

## MTI RFID Explorer User Manual Version 1.0.0

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# **1** Introduction

## **1.1 Overview**

Explorer application is a .NET-based graphical user interface (GUI) tool. It can exercise the functionality of the reader platform, a platform that is based on the MTI R1000 chip, and firmware respectively. Explorer also support test functions to confirm the performance.

# **2** Explorer Installation

## 2.1 Installation Requirements

Explorer relies on release 2.0 of the Microsoft .Net Framework. The Explorer setup program checks to ensure that the correct version of the .Net Framework is installed. If the correct version is not installed, the Explorer setup program offers to install it. The user may also download and install a copy of the .Net Framework from the Microsoft Windows Update Site (<u>http://update.microsoft.com/</u>) or the Microsoft Download Center (<u>http://www.microsoft.com/downloads/</u>).

To take advantage of the data import/export feature, Microsoft Excel 2003 is required.

### 2.2 Installation

It is possible for multiple versions of Explorer to co-exist on a single system, so long as a unique install path is used for each, such as the default installation directory.

### 2.2.1 Installation Procedure

To install the Explorer tool:

- 1. Double click the Explorer installer file, MTI RFID Explorer [Version].msi, to launch the installation wizard.
- 2. When prompted, designate the desired installation directory. The default is [Program Files]\MTI\MTI RFID Explorer [version]\.
- 3. Installation includes the C++ runtime libraries and adds a desktop shortcut to the Explorer application.
- 4. To Start the Explorer application:
  - Double click the desktop shortcut, or Use the Start Menu. For example, if installed to the default directory:
     Click Start Select All Programs MTL MTL RFID Explorer [version]. Click
    - Click Start, Select All Programs, MTI, MTI RFID Explorer [version], Click Explorer.
  - $\circ$  ~ Open the Explorer installation folder and double click Explorer.exe.

#### 2.2.2 Removal Procedure

To uninstall the Explorer tool:

- 1. Click Start, Select All Programs, MTI, MTI RFID Explorer [version], Click Uninstall Explorer.
- 2. When prompted to uninstall this product, click **Yes**.

Alternatively:

- 1. Open the Control Panel and select Add or Remove Programs.
- 2. Select the entry for the Explorer version to uninstall and click Change/Remove.
- 3. When prompted to remove this product, click **Yes**.

#### 2.2.3 Configuring for Serial Operation

- 1. Open Explorer and select "Tools", "Set COM port" option in the tool bar.
- 2. Type COM port number.
- 3. Click Set.
- 4. Select Yes or No.

This window contains the COM port number. Explorer will use this number to connect the device. If this setting is changed, Explorer will close. With Serial operation, only a single reader can be controlled.

	MTI RFID Explorer					
	<u>F</u> ile <u>E</u> dit <u>V</u> iew Reader C	ols <u>H</u> elp				
			<u>E</u> xplorer Options			
	: 🐃 Run Inventory Invent	ory Once	Set COM port	2 <sup>tlear</sup>		
	Standard View		RF Test			
	ISO 18000-6C Inventory (PC - EF	°C - CRC	Return Loss	Current ( Read Co		
Set COM port						

Figure 1: Select COM port

# **3 Explorer Usage**

This section describes the features of the Explorer Application.

Explorer has been adapted with reader platform differences in mind. Consequently, Explorer supports the RU-861-based reader, hereafter referred to as the reader.

### **3.1 Explorer Appearance**

The Explorer consists of a main display window See figure below.

- The main window contains a menu and a main display area used to show different views of the data received from the reader.
- The control bar is used to start, stop, and pause inventory rounds, and to perform other reader actions.

💽 MTI RFID Explorer 📃 🗖 🔀					
<u>File Edit V</u> iew Reader Control <u>I</u> ools <u>H</u> elp	Too	l Bar			
Run Inventory Inventory Once Access Tag Stor	Pause Abort Cl	ear Cont	rol Bar		
Standard View					
ISO 18000-6C Inventory (PC - EPC - CRC)	Read Count	Current Cycle Read Count	Antenna 0	Ante	
34-00-E2-00-90-02-51-19-01-38-22-00-30-F5-E2-0C	593	593	593		
		Status	Bar	2	
	_	Status		~	
Retry Count - Inventory Rules - Device: UART-0	000 W	Jorking	Inventor	ied 25	

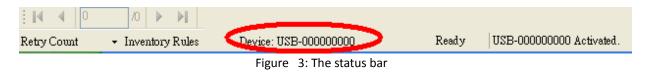
Figure 2: Explorer User Interface Main Window.

### 3.2 Detect a Device and Select a Mode

### 3.2.1 Detect a Device

When the Explorer application starts, it attempts to open one attached readers. Explorer detects USB Interface first. If no reader is found by USB, Explorer starts to detect the serial port.

If any reader is found, it shows **Device Interface** (USB or Serial) and **serial number**. Otherwise, it shows "No Device".



### 3.3 Controlling a Device

After detecting the reader, you can control the reader from the **Reader Control** menu or from the **Control Bar**. The figure below shows the **Control Bar** buttons and describes the actions they perform.

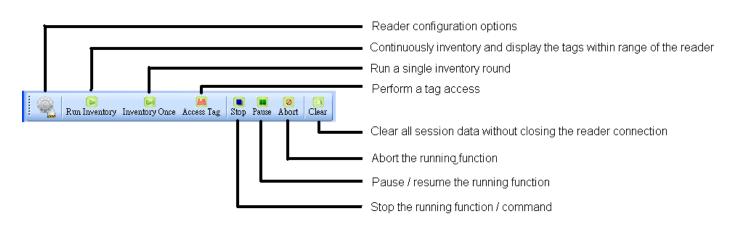


Figure 4: Reader Control bar

### 3.3.1 Inventory Rules

The Activate Select Rules and Active Post-Singulation Rules checkboxes control whether the select and post singulation criteria that have been configured should be utilized during inventory operations.



### 3.3.2 Tag Access

Selecting the **Tag Access** option presents the user with the configuration dialog shown in the figure below. :

Access Type Read   Memory Bank EPC   Offset (h) 0   Count 1   Accesss Pwd (h)   0     Image: Content of the select Rules		Access
Memory Bank EPC  Offset (h) Count 1  Accesss Pwd (h) 0		
Offset (h) 0 Count 1		
Count 1	EPC	lemory Bank
Accesss Pwd (h) 0	0	ffset (h)
Accesss Pwd (h) 0	1	ount
	0	ocean Rud (h)
Activate Select Rules	0	ccess rwa (n)
OK Cancel Activate Post-Singulation Rules	Cancel	OK

Figure 6: Tag Access dialog box, Access Type Read selected

From the **Tag Access** dialog box, the user can perform many different access operations against tags as follows.

The Activate Select Rules and Active Post-Singulation Rules checkboxes control whether the select and post singulation criteria that have been configured should be utilized during read, write, and similar operations.

#### 3.3.2.1 Access Type Read

Selecting the **Read** Access Type option displays the configuration dialog shown in the figure above.

From this dialog, the user can perform a read operation against tags and can provide the following configurable parameters:

- **Memory Bank**—the target for the read operation, has selectable values of either the EPC, TID, User, or Reserved memory bank
- **Offset**—the offset in hexadecimal of the first 16-bit word to read from the target memory bank
- **Count**—the number of 16-bit words to read, starting at **Offset**
- Access Pwd—the previously applied access password for the target tag, or no entry for tags with no access permissions

Output from read operations is directed to the primary application window.

#### **3.3.2.2** Access Type Write

Selecting the **Write** Access Type option displays the configuration dialog shown in the figure below.

Tag Access		
Ассезз Туре	Write 💌 💙	
Memory Bank	EPC 🔽	
Offset (h)	0	
Count	1	
Value 1 (h)	0	
Value 2 (h)	0	
Accesss Pwd (h)	0	
		Activate Select Rules
OK	Cancel	Activate Post-Singulation Rules

Figure 7: Tag Access dialog box, Access Type Write selected

From this dialog, the user can perform a write operation against tags and can provide the following configurable parameters:

- Memory Bank—the target for the write operation, has selectable values of either the EPC, TID, User, or Reserved memory bank
- **Offset**—the offset in hexadecimal of the first 16-bit word to write from the target memory bank
- **Count**—the number of 16-bit words to read, starting at **Offset**
- Value 1—the hexadecimal value of the 16-bit word to write at Offset
- Value 2—the hexadecimal value of the 16-bit word to write at Offset+1, applicable if Count is 2
- Access Pwd—the previously applied access password for the target tag, or no entry for tags with no access permissions

Output from write operations is directed to the primary application window.

#### **3.3.2.3 3.3.1.3Access Type Kill**

The kill operation allows the user to render any tag with a matching access and kill password as permanently non-functional. Selecting the **Kill** Access Type option displays the configuration dialog shown in the figure below.

Tag Access		×
Access Type	Kill	
Accesss Pwd (h)	0	
Kill Pwd (h)	0	
		Activate Select Rules
OK	Cancel	Activate Post-Singulation Rules

Figure 8: Tag Access dialog box, Access Type Kill selected

**Note:** Tags with a value of zero for their password are not expected to respond to the kill command.

#### 3.3.2.4 Access Type Lock

The lock operation allows the user to specify the desired exposure of tag kill and access password permissions. It also allows the user to specify write permission and condition levels for the EPC, TID, and User memory banks. Selecting the **Lock** Access Type option displays the dialog box shown in the figure below.

Tag Access				
Ассезз Туре	Lock 💌			
		Permissions		
		Kill Pwd	ACCESSIBLE	*
		Access Pwd	ACCESSIBLE	~
		EPC Bank	WRITEABLE	~
		TID Bank	WRITEABLE	~
Accesss Pwd (h)	0	User Bank	WRITEABLE	~
OK	Cancel	Activate Se	lect Rules ost-Singulation Rules	

Figure 9: Tag Access dialog box, Access Type Lock selected

Note that all permissions are set in a single operation. In many circumstances, it may be desirable to leave one or more of the target passwords or permissions in an unmodified state. To do this, select the NO\_CHANGE option for those targets.

#### 3.3.2.5 Access Type BlockWrite

Selecting the **BlockWrite** Access Type option displays the configuration dialog shown in the figure below.

Tag Access		×
Access Type	Block Write 💌 🐱	
Memory Bank	EPC 🔽	
Offset (h)	0	
Count	1	
Value 1 (h)	0	
Value 2 (h)	0	
Accesss Pwd (h)	0	
		Activate Select Rules
OK	Cancel	Activate Post-Singulation Rules

Figure 10: Tag Access dialog box, Access Type BlockWrite selected

From this dialog, the user can perform a block write operation against tags and can provide the following configurable parameters:

- **Memory Bank**—the target for the read operation, has selectable values of either the EPC, TID, User, or Reserved memory bank
- **Offset**—the offset in hexadecimal of the first 16-bit word to read from the target memory bank
- **Count**—the number of 16-bit words to read, starting at **Offset**
- Value 1—the hexadecimal value of the 16-bit word to write at Offset
- Value 2—the hexadecimal value of the 16-bit word to write at Offset+1, applicable if Count is 2.
- Access Pwd—the previously applied access password for the target tag, or no entry for tags with no access permissions

Output from block write operations is directed to the primary application window.

#### 3.3.2.6 Access Type BlockErase

Selecting the **BlockErase** Access Type option displays the configuration dialog shown in the figure below.

Tag Access		
Ассезз Туре	BlockErase 🛛 🐱	
Memory Bank	EPC 🔽	
Offset (h)	0	
Count	1	
Accesss Pwd (h)	0	
OK	Cancel	Activate Select Rules Activate Post-Singulation Rules

Figure 11: Tag Access dialog box, Access Type BlockErase selected

From this dialog, the user can perform a read operation against tags and can provide the following configurable parameters:

- **Memory Bank**—the target for the read operation, has selectable values of either the EPC, TID, User, or Reserved memory bank
- **Offset**—the offset in hexadecimal of the first 16-bit word to erase in the target memory bank
- **Count**—the number of 16-bit words to erase, starting at **Offset**
- Access Pwd—the previously applied access password for the target tag, or no entry for tags with no access permissions

Output from block erase operations is directed to the primary application window.

### 3.4 RFID Data Views

#### 3.4.1 Overview

The Explorer provides several views that allow users to examine RFID data from different perspectives. Use the **View** menu (on the main window) to select different views.

Explorer provides two types of data views:

- Live data views, which are captured in real-time from the reader
- Post-capture views, which are generated after an operation is completed

The live data views display data as the packets arrive from the reader. The application applies minimal processing to this live data. The following table describes the three live data views that are available.

Table 1: Live Data Views		
View Name	Contents	
Summary View	Overview statistics about the current session, currently	
	executing command and reporting time slice.	
Standard View	A list of unique tag singulations (tag id inventoried) in the session and a count of the number of times the id was read (inventoried).	
Protocol Trace	A graphical view of the packet data for the current (active) command broken out by the packet fields. The packets are logic packets. Not physical packets.	

Note that while a reader is actively executing a command, such as Inventory, only live data views are available. Even if a user has selected a post-capture view, the view is automatically switched to a live data view when a command is issued to the reader.

While the command is running, users can switch between any of the three live views (Summary, Standard and Protocol Trace). However, the user interface prevents users from switching to any of the post-capture views. See the figure below.

File Edit	<u>▼</u> iew Reader Contr	ol <u>I</u> ools	Help		
Rus	<ul> <li>Summary View</li> <li>Standard View</li> </ul>		Stop Pause	Abort Clear	
Summary	Protocol Trace		-	During the execution o packets are actively be	
	Build Post-Captur Summary Views	e Views	DN	The View menu is rest data views.	ricted to three live
Pac	Diagnostics Views	•		2	2
	Performance View	•		0	0

Figure 12: View Menu Options – During Reader Command Execution

### 3.4.2 Performing Post-Capture Processing

After reader functions has completed, Explorer must perform the post-capture processing to create the post-capture views. The post-capture processing builds an index of the captured data which provides the data for the post-capture views.

You can perform the post processing by initiating it yourself or by configuring the application to invoke it automatically. The procedure for each approach is described below:

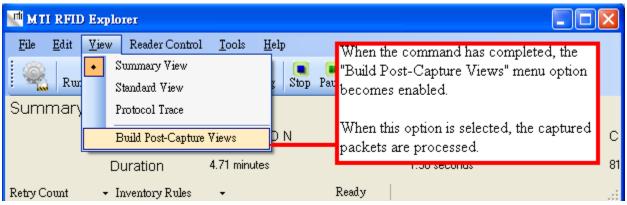


Figure 13: View Menu Options - Build Post-Capture View

- To initiate the post processing (i.e., to build the indexed data file), select **Build Post-Capture Views** as shown in the figure below. This option is enabled after the reader functions have completed.
- To configure the application to automatically invoke the post-capture processing:
  - 1. From the **Tools** menu, select **Explorer Options**. The Explorer Option dialog box displays.
  - 2. Select **Automatically perform post-capture processing** as shown in the figure below.

Explorer Options	2
General Options	
Data Logging	<ul> <li>Maximize main window on startup.</li> <li>Confirm before closing application.</li> <li>Automatically perform post-capture processing.</li> </ul>
	Default view Standard View
	OK Cancel

Figure 14: Automatically Perform Post-Capture Processing

When the post-capture processing completes, all views become available from the **View** menu, as shown in the figure below.

🛄 M TI RFID E	xploer			_O×
File Edit View	Reader Control Tools He	lp		
Summary	Summary View			
	Standard View	COMMANE	After the raw packets have	
	Protocol Trace		been processed, the post-	
	Build Post-Capture Views	2.03 seconds	capture views are enabled.	
Pacl	Summary Wews	Tag Access		
Ar	Diagnostics Views	Command Summary	0	
Inve	Performance Views	Antenna Cycle Summary	0	
Inventory	v rounds 0	Inventory Cycle Summary	0	
inventory	y rounus o	Inventory Round Summary	Ū	
		Inventory Parameters		
Total size		10E 15: Viow Monu Ontions	97	

Figure 15: View Menu Options - Post-capture Views

Except for the Reader Protocol view, all post-capture views are divided into three groups under the submenus:

- Summary Views
- Diagnostic Views
- Performance Views

The Protocol Trace is the only view that supports the display of both live and post-capture data. When the reader is active, the Reader Protocol view displays the last one thousand captured packets for the current command. When the post-capture process completes, the Reader Protocol view displays all packets for the active session.

The following table lists the post-capture packet views that are available:

View Nam	Contents	
Tag Access	Lists in chronological order all Inventory Response packets received from the reader. The view includes the Tag ID, time of packet arrival, the Antenna number, device time, the access type, and the tag data.	
Command Summary	Provides summary information about the commands executed by the reader in the current session. Data items include elapsed time of the command, execution mode, tag count, unique tag count, and tag read rate.	
Antenna Cycle Summary	Provides summary information about the antenna cycles executed by the reader in the current session. Data items include the number of antennas included, the tag count, unique tags, and tag singulation rate.	
Inventory Cycle Summary	Provides a summary of all of the inventory cycles included in the current session (or since the last time the session was cleared). The view includes the total and unique tag count, logical antenna number, and read rate.	

Table 2: Post-Capture Packet Views	
------------------------------------	--

Inventory Round Summary	Lists data related to each inventory round including the antenna used, tag count, and elapsed time in milliseconds.
Inventory Parameters	Lists the parameter used in the session's inventory rounds.

The following table lists the post-capture diagnostic views that are available:

View Name	Contents	
All Packets (Raw Format)	Lists in chronological order all packets received from the reader.	
All Packets (Raw Format)	Lists invalid or unrecognized packets, the raw data, and the parsing error.	
Inventory Cycle Diagnostics	Lists diagnostic information for each inventory cycle. <b>Note:</b> The extended data format must be selected to obtain this information.	
Inventory Round Diagnostics	Lists the diagnostic information for each inventory round. <b>Note:</b> The extended data format must be selected to obtain this information.	

The following table lists the post-capture performance view that is available:

Table 4: Post-Capture	Performance View

View Name	Contents			
Singulation Rate Data	Provides data useful for calculating the read rate achieved by the reader.			

### 3.5 Exporting Data

The Explorer application allows you to export data to Microsoft Excel 2003. To export data:

• From the **File** menu, click **Export**. A dialog box opens from which you can select the views you wish to export. You can export one or more views at a time.

The application saves exported files in the user's directory. After the export completes, Explorer invokes Microsoft Excel, or the associated application for xml format worksheets, to open the exported data file. Each view selected for export becomes a separate sheet in an Excel workbook.

**Note:** Microsoft Excel allows only the first 65536 rows in each view to be exported. If a session is too big for Excel, you can always view it in the Explorer application.

## 3.6 Logging Data

Explorer supports the logging to a text file of all packets received from readers. See figure below To enable logging:

- 1. From the **Tools** menu, click **Explorer Options**. This opens the Explorer Options dialog box.
- 2. In the Explorer Options dialog box, click the **Data Logging** tab.
- 3. Select the **Enable Logging** check box.
- 4. If desired, specify an alternative directory in which log files should be stored.

Explorer Options	
General Options	
Data Logging	Enable Logging.
	Log file directory C:\Documents and Settings\MTIjMy Documents
	<ul> <li>Do not save data to temporary file. (application restart required to take effect)</li> <li>Selecting this option will prevent the application from storing any data on disk. This can be helpful for running for extended periods of time, however only minimal statistical information will be available.</li> <li>Note: Changing this option will not take effect until the application is</li> </ul>
	OK Cancel

Figure 16: Data Logging

The log files created by Explorer are named rfidxxxx.log, where xxxx is a four digit sequence number. The figure below shows an example of log file content.

00	1962797	"Cmd Begin"	01-00-00-02-00-00-0F-00-00-05-00-00-00
00	1962797	"Cyc Begin"	01-00-02-00-00-00-00
00	1962797	"Ant Begin"	01-00-03-00-01-00-00-00-00-00-00-00
00	1962797	"Inv Begin"	01-00-04-00-00-00-00
00	1962797	"Inventory"	01-00-05-00-03-00-29-41-2D-A8-09-00-10-00-00-00-00-EB-6B
00	1962797	"Inventory"	01-00-05-00-03-00-29-41-2D-A8-09-00-10-00-00-00-00-01-FB-4A
00	1962798	"Inventory"	01-00-05-00-03-00-29-41-2D-A8-09-00-10-00-00-00-00-02-CB-29
00	1962798	"Inventory"	01-00-05-00-03-00-29-41-2D-A8-09-00-10-00-00-00-00-03-DB-08
00	1962798	"Inventory"	01-01-05-00-01-00-00-06-00-00-00
00	1962798	"Inv End" 01-00-09-	00-00-00-00
00	1962798	"Inv Begin"	01-00-04-00-00-00-00



The log file contains four fields separated by tab characters. These fields are defined in the following table.

#### Table 5: Log File Field Definitions

Field	Contents
Radio Index	A unique serial number for the reader.
Time stamp	Elapsed time in milliseconds from the start of the session.
Symbolic Name	The symbolic name for the packet.
Packet Data	The packet data in hexadecimal format.

### 3.7 Accessing and Changing Reader Configuration

The Explorer application allows the user to configure many of the settings of the attached readers. To access the configuration panel:

• From the **Reader Control** menu, select **Configure Reader**. Alternatively, from the **Tool Bar**, select **Configure Reader**. See the figure below. This opens the **Explorer Reader Configuration** dialog box.

🌁 MTI RFID Explo	JIET				
File Edit View Run Invento Standard View ISO 18000-6C Invento 25-14-11-EE	Reader Control     Iools     Help       Configure Reader       Register Access       Get Inventory Once       Run Inventory       Tag Access	Stop Pause Abort C Read Count 51		onfigure Reader" Reader Control Antenna U 0	Antenna 1 0
	1 Newtory Rules - Device	: UAR T-000	Ready UA	RT-000 Activated.	.:

Figure 18: Accessing the Reader Configuration Dialog

The **Explorer Reader Configuration** dialog contains many function-specific pages, each of which is listed on the left-hand side selection bar. The current selection is always indicated by a visual highlight. For example, in the figure below, the **Settings** page is active.

MTI RFID Explorer	Module Configuration ?
Settings	
Antenna Ports	Communication Port ⊙ USB ◯ UART Update
Select Criteria	• USB UART Update
Algorithm	Region
Post Singulation	EU Set
GPIO	
About Module	
Troubleshooting	Link Profile 1 : PR_ASK / M4 / 250 khz 💟
	Inventory Algorithm
	OK Cancel

Figure 19: Reader Configuration Dialog Box

### 3.7.1 Settings Page

When the **Reader Configuration** dialog first opens, it displays the **Settings** page shown in the figure above. The settings displayed are the current settings on the reader.

From this page, you can view and/or configure the following items:

- Communication Port Set the reader communication to USB or Serial. If clicks "Update", Explorer will be closed. Need to restart the reader.
- Operating Region
- Link Profile (Read only)
- Inventory Algorithm (Fixed Q or Dyanmic Q)

Note: RU-824 Reader doesn't support UART function. If connect RU-824, Explorer will disable Update UART function.

### 3.7.2 Antenna Configuration Page

From the **Antenna Configuration** page, you can configure the reader's 16 logical antenna ports. As the figure below shows, this page displays the current antenna configuration within a grid.

Antenna Ports       #       Physical Port       Power Level 1/10 dBm       Dwell Time (malliseconds)       Inventor Rounds         Select Criteria Algorithm       0       3       240       No Limit       819         Edit       0       3       240       No Limit       819         Edit       1             Post Singulation G P I O       Edit       3            Edit       3               About Module Troubleshooting       Edit       5   <						n	nfiguratio	Antenna Co	Settings	
Algorithm Post Singulation G P I O About Module Troubleshooting	{^	Inventory 1 Rounds	Inventor, Rounds			Physical Port	+		-	
Algorithm Post Singulation G P I O About Module Troubleshooting Edit 5 E	=	8192	8192	No Limit	240	3	0	Edit	Select Criteria	
Post Singulation G P I O About Module Troubleshooting Edit 2 Edit 3 Edit 4 Edit 5 Edit 6 Edit 5 Edit 6 Edit 6 Experiment 10 Experiment 10 E							1	Edit	Algorithm	
G P I O About Module Troubleshooting Edit 3 Edit 4 Edit 5 Edit 5 Exp							2	Edit	-	
About Module Troubleshooting							3	Edit		
Troubleshooting							4	Edit	GPIO	
Exp	~						5		About Module	
	>	>						<	Troubleshooting	
Inne	rt to Excel	Export to Excel	Expo							
Turbo	from Excel	Import from Exce	Impor							
Res	re Default	Restore Default	Rest							

Figure 20: Antenna Configuration

The **Import** and **Export** buttons allow the antenna data to be manipulated by Microsoft Excel and then imported back into the reader.

To change the setting for a logical antenna, click its associated **Edit** button in the first column of the grid. This displays the dialog box shown in the figure below.

Edit Antenna Settings		
Antenna O ENAELED	Physical Port 3	Maximum Dwell Time Milliseconds 0 Maximum Inventory Cycles 8192 Power ( 1/10 dBm ) 240
	OK Canc	el

Figure 21: Antenna Logical Settings

Configurable parameters for individual antennas are:

- Physical Port indicating the physical connector (0 thru 3) to which the logical antenna is bound for transmission of data.
- Maximum Dwell Time indicating the maximum number of milliseconds that may be spent on the logical antenna during a single cycle.
- Maximum Inventory Cycles specifying the maximum number of inventory cycles that will be spent on the logical antenna before a switch to the next one available.
- Antenna transmission Power in 1/10 dBm increments.

**Note:** The dwell time and inventory cycles may not both be set to a value of zero. If the user attempts to perform such an operation, Explorer will response error message.

### 3.7.3 Select Criteria Page

Use the **Select Criteria** page to view and configure the selection criteria query settings that can be used for any tag–protocol operations. As shown in the figure below, this page displays the active selection criteria of the current reader.

MTI RFID Explorer	Module Configuration
Settings	Select Criteria
Antenna Ports	Display Criterion # 1
Select Criteria	
Algorithm	Memory Bank EPC 👽 Inventory Target S0 🗸
Post Singulation	Memory Bank Offset 0 🗘 Truncation ? DISABLE 🗸
GPIO	Mask Bit Count O Action ? ASLINVA_DSLINVB
About Module Troubleshooting	Mask 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	Edit
	OK Cancel

Figure 22: Select Criteria View

The **Display Criterion** # spin box allows you to select the criteria currently being viewed. It has a range of one (1) up to the value displayed under **Active Criteria**.

The **Load** button causes the application to perform a direct query to the current reader and reload the page with the retrieved select criteria settings.

To change the select criteria parameters for the active reader, click the **Edit** button. This displays the dialog box shown in the figure below.

	📕 Edit Select Criteria	Settings	:
	Select Criteria		
	Display Criterion #	1 Active Criteria 1	
	Memory Bank	EPC Inventory Target S2	
I	Memory Bank Offset	0 Truncation ? DISABLE	
I	Mask Bit Count	0 Action ? ASLINVA_DSLINVB	
	Mask 0 0	0     0     0     0     0     0     0     0     0     0       0     0     0     0     0     0     0     0     0     0     0	
		Save Cancel	111

Figure 23: Select Criteria Edit Dialog

This panel allows configuration of individual select criterion parameters.

**Note :** Truncation is not supported in the MTI firmware at this time. The **Truncation** parameter should be set to **DISABLE**.

### 3.7.4 Inventory Algorithm Panel

The Inventory Algorithm panels are used to view and configure the reader's query settings. The figure below shows an example of the Inventory Algorithm View panel.

MTI RFID Explorer	Module Configura	tion				? 🛛
Settings	Algorithm Setting	5				
Antenna Ports Select Criteria	Active Algorithm	DYNAMICQ	~	Select State	SELECT_ALL	~
Algorithm				Session	\$2	~
Post Singulation				Session Target	A	<b>*</b>
GPIO						
About Module	Start Q Value	4	*	Retry Count	0	*
Troubleshooting	Min Q Value	0	*	Threshold Multiplier	4	\$
	Max Q value	15	*	Toggle Target ( A <> B )	Enable	~
		Edit		Load		
				OK Cance	1	

Figure 24: Algorithm Settings View Page

The **Load** button queries the current reader and refreshes the values displayed on the **Algorithm Settings** page.

To modify the algorithm settings for the current reader, click the **Edit** button. This opens a dialog box similar to the one shown in the figure below.

•	Edit Algorithm 9	Settings				-O×
	Algorithm Settings	1				
	Active Algorithm	DYNAMICQ	•	Select State Session	SELECT_ALL	•
				Session Target	A	•
ľ						
	Start Q Value	4	-	Retry Count	0	-
	Min Q Value	0	-	Threshold Multiplier	4	-
	Max Q value	15	-	Toggle Target (A⇔B)	Enable	•
		Save		Cancel		

Figure 25: Inventory Algorithm Edit Page

In the **Active Algorithm** dropdown box, you can select between the Fixed Q and Dyanmic Q algorithm. When you select a new algorithm, the configurable fields display in the center sub-panel change to match those available with the selected algorithm.

#### 3.7.5 Post Singulation Criteria Page

Use the **Post Singulation** page to view and configure reader settings that define the manner in which tags and post singulation are filtered (based on all or part of the tag's EPC).

The figure below shows an example of the page displayed when the **Post Singulation Criteria** option is chosen.

Settings	Post Singulation Crite	rria												
Antenna Ports	Display Criterion #	1			\$		Act	ive Cr	iteria	1				¢
Select Criteria														
Algorithm	Memory Bank Offset	t .	Mask											
Post Singulation	0	4 ¥	0	0	0	0	0	0	0	0	0	0	0	0
GPIO	Mask Bit Count		0	0	0	0	0	0	0	0	0	0	0	0
About Module	0	<b>*</b>	0	0	0	0	0	0	0	0	0	0	0	0
	Mask Match		0	0	0	0	0	0	0	0	0	0	0	0
roubleshooting	INVERSE	~	0	0										
			_											
[		Edit						(	L	oad				
1											_			

Figure 26: Post Singulation Criteria View Page

The **Display Criterion #** spin box allows you to select the criteria currently being viewed. It has a range of one (1) up to the value displayed under **Active Criteria**.

The **Load** button causes the application to perform a direct query to the current reader and reload the page with the retrieved post singulation criteria settings.

To change the post singulation criteria parameters for the active reader, click the **Edit** button. This displays the dialog box shown in the figure below.

ConfigurePostSingulation_E Post Singulation Criteria	dit								
Display Criterion #		•	Ac	tive Crite	eria 🛛 1				÷
Memory Bank Offset          0       **         Mask Bit Count       **         0       **         Mask Match       REGULAR	Mask 0 0 0 0 0 0 0 0 0 0 0 0		) 0 ) 0	0 0 0	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0	0 0 0	0 0 0 0	0 0 0 0
Save	•				Cancel				

Figure 27: Post Singulation Criteria Edit Dialog

This page allows configuration of individual post singulation criterion parameters.

**Note:** Only one active post singulation criteria is allowed at this time. Attempts to set the **Active Criteria** count greater than one (1) in the **Edit** dialog result in an Invalid Parameter error. This error is generated and displayed when the **Save** button is clicked.

### 3.7.6 GPIO Pin Configuration Page

Use the **GPIO Pin Configuration** page to set and retrieve the current values of General Purpose Input/Output (GPIO) pins which are accessible to the user on the MTI Firmware microcontroller. The figure below shows the GPIO panel.

Explorer Module Configuration								
Settings	GPIO Pi	in Configuration	L					
Antenna Ports			Name	Access		State		Status
Select Criteria		APPLY	PIN_0	GET	~ 1	HI	~	SUCCESS
Algorithm		Unsupported	PIN_1	GET	~	Unsupported	~	Unsupported
Post Singulation		Unsupported	PIN_2	GET	~	Unsupported	~	Unsupported
-		APPLY	PIN_3	GET	<b>~</b> ]	HI	~	SUCCESS
GPIO								
About Module								
Troubleshooting								
				Read All		1		
						,		
					C		Cancel	

Figure 28: GPIO Pin Page

To retrieve the current value for a specific GPIO pin:

- 1. Set the Access value to GET.
- Click the associated Apply button. The State column then indicates the retrieved value— LOW for a binary value of zero or HI for a binary value of one. If the operation fails, the Status field indicates this and the displayed state changes to Unsupported.

To retrieve the current values of all GPIO pins:

• Click the **Read All** button. This operation sets all pins to **GET** mode and retrieves the current values from the system.

To set a value for a specific GPIO pin:

- 1. Change the Access value to SET.
- 2. Change the **State** field to the desired value.
- 3. Click the associated **Apply** button.

### 3.7.7 About Reader Page

The **About Reader** page is a static page that provides versioning information for the MTI components of the reader. It provides a single place to find the version information for the MTI device, MTI Firmware, and MTI BootLoader . The figure below shows a sample About Page.

Explorer Module C	onfiguration 💽 🔀
Settings Antenna Ports	About Module
Select Criteria	Product Name MTI UHF RFID PRODUCT Serial Number 000000000 Model Name RU-861-010 Region EU
Algorithm Post Singulation	Manufacturer Microelectronics Technology Inc.
G P I O About Module	Version Information
Troubleshooting	Firmware 0.8.4 OEM Configuration 1.0.0
	BoofLoader 255 255 255 OEM Configuration 0.0
	OK Cancel

Figure 29: About Reader Page

#### 3.7.8 Troubleshooting Panel

The **Troubleshooting** page provides access to the MTI Firmware error register as well as the ability to clear the error and reset the MTI Firmware. See the figure below.

Explorer Module Co	nfiguration
Settings Antenna Ports Select Criteria Algorithm Post Singulation G P I O About Module Troubleshooting	MAC Error Current Error Cole Ox0 Last Error Cole Ox0 Reset Firmware Reset
	OK Cancel

Figure 30: Troubleshooting Page

**Note:** Performing a **Reset Firmware** operation causes a reset of the connection to the current reader. The reader will no longer be accessible via the application until the application is restarted.

### 3.7.9 Register Access Panel

It is recommended that you have a very strong understanding of the behavior of the underlying MTI Firmware prior to modifying register values directly via this method.

For the purpose of controlling and configuring the reader, the Explorer application allows the user to read and write the various MTI Firmware registers.

#### 3.7.9.1 Register Type Mac

Selecting the **Mac** Register Access option displays the dialog shown in the figure below. From this dialog, the user can perform read and write access to MAC Registers.

Register Access		×
Register Type Mac		Close
Read Address (h) 0	Count (d) 1 🛨	Dump MAC
Write Address (h) 0	Data (h) 0	
	Stop On Error	
Clear Status Save Status		🔽 Keep History

Figure 31: MAC Registers Page

To read an individual MAC register value:

- Enter the hexadecimal start address and the total number registers to read.
- Click the **Read** button. If a register cannot be read, for example because of an invalid address entry or the register is write-only, a read fail result will be displayed in the status window.

To write an individual MAC register value:

- Enter the hexadecimal start address and the hexadecimal value to write.
- Click the **Write** button. If a register cannot be written, for example because of an invalid address entry or the register is read-only, a write fail result will be displayed in the status window.
- The **Batch** button allows for batch processing of multiple registers. Select the **?** button for Register Access Batch Help and file format.
- The **Dump MAC** button reads all MAC registers and dumps the data in the status window.
- The **Clear Status** button clears the status window.
- The **Save Status** button allows the content of the status window to be saved to a file.
- Check **Keep History** to retain all access history in the status window. Uncheck **Keep History** to retain only the last access record in the status window.

#### 3.7.9.2 Register Type MacBank

Selecting the **MacBank** Register Access option displays the dialog shown in the figure below. This dialog reduces the user input required to perform read and write access to MAC Banked Registers.

Register Acces	5			×
Register Type	MacBank.	]		Close
Read	Address (h) 0	Count (d) 1 📑		Dump MAC
Write	Address (h) 0	Data (h) 0	Bank (h) 0	
Batch	? 🗖 Batch Stop	On Error		
Clear Status	Save Status			Keep History

Figure 32: MAC Banked Registers Page

The configurable parameters for MAC Banked Register read operations are identical to Mac Register read. The figure below shows the status window for a valid banked register read, detailing the currently selected bank, the applicable selector address, and the content of all banks.

Figure 33: MAC Banked Register Read Status Example

The configurable parameters for MAC Banked Register write operations are identical to MAC Register write, except that an additional bank parameter is provided. This alleviates the need to utilize the Mac Register Access dialog to select the desired bank via the bank selector register before performing banked register operations. The figure below shows the status window for a valid banked register read, detailing the currently selected bank, the applicable selector address, and the content of all banks. This is followed by a write to each bank by simply changing the bank index.

gister Acces	15	
Register Type	MacBank	Close
Read	Address (h) 903 Count (d) 1	Dump MAC
Write	Address (h) 903 Data (h) 000040F2 Bank (h) 1	
Batch	? 🗖 Batch Stop On Error	
	( ( (	
Clear Status	Save Status	Keep History
Read Regis Read Mac   Read Mac   Read Mac   Write Regi Write Mac	Save Status [0903][01] = 000040F2 (Banked Sel:0902) Register Bank [0903][00] = 00000004 Register Bank [0903][01] = 000040F2 ster [MacBank] Register Bank [0903][00] = 00000002 ster [MacBank]	I Keep History

Figure 34: MAC Banked Register Read and Write Status Example

#### **3.7.9.3** Register Type Bypass

Selecting the **MacBypass** Register Access option displays the dialog shown in the figure below. From this dialog, the user can perform read and write access to Registers.

gister Acces	5	
Register Type	Eypass	Close
Read	Address (h) 0 Count (d) 1	Dump MAC
Write	Address (h) 0 Data (h) 0	
Batch	? Eatch Stop On Error	
Clear Status	Save Status	Keep History

Figure 35: MAC Bypass Registers Page

The configurable parameters for Bypass Register read and operations are identical to Mac Register read.

#### 3.7.9.4 Register Type OEM

Selecting the **OEM** Register Access option displays the dialog shown in the figure below. From this dialog, the user can perform read and write access to the OEM Registers.

Register Access	×
Register Type	Close
Read Address (h) 0 Count (d) 1	Dump MAC
Write Address (h) 0 Data (h) 0	
Batch ? Batch Stop On Error	
Clear Status Save Status	Keep History

Figure 36: OEM Registers Page

The configurable parameters for OEM Register read and operations are identical to those in section Mac Register write.

## 3.8 RF Test

MTI supports 3 functions which are "Inventory", "RF On/Off" and "Pulse" to help user to perform the device. Select **Configure** option. Click **RF Test**. The RF Test dialog will be show.

💽 MTI RFID Explorer	1		
<u>File E</u> dit <u>V</u> iew Reader Control	Tools Help		
i 🙈  🖬	Explorer Options		
E 📸 Run Inventory Inventory Once	Set COM port Olear		
Standard View	RF Test		
ISO 18000-6C Inventory (PC - EPC - CRC, Return Loss			
Figure 27. F	C Tact Calact DE Tact		

Figure 37: RF Test – Select RF Test

In the "Hopping" Channel, only support "Inventory". In the "Single" Channel, support full function to perform the device.

RF Test	RF Test
Configuration Frequency Region EU	Configuration Frequency Region EU Channel
Frequency 865.700 Single Channel	Frequency 865.700
Pulse for ETSI Antenna	Pulse for ETSI Antenna
On Time 30 Physical Port 0	On Time 30 Physical Port 0
Off Time 5 Power Level 300 Tx Port 1/10 dBm	Off Time 5 Power Level 300 ms Tx Port 1/10 dBm
Keep inventory after received error.	Keep inventory after received error.
Function	Function
RF On RF Off Inventory On Pulse On Clear	RF On RF Off Inventory On Pulse On Clear

Figure 38: RF Test – Support full function in Single Channel

Start one test flow at one time. Another buttons become disable status until stop the test flow. In the test time, Explorer doesn't allow user to exit the dialog.

Click **RF On/Off** button, start to CW On/Off flow. Click **Pulse** button, start to transmit random data. Click **Inventory** button, start to inventory and you can watch the tag information in the main views.

🚺 MTI RFID Explorer				<u>ال</u>
<u>F</u> ile <u>E</u> dit <u>V</u> iew Reader Control <u>T</u> ools <u>H</u> elp				
Run Inventory Inventory Once Access Tag Stop	Pause Abort Cl	) ear		
Standard View				
ISO 18000-6C Inventory (PC - EPC - CRC)	Read Count	Current Cycle Read Count	Antenna 0	Antenna 1
34-00-E2-00-90-02-51-19-01-38-22-00-30-F5-E2-0C	177	176	177	0
Configuration         Frequency         Region       EU         Frequency       865.700         Pulse for ETSI       On Time         On Time       30         Off Time       5         Keep inventory after received end         Function       RF On         RF On       RF Off	MHz Anten Physic ms Power mor.	<ul> <li>Hopping</li> <li>Single Channel</li> <li>na</li> <li>al Port</li> <li>U</li> <li>Level</li> <li>300</li> <li>Tx Por</li> </ul>	t 1/10 dBm	

Figure 39: RF Test – Tag information is showed in the main views

If you want Explorer to run continually after received error, click the box "Keep inventory after received error". In normal mode, after receive error message in the End Packet, Inventory will stop. In this test mode, Inventory stop soon, then run again automatically.

Configuration						
-Frequency-			Channel			
Region	EU	~	💿 Нор	ping		
Frequency	865.700	~	🔿 Sing	gle Channel		
		MHz				
-Pulse for ET	SI		Antenna			
On Time	30	*	Physical Port	0	~	
Off Time	5	*	Power Level	300	*	
		ms		Tx Port 1	/10 dBm	
Keep invento	nry after received en		nventory Off	Pulse On	Clear	
4 4 1	/1   • • •					

Figure 40: RF Test – Keep inventory after received error

### 3.9 Return Loss

MTI supports "Return Loss" to help user to perform the device. Select **Configure** option. Click **Return Loss**. The Return Loss dialog will be show.

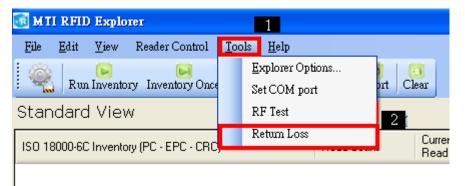


Figure 41: Return Loss – Select Return Loss

#### 3.9.1 Formula

**Return Loss = Reflected Power Level** (0xB04) - PA **Power Level** (0xB00).

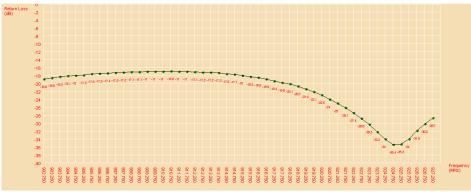
#### 3.9.2 Single Channel

Explorer has Frequency tables which is support-region. Choose one single in Frequency Box, and click "Run" Button. Explorer will show the channel information in the window.

Note: If your region is "Customer", you should type the frequency by yourself. Explorer doesn't know the frequency that you want.

### 3.9.3 Multiple Channels

Click **CHANNEL\_ALL** in the frequency Box. Click **Run** button. Explorer will show all channels and paint Broken Line Graph.



Note: "Customer" region doesn't support this function.

Figure 42: Return Loss - Multiple channels Broken Line Graph

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## **4 Known Issues**

- The application does detect new readers that become active after the application has started. You should power on and connect your readers prior to starting the Explorer application.
- The names of detected readers are displayed as ASCII.

Truncation is not supported in the Firmware Release v2.4.2, so selecting it in the Select criteria will render an error.

## **5** Revision history

#### Table 6: Revision history

Version Number	Description	Revision Date
1.0.0	First release of document. The revision is used on software version 1.0.4	Oct 6, 2011