

3M Toll RFID Reader 6204

User's Guide



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FCC Notice

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.

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Canadian Note: CAN ICES-3(A)/NMB-3(A)

FCC Notice (Wiegand Interface Module)

The Wiegand Interface Module has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

FCC Radiation Exposure Statement

The antennas used for this transmitter must be installed to provide a separation distance of at least 1.2 meters from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. 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

http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct/index-eng.php

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:

http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct/index-fra.php

NOTICE

The 3M Toll RFID Reader 6204 is designed to meet the regulatory requirements in those jurisdictions in which it is offered. Changes or modifications not expressly approved by 3M for compliance could void the user's authority to operate the equipment.

Patent: 3M.com/patent
Product ID: RFID6204



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Preface

Intended audience

This document is intended for those who wish to setup and operate the 3M Toll RFID Reader 6204. 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: This chapter provides a brief overview of the 3M Toll RFID Reader 6204 hardware and software.

Chapter 2 - Safety Information – This chapter provides important safety information about the 3M Toll RFID Reader 6204. All users must read this section before installing or operating this reader.

Chapter 3 - Reader Equipment Installation – This chapter describes how to mechanically and electrically install the reader.

Chapter 4 - Reader Startup Tool (RST) Software Installation – This chapter describes how to install the Microsoft Windows RST application.

Chapter 5 - Reader Operation – This chapter describes how to initially test a reader and how to operate deployed readers.

Chapter 6 - Reader Startup Tool (RST) – This chapter describes the RST and the various functions you can perform with this Microsoft Windows application.

Chapter 7 - Reader Configuration Tool (RCT) – This chapter describes the RCT and the various functions you can perform with this embedded reader application.

Chapter 8 - Configuring Digital Inputs and Outputs – This chapter describes how to setup the reader's digital inputs and outputs.

Chapter 9 - Specifications – This chapter detailed mechanical, electrical, and environmental specifications for the 3M Toll RFID Reader 6204.

Appendix A - Using the Wiegand Interface – This appendix provides instruction for installing and configuring the Wiegand Interface Module.

Appendix B - Error Handling – This appendix lists 3M Toll RFID Reader 6204 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 1.4 updates the Reader Setup Wizard, Reader Startup Tool, Reader Test Tool, Reader Diagnostic Tool, and the Reader Configuration Tool. Additional product use and safety information has been added.

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.

NOTES

Important information and other tips are presented in light blue boxes to the left of the applicable section.



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.



ATTENTION: This yellow symbol indicates that the device is susceptible to Electro Static Discharge and appropriate precautions must be taken to avoid equipment damage.

NOTICE

NOTICE advises the reader that a condition can be created by a particular action that can cause equipment damage or result in equipment operation that violates regulatory requirements.

Product Use Statement

Product Use: Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

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1 Reader Overview

1.1. Reader Hardware

The 3M Toll RFID Reader 6204 is a multi-protocol, multi-regional Radio Frequency Identification (RFID) System that operates in the 860–960 MHz UHF band. The reader is configured at the factory to operate within a specific regulatory region (for example: FCC Part 90).



Figure 1 3M Toll RFID Reader 6204

As shown in the following figure, the 6204 supports four Tx/Rx antennas (not shown). The reader is also equipped with RS-232 serial and Ethernet interfaces.

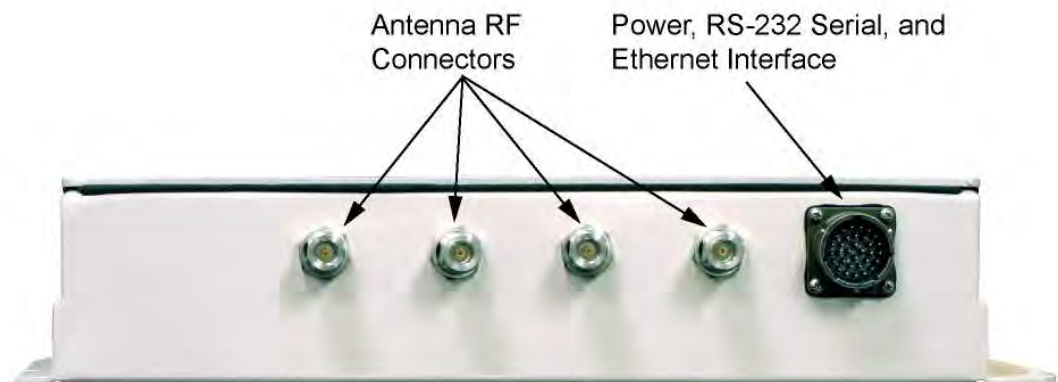


Figure 2 3M Toll RFID Reader 6204 Power and I/O Connections

1.2. Reader Software

The 6204 is shipped with two software applications that you can use to configure and control the reader.

Reader Startup Tool (RST)

The RST is a Microsoft Windows based application you install on your computer. With RST, you can view all readers on your network. After selecting a reader, you can modify its communication, network, and operational parameters. You can also read tags, review tag data, and perform diagnostics. This RST is primarily intended for initially configuring a reader prior to deployment. After deployment, use the Embedded Reader Configuration Tool (RCT). Detailed information on the RST is provided in Chapter 5.

Embedded Reader Configuration Tool (RCT)

This RCT is an embedded reader application that allows you to access your readers across a LAN or WAN. Enter the IP address of the reader into your Web browser and the RCT allows you to fully modify and operate the reader. With the same functionality as the RST, this application allows you to modify the reader's communication, network, and operational parameters. You can also read tags, review tag data, perform diagnostics, and upload new software. This application is primarily intended for configuring and managing deployed readers. Detailed information on the RCT is provided in Chapter 6.

2 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.

2.1. 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), Intelligent Transportation Systems (ITS), Traffic Management Systems (TMS), Electronic Vehicle Registration (EVR) 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 3M and may lead to an unsafe condition.

2.2. Explanation of Signal Word Consequences



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.

NOTICE: Indicates a situation which, if not avoided, could result in property damage.

2.3. Attendant Warnings



WARNING: To reduce the risks associated with hazardous voltage, and non-ionizing radiation exposure:

- Do not modify or attempt to service the Reader System. Return to 3M authorized service centers for repair or service. There are no user serviceable parts.



WARNING: To reduce the risks associated with exposure to non-ionizing radiation exposure:

- Do not modify software outside the parameters stated in the manual.

2.4. Installation and Service Technician Warnings and Cautions



WARNING: To reduce the risks associated with hazardous voltage, fire and impact:

- Installation and service of 3M 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.
- Inspect all system components at least every 6 months.

2.4.1. Power Supply Related



WARNING: To reduce the risks associated with 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 2 environment.
- Do not introduce any object into the power supply.
- Keep power supply away from fire and water.

2.4.2. Reader System Related



WARNING: To reduce the risks associated with 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 3M authorized personnel only.



WARNING: To reduce the risks associated with hazardous voltage, and non-ionizing radiation exposure:

- Do not modify or attempt to service the Reader System. Return to 3M authorized service centers for repair or service. There are no user serviceable parts.



WARNING: To reduce the risks associated with non-ionizing radiation exposure and property damage:

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



WARNING: To reduce the risks associated with electromagnetic interference:

- Use only the antennas described in this manual or the *3M RFID Antennas for Toll RFID Readers Application Guide*.

⚠ WARNING: To reduce the risks associated with hazardous temperature and fire related to the power supply:

- Do not cover ventilation holes in power supply.
- Leave sufficient space around the power supply for cooling.
- Do not mount directly above a heat source.
- Disconnect unit from power before installation, maintenance, service, or modification.
- Do not use in wet or damp locations.
- Do not use near flames.
- -Always disconnect AC power from the power supply unit when connecting or disconnecting components of the system.

⚠ WARNING: To reduce the risks associated with hazardous voltage:

- Replace damaged components with only the 3M designated replacement parts.
- Use only the power supply specified by 3M

⚠ WARNING: To reduce the risks associated with fire and explosion:

- Do not install in a hazardous location.

⚠ WARNING: To reduce the risks associated with 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.

⚠ WARNING: To reduce the risks associated with impact, muscle strain and abrasions:

- Use appropriate PPE and follow safe workplace practices during installation.

⚠ CAUTION: To reduce the risks associated with hot surfaces and reader performance:

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

⚠ CAUTION: To reduce the risk associated with rough edges:

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

⚠ CAUTION: To reduce the risks associated with environmental contamination:

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

NOTICE: Do not use 6204 with wire harness from previous reader installations. Power pins have been moved.
Do not use solvents or harsh cleaners on radome or antennas.

2.5. RF Safety

NOTICE: The 3M Toll RFID Reader 6204 UHF Reader is equipped with four (4) RF ports. To prevent reader damage, unused RF ports must be properly terminated with a 50 ohm load or a functional UHF antenna before power up if the reader has been configured to use this port. Never power up the reader unless the appropriate loads or antennas are connected. Always power down the reader before removing an antenna or load from an RF port.
The maximum antenna cable length is 10 meters.

2.6. Electrostatic Discharge



ATTENTION

3M Toll RFID Reader 6204 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 3M Toll RFID Reader 6204 reader antenna or communication ports. Equipment failure can result if the antenna or communication ports are subjected to ESD.

2.7. Regulatory Compliance

NOTICE: The 3M Toll RFID Reader 6204 is designed to meet the regulatory requirements in those jurisdictions in which it is offered. Changes or modifications not expressly approved by 3M for compliance could void the user's authority to operate the equipment.

2.7.1. FCC Notice (3M Toll RFID Reader 6204)

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.

2.7.2. FCC Notice (Wiegand Interface Module)

The Wiegand Interface Module has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

2.8. Power/Data Cable Size

NOTICE: The 3M supplied power/data cable is only to be used with the 3M 24 VDC power supply. Use of these cables with power supplies providing lesser voltages may result in cable and/or reader damage.

3 Reader Equipment Installation

3.1. Mechanical Installation

The 3M Toll RFID Reader 6204 is available with two mounting flanges suitable for most pole and wall mount applications. Any mounting surface must be able to support a minimum static load of 11.0 pounds (5 kg) plus any additional live load due to environmental conditions.

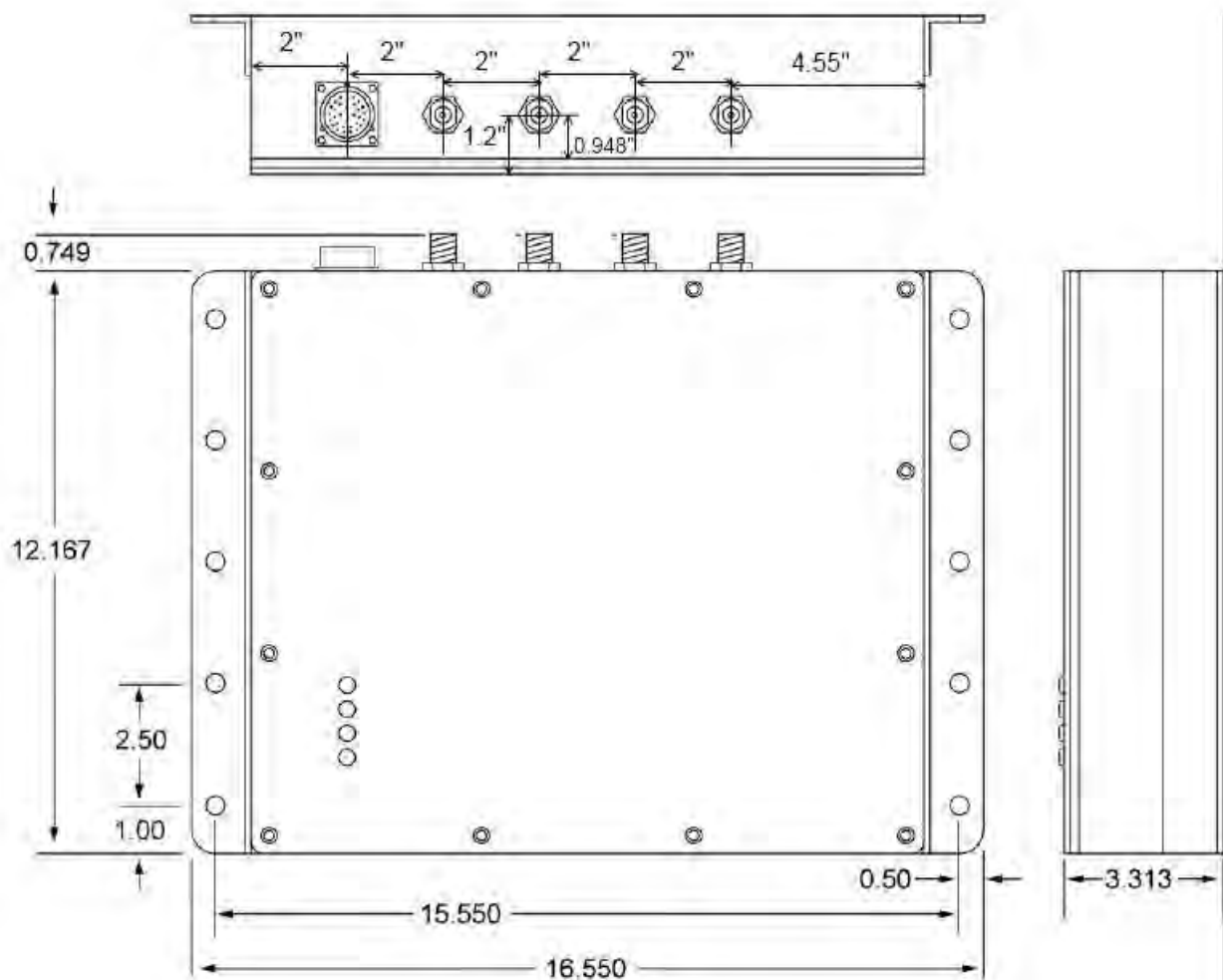


Figure 3 3M Toll RFID Reader 6204 Mechanical Dimensions and Mounting Hole Locations (Dimensions in Inches)

To mount the 6204 assembly, refer to Figure 3 and perform the following:

- 1** Prepare the mounting surface to accept the 10 mounting bolts. The hole pattern should match that shown in Figure 3 and the mounting surface must be able to support 11 lbs (5 kg).
- 2** Mount the reader.
- 3** Locate the Interface Cable.
- 4** Connect the cable to the reader's bulk head connector and twist to lock in place.
- 5** Connect the antenna cables (see Figure 4).
- 6** Adjust the angle of the antennas and tighten the hardware.

3.2. Electrical Installation

A general installation diagram is shown in the following figure. Refer to Chapter 7 – Specifications for specific information.

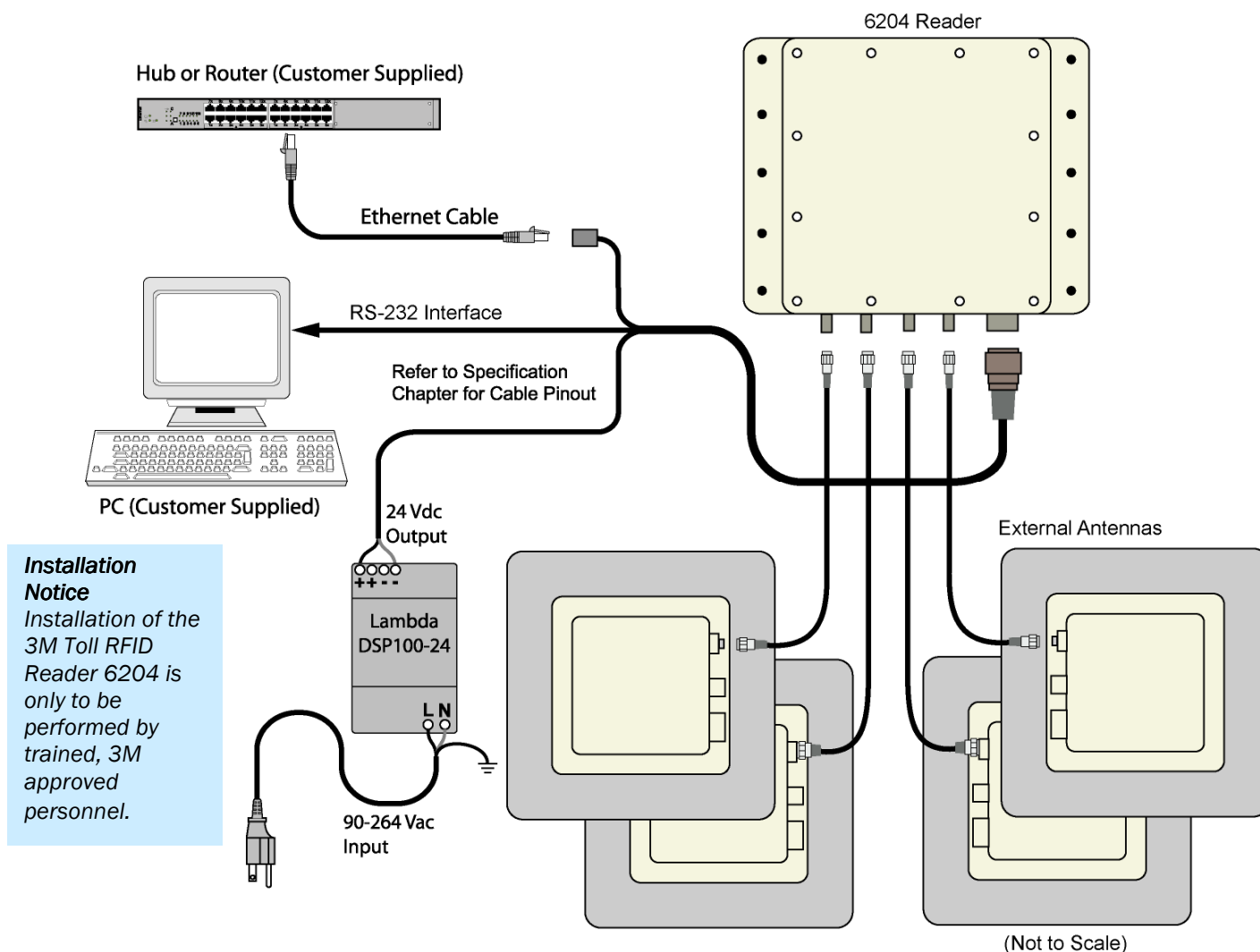


Figure 4 3M Toll RFID Reader 6204 Electrical Connections

NOTICE: The 3M Toll RFID Reader 6204 is designed to meet the regulatory requirements in those jurisdictions in which it is offered. Changes or modifications not expressly approved by 3M for compliance could void the user's authority to operate the equipment.



ATTENTION

3M Toll RFID Reader 6204 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 3M Toll RFID Reader 6204 reader antenna or communication ports. Equipment failure can result if the antenna or communication ports are subjected to ESD.

3.2.1. Connecting the Serial Port

The 6204 RS-232 serial port provides communication up to 115200 Baud. This port is accessed through the bulkhead connector on the reader. If you are using the serial port for reader communication, connect a serial cable from the COM port on your PC to the serial port on the reader. See Figure 2 for location of the connector.

Refer to the Chapter 8 – *Specifications* for details on the bulkhead connector.

3.2.2. Connecting and Configuring the Ethernet Port

The 6204 Ethernet port is accessed through the bulkhead connector. If you are communicating with your reader across a Local Area Network (LAN), connect an Ethernet cable from your hub or router to the bulkhead connector.

By default, the reader is configured to use a DHCP server to obtain its IP address and related information. In the event a DHCP server is unavailable, the reader will boot with an IP address in the 169.254.x.x subnet.

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 *View or Change the Reader's Network Settings* section in Chapter 5.

Refer to the Chapter 8 – *Specifications* for details on the bulkhead connector.

3.2.3. Connecting Digital Inputs/Outputs

The 6204 is equipped with a general purpose digital input/output (I/O) port that provides four optically isolated 5-24 VDC input signals and four open-collector 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.

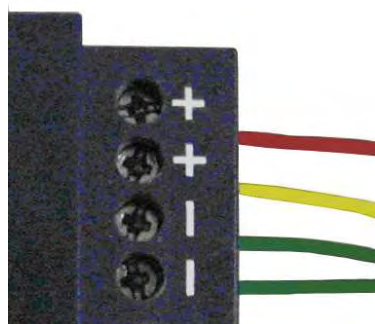
The digital outputs can be used as general purpose outputs, to indicate tag reading activity, or to indicate the reader is transmitting (RF On). The outputs can also be configured to trigger conveyor gates or other access control and sorting devices. For detailed information on configuring the digital inputs and outputs refer to Chapter 7.

3.2.4. Connecting the Power

The 6204 operates on 24 Vdc $\pm 5\%$ provided through the bulkhead connector on the rear of the reader.

The bulkhead power connections are as follows. Note that both pairs must be connected.

Pair	Pin	Color	Pin Name	Function
9	T	Red	+24 VDC	Power
	U	Green	24 VDC GND	Ground
16	h	Yellow	+24 VDC	Heater Power
	j	Green	24 VDC GND	Heater Ground



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 30 seconds for the reader to initialize.

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

Refer to the Chapter 8 – *Specifications* for additional details on the bulkhead connector.

NOTICE: *The 3M supplied power cable is only rated at 24V $\pm 5\%$. Input power less than 24V $\pm 5\%$ while using 3M supplied cables may result in cable and/or reader damage.*

3.2.5. Installation with the 3M Reader Redundancy Switch

The 6204 can be installed with the optional 3M Reader Redundancy Switch (RRS). The RRS interfaces two 3M Toll RFID Reader 6204s and their associated antenna systems to provide an antenna change over facility in the event of a reader failure. Please consult the 3M Reader Redundancy Switch User's Guide for installation details.

Reader Startup Tool (RST) Software Installation

4.1. Installing RST Software

The 3M Toll RFID Reader 6204 is delivered with a Microsoft Windows application called Reader Startup Tool (RST). You can use this application to initially configure your reader as well as read and display tag data.

NOTE: The product CD provided with your reader contains a setup file called **setup.exe**. This file will fully check your system configuration and load all required software including Microsoft .Net 4.5.

Install RST

- 1 To install RST, load your product CD and double-click the **setup.msi** file:



- 2 Press **Next>**



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



4 Select Setup Type. Press **Next>**.



5 Monitor the progress of the installation.

5 Press **Install**.



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

4.2. 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:

For 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.

For 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.

4.3. Reader Startup

To begin using your reader, open the RST application.

Open RST

- 1 From your Windows desktop, select:

Start→Programs→3M→Reader Startup Tool (RST)

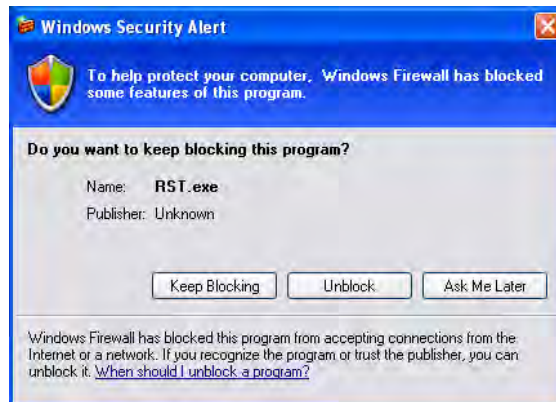
	Mac Address	IP Address	Host Name	Version	Model	Serial Number	Method (IPv4/IPv6)	Location	Zone	Subnet	Gateway
	40:83:DE:11:95:AF	169.15.131.66 fe80::4283:deff:fe11:95af/64	Nays610.mmm.com	1.4.25362_5	6204	96FE440400844A4D	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
	00:23:68:C6:4E:5F	169.15.131.51 fe80::223:68ff:fec6:4e5f/64	IN610C64E5F.mmm.com	1.4.tb_2540	6204	960B440400844A21	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
	00:23:68:C3:EC:F7	169.15.131.72 fe80::223:68ff:fec3:ecf7/64	IN610C3ECF7.mmm.com	1.4.25329	6204	96038402008C9F2A	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
	00:17:9E:49:62:7B	169.15.131.70 fe80::217:9eff:fe49:627b/64	IN61049627B.mmm.com	1.3.24027	6204	96FC8402038CAEFA	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
	00:23:68:C4:11:80	169.15.131.57 fe80::223:68ff:fec4:1180/64	ID6204C41180.mmm.com	1.4.tb_2540	6204	96FB8402038C0CCF	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
	00:23:68:C6:5F:84	169.15.131.106 fe80::223:68ff:fec6:5f84/64	FX9500C65F84.mmm.com	1.1.22280	6204	96FE440400844A1D	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
	00:23:68:C3:FC:3D	169.15.131.45 fe80::223:68ff:fec3:fc3d/64	6204C3FC3D.mmm.com	1.4.25390	6204	96FE8402008C9F26	static/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
	00:23:68:C3:EF:6A	169.15.131.110	6204C3EF6A.mmm.com	1.4.25215	6204	96038402038C9FFA	dhcp/disabled	unknown	unknown	255.255.255.0	169.15.131.1 none
	00:23:68:C3:B4:11	169.15.131.75 fe80::223:68ff:fec3:b411/64	6204C3B411.mmm.com	1.4.25390	6204	96FE8402008C9F46	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none

RST Version: 5.2.24797.21875 Discovery Listen Address: 239.192.1.101

NOTE:

Earlier versions of Microsoft Windows™ may not provide the Security Alert popup. If RST does not discover your reader, check your Windows Firewall/Security settings.

- 2 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.
- 3 If the warning window is hidden under the RST windows, collapse the RST window.



- 4 Press Unblock.
- 5 Press **Refresh** on the RST
- 6 The RST main page will display any readers currently connected to the network.

4.4. Initial Reader Setup

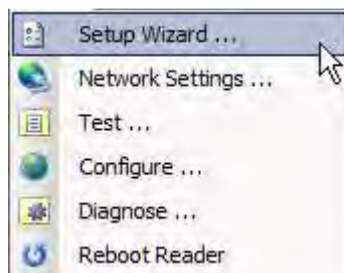
To configure a specific reader, perform the following:

Reader Setup

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

	Mac Address ▲	IP Address	Host Name	Serial Number
	00:17:9E:00:01:47	10.1.1.64	00179E000147	0B067200FC439853
▶	00:17:9E:00:01:48	10.1.1.65	00179E000148	0F666900CD43F3B6
	00:17:9E:00:2D:F7	10.1.1.59	00179E002DF7	0A469501BE448D92

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



- 3 The Reader Setup Wizard (RSW) is displayed.



Login Page

The reader Login Page is only displayed when the default login is set to **guest**. Readers leave the factory with a default login of **admin**. Therefore, you will not see the login screen if you have not configured your reader.

Region Selection

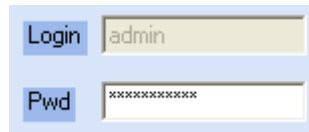
The reader is configured at the factory to operate within a specific regulatory region. As a result your region selections may be different from those shown in this manual.

Note that Region Selection is not user configurable.

Protocols

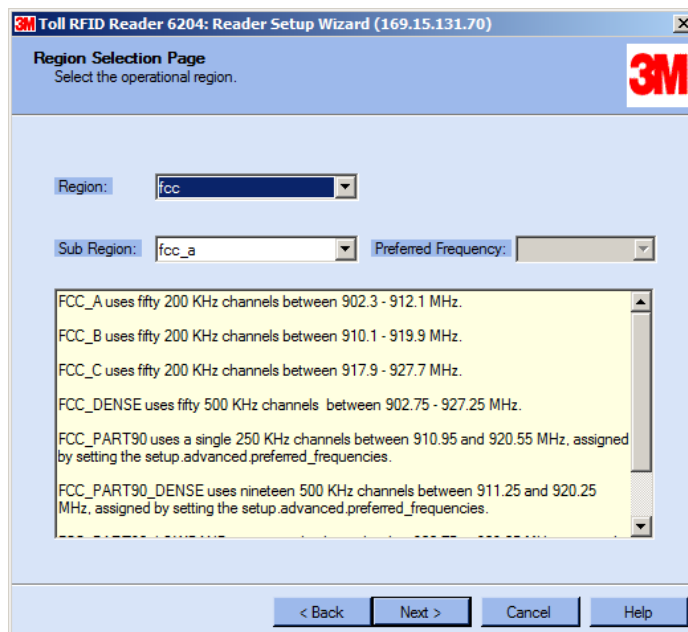
Only those protocols enabled in the reader will be active on the Protocol Selection page.

- 4 Press **Next>** and enter the Login (**admin**) and Password. If this is the first time configuring your reader, enter: **readeradmin**.



The screenshot shows a login form with two input fields. The first field is labeled 'Login' and contains the text 'admin'. The second field is labeled 'Pwd' and contains a series of asterisks 'xxxxxxxxxx'.

- 5 After entering your Login and Password, press **Next>**

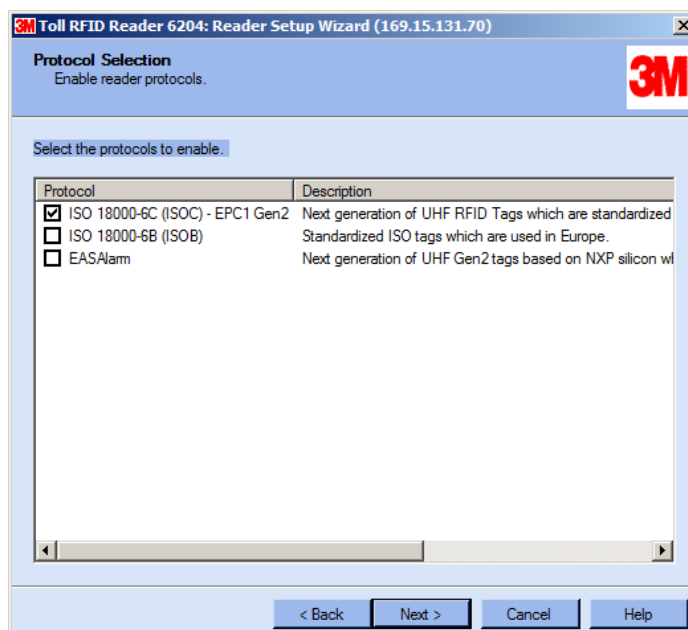


The screenshot shows the 'Region Selection Page' of the '3M Toll RFID Reader 6204: Reader Setup Wizard'. The page title is 'Region Selection Page' with the instruction 'Select the operational region.' Below the title, there are two dropdown menus: 'Region:' set to 'fcc' and 'Sub Region:' set to 'fcc_a'. To the right of the 'Sub Region' dropdown is a 'Preferred Frequency:' dropdown. Below these is a text area listing various FCC channel allocations:

- FCC_A uses fifty 200 KHz channels between 902.3 - 912.1 MHz.
- FCC_B uses fifty 200 KHz channels between 910.1 - 919.9 MHz.
- FCC_C uses fifty 200 KHz channels between 917.9 - 927.7 MHz.
- FCC_DENSE uses fifty 500 KHz channels between 902.75 - 927.25 MHz.
- FCC_PART90 uses a single 250 KHz channels between 910.95 and 920.55 MHz, assigned by setting the setup.advanced.preferred_frequencies.
- FCC_PART90_DENSE uses nineteen 500 KHz channels between 911.25 and 920.25 MHz, assigned by setting the setup.advanced.preferred_frequencies.

 At the bottom of the window are four buttons: '< Back', 'Next >', 'Cancel', and 'Help'.

- 6 Select the Region and Sub Region and press **Next>**.



The screenshot shows the 'Protocol Selection' page of the '3M Toll RFID Reader 6204: Reader Setup Wizard'. The page title is 'Protocol Selection' with the instruction 'Enable reader protocols.' Below the title, there is a section 'Select the protocols to enable.' followed by a table with two columns: 'Protocol' and 'Description'.

Protocol	Description
☒ ISO 18000-6C (ISOC) - EPC1 Gen2	Next generation of UHF RFID Tags which are standardized
☐ ISO 18000-6B (ISOB)	Standardized ISO tags which are used in Europe.
☐ EASAlarm	Next generation of UHF Gen2 tags based on NXP silicon w/

 At the bottom of the window are four buttons: '< Back', 'Next >', 'Cancel', and 'Help'.

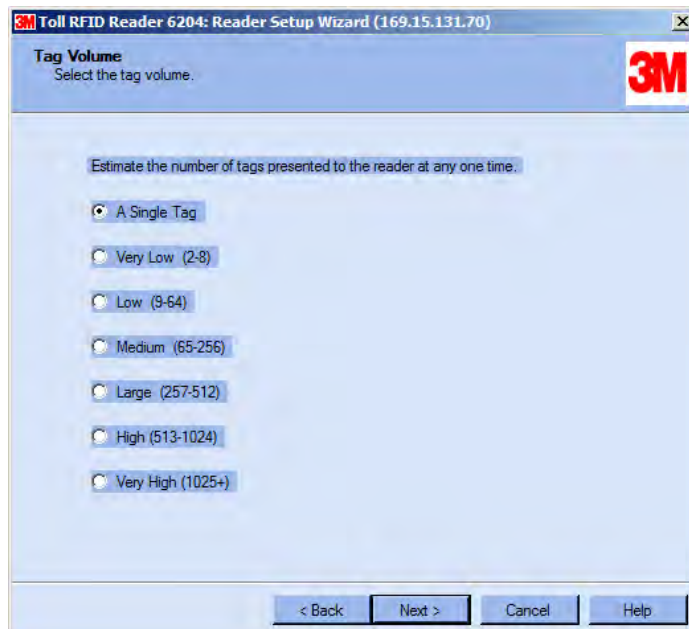
Custom Setup

If your installation type differs from one of the choices shown in the Setup Wizard, you can always customize your setup later using the embedded web interface capability. See the Advanced Setup chapter in this guide for more information.

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



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

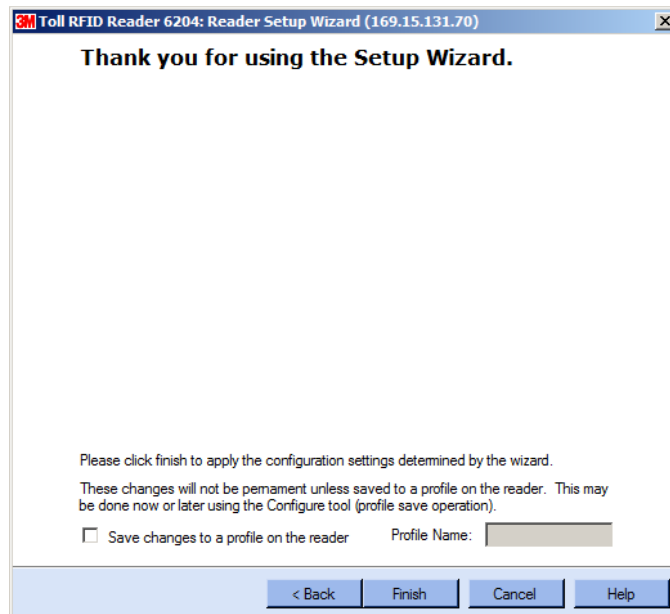


- 9 Estimate the number of tags that will be presented to the reader at any one time and press **Next>**.

Saving Reader Setup

Reader setup information should be saved as a profile. In the event that you need to reboot or power down a reader, the reader setup can be quickly reloaded by loading the profile.

If you don't save the reader setup, you can lose the information if the reader is rebooted.



- 10** It is highly recommended that you save the reader setup as a profile. Select **Save changes to a profile...**, enter a **Profile Name**, and press **Finish** to complete the initial reader setup.

Reader Operation

5.1. Basic Operation with RST

The 3M Toll RFID Reader 6204 can be operated either from the RST application or by logging directly into the reader's embedded Reader Configuration Tool (RCT). To operate the reader from RST, perform the following:

Open RST

- 1 From your Windows desktop, select:

Start→Programs→3M→Reader Startup Tool (RST)

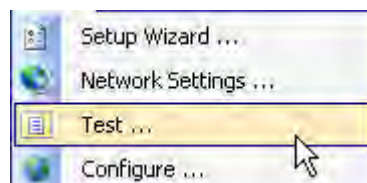
Mac Address	IP Address	Host Name	Version	Model	Serial Number	Method (IPv4/IPv6)	Location	Zone	Subnet	Gateway
40:83:DE:11:95:AF	169.15.131.66 fe80::4283:deff:fe11:95af/64	Nays610.mmm.com	1.4.25362_5	6204	96FE440400844A4D	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C6:4E:5F	169.15.131.51 fe80::223:68ff:fec6:4e5f/64	IN610C64E5F.mmm.com	1.4.rb_2540	6204	960B440400844A21	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C3:EC:F7	169.15.131.72 fe80::223:68ff:fec3:ecf7/64	IN610C3ECF7.mmm.com	1.4.25329	6204	96038402008C9F2A	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:17:9E:49:62:7B	169.15.131.70 fe80::217:9eff:fe49:627b/64	IN61049627B.mmm.com	1.3.24027	6204	96FC8402038CAEFA	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C4:11:80	169.15.131.57 fe80::223:68ff:fec4:1180/64	ID6204C41180.mmm.com	1.4.rb_2540	6204	96FB8402038C0CCF	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C6:5F:84	169.15.131.106 fe80::223:68ff:fec6:5f84/64	FX9500C65F84.mmm.com	1.1.22280	6204	96FE440400844A1D	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C3:FC:3D	169.15.131.45 fe80::223:68ff:fec3:fc3d/64	6204C3FC3D.mmm.com	1.4.25390	6204	96FE8402008C9F26	static/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C3:EF:6A	169.15.131.110	6204C3EF6A.mmm.com	1.4.25215	6204	96038402038C9FFA	dhcp/disabled	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C3:B4:11	169.15.131.75 fe80::223:68ff:fec3:b411/64	6204C3B411.mmm.com	1.4.25390	6204	96FE8402008C9F46	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none

RST Version: 5.2.24797.21875 Discovery Listen Address: 239.192.1.101

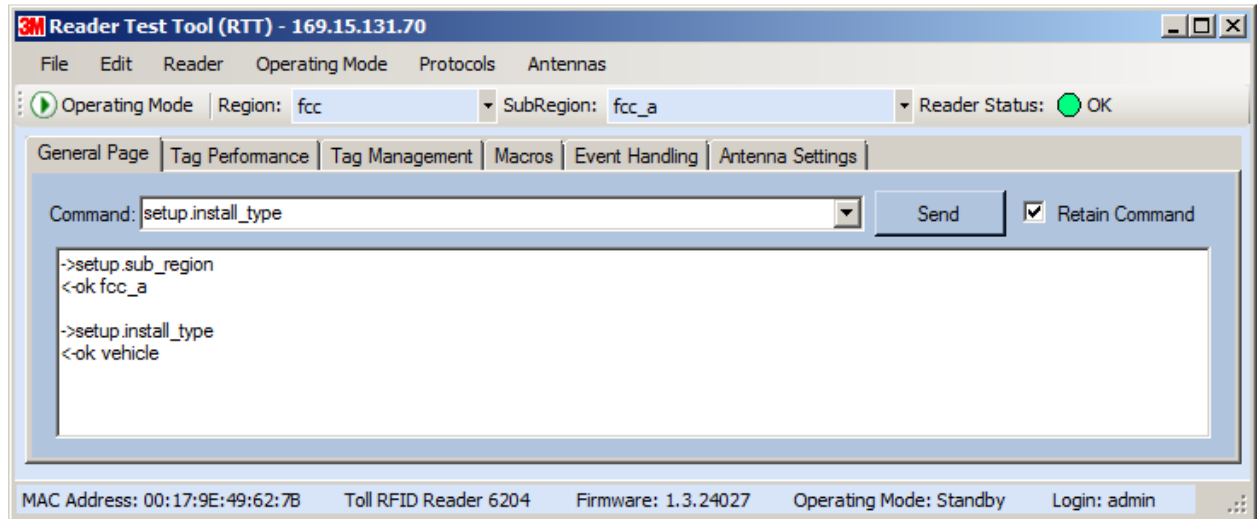
Customize the display

Customize your RST display by clicking and dragging the columns. You can also sort by column.

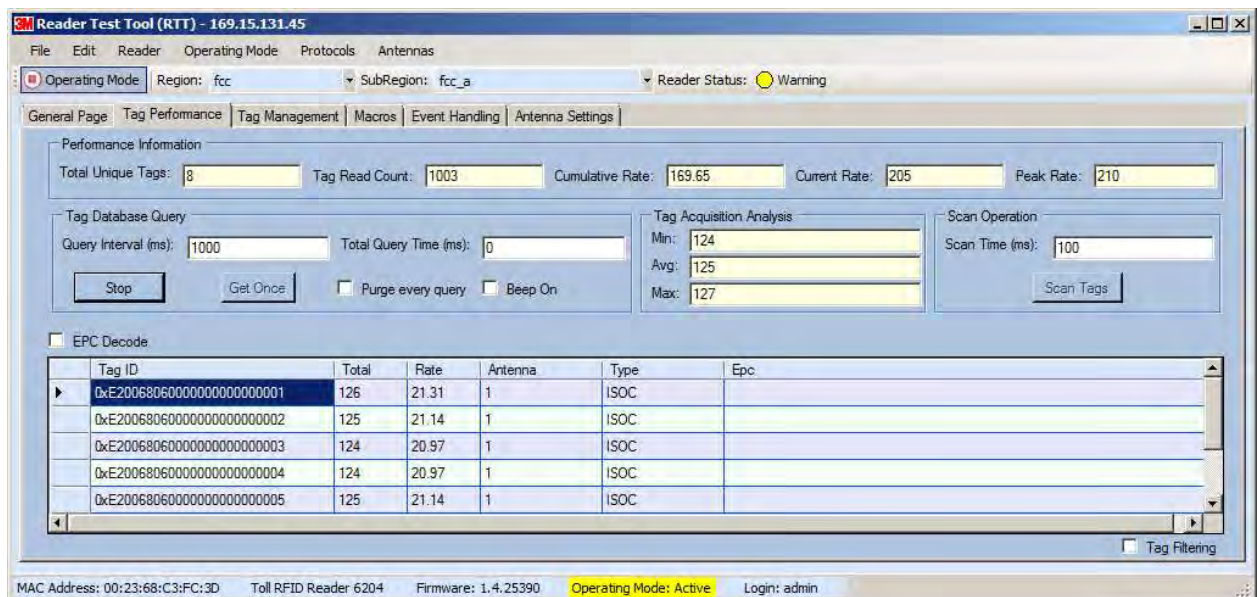
- 2 Select a reader and press  **Test** on the RST tool bar or select **Test** from the **Tools** pull-down menu.



3 The Reader Test Tool (RTT) is displayed.



- 4 Login to the reader. From the pull-down menu select **Reader**→**Login....**
- 5 For administrator login, select **admin**. The initial password (**Pwd**) is **readeradmin**. Refer to the **3M Toll RFID Reader 6204 Protocol Reference Guide** for instructions on how to use the **reader.set_pwd** command to change the password.
- 6 Verify the Operating Mode is set to **Active**. From the pull-down menu select **Operating Mode**→**Active**.
- 7 Select the **Tag Performance** tab and press **Start**.
- 8 Place tags in front of antenna and verify tags are read and displayed.



5.2. Deployed Reader Operation 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  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.

Name	Value	?
Login	admin	?
Password	*****	?

- 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
0x0304020800000000000016335	ISOC	4	25	2009-06-02T21:08:54.865	2009-06-02T21:08:57.178
0x0304020800000000000016336	ISOC	3	12	2009-06-02T21:08:54.954	2009-06-02T21:08:57.045
0x0304020800000000000016337	ISOC	4	25	2009-06-02T21:08:54.876	2009-06-02T21:08:57.176
0x0304020800000000000016338	ISOC	4	25	2009-06-02T21:08:54.868	2009-06-02T21:08:57.178
0x0304020800000000000016354	ISOC	4	25	2009-06-02T21:08:54.900	2009-06-02T21:08:57.176
0x0304020800000000000016355	ISOC	4	13	2009-06-02T21:08:54.848	2009-06-02T21:08:57.175

Polling Period (seconds):

- 10 If you need to configure additional changes to your reader, refer to *Chapter 7 – Reader Configuration Tool* for information on using RCT to adjust configuration variables and parameters.

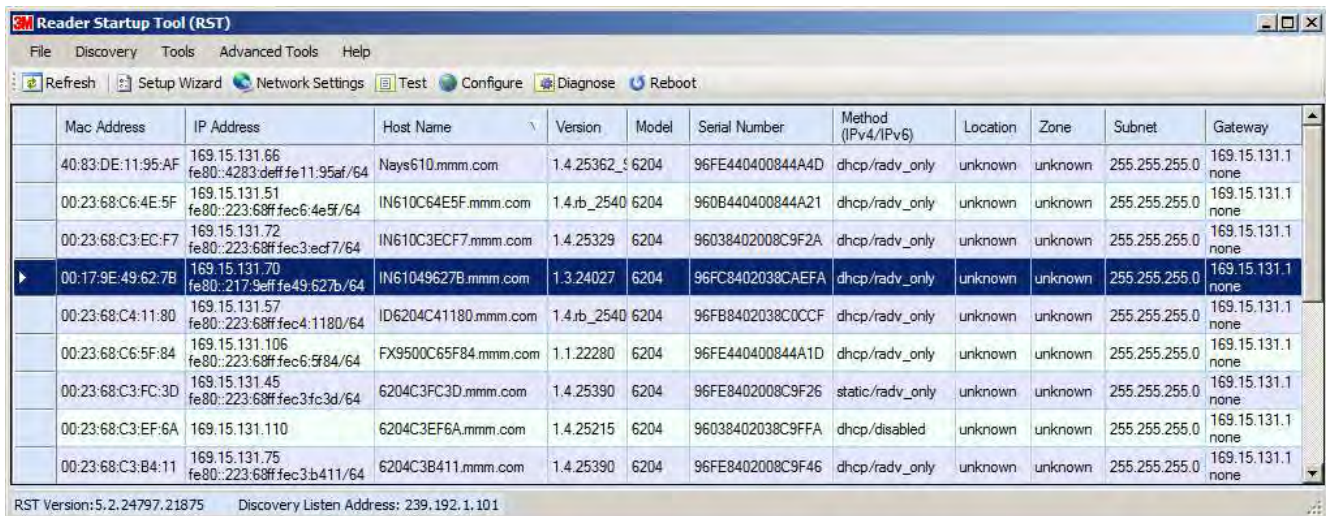
6 Reader Startup Tool (RST)

The Reader Startup Tool (RST) provides an easy-to-use interface for the 3M Toll RFID Reader 6204 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

6.1. View Readers on the Network

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



The screenshot shows the Reader Startup Tool (RST) application window. The title bar reads "Reader Startup Tool (RST)". The menu bar includes "File", "Discovery", "Tools", "Advanced Tools", and "Help". The toolbar contains icons for "Refresh", "Setup Wizard", "Network Settings", "Test", "Configure", "Diagnose", and "Reboot". Below the toolbar is a table listing discovered readers. The table has 12 columns: Mac Address, IP Address, Host Name, Version, Model, Serial Number, Method (IPv4/IPv6), Location, Zone, Subnet, and Gateway. The table contains 10 rows of data. The 4th row is selected, indicated by a blue highlight. At the bottom of the window, the status bar shows "RST Version: 5.2.24797.21875" and "Discovery Listen Address: 239.192.1.101".

Mac Address	IP Address	Host Name	Version	Model	Serial Number	Method (IPv4/IPv6)	Location	Zone	Subnet	Gateway
40:83:DE:11:95:AF	169.15.131.66 fe80::4283:deff:fe11:95af/64	Nays610.mmm.com	1.4.25362_5	6204	96FE440400844A4D	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C6:4E:5F	169.15.131.51 fe80::223:68ff:fec6:4e5f/64	IN610C64E5F.mmm.com	1.4.rb_2540	6204	960B440400844A21	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C3:EC:F7	169.15.131.72 fe80::223:68ff:fec3:ecf7/64	IN610C3ECF7.mmm.com	1.4.25329	6204	96038402008C9F2A	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:17:9E:49:62:7B	169.15.131.70 fe80::217:9eff:fe49:627b/64	IN61049627B.mmm.com	1.3.24027	6204	96FC8402038CAEFA	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C4:11:80	169.15.131.57 fe80::223:68ff:fec4:1180/64	ID6204C41180.mmm.com	1.4.rb_2540	6204	96FB8402038C0CCF	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C6:5F:84	169.15.131.106 fe80::223:68ff:fec6:5f84/64	FX9500C65F84.mmm.com	1.1.22280	6204	96FE440400844A1D	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C3:FC:3D	169.15.131.45 fe80::223:68ff:fec3:fc3d/64	6204C3FC3D.mmm.com	1.4.25390	6204	96FE8402008C9F26	static/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C3:EF:6A	169.15.131.110	6204C3EF6A.mmm.com	1.4.25215	6204	96038402038C9FFA	dhcp/disabled	unknown	unknown	255.255.255.0	169.15.131.1 none
00:23:68:C3:B4:11	169.15.131.75 fe80::223:68ff:fec3:b411/64	6204C3B411.mmm.com	1.4.25390	6204	96FE8402008C9F46	dhcp/radv_only	unknown	unknown	255.255.255.0	169.15.131.1 none

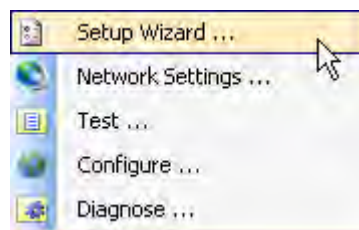
6.2. Configure Reader with the Setup Wizard

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  **Setup Wizard** 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 Chapter 2 – *Reader Configuration* for detailed instructions on using the Reader Setup Wizard.

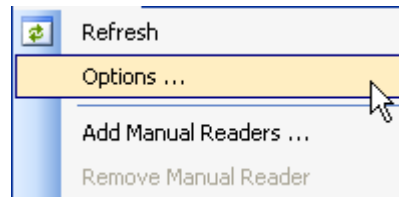
6.3. Customize Discovery Options

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

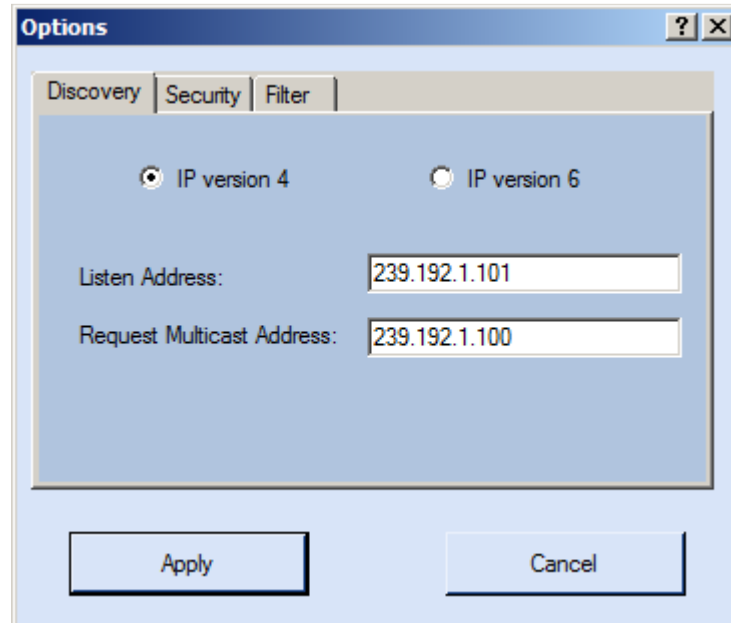
- **Listen Address** – Address that RST uses to listen for UDP discovery packets from the reader. This is customizable on the reader.
- **Request Multicast Address** –Address used by RST to send out the UDP update request packets. This is customizable on the reader.

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.

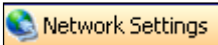


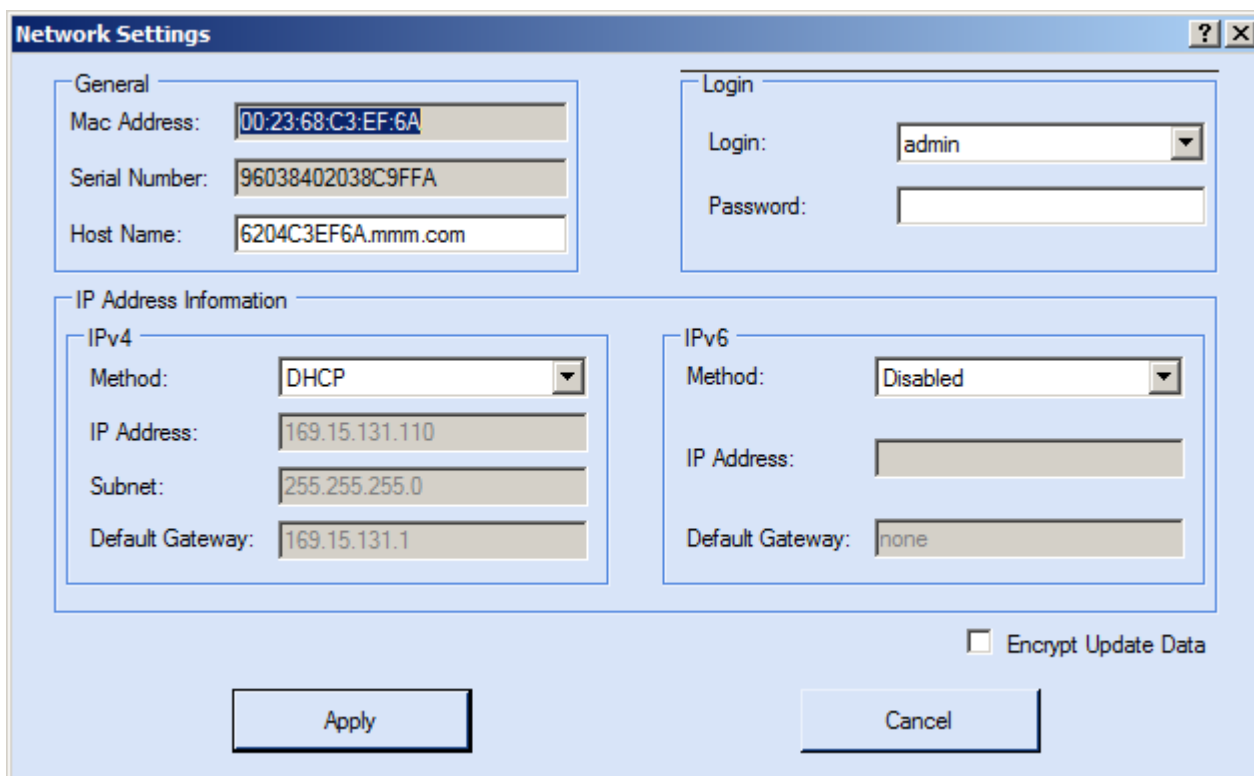
Only Display Specific Reader Models
Select **Options**→**Filter** to view only specific reader models.



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

6.4. View or Change the Reader's Network Settings

- 1 From the RST main page, press the  button.



The Network Settings dialog box is shown with the following fields and options:

- General**
 - Mac Address: 00:23:68:C3:EF:6A
 - Serial Number: 96038402038C9FFA
 - Host Name: 6204C3EF6A.mmm.com
- Login**
 - Login: admin
 - Password: (empty field)
- IP Address Information**
 - IPv4**
 - Method: DHCP
 - IP Address: 169.15.131.110
 - Subnet: 255.255.255.0
 - Default Gateway: 169.15.131.1
 - IPv6**
 - Method: Disabled
 - IP Address: (empty field)
 - Default Gateway: none
- ☐ Encrypt Update Data
- Buttons:** Apply, Cancel

- 2 Verify the **IP Address**, **Subnet**, and **Default Gateway** are correct.
- 3 If **Method: DHCP** is selected these fields will be locked.
- 4 If required, change the values.

6.5. Reader Test Tool (RTT)

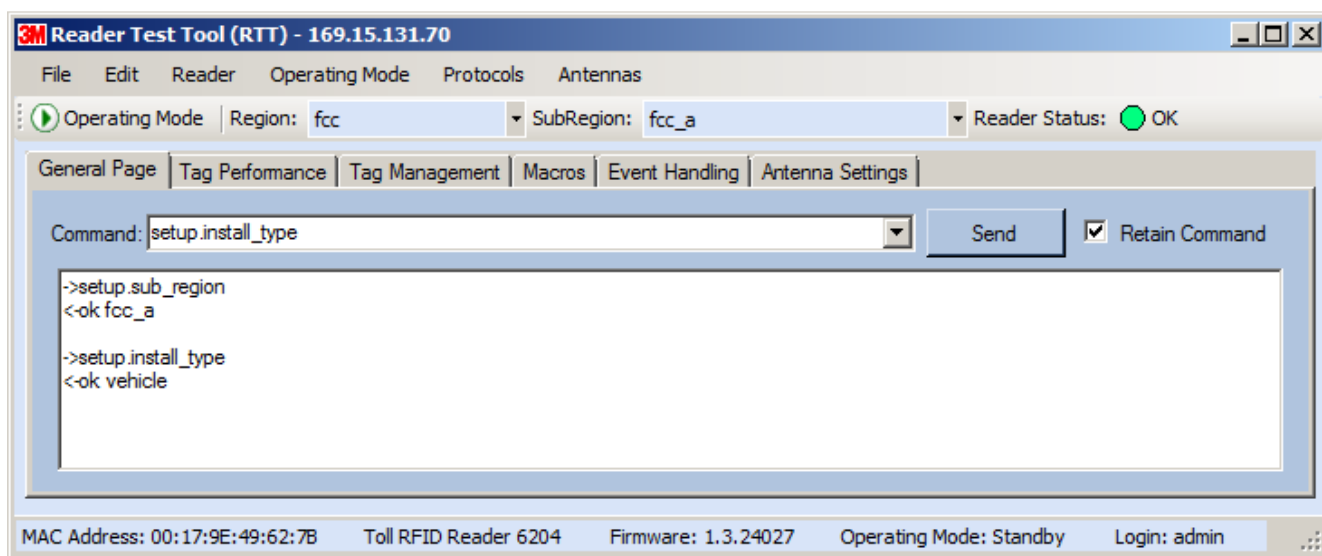
The Reader Test Tool (RTT) is primarily designed for new users to test reader operation and perform a few basic reader functions. With RTT, you can perform the following:

- 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.



6.5.1. 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.



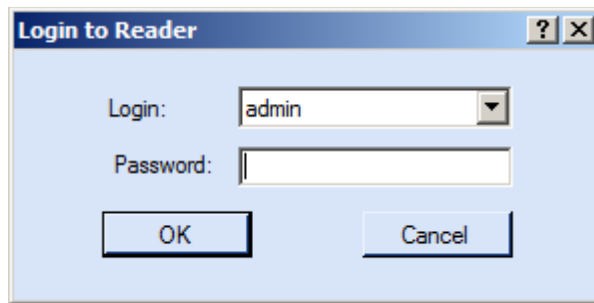
Login to Reader

To login to the reader, perform the following:

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

Default Admin Password

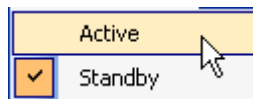
3M recommends changing the default Admin password once installation, configuration, and testing are complete.



- 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**. Enter **readeradmin** as the password if you logged in as **admin**.
- 4 Press **OK**.

Select Operating Mode

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.



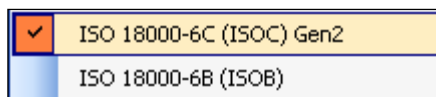
- **Active** – Reader is continuously attempting to singulate tags and automatically reports any singulated tag via an asynchronous event notification on the event channel.
- **Standby** – Reader is not transmitting any RF energy, unless processing a tag related command. The transmitter is enabled at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

NOTE

Certain protocols require licensing and may not be available. Contact 3M for more information.

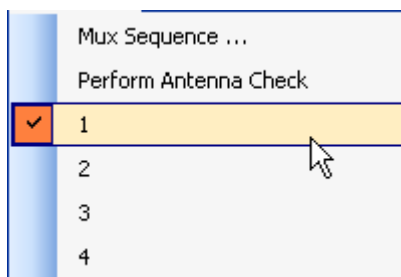
Select Protocol

You can activate one or more protocols on the 6204 using RST. From the pull-down menu, select **Protocols**→<protocol>. Active protocols are indicated by .

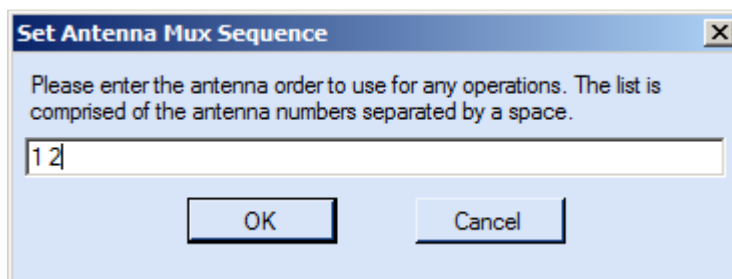
**Antenna Selection**

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

- 1 From the pull-down menu, select **Antennas**→<n>. Active antennas are indicated by .



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

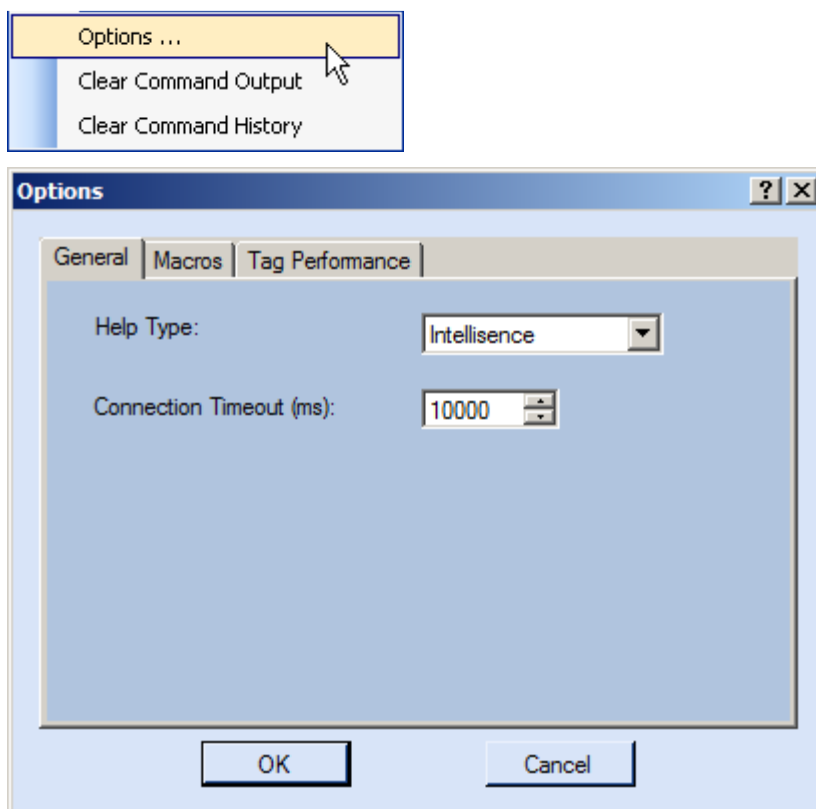


- 3 Enter the antenna numbers in the order to be activated.
- 4 Press **OK**.

Set Reader Options

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

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



6.5.2. 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.

Reader Test Tool (RTT) - 169.15.131.45

File Edit Reader Operating Mode Protocols Antennas

Operating Mode Region: fcc SubRegion: fcc_a Reader Status: Warning

General Page Tag Performance Tag Management Macros Event Handling Antenna Settings

Performance Information

Total Unique Tags: 8 Tag Read Count: 1003 Cumulative Rate: 169.65 Current Rate: 205 Peak Rate: 210

Tag Database Query

Query Interval (ms): 1000 Total Query Time (ms): 0

Stop Get Once ☐ Purge every query ☐ Beep On

Tag Acquisition Analysis

Min: 124 Avg: 125 Max: 127

Scan Operation

Scan Time (ms): 100 Scan Tags

☐ EPC Decode

Tag ID	Total	Rate	Antenna	Type	Epc
0xE20068060000000000000001	126	21.31	1	ISOC	
0xE20068060000000000000002	125	21.14	1	ISOC	
0xE20068060000000000000003	124	20.97	1	ISOC	
0xE20068060000000000000004	124	20.97	1	ISOC	
0xE20068060000000000000005	125	21.14	1	ISOC	

MAC Address: 00:23:68:C3:FC:3D Toll RFID Reader 6204 Firmware: 1.4.25390 Operating Mode: Active Login: admin

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.

Performance Information

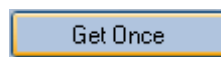
Total Unique Tags – Number of unique tags in the tag database.

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.

Tag Database Query Controls



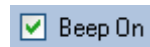
Click to retrieve the current information from reader's tag database.



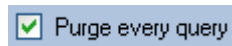
Click to query the tag database every **Query Interval (ms)** for a total time of **Total Query Time (ms)**. Do not set the interval less than 500. If Total Query Time is set to 0, query continues indefinitely.



Click to stop automatic query.



Indicates current read rate with audible tone.



Check to purge the reader's tag database after each query. Refer to the *3M Toll RFID Reader 6204 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:

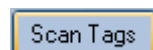
Min = 59

Avg = 134

Max = 223

Scan Operation

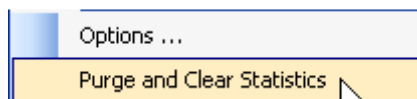
Scan time (ms) – Enter the duration of reader operation in milliseconds. After this time expires, the tag information is displayed.



Press this button to activate the reader.

Purge and Clear Reader Statistics

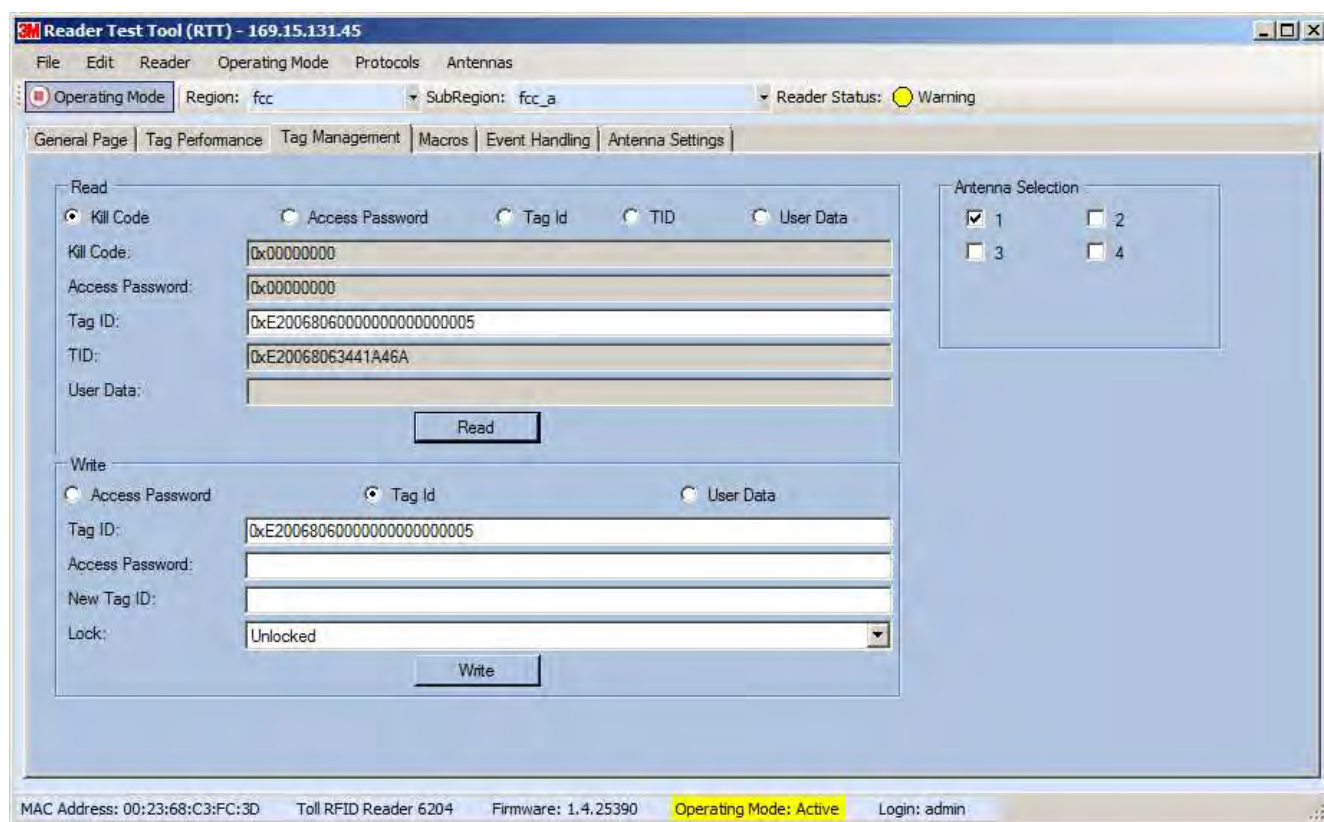
Select the reader and then select **Edit**→**Purge and Clear Statistics**.



6.5.3. Tag Management Page

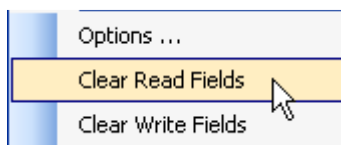
The **Tag Management** page is used for reading individual fields on a single tag as well as writing the access password and locking a tag. The **Read** button will cause the reader to singulate and read a tag in the selected antennas' RF field. Specific fields you can read include:

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



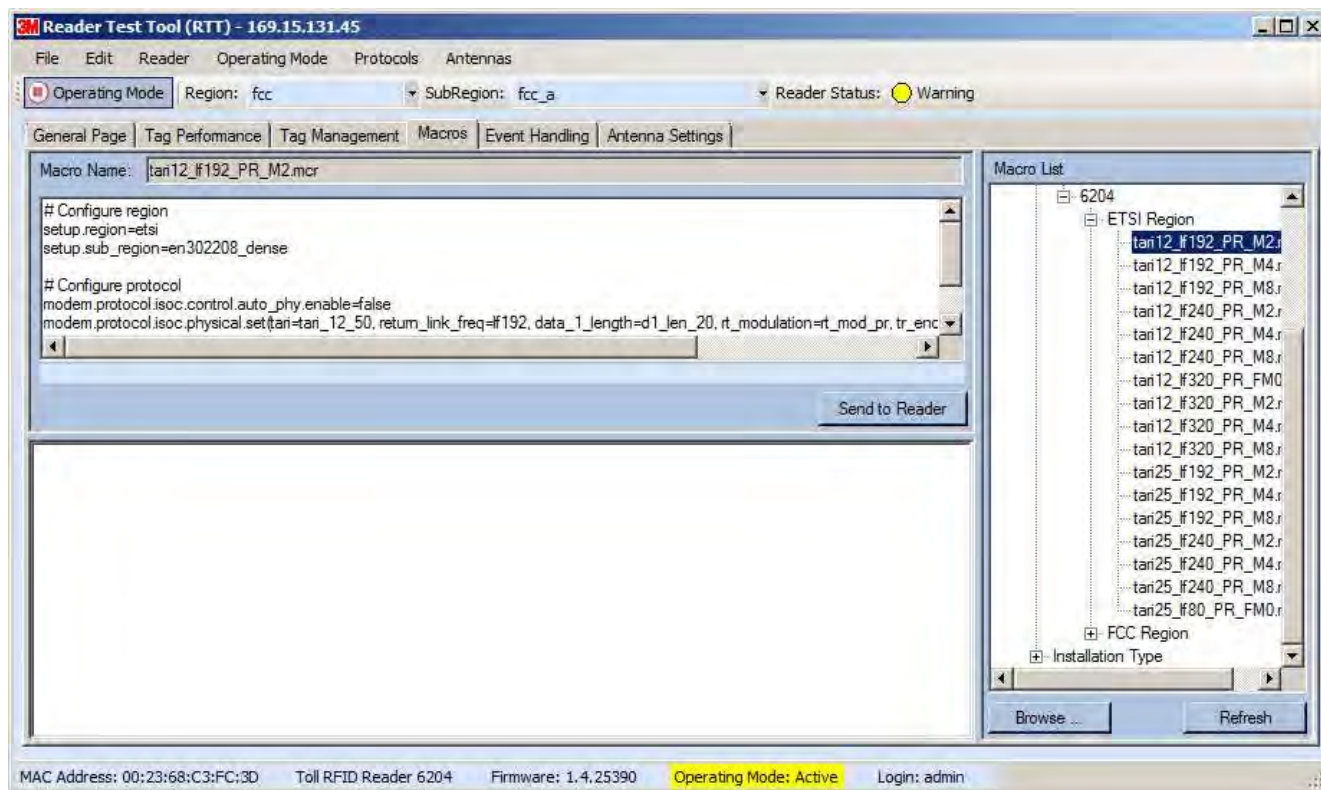
Clear Read and Write Fields

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



6.5.4. Macros Page

The **Macros** page allows the reader to manage macro files. The macros are provided by 3M 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.

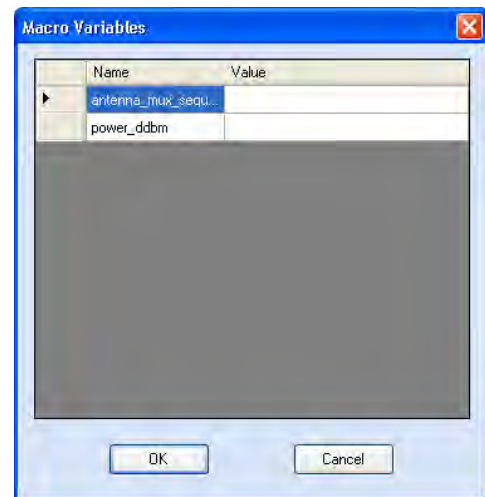
Macro Output sub-window

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.



Macro Example

To configure the reader for FCC, Part 90 Dense operation, send the following macro (**part90_6tari_1f640_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,
```

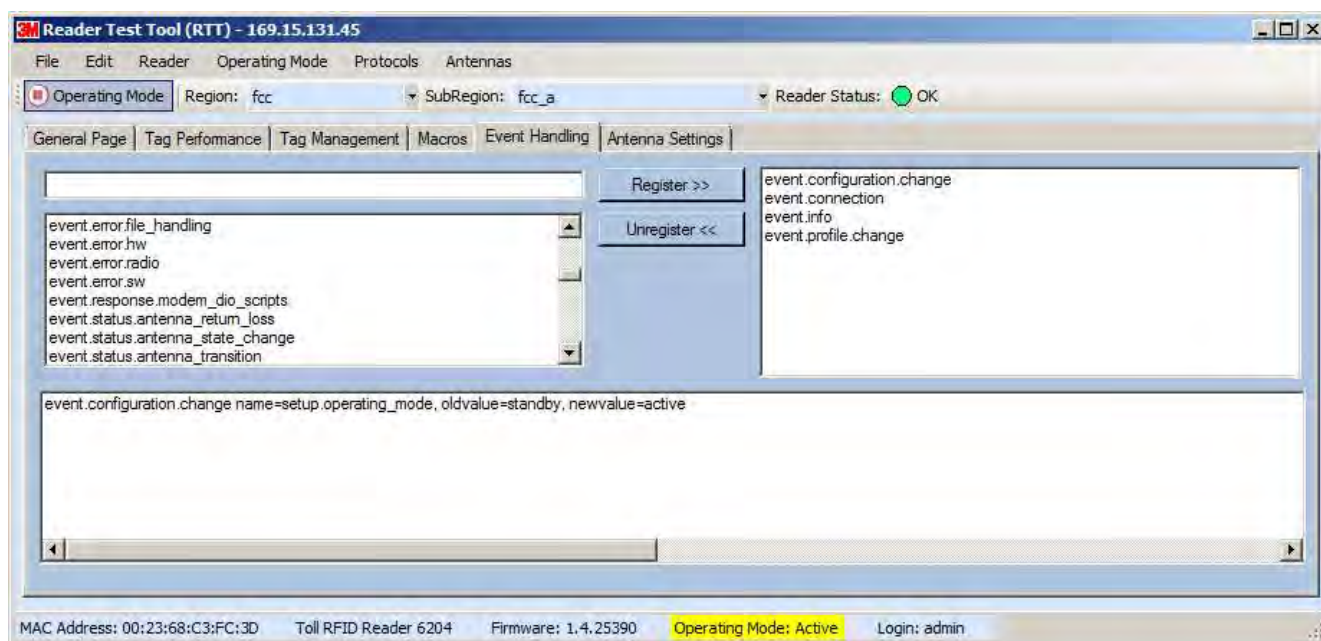
```
return_link_freq=LF640, data_1_length=d1_len_20,
```

```
rt_modulation=rt_mod_pr,
```

```
tr_encoding=tr_enc_miller_2,interrogator_mode=dense)
```

6.5.5. Event Handling Page

The **Event Handling** page allows you to register for Reader Events. After registration, events are displayed with the newest on the bottom and the most recent event will scroll to the bottom of the window. Individual events or a group of events can be registered. For detailed information on individual events, refer to *Chapter 18 – Events Namespace* of the **3M Toll RFID Reader 6204 Protocol Reference Guide**.



Registering for an individual event

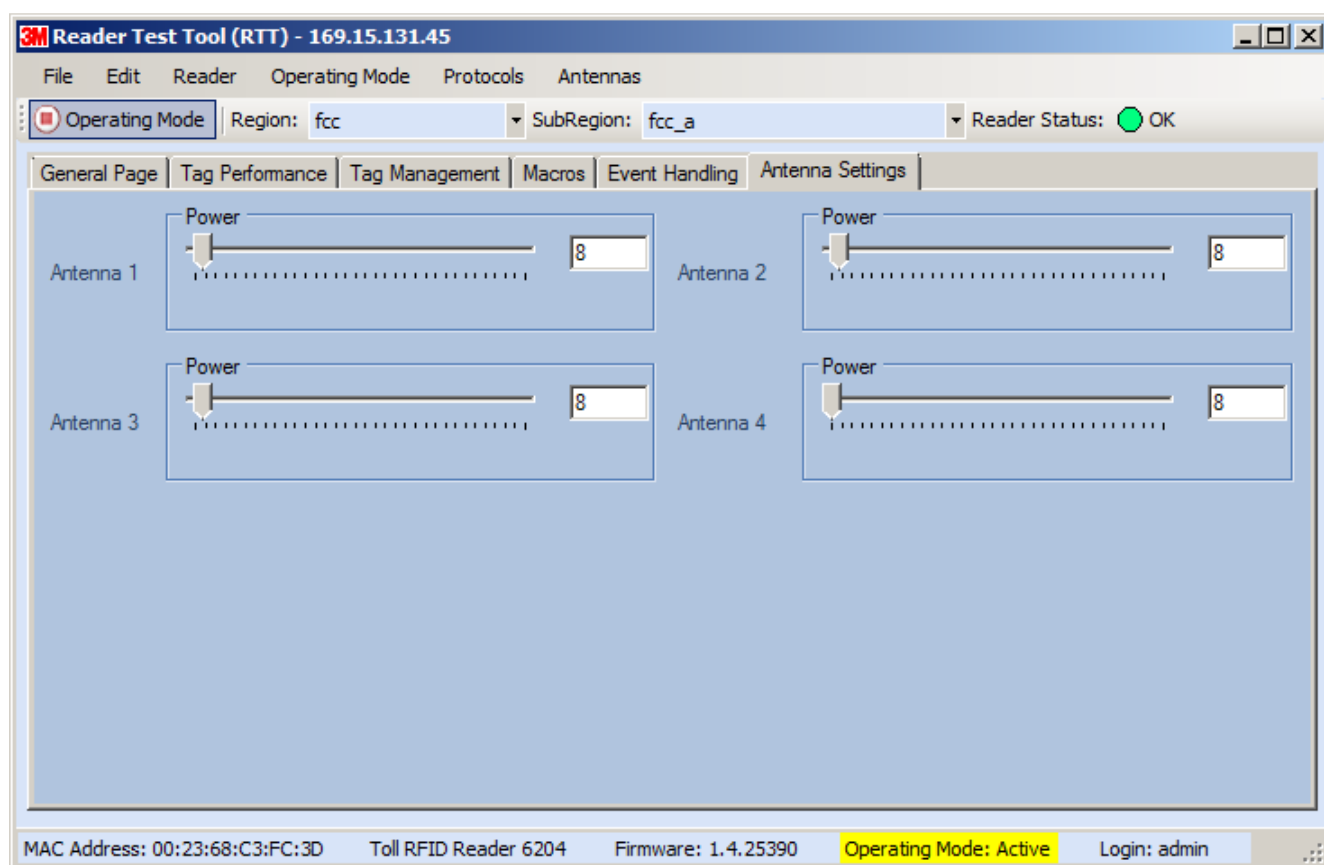
To register for an individual event, either type the event name or select an event from a pull-down list.

Registering for a group of events

Registering for **event.error** events, will cause the reader to autonomously send all events in the **event.error** namespace to the RTT program and be displayed in the window of this page. Enter **event.error** in the **Events:** field and press the **Register** button. The **Clear** button can be selected at any time to clear the window.

6.5.6. Antenna Settings Page

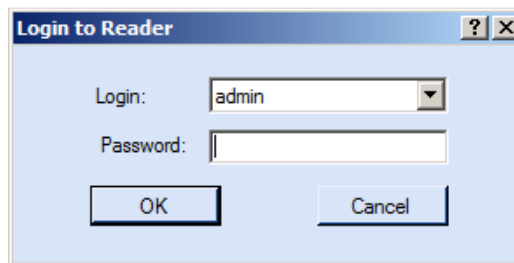
The **Antenna Settings** page allows you to adjust the power settings for each antenna. Only the controls for those antennas that are connected are activated.



6.6. Reader Diagnostics Tool (RDT)

The RDT is to be used by 3M 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:

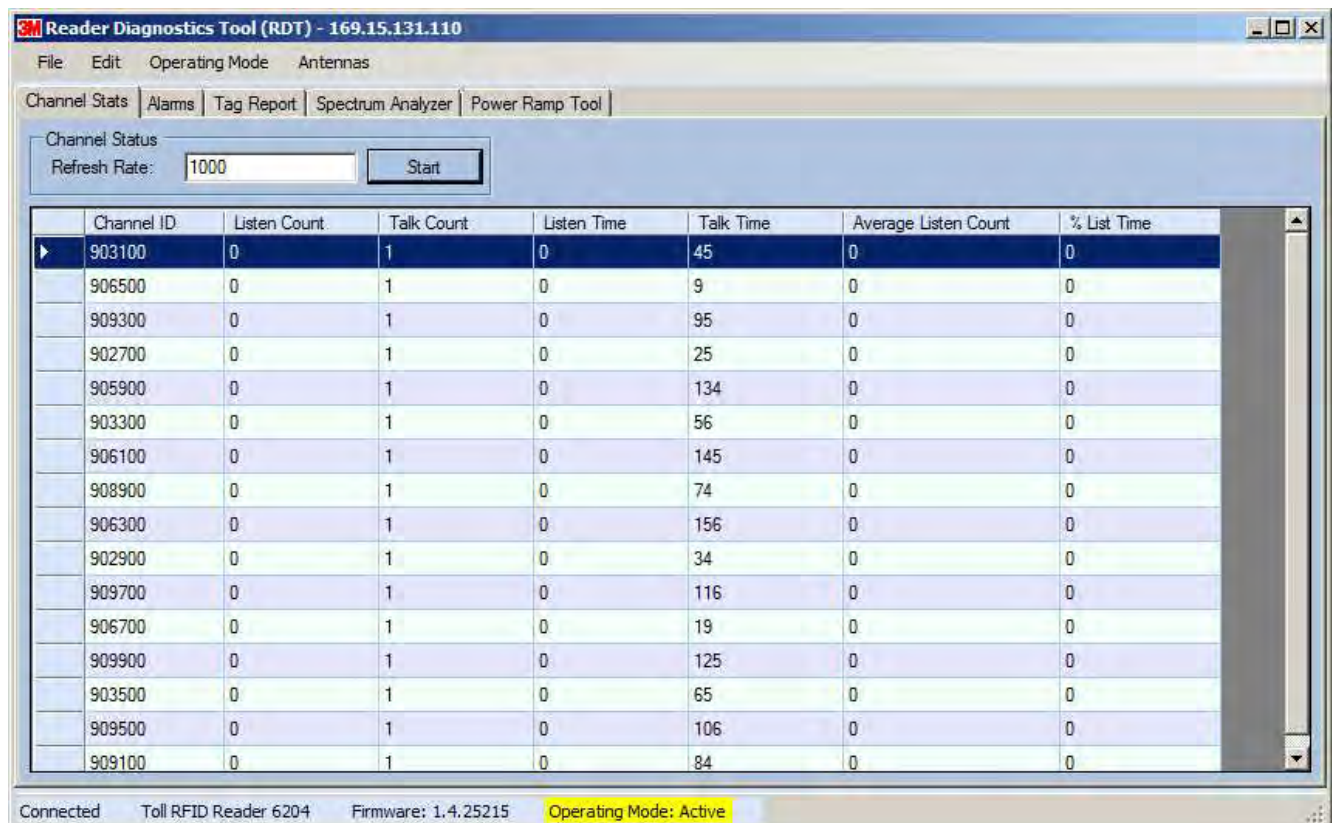


A dialog box titled "Login to Reader" with a blue header bar containing a question mark icon and a close button. The dialog has two input fields: "Login:" with a dropdown menu showing "admin" and "Password:" with an empty text box. Below the fields are two buttons: "OK" and "Cancel".

Enter your **Password**. Enter **readeradmin** or your current administrator password. Press **OK**.

6.6.1. Channel Statistics

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



The screenshot shows the main window of the 3M Reader Diagnostics Tool (RDT) connected to 169.15.131.110. The window has a menu bar (File, Edit, Operating Mode, Antennas) and a tabbed interface with "Channel Stats" selected. Below the tabs, there's a "Channel Status" section with a "Refresh Rate" set to 1000 and a "Start" button. The main area displays a table of 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
	909900	0	1	0	125	0	0
	903500	0	1	0	65	0	0
	909500	0	1	0	106	0	0
	909100	0	1	0	84	0	0

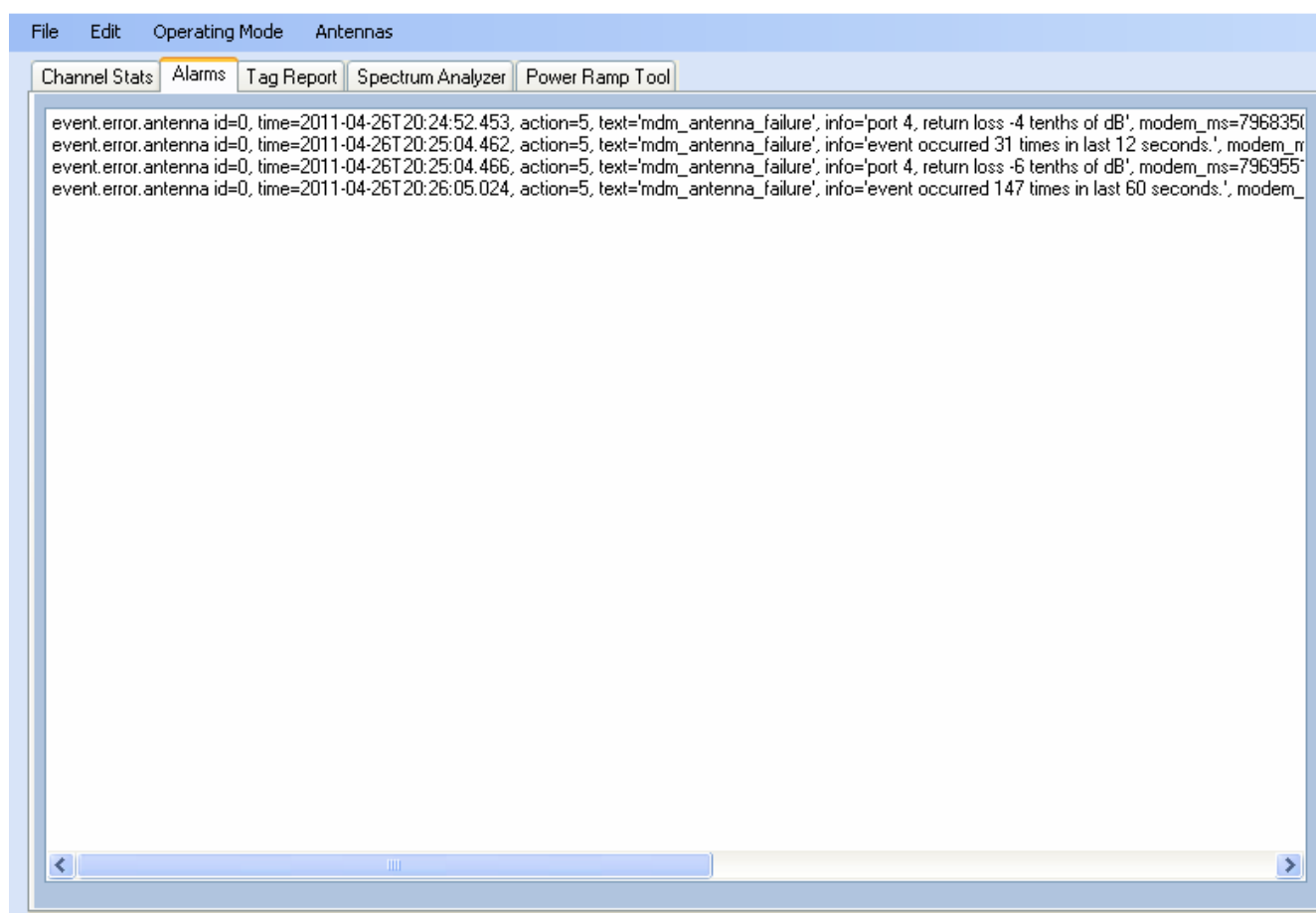
At the bottom of the window, a status bar shows: "Connected", "Toll RFID Reader 6204", "Firmware: 1.4.25215", and "Operating Mode: Active".

6.6.2. 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`

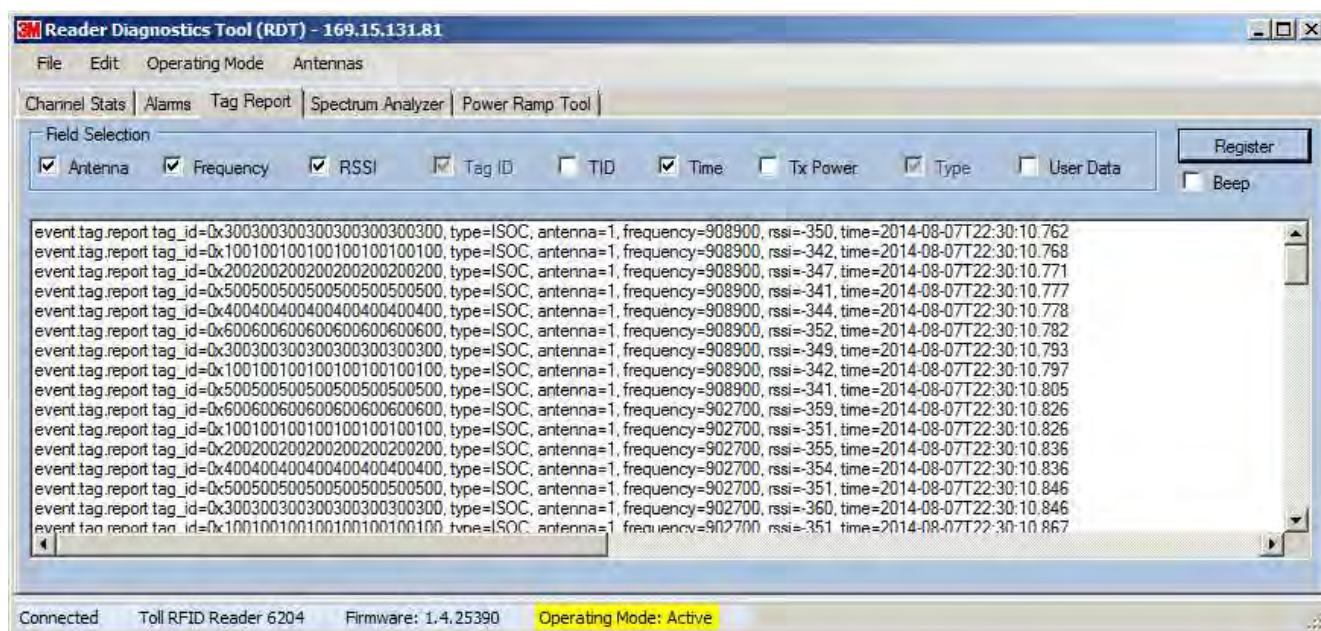
`event.warning`



6.6.3. 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.

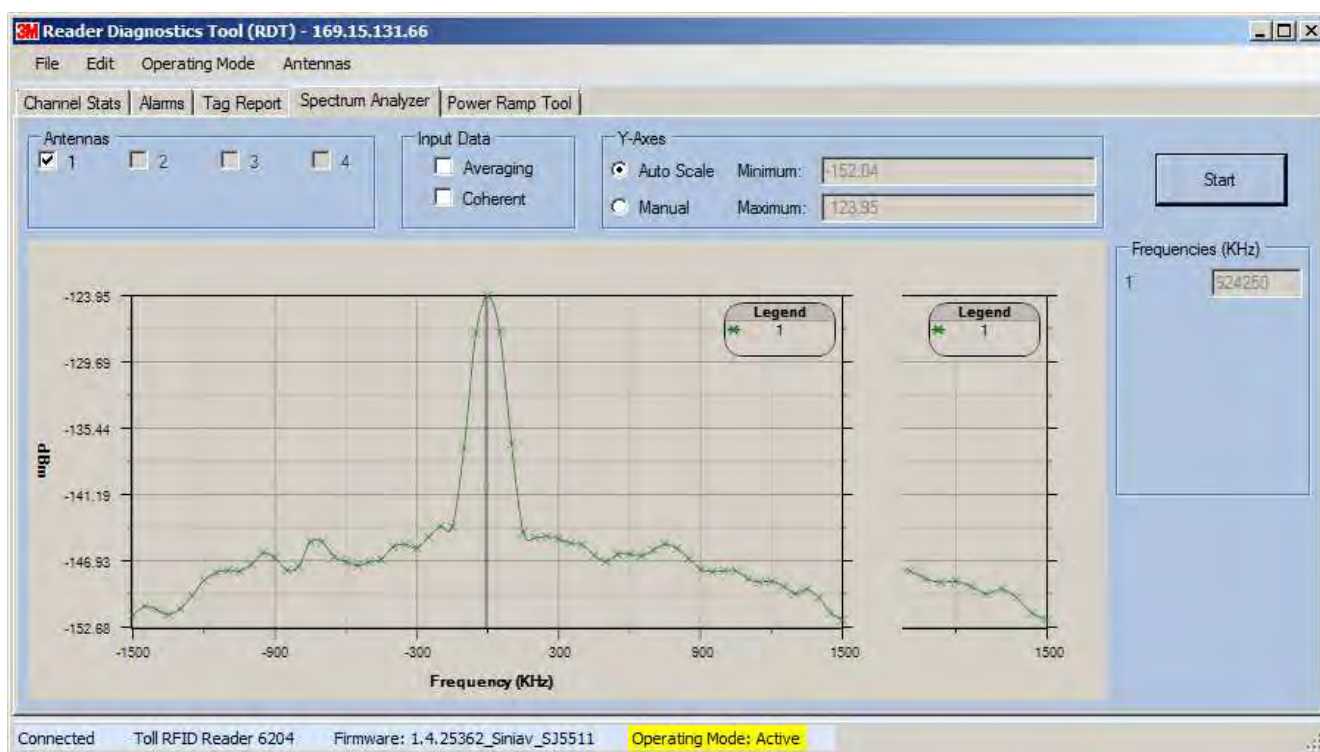
NOTICE: Use of this tool can adversely affect tag reader performance, particularly if many tag fields are enabled. Use the **RTT->Tag Performance** page for normal tag performance testing.



6.6.4. 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.

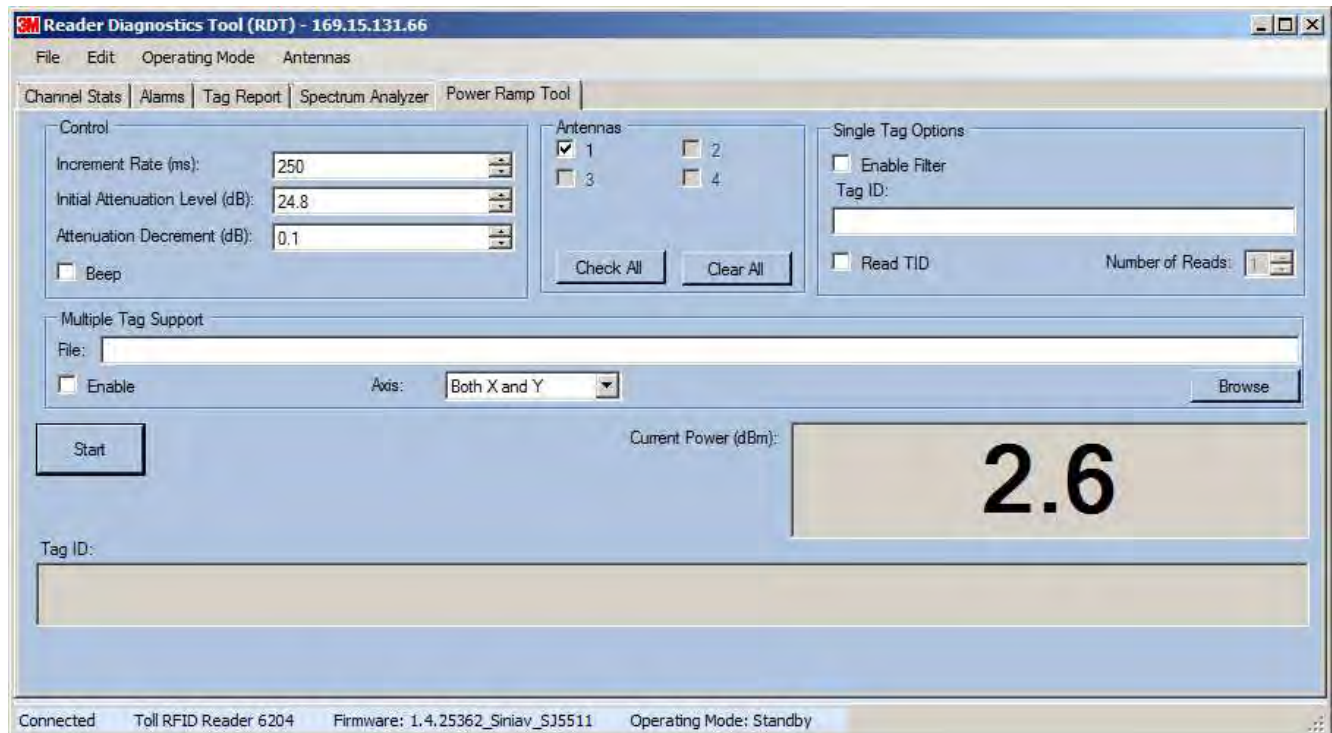
NOTICE: Using this feature during normal reader operation can significantly degrade tag reading performance.



6.6.5. 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.



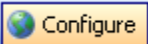
The Power Ramp controls include:

- **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** section allows you to select which antenna(s) to test with.
- **Filter** section allows you to apply a filter to only look for a particular tag.

7 Embedded 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
- Access the online Help

To access the RCT, press the  button on the main RST page.



7.1. 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

7.1.1. 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.

7.1.2. 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 *Chapter 4 – Reader Behavior* of the **3M Toll RFID Reader 6204 Protocol Reference Guide**.

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

Manage Profiles

This page helps you manage profiles. You can restore the factory profile, create a new profile (saving the current configuration state of the reader), activate a profile or delete a profile. If you delete the current active profile, the system will revert to the factory profile.

Save reader configuration state and set new current profile as :

Profile Name	Activate	Delete	?
avi	Activate	Delete	?

Factory Defaults

☒ Reset Factory Profile (Reader will reboot)
☐ Stop All Embedded Applications
☐ Reset Serial Port
☐ Reset Network Interface Configuration

Profile Names

The profile name **factory** is reserved and cannot be used. This profile is a read only profile.

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.

NOTICE: Resetting the 3M Toll RFID Reader 6204 to Factory Default will reboot the reader.

7.1.3. Set Tag Protocol



Basic Configuration

- Manage Profiles
- Set Tag Protocol
- Setup Ethernet/LAN
- Setup Serial Port
- Setup Digital Accessories
- Setup Antenna/Cables
- Set Regulatory Mode (Region)
- Setup Summary

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.

Protocol Configuration

Advanced protocol options are available under Advanced->Expert Configuration->Modem.

Protocols: ☒ ISOC ☒ ISOB ☒ EASALARM Enable Selected Protocols

Select Protocol to Configure:

ISOC/EASALARM ISOB

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 Chapter 15 – Modem Namespace of the 3M Toll RFID Reader 6204 Protocol Reference Guide. Parameter descriptions are provided in the modem.protocol.isoc.control and modem.protocol.isoc.physical configuration variable sections.

7.1.4. Setup Ethernet/LAN



Basic Configuration

- Manage Profiles
- Set Tag Protocol
- Setup Ethernet/LAN
- Setup Serial Port
- Setup Digital Accessories
- Setup Antenna/Cables
- Set Regulatory Mode (Region)
- Setup Summary

NOTE:

Always record the IP, Mac, subnet, and default gateway addresses for your readers and keep this data in a safe location. You can use this data to reconfigure the network in the event of application failure or data loss.

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**.

7.1.5. Setup Serial Port



The Setup Serial Port function allows you to configure the serial port parameters. These parameters include:

- Baud rate
- Data bits
- Parity
- Echo
- Stop bits

Name	Value	?
Baudrate	115200 ▼	?
Data Bits	8 ▼	?
Parity	NONE ▼	?
Echo	true ▼	?
Stopbits	1 ▼	?

Use the pull-down menus to select a value and press **Submit** to update the reader.

7.1.6. 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 ▼	?

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 **3M Toll RFID Reader 6204 Protocol Reference Guide** for more information on configuring the digital inputs and outputs.

7.1.7. Setup Antenna/Cables



Basic Configuration

- Manage Profiles
- Set Tag Protocol
- Setup Ethernet/LAN
- Setup Serial Port
- Setup Digital Accessories
- Setup Antenna/Cables
- Set Regulatory Mode (Region)
- Setup Summary

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 *Chapter 4 – Reader Behavior* of the **3M Toll RFID Reader 6204 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**.

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)	?

ADDITIONAL ANTENNA NOTES:

1. The required antenna impedance is 50 ohms.
2. 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.
3. 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:
http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct/index-eng.php.
4. Additional details for the approved antennas for the 3M Toll RFID Reader 6204 can be found in **Section 9.1.7., 3M Toll RFID Reader 6204 Antenna Specifications**.

7.1.8. 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 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 **3M Toll RFID Reader 6204 Protocol Reference Guide**. Descriptions are provided in the **setup.region** and **setup.sub_region** configuration variable sections.

7.1.9. Setup Summary

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

Name	Value	?
Region	fcc	?
Sub Region	fcc_part90_dense	?
Protocols	☒ ISOC ☐ ISOB ☐ EASALARM	?

Antenna Selection

Name	Value	?
Antennas	☒ 1 ☐ 2 ☐ 3 ☐ 4	?

7.2. 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
- View and edit the Wiegand Translation Table

7.2.1. Firmware Management

This 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
- Upgrade Wiegand component firmware files (note you cannot rollback the Wiegand firmware)
- Update the LLRP Component update file and to update the LLRP Component firmware on the reader.

Enter the name of the 3M provided firmware file in the **Firmware File** field. Use the **Browse** button to help locate the file.

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

Firmware Management

Upgrade Firmware

Current Firmware version: 3.3.22565

Firmware File:

Choose File

No file chosen

?

Upgrade Firmware

Rollback Firmware

Firmware rollback version: 3.1.15929

Rollback Firmware

Wiegand Component Firmware

Current Component version: Unknown

Update File:

Choose File

No file chosen

?

Update Component

LLRP Component Firmware

Current Component version: 341

Update File:

Choose File

No file chosen

?

Update Component

7.2.2. 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

Configuration file:

☒ XML File ☐ Text File

Export Configuration from Reader

Import Licenses

This section is for importing of reader feature license files to the reader.

License file:

Import Security Keys

This section is for importing of reader security keys to the reader.

Key file:

The screenshot displays the 'Reader Configuration Tool' interface with four distinct sections for managing Wiegand Translation Tables and Application Packages.

- Import Wiegand Translation Table:** This section features a text input field labeled 'Translation Table File:', a 'Browse...' button, and a question mark icon. Below the input field is an 'Import Table' button.
- Export Wiegand Translation Table:** This section includes a descriptive paragraph: 'This section is for exporting of the Wiegand Translation Table from the reader.' Below the text is an 'Export Table' button.
- Import Application Package:** This section contains a paragraph: 'Click below to import a previously saved application package file. Note that importing this package will overwrite any scripts with the same names as scripts in the package, and will overwrite all autostart information.' Below this text is a text input field labeled 'Package File:', a 'Browse...' button, and a question mark icon. Below the input field is an 'Import Package' button.
- Export Application Package:** This section includes a paragraph: 'Click below to export a package which includes all applications stored on the reader, as well as their autostart status & arguments. This package can be imported to another reader in order to replicate the application environment.' Below the text is an 'Export Package' button.

Import Configuration to Reader

Enter the name of a saved configuration file in the **Configuration file** field. Select the **XML File** option and press the **Transfer Configuration to Reader** button to send the profile to the reader.

Export Configuration from Reader

This function is used to export the current reader settings for later uploading. Press the **XML Format** button to view the XML file in the browser. Save this file to your computer if you wish retain it for future.

If you wish to view the current configuration parameters for a reader, press **Text Format** button.

Import Licenses

This function is used to import a feature license file. Navigate to the license file and press **Import License** to load the file into the reader.

Import Security Keys

This function is used to import reader security keys to the reader. Navigate to the key file and press **Import Security Keys** to load the file into the reader.

Export Security Keys

This function is used to export reader security keys from the reader. Enter the commissioning password and the mac address file containing a list of readers (each number followed by a carriage return) to allow import of these keys. Navigate to the mac address file and press **Export Security Keys** to load the file into the reader.

Import Wiegand Translation Table

This function is used to import a Wiegand translation table to the reader. The file will typically have a **.csv** extension.

Export Wiegand Translation Table

This function is used to export a Wiegand translation table from the reader. The file extension will default to **.csv**.

Import Application Package

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

Export Application Package

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

7.2.3. 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 **3M Toll RFID Reader 6204 Protocol Reference Guide**.

Command:

Send

Response

```
ok
reader_uptime = 24183,
in_use_memory = 61427712,
free_memory = 2076672,
cpu_load = 2,
modem_alive = true,
modem_uptime = 24075,
antenna_status = ok,
tx_interlock = false,
synth_locked = true,
ps_fault = true
```

7.3. Expert Configuration

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

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

NOTE

For details on reader variables, refer to the 3M Toll RFID Reader 6204 Protocol Reference Guide.

7.3.1. 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	engineer	?
setup.install_type	vehicle	?
setup.operating_mode	standby	?
setup.protocols	isoc	?
setup.region	fcc	?
setup.sub_region	fcc_dense	?
setup.tag_volume	1	?
setup.valid_protocols	isoc isob easalarm	?
setup.valid_regions	fcc taiwan thailand brazil	?
setup.valid_sub_regions	fcc_dense fcc_part90 fcc_part90_dense fcc_part90_	?
setup.advanced.preferred_frequencies	0	?

7.3.2. Expert Configuration – Tag

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

The 6204 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.

NOTE

For details on tag variables, refer to the 3M Toll RFID Reader 6204 Protocol Reference Guide.

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	?

7.3.3. 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 3M for technical support.

Name	Value	?
version.hwr	A	?
version.hwr_detail	0000	?
version.llrp	334	?
version.rollback	1.1.21501	?
version.sw	1.1.21637	?
version.sw_detail	sw = 1.1.21637, fw = 21637, dsp = 5.0, fpga = 0x000	?

7.3.4. 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.

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	?

7.3.5. 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.tcpcnodelay	false	?
com.network.tcpsynretries	5	?

NOTE

For details on communication parameters, refer to the 3M Toll RFID Reader 6204 Protocol Reference Guide.

7.3.6. 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 *Chapter 4 – Reader Behavior* of the **3M Toll RFID Reader 6204 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 ▾	?

7.3.7. 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 **3M Toll RFID Reader 6204 Protocol Reference Guide** for detailed information on each of these variables.

Name	Value	?
dio.control.3	iop v	?
dio.control.4	iop v	?
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	?

7.3.8. Expert Configuration – Security

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

Refer to the **3M Toll RFID Reader 6204 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	?

7.3.9. Expert Configuration – Writeback

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

Refer to the **3M Toll RFID Reader 6204 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	?

7.3.10. 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 **3M Toll RFID Reader 6204 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.

7.3.10.1. 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	?

7.3.10.2. 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	?

7.3.10.3. 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	?

7.3.10.4. 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		?

7.3.10.5. 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 911250	?
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 ▾	?

7.3.10.6. 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	?

7.4. 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

There are no user applications running on the reader.

Application Transfer

Application to Transfer: No file chosen

Applications available on the reader

Application Name	View	Delete
display_rs232.py	View	Delete

Start Applications

Type	Name	Options	Autostart	Submit
Python Applications	display_rs232.py	Arguments:	False	Go
		Arguments:		
Java Applications	TowersOfHanoi	Class Path:	False	Go
		Jar:		

- **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.

7.5. Change Operating Mode

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

Select	Operating Mode	?
☐	Active Mode	?
☒	Stand By Mode	?

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.

7.6. Wiegand Translation Table

This page allows you to view and edit the Translation Table used for Wiegand operation and also for the Standalone Access Control script.

The table is only displayed when the Wiegand component is active (when `com.wiegand.enable` is set to true). Buttons allow you to edit existing translation table entries, add new entries, or delete existing entries. You must click **Submit** to save table changes to the reader.

The **Scan For ID** button may be used to operate the reader briefly and populate the "Original Tag ID" field with the first tag ID seen. Please see Appendix A for details on the format of the translation table.

Delete	Original Tag ID	Tag Type	Translated Tag ID	# Entries	Handler
Delete	0x4B1122334455667788 Scan For ID	ISOC	099-00100	1	1 ☐ PWV Auth ☐ Blacklist ☐ TID Auth ☒ Use Trans ID
Delete	0x0487A57E00190E44 Scan For ID	FLEX	123-04567	3	1 ☐ PWV Auth ☐ Blacklist ☐ TID Auth ☒ Use Trans ID
Delete	IDR.000081 Scan For ID	ISO10374	0x00020002	1	1 ☐ PWV Auth ☐ Blacklist ☐ TID Auth ☒ Use Trans ID
Delete	TNB.00001290 Scan For ID	ISO10374	0xaabbccdd	2	1 ☐ PWV Auth ☐ Blacklist ☐ TID Auth ☒ Use Trans ID

7.7. 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.

Reader Operating Mode

The current reader operating mode is displayed as the default item in the pulldown list. To change the operating mode, highlight and select the desired mode from the list.

Select	Operating Mode	?
☒	Active Mode	?
☐	Stand By Mode	?

Tag Database Display

Click on the 'Start' button to begin a display of the reader tag database and continuously refresh the display for the specified polling period. The 'Stop' button stops updating the display of the reader tag database. The 'Get Once' button can be used to display the reader tag database a single time. The 'Purge' button purges all tags from the reader tag database.

Unique Tags:

Tag ID	Protocol	Antenna	Repeat Counts	First Read Time	Last Read Time
0x041012090000000000000061B	ISOC	1	2008156	2001-07-06T04:34:45.359	2001-07-06T06:34:43.554

Polling Period (seconds):

7.8. 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 3M 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	?

7.9. Review Logs

This page allows you to view the reader logs. These logs can be used by 3M 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
- **Wiegand Translation Logs** – Logs associated with the translation tables for the Wiegand Interface Module

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

8 Configuring Digital Inputs and Outputs

8.1. Digital Inputs

Digital I/O Module
An optional Digital I/O Module is available for the 3M Toll RFID Reader 6204. Refer to Appendix A for more

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 +24 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.

8.2. 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). Digital outputs can be pulled high.

No voltage higher than +40 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 $\leq 1W$.

8.3. Low Latency Digital Input/Output Operation

The 6204 is equipped with low-latency digital inputs and outputs. The 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 μ Sec) is defined by:

```
modem.dio.out.X.pulse_width -(default 100  $\mu$ Sec)
```

Example (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"
```

Example (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
```

8.4. Digital I/O Monitoring and Control Scripts

Several digital I/O monitoring and control scripts are provided with the reader to allow you to monitor the digital I/Os and take specific actions. These Python application scripts can be used as is or modified to suit your particular application. For detailed information on loading Python scripts, refer to *Chapter 5 – Embedded Reader Applications* of the **3M Toll RFID Reader 6204 Protocol Reference Guide**.

8.4.1. scan_trigger.py

This routine monitors the state of the digital input pin specified as the input parameter. If the state of the pin is low, the operating mode is set to *standby*. If the I/O pin state changes to high, the operating mode is set to *active*.

Inputs: *<pin>* – (optional) Input pin number (1–4). Default is digital in 1.

<trigger logic level> –(optional) 0 or 1. Default is trigger on 1.

Examples:

<code>scan_trigger.py</code>	Monitors digital input pin 1
<code>scan_trigger.py 1</code>	Monitors digital input pin 1
<code>scan_trigger.py 4</code>	Monitors digital input pin 4
<code>scan_trigger.py 3 0</code>	Monitors digital input pin 3, trigger on 0

8.4.2. scan_trigger_timer.py

This routine monitors the I/O pin. When the pin goes high, the timer is started and the operating mode is set to *active*. While the timer is running, I/O pin state changes are ignored. When the timer expires, the operating mode is set to *standby*. The minimum value for the timer is 10 milliseconds (ms).

Inputs: *<pin>* – (optional) Output pin number (1–4). Default is output 1.

<time> – (optional) Time, in ms for timer to run. Default is 1000 ms.

<trigger logic level> –(optional) 0 or 1. Default is trigger on 1.

Examples:

scan_trigger_timer.py	Monitors input 1, timer 1000 ms, trigger on 1
scan_trigger_timer.py 2	Monitors input 2, timer 1000 ms, trigger on 1
scan_trigger_timer.py 4 2000	Monitors input 4, timer 2000 ms, trigger on 1
scan_trigger_timer.py 3 4000 0	Monitors digital input 3, timer 4000 ms, trigger on 0

8.4.3. signal_read.py

This routine will turn on a digital output if a tag is successfully read. The optional output pin number can be specified on the command line. If not specified, output pin 1 is used. The output pin will remain high for *n* ms, where *n* is either the default of 1000 ms, or the value supplied on the command line. Minimum value for *n* is 10 ms.

Inputs: *<pin>* – (optional) Output pin number (1–4). Default is output 1.

<time> – (optional) Time, in ms, to keep the output high. Default is 1000 ms (1 sec).

<logic level> – (optional) Logic level for digital out *On*. 0 or 1. Default is 1 (*On*).

Examples:

signal_read.py	Turns on output 1 for 1000 ms on tag reads
signal_read.py 2	Turns on output 2 for 1000 ms on tag reads
signal_read.py 1 5000	Turns on output 1 for 5000 ms on tag reads
signal_read.py 1 500	Turns on output 1 for 500 ms on tag reads
signal_read.py 1 800 0	Turns on digital output 1, logic level 0, for 800 ms on tag reads

8.4.4. signal_read_crc_error.py

This routine will turn on a digital output if a tag read CRC error is detected. The output pin number can be specified on the command line. If not specified, output pin 1 is used. The output pin will remain high for *n* ms, where *n* is either the default of 1000 ms or the value supplied on the command line. Minimum value for *n* is 10 ms.

Inputs: *<pin>* – (optional) Output pin number (1–4). Default is output 1.
<time> – (optional) Time, in ms, to keep the output high. Default is 1000 ms.
<logic level> – (optional) Logic level for digital out *On*. 0 or 1. Default is 1 (*On*).

Examples:

signal_read_crc_error.py	Turns on output 1 (logic level 1=on), for 1000 ms on tag read CRC error.
signal_read_crc_error.py 2	Turns on output 2 (logic level 1=on), for 1000 ms on tag read CRC error.
signal_read_crc_error.py 1 5000	Turns on output 1 (logic level 1=on), for 5000 ms on tag read CRC error.
signal_read_crc_error.py 1 500	Turns on output 1 (logic level 1=on) for 500 ms on tag read CRC error.
signal_read_crc_error.py 1 800 0	Turns on output 1 (logic level 0=on), for 800 ms on tag CRC error.

8.4.5. rf_mon.py

This routine will monitor the state of the transmitter. If the transmitter is on, it sets the appropriate output pin high. If low, it sets the output pin low.

Inputs: *<pin>* – (optional) Output pin number (1–4). Default is output 1.
<logic level> – (optional) Logic level for digital out *On*. 0 or 1. Default is 1 (*On*).

Examples:

rf_mon.py	Monitors RF status, set/clear output 1 on change, logic level 0 for on
rf_mon.py 1	Monitors RF status, set/clear output 1 on change, logic level 0 for on
rf_mon.py 2	Monitors RF status, set/clear output 2 on change, logic level 0 for on
rf_mon.py 3 0	Monitors RF status, set/clear output 3 on change, logic level 1 for on

8.5. Digital Input Alarm Generation

The 6204 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.

8.6. Digital I/O Hardware Connection

Figure 5 shows a typical sensor/indicator connection to the digital I/Os.

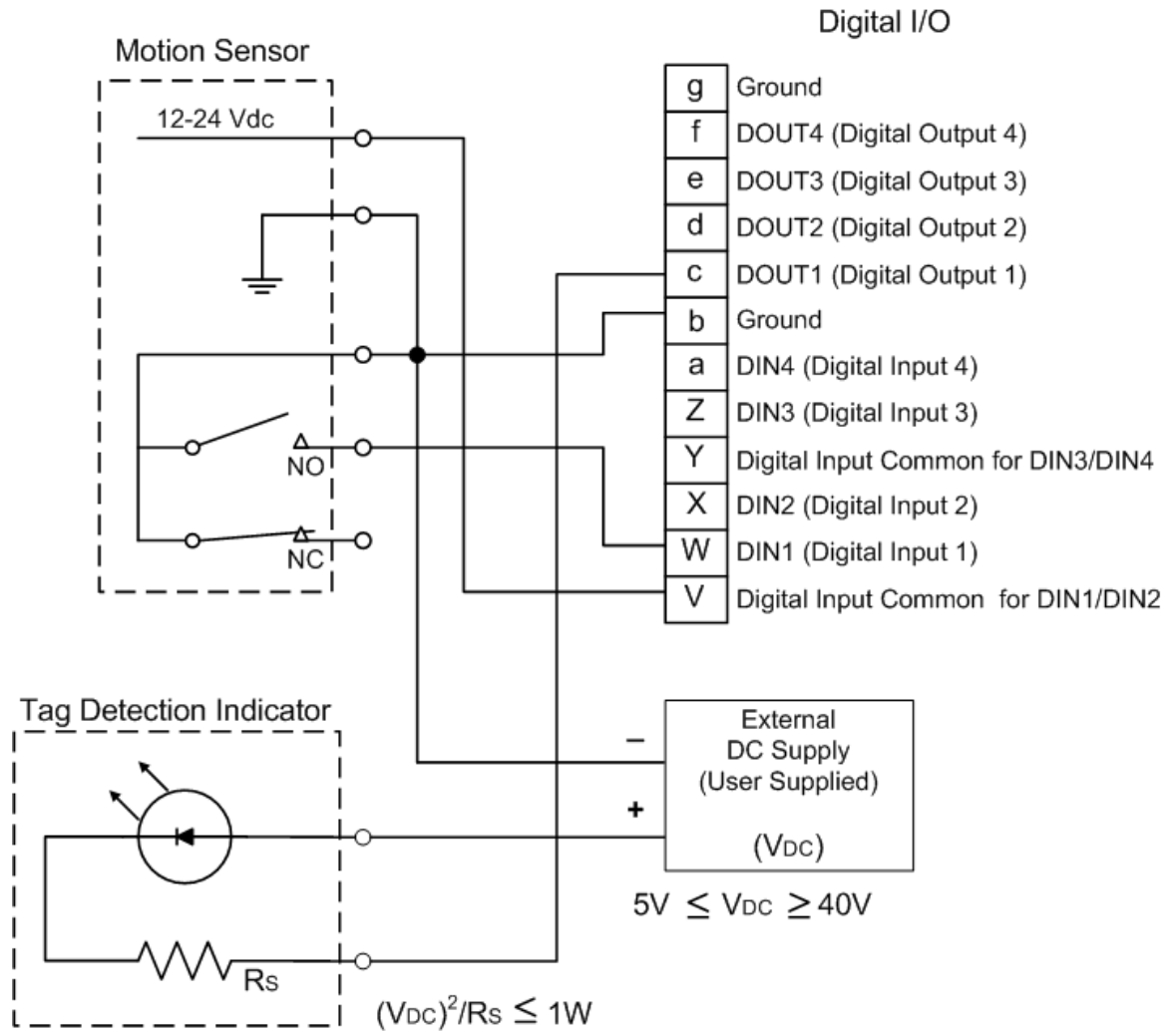


Figure 5 Example Motion Detector and Indicator connected to the Digital I/O

9 Specifications

9.1.1. Reader Specifications (General)

Frequency	865 – 868 MHz (ETSI)
	902 – 928 MHz (FCC Part 15)
	902 – 904 MHz (FCC Part 90 Low Band)
	911 – 921 MHz (FCC Part 90 Dense)
RF Power	20 mW – 560 mW conducted (13 – 27.5 dBm) (ETSI)
	20 mW – 1 W conducted (13 – 30 dBm) (FCC Part 15)
	20 mW – 2 W conducted (13 – 33 dBm) (FCC Part 90)
Power Consumption	10 W (max while idle)
	22 W (max at 33 dBm conducted output power, FCC Part 90)
Connections	RS-232, Digital I/O, Ethernet LAN
Input Voltage	24 VDC $\pm$ 5% at input of 3M supplied cable, 36 W
Input Current	1.5A maximum at 24 Vdc
Dimensions	16.5 x 13.0 x 3.4 in (419 x 330 x 86 mm)
Weight	5.0 kg (11 lbs)

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

NOTICE: *The 3M supplied power cable is only rated at 24V $\pm$ 5%. Input power less than 24V $\pm$ 5% while using 3M supplied cables may result in cable and/or reader damage.*

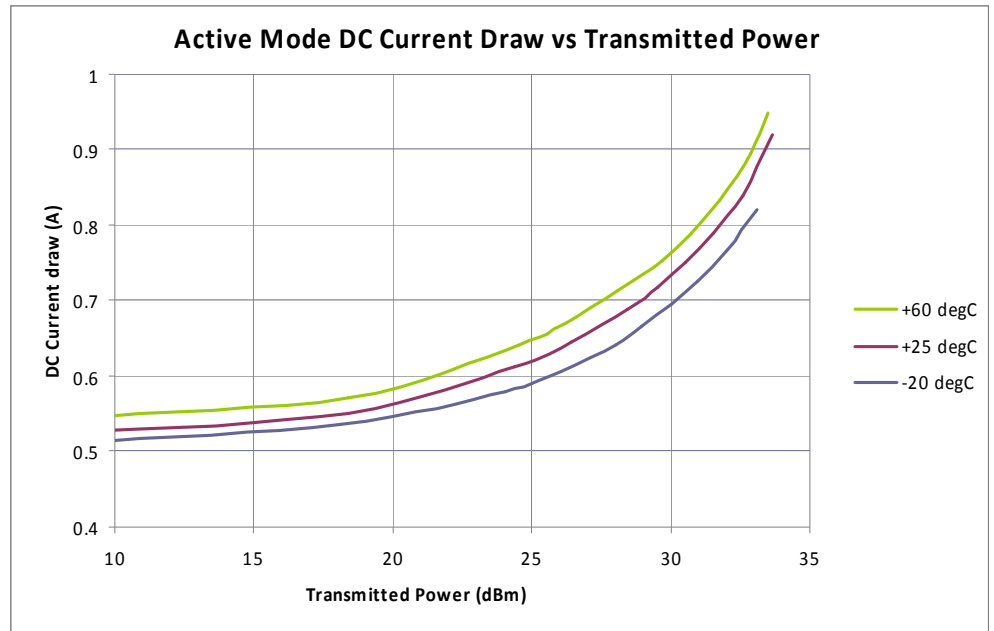


Figure 6 Typical Power Consumption versus Conducted Output Power at 910 MHz

9.1.2. Environmental Specifications

Operating Temperature	-40 °F to 131 °F (-40 °C to 55 °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

9.1.3. AC/DC Power Adapter Specifications

Model	Lambda DSP100-24
Input Voltage	90 – 264 Vac,
Input Frequency	47 to 63 Hz
Power	100.8 W
Holdup Time	10 ms (115 Vac)
Output Voltage	24 VDC
Output Current	4.2 A

9.1.4. RS-232 Specifications

Baud rate	1200 - 115200 (Default = 115200)
Parity	None
Data bits	8
Stop bits	1
Signals	Refer to Section 9.1.8 for cable pin out.

9.1.5. Digital Input/Output Specifications

Input	5 to 24 Vdc, 1 to 5 mA, Optically Isolated
Output	Open Collector (3 to 40 V, 100 mA Max)
Signals	Refer to Section 9.1.8 for cable pin out.

9.1.6. Ethernet LAN Specifications

Ethernet	10/100 BaseT
Signals	Refer to Section 9.1.8 for cable pin out.

9.1.7. 3M Toll RFID Reader 6204 Antenna Specifications

Please refer to the 3M Antenna Application Guide for detailed specifications and application information for 3M Toll RFID Reader 6204 antennas.

3M SKU Number	78-0060-1044-7	78-0060-1045-4
Previous Part Number	ANTENNA-013	ANTENNA-018-E
Frequency range	902–928 MHz	902–928 MHz
Antenna type	Patch	Patch
Impedance	50 Ω , nominal	50 Ω , nominal
Gain	13 dBi	9.0 dBic (min) 10 dBic (max)
Beam width (-3 dB)	42°, nominal	63°, typical
Polarization	Linear	RH circular
F/B ratio	-24 dB, typical	-18 dB, maximum -20 dB, typical
Side lobes level	-19 dB, typical	-16 dB, typical @ 90°
Power input	37 dBm (5 W)	38 dBm (6 W)
Return loss	-12 dB, minimum	-14 dB, minimum
Connector type	N type Female (Jack)	N type Female (Jack)

3M SKU Number	78-0060-1047-0	78-0060-1048-8
Previous Part Number	ANTENNA-020	ANTENNA-021
Frequency range	865 - 956 MHz	902–928 MHz
Antenna type	Patch	Patch
Impedance	50 Ω , nominal	50 Ω , nominal
Gain	7.5 dBi	13 dBi
Beam width (-3 dB)	70°, nominal	36°, nominal
Polarization	RH Circular	Linear
F/B ratio	-20 dB, typical	-20 dB, typical
Side lobes level		-14 dB, typical
Power input	38 dBm (6 W)	37 dBm (5 W)
Return loss	-20.8, typical	-12 dB, maximum
Connector type	N type Female (Jack)	N type Female (Jack)

3M SKU Number	78-0060-1051-2	78-0060-1053-8
Previous Part Number	ANTENNA-023	ANTENNA-024
Frequency range	902–928 MHz	902–928 MHz
Antenna type	Multi-element Patch	Multi-element Patch
Impedance	50 Ω , nominal	50 Ω , nominal
Gain	15 dBi	15 dBi
Beam width (-3 dB)	22°, nominal	30°, nominal
Polarization	Linear	Linear
F/B ratio	-36 dB, typical	-36 dB, typical
Side lobes level	-18 dB, typical	-18 dB, typical
Power input	37 dBm (5 W)	37 dBm (5 W)
Return loss	-12 dB, minimum	-12 dB, minimum
Connector type	N type Female (Jack)	N type Female (Jack)

3M SKU Number	75-0302-3902-6
Previous Part Number	N/A
Frequency range	902–928 MHz
Antenna type	Multi-element Patch
Impedance	50 Ω , nominal
Gain	14.5 dBi
Beam width (-3 dB)	22°, nominal
Polarization	Linear Horizontal
F/B ratio	-25 dB, typical
Side lobes level	-18 dB, typical
Power input	38 dBm (6 W)
Return loss	-12 dB, minimum
Connector type	N type Female (Jack)

**Site License –
Customer Disclaimer**

Customer (end user) acknowledges that a site license is required for each reader system location. It is the customer's responsibility to file for the site license and submit the appropriate filing payment. 3M 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.

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. 3M 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

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 3M could void the user's authority to operate the equipment.

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 3M 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:

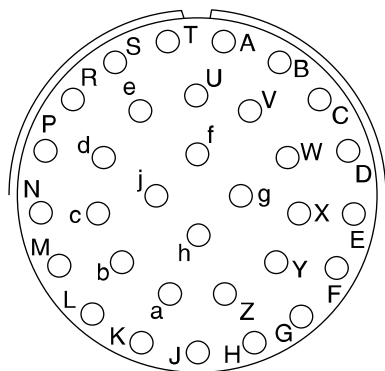
44.8 dBm (ERP) - Pout

where Pout is the measured RF output power (dBm)

Reader output power is limited to a maximum of 2W under all conditions.

When operating at that power level, the maximum permissible antenna gain is 11.2dBd.

9.1.8. Bulkhead Connector/Interface Cable Pinout



Note: Drawing is for cable socket on reader.

Pair	Pin	Color	Pin Name	Function
1	A	Black	Tx+	Ethernet
	B	Green	Tx-	Ethernet
2	C	Black	Rx+	Ethernet
	D	Orange	Rx-	Ethernet
3	E	Blue	VC2+	Ethernet
	F	Black	VC2-	Ethernet
4	G	Black	VC2+	Ethernet
	H	Brown	VC2-	Ethernet
5	J	Black	RS-232 TXD (to WIM RXD)	Serial or WIM Port
	K	Red	RS-232 RXD (to WIM TXD)	Serial or WIM Port
6	L	Black	DTR (Short to Pin N DSR)	Serial or WIM Port
	M	White	RS-232 GND (to WIM SGND)	Serial or WIM Port
7	N	Black	DSR (Short to Pin L DTR)	Serial or WIM Port
	P	Yellow	RS-232 CTS (to WIM RTS)	Serial or WIM Port
8	R	Red	RS-232 RTS (to WIM CTS)	Serial or WIM Port
	S	White	No Connect	Not Applicable
9	T	Red	+24 VDC	Power
	U	Green	24 VDC GND	Ground
10	V	Red	DIN Ref 1 To (+5 to +24)VRef	Digital Input Common
	W	Blue	DIN1	Digital Input 1
11	X	Red	DIN2	Digital Input 2
	Y	Yellow	DIN Ref 2 To (+5 to +24)VRef	Digital Input Common
12	Z	Red	DIN3	Digital Input 3
	a	Brown	DIN4	Digital Input 4
13	b	Red	GND	Ground (Reader)

Pair	Pin	Color	Pin Name	Function
14	c	Orange	DOUT1	Digital Output 1
	d	Green	DOUT2	Digital Output 2
	e	White	DOUT3	Digital Output 3
15	f	Green	DOUT4	Digital Output 4
	g	Blue	GND	Ground (Reader)
16	h	Yellow	+24 VDC	Heater Power
	j	Green	24 VDC GND	Heater Ground

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

A Using the Wiegand Interface

A.1. Overview

The 3M Wiegand Interface Module (WIM) is a serial (RS-232) to 4-channel Wiegand module designed to interface with the 6204 reader. Currently, 2 Wiegand channels are used, corresponding to the 2 antennas available on the 6204. Channel 1 is associated with the internal antenna. Channel 2 is associated with the External antenna.



Channels 3 and 4 can be configured to act as open-collector, digital pulse outputs under software control. This requires an additional custom script file to define the output function. Contact your local 3M Representative for further information.

A.2. Wiegand Protocol

The Wiegand communication protocol is a 3-wire communications scheme comprising:

- Data One line
- Data Zero line
- Ground line

These three lines constitute a Wiegand Channel.

Data is transmitted in a serial manner over these lines by pulsing the Data One line low for a logic **1**, and pulsing the Data Zero line low for a logic **0**.

Two parameters define the behavior of bit-wise transmission:

- Pulse Width Time (Tp_w) is the duration of the pulse.
- Pulse Interval Time (Tp_i) is the interval between the end of a pulse and the start of the next pulse.

Based on this, the total bit time is Tp_w + Tp_i.

A Wiegand frame consists of a string of bits transmitted in the Wiegand format. Typically, this is 26 bits (including two parity bits). Following the transmission of a Wiegand frame, a hold-off time (Thold) is asserted where the Wiegand interface will not transmit. This mechanism is used to separate adjacent Wiegand frames.

The unit, by default, outputs a 26-bit Wiegand frame (24 data bits , 2 parity bits). Data lengths of up-to 128 bits can be accommodated. The current default values for the Wiegand are as follows:

Parameter	Value
TPW Pulse Width Time	50 μ s
TPI Pulse Interval Time	2000 μ s
Inter Frame Message Delay Time	250 ms
Data bits	24
Parity	Standard
Bit format	MSB first

In some installations, Wiegand equipment may report only a single transaction when multiple tags are read simultaneously. In this case, the Wiegand equipment may require a larger delay between consecutive Wiegand data frames (up to 1.5 seconds).

To increase the delay, set **com.wiegand.X.physical.thold**, where **X** is the Wiegand output number, to the desired interframe time in ms (i.e. 1500 for 1.5 seconds).

For more information, refer to the AC-01 Wiegand Specification: “Access Control Standard Protocol For The 26-Bit Wiegand Reader Interface”.

A.3. Wiegand Applications

Many access control panels incorporate a Wiegand Interface, and in many applications a host reader will communicate with an access control panel via the Wiegand Interface. Many Wiegand-enabled panels are configured to receive Facility Code information and Serial Number information in Wiegand format.

In an RFID-based access control system, the Facility Code and Serial Number may be embedded into a data string known as a Translated ID. In some applications, an actual tag ID may be mapped to a Translated ID via some form of look-up table.

This 6204 Wiegand application primarily uses secure tags for authentication. The reader will read such tags and derive a Translated ID from the tag. This Translated ID is then sent to the Wiegand Interface Module (WIM) for transmission over a Wiegand Interface to a Wiegand panel. However, a translation table facility is incorporated for managing standard legacy tags.

A.4. Mechanical Installation

The WIM is housed in a plastic enclosure and should be located in your control panel. Mount the module in a ventilated area on a flat panel and ensure that the module is protected from water and moisture ingress, and is not mounted directly above a heat source.

Secure the module in place with two #8 (M4) flat-head type screws. Figure 7 shows the location of the mounting flanges.

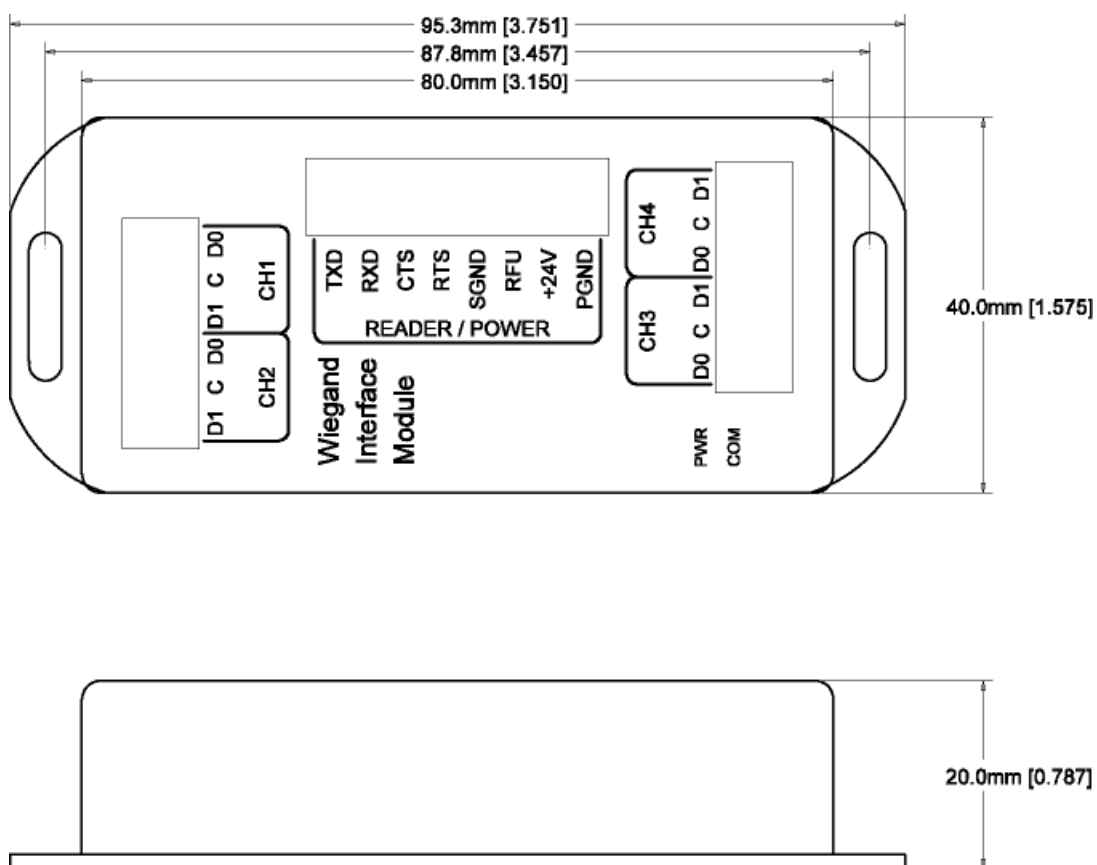


Figure 7 Wiegand Interface Mounting Flanges

A.5. Electrical Installation

Power for the WIM is supplied by the 24 VDC 6204 reader power supply. The 6204 serial port is used to communicate with the WIM and is therefore not available for standard serial communications. Connections to the WIM are made via pluggable screw terminal blocks.

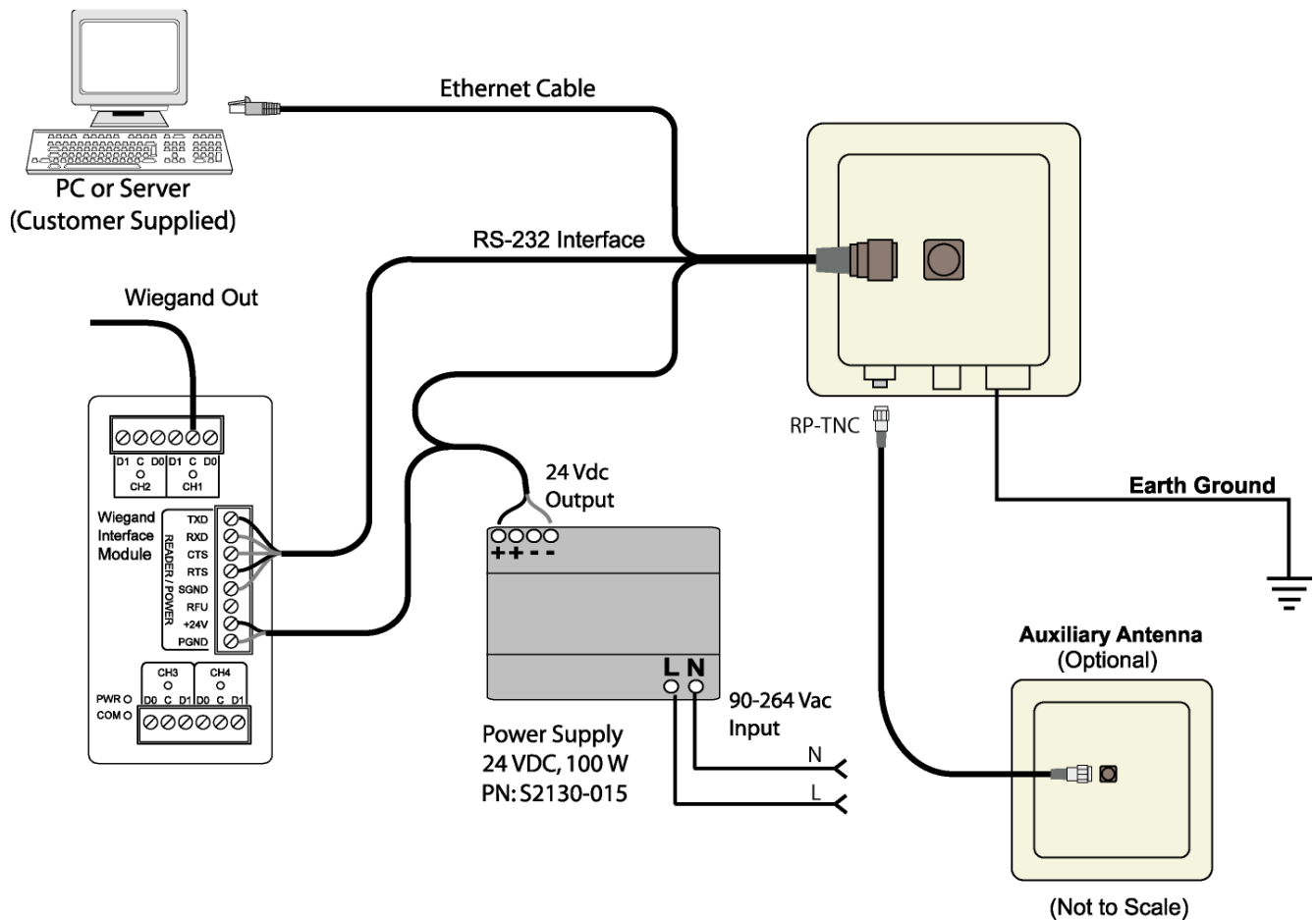


Figure 8 3M Toll RFID Reader 6204 Electrical Connections (Wiegand Interface Module)

Refer to Figure 9 for actual Wiegand Module power and RS-232 wiring.

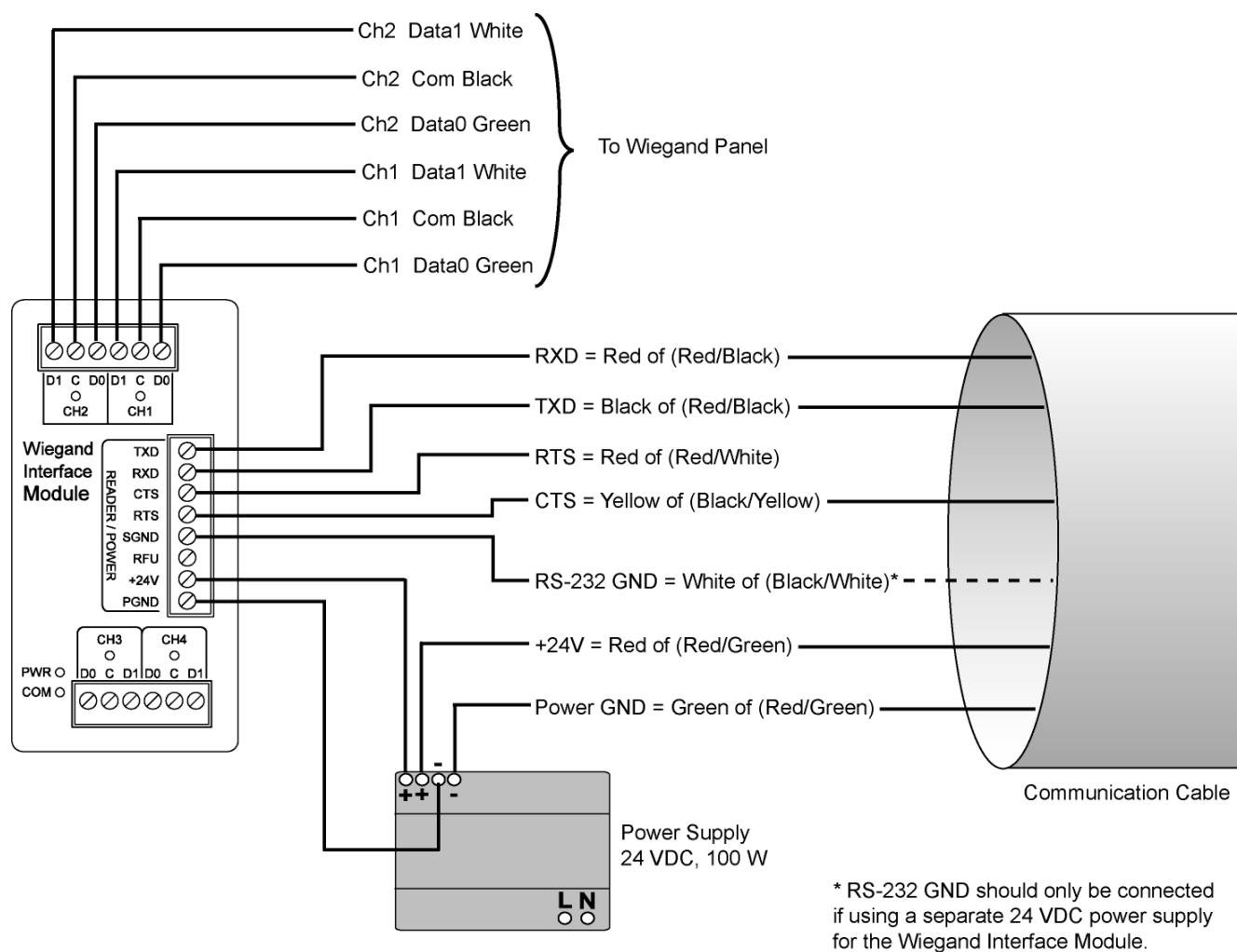


Figure 9 Wiegand Interface Module Electrical Connections

A.5.1. Connect the Serial Port

Disconnecting WIM from Serial Port

In the event you disconnect the WIM module from the serial port, you need to restart the console service for the reader command line interface (cli).

See “Disconnecting the Wiegand Interface Module” later in the is section.

To connect the serial port, perform the following:

- 1 Terminate the reader umbilical cable using a suitable cable gland or equivalent method.
- 2 Identify the serial interface wires and terminate these five wires on the **READER/POWER** connector.
- 3 Use care when performing the termination to avoid Pin 3 (**RFU**) on this connector.

A.5.2. Connect the Wiegand Outputs

Optically-isolated open-collector outputs are provided to meet the requirements of the AC01 Wiegand specification. These are protected by 5V transient voltage-suppression diodes.

To connect the Wiegand outputs, perform the following:

- 1 When using the single Internal antenna of the 6204, connect CH1 (3 wires) of the WIM to the Wiegand panel.
- 2 If using the External antenna, connect CH2 (3 wires) of the WIM to the Wiegand panel.
- 3 Refer to Figure 9 for the standard Wiegand color code as defined in the AC-01 Wiegand specification.

A.5.3. Connect the 24V Power

To connect 24V power, perform the following:

- 1 Using the black and red power harness supplied, connect one end of the black wire to Terminal 1 (**PGND**).
- 2 Connect one end of the red wire to Terminal 2 (**+24V**) of the **READER/POWER** connector.
- 3 Connect the remaining end of the red wire to the **+** output terminal.
- 4 Connect the remaining end of the black wire to the **–** output terminal of the PSU
- 5 Verify the connections.

A.5.4. Initial Testing

Initial testing is optional, but recommended. The purpose is to verify that the 24V PSU and Wiegand module power supply are operating correctly. Perform the following:

- 1 Ensure that the reader is disconnected from the umbilical cable by unlocking and removing the connector at the reader end.
- 2 Apply AC power to the PSU Module.
- 3 Using a Digital Multimeter (DMM) confirm that the output of the PSU lies in the range 21.6 to 26.4 VDC
- 4 Check that the **PWR LED** on the module is illuminated.
- 5 Using the DMM, measure the DC voltage between **PGND** and **RFU** on the **READER/POWER** connector. For correct operation, this should be between 4.75 and 5.25 VDC.
- 6 Disconnect the PSU and reconnect the umbilical cord to the reader.

A.6. Disconnecting the Wiegand Interface Module

In the event you wish to disconnect the WIM, perform the following:

- 1 Remove AC power from the PSU.
- 2 Disconnect the serial cable from the reader.
- 3 Restart the console service for the reader command line interface by sending the following command to the reader:

```
com.serial.console(program=cli)
```

A.7. Using RCT to Configure the Wiegand Interface Module

You can use the embedded Reader Configuration Tool to configure the WIM parameters. Perform the following:

Open RST

- 1 From your Windows desktop, select:

Start→Programs→3M→Reader Startup Tool (RST)

	Mac Address	IP Address	Host Name	Version	Model	Serial Number	Method (IPv4/IPv6)	Location	Zone	Subnet	Gateway
▶	00:17:9E:00:20:C6	10.1.1.111 fe80::217:9eff:fe00:20c6::6	00179E0020C6	3.3.trunk_rb_226	4100	0B067200FC439953	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
	00:17:9E:00:24:23	10.1.1.101 fe80::217:9eff:fe00:2423::6	00179E002423	3.3.22565	5100	2025200045451B0F	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
	00:17:9E:00:3C:16	10.1.1.71 fe80::217:9eff:fe00:3c16::6	00179E003C16	3.3.22565	5100	96EAE404034C7EF7	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
	00:17:9E:00:50:D0	10.1.1.86	00179E0050D0	3.3.22565	5100	96F924220024801E	dhcp/disabled	unknown	unknown	255.255.255.0	10.1.1.1 none
	00:17:9E:00:54:89	10.1.1.110	00179E005489	3.3.22565	5100	96F624220024A922	dhcp/disabled	unknown	unknown	255.255.255.0	10.1.1.1 none
	00:17:9E:00:57:9B	10.1.1.68	00179E00579B	3.3.22565	5100	96FB234600224C39	dhcp/disabled	unknown	unknown	255.255.255.0	10.1.1.1 none
	00:17:9E:00:57:FF	10.1.1.61	00179E0057FF	3.3.22565	5100	96F1234600220716	dhcp/disabled	unknown	unknown	255.255.255.0	10.1.1.1 none
	00:23:68:C2:CC:17	10.1.1.69 fe80::223:68ff:fec2:cc17::6	002368C2CC17	2.0.tb_22765	610	96078402008C090B	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
	00:17:9E:00:01:34	10.1.1.76 aa::205/64	510-000134.fsg	3.3.22659M_r	5204	044165008E43D36E	dhcp/static	unknown	unknown	255.255.255.0	10.1.1.1 none
	00:17:9E:BE:17:2F	10.1.1.56 fe80::217:9eff:febe:172f::6	610BE172F-DF	2.0.22729	610	96FD8402008C0C23	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
	00:23:68:C3:B4:5D	10.1.1.58 fe80::223:68ff:fec3:b45d::6	610C3B45D.fsg	2.0.mp_em61	610	96008402008C9F46	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
	40:83:DE:11:95:91	10.1.1.74	610EP3-000001	1.1.tb_22765	6204	96FCC4000308F6EC	dhcp/disabled	unknown	unknown	255.255.255.0	10.1.1.1 none
	00:17:9E:00:01:BE	10.1.1.59 fe80::217:9eff:fe00:1be/64	62040001BE.fsg	1.1.22280	6204	96FE8402008C9F12	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
	00:23:68:C3:B4:11	10.1.1.60 fe80::223:68ff:fec3:b411::6	9600C3B411.fsg	2.0.22807M_r	610	96FE8402008C9F46	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1

RST Version:5.0.22792.12572 Discovery Listen Address: 239.192.1.101

- 2 Select a specific reader and press **Configure**.
- 3 The Reader Configuration Tool (RCT) is displayed.



- 4 Press **Login** and log into the reader as **admin**. The initial password is **readeradmin**.

- 5 Select **Advanced Functions** → **Expert Configuration**.
- 6 Select the **Communication** tab.
- 7 Set **com.wiegand.enable** to **true** and press **Submit**.
- 8 Press the Back  key to return to **Expert Configuration** screen.

Expert Configuration

Setup Tag Version Information **Communication** Antennas Digital IO Modem Security

This page provides access to all the configuration information to the user. This page should only be used by an expert user. Assigning incorrect parameters on this page may cause your reader not to function properly.

Name	Value	?
com.event.overflow_backoff_time	3	?
com.llrp.antennas_disabled		?
com.wiegand.enable	true	?
com.wiegand.info		?
com.wiegand.1.control.send_data		?
com.wiegand.1.frame.data_index	24	?
com.wiegand.1.frame.data_length	24	?
com.wiegand.1.frame.endian_type	big_endian	?
com.wiegand.1.frame.format	standard_parity	?

- 9 Select the **Setup** tab.
- 10 Set **setup.operating_mode** to **active** and press **Submit**.
- 11 Press the Back  key to return to **Expert Configuration** screen.

Name	Value	?
setup.default_login_level	admin	?
setup.install_type	vehicle	?
setup.operating_mode	active	?

Save Reader Setup

Save reader setup information as a profile. If you need to reboot or power down a reader, the reader setup can be quickly reloaded by loading the profile.

12 Once setup is complete, save your settings in a **Profile**.

13 In the configuration header, press **Manage Profiles**.



14 The profile management page is displayed

Save reader configuration state and set new current profile as :

Profile Name	Activate	Delete	?
avi	Activate	Delete	?
portal	Activate	Delete	?

Factory Defaults

- ☒ Reset Factory Profile
- ☐ Stop All Embedded Applications
- ☐ Reset Serial Port
- ☐ Reset Network Interface Configuration

15 Enter a profile name in the box and press **Save**.

16 Your reader configuration will be saved under this profile name and can be quickly reloaded if the reader reboots or you lose your reader configuration.

17 To load a profile, press the **Activate** button next to the **Profile Name**.

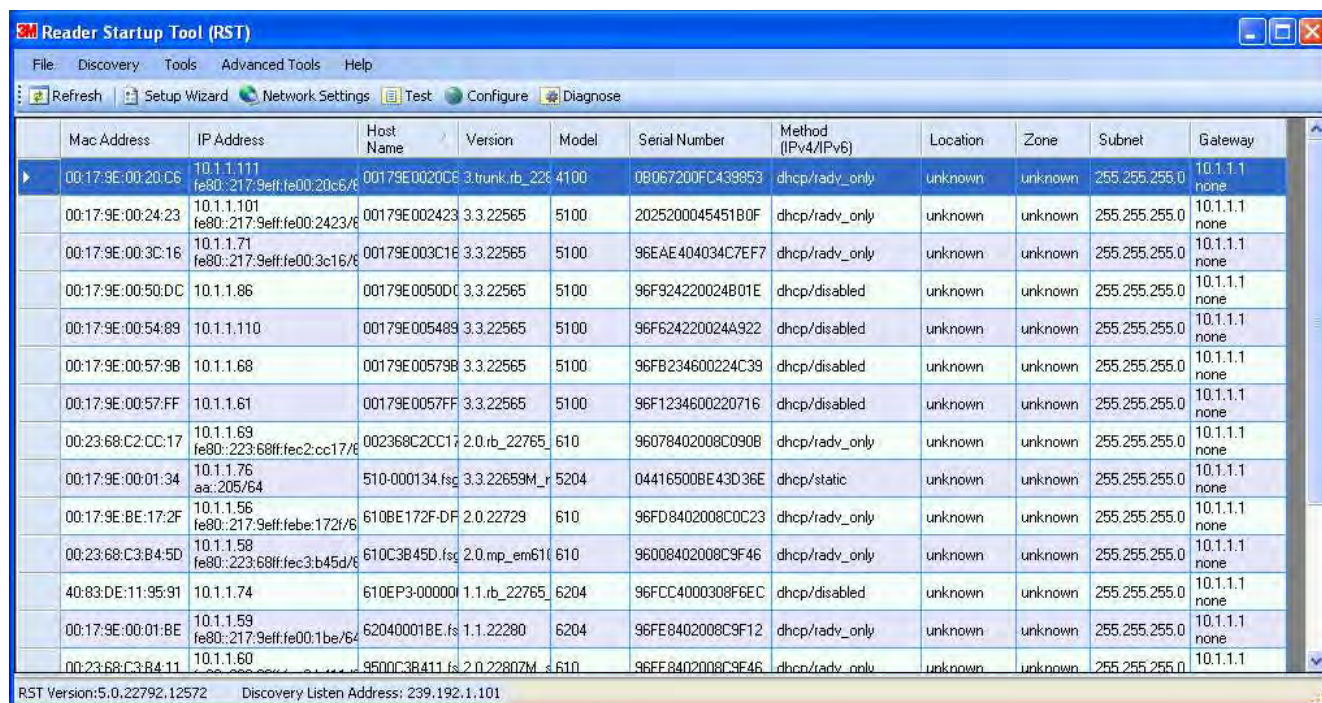
A.8. Converting Translation Tables for use with 6204

If you have translation tables, such as those developed for Sirit Identity MaX readers, these tables can be converted for use with the 3M Toll RFID Reader 6204 and Wiegand Interface Module.

For a Single Translation Table

- 1 From your Windows desktop, select:

Start→Programs→3M→Reader Startup Tool (RST)



The screenshot shows the Reader Startup Tool (RST) window with a menu bar (File, Discovery, Tools, Advanced Tools, Help) and a toolbar (Refresh, Setup Wizard, Network Settings, Test, Configure, Diagnose). Below the toolbar is a table with the following columns: Mac Address, IP Address, Host Name, Version, Model, Serial Number, Method (IPv4/IPv6), Location, Zone, Subnet, and Gateway. The table contains 15 rows of data, including entries for various MAC addresses and IP ranges. At the bottom of the window, it displays 'RST Version: 5.0.22792.12572' and 'Discovery Listen Address: 239.192.1.101'.

Mac Address	IP Address	Host Name	Version	Model	Serial Number	Method (IPv4/IPv6)	Location	Zone	Subnet	Gateway
00:17:9E:00:20:C6	10.1.1.111 fe80::217:9eff:fe00:20c6%	00179E0020C6	3.3.22565	4100	08067200FC439853	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
00:17:9E:00:24:23	10.1.1.101 fe80::217:9eff:fe00:2423%	00179E002423	3.3.22565	5100	202520004545180F	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
00:17:9E:00:3C:16	10.1.1.71 fe80::217:9eff:fe00:3c16%	00179E003C16	3.3.22565	5100	96EAE404034C7EF7	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
00:17:9E:00:50:DC	10.1.1.86	00179E0050DC	3.3.22565	5100	96F924220024B01E	dhcp/disabled	unknown	unknown	255.255.255.0	10.1.1.1 none
00:17:9E:00:54:89	10.1.1.110	00179E005489	3.3.22565	5100	96F624220024A922	dhcp/disabled	unknown	unknown	255.255.255.0	10.1.1.1 none
00:17:9E:00:57:98	10.1.1.68	00179E005798	3.3.22565	5100	96FB234600224C39	dhcp/disabled	unknown	unknown	255.255.255.0	10.1.1.1 none
00:17:9E:00:57:FF	10.1.1.61	00179E0057FF	3.3.22565	5100	96F1234600220716	dhcp/disabled	unknown	unknown	255.255.255.0	10.1.1.1 none
00:23:68:C2:CC:17	10.1.1.69 fe80::223:68ff:fec2:cc17%	002368C2CC17	2.0.rb_22765	610	96078402008C90B8	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
00:17:9E:00:01:34	10.1.1.76 aa:205/64	510-000134.fsg	3.3.22659M_r	5204	04416500BE43D36E	dhcp/static	unknown	unknown	255.255.255.0	10.1.1.1 none
00:17:9E:BE:17:2F	10.1.1.56 fe80::217:9eff:febe:172f%	610BE172F-DF	2.0.22729	610	96FD8402008C0C23	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
00:23:68:C3:B4:5D	10.1.1.58 fe80::223:68ff:fec3:b45d%	610C3B45D.fsg	2.0.mp_em610	610	96008402008C9F46	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
40:83:DE:11:95:91	10.1.1.74	610EP3-000001	1.1.rb_22765	6204	96FCC4000308F6EC	dhcp/disabled	unknown	unknown	255.255.255.0	10.1.1.1 none
00:17:9E:00:01:BE	10.1.1.59 fe80::217:9eff:fe00:1be/64	62040001BE.fsg	1.1.22280	6204	96FE8402008C9F12	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1 none
00:23:68:C3:B4:11	10.1.1.60	9500C3B411.fsg	2.0.22807M_r	610	96FE8402008C9F46	dhcp/radv_only	unknown	unknown	255.255.255.0	10.1.1.1

- 2 Press the **WTC** button under **Advanced Tools**.



The screenshot shows the Wiegand Translation Table Conversion Utility window. It has a menu bar (File, Discovery, Tools, Advanced Tools, Help) and a toolbar (Refresh, Setup Wizard, Network Settings, Test, Configure, Diagnose). Below the toolbar are three input fields: 'Input File:' with the path 'C:\3M\Toll RFID Reader 4100\Translation Tables', 'Output Location:' with the path 'C:\3M\Toll RFID Reader 4100\Translation Tables', and 'Output File:' with the name 'Translation Tables.csv'. To the right of each field is a 'Browse' button. At the bottom right is a 'Convert' button.

- 3 Enter the location and name of your input file, output file location, and output file name.
- 4 Press **Convert**.

For Multiple Translation Tables

- 1 If you have multiple translation tables to convert, perform the previous procedure for each table.
- 2 Create a new document using a text editor such as *Notepad*. This will be the main file used to build the combined translation table.
- 3 Start another session of the text editor (such as *Notepad*) to open one of the converted translation tables.
- 4 Copy the contents and paste them into the main file. (The converted translation tables have a **.csv** extension. Do not open these by double-clicking, as this will invoke Excel).
- 5 Repeat Step 3 for all converted tables.
- 6 Use care to not replicate the same information multiple times. Edit the main file if necessary to eliminate duplications.
- 7 Save the main file, giving it a **.csv** extension.

A.9. Importing/Exporting a Translation Table

To load or import a translation table, perform the following:

- 1 Under the **Advanced Functions**, select **Import/Export Configuration**.

The screenshot shows a software interface with two sections. The top section is titled 'Import Wiegand Translation Table' and contains the text 'This section is for importing of a Wiegand translation table to the reader.' Below this text is a label 'Translation Table file:' followed by a text input field and a 'Browse...' button. Below the input field is an 'Import Translation Table' button. The bottom section is titled 'Export Wiegand Translation Table' and contains the text 'This section is for exporting of the Wiegand Translation Table from the reader.' Below this text is an 'Export Translation Table' button.

- 2 Under **Import Wiegand Translation Table**, press **Browse** and navigate to the location of your translation tables.
- 3 Select the translation table file name and press **Import Translation Table**.
- 4 To export the translation table, press **Export Translation Table**.
- 5 Save the file as needed.

A.10. Programming the Wiegand Interface

The WIM may be configured in hardware to contain two or four Wiegand channels. Each channel can be individually configured and controlled.

In the following variable and function descriptions **<n>** will refer to a generic Wiegand channel. Valid values include **1, 2** (Wiegand channels 1, 2) for all systems and **3, 4** (Wiegand channels 3, 4) for four channel modules. (See Module Type 0x14 in the **com.wiegand.info** variable description). A channel value falling out of range should generate an error.

For this system, Wiegand channel **1** is associated with the Internal antenna and Wiegand channel **2** is associated with the External antenna.

com.wiegand.dealer_code_list

This variable is used to configure a string of dealer codes.

A Dealer Code List can be configured with one or more Dealer Codes, each separated by a "space". Authenticated secure tags containing a Dealer Code which matches a value in the Dealer Code List will be forwarded to the Wiegand interface. Authenticated secure tags containing a Dealer Code that does not match a value in the Dealer Code List will be blocked. Dealer Code filtering does not apply to legacy tags. Dealer Code filtering can be disabled by specifying a blank Dealer Code List.

Type	var
Permissions	guest=r,admin=rw
Data Type	string
Default	""

com.wiegand.dealer_code_list

This variable provides a space-separated list of dealer codes used by Wiegand application to filter out tags. Empty list means no dealer code is used.

Type	var
Permissions	guest=r,admin=rw
Data Type	string
Default	""

com.wiegand.enable

This variable enables/disables the WIM.

Type	var
Permissions	guest=r,admin=rw
Data Type	bool
Default	false

com.wiegand.events_only

If this variable is set to true, WIMApp will run and use the translation table, but will not actually communicate with a Wiegand Interface Module over the serial port. event.wim.report events are generated, and this is the only output from WIMAPP.

This mode is intended to be used in order to allow WIMAPP to perform access control functionality using the translation table as a whitelist. When false, WIMAPP attempts to communicate with the Wiegand Interface Module on the serial port and will not function properly if this communication is impossible.

Type	var
Permissions	guest=r,admin=rw
Data Type	bool
Default	true

com.wiegand.export_table

Export translation table of the Wiegand module to /tmp/wim/table.

Type	function
Permissions	guest=-,admin=x

com.wiegand.id_format

If this variable is set to HEXADECEIMAL, the full wiegand ID will be displayed as a single hexadecimal number in the wiegand_id field of tag reports. If this variable is set to FORMATTED, the wiegand ID will be split into facility code and serial number portions, and each field will be displayed in decimal notation (i.e. 123-4567) in the wiegand_id field of tag report events.

Type	var
Permissions	guest=r,admin=rw
Data Type	enum
Default	FORMATTED
Enum	HEXADECEIMAL FORMATTED

com.wiegand.import_table

Import translation table of the Wiegand module.

Type	function
Permissions	guest=,admin=x
Parameters	file (string)

com.wiegand.info

This variable returns a string containing information about the WIM, such as number of channels (channels), firmware version number (firmware_version) and serial number (serial_no).

```
>>> com.wiegand.info()
ok channels=4, firmware_version=0.25,
serial_no=0x1122334455667788
```

Type	var
Permissions	guest=r,admin=rw
Data Type	string
Default	""

com.wiegand.reset

This function resets the WIM.

Type	function
Permissions	guest=-,admin=x

com.wiegand.retransmission_interval

This variable provides the facility for a Wiegand stream to be retransmitted at defined periodic intervals for the time a tag resides in the RF field. This variable defines the interval in seconds. A value of 0 disables the retransmission mechanism.

Type	var
Permissions	guest=r,admin=rw
Data Type	int
Default	0
Min	0
Max	300

com.wiegand.<n>.control.send_data

This variable sends data to the Wiegand interface. The data is specified in hexadecimal form (for example, 0XXXXXXXXXXXXXXXXX) and represents a value of up-to 8 bytes. The data will typically represent a translated ID. n = 1 to 4.

Type	var
Permissions	guest=r,admin=rw
Data Type	string
Default	""

com.wiegand.<n>.control.send_test_pattern

Send a fixed, predetermined test pattern to the Wiegand channel.
n = 1 to 4.

Type	function
Permissions	guest=.,admin=x

com.wiegand.<n>.frame.data_index

This variable sets or interrogates the data index. This is the index, in bits, where serialization of the translated ID begins (for discarding unused/redundant translated ID bits, for example Dealer Code). n = 1 to 4.

Type	var
Permissions	guest=rw,admin=rw
Data Type	int
Default	24
Min	0
Max	255

com.wiegand.<n>.frame.data_length

This variable sets or interrogates the data length of the Wiegand frame. This defines the total number of bits (excluding parity bits) of a translated ID that will be transmitted over the Wiegand interface. n = 1 to 4.

Type	var
Permissions	guest=r,admin=rw
Data Type	int
Default	24
Min	1
Max	112

com.wiegand.<n>.frame.endian_type

This variable sets or interrogates the endian type of the Wiegand output frame. This defines whether the most-significant, or least-significant bit of the selected portion of the translated ID will be transmitted first. n = 1 to 4.

Type	var
Permissions	guest=r,admin=rw
Data Type	enum
Default	BIG_ENDIAN
Enum	BIG_ENDIAN LITTLE_ENDIAN

com.wiegand.<n>.frame.fc_length

This variable is used to set or interrogate the length of the facility code portion of the Wiegand ID. The serial number length of the ID is implied by the difference between com.wiegand.X.frame.data_length and the corresponding fc_length. This field is used when the wiegand data is presented in FORMATTED mode (see com.wiegand.id_format). n = 1 to 4.

Type	var
Permissions	guest=r,admin=rw
Data Type	int
Default	8
Min	0
Max	112

com.wiegand.<n>.frame.format

This variable sets or interrogates the frame format of the Wiegand output. n = 1 to 4.

Type	var
Permissions	guest=r,admin=rw
Data Type	enum
Default	STANDARD_PARITY
Enum	STANDARD_PARITY REVERSE_PARITY CHECKSUM RAW_DATA

com.wiegand.<n>.physical.thold

This variable is used to set or to interrogate the inter-frame hold-off time (Thold), where the inter-frame hold-off time is specified in milliseconds. Values of 50 to 20,000 ms are valid. The default value is 250 ms. The variable will return a value in the range 50 to 20,000 ms. n = 1 to 4.

Note that the WIM has a granularity of 50 ms and hold-off times will be truncated to the nearest 50 ms.

Type	var
Permissions	guest=r,admin=rw
Data Type	int
Default	5
Min	50
Max	20000

com.wiegand.<n>.physical.tpi

This variable is used to set or interrogate the pulse interval time, where the pulse interval time is specified in microseconds. Values of 200 μ s to 20,000 μ s are valid. The default value is 2000 μ s. The variable will return a value in the range 200 to 20,000 μ s. n = 1 to 4.

Note that the WIM has a granularity of 200 μ s. Therefore, pulse_interval_times will be truncated to the nearest 200 μ s.

Type	var
Permissions	guest=r,admin=rw
Data Type	int
Default	2000
Min	200
Max	20000

com.wiegand.<n>.physical.tpw

This variable is used to set or to interrogate the pulse width time (Tp_w), where the pulse width time is specified in microseconds. Values of 40 to 250 μ s are valid. The default value is 50 μ s. The variable will return a value in the range 40 to 250 μ s. n = 1 to 4.

Note that the WIM has a granularity of 5 μ s and pulse_width_times will be truncated to the nearest 5 μ s.

Also note that these are nominal time values for 470 Ω pull-up loads on the Wiegand outputs. The pulse width time lengthens for higher values of pull-ups, and shortens for lower values. This phenomenon is caused by Miller capacitance on the loads. The 5 μ s granularity on the pulse_width_time can be used to tailor the pulse width to the required value.

Type	var
Permissions	guest=r,admin=rw
Data Type	int
Default	50
Min	40
Max	255

error.wiegand.failure

This response indicates WIM function failed.

event.wim.report

This event is generated each time data is sent to the WIM interface. The event returns the translated ID, timestamp, and antenna value

Type	event
Permissions	guest=rw,admin=rw
Return Values	id (int) time (string) text (string)

definitions.enum.wiegand.frame.endian_type

This variable sets wiegand module output frame endian type.

Type	var
Permissions	guest=,admin=
Data Type	enum
Default	BIG_ENDIAN
Enum	BIG_ENDIAN LITTLE_ENDIAN

definitions.enum.wiegand.frame.format

This variable sets wiegand module output frame format.

Type	var
Permissions	guest=,admin=
Data Type	enum
Default	STANDARD_PARITY
Enum	STANDARD_PARITY REVERSE_PARITY CHECKSUM RAW_DATA

A.11. Programming the Translation Table

The 6204 has a translation table facility that allows a translation table to be imported into the reader. This facility serves three primary functions:

- Support the use of legacy tags.
- Manage exceptions, such as the black-listing of tags.
- Serve as the list of allowed (and/or black-listed) tags for a standalone access control system (See Standalone Reader Operation Application Note).

A.11.1. Translation Table Format

The translation table uses a comma-separated variable (csv) format and will typically have a .csv extension. The first line of the file must contain the version number of the file format.

Currently the file format version is 1.0. The second line of the file may optionally contain a string **FC_LEN=X,SNR_LEN=Y**, where **X** and **Y** are the facility code and serial number bit lengths respectively. If present, this line indicates how any decimal translated IDs in the rest of the file shall be interpreted (i.e. how many bits are represented by each field). If not present, a facility code length of 8 bits and a serial number length of 16 bits is assumed. Note that currently the web interface (RCT) does not generate this optional line, so any web-entered decimal Wiegand data assumes these default bit field lengths.

Each subsequent line of the file represents a sequence of tags and has the following format:

[StartID], [TagType], [StartXlateID], [Entries], [Handler]<CR><LF>

where:

[StartID] is the first tag ID of a sequence of tag IDs. In most cases, this is a hexadecimal number, preceded by **0x**. If the tag protocol is configured to display tag IDs in 6 bit ASCII format, this is the ASCII string representing the starting tag ID. In the ASCII tag case, this is typically a 4 letter identifier followed by a 8 digit decimal number.

[TagType] is the tag protocol type. This must be one of the protocols supported by the reader, for example, ISOC or ISOB.

[StartXlateID] is the first translated ID of a sequence of translated IDs. The number is preceded by **0x**. This value may be in hexadecimal format (if preceded by 0x), or in decimal format with facility code and serial number separated by a dash (i.e. "123-4567").

[Entries] is presented as a decimal number representing the number of tags in the sequence.

Note: Maximum Number of FC and SNR Values

When populating the translation table, specify only values that can be expressed in the number of bits used for Facility Code (FC) and Serial Number (SNR).

For example, if 16 bit serial numbers are used, then only serial numbers in the range of 0 through 65535 should be specified in the table.

A.12. Interaction between Translation Table and Wiegand-Encoded Tags

Some tags are encoded with Wiegand data directly on them. The 3M Toll RFID Reader 6204 supports these direct Wiegand encoded tags of the following format:

- Secure ISOC
- ISOB
- ISO10374 (if supported by your model of 6204)
- Flex (if supported by your model of 6204)

Because of the security features present on direct Wiegand encoded Secure ISOC tags, they can be positively identified, and the Wiegand data encoded on the tag is transmitted via the WIM. For each of the other protocols, some C2 variables are used to enable the direct Wiegand feature on a protocol-by-protocol basis:

- `modem.protocol.isob.control.wiegand.enabled`
- `modem.protocol.iso10374.control.wiegand.enabled`
- `modem.protocol.flex.control.wiegand.enabled`

When these variables are set to "true", WIMapp will perform the following actions when a tag is read:

1. The standard tag ID will be looked up in the translation table (described above). If there is an entry matching the tag ID in the translation table, the action specified by the translation table entry will be performed.
2. If the tag ID is not present in the translation table, and if the direct Wiegand feature is enabled via the variables above, then the Wiegand data encoded on the tag will be transmitted via the WIM.

Although the default values are correct for most installations, and should not be changed without consulting 3M technical support, it is possible to modify the areas in tag memory from which the Wiegand data is extracted by changing the following variables:

- `modem.protocol.isob.control.wiegand.length`
- `modem.protocol.isob.control.wiegand.offset`
- `modem.protocol.iso10374.control.wiegand.length`
- `modem.protocol.iso10374.control.wiegand.offset`
- `modem.protocol.flex.control.wiegand.length`
- `modem.protocol.flex.control.wiegand.offset`

A.13. Transaction Log

A transaction log is used to record information on tag arrivals. Each entry in the log contains the following information:-

[time] – provides the date and time of the tag arrival.

[tag_id] – ID of the tag.

[antenna] – states the antenna where the tag was read.

[handle] – 8-bit values that provide information about a tag upon its arrival. The bit values are defined as:

- Bit 7 Password Authentication
 - 1 = Password Authenticated
 - 0 = Not Password Authenticated
- Bit 6 Blacklist Indicator
 - 1 = Blacklisted
 - 0 = Not Blacklisted
- Bit 5 TID-Authentication
 - 1 = TID Authenticated
 - 0 = Not TID Authenticated
- Bit 4 User Data Read Failure
 - 1 = Failed To Read User Data
 - 0 = User Data Read (for authenticated tag)
(or) Not Applicable (for legacy tag)
- Bit 3 Dealer Code Mismatch
 - 1 = Dealer Code Mismatch
 - 0 = Dealer Code Match (for authenticated tag)
(or) Not Applicable (for legacy tag)
- Bit 2 RFU
- Bit 1 RFU
- Bit 0 Wiegand Access
 - 1 = Translated ID passed to Wiegand interface.
 - 0 = No data passed to Wiegand interface.

[type] – tag protocol type

[translated_id] – hexadecimal value of the translated tag ID (result of the translation table lookup).

A.14. Module Specifications

Operating Temperature Range	-40C to +60C
Storage Temperature Range	-40C to +85C
DC Power Input	12V-28V DC reverse polarity protected
Total Power Consumption	<1.25W (equivalent to <60mA @ 24VDC)
RS-232 Serial Port	115,200 Baud, 8 Bits, No Parity, 1 Stop Bit
Wiegand Port	Data Zero and Data One outputs
Configuration type	5Y (See App A of AC-01 Wiegand Specification)
Outputs	Optically isolated open-collector outputs capable of sinking 25mA These outputs will need to be pulled up to 5V at the inputs of the terminating Wiegand panel. Optimum pull-up resistor values lie in the range 470Ω to 1kΩ.
Tpw (Output Pulse Width)	40 μs -255μs in 5μs increments (with 470Ω pull-up resistor)
Tpi (Output Pulse Interval)	200μs to 20ms in 200μs steps
Hold-off time	50ms-20s in 50ms steps

B 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 3M support.

B.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_CLOSED_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 3M 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 3M 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 3M support.
MDM_SYNTHESIZER_LOCK_FAIL	event.error. radio	Synthesizer can't lock to desired frequency.	Perform reader reboot. If condition persists, contact 3M support.
MDM_TEMPERATURE_SENSOR_FAIL	event.error.hw	Temperature sensor unable to detect temperature.	Perform reader reboot. If condition persists, contact 3M 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 3M support.
SEEPROM_UNABLE_TO_WRITE	event.error.hw	Unable to write to SEEPROM.	Perform reader reboot. If condition persists, contact 3M support.

B.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 3M support.
DATA_FORMAT_ERROR	event.error.sw	An error is detected in the data format.	Perform reader reboot. If condition persists, contact 3M support.
DEVICE_INIT_FAILURE	event.error.sw	Error initializing a device in the system.	Perform reader reboot. If condition persists, contact 3M 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 than 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 3M support.
INDEX_OUT_OF_BOUNDS	event.error.sw	Software is indexing beyond end of array.	If condition persists, contact 3M support.
INVALID_ARGUMENT	event.error.sw	Argument of an internal command is invalid.	If condition persists, contact 3M support.
IOP_CONMGR_INVALID_CMDRESP_FD	event.error.communication	Unknown command channel being closed.	Perform reader reboot. If condition persists, contact 3M support.
IOP_CONMGR_INVALID_EVENT_FD	event.error.communication	Unknown event channel being closed.	Perform reader reboot. If condition persists, contact 3M support.
IOP_HB_MODEM_NOT_RESPONDING	event.error.hw	Modem not responding to keepalives from main processor.	If condition persists, contact 3M 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 sequence.	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 3M 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 3M support.
IOP_IPRC_TRY_AGAIN	event.error.communication	No data available from the modem processor.	Perform reader reboot. If condition persists, contact 3M support.

Major Error	Event	Description	Corrective Action
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 3M support.
IOP_SPI_BAD_VERIFY	event.error. communication	Verification of data in SPI FLASH failed.	Contact 3M 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 3M 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 3M support.
MDM_ADC_DEVICE_FAILURE	event.error.hw	The ADC device on the modem has generated an error.	If condition persists, contact 3M support.
MDM_ANTENNA_CHECK_FAILURE	event.error. antenna	The reader cannot perform an antenna check.	If condition persists, contact 3M support.
MDM_CALIBRATION_IQ_DATA_CORRUPT	event.error.hw	Invalid transmit offset calibration data found on the reader flash.	Contact 3M support.
MDM_CALIBRATION_IQ_DATA_MISSING	event.error.hw	Unable to find valid transmit offset calibration data from the reader flash.	Contact 3M support.
MDM_CALIBRATION_TX_DATA_CORRUPT	event.error.hw	Invalid transmit power calibration data found on the reader flash.	Contact 3M support.
MDM_CALIBRATION_TX_DATA_MISSING	event.error.hw	Unable to find valid transmit power calibration data from the reader flash.	Contact 3M support.
MDM_CNR_CLOSED_LOOP_FAILED	event.error.radio	CNR closed loop control failed.	If condition persists, contact 3M support.
MDM_CNR_UPDATE_WITH_TXOFF	event.error.sw	An error is occurred when CNR update with transmission turned off.	If condition persists, contact 3M support.
MDM_FPGA_LOAD_FAILURE	event.error.hw	Unable to load FPGA device on the modem.	If condition persists, contact 3M support.
MDM_FPGA_RAMTEST_FAILURE	event.error.hw	FPGA device on the modem failed RAM test.	If condition persists, contact 3M support.
MDM_FPGA_RESET_FAILURE	event.error.hw	FPGA device on the modem cannot be reset.	If condition persists, contact 3M support.
MDM_FPGA_TIMEOUT_FAILURE	event.error.hw	PPI bus stopped unexpectedly	If condition persists, contact 3M support.
MDM_FPGA_TIMEOUT_WARNING	event.error.hw	Timeout waiting on FPGA SPI bus.	If condition persists, contact 3M support.

Major Error	Event	Description	Corrective Action
MDM_ICM_ERROR	event.error.communication	An inter-core message response on the modem has an error.	Contact 3M support.
MDM_ICM_TIMEOUT	event.error.communication	An inter-core message response on the modem has timed out.	Contact 3M support.
MDM_INVALID_RX_COMB_LENGTH	event.error.sw	Invalid receiver filter length is detected.	Contact 3M support.
MDM_INVALID_RX_Q_CHANNEL_COEFS	event.error.sw	Invalid receiver filter coefficient is detected.	Contact 3M 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 3M 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 3M support.
MDM_IPRC_TRY_AGAIN	event.error.communication	Modem communication buffer that receives data from the main processor has no full message yet.	Contact 3M support.
MDM_L1_TX_PACKET_TIMEOUT	event.error.communication	Lowest level physical layer transmit process timed out.	Contact 3M 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 3M specifications. If condition persists, contact 3M support.
MDM_MINIMUM_GAIN_LIMIT	event.error.sw	Receiver gain limit is exceeded.	Contact 3M support.
MDM_PHY_ENCODER_TIMEOUT	event.error.hw	The modem transmitter has failed to complete a transmission.	If condition persists, contact 3M support.
MDM_PPI_DEVICE_FAILURE	event.error.hw	The PPI interface has generated an error.	Contact 3M support.
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 3M support.

Major Error	Event	Description	Corrective Action
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 3M specifications. If condition persists, contact 3M support.
MDM_RX_TRAIN_TIMEOUT	event.error.sw	The modem has exceeded the receiver training time limit.	If condition persists, contact 3M support.
MDM_UNKNOWN_PROTOCOL	event.error.sw	The modem detected an unsupported protocol.	If condition persists, contact 3M support.
MDM_UNKNOWN_TX_INTERP_RATE	event.error.sw	The modem detected an unsupported transmit interpolation rate.	Contact 3M support.
MDM_UNKNOWN_TX_TEST_MODE	event.error.sw	The modem detected an unsupported transmit test mode.	Contact 3M support.
MDM_UNKNOWN_TX_WAVEFORM_TYPE	event.error.sw	The modem detected an unsupported transmit waveform.	Contact 3M support.
SPARSE_ARRAY_BOUNDS_CHECK	event.error.sw	Software attempted to index beyond the limits of the sparse array.	Contact 3M 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 3M 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.

B.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.
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.

Warnings	Event	Description	Corrective Action
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.
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_FACTORY_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_NETWORK_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_SERIAL_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_SERIAL_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_SERIAL_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_INVALID	event.warning.sw	Default value is invalid for the symbol.	None required.
SYMBOL_TABLE_FAILED_TO_RESTORE	event.warning.configuration	Indicates a failure in restoring the configurations.	None required.
SYMBOL_TABLE_FAILED_TO_SAVE	event.warning.configuration	Indicates a failure to save the configurations.	None required.

Warnings	Event	Description	Corrective Action
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.

B.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.
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.

Message	Event	Description
READER_RESET_BY_FP_SWIT CH	event.info	Indicates the reader being reset by hardware reset

c.1. Visually Inspect all Readers and Antennas (6 months)

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

c.2. 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.

c.3. 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. See Chapter 8 – Specifications for detailed information.

c.4. 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.

c.5. 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.

c.6. 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.

