54.876 | 2009-06-02T21:08:57.176 |
| 0x030402080000000000016338 | ISOC | 4 | 25 | 2009-06-02T21:08:54.868 | 2009-06-02T21:08:57.178 |
| 0x030402080000000000016354 | ISOC | 4 | 25 | 2009-06-02T21:08:54.900 | 2009-06-02T21:08:57.176 |
| 0x030402080000000000016355 | ISOC | 4 | 13 | 2009-06-02T21:08:54.848 | 2009-06-02T21:08:57.175 |

Polling Period (seconds): 5 Start Stop Get Once Purge

10 If you need to configure additional changes to your reader, refer to Chapter 8, "Reader Configuration Tool (RCT)" (pg. 54) for information on using RCT to adjust configuration variables and parameters.

# 5

# READER STARTUP TOOL (RST)

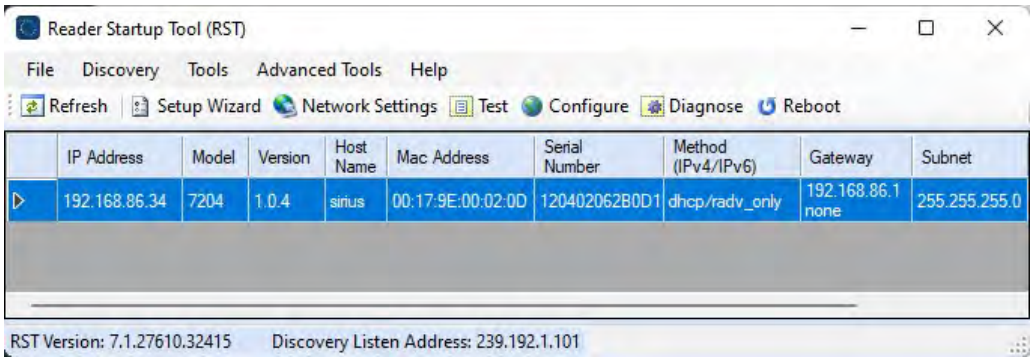
# 5 READER STARTUP TOOL (RST)

The Reader Startup Tool (RST) provides an easy-to-use interface for the Neology Toll RFID Reader 7204 configuration and operation functions. This application resides on your Windows based computer and allows you to perform the following:

- View all readers on the network
- Launch the **Reader Setup Wizard** to configure a reader
- View and change a reader's network settings
- Add a new reader to the network
- Launch **Reader Test Tool** to perform basic reader/tag operations
- Launch **Reader Diagnostic Tool** to view statistics, alarms, and reports

## 5.1 VIEW READERS ON THE NETWORK

When RST starts up, all readers currently connected to the network and powered up are displayed.




## 5.2 CONFIGURE READER WITH THE SETUP WIZARD

The Reader Setup Wizard is used to initially configure your reader for operation. With this application, you can select the following:

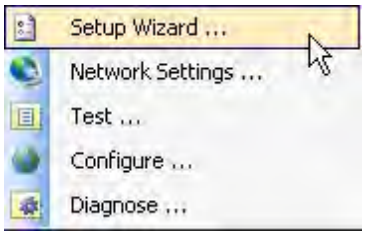
- Installation type
- Regulatory region and sub-region
- Protocol
- Number of antennas
- Estimated tag volume

To initially configure your reader perform the following:

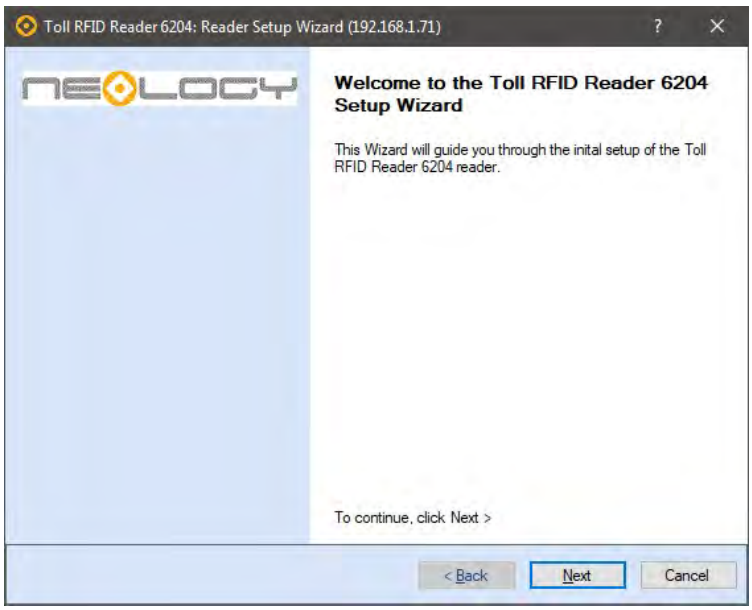
1 Press the

button on the RST tool bar or select **Setup Wizard** from

the **Tools** pull-down menu.




2 The Reader Setup Wizard (RSW) is displayed.




3 Refer to section 3.2, "Initial Configuration" (pg. 20) for detailed instructions on using the Reader Setup Wizard.

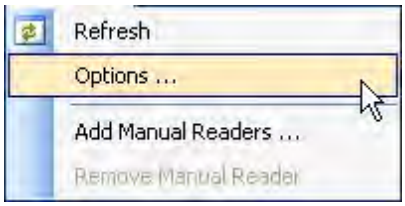
## 5.3 CUSTOMIZE DISCOVERY OPTIONS

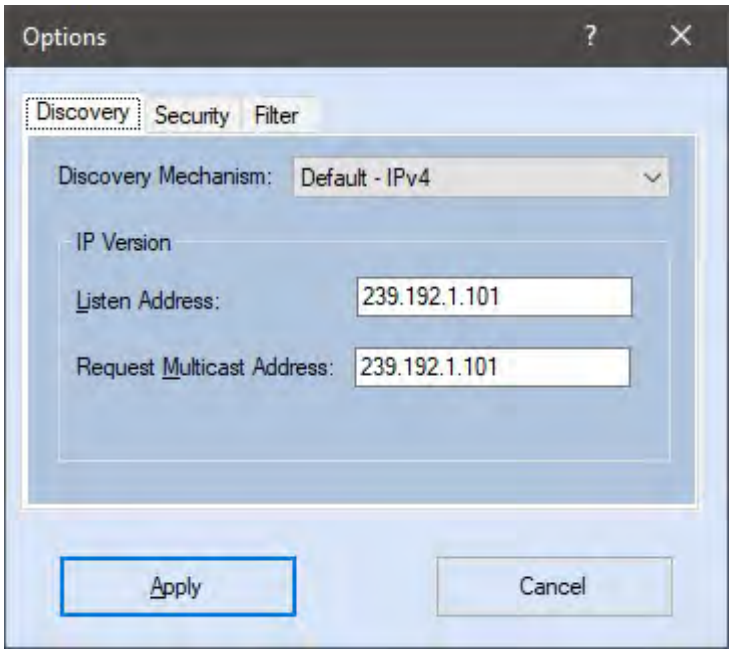
You can customize the reader discovery options including the Listen Address and Request Multicast Address.

- **Listen Address** – Address that RST uses to listen for UDP discovery packets from the reader. This is customizable on the reader.
- **Request Multicast Address** –Address used by RST to send out the UDP update request packets. This is customizable on the reader.

In addition, you can select if you want a secure connection for the Test, Configure, and Diagnostic Tools. This connection uses the HTTPS protocol and any data transferred between devices is encrypted.

1 On the RST tool bar select **Options** from the **Discovery** pull-down menu.




2 Select either **IP version 4** or **IP version 6**.

IP version 4 is appropriate for most installations.

3 Enter the **Listen Address** and **Request Multicast Address** as required.

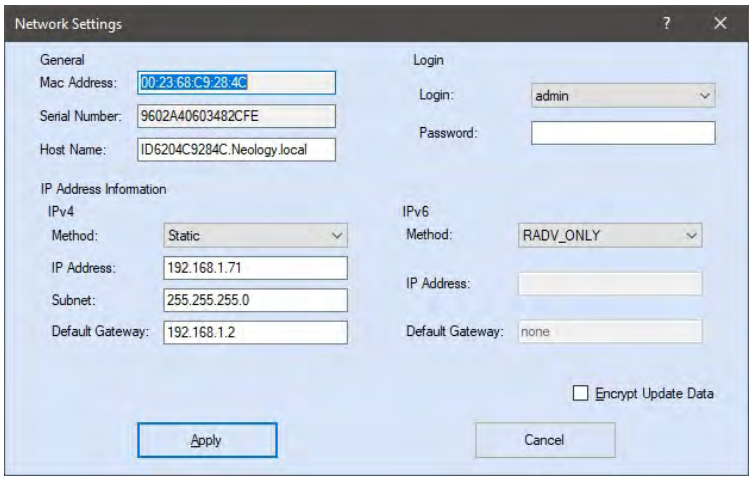
4 Select whether you require a secure connection for the Test, Configure, and Diagnostic Tools.

5 Press **Apply**.

## 5.4 VIEW OR CHANGE THE READER'S NETWORK SETTINGS

1 From the RST main page, press the

button.




2 Verify the **IP Address**, **Subnet**, and **Default Gateway** are correct.

If **Method: DHCP** is selected these fields will be locked.

If required, change the values.

# 6

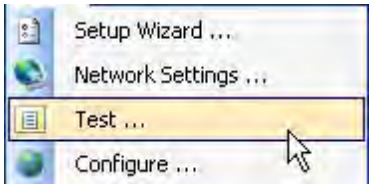
# READER TEST TOOL (RTT)

# 6 READER TEST TOOL (RTT)

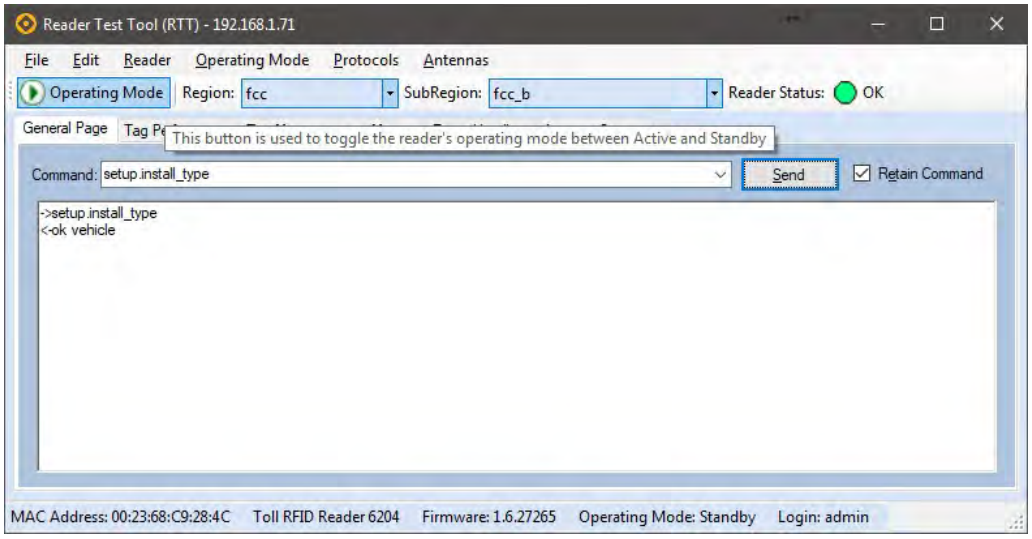
The Reader Test Tool (RTT) is primarily designed for new users to test reader operation and perform a few basic reader functions. With RTT, you can perform the following:

- Read tags
- Issue commands to the reader and view the responses
- Run macros
- Observe reader events

To access the Reader Test Tool, select a reader and press Test on the RST tool bar or select **Test** from the **Tools** pull-down menu.




## 6.1 GENERAL PAGE




The **General Page** allows you to issue commands to the reader and view any responses. From the pull-down menus, you can also login to the reader, change the operating mode, select another protocol, and select which antennas are active.

To login to the reader, perform the following:

### Login to Reader

1 From the pull-down menu, select **Reader→Login…**.

2 Select the type of **Login** from the pull down. The default login is **guest**. If you need administrator privileges, login as **admin**.

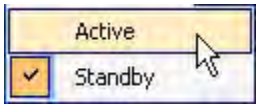
3 Enter your **Password**.

> *Password Security*
>
> **readeradmin** is the default password for the **admin** user. Admin passwords should be changed at setup to an appropriate value that aligns with your local IT policy.

4 Press **OK**.

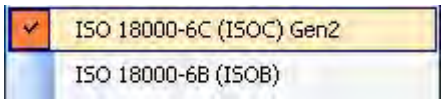
### Select Operating Mode

5 From the pull-down menu, select **Operating Mode → (Active | Standby)**




or, press the Operating Mode select button on the left side of the tool bar.

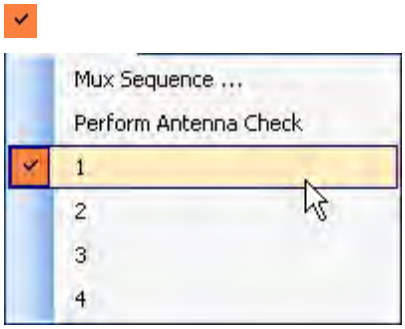
6 You can activate one or more protocols on the 7204 using RST. From the pull-down menu, select **Protocols → (protocol)**. Active protocols are indicated by ✓.



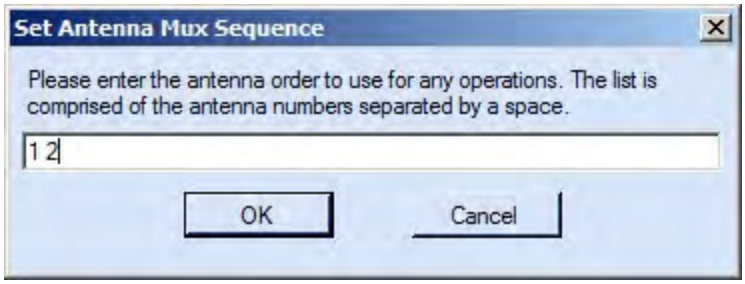

You can select the ports that have antennas connected and which antennas are active. Perform the following:

### Antenna Selection

7 From the pull-down menu, select **Antennas → (n).** Active antennas are indicated by




8 You can also select the order in which antennas are activated. From the pull-down menu, select **Antennas→Mux sequence….**



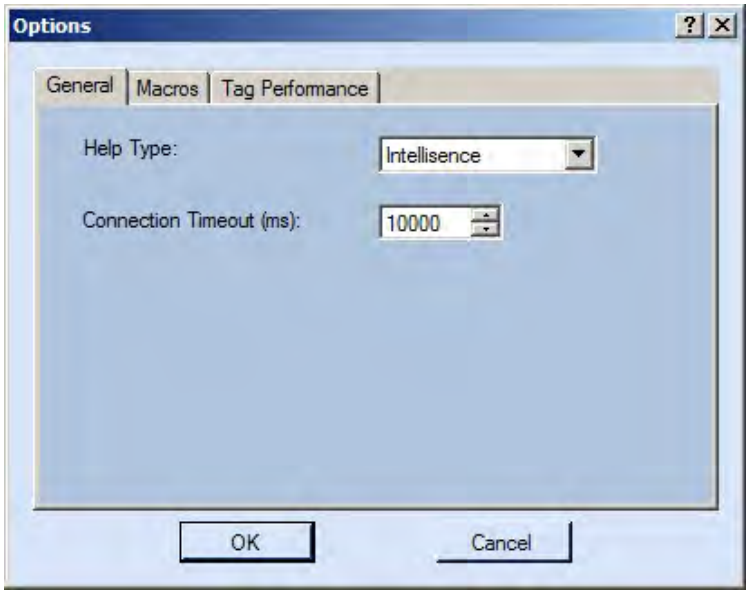

9 Enter the antenna numbers in the order to be activated.

10 Press **OK**.

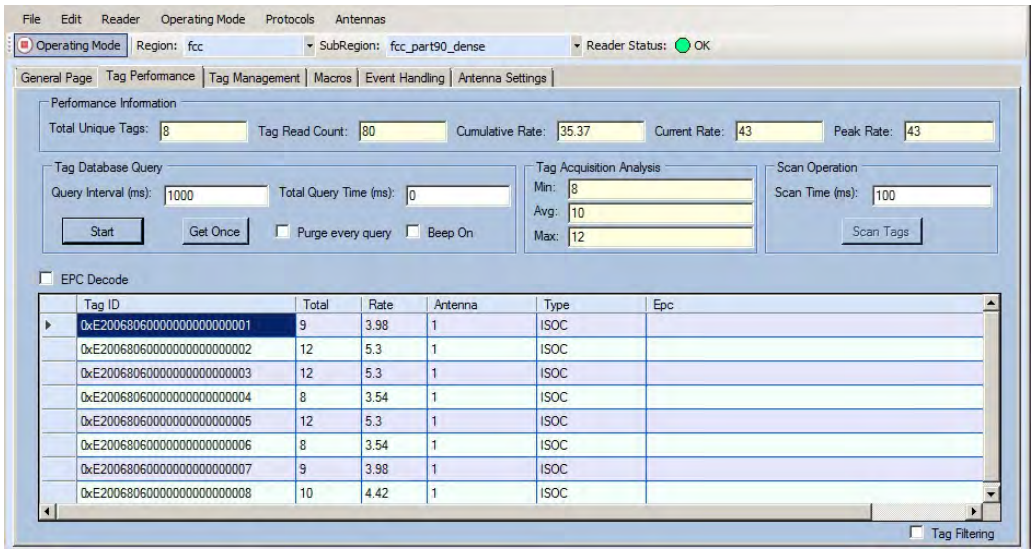
You can setup other reader options including help type macro highlighting.

### Set Reader Options

1 From the pull-down menu, select **Edit→Options**.




## 6.2 TAG PERFORMANCE PAGE




The **Tag Performance** page is used to test the reader performance.

To initiate a timed test, enter the length of test (in ms) into the **Total Query Time** field. For example, to verify to number of tags read in a 30-second interval, select **Active** Operating Mode, enter 30000, and press the **Start** button. The test will complete after 30 seconds and the output statistics are updated for the query time.

Output statistics are read-only and include: Total Unique Tags, Tag Read Count,

Cumulative Rate, and Current Rate.

Detailed descriptions of the various Tag Performance fields and functions are provided in the following sections.

Tag read controls are provided by the **Tag Database Query** and **Scan Operation** blocks. Use the **Query** controls when the reader is in Active mode. Use the **Scan Operation** controls when in Standby mode.

Tag and reader performance data is provided in the **Performance Information** and **Tag Acquisition Analysis** blocks.

Table 1 Performance Information

| | |
|---|---|
| **Total Unique Tags** | Number of unique tags in the tag database |
| **Tag Read Count** | Total number of tags read (including repeat reads) |
| **Cumulative Rate** | Cumulative read rate in tags/second since the **Start** button was pressed |
| **Current Rate** | Current read rate in tags/second |

Table 2 Tag Database Query Controls

| | |
|---|---|
| Get Once | Click to retrieve the current information from reader's tag database. |
| Start | Click to query the tag database every **Query Interval (ms)** for a total time of **Total Query Time (ms)**. Do not set the interval less than 500. If Total Query Time is set to 0, query continues indefinitely. |
| Stop | Click to stop automatic query. |
| ☑ Beep On | Indicates current read rate with audible tone. |
| ☑ Purge every query | Check to purge the reader's tag database after each query. Refer to the Neology Toll RFID Reader 7204 Protocol Reference Guide for more information on the tag database. |

## Tag Acquisition Analysis

The **Tag Acquisition Analysis** fields provide the minimum, maximum, and average number of times each tag was read. For example, assume five tags (A, B, C, D, and E) are read 107, 59, 223, 187, and 94 times respectively. The displayed values are as follows:

- **Min** = 59
- **Avg** = 134

- **Max** = 223

### Scan Operation

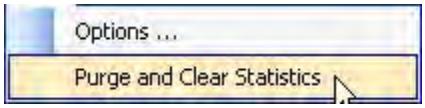
1 **Scan time (ms)** – Enter the duration of reader operation in milliseconds. After this time expires, the tag information is displayed.

2 Press the

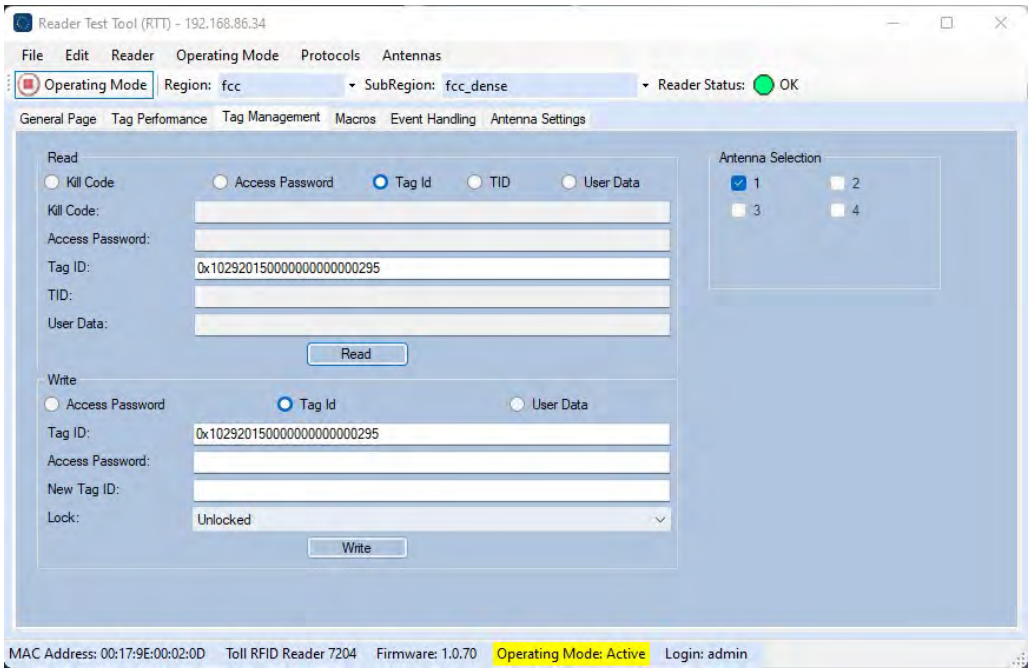
button to activate the reader.

### Purge and Clear Reader Statistics

Select the reader and then select **Edit→Purge and Clear Statistics**.




## 6.3 TAG MANAGEMENT PAGE




The **Tag Management** page is used for reading individual fields on a single tag as well as writing the access password and locking a tag. The **Read** button will cause the reader to singulate and read a tag in the selected antennas' RF field. Specific fields

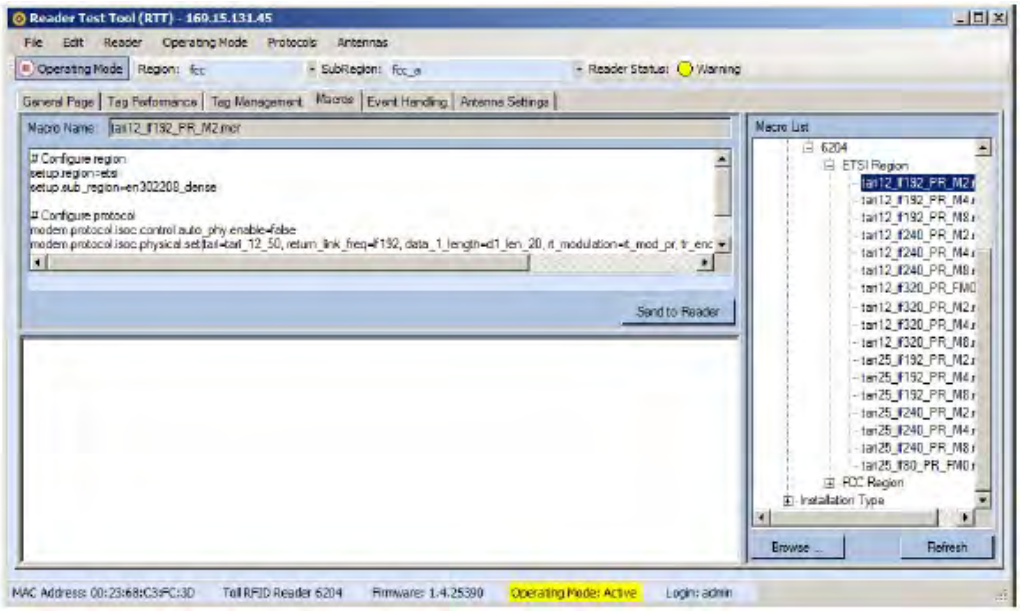
you can read include:

- Kill Code
- Access Code
- Tag ID
- TID
- User Data

### Clear Read and Write Fields

To clear the Read or Write fields, select **Edit→Clear…**.

## 6.4 MACROS PAGE




The **Macros** page allows the reader to manage macro files. The macros are provided by Neology or can be written by the end user. Some of the macros provided are dependent on the operating region of the reader.

A macro (script or command file) is a text file that contains one or more reader

commands. These commands are used to configure the reader to a known configuration. The Macros can contain variables. These variables are resolved by a dialog box (**Macro Variables**) that appears when the **Send to Reader** button is selected.

The syntax of a variable is:

```
[$variable_name]
```

During execution, the variable is replaced with user entries into the **Macro Variables** dialog box. Macros can be edited with any text editor including Windows Notepad.

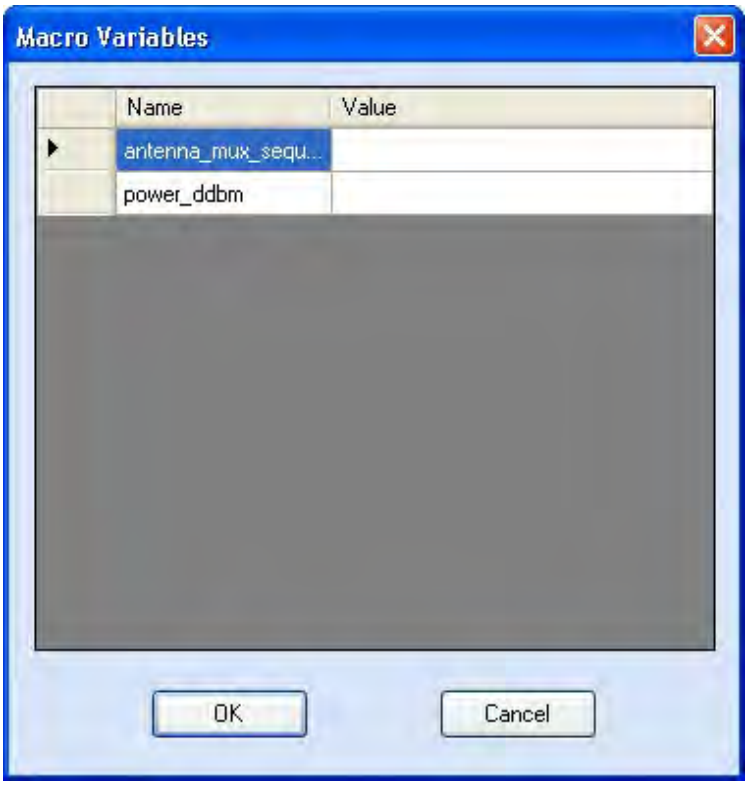
### Macro Input Sub-Window

The **Macro Input** window shows the current script that will be sent to the reader when the **Send to Reader** button is selected. The text in the **Macro Input** window can be edited prior to being sent to the reader.

The **Macro Output** window is updated after the **Send to Reader** button is selected. Look at this window to verify that each command line in a script executed correctly. Look for the **–>> ok** response from the reader for each command line.

### Macro Variables Dialog Box

When a macro is sent to the reader, the values for variables must be resolved via this Windows Dialog box.



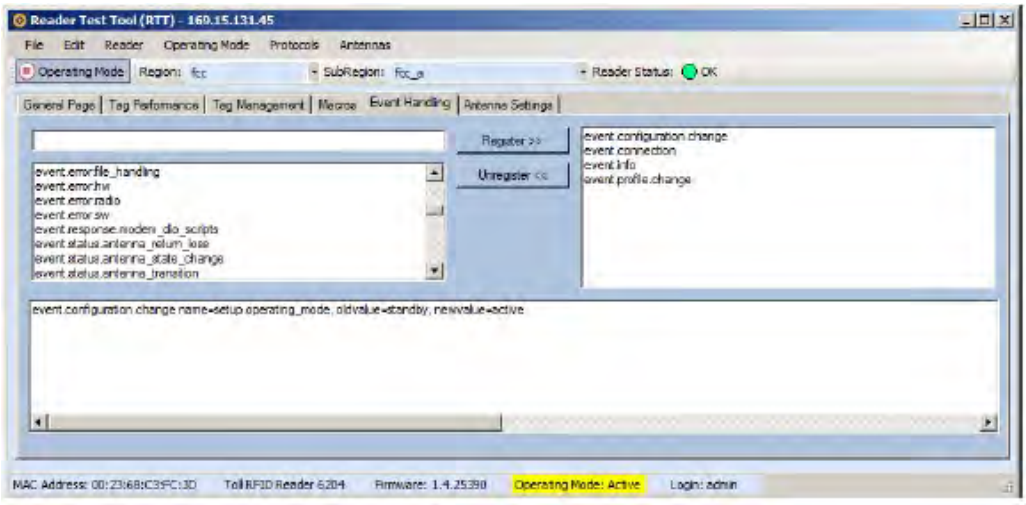
You can **[tab]** to each value field and enter the desired value.

For example, one macro can be used for two different applications by using variables for antenna selection and transmit power.

To configure the reader for FCC, Part 90 Dense operation, send the following macro (`part90_6tari_lf640_PR_M2.mcr`):

```
# configure region

setup.region=fcc

setup.sub_region=fcc_part90

# set frequency

setup.advanced.preferred_frequencies=915950

# configure protocol

modem.protocol.isoc.control.auto_phy.enable=false

modem.protocol.isoc.physical.set(tari=tari_06_25,
return_link_freq=LF640, data_1_length=d1_len_20,
rt_modulation=rt_mod_pr,
tr_encoding=tr_enc_miller_2,interrogator_mode=dense)
```

### 6.4.1 Event Handling Page



The **Event Handling** page allows users to monitor for Reader Events in RTT. Events-to-be-monitored must first be registered in RTT. Registered events are displayed in the bottom window, in chronological order, with newest events at the bottom. To see the most recent events, scroll to the bottom of the window.

A user may register individual events or a group of events.

### Registering for an individual event

1 To register for an individual event, select an event from a pull-down list.

### Registering for a group of events

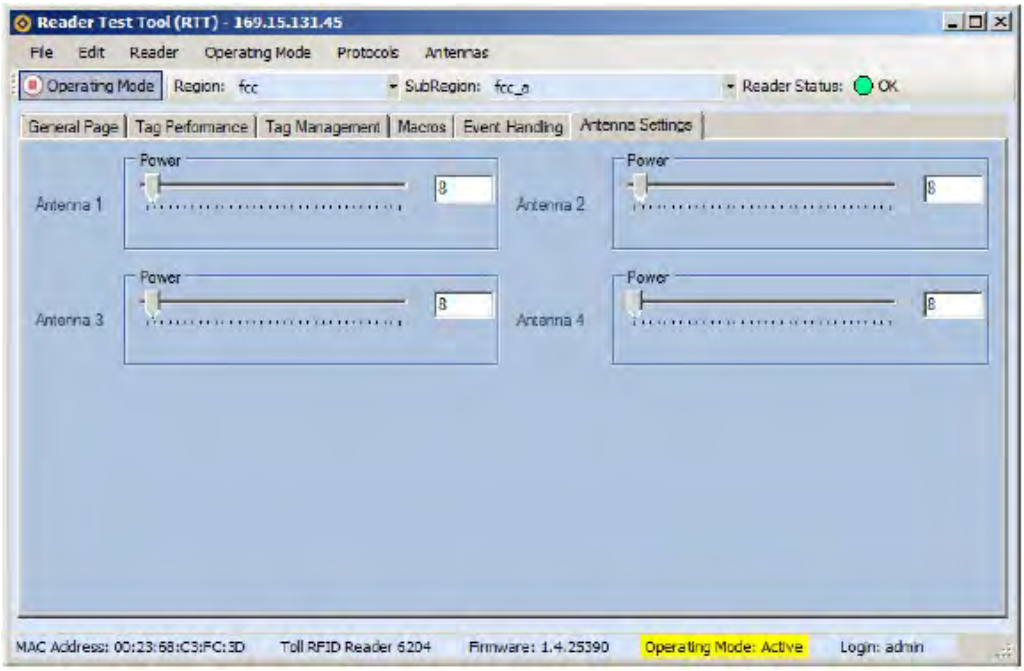
2 Enter `event.error` in the **Events:** field and press the **Register** button.

Registering for `event.error` will cause the reader to send **all** events in the `event.error` namespace automatically the RTT program. and be displayed in the window of this page.

3 The **Clear** button can be selected at any time to clear the window.

For detailed information on individual events, refer to the **Events Namespace** section of the **Neology Toll RFID Reader 7204 Protocol Reference Guide**.

## 6.5 ANTENNA SETTINGS PAGE




The **Antenna Settings** page allows you to adjust the power settings for each antenna. Only the controls for those antennas that are connected are activated.

# 7

# READER DIAGNOSTICS TOOL (RDT)

# 7 READER DIAGNOSTICS TOOL (RDT)

The RDT is to be used by Neology trained technicians to troubleshoot and diagnose various reader issues. Administrator login is required.

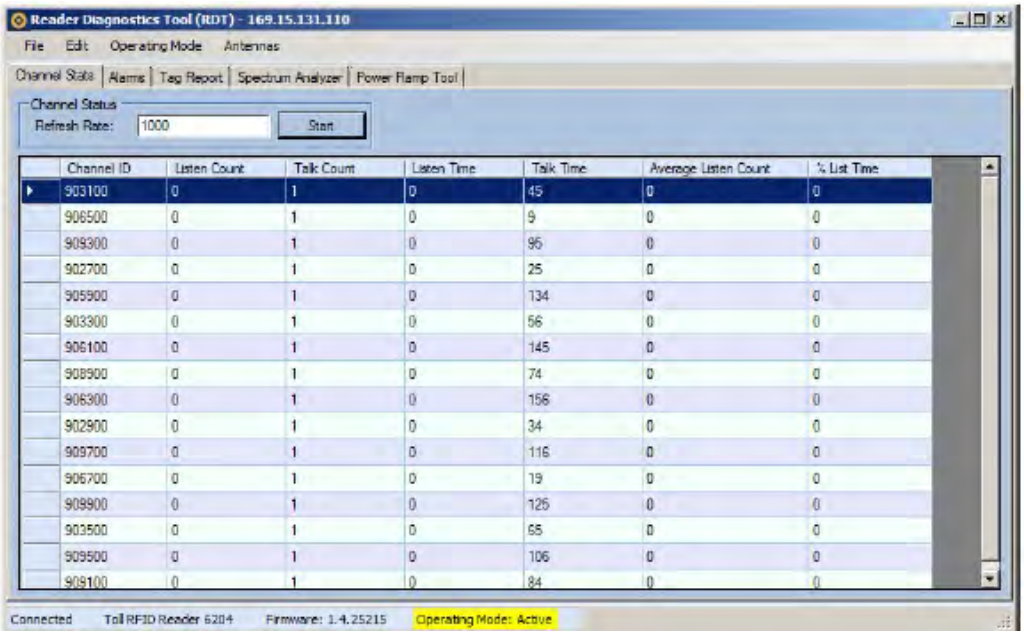
To use RDT, you must login as an administrator, perform the following. When you first start RDT, the following login will appear:

1 Enter your **Password**.

2 Enter **readeradmin** or your current administrator password.

3 Press **OK**.

## 7.1 CHANNEL STATISTICS




| Channel ID | Listen Count | Talk Count | Listen Time | Talk Time | Average Listen Count | % List Time |
|---|---|---|---|---|---|---|
| 903100 | 0 | 1 | 0 | 45 | 0 | 0 |
| 906500 | 0 | 1 | 0 | 9 | 0 | 0 |
| 909300 | 0 | 1 | 0 | 95 | 0 | 0 |
| 902700 | 0 | 1 | 0 | 25 | 0 | 0 |
| 905900 | 0 | 1 | 0 | 134 | 0 | 0 |
| 903300 | 0 | 1 | 0 | 56 | 0 | 0 |
| 906100 | 0 | 1 | 0 | 145 | 0 | 0 |
| 908900 | 0 | 1 | 0 | 74 | 0 | 0 |
| 906300 | 0 | 1 | 0 | 156 | 0 | 0 |
| 902900 | 0 | 1 | 0 | 34 | 0 | 0 |
| 909700 | 0 | 1 | 0 | 116 | 0 | 0 |
| 906700 | 0 | 1 | 0 | 19 | 0 | 0 |
| 908900 | 0 | 1 | 0 | 125 | 0 | 0 |
| 903500 | 0 | 1 | 0 | 65 | 0 | 0 |
| 909500 | 0 | 1 | 0 | 106 | 0 | 0 |
| 908100 | 0 | 1 | 0 | 84 | 0 | 0 |

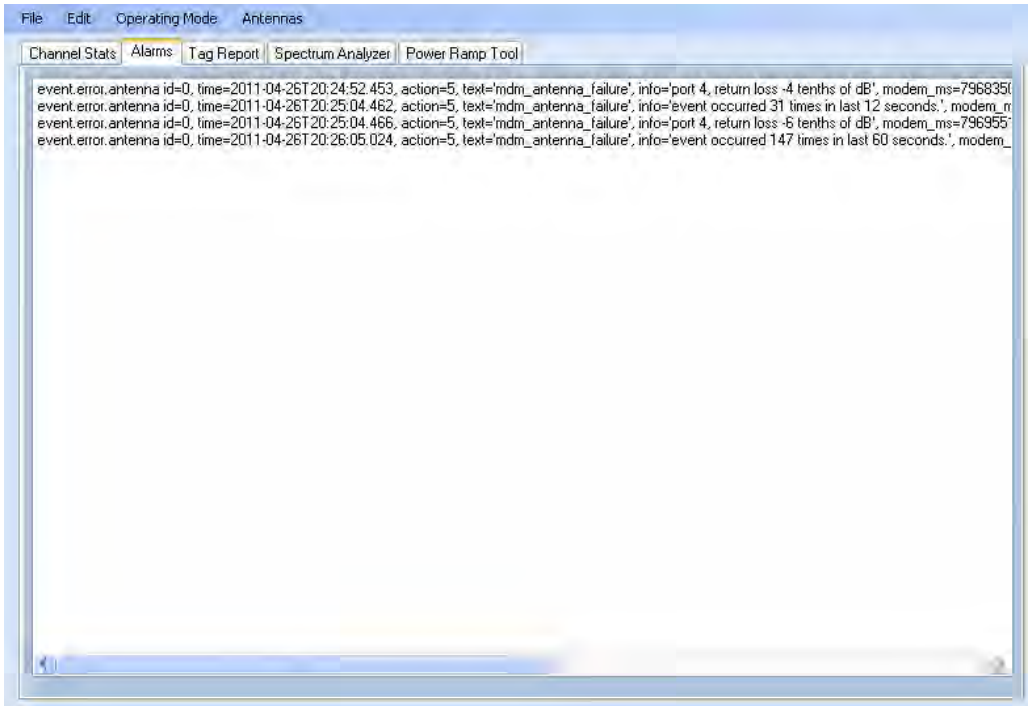
The **Channel Stats** page shows details of channel changes. This page is typically used to observe regional behavior.

## 7.2 ALARMS

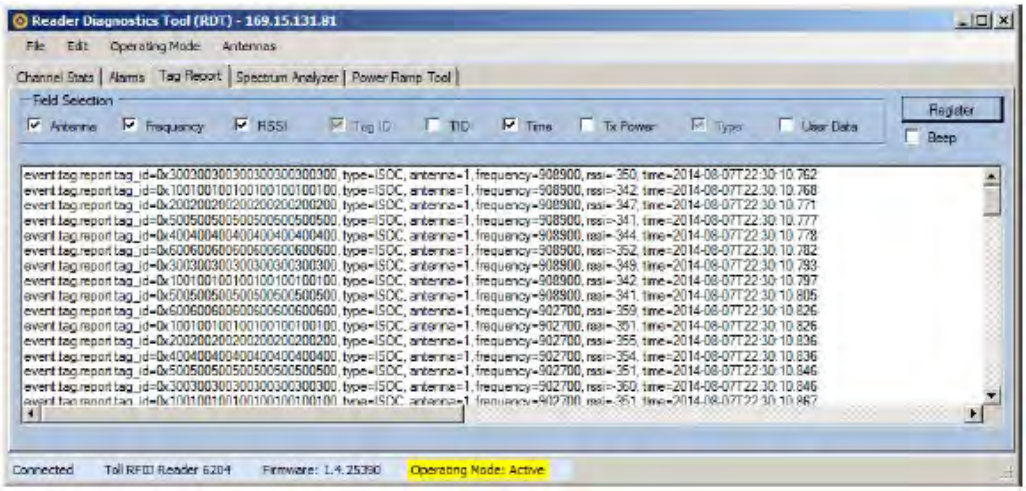
The **Alarms** page is used to capture autonomous alarms generated by the reader during normal operation. The alarms are defined as autonomous reader events for the following namespaces:

`event.error`

`event.warning`



## 7.3 TAG REPORT



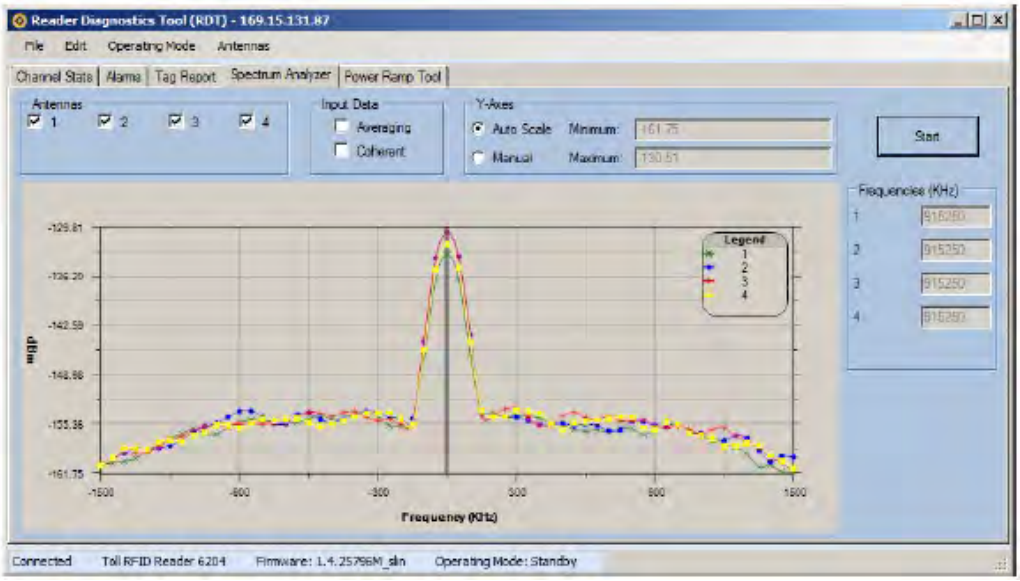

The Tag Report page is used to view specific information for each tag singulation. This feature provides detailed attributes of tag singulations such as tag power (RSSI) and on which antenna that tag singulated.

*Tag Report Impacts Reader Performance*

Use of the **Tag Report** tool can adversely affect tag read performance, particularly if there are fields enabled that are unused in the site installation.

Use the **RTT→Tag Performance** page for normal tag performance testing.

## 7.4 SPECTRUM ANALYZER




The Spectrum Analyzer allows you to examine the spectral composition of the radio waves in your surrounding environment. This feature provides a graphical representation of the current spectral RF noise in units of dBm with a range of 0 to -120 dBm. This feature is intended for expert users to verify RF environmental conditions during an installation.

> Using this feature during normal reader operation can significantly degrade tag reading performance.

## 7.5 POWER RAMP TOOL

The Power Ramp Tool determines the minimum power to activate a tag and can help determine tag quality. This activation power level can help determine the read range at various attenuation levels and, for AVI applications, can help determine the "read-zone" or an antenna pattern.

The tool starts by configuring the reader to start transmitting at a high attenuation level (usually maximum allowed for reader) and decrements the level until it observes a response from the tag. The transmitter is turned off and the minimum value to activate the tag for a given antenna and distance is reported.

The Power Ramp controls include:

| | |
|---|---|
| **Increment Rate (ms)** | Time tool stays at a particular power level before incrementing to the next power level |
| **Initial Attenuation Level (dBm)** | Starting attenuation level |
| **Attenuation Decrement (dBm)** | Step-size for attenuation decrement |
| **Antennas** | Allows you to select which antenna(s) to test with |
| **Filter** | Allows you to apply a filter to only look for a particular tag |

# 8

# READER CONFIGURATION TOOL (RCT)

# 8 READER CONFIGURATION TOOL (RCT)

The embedded Reader Configuration Tool (RCT) allows you to access your reader across the internet by entering the reader's IP address into your web browser. With the RCT, you can fully configure your reader for operation in a variety of applications and environments.

With this application, you can perform the following:

- Basic Configurations
- Advanced Configurations
- Check System Status

To access the RCT, press the

button on the main RST page.

## 8.1 BASIC CONFIGURATION

With the Basic Configuration functions you can perform the following:

- Manage reader profiles
- Set tag protocols
- Setup the Ethernet/LAN configuration
- Setup the serial port
- Setup digital accessories
- Setup antennas
- Set regulatory modes

### 8.1.1 Configuration Page Header

Each page displayed by the RCT has the following header.

This header provides pull-down menus for each of the configuration function categories. Additional functions include the user login and the currently loaded reader profile.

#### Login

The reader's default user level is **guest**. However, a user can login as **admin**. If not logged in as **admin**, the default level is always **guest**.

The guest login level provides read-only access to the reader. Clients that login in at the guest level can read the settings of the reader and can access the tags that the reader has inventoried. Clients at this level cannot change the configuration of the reader.

The admin login level provides read-write access to the reader. Clients that login in at the admin level can read and write the settings of the reader and can access the tags that the reader has inventoried.

#### Logout

After logging in as **admin**, the **Logout** button logs you out of the reader. Logging out automatically sets the login level to guest.

#### Profile

Profile is the currently active profile in the reader. Refer to the Manage Profiles section for detailed information on reader profiles.

#### Save

The Save button saves the reader's current configuration to the specified profile. Refer to the Manage Profiles section for detailed information on reader profiles.

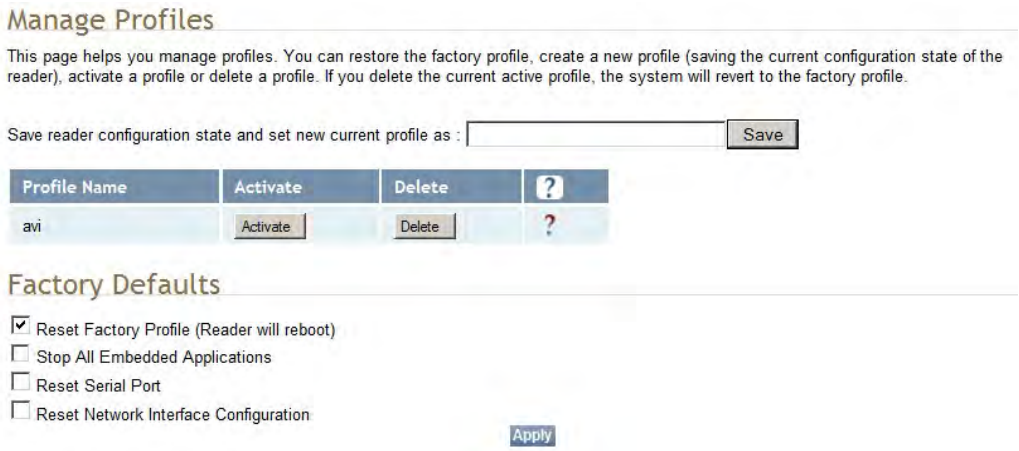
#### Manage Profiles

This link allows you to list, save, and delete profiles. Refer to the Manage Profiles section for detailed information on reader profiles.

### 8.1.2 Manage Profiles

The reader's configuration is stored in a profile. A profile contains the setting of all the configuration variables in the reader. The reader can support up to 8 unique profiles. Detailed information about reader profiles is provided in the **Reader Behavior** section of the **Neology Toll RFID Reader 7204 Protocol Reference Guide**.

The **Manage Profiles** page provides a list of all profiles stored in the reader.




#### Save a Profile

To save your current reader configuration under a new profile, enter a profile name and press **Save**. The new profile will appear in the Profile Name list. Profile names must consist of the characters `A - Z, a z, 0 - 9, '-'` or `'_'` and must be between 1 and 32 characters in length. The reader can store up to 8 different profiles.

#### Activate a Profile

To activate a previously saved profile, press the **Activate** button beside the profile name. The selected profile will be loaded into the reader.

#### Delete a Profile

To delete a previously saved profile, press the **Delete** button beside the profile name. This is a destructive operation. Once a profile is deleted, it cannot be recovered.

#### Reset to Factory Default

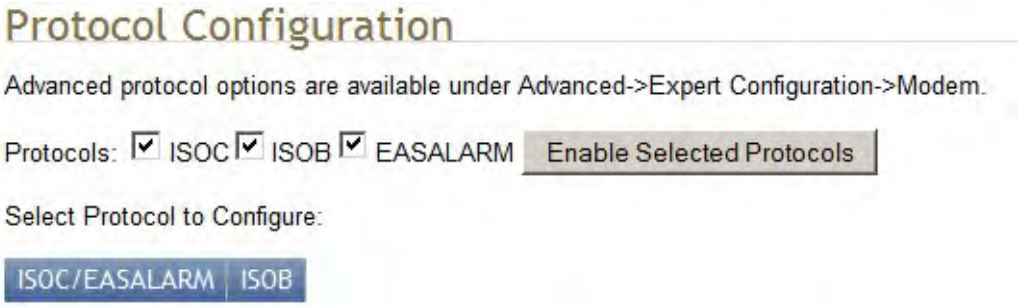
In addition to managing reader profiles, you can also reset the reader back to its factory default configuration. From the Profiles page select one or more of the following:

- **Stop All Embedded Applications** – This option terminates any embedded applications currently running on the reader.
- **Reset Serial Port** – This option resets the serial port configuration to the factory default settings.
- **Reset Network Interface Configuration** – This option resets the network configuration to factory defaults.

Resetting the Neology Toll RFID Reader 7204 to Factory Default will reboot the reader.

### 8.1.3 Set Tag Protocol

This **Set Tag Protocol** page consists of two forms. The first form (top) allows you to select which type of tags the reader will acquire or the type of protocol(s) to utilize on the air interface.




Select the check box for the protocol(s) to enable and then press **Enable Selected**

**Protocols** to activate the protocol.

Click on a specific protocol to view the lower form. This form allows you to configure various protocol level parameters. The protocol level parameters are divided into two categories: control and physical. Control parameters configure the protocol control. Physical parameters configure the physical air interface for the protocol.

## Control

| Name | Value |
|---|---|
| Mem Bank For Selection | membank_epc |
| Number Slots Q | 0 |
| Select Cmd Period | 0 |
| Session ID | session_0 |
| Transmit Attenuation | 0 |
| User Block Write | false |

## Physical

| Name | Value |
|---|---|
| Mode | 4 - Miller4/LF240/12.5tari/PR_ASK |
| Modulation Depth | 90 |

For detailed information on each of the Control and Physical parameters, refer to **Modem Namespace** section of the **Neology Toll RFID Reader 7204 Protocol Reference Guide**. Parameter descriptions are provided in the `modem.protocol.isoc.control` and `modem.protocol.isoc.physical` configuration variable sections.

### 8.1.4 Setup Ethernet/LAN

The Setup Ethernet/LAN page allows you to configure the network interface of the reader.

# Ethernet-LAN Configuration

This page can be used to configure ethernet adapter of the reader.

## General Settings

| Name | Value | ? |
|---|---|---|
| Host Name | 62040001BE | ? |
| Command Port | 50007 | ? |
| Event Port | 50008 | ? |
| Domain Name | mmm.com | ? |
| Mac Address | 00:17:9E:00:01:BE | ? |

## IPv4 Settings

| Name | Value | ? |
|---|---|---|
| Method | dhcp | ? |
| IP Address | 169.15.150.61 | ? |
| Subnet Mask | 255.255.255.0 | ? |
| Default Gateway | 169.15.150.1 | ? |

## IPv6 Settings

| Name | Value | ? |
|---|---|---|
| Method | radv_only | ? |
| IP Addresses | fe80::217:9eff:fe00:1be/6 | ? |
| Default Gateway | none | ? |

## Other Settings

| Name | Value | ? |
|---|---|---|
| NTP Servers | | ? |
| DNS Servers | 169.10.8.5 169.10.8.4 | ? |
| Domain List | mmm.com | ? |

Submit Reset

**General Settings** allow you to specify the host and domain name of the reader. The Command and Event Ports are also shown. You can also select your domain name in this window.

**IPv4/IPv6 Settings** allow you to configure the reader's IP address. If the reader is to automatically acquire its IP address, subnet mask and default gateway from a DHCP server, select **Enable DHCP**. To manually specify this information, deselect **Enable DHCP** and fill in the desired IP address, subnet mask and default gateway.

**Other Settings** allow you to configure the NTP servers the reader can contact to obtain the current time, DNS servers the reader can contact for domain name resolution, and the Domain list to resolve names to IP addresses.

Enter all the required information and press **Submit**.

Figure 5 Setup Digital Accessories

The Setup Digital Accessories function allows you to configure the Digital Inputs and Outputs on the reader.

**Digital Input**

| Name | Current Value | Debounce | ? |
|---|---|---|---|
| 1 | true | 30 | ? |
| 2 | true | 30 | ? |
| 3 | true | 30 | ? |
| 4 | true | 30 | ? |

**Digital Output**

| Name | Current Value | ? |
|---|---|---|
| 1 | false | ? |
| 2 | false | ? |
| 3 | false | ? |
| 4 | false | ? |

Submit Reset

## Digital Input

The status of the four digital input values (1–4) can be seen in this window. The **Current Value** is not configurable and is shown as **true** or **false**. The Debounce value can be set and is in milliseconds.

## Digital Output

The output value for each digital output can be set to **true** or **false**. Press the **Submit** button to send the appropriate commands to the reader to update the digital inputs and outputs.

Refer to the **Neology Toll RFID Reader 7204 Protocol Reference Guide** for more information on configuring the digital inputs and outputs.

### 8.1.5 Setup Antenna/Cables

This page allows you to configure the reader's antenna multiplexer sequence as well as conducted power. For detailed descriptions of each of the antenna and cable variables, refer to Antenna Configuration in **Reader Behavior** of the **Neology Toll RFID Reader 7204 Protocol Reference Guide**.

To configure an antenna, enter the antenna number in the **Mux Sequence** field. The individual antenna **Conducted Power** fields will be activated in the lower window. The current values will be displayed. Only those antennas listed in the **Mux Sequence** will be shown. Also, you must set **Conducted Power** to **0** in order to set or change the **Attenuation**, **Cable Loss**, or **Gain**.

NOTE

Changing Attenuation, Cable Loss, or Gain should be done by a trained professional at installation time.

To change, enter the appropriate values for each antenna parameter and press the **Submit** button to update the antenna and cable configuration. Select the next antenna and repeat.

| Name | Value | ? |
|---|---|---|
| Detected Antennas | | ? |
| Port Count | 4 | ? |
| Configuration | all_monostatic | ? |
| Mux Sequence | 1 2 3 4 | ? |

This table provides information related to the individual antennas.

| Name | Antenna 1 | Antenna 2 | Antenna 3 | Antenna 4 | ? |
|---|---|---|---|---|---|
| Conducted Power | 0 | 0 | 0 | 0 | ? |
| Attenuation | 0 | 0 | 0 | 0 | ? |
| Cable Loss | 10 | 10 | 10 | 10 | ? |
| Gain | 130 | 130 | 130 | 130 | ? |
| Gain Units | dbi | dbi | dbi | dbi | ? |
| Computed Conducted Power | 340 (ddBm), 2.51 (W) | 340 (ddBm), 2.51 (W) | 340 (ddBm), 2.51 (W) | 340 (ddBm), 2.51 (W) | ? |

See additional antenna notes on the following page.

*Additional Antenna Notes*

- The required antenna impedance is 50 ohms.
- 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.
- The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit an RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website at:
- Additional details for the approved antennas for the Neology Toll RFID Reader 7204 can be found in Section 10.6, "Antenna Specifications" (pg. 112) .

### 8.1.6 Set Regulatory Mode (Region)

This page allows the user to configure the reader to meet the regulatory requirements for the geographic region where the reader is deployed. The region option is locked by the factory and cannot be modified. The sub_region sets the secondary regulatory mode for the geographic region where the reader is deployed.

| Name | Value | ? |
|---|---|---|
| Region | fcc | ? |
| Sub Region | fcc_part90_dense | ? |

For detailed information on each of these parameters, refer to the **Neology Toll RFID Reader 7204 Protocol Reference Guide**. Descriptions are provided in the `setup.region` and `setup.sub_region` variable sections.

### 8.1.7 Setup Summary

This page allows you to set the basic operational parameters of the reader.

## 8.2 ADVANCED FUNCTIONS

With the Advanced Functions you can perform the following:

- Firmware Management
- Import/Export Configuration
- Command Line operations
- Expert Configuration
- User Application Management
- Change Operating Mode
- Restart

### 8.2.1 Firmware Management

The **Firmware Management Page** allows you to perform the following:

- Read the current reader firmware version
- Upgrade the reader firmware files
- Rollback to the previous reader firmware version

The firmware version number `1.x.x` follows the convention `major.minor.patch`. The firmware version running on the reader is displayed above the "Upgrade Firmware" dialog box for reference when performing an upgrade.

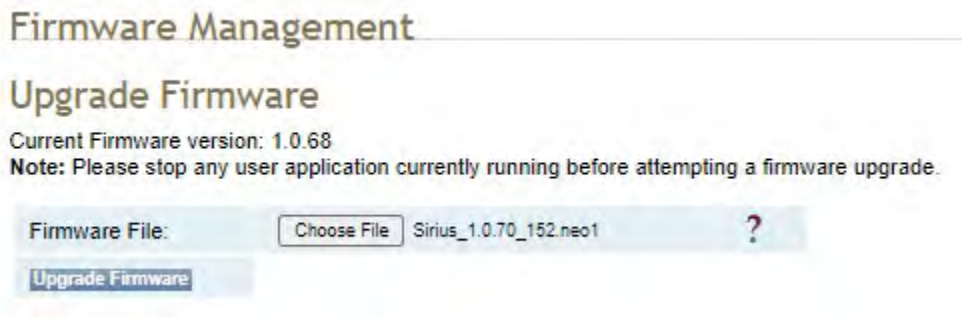
#### Upgrade Firmware

1 Login as **Admin**.

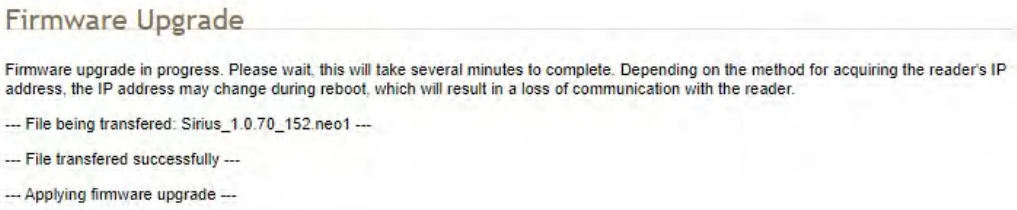
2 Navigate to the **Firmware Management** page.

3 Point RCT to the new firmware.

On the **Upgrade Firmware** panel, click **Choose File** to the right of the **Firmware File** field. A Windows **File Explorer** will open. Navigate to the location of the new firmware file on your PC. Select the file by clicking once on it. The firmware name will appear in the **File name** field. Click **Open**.




4 Click **Upgrade Firmware**



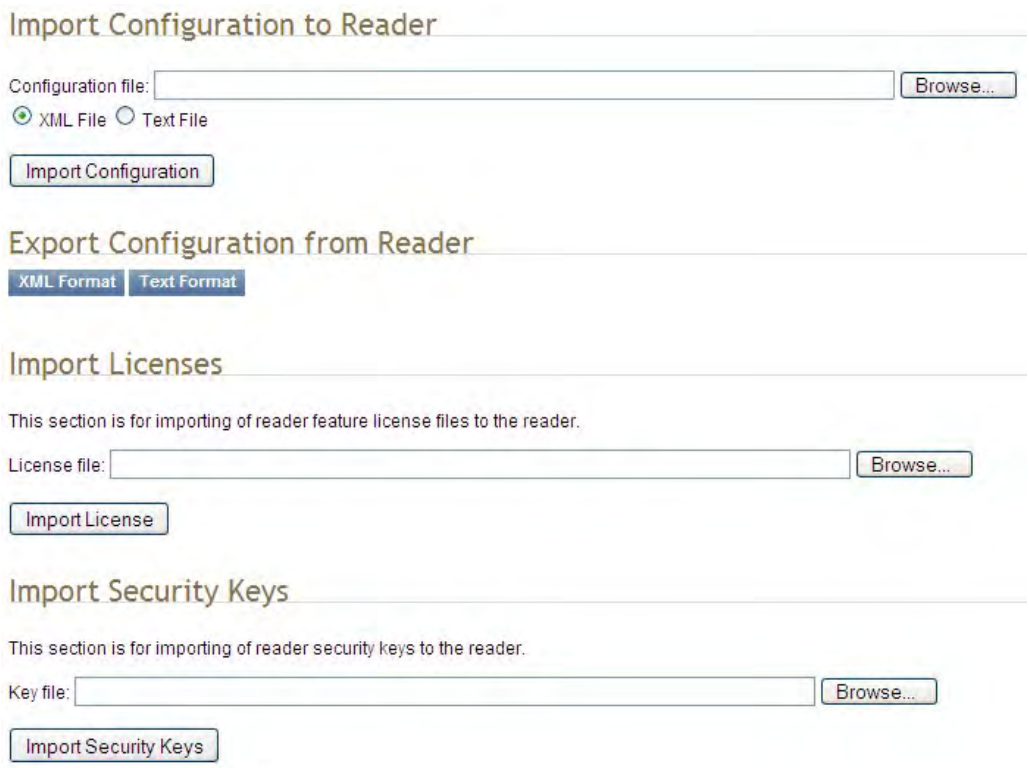

The page will take a moment to refresh. When it does, the screen will show the firmware installation progress.

When the Installation successfully completes, the reader will automatically reboot. image::media/usr_gd/rct_successrul_firmware_upgrade.png[RCT Successful Firmware Upgrade]

The **Rollback Firmware** button will roll back the reader firmware to the previous version.

### 8.2.2 Import/Export Configuration

This page allows you to transfer a reader configuration to or from your host computer. This is useful for configuring a reader to a known state.




### Import Configuration to Reader

1 Enter the name of a saved configuration file in the **Configuration file** field.

2 Select the **XML File**, or **Text File** option, and press the **Transfer Configuration to Reader** button to send the profile to the reader.

### Export Configuration from Reader

3 To view the current configuration parameters for a reader, press **Text Format** button.

4 Press the **XML Format** button to view the XML file in the browser.

5 Save this file to your computer if you wish retain it for future.

> Current reader settings may be exported for later uploading.

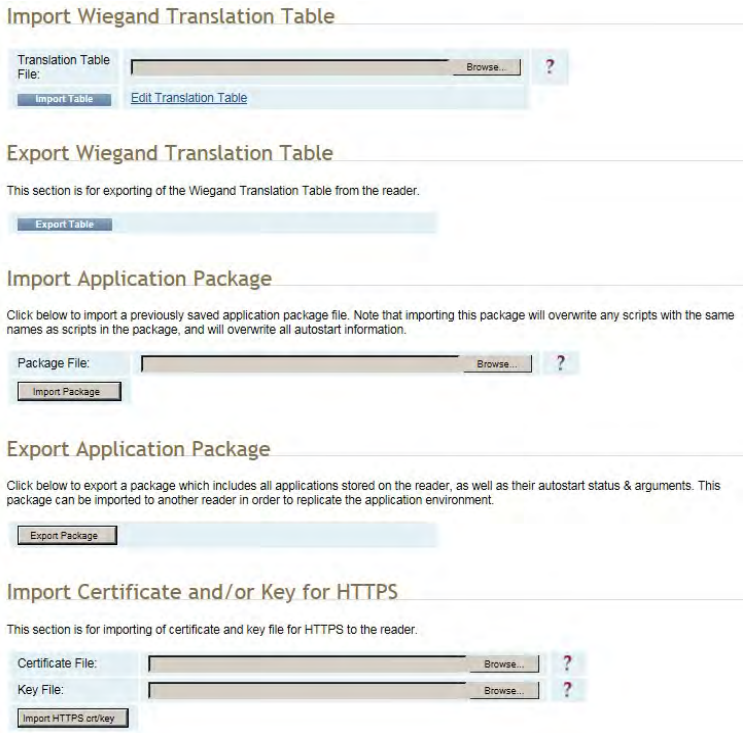
### Import Licenses

6 This function imports a feature license file. Navigate to the license file and press

**Import License** to load the file into the reader.

Import Security Keys

7 This function imports reader security keys to the reader. Navigate to the key file and press **Import Security Keys** to load the file into the reader.




Import Application Package

8 This function is used to import a set of user applications, along with each application's arguments and autostart status.

Export Application Package

9 This function is used to export the user applications, along with each application's arguments and autostart status.

Import Certificate and/or Key for HTTPS

10 Navigate to the certificate `anf` key files and press **Import HTTPS crt/key** to load the files into the reader.

### 8.2.3 Command Line

This page allows you to directly enter reader commands from your web browser. To directly enter commands from the Command Line Interface (CLI), refer to the

**Neology Toll RFID Reader 7204 Protocol Reference Guide**.

### 8.2.4 Expert Configuration

The Expert Configuration functions allow you to configure low-level functions within the reader. These functions should only accessed by expert users. Expert configurations include:

- Setup
- Tag
- Version
- Information
- Communication
- Antennas
- Digital I/O
- Security
- Writeback
- Modem

#### 8.2.4.1 Expert Configuration – Setup

This page allows you to set the basic operating parameters of the reader including region, sub region, mode, and active protocols. You can also view the valid protocols and regions.

| Name | Value | ? |
|---|---|---|
| setup.default_login_level | admin | ? |
| setup.install_type | vehicle | ? |
| setup.operating_mode | standby | ? |
| setup.protocols | isoc | ? |
| setup.region | fcc | ? |
| setup.sub_region | fcc_a | ? |
| setup.tag_volume | 1 | ? |
| setup.valid_protocols | isoc isob easalarm | ? |
| setup.valid_regions | fcc etsi | ? |
| setup.valid_sub_regions | fcc_a fcc_b fcc_c fcc_dense en302208_dense fcc_pa | ? |
| setup.advanced.preferred_frequencies | 0 | ? |

8.2.4.2 Expert Configuration – Tag

This page allows you to configure how the reader reports tags.

The 7204 supports the ability to filter tags or eliminate tags from being reported based on the conditions specified in the filter configuration variables. The reader supports eight filters and each filter is specified by the following configuration variables:

- **enabled** – Enables or disables the filter.
- **inclusive** – Indicates to either include tags that match (Inclusive) or include tags that do not match (Exclusive) the tag filter.
- **mask** – Mask (as an array of hex bytes) for the tag filter.
- **name** – Name given to the tag filter
- **pattern** – Pattern (as an array of hex bytes) for the tag filter

The following figure shows a small sample of the available variables.

| Name | Value | ? |
|---|---|---|
| tag.db.acknowledge_timeout | 10 | ? |
| tag.db.create_entry_on_arrival | false | ? |
| tag.db.max_count | 50000 | ? |
| tag.db.max_user_data | 64 | ? |
| tag.db.memory_use | minimize | ? |
| tag.db.next_audit_record | 0 | ? |
| tag.db.store_tags | false | ? |
| tag.filter.1.enabled | false | ? |
| tag.filter.1.inclusive | true | ? |
| tag.filter.1.mask | 00 | ? |
| tag.filter.1.name | | ? |
| tag.filter.1.pattern | 00 | ? |

| | | |
|---|---|---|
| tag.filter.antenna_cross.enabled | false | ? |
| tag.filter.antenna_cross.max_speed | 10 | ? |
| tag.filter.antenna_cross.performance_metric | 10 | ? |
| tag.filter.portal_cross.enabled | false | ? |
| tag.filter.portal_cross.1.threshold | 100 | ? |

#### 8.2.4.3 Expert Configuration – Version

This page displays the version of reader hardware and reader software within the reader. The version numbers are read-only and will be needed if you contact Neology for technical support.

| Name | Value | ? |
|---|---|---|
| version.hw | A | ? |
| version.hw_detail | 0000 | ? |
| version.llrp | 393 | ? |
| version.rollback | 1.4.25667 | ? |
| version.sw | 1.5.26574 | ? |
| version.sw_detail | sw = 1.5.26574, fw = 26573, dsp = 5.0, fpga = 0x000A | ? |
| version.wiegand_interface_module | 3.36 | ? |

Submit Reset

Note that the `version.weigand` value will only be displayed if the wiegand module is enabled on the reader.

#### 8.2.4.4 Expert Configuration – Information

This page allows you to customize the reader's identity. You can assign each reader a name, description, location, and zone. You can also set how the reader reports timestamps.

The following figure shows a portion of information parameters available on the reader.

| Name | Value | ? |
|---|---|---|
| info.agency_code | 0x0000 | ? |
| info.description | unknown | ? |
| info.location | unknown | ? |
| info.make | Toll RFID Reader | ? |
| info.manufacturer | 3M | ? |
| info.manufacturer_description | 3M Toll RFID Reader | ? |
| info.model | | ? |
| info.name | unknown | ? |
| info.reader_id | 0x00000000 | ? |
| info.serial_number | 0B067200FC439853 | ? |
| info.sub_model | 1 | ? |
| info.time | 1999-11-30T07:56:47.697 | ? |
| info.time_reporting | local | ? |
| info.time_zone | GMT | ? |

#### 8.2.4.5 Expert Configuration – Communication

This page allows you to customize the reader's communication parameters. Refer to the **Setup Ethernet/LAN** and **Setup Serial Port** sections for additional information.

The following figure shows a portion of communication parameters available on the reader.

| Name | Value | ? |
|---|---|---|
| com.event.overflow_backoff_time | 3 | ? |
| com.llrp.antennas_disabled | | ? |
| com.llrp.client_ip_address | | ? |
| com.llrp.keepalive_count | 3 | ? |
| com.llrp.log_level | error | ? |
| com.llrp.reader_init_conn | false | ? |
| com.network.dns_servers | 169.10.8.5 169.10.8.4 | ? |
| com.network.domain_list | mmm.com | ? |
| com.network.domainname | mmm.com | ? |
| com.network.hostname | 6204C3B45D | ? |
| com.network.ntp_servers | 169.10.250.114 | ? |
| com.network.tcpkeepalive | true | ? |
| com.network.tcpnodelay | false | ? |
| com.network.tcpsynretries | 5 | ? |

#### 8.2.4.6 Expert Configuration – Antennas

This page allows you to configure the properties of the reader's antenna configuration. For detailed description of each of the antenna and cable variables, refer to the Antenna Configuration section in **Reader Behavior** of the **Neology Toll RFID Reader 7204 Protocol Reference Guide**.

Enter the appropriate values for each antenna parameter and press the **Submit** button to update the antenna and cable configuration. Only Antenna 1 and common antenna variables shown.

| Name | Value | ? |
|---|---|---|
| antennas.configuration | all_monostatic | ? |
| antennas.detected | 1 2 3 4 | ? |
| antennas.max_computed_conducted_power | 330 | ? |
| antennas.max_set_conducted_power | 300 | ? |
| antennas.mux_sequence | 1 | ? |
| antennas.part90_computed_conducted_power_increase | 10 | ? |
| antennas.port_count | 4 | ? |
| antennas.tx_limit | 15 | ? |
| antennas.1.conducted_power | 0 | ? |
| antennas.1.label | unknown | ? |
| antennas.1.position | 0 | ? |
| antennas.1.rssi_spread | 200 | ? |
| antennas.1.advanced.attenuation | 0 | ? |
| antennas.1.advanced.cable_loss | 18 | ? |
| antennas.1.advanced.computed_conducted_power | 340 | ? |
| antennas.1.advanced.gain | 130 | ? |
| antennas.1.advanced.gain_units | dbi | ? |

#### 8.2.4.7 Expert Configuration – Digital I/O

This page allows you to configure the digital inputs and output behavior. You can set the digital input debounce time (in milliseconds), as well as the input and output pin values. Refer to the **Neology Toll RFID Reader 7204 Protocol Reference Guide** for detailed information on each of these variables.

| Name | Value | ? |
|---|---|---|
| dio.control.3 | iop | ? |
| dio.control.4 | iop | ? |
| dio.debounce.1 | 30 | ? |
| dio.debounce.2 | 30 | ? |
| dio.debounce.3 | 30 | ? |
| dio.debounce.4 | 30 | ? |
| dio.in.1 | 1 | ? |
| dio.in.2 | 1 | ? |
| dio.in.3 | 1 | ? |
| dio.in.4 | 1 | ? |
| dio.in.all | 0xF | ? |
| dio.in.alarm.logic_level.1 | 1 | ? |
| dio.in.alarm.logic_level.2 | 1 | ? |
| dio.in.alarm.logic_level.3 | 1 | ? |
| dio.in.alarm.logic_level.4 | 1 | ? |
| dio.in.alarm.timeout.1 | 0 | ? |
| dio.in.alarm.timeout.2 | 0 | ? |

#### 8.2.4.8 Expert Configuration – Security

This page allows you to configure the tag.security parameters.

Refer to the **Neology Toll RFID Reader 7204 Protocol Reference Guide** for detailed information on each of these variables.

| Name | Value |
|---|---|
| tag.security.authentication_handle_timeout | 0 |
| tag.security.enable_priority | true |
| tag.security.log_errors | false |
| tag.security.log_events | false |
| tag.security.packet_counter_enable | false |
| tag.security.password_authentication_enable | false |
| tag.security.read_retries | 2 |
| tag.security.rssi_threshold | -470 |
| tag.security.sequence_retries | 2 |
| tag.security.tid_authentication_enable | false |
| tag.security.wait_for_rssi_threshold | false |
| tag.security.write_retries | 2 |
| tag.security.secure_reader.enable_security | false |
| tag.security.tag_type.1.block_flags | |
| tag.security.tag_type.1.block_size | 0 |
| tag.security.tag_type.1.epc_flags | 00 |
| tag.security.tag_type.1.key_index_version_offset | 0 |
| tag.security.tag_type.1.label | Unknown |
| tag.security.tag_type.1.num_blocks | 0 |

#### 8.2.4.9 Expert Configuration – Writeback

This page allows you to configure the tag.writeback parameters.

Refer to the **Neology Toll RFID Reader 7204 Protocol Reference Guide** for detailed information on each of these variables.

| Name | Value | ? |
|---|---|---|
| tag.writeback.isoc.bytes_per_write | 0 | ? |
| tag.writeback.isoc.enable | false | ? |
| tag.writeback.isoc.log_events | false | ? |
| tag.writeback.isoc.read_retries | 2 | ? |
| tag.writeback.isoc.sequence_retries | 2 | ? |
| tag.writeback.isoc.use_block_write | true | ? |
| tag.writeback.isoc.write_retries | 2 | ? |
| tag.writeback.isoc.basic.filter_mask | 0000 | ? |
| tag.writeback.isoc.basic.filter_type | all | ? |
| tag.writeback.isoc.basic.filter_value | 0000 | ? |
| tag.writeback.isoc.basic.op.1.action | write | ? |
| tag.writeback.isoc.basic.op.1.data | 0000 | ? |
| tag.writeback.isoc.basic.op.1.enable | false | ? |
| tag.writeback.isoc.basic.op.1.mask | 0000 | ? |
| tag.writeback.isoc.basic.op.1.offset | 0 | ? |
| tag.writeback.isoc.basic.op.1.value | 0 | ? |

#### 8.2.4.10 Expert Configuration – Modem

This page allows you to set the reader's modem variables. Modem variables are divided into the following categories:

- Control
- Debug
- Diagnostics
- Digital IO
- Radio
- Statistics

Refer to the **Neology Toll RFID Reader 7204 Protocol Reference Guide** for detailed information on each of these variables. The following figures show only a small sample of the available modem configuration variables.

Figure 6 Modem – Control

| Name | Value | ? |
|---|---|---|
| modem.control.inventory.period | 0 | ? |
| modem.control.pilot.write_threshold | -70 | ? |
| modem.control.sync.antenna_sequence | 1 | ? |
| modem.control.sync.dio_in | 4 | ? |
| modem.control.sync.dio_out | 4 | ? |
| modem.control.sync.iterator | protocol | ? |
| modem.control.sync.mode | off | ? |
| modem.control.sync.period | 1000000 | ? |
| modem.control.sync.slot_on_time | 20000 | ? |
| modem.control.sync.slot_period | 40000 | ? |
| modem.control.sync.slot_start_offset | 0 | ? |
| modem.control.sync.protocol.1.enabled | false | ? |

Figure 7 Modem – Debug

| Name | Value | ? |
|---|---|---|
| modem.debug.channel_scan | false | ? |
| modem.debug.channel_scan_coherent | false | ? |
| modem.debug.db0 | 0 | ? |
| modem.debug.db1 | 0 | ? |
| modem.debug.db2 | 0 | ? |

Figure 8 Modem – Diagnostics

| Name | Value | ? |
|---|---|---|
| modem.diag.aux_adc_raw_temp | 1035 | ? |
| modem.diag.current_temperature | 33 | ? |
| modem.diag.lna_bypass | 1 | ? |
| modem.diag.vgadac | 512 | ? |
| modem.diag.error_handler.period | 60 | ? |

Figure 9 Modem – Digital IO

| Name | Value | ? |
|---|---|---|
| modem.dio.in.3.negative_level | noop | ? |
| modem.dio.in.3.positive_level | noop | ? |
| modem.dio.in.3.script.cmd1 | | ? |
| modem.dio.in.3.script.cmd10 | | ? |
| modem.dio.in.3.script.cmd2 | | ? |

Figure 10 Modem – Radio

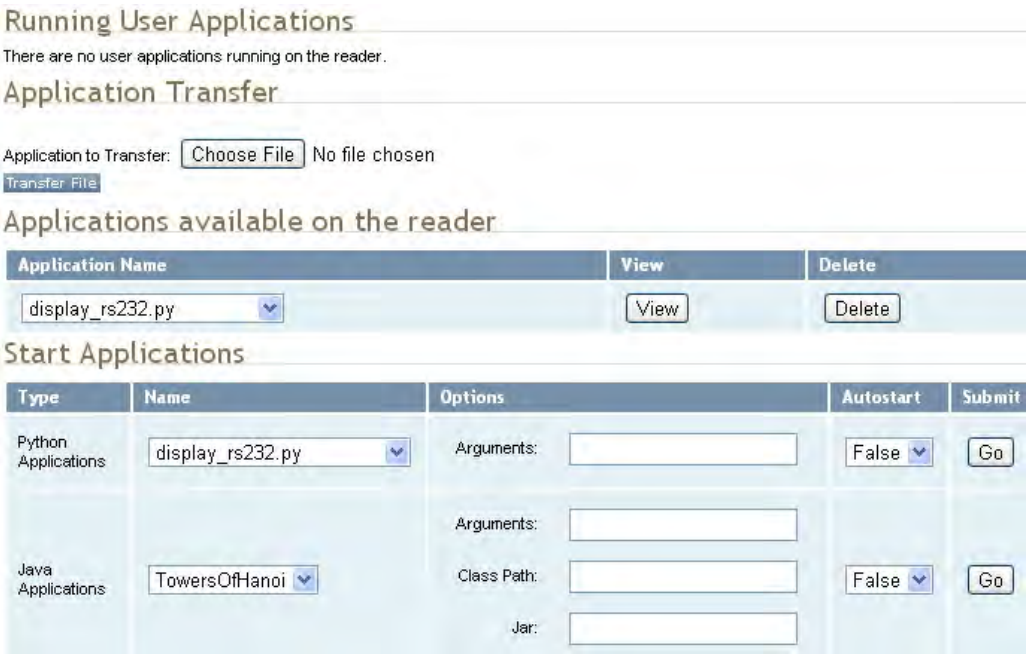
| Name | Value | ? |
|---|---|---|
| modem.radio.idle_cw | false | ? |
| modem.radio.freq_mgmt.frequency_mode | static | ? |
| modem.radio.freq_mgmt.hop_table.frequencies | 902750 926750 910750 918750 903250 927250 91125 | ? |
| modem.radio.lbt.enabled | false | ? |
| modem.radio.lbt.listen_antenna | lbt_antenna_all | ? |
| modem.radio.lbt.listen_time | 5000 | ? |
| modem.radio.lbt.type | standard | ? |
| modem.radio.lbt.random_time.enabled | true | ? |
| modem.radio.tx.interlock | false | ? |

Figure 11 Modem – Statistics

| Name | Value | ? |
|---|---|---|
| modem.stats.nxp_calibrate | 0 | ? |
| modem.stats.nxp_calibrate_failure | 0 | ? |
| modem.stats.nxp_eas_alarm | 0 | ? |
| modem.stats.nxp_eas_alarm_failure | 0 | ? |
| modem.stats.nxp_eas_change | 0 | ? |
| modem.stats.nxp_eas_change_failure | 0 | ? |
| modem.stats.nxp_read_protect | 0 | ? |
| modem.stats.nxp_read_protect_failure | 0 | ? |

### 8.2.5 User Application Management

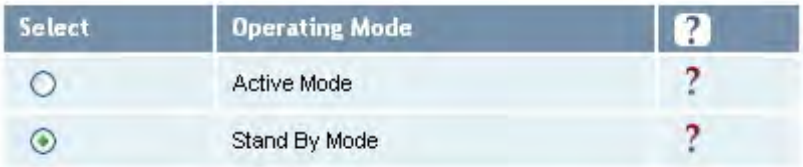
This page lists any user applications currently available on the reader and if any applications are running. This page also allows you to upload applications to the reader.




- **Running User Applications** – Lists any user applications currently running on the reader. The application name, process ID, configuration, and status are provided. Controls are provided to view the application file and stop the application.
- **Application Transfer** – This function allows you to load custom user applications onto the reader.
- **Applications available on the reader** – This function allows you to view a list of all user applications stored on the reader. Controls are provided to view the application and delete it from the reader.
- **Start Applications** – This function allows you to start Python and Java applications.

### 8.2.6 Change Operating Mode

This page allows you to configure the operational mode of the reader.



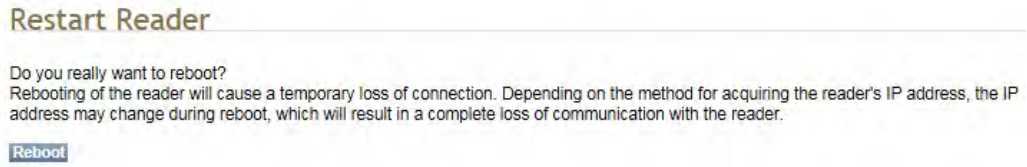

The reader supports the following operational modes:

- **Active Mode** - Reader is continuously attempting to singulate tags and automatically reports any singulated tag via an asynchronous event notification on the event channel.
- **Stand By Mode** - Reader is not transmitting any energy, unless processing a tag related command. The RF transmitter is enabled at the beginning of the command processing, any protocol operations required for the command are performed, and then the RF transmitter is turned back off.

### 8.2.7 Restart

This function reboots the reader. Ensure that this is your intention before proceeding.

Rebooting of the reader will cause a temporary loss of connection. Depending on the method for acquiring the reader's IP address, the IP address may change during reboot, which will result in a complete loss of communication with the reader.

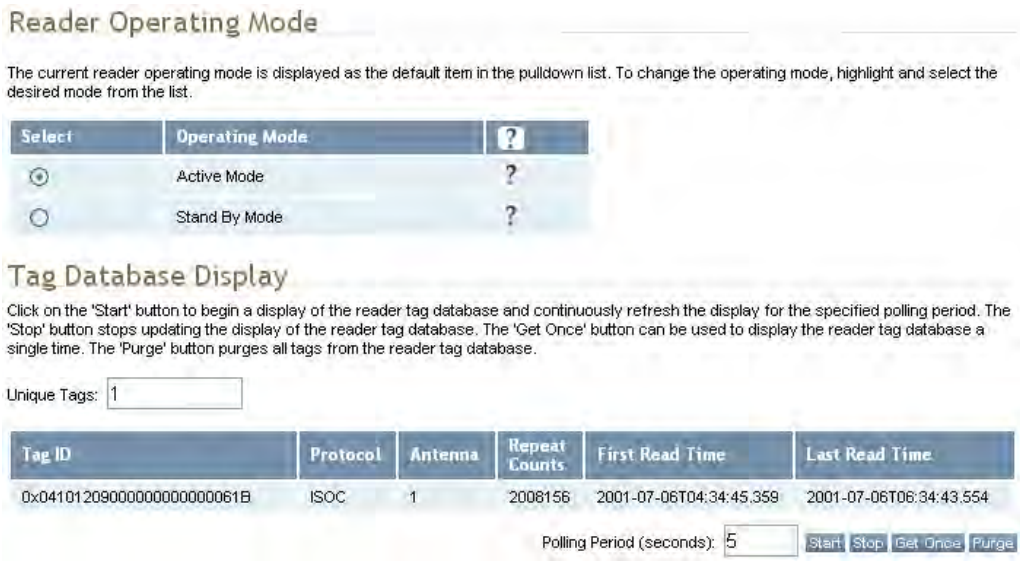



## 8.3 SYSTEM STATUS

### 8.3.1 View Tags

All tags read by the reader are stored in a database on the reader. This page allows you to view the tags in the database as well as change the current Operating Mode (**Active** or **Stand By**).

Press **Start** to begin displaying the tag database. This page is automatically refreshed every five seconds. Press **Get Once** to update the database one time (refresh is off). Press **Purge** to purge all tags from the database.




### 8.3.2 Check Reader Status

This page allows you to view the reader/system status, CPU utilization, services, and licensed features. This information can be used by Neology Technical Support to verify reader operation.

## System Status

This table shows the current status of the system.

| Name | Value | Status | ? |
|---|---|---|---|
| in_use_memory | 49135616 | INFO | ? |
| modem_uptime | 112401 | INFO | ? |
| reader_uptime | 112429 | INFO | ? |
| free_memory | 80154624 | INFO | ? |
| filesystem:/apps | 4% | INFO | ? |
| filesystem:/ | 58% | INFO | ? |
| filesystem:/tmp | 0% | INFO | ? |
| tx_interlock | false | NORMAL | ? |
| synth_locked | true | NORMAL | ? |
| ps_fault | true | NORMAL | ? |
| antenna_status | ok | NORMAL | ? |
| modem_alive | true | NORMAL | ? |
| error/warning condition | error | ABNORMAL | ? |

View Error/Warning Log  Clear

## CPU Utilization

This table shows the current CPU utilization for the reader.

| Name | Value | ? |
|---|---|---|
| cpu_load_user | 0% | ? |
| cpu_load_system | 0% | ? |

Polling Period (seconds): 3 Start Stop

## Services

This table shows the current status for the services running on the reader.

| Name | Status | Submit | ? |
|---|---|---|---|
| discovery | Running | Stop | ? |
| sshd | Running | Stop | ? |
| ssl_cmd_evt | Stopped | Start | ? |
| ntpd | Running | Stop | ? |
| console | Running | Stop | ? |
| snmpd | Stopped | Start | ? |
| wsd | Running | Stop | ? |
| llrp | Running | Stop | ? |
| usb_console | Running | Stop | ? |
| netbt | Running | Stop | ? |

## Licensed Features

This table shows the current license state for the given features.

| Name | License State | ? |
|---|---|---|
| Antenna Crossing Feature | License Unlimited | ? |
| Stray Tag Elimination Feature | License Unlimited | ? |
| Tag Phase Reporting Feature | License Unlimited | ? |
| Secure Reader Feature | Not Licensed | ? |

### 8.3.3 Review Logs

This page allows you to view the reader logs. These logs can be used by Neology Technical Support to verify reader operation. The reader logs include:

- **Reader level Logs** – System level reader operation
- **System Level Logs** – Linux logs

- **Firmware Update Log** – System level
- **Reader Applications Log** – User application logs
- **Command History Log** – Recent commands sent to the reader

## System Status

This page shows current status of the system.

| Number | Log Type |
|---|---|
| 1 | Reader level Logs |
| 2 | Reader level Logs (Previous) |
| 3 | System Level Logs |
| 4 | Firmware Update Log |
| 5 | Reader Applications Log |
| 6 | Command History Log |
| 7 | Wiegand Transaction Logs: 1 2 3 4 5 6 7 8 9 10 |

# 9

# CONFIGURING DIGITAL INPUTS AND OUTPUTS

# 9 CONFIGURING DIGITAL INPUTS AND OUTPUTS

## 9.1 DIGITAL INPUTS

The digital inputs (DIN1 – DIN4) can be used as general purpose inputs or to trigger the reader for tag reading. Unused or open digital inputs are floating inside the reader.

To activate the input, pull it low (0 Vdc) with an external device or connection to ground that can sink 2.5 mA. No voltage higher than +3.3 Vdc or lower than 0 Vdc should ever be connected to the input. See Figure 5 for an example of a typical motion sensor installed as a tag read trigger device.

## 9.2 DIGITAL OUTPUTS

The digital outputs (DOUT1 – DOUT4) can be used as general purpose outputs, to indicate tag reading activity, or to indicate the reader is transmitting (RF On).

No voltage higher than +3.3 Vdc or lower than 0 Vdc should ever be connected to a digital output. The reader activates the output by pulling it low (0 Vdc) and can sink current such that power dissipation is ≤ 1W.

## 9.3 LOW LATENCY DIGITAL INPUT/OUTPUT OPERATION

The 7204 is equipped with low-latency digital inputs and outputs. These inputs, (3 and 4), can be used by the modem to trigger low-latency events. Two commands control these inputs as follows:

```
modem.dio.in.X.positive_level = Y -- if X goes high,
it triggers Y


modem.dio.in.X.negative_level = Y -- if X goes low,
it triggers Y
```

where `Y` can be:

- `NOOP` (default)
- `ACTIVE_MODE`
- `STANDBY_MODE`
- `TOGGLE_MODE`
- `ONE_ROUND` (performs one inventory round, nonblock)
- `RUN_SCRIPT` (runs series of modem commands, see the following)

Any time the `RUN_SCRIPT` operation is invoked, the reader will sequence through a maximum of 10 modem commands as follows:

```
modem.dio.in.X.script.num_cmds = Q
```

```
modem.dio.in.X.script.cmd1 = Z

modem.dio.in.X.script.cmd2 = Z

modem.dio.in.X.script.cmd3 = Z

.

.

.

modem.dio.in.X.script.cmd10 = Z
```

where:

- `Q` is the number of commands. `Q` can be `0` to `10` (maximum 10 modem commands).
- `Z` can be any modem command

An event `event.response.modem_dio_scripts dio_in=`, cmdnum=, **resp=***** is generated after each modem command.

Digital outputs 3 and 4 can be driven by modem after setting the following:

```
dio.control.X = modem
```

Actions that triggered the output can be defined by:

```
modem.dio.out.X.op = Y
```

where **Y** can be:

- `NOOP` (default)
- `END_OF_ROUND` (generates a pulse at end of each inventory round)
- `ACTIVE_MODE` (triggers high in active mode)
- `SCRIPT_RUNNING` (triggers high when digital input io triggered script is running)
- `ANTENNA_FAILURE` (triggers high in antenna failure state)
- `ERROR` (generates a pulse when an error occurs)
- `WARNING` (generates a pulse when an warning occurs)

All output (level/pulse) polarity is defined by:

`modem.dio.out.X.polarity = Z`

where `Z` can be:

- `POSITIVE` (default)
- `NEGATIVE`

All pulse width (in µSec) is defined by: `modem.dio.out.X.pulse_width` (default 100 µSec)

#### Input

The following example triggers a series of modem commands, when DIO input 4 goes high.

```
modem.dio.in.4.positive_level = RUN_SCRIPT

modem.dio.in.4.script.num_cmds = 3

modem.dio.in.4.script.cmd1 =
"modem.antennas.perform_check()"

modem.dio.in.4.script.cmd2 =
"modem.diag.current_temperature"

modem.dio.in.4.script.cmd3 = "modem.stats.tag_read"
```

#### Output

In the following example, DIO output 3 will trigger low when the reader is in active mode.

```
dio.control.3 = modem

modem.dio.out.3.op = ACTIVE_MODE

modem.dio.out.3.polarity = NEGATIVE
```

## 9.4 DIGITAL INPUT ALARM GENERATION

The 7204 can be configured to generate an alarm when a digital input is disconnected or sensor failure is detected. The alarm is triggered when the signal level on the digital input stays in the specified state longer than the specified alarm

timeout. This behavior can be configured independently for each digital input.

The configuration variable `dio.in.alarm.logic_level.(N)` (where (N) is 1,2,3,4) sets whether the alarm is coupled to a input logic level of 0 (low) or 1 (high).

The configuration variable `dio.in.alarm.timeout.(N)` (where (N) is 1,2,3,4) sets the amount of time, in seconds, to wait for a signal state change. A value of 0 (default) disables alarm generation.

The digital input logic level is used along with the corresponding digital input pin timeout value to determine if an alarm (in the form of an event) should be generated. If a timeout value is set, the input pin is monitored. If the input pin value does not change during the timeout period AND the input pin value matches the alarm logic level, the event `event.dio.in.alarm.timeout.n` (where n is the pin number) is generated. This alarm event generation can be helpful in alerting to the loss of digital inputs to the reader.

# 10

# READER SPECIFICATIONS

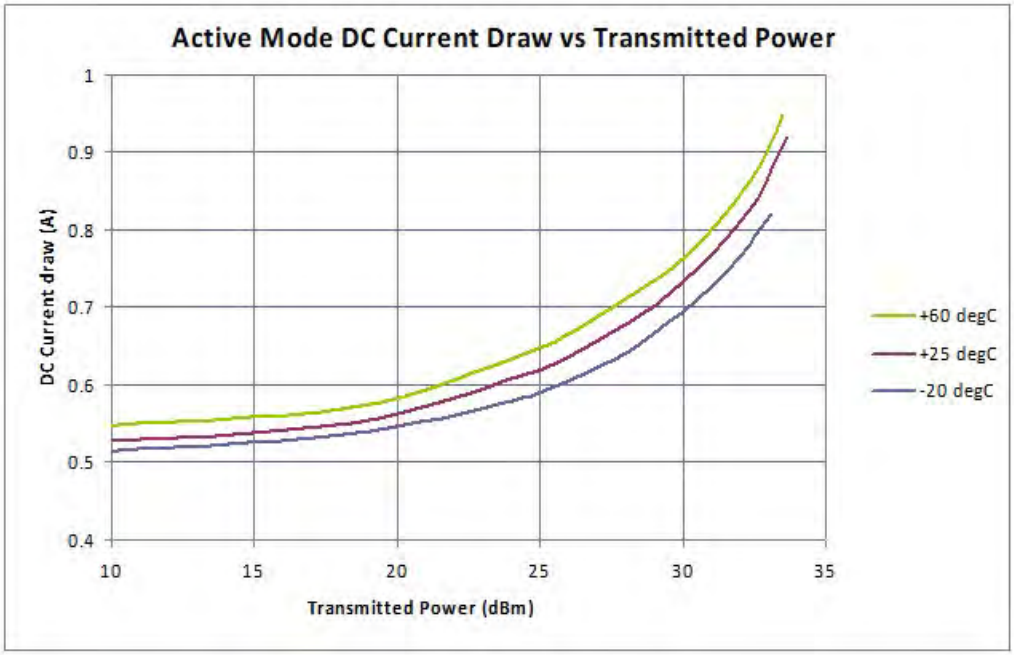
# 10 READER SPECIFICATIONS

## 10.1 READER SPECIFICATIONS (GENERAL)

| | |
|---|---|
| Frequency | 865 – 868 MHz (ETSI)<br>902 – 928 MHz (FCC Part 15)<br>902 – 904 MHz (FCC Part 90 Low Band)<br>911 – 921 MHz (FCC Part 90 Dense) |
| RF Power | 20 mW – 560 mW conducted (13 – 27.5 dBm) (ETSI)<br>20 mW – 1 W conducted (13 – 30 dBm) (FCC Part 15)<br>20 mW – 2 W conducted (13 – 33 dBm) (FCC Part 90) |
| Power Consumption | 11 W (max while idle)<br>24 W (max at 33 dBm conducted output power, FCC Part 90) |
| Connections | Digital I/O, Ethernet LAN |
| Input Voltage | 18-30 VDC at input of reader or 24 VDC at input of power cable when using maximum length cable |
| Input Current | 1.3A maximum at 18 Vdc |
| Dimensions | 16.5 x 13.0 x 3.27 in (419 x 330 x 83 mm) |
| Weight | 5.44 kg (12 lbs) |

If DC power is disconnected from the reader, wait a minimum of 30 seconds before reapplying power.

Figure 12 Typical Power Consumption versus Conducted Output Power at 910 MHz




## 10.2 ENVIRONMENTAL SPECIFICATIONS

| | |
|---|---|
| Operating Temperature | -40 °F to 140 °F (-40 °C to 65 °C) |
| Storage Temperature | -40 °F to 185 °F (-40 °C to 85 °C) |
| Maximum Shock | 1 foot (0.3 meter) drop to any corner |
| Relative Humidity | 95 %, non-condensing |
| Int'l Protection Rating | IP66 |

## 10.3 AC/DC POWER ADAPTER SPECIFICATIONS

| | |
|---|---|
| Model | CUI, Inc. PDRC-75-24-2 |
| Input Voltage | 90 – 264 Vac, |

| | |
|---|---|
| Input Frequency | 47 to 63 Hz |
| Power | 91 W |
| Holdup Time | 12 ms (115 Vac) |
| Output Voltage | 24 VDC |
| Output Current | 3.8 A |

## 10.4 DIGITAL INPUT/OUTPUT SPECIFICATIONS

| | |
|---|---|
| Input | 3.3V RS-485/RS-422 level |
| Output | 3.3V RS-485/RS-422 level |
| Signals | Refer to Section 10.7, "Connector Pinouts" (pg. 102) for cable pin out. |

## 10.5 ETHERNET LAN SPECIFICATIONS

| | |
|---|---|
| Ethernet | 10/100/1000 BaseT |
| Signals | Refer to Section 10.7, "Connector Pinouts" (pg. 102) for cable pin out. |

## 10.6 ANTENNA SPECIFICATIONS

Please refer to the **Antenna Application Guide** for detailed specifications and application information for 7204 antennas.

| Neology SKU Number | 78-0060-1044-7 | 78-0060-1045-4 | 78-0060-1048-8 | 75-0302-0147-1 | 75-0302-1572-2 |
|---|---|---|---|---|---|
| **Previous Part Number** | ANTENNA-013 | ANTENNA-018-E | ANTENNA-021 | ANTENNA-023 | ANTENNA-024 |
| **Frequency range** | 902–928 MHz | 902–928 MHz | 902–928 MHz | 902–928 MHz, 864-868 MHz | 902–928 MHz 865-868 MHz |
| **Antenna type** | Patch | Patch | Patch | Multi-element Patch | Multi-element Patch |
| **Impedance** | 50 Ω, nominal | 50 Ω, nominal | 50 Ω, nominal | 50 Ω, nominal | 50 Ω, nominal |
| **Gain** | 13 dBi a | 9.5 dBic (min) | 13 dBi | 14.5 dBi | 14.5 dBi |
| **Beam width (-3 dB)** | 42°, nominal | 63°, typical | 36°, nominal | 22°, nominal | 30°, nominal |
| **Polarization** | Linear | RH circular | Linear | Linear | Linear |
| **F/B ratio** | -24 dB, typical a | -18 dB (maximum) - 20 dB (typical) | -20 dB, typical | -25 dB, typical | -25 dB, typical |
| **Side lobes level** | -19 dB, typical | -16 dB, typical @ 90° | -14 dB, typical | -15 dB, typical | -18 dB, typical |
| **Power input** | 37.8 dBm (6W) | 37.8 dBm (6W) | 37.8 dBm (6W) | 37.8 dBm (6W) | 37.8 dBm (6W) |
| **Connector type** | N type Female (Jack) | N type Female (Jack) | N type Female (Jack) | N type Female (Jack) | N type Female (Jack) |

### 10.6.1 Site License – Customer Disclaimer

Customer (end user) acknowledges that a site license is required for each reader system location, operating under FCC Part90 or IC RSS-137 rules. It is the customer's responsibility to file for the site license and submit the appropriate filing payment. Neology can assist with the completion of forms. United States filings require completion and submission of FCC Form 601 with Schedule D and H. Canadian filings require completion and submission of Industry Canada Forms IC2365BB and IC2430BB.

### 10.6.2 Licence d'Etat-client Avertissement

Client (utilisateur final) reconnaît que le site d'une licence est requise pour chaque lecteur emplacement du système. Il incombe au client de déposer pour la licence d'exploitation et soumettre le paiement du dépôt approprié. Neology peut aider à la réalisation de formes. Unis dépôts États exigent l'achèvement et la soumission du formulaire FCC 601 à l'annexe D et H. Dépôts canadiennes exigent l'achèvement et la soumission de Industrie Canada Formulaires IC2365BB et IC2430BB

#### 10.6.2.1 FCC Part 15 NOTICE

This equipment complies with FCC Part 90 and Industry Canada.RSS-137 rules.

This device complies with FCC Part 15 and Industry Canada license exempt RSS standard(s). 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.

Cet appareil est conforme à FCC Partie15 de Industrie Canada RSS standard exempts de licence (s). Son utilisation est soumise à Les deux conditions suivantes: (1) cet appareil ne peut pas provoquer d'interférences et (2) cet appareil doit accepter Toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositif.

Any changes or modifications not expressly approved by Neology could void the user's authority to operate the equipment.

#### 10.6.2.2 FCC Part 90 NOTICE

This equipment complies with FCC Part 90 and Industry Canada.RSS-137 rules.

Any changes or modifications not expressly approved by Neology could void the user's authority to operate the equipment.

The professional installer will need to calculate and verify the reader's power output allowable based on the antenna (gain) used and cabling (loss) effects. This value will be used in the user's submission of their site license application. The maximum antenna gain plus cable effects for a given output power can be calculated by:

$$44.8 \text{ dBm (ERP)} - P_{out}$$

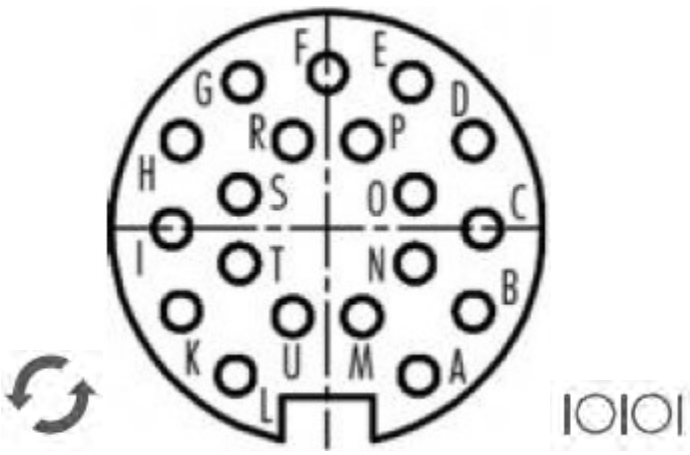
where $P_{out}$ is the measured RF output power (dBm)

Reader output power is limited to a maximum of 3.2W under all conditions. When operating at that power level, the maximum permissible system gain is 9.7dBd.

## 10.7 CONNECTOR PINOUTS

### 10.7.1 Synchronization & GPIO Connectors

NOTE The Binder 09-0464-80-19 femaie bulkhead connector is shown below, along with symbols used for synchronization and GPIO.




The 7204 Reader DIO-Sync Cable *(Neology part number 33-00011)* is used for connecting synchronization and GPIO applications to the reader. Cables are CAT6 and pre-wired with the Binder 99-5661-15-19 plugin connector.

Connections shown in Table 3 define the functional pin assignments when the 33-00011 cable is connected to the reader's **synchronization port:**

Refer to sync wiring and programming instructions before using

Table 3: Sync Plugin Connector Pinout (Binder 99-5661-15-19)

| Pair | Pin | **Color** | **Pin Name** | **Function** |
|---|---|---|---|---|
| 1 | A | White/Orange | DI3A | DIN 3A, Rx+ |
| | B | Orange | DI3B | DIN 3B, Rx- |
| | C | Shld Drain | GND | Digital Input/Output GND |

| Pair | Pin | Color | Pin Name | Function |
|---|---|---|---|---|
| 2 | D | Green | DO3Z | DIN 3Z, Tx- |
| | E | White/Green | DO3Y | DIN 3Y, Tx+ |
| 3 | F | White/Brown | DI4A | DIN 4A, Rx+ |
| | G | Brown | DI4B | DIN 4B, Rx- |
| | H | | GND | Digital Input/Output GND |
| 4 | I | Blue | DO4Z | DIN 4Z, Tx- |
| | K | White/Blue | DO4Y | DIN 4Y, Tx+ |
| | L - U | | **NU** | **NOT USED** |

Colors above are defined for outdoor shielded Cat 6 cable.

The connections defined in Table 4 show the functional pin assignments when the 33-00011 cable is connected to the reader's **GPIO port**:

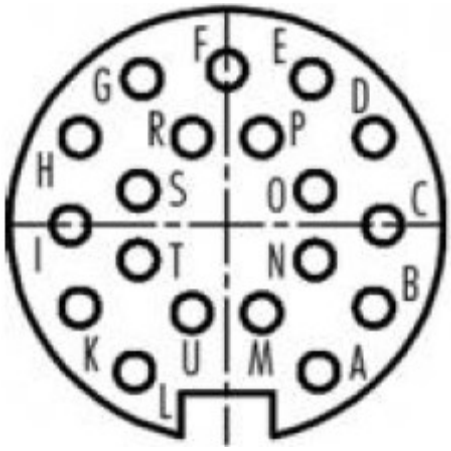


Table 4: GPIO Plugin Connector Pinout (Binder 99-5661-15-19)

| Pair | Pin | Color | Pin Name | Function |
|---|---|---|---|---|
| 1 | A | White/Orange | DI1A | DIN 1A, Rx+ |
| | B | Orange | DI1B | DIN 1B, Rx- |
| | C | Shld Drain | GND | Digital Input/Output GND |
| 2 | D | Green | DO1Z | DIN 1Z, Tx- |
| | E | White/Green | DO1Y | DIN 1Y, Tx+ |
| 3 | F | White/Brown | DI2A | DIN 2A, Rx+ |
| | G | Brown | DI2B | DIN 2B, Rx- |
| | H | | GND | Digital Input/Output GND |
| 4 | I | Blue | DO2Z | DIN 2Z, Tx- |
| | K | White/Blue | DO2Y | DIN 2Y, Tx+ |
| | L - U | | **NU** | **NOT USED** |

Colors above are defined for outdoor shielded Cat 6 cable.

### 10.7.2 Ethernet Connector

The Binder 70-3784-706-08 bulkhead connector used for making Ethernet connections to the 7204 reader is shown in the picture below.

Table 5 Binder 70-3784-706-08 Bulkhead Connector Pinout

| Pair | Pin | Color | Pin Name | Function |
|---|---|---|---|---|
| A | 1 | White/Orange | **BI_DB+** | **1000BASE-T Ethernet** |
| | 2 | Orange | **BI_DB-** | **1000BASE-T Ethernet** |
| B | 3 | White/Green | **BI_DA+** | **1000BASE-T Ethernet** |
| | 4 | Green | **BI_DA-** | **1000BASE-T Ethernet** |
| D | 5 | White/Brown | **BI_DD+** | **1000BASE-T Ethernet** |
| | 6 | Brown | **BI_DD-** | **1000BASE-T Ethernet** |
| C | 7 | White/Blue | **BI_DC+** | **1000BASE-T Ethernet** |
| | 8 | Blue | **BI_DC-** | **1000BASE-T Ethernet** |

Colors above are defined for outdoor shielded Cat 6 cable.

Neology cables shown below are pre-wired with the Binder 99-3787-810-08 plugin connector using CAT6 cable.

- 33-00003 : Cable, 7204, Outdoor Ethernet, 2m
- 33-00004 : Cable, 7204, Outdoor Ethernet, 5m
- 33-00005 : Cable, 7204, Outdoor Ethernet, 100m

The Neology cables must be terminated by the user using the included RJ45. Neology installations terminate the RJ45 as shown Table 6.

Table 6 RJ45 Signal Connection

| RJ45 Pin Number | Wire Color | MDI Function |
|---|---|---|
| 1 | white/orange | **BI_DA+** |
| 2 | orange | **BI_DA-** |
| 3 | white/green | **BI_DB+** |
| 4 | blue | **BI_DC+** |
| 5 | white/blue | **BI_DC-** |
| 6 | green | **BI_DB-** |
| 7 | white/brown | **BI_DD+** |
| 8 | brown | **BI_DD-** |
| Shield housing | Shield Drain | |

### 10.7.3 DC Power Connector Pinout (ITT Cannon CA02COM-E10SL-4PB)

| Pin | **Color** | **Pin Name** | **Function** |
|---|---|---|---|
| A | Red | **+18 to +30 VDC** | **DC Voltage** |
| B | Black | **VDC GND** | **Ground** |

If DC power is disconnected from the reader, wait a minimum of 30 seconds before reapplying power.

# 1

# APPENDIX: SAFETY INFORMATION

# 1 APPENDIX: SAFETY INFORMATION

Please read, understand, and follow all safety information contained in these instructions prior to the use of this RFID Interrogator/Reader product. Retain these instructions for future reference.

## 1.1 INTENDED USE

This RFID Interrogator/Reader product is intended for use with RFID antennas and transponders in vehicle related applications such as Automatic Vehicle Identification (AVI) and/or parking and access control. It is expected that all users be fully trained in the safe operation of this device. Use in any other application has not been evaluated by Neology and may lead to an unsafe condition.

## 1.2 ATTENDANT WARNINGS

*Do not modify or attempt to service the Reader System*

Reduce the risks associated with hazardous voltage and non-ionizing radiation exposure. Return to Neology authorized service centers for repair or service. There are no user serviceable parts.

*Do not modify software outside the parameters stated in the manual*

Reduce the risks associated with exposure to non-ionizing radiation exposure.

## 1.3 INSTALLATION AND SERVICE TECHNICIAN WARNINGS AND CAUTIONS

*Hazardous Voltage, Fire, and Impact*

- Installation and service of Neology Toll RFID Reader systems is to be performed by qualified installation personnel.
- Installation and service activities must be in compliance with all applicable building and electrical codes.
- Do not install in a hazardous or explosive environment.
- Inspect all system components at least every 6 months.
- Always ensure that the system is properly grounded in accordance with the local electrical code.
- Always ensure the antennas and coax are properly isolated in accordance with the local electrical code.
- Always ensure antenna and cable connections are mated dry during installation.

# 1 APPENDIX: SAFETY INFORMATION

### 1.3.1 Power Supply Related

*Hazardous Voltage and Fire*

- Always disconnect the power supply system power before any installation, maintenance, service or modification work.
- Ensure that it cannot be re-connected inadvertently.
- Connection to main power supply in compliance with VDE01000 and EN50178.
- With Stranded wires: all strands must be secured in the terminal blocks.
- Power supply and cables must be properly fused.
- If necessary, a manually controlled disconnecting element must be used to disengage from supply mains.
- All output lines must be rated for the power supply output current and must be connected with the correct polarity.
- Do not block vents on power supply.
- For use in only a Pollution Degree 1 or Pollution Degree 2 Environment.
- Do not introduce any object into the power supply.
- Keep power supply away from fire and water.

### 1.3.2 Reader System

*Hazardous Voltage and Fire*

- Always disconnect AC power from the power supply unit when connecting or disconnecting components of the system.
- System modification and service by Neology authorized personnel only.
- Service is to be performed by Neology qualified personnel or

qualified Value Added Reseller (VAR).

*Hazardous Voltage and Non-Ionizing Radiation Exposure*

Do not modify or attempt to service the Reader System. Return to Neology authorized service centers for repair or service. There are no user serviceable parts.

*Non-Ionizing Radiation Exposure and Property Damage*

Always turn off the RF from the antenna before cleaning, inspecting, service or repair.

*Electromagnetic Interference*

Use only the antennas described in this manual or the Neology RFID Antennas for Toll RFID Readers Application Guide.

*Hazardous Temperature and Fire (power supply)*

- Verify power connections and wiring prior to first powering the system.
- Use only the power supply specified by Neology
- Replace damaged components with only the Neology designated replacement parts.

*Hazardous Voltage*

- Replace damaged components with only the Neology designated replacement parts.
- Use only the power supply specified by Neology

# 1 APPENDIX: SAFETY INFORMATION

*Fire and Explosion*

Do not install in a hazardous location.

*Impact*

Any mounting surface must be able to support a minimum static load of equal to the maximum weight of the reader plus any additional live load due to environmental conditions.

*Impact, Muscle Strain and Abrasions*

Use appropriate PPE and follow safe workplace practices during installation.

*Hot Surfaces and Reader Performance*

Do not paint the reader, antenna(s), and power supply any color.

*Rough Edges*

Wear appropriate gloves when handling the reader and antenna mounting hardware.

*Environmental Contamination*

Dispose of all system components in accordance with applicable local and government regulations, including removal of button battery, prior to disposal.

Power pins have been moved. Do not use solvents or harsh cleaners on radome or antennas.

## 1.4 RF SAFETY

The 7204 UHF Reader is equipped with four (4) RF ports. RF ports must be properly terminated with a 50 Ohm load or a functional UHF monostatic antenna before applying power if the reader has been configured to use the antenna port. Never power up the reader unless the appropriate loads or antennas are connected. Always disconnect power to the reader before removing an antenna or load from an RF port.

The sum of all system losses between the reader and antenna should be limited to 3 dB. The sum of system losses and the gain of the antenna must be properly configured in the reader.

## 1.5 ELECTROSTATIC DISCHARGE

7204 signal ports may be susceptible to damage from Electrostatic Discharge (ESD). Use proper ESD precautions to prevent damage when handling or making connections to the 7204 reader signal ports. Equipment failure can result if the antenna or communication ports are subjected to ESD. Neology Toll RFID Reader 7204 antenna ports may be susceptible to damage from static discharge or other high voltage. Use proper Electrostatic Discharge (ESD) precautions to avoid static discharge when handling or making connections to the Neology Toll RFID Reader 7204 reader antenna or communication ports Equipment failure can result if the antenna or communication ports are subjected to ESD.

## 1.6 REGULATORY COMPLIANCE

The 7204 is designed to meet the regulatory requirements in those jurisdictions in which it is offered. Changes or modifications not expressly approved by Neology for compliance could void the user's authority to operate the equipment.

### 1.6.1 EMC Compliance

#### 1.6.1.1 FCC Radio Frequency Rules and Regulations

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.

#### 1.6.1.2 FCC Intentional Radiator Certification

**FCC ID:** 2AKNF7204

This equipment contains an intentional radiator approved by the FCC under the FCC ID number shown above. 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.

**NO MODIFICATIONS.** Modifications to this device shall not be made without the written consent of Neology. Unauthorized modifications may void the authority granted under Federal Communications Commission Rules permitting the operation of this device.

This radio transmitter, 7204, has been approved by Industry Canada and FCC to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device and may void the authority granted under FCC and Industry Canada Rules permitting the operation of this device.

See Section 10.6, "Antenna Specifications” (pg. 112) for antenna information.

#### 1.6.1.3 ISED RSS-GEN Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions:

1) This device may not cause interference.
2) This device must accept any interference, including interference that may cause undesired operation of the device.

L’émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d’Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes :

1) L’appareil ne doit pas produire de brouillage;
2) L’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.

#### 1.6.1.4 FCC Radiation Exposure Statement

The antennas used for this transmitter must be installed to provide a separation distance of at least 60 centimeters from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Les antennes utilisées pour cet émetteur doivent être installées pour fournir une distance de séparation d'au moins 60 centimètres de toutes les personnes et ne doivent pas être co-localisées ou fonctionner en conjonction avec une autre antenne ou émetteur.

This device complies with Health Canada's Safety Code. The installer of this device should ensure that RF radiation is not emitted in excess of the Health Canada's requirement. Information can be obtained at

https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/occupational-exposure-regulations/safety-code-6-radiofrequency-exposure-guidelines.html

Cet appareil est conforme avec Santé Canada Code de sécurité 6. Le programme d'installation de cet appareil doit s'assurer que les rayonnements RF n'est pas émis au-delà de l'exigence de Santé Canada. Les informations peuvent être obtenues:

https://www.canada.ca/fr/sante-canada/services/securite-et-risque-pour-sante/radiation/exposition-professionelle-reglementation/code-securite-6-lignes-directrices-exposition-radiofrequences.html

Industry Canada

**IC ID:** 23567-7204

CAN ICES-3(A)/NMB-3(A)

European Union Regulations

This is a class A ITE product. In a domestic environment this product may cause radio interference in which case under the user may be required to take adequate measures.

*Recommended Cable Sizes*

DC input voltage should be supplied to the reader using 16AWG wire up to 100 meters in length.

Use Cat 5E, Cat 6, or Cat 7 cable up to 100 meters in length for Ethernet connections. Longer lengths may result in anomalous behavior or degraded operation.

# 1 APPENDIX: SAFETY INFORMATION

# 2 APPENDIX: ERROR HANDLING

# 2 APPENDIX: ERROR HANDLING

This appendix provides a listing of errors and warnings. Where applicable, a corrective action has been provided. Errors and warnings are listed by severity (critical, major, warning) and then alphabetically. If an issue does not resolve itself after taking the recommended corrective action, contact Neology support.

## 2.1 CRITICAL ERRORS

Critical errors are those errors that are likely to result in loss or severe degradation of service. These errors must be addressed immediately.

| Critical Error | Event | Description | Corrective Action |
|---|---|---|---|
| `MDM_ANTENNA_FAILURE` | `event.error.antenna` | Failed to set or change antenna. Probably due to un-terminated antenna port. | Check condition of antennas, connectors, and coax. Use `modem.antennas.perform_check()` to perform antenna check function to determine if issue has been located. |
| `MDM_CkeLOSED_LOOP_POWER_CTL_FAIL` | `event.error.radio` | Internal RF power control failed. May cause inaccurate antenna power output. | Perform reader reboot. If condition persists, contact Neology support. |
| `MDM_OVERTEMP_FAULT` | `event.error.environmental` | High temperature measured at modem | Determine cause of excessive reader temperature and correct. |
| `MDM_RC_CANT_SET_FREQUENCY` | `event.error.radio` | Synthesizer problem tuning to desired frequency. | Perform reader reboot. If condition persists, contact Neology support. |
| `MDM_RC_NO_ANTENNA` | `event.error.antenna` | Failed to detect antenna. Probably due to antenna disconnected. | Check antenna connections, then perform antenna check function. |
| `MDM_SPI_NO_RESPONSE` | `event.error.communication` | Modem has attempted to communicate with a SPI bus peripheral and received no response. | Perform reader reboot. If condition persists, contact Neology support. |
| `MDM_SYNTHESIZER_LOCK_FAIL` | `event.error.radio` | Synthesizer can't lock to desired frequency. | Perform reader reboot. If condition persists, contact Neology support. |
| `MDM_TEMPERATURE_SENSOR_FAIL` | `event.error.hw` | Temperature sensor unable to detect temperature. | Perform reader reboot. If condition persists, contact Neology support. |
| `READER_INIT_FAILURE` | `event.error.sw` | The main processor has failed to successfully complete the initialization process. | Perform reader reboot. If condition persists, contact Neology support. |

# 2 APPENDIX: ERROR HANDLING

| Critical Error | Event | Description | Corrective Action |
|---|---|---|---|
| SEEPROM_UNABLE_TO_WRITE | event.error.hw | Unable to write to SEEPROM. | Perform reader reboot. If condition persists, contact Neology support. |

## 2.2 MAJOR ERRORS

Major errors are those errors that may result in loss or degradation of service. These errors must be addressed as soon as possible.

| Major Error | Event | Description | Corrective Action |
|---|---|---|---|
| CHUNK_NOT_FOUND | event.error.sw | Unable to find valid data in the flash. | Perform reader reboot. If condition persists, contact Neology support. |
| DATA_FORMAT_ERROR | event.error.sw | An error is detected in the data format. | Perform reader reboot. If condition persists, contact Neology support. |
| DEVICE_INIT_FAILURE | event.error.sw | Error initializing a device in the system. | Perform reader reboot. If condition persists, contact Neology support. |
| DEVICE_OPEN_FAILURE | event.error.sw | Unable to open device or piped command. | Check memory and disk usage via "Check Reader Status" webpage. If "free_memory" is lower then 10 MBytes or if filesystem:/apps or filesystem:/tmp is higher than 90%, determine if embedded application is improperly using memory. If condition persists, contact Neology support. |
| INDEX_OUT_OF_BOUNDS | event.error.sw | Software is indexing beyond end of array. | If condition persists, contact Neology support. |
| INVALID_ARGUMENT | event.error.sw | Argument of an internal command is invalid. | If condition persists, contact Neology support. |
| IOP_CONMGR_INVALID_CMDRESP_FD | event.error.communication | Unknown command channel being closed. | Perform reader reboot. If condition persists, contact Neology support. |
| IOP_CONMGR_INVALID_EVENT_FD | event.error.communication | Unknown event channel being closed. | Perform reader reboot. If condition persists, contact Neology support. |

# 2 APPENDIX: ERROR HANDLING

| Major Error | Event | Description | Corrective Action |
|---|---|---|---|
| IOP_HB_MODEM_NOT_RESPONDING | event.error.hw | Modem not responding to keepalives from main processor. | If condition persists, contact Neology support. |
| IOP_IPRC_CRC_ ERROR | event.error.communication | Communication from modem processor had a CRC error. May see at bootup, since extra bytes are sent from modem processor during its boot squence. | Usually caused by excessive processing loading on the reader by external entities. Determine if any external process is continuously sending command requests to the reader at a high rate. If running an embedded application, ensure that it is not monopolizing the processor. If condition persists, contact Neology support. |
| IOP_IPRC_TIMEOUT | event.error.communication | Communication to modem processor timed out. May see at boot up, since modem processor may take a few seconds to boot. | Perform reader reboot. If condition persists, contact Neology support. |
| IOP_IPRC_TRY_AGAIN | event.error.communication | No data available from the modem processor. | Perform reader reboot. If condition persists, contact Neology support. |
| IOP_SPI_BAD_FILE | event.error.file_handling | Unable to open the firmware file to be written to the SPI FLASH. | Perform reader reboot. If condition persists, contact Neology support. |
| IOP_SPI_BAD_VERIFY | event.error.communication | Verification of data in SPI FLASH failed. | Contact Neology support. |
| IOP_SPI_INVALID_FILE_FORMAT | event.error.file_handling | The firmware file to be written to the SPI FLASH does not appear to be in the proper hex format. | Contact Neology support. |
| LICENSE_ERROR | event.error.sw | The main processor has attempted a license operation or import that has failed. | Verify license file contains MAC address of this specific unit. Verify the license file has not been imported previously. If condition persists, contact Neology support. |
| MDM_ADC_DEVICE_FAILURE | event.error.hw | The ADC device on the modem has generated an error. | If condition persists, contact Neology support. |
| MDM_ANTENNA_CHECK_FAILURE | event.error.antenna | The reader cannot perform an antenna check. | If condition persists, contact Neology support. |

# 2 APPENDIX: ERROR HANDLING

| Major Error | Event | Description | Corrective Action |
|---|---|---|---|
| MDM_CALIBRATION_IQ_DATA_CORRUPT | event.error.hw | Invalid transmit offset calibration data found on the reader flash. | Contact Neology support. |
| MDM_CALIBRATION_IQ_DATA_MISSING | event.error.hw | Unable to find valid transmit offset calibration data from the reader flash. | Contact Neology support. |
| MDM_CALIBRATION_TX_DATA_CORRUPT | event.error.hw | Invalid transmit power calibration data found on the reader flash. | Contact Neology support. |
| MDM_CALIBRATION_TX_DATA_MISSING | event.error.hw | Unable to find valid transmit power calibration data from the reader flash. | Contact Neology support. |
| MDM_CNR_CLOSED_LOOP_FAILED | event.error.radio | CNR closed loop control failed. | If condition persists, contact Neology support. |
| MDM_CNR_UPDATE_WITH_TXOFF | event.error.sw | An error is occurred when CNR update with transmission turned off. | If condition persists, contact Neology support. |
| MDM_FPGA_LOAD_FAILURE | event.error.hw | Unable to load FPGA device on the modem. | If condition persists, contact Neology support. |
| MDM_FPGA_RAMTEST_FAILURE | event.error.hw | FPGA device on the modem failed RAM test. | If condition persists, contact Neology support. |
| MDM_FPGA_RESET_FAILURE | event.error.hw | FPGA device on the modem cannot be reset. | If condition persists, contact Neology support. |
| MDM_FPGA_TIMEOUT_FAILURE | event.error.hw | PPI bus stopped unexpectedly | If condition persists, contact Neology support. |
| MDM_FPGA_TIMEOUT_WARNING | event.error.hw | Timeout waiting on FPGA SPI bus. | If condition persists, contact Neology support. |
| MDM_ICM_ERROR | event.error.communication | An inter-core message response on the modem has an error. | Contact Neology support. |
| MDM_ICM_TIMEOUT | event.error.communication | An inter-core message response on the modem has timed out. | Contact Neology support. |

# 2 APPENDIX: ERROR HANDLING

| Major Error | Event | Description | Corrective Action |
|---|---|---|---|
| MDM_INVALID_RX_COMB_LENGTH | event.error.sw | Invalid receiver filter length is detected. | Contact Neology support. |
| MDM_INVALID_RX_Q_CHANNEL_COEFS | event.error.sw | Invalid receiver filter coefficient is detected. | Contact Neology support. |
| MDM_IPRC_CRC_ERROR | event.error.communication | Modem has received communication from main processor which fails CRC check. May see at boot up, since processors may come up (and start sending messages) at slightly different times. | Contact Neology support. |
| MDM_IPRC_OVERFLOW | event.error.communication | Modem communication buffer that receives data from the main processor has overflowed and data has been lost. | Contact Neology support. |
| MDM_IPRC_TRY_AGAIN | event.error.communication | Modem communication buffer that receives data from the main processor has no full message yet. | Contact Neology support. |
| MDM_L1_TX_PACKET_TIMEOUT | event.error.communication | Lowest level physical layer transmit process timed out. | Contact Neology support. |
| MDM_LOW_VOLTAGE_FAULT | event.error.environmental | Low voltage on digital portion of modem. | Verify correct operational voltage is being supplied to reader. Verify power supply voltages meet Neology specifications. If condition persists, contact Neology support. |
| MDM_MINIMUM_GAIN_LIMIT | event.error.sw | Receiver gain limit is exceeded. | Contact Neology support. |
| MDM_PHY_ENCODER_TIMEOUT | event.error.hw | The modem transmitter has failed to complete a transmission. | If condition persists, contact Neology support. |
| MDM_PPI_DEVICE_FAILURE | event.error.hw | The PPI interface has generated an error. | Contact Neology support. |

# 2 APPENDIX: ERROR HANDLING

| Major Error | Event | Description | Corrective Action |
|---|---|---|---|
| MDM_RESET_COMPLETE_MDM_DOWN | event.error.hw | The main processor has reset the modem, but has been unable to communicate with it. | Perform reader reboot. If condition persists, contact Neology support. |
| MDM_RF_VOLTAGE_FAULT | event.error.hw | RF subsystem voltage below acceptable level. (May be seen when unit powered off.) | Verify correct operational voltage is being supplied to reader. Verify power supply voltages meet Neology specifications. If condition persists, contact Neology support. |
| MDM_RX_TRAIN_TIMEOUT | event.error.sw | The modem has exceeded the receiver training time limit. | If condition persists, contact Neology support. |
| MDM_UNKNOWN_PROTOCOL | event.error.sw | The modem detected an unsupported protocol. | If condition persists, contact Neology support. |
| MDM_UNKNOWN_TX_INTERP_RATE | event.error.sw | The modem detected an unsupported transmit interpolation rate. | Contact Neology support. |
| MDM_UNKNOWN_TX_TEST_MODE | event.error.sw | The modem detected an unsupported transmit test mode. | Contact Neology support. |
| MDM_UNKNOWN_TX_WAVEFORM_TYPE | event.error.sw | The modem detected an unsupported transmit waveform. | Contact Neology support. |
| SPARSE_ARRAY_BOUNDS_CHECK | event.error.sw | Software attempted to index beyong the limits of the sparse array. | Contact Neology support. |
| SYSLOG_INVALID_LOG_LEVEL | event.error.sw | Invalid level specified in C2 command for remote syslog. | Verify the correct logging level of syslog messages sent to the specified remote syslog file server. If condition persists, contact Neology support. |
| MDM_SYNC_NO_SIGNAL_DETECTED | event.error.hw | Unable to detect synchronization signal. | Verify synchronization cables are appropriately connected and a device (GPS or other reader) exists which is generating a sync signal. |

## 2.3 WARNINGS

Warnings indicate that the system has detected an abnormality. Although no action is required, the system should be monitored for further issues.

| Warnings | Event | Description | Corrective Action |
|---|---|---|---|
| HEATER_ACTIVE_OVERTEMP | event.warning.hw | The measured temperature is higher than the maximum temperature when the heater is active. | None required. |
| IOP_CONFIG_FILE_CORRUPT | event.warning.file_handling | During the loading of a profile or auxiliary configuration file, a file has been determined to be corrupt. | None required. |
| IOP_EVENT_INVALID_FORMAT | event.warning.communication | Indicates an event with invalid format being sent to the main processing system. | None required. |
| IOP_FILE_TRANSFER_ERROR | event.warning.file_handling | An attempt to move files in the main processing system has failed. | None required. |
| IOP_SOCKET_CREATE_FAILURE | event.warning.communication | Indicates a failure to connect to the modem. | None required. |
| IOP_SPI_NO_ANSWER | event.warning.communication | Indicates a failure to connect to the SPI bus. | None required. |
| IOP_TMR_NO_MORE_TIMERS | event.warning.sw | Indicates a failure to find valid timers. | None required. |
| KERNEL_FN_FAILURE | event.warning.sw | Indicates a failure in accessing the kernel drivers. | None required. |
| LICENSE_EXPIRED | event.warning.license | A temporary license has expired. The licensed feature has been disabled. | None required. |
| LICENSE_EXPIRING | event.warning.license | A temporary license is near expiration. The licensed feature is still enabled. | None required. |

# 2 APPENDIX: ERROR HANDLING

| Warnings | Event | Description | Corrective Action |
|---|---|---|---|
| LICENSE_WARNING | event.warning.license | A minor problem occurred during a license import. | None required. |
| MALLOC_FAIL | event.warning.sw | Indicates a failure in allocating memory. | None required. |
| MDM_ALL_CHANNELS_BUSY | event.warning.radio | The modem is unable to find valid channels. | None required. |
| MDM_CALIBRATION_RSSI_DATA_CORRUPT | event.warning.hw | Invalid RSSI calibration data found on the reader flash. | None required. |
| MDM_CALIBRATION_RSSI_DATA_MISSING | event.warning.hw | Unable to find valid RSSI (Return Signal Strength Indicator) calibration data from the reader flash. | None required. |
| MDM_LBT_CHANNEL_IS_OCCUPIED | event.warning.radio | The selected channel is occupied. | None required. |
| MDM_NO_AVAILABLE_FREQUENCIES | event.warning.radio | There are no frequencies available for transmission which meet the LBT and/or minimum-off-time requirements. | None required. |
| MDM_OVER_TEMP | event.warning.hw | The measured temperature is higher than the warning threshold, but not high enough to cross fault threshold. | None required. |
| MDM_POWERMEASURE_CLIPPED | event.warning.radio | An error is detected in the power reading process. | None required. |
| MDM_PREDISTORTION_DATA_MISSING | event.warning.hw | Unable to find valid predistortion calibration data from the reader flash. | None required. |
| MDM_RC_NO_AVAILABLE_FREQUENCIES | event.warning.radio | The modem is unable to find valid frequencies. | None required. |

# 2 APPENDIX: ERROR HANDLING

| Warnings | Event | Description | Corrective Action |
|---|---|---|---|
| MDM_REFLECTED_POWER | event.warning. antenna | An antenna's return loss is lower than the warning threshold, but not low enough to cross the fault threshold. | None required. |
| MODULE_NOT_INITIALIZED | event.warning.sw | Indicates a failure in module initialization. | None required. |
| NULL_POINTER | event.warning.sw | Indicates a failure in the pointer. | None required. |
| READER_RESET_FP_SWITCH_F ACTORY_SET_ERROR | event.warning.sw | Error detected during reset of profile to factory default when pressing the hardware reset switch. | None required. |
| READER_RESET_FP_SWITCH_N ETWORK_SET_ERROR | event.warning.sw | Error detected during reset of network to factory setting when pressing the hardware reset switch. | None required. |
| READER_RESET_FP_SWITCH_S ERIAL_CONSOLE_SET_ ERROR | event.warning.sw | Error detected during reset of serial interface to CLI when pressing the hardware reset switch. | None required. |
| READER_RESET_FP_SWITCH_S ERIAL_RAWMODE_SET_ERROR | event.warning.sw | Error detected during reset of serial interface raw mode to FALSE when pressing the hardware reset switch. | None required. |
| READER_RESET_FP_SWITCH_S ERIAL_SET_ERROR | event.warning.sw | Error detected during reset of serial interface parameters when pressing the hardware reset switch. | None required. |
| SPARSE_ARRAY_NULL | event.warning.sw | Indicates a non-existent sparse array. | None required. |
| SYMBOL_TABLE_DEFAULT_INV ALID | event.warning.sw | Default value is invalid for the symbol. | None required. |
| SYMBOL_TABLE_FAILED_TO_R ESTORE | event.warning. configuration | Indicates a failure in restoring the configurations. | None required. |

| Warnings | Event | Description | Corrective Action |
|---|---|---|---|
| SYMBOL_TABLE_FAILED_TO_SAVE | event.warning.configuration | Indicates a failure to save the configurations. | None required. |
| SYMBOL_TABLE_OVER_REGISTRATION | event.warning.sw | Indicates duplicated registrations of the symbol. | None required. |
| SYMBOL_TABLE_WRONG_TYPE | event.warning.sw | Data type is invalid for the symbol. | None required. |

## 2.4 INFORMATIONAL MESSAGES

Informational messages describe various system events.

| Message | Event | Description |
|---|---|---|
| AUX_PROCESS_FAILURE | event.info | The main processor has detected an error in an auxiliary process. |
| `HEATER_STATUS_ACTIVE | event.info | The heater is in active state. |
| IOP_EVENTS_DROPPED | event.info | The main processor has detected events being dropped. |
| IOP_TAG_DB_OVERFLOW | event.info | The main processor has detected an overflow in the tag database. |
| IOP_TMR_NO_EVENTS_PENDING | `event.info | Indicates a timer signaled attention, but there were no timer events pending. |
| IOP_TMR_NOT_ACTIVE | event.info | Indicates a timer operation is being performed on an expired timer. |
| ITEM_NOT_FOUND | event.info | Indicates a search failure. |
| MDM_RESET_COMPLETE | event.info | Modem reset is complete. |
| MDM_SET_TXDAC_WHILE_IDLECW_ON | event.info | Indicates setting transmission DAC values while IDLE cw is active. |
| MDM_TEMP_RESUME | event.info | Indicates temperature reaching resume value. |

# 2 APPENDIX: ERROR HANDLING

| Message | Event | Description |
|---|---|---|
| NO_AVAILABLE_CONNECTIONS | event.info | Indicates the maximum number of command/response or event channels have been exceeded. |
| OUT_OF_MEMORY | event.info | Indicates the maximum number of events allowed for registration has been reached. |
| READER_ENTER_DUTY_CYCLE | event.info | Indicates the reader entering the duty cycle. |
| READER_INIT_SUCCESS | event.info | Indicates the reader successfully initialized. |
| READER_RECOVERY | event.info | Indicates the reader recovery being performed. |
| READER_RESET_BY_FP_SWITCH | event.info | Indicates the reader being reset by hardware reset |

# 3

# APPENDIX: READER MAINTENANCE

# 3 APPENDIX: READER MAINTENANCE

### Visually Inspect all Readers and Antennas (6 months)

Every six (6) months, visually inspect the reader and antennas for visible damage.

### Inspect Reader Support Hardware (6 months)

Every six (6) months, inspect all reader mounting hardware for excessive corrosion, looseness, or damage. Inspect the mounting structure, universal mounting bracket, and U-bolts.

### Inspect Power and Communication Connections (6 months)

Every six (6) months, inspect all reader power and communication cable connections. Verify the voltage levels at the reader are within specification.

### Inspect and Clean Antenna Radome (6 months)

Every six (6) months, inspect all reader antenna radomes and remove any build-up of foreign substances. Use water and mild detergent to clean the radome if necessary.

### Check Reader Error Log (3 months)

Every three (3) months, check the reader error log. If the lane system is not constantly monitoring the reader for warning and error conditions, check the reader error log as often as necessary. Please note that all messages reported in the error log do not necessarily indicate that there is an issue with the reader. Please refer to the **Protocol Reference Guide** document for additional details on error messages.

### Verify Antenna Mapping (as required)

If a particular travel lane is experiencing reduced reader performance, verify the antenna mapping for that lane. Readjust antenna as required.

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# APPENDIX: DOCUMENT CHANGE NOTICE

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| Version | Date | Change |
|---|---|---|
| 1 | 8/23/2021 | Initial version |
| 1.1 | 10/2/2021 | Updated pinouts in Section 10.7 |
| | 10/2/2021 | Added Regulatory Info: ISED RSS-GEN Statements |
| 1.2 | 10/8/2021 | Internal review: Section 10.7 reorganized. SYNC/GPIO, Ethernet, and power documentation updated. |
| | 10/11/2021 | Added Appendix 4 – Document Change Notice |
| | 10/15/2021 | Revised ISEC RSS-GEN Statements per regulatory feedback |