



# USER GUIDE

ClearStream RFID Version 8  
Portable Technology Solutions, LLC.  
221 David Ct.  
Calverton, NY 11933  
[www.clearstreamrfid.com](http://www.clearstreamrfid.com)



**Portable Technology Solutions**

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# ClearStream RFID™

## User Guide

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Version 8.0  
Portable Technology Solutions, LLC

Toll-Free: 1-877-640-4152 (US)  
Telephone: 1-631-727-8084  
Fax: 1-501-421-5085  
Web: [www.clearstreamrfid.com](http://www.clearstreamrfid.com)

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### Chapter 1: Introduction

#### 1.1 What is ClearStream RFID

**ClearStream RFID** is the only user-configurable, fixed RFID tag and BLE Beacon reading software that gives you the flexibility to easily capture and stream data based on your specific business needs. **ClearStream RFID** can be used as an extension of your software management systems, streaming the data you need between readers and target databases. **ClearStream RFID** can also be used as a standalone system streaming to Excel, Access, SQL Server, ODBC databases and many other custom destinations.

With the release of **ClearStream RFID 8.0** users can now use **ClearStream** as the engine of a **Real-time Location System (RTLS)**. With a valid subscription to the **PTS RTLS Cloud** users can gain unmatched visibility into critical business assets and their real-time locations. This service allows a user to upload and design maps and floorplans, place fixed RFID readers, and define custom zones, all through an easy to use drag and drop cloud environment. As the system is running the location of tagged assets will be displayed within the live map view of the user's environment. The location data collected within the **PTS RTLS Cloud** can be integrated with many 3<sup>rd</sup> Party systems using a modern REST web service API. For more information on this service, visit the **ClearStream RFID** website.

**ClearStream RFID and the PTS RTLS Cloud** are provided on a trial basis in order to offer businesses the opportunity to gain hands-on experience with the features of **ClearStream RFID** before buying. **ClearStream RFID** trial limitations such as a nag dialogue are removed after purchase and registration or subscription.

#### 1.2 How ClearStream RFID Works

Tapping the power of **ClearStream RFID** through the creation of read processes allows users to see anything, anywhere, anytime with accuracy never seen before. Processes are unique tasks defined within **ClearStream RFID** that allow you to track your data through the use of RFID and Bluetooth Beacon technology. Processes, such as scheduling a reader to scan a room every twenty minutes, can be quickly configured by non-programmers through the intuitive tools within **ClearStream RFID**. Below is a small sample of the processes that can be quickly configured via **ClearStream RFID**.

##### Sample ClearStream RFID Application Configurations

- Inventory Audits
- IT Asset Tracking
- Employee/Student/Visitor Tracking
- Material Check-In/Check-Out
- Loss Prevention
- Vendor Managed Inventory

#### 1.3 ClearStream RFID Support

As a registered **ClearStream RFID** user, you receive one free year of support which includes unlimited phone support, email support and free version upgrades. We encourage all users of **ClearStream RFID** to visit our

Support Center at <https://www.clearstreamrfid.com/support> for access to general Knowledgebase, frequently asked questions, training videos and other resources intended to speed the learning curve.

### **1.4 A Note on Terminology**

With the latest release of ClearStream RFID, we have added support for some similar but slightly different technology, namely Bluetooth Beacons. While the technology is similar enough, there are some differences. In the interest of brevity for this document, we will use the term “tags” to represent traditional UHF EPC tags as well as the Beacon devices now supported in ClearStream RFID. Similarly, we will use the term “readers” to represent both the traditional RFID readers as well as the Beacon gateways. We will distinguish between the two technologies as appropriate but most of this documentation and descriptions serves to represent both.

## Chapter 2: Installation

### 2.1 System Requirements

- A Windows PC running Windows Vista/7/8/10/11, Windows Server 2008/2012/2016/2019.
- Microsoft .NET Framework 4.8 or greater (You will be prompted for install if required).
- Compatible RFID Readers: Zebra, Feig, Impinj, Alien, Intermec, ThingMagic, Jadak or any other reader that supports LLRP (Low Level Reader Protocol).
- Compatible RFID readers for ClearStream On-Board: Zebra FX7500, FX9600, ATR7000, and Impinj R700/720.
- Compatible Bluetooth Beacon Gateways: BluEpyc, BlueCats, and Minew.
- Network access or router connected to a standalone PC.

### 2.2 ClearStream RFID Hardware and Software Installation

**ClearStream RFID** enables readers to stream data to pre-existing databases across a network. Network access or a router connected to a PC is a preliminary requirement when using **ClearStream RFID**. With network access or a working router, follow the steps below to install readers, antennas and the **ClearStream RFID** software.

#### 2.2.1 Hardware Installation

1. Mount RFID readers and antennas or Bluetooth Beacon Gateways as needed for configuration.
2. Connect antennas to the antenna inputs of the reader using the supplied cables if required.
3. Connect the RFID reader or Beacon Gateway to your network or a router connected to a standalone PC.
4. Connect the power supply and line cord to the reader, then to a power source.

#### 2.2.2 Software Installation - ClearStream RFID Management Studio

1. Download **ClearStream RFID** from <https://www.clearstreamrfid.com/> or an authorized reseller and install to a PC that will be used to set up and administer the application.
2. When the **Install Wizard Completed** screen appears you have the option to **Launch Management Studio** upon clicking **Finish**.
3. Proceed to [Chapter 3: Registration](#) for registration and trial instructions.

#### 2.2.3 Software Installation - ClearStream Onboard

ClearStream Onboard is another option for using ClearStream technology but in a more direct to the reader approach. Specifically, ClearStream Onboard is available to run directly on select readers and can be useful in no/low network connectivity environments since tag data and even GPO feedback is all available without any outside control required. Currently, this portfolio of readers supports Zebra and Impinj RFID readers but is always growing. Installation instructions for ClearStream Onboard are included with this installation and can be found at "Windows Start menu→PTS→ClearStream RFID→Install Clearstream RFID Onboard."



### 2.3 Uninstalling ClearStream RFID

In the unlikely event that you would like to remove **ClearStream RFID**, follow these simple instructions.

#### ClearStream RFID Windows Installation

1. Exit **ClearStream RFID** if open and stop the **ClearStream Service** if running.
2. Open the Control Panel window on your PC.
3. Select **Add/Remove Programs** or **Uninstall or Change a Program** (depending on OS).
4. Locate **ClearStream RFID** and select **Uninstall**.

#### ClearStream RFID On-board

- Using a web browser, navigate to the RFID Reader's web console administration tool. This is usually done by entering the IP address of the reader in the web browser.
- Login to the web portal using the Reader login credentials.
- Depending on the reader type the next steps will vary:

##### Zebra Devices

- Navigate to **Applications** using the main menu on left-hand side.
- Select the **CSOnboard** application from the **List of Installed apps** drop down.
- Stop the Application using the **Start/Stop** button.
- Click on the **Uninstall** button to perform the uninstallation.

##### Impinj R700/720

- Perform a factory reset.

### Chapter 3: Registration and Subscription

**ClearStream RFID** offers flexible licensing options for any installation need. Licenses can be purchased as **perpetual registrations** (using a one-time code), or as a **Subscription** offering low recurring payment plans. The Subscription model also offers the benefit of a web portal to track devices' status remotely, as well as access to the **ClearStream RTLS Cloud**. Chapter 3 describes these options in detail.

#### 3.1 ClearStream RFID Trial Limitations

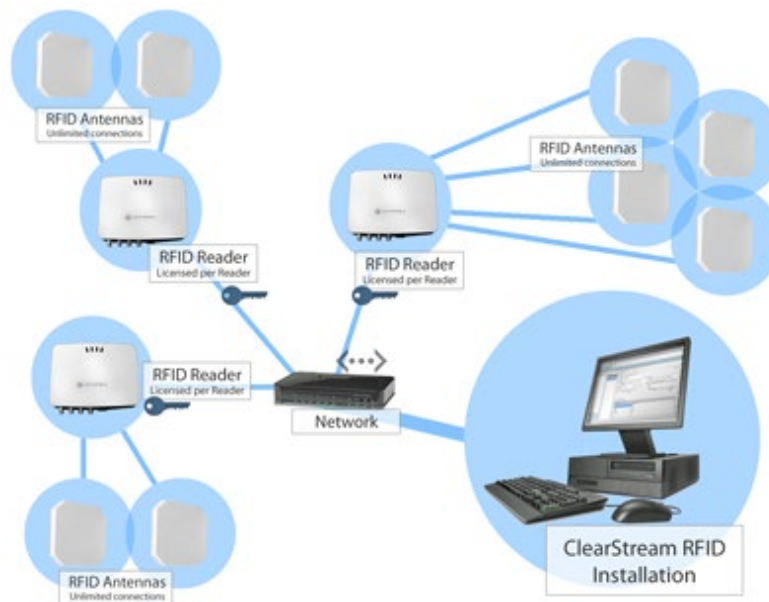
**ClearStream RFID** is available as a trial application. This trial mode allows potential users to test the functionality of the software without purchasing. Trial limitations include:

- A trial code is required to stream data from your connected reader. Follow the instructions below to request a trial code:
  - Select the **Registration/Subscription...** option from the **Tools** menu.
  - Click the **Request trial code** link from the **Trial Info** tab and fill out the web form.
  - Submit the form and a trial registration code will be emailed to the address provided.
- A 30-day window to evaluate **ClearStream RFID** (Extensions are available).
- The Windows Service will not run in trial mode, the Management Studio must be used.

#### 3.2 ClearStream RFID Licensing Model

**ClearStream RFID** is licensed/subscribed per seat; a seat is the connection between the RFID reader or Bluetooth Gateway and the host PC in which **ClearStream RFID** is installed. Below is a typical **ClearStream RFID** install with licensing requirements.

**Example:** Three registered or subscribed seats of ClearStream RFID enables three RFID readers to stream data to a host PC or server.



### 3.3 ClearStream RFID Subscriptions (Recommended)

**ClearStream RFID** offers flexible licensing to suit your requirements. The **Subscription** model allows an administrator to pay for each seat on a schedule and manage these users in the **ClearStream web portal**. After purchasing a **ClearStream** subscription, use the **Tools->Registration/Subscription** dialog to enter your **Username** and **Password** you have configured in the web portal. The issuing of subscription seats can be done by using the web portal or allowing a device to connect and be automatically assigned when first starting the device. All **Subscribed** seats will be automatically downloaded from the web portal if the administrator were to install a new instance of **ClearStream RFID**.

### 3.4 Registering ClearStream RFID (Perpetual)

When utilizing a perpetual license of **ClearStream RFID**, the application must be fully registered. Registering **ClearStream RFID** is a simple process which can be completed after the purchase of seats. Registering the ClearStream software is done if a perpetual license was purchased. This is a one-time process unless additional seats are added at a later date.

1. Purchase a **ClearStream RFID** license for the number of seats / readers you need to enable.
2. After purchase, you will receive a confirmation email including a **Redemption Link**; this link will enable you to register the number of seats you purchased.
3. Click the **Redemption Link** which will open a **Registration Request** form. Complete the **Registration Request** form and click **Request Registration**.

**Note:** You can locate your **PC ID** by selecting **Tools → Registration/Subscription** from the top menu bar in ClearStream RFID and selecting the **Registration** tab.

4. After receiving the **Registration Code**, select **Tools → Registration/Subscription** from the **ClearStream RFID** menu bar and enter this code into the **Registration Code** field on the **Registration** tab.
5. Once this **Registration Code** is entered and verified, the total license count and remaining available licenses are displayed.

### 3.5 Issuing Seats to RFID Readers, Bluetooth Beacon Gateways, or Custom Devices

When registered, the **ClearStream RFID Registration** form will show the **Status** as **Registered** and show a table listing of any RFID readers or BLE Gateways that have been previously connected to **ClearStream RFID**. In most cases, the number of rows shown in this table will match that of the number of seats purchased. Follow the instructions below to issue a seat license to an RFID reader/BLE Gateway.

**Note:** With the **Auto register new readers** option enabled within the **Registration** dialog, any new devices connecting to ClearStream RFID will be automatically registered if there is a license seat available.

1. Locate the **Device ID** you wish to license. If your ID is not listed, enter it to the **Device ID** field and click **Issue**. Proceed to step 3.
2. Right-click the **Device ID** and select **Issue**.

## Chapter 3: Registration and Subscriptions

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3. You will receive a message confirming the registration of this reader.
4. Select **Yes** and the reader now shows as **Licensed** in the **License Status** column.

**Note:** Once you have registered all of your readers, you can export this license file to another PC if you plan to move your ClearStream RFID installation. For more information on this, see [APPENDIX A](#).

### Chapter 4: Streaming Tags with the Sample Fixed RFID Process

PTS provides a Sample Fixed RFID Process to utilize in testing RFID antenna read ranges, RFID tags and antenna placements. We also encourage users to use this after installing **ClearStream RFID** in order to better understand the basics of the configuration of a **Stream Process**.

**Note:** To utilize the Sample Fixed RFID Process, you must first have a registered trial or full registered version of ClearStream RFID. See [Chapter 3: Registration](#) for more information.

#### 4.1 Connecting an RFID Reader to ClearStream RFID

The first step in utilizing the **Sample Fixed RFID Process** is to connect the RFID reader to the process. To start connecting your reader, follow the steps below.

1. In the **Profile Configuration** → **Sample Welcome Profile** → **Sample RFID Process** window click the **Devices** button.
2. In the **Device Configuration** dialog click the **Add** button and select the reader manufacturer you would like to connect (e.g., Zebra, Impinj, Alien etc.).
3. Click in the **IP/Hostname** field and click the **Find** button when it appears.
  - Alternatively, you can simply enter the IP or Host Name of the reader (if known).
4. Select your domain from the **Find RFID readers on your network** window.
5. Click the **Start** button and wait for the available readers on your domain to appear.
6. Highlight the reader you wish to connect to. Click **Select**.
7. Click Close and save your project using the **Save** button.

**Note:** When initially added, the device is enabled and configured with default settings. To further customize these settings, see [Chapter 6](#).

#### 4.2 Connecting a Bluetooth Beacon Gateway to ClearStream RFID

The setup for Bluetooth Gateways is different from that of most RFID readers. Bluetooth Gateways are typically configured to send beacons to a predefined IP Address or Host name. This is configured using the Gateways Configuration utility. For both supported gateway types (BluEpyc, BlueCats, and Minew), this is done using the web console of the Gateway.

##### 4.2.1 BluEpyc

After attaching the Gateway to the network, log into the web console using a browser. The Gateway needs to be configured in **Notification mode**, and the IP address needs to be configured to be the IP address that ClearStream is running on.

### 4.2.2 BlueCats

Attach the Gateway to the network and log into the web console. Select **BlueCats->Setup Endpoints**. Enter the ClearStream RFID IP address in the **UDP EndPoint Host or IP address** field. Click **Save and Apply**.

### 4.2.3 Minew

Attach the Gateway to the network and log into the web console using a web browser (e.g., <http://xxx.xxx.xxx.xxx>). Select **Service** and **change Service Access** to **HTTP**. In the **Url** field enter the address running ClearStream followed by the port and the Minew path (e.g., <http://192.168.1.1:4405/api/v1/data/minew>). Finally, if using Eddystone beacons make sure **Upload Unknown** is enabled.

ClearStream RFID can now be setup to use the configured Gateways. Follow the same steps for setting up an RFID Reader above to configure the Gateway to stream beacons to the selected destination. There is a BLE Beacon List table prebuilt in the sample Microsoft Access database that can be used to collect all of the data from a beacon.

## 4.3 Adding Custom Web/Network Devices

ClearStream supports the streaming of data from a custom web enabled device. The communication can be handled using a TCP, UDP or HTTP connection to ClearStream.

This data must be sent over as **GET** parameters to the ClearStream API URL, or as structured **JSON** as a **POST**.

**GET Sample** (where 192.168.1.1 is the IP address of the ClearStream PC, and 123 is the Device ID):

<http://192.168.1.1:4405/api/v1/data/custom/123?MAC=123341243&deviceid=123&myfield=myvalue>

**POST Sample:**

URL: <http://192.168.4.137:4405/api/v1/data/custom/123>

Body: `{ "MAC": "00:11:22:33:44:55", "DeviceID": "123", "myfield": "my value" }`

For information on supported devices and the configuration, see [Appendix E: Custom Devices with ClearStream RFID](#).

## 4.4 Starting and Stopping Devices

With your device properly connected to the **Sample Fixed RFID Process** and a Destination data source configured, you will next start and stop the device to read RFID tags or Bluetooth Beacons. To start and stop your device, follow the steps below.

**Note:** Your read results may vary depending on the chosen antenna strength settings and the type of tags or beacons being tested.

1. In the **View** menu or from the **Navigation Bar**, click the **Start/Stop** icon.

2. In the **Start Stop Devices** window click the **Start All** or **Start Selected** Button corresponding to the device you configured in **Section 4.1** or **Section 4.2**.
3. In the **Activity Monitor** Window, you will see data streaming through if properly configured.
4. When finished with the stream click the **Stop All** or **Stop Selected** Button.

### 4.5 Viewing Streamed Data

After a device streaming cycle has been completed, data can be viewed from within **ClearStream RFID**. Follow the steps below to access the **Data Viewer**.

1. In the **View** menu or from the **Navigation Bar**, click the **Data Viewer** icon.
2. Review the tags or beacons read (you may need to hit the **Refresh** button to see the data).

### Chapter 5: Creating a New Project and Streaming Data

**ClearStream RFID** enables you to control your RFID Readers or Bluetooth Gateways as well as the moving of data to destination files through the use of **Projects**, **Profiles** and **Processes**.

#### 5.1 Creating a New Project

A **Project** is a grouping of profiles. A project is typically saved at a company or business unit level. Creating a new **Project** is the first step in configuring a fixed RFID or Beacon environment. Follow the steps below to create a new **Project**.

1. In the **File** menu, select **New** or click the **New** Icon on the toolbar.
2. Proceed to **Section 5.2** below to learn how to add a **Profile**.
3. To save your project, select **Save** or **Save As** from the **File** menu or click the **Save** icon on the toolbar.
4. To open an existing project, choose **Open** from the **File** menu or click the **Open** icon on the toolbar.

#### 5.2 Adding Profiles

A **Profile** is a grouping of individual RFID or Beacon data collection processes. A **Profile** is typically set up to perform a discrete set of tasks in which each process is used to perform a specific function. Follow the steps below to create a **Profile**.

1. In the **Profile Explorer** window click the **New Profile** icon.
2. In the **Profile Configuration** window enter a **Name** for the **Profile**.
3. Proceed to **Section 5.3** below to learn how to add processes to your **Profile**.
4. A **Profile** can be deleted, copied or moved up/down in order using the respective icons in the **Profile Explorer**.

#### 5.3 Adding Processes

A **Process** is used to connect to your RFID reader or Bluetooth Gateway, set its parameters, and control where it streams data. A **Profile** typically contains one or more processes that perform related tasks. Follow the steps below to create a new **Process**.

1. In the **Sync Process List** window click the **Add Process** icon.
2. **Name** the Process.
3. Add a **Comment** to further detail the process.
4. In the **Source** tab, select **RFID/Bluetooth** from the **Type** drop down.
5. Select a device to use from the **Device** drop down. If the device you need has not been added yet, use the **Devices** button to add and configure any devices used in the application (See [Section 4.1](#) for information on adding readers).
6. In the **Destination** tab, select your preferred method of data destination from the **Type** drop down.
7. You will then be presented with options specific to the **Type** selected. (See [Chapter 7: Data Integration Settings](#) for more information on further defining the different data types.)



8. Repeat steps 1-7 to add additional processes.
9. **Save** your project.
10. A **Process** can be copied, deleted or moved up/down in order using the respective icons in the **Sync Process List** window.

### 5.4 Streaming Data

Now that you have successfully configured your project you are now ready to start streaming data. Follow the instructions below to start a data stream.

1. In the **View** menu or from the **Navigation Bar** click the **Start/Stop** icon.
2. In the **Start Stop Devices** list, select the desired **Device** and click the **Start Selected** Button. Alternatively, click the **Start All** button to start all devices.
3. When properly configured, you should see data streaming in the **Activity Monitor** Window.
4. When finished streaming, click the **Stop All** or **Stop Selected** button.

**Note 1:** RFID data streaming can be started based on a **General Purpose Input (GPI)** trigger (external button press or light/motion sensor). See [Chapter 6: Device Settings](#) for more information on setting this up.

**Note 2:** Device data streaming can also be started using the **ClearStream RFID Service**. This allows the streaming of data to take place unattended without the Management Studio running. See [Chapter 9: Running as a Windows Service](#) for more information on setting this up.

**Note 3:** Data streaming can also be started using the ClearStream RFID Web Service API see [Chapter 11](#) for more information.

### Chapter 6: Device Settings

The **Device Settings** within **ClearStream RFID** allow you to control when the data is streamed, set antenna power levels and configure the General Purpose Input and Output (GPIO) ports. To configure these settings, click the **Devices** button located on the Configuration form within your RFID process window.

#### 6.1 Scan Mode (RFID Readers only)

The **Scan Mode** allows you to configure the read cycle of the RFID reader. These options, located on the **Scanning** tab, include **Continuous**, **Timed** and **GPI Trigger**. These options are explained below.

##### 6.1.1 Continuous

With this option enabled, the RFID reader(s) is continuously powered; streaming data to your destination once a reader has been started. This is only recommended for high volume / rapid changing environments and can decrease the lifespan of your connected antennas.

##### 6.1.2 Timed

With this option enabled, data can be streamed based on a timed **Interval** or run on a **Daily Schedule** by setting a specific time. This **Scan Mode** takes effect once the reader(s) has been started.

##### Interval Scanning

Begins a read operation after the specified interval and for the length of the duration.

1. **Interval** – This value (in seconds) specifies the length of time between cycle reads. If this value is set to -1 the read will start immediately and run for the specified **Duration**.
2. **Duration** – This value (in seconds) specifies how long the data stream should run once the reader has started streaming.
3. **Send tags when read** – When enabled, tag data is sent from the reader as tags are read. Disabling this feature sends tag data at the end of a read duration (Recommended when using a **Post Type of Overwrite** in the **Destination Options**).

**Example:** An **Interval** of 300 with a **Duration** of 15 means the reader will run every 5 minutes for 15 seconds each time. Once the 15 seconds have passed, the reader will stop and start again 5 minutes later.

##### Daily Scanning

Daily scanning allows you to configure the read operations to be performed on selected days/times of the week, allowing you to set a **Start** and **Stop** time.

### 6.1.3 GPI Trigger

With this option enabled, data will only be streamed when a signal is received from the specified Trigger Port. Items that can be connected to this type of port could be a push button/switch or a motion/light sensor. This **Scan Mode** takes effect once the reader has been started.

1. **Port** – This value tells **ClearStream RFID** which General Purpose Input port on your RFID reader to expect the trigger from. If a trigger is received, the read will be started.
2. **Name** – This value specifies a name for the GPI trigger. This value can be posted to your destination when the **Start Event** field is mapped.
3. **Duration** - This value (in milliseconds) specifies how long the reader should run once the process has started streaming.
4. **De-bounce** – Determines how long (in milliseconds) after a GPI Duration the reader must wait before a subsequent GPI event can trigger a read (Only available when multiple GPI ports are configured).
5. **Send tags when read** – When enabled, tag data is sent from the reader as tags are read. Disabling this feature sends tag data at the end of a read duration.

**Example:** You are looking to track items as they pass through an entry point but do not want to run the RFID reader constantly. In this case, a motion sensor can be connected to one of your readers GPI ports. When someone activates this motion sensor, it will then trigger the RFID reader to start the read, capturing the tag data when it passes though the entry point. The read will stop after the set **Duration** has expired.

### 6.2 Antenna Settings (RFID Readers only)

**ClearStream RFID** allows you to specify a name for each antenna and its power level. This helps in identifying the location where a tag was read. To modify antenna settings, click the **Add** button for each antenna you have connected and see below for more information. If these antenna settings are left blank, the default values are used.

- **ID** – This correlates to the antenna port of your RFID reader and is a read only field.
- **Name** – This allows you to name each antenna according to where it is located.
- **Power** – This value (in dBm) controls the read power of each antenna. The higher this setting the further away tags can be read. The allowed values depend on which reader has been selected.
- **Tag Session** – The Tag Session is a setting for making inventory events easier to manage. These sessions serve two purposes: Determines how often a tag will respond to a query from the reader and allows for multiple readers to conduct independent inventories. Select from the 4 options below:
  - a. **S0** – Does not stay Inventoried at all.
  - b. **S1** – Stays Inventoried for .5 to 5 seconds.
  - c. **S2** – Stays Inventoried for at least 2 seconds.
  - d. **S3** – Stays inventoried for at least 2 seconds.
- Antennas can be deleted by highlighting the antenna and clicking the **Remove** button.

**More about Tag Sessions:** All tags have internal flags that are set to A (I have not been inventoried) or B (I have been inventoried). When you read that the session target is A or B, it means that only tags with the flag in that position will be inventoried. The flag is flipped automatically when a tag is inventoried. Depending on which session setting is used and the capabilities of the tag, the flag always flips back to A after a time if it had previously been set to B. A is the tags default state.

**Tip:** To reduce the probability of cross reading from adjacent rooms, the power level should be adjusted after thorough tag read testing.

### 6.3 Tag Settings (RFID Readers only)

Due to the many different tag types and storage capabilities, **ClearStream RFID** gives the ability to specify these values using the **Tag Settings**. In some cases, the tag specifications may not match the default and can be specified here.

- **EPC Tag Length** – The length in bytes of the **EPC** memory bank of the tag.
- **User memory bank length** – The length in bytes of the **User** memory bank of the tag.
- **TID memory bank length** – The length in bytes of the **TID** memory bank of the tag.
- **Max tag count** – Used for performance, this value should be set to the expected number of tags that may be in the readers read range at any one moment.
- **Convert EPC to ASCII** – When enabled, **EPC** values are read in ASCII (text) format.
- **Convert User memory bank to ASCII** – When enabled, the tag's **User** memory bank is read in ASCII (text) format.
- **Read all memory banks during scan** – When enabled, the tag's **TID** and **User** memory banks are read and posted to the destination when mapped.
- **Decode SGTIN** – When enabled, the GS1 SGTIN-96/198 values in a properly encoded GS1 tag will be parsed out into individual tag fields for each tag read. These fields will be added as mappable fields for use in the **Field Mappings** configuration of the Sync Process.
  - **Include check digit** – When enabled the Check Digit will be appended to the UPC/GTIN that is parsed from the GS1 encoded tag.

**Note:** When the **Read all memory banks during scan** option is enabled and a tag is read that does not have a User memory bank value, the tag will not be sent to the destination. Only tags with the User memory bank encoded will be sent to the destination in this case.

### 6.4 Tag Events/Beacon Events/Data Events

As tags, beacons, or custom events are received by **ClearStream** they can trigger different events to take place. These settings are located under **Tag Settings** for RFID Readers, **Beacon Settings** for Beacon Gateways, and **Data Settings** for Custom devices. The default events available are **Tag visible** and **Tag no longer visible**. Tag visible means that a tag has reported itself successfully to the device. Tag no longer visible is an event in which the tag has not reported itself to the device within a certain timeout period so it can be considered no longer in the field of view of the device or antenna. Finally, custom tag events can be created based on multiple tag events in a sequence. The specific Tag Event triggered will be posted to the database as a string when the **TagEvent** field is mapped.

- **Moderate tag reads/Moderate beacon reads/Moderate events** – Enables or Disables tag event reporting.
- **Moderate by (RFID Readers and BLE Beacons only)** – Defines at what level the tag events should be stored. By **Device** will maintain the tag state regardless of the antenna that read it. When in this mode if a tag is read by one antenna, followed by a second within the timeout timeframe it will only be reported once. By **Antenna** will maintain the tag state per antenna. So, in the same example, if a tag is read by one antenna followed by a second within the timeout timeframe it will be reported twice.
- **Timeout** – The length of time in milliseconds to keep track of the tag state. At the end of this timeout the tag is considered no longer visible to the reader.
- **Visible description** – The value as a string reported to the destination when a tag is scanned.
- **No longer visible description** – The value as a string reported to the destination when a tag is no longer visible to the reader.
- **No tag read description** – The value as a string reported to the destination when a read was triggered but no tags were read.
- **Report visible** – Enables or disables whether or not the tag should be reported to the destination for this event.
- **Report no longer visible** – Enables or Disables whether or not the tag should be reported to the destination when it is no longer seen by the reader.
- **Report no tag read** – Enables or Disables whether or not an event should be reported to the destination when no tag is read.
- **Report again only after not visible** – When enabled, a tag that stays in the field of view of the antenna will not be reported to the destination again until after it has left the field of view of the antenna. If this is disabled, a tag will be reported to the destination every n milliseconds defined by the timeout setting.
  - **Report on value changed** – When enabled, an event will only be sent to the destination when a field value of the current tag or beacon changes within the ClearStream buffer for the device. For example, if this option is enabled with the Antenna field selected, an RFID tag will be reported/sent to the destination when the current antenna changes for that tag.
  - **Update Buffer Conditions** – See below for more information.
- **Key Field (Custom and Group only)** – Defines the row identifier for the data collected by the device and is used by ClearStream to maintain the state of an item to correctly report when this item is seen/unseen.

### Update Buffer Conditions

Defines a set of conditions that must be met in order for the ClearStream Device buffer to be updated with the most recent tag, beacon, or event data.

- **Update List (OR)** – A list of conditions that are checked for every new tag, beacon or data event. If anyone of the items in the list are met (OR), the buffer will be updated with the new event data.
- **Update Conditions (AND)** – Defines a list of conditions that must all be met (AND) in order for the new event data to update the buffer.
  - **Field** – The field used to check the condition.
  - **Operator** – The comparison operator that checks the new event data for the selected field against the value that already exists in that field in the buffer.
  - **Value** – The value used in the comparison with the Field that determines if the condition has been met. This is a read only field since the value is determined by the current value in the buffer.

**Use Case:** You have a Group of Bluetooth Gateways that need to track which gateway is the closest to a beacon. Using the Update Buffer Conditions, you can configure the buffer to only change when the new Distance value is less than the old Distance value. In other words, we only record the beacon when it becomes closer to one gateway than another.

### Custom Events

**Custom Events** define a sequence of tag events that need to occur before the custom event is triggered. This means that the tag needs to perform a certain sequence of events before it is reported. This is useful for things such as check in and check out applications, where you only want to report the activity of the tag after it has done something like pass by two antennas in a specific order.

- **Tag Event Description** – The tag event value as a string that will be reported to the destination when this event occurs. Click the **Add** button to add a new custom tag event. Click the **Remove** button to remove the selected event.
- **Tag Sequence** – Defines the list of events that need to occur before the tag will be reported to the destination. Click the **Add** button to add a new tag sequence. Click the **Remove** button to remove the selected sequence.
  - **Field** – The field used to check for an event.
  - **Operator** – The comparison operator that checks the field value against the entered value to determine if the event occurred.
  - **Value** – The value used in the comparison with the Field that determines if the event occurred.
- **Clear tag/beacon from buffer on event** – When enabled, a tag or beacon that performs a custom event will be removed from the buffer. This can be used if the event needs to be immediately accessible again after it has been completed rather than needing to time out of the buffer.
- **IF** – The **If** row defines a condition which must be met for the data to be checked in the **Tag Sequence**. For example, if you only wanted to check a sequence against tags that start with '1000' the condition of **EPC StartsWith '1000'** can be entered.
- **Minimum tag/beacon reads** – Specifies the minimum number of reads of each RFID tag or BLE Beacon that needs to occur before the custom event will be checked.
- **Average RSSI/Distance** – When enabled, the RSSI values, and the relative distance (for BLE only) will be averaged for each of the reads that will be processed during the custom event.

**Use Case:** You are looking to track items as they pass through antennas on separate sides of a gate. If it is read by Antenna 1, then read by antenna 2, a custom event can be setup to mark this event as "Check-In". To do this, create an event called Check-In, then add two sequences. The first will be where **Antenna Equals Antenna: 1**, then, add a 2<sup>nd</sup> sequence where **Antenna Equals Antenna: 2**. This will now only send a read to the destination once the item has passed over Antenna 1 first followed by Antenna 2 and will report the event as "Check-In" to the destination. Note that Antenna values used for the sequences above will depend on what you have named your antennas in the [Antenna settings](#) section.

**Note:** When using Custom Events, Tag visible and Not visible settings will be ignored and should not be used.

### Send Delay

The **Send Delay** feature limits how often event data is sent to the destination. When **Enabled**, tag, beacon, or other event data will only be sent at an interval specified in the **Interval** and **Max events per send** fields.

- **Interval** – The length of time (in milliseconds) between sends of event data to the destination.
- **Max events per send** – The maximum number of events that will be sent to the destination for every interval.

### 6.5 Custom Fields

ClearStream RFID provides a number of default fields that are collected every time a reader scans a tag. The **Custom Fields** tab allows a user to define extra fields that can be static values, or values based off of other data collected by the reader. For instance, a tag's user memory bank may contain a number of fields that can be parsed into separate values. These values can be parsed and used in the field mappings of the configured sync process as custom fields.

- **Add** – Adds a Custom Field, or a Value of the selected field to the list.
- **Remove** – Removes the selected Custom Field or Value from the list.

#### Custom Fields Settings

A Custom Field is made up of one or more Values. These values can be either a Static value or a value from another field collected by the reader. Conditions can also be defined to supply the value if the condition is met. Finally, a function can be configured which defines how the value is parsed from the source data.

- **Field Name** – The name of the custom field being configured. This is the value that will be displayed in the Field Mappings after the field has been created.

#### Custom field Value

The Custom field value is the value that will be supplied to the destination when a tag is read and sent to the destination.

- **Name** – The name for the selected Value.
- **Type** – The type of value to use and can be set to **Static** or **From field**.
  - **Static** – When enabled, a value must be entered to the text field below. This will supply said value to the destination every time a tag is scanned. This is commonly used to send required data to the destination every time a tag is scanned that is not otherwise collected by the reader.
  - **From field** – When enabled, a field must be chosen from the drop down that you wish to pull this data from. The **UserMemoryBank** is a common selection for this, and further manipulation of this data can be done using the **Function** option below.
    - i. **From moderated tag** – When enabled, the custom field value is retrieved from a tag that is within the Moderated Tag Table. Use the Condition configuration as the filter to select the desired tag in the moderated table. If no tag matches the condition the custom field value will be an empty string.
- **Function** – Determines the function used to grab data from the field supplying the value. This can be one of three parsing functions: **LEFT**, **MID**, or **RIGHT**. Only available when **From field** is enabled.
  - **LEFT** – Set the function to LEFT if you wish to do a LEFT parse based on the entered Index.
  - **MID** – Set the function to MID if you wish to start the parse at a specific index and then define the length to parse from that starting index value.
  - **RIGHT** – Set the function to RIGHT if you wish to do a Right parse based on the entered index.

### Use the value if condition met

In this section, users can require a specific condition to be met when using custom fields.

- **Condition** – Defines the condition that must be met for this Value to be set for the Custom Field.
  - **If** – The field the Condition is to be based on.
  - **Operator** – The comparison operator that checks the field value against the entered value to determine if the condition is met.
  - **Value** – The value used in the comparison with the Field that determines if the condition has been met.

### 6.6 Using GPO (RFID Readers Only)

ClearStream RFID allows you to trigger external devices connected to your RFID reader's **GPIO** ports based on the set alerts. For example, these can be used to turn on/off lights or even sound audible alarms. From the **GPO** tab, click the **Add** button for each output you want to trigger and follow the instructions below.

1. **Port** – Set this value to the **General Purpose Output** port number of your RFID reader that your output device is connected to. (Depending on your reader this value is usually between 1-4)
2. **Alert Type** – Select the type of alert. Available options are described below.
  - a. **API** – Occurs through the use of the ClearStream command API.
  - b. **Destination Data Delete** – Occurs when a row in the destination is deleted.
  - c. **Destination Data Insert** – Occurs when a row is added to the destination.
  - d. **Destination Data Update** – Occurs when a row in the destination is updated with new data.
  - e. **Inventory Started** – Occurs when a reader switches to the RFID scanning state.
  - f. **Inventory Stopped** – Occurs when a reader switches to the RFID stopped state.
  - g. **Moderated Tag in Buffer** – Occurs when there are tags in the event buffer. This will only occur when Moderate Tags Reads is enabled.
  - h. **No Tag Read During Inventory** – Occurs when an RFID Inventory is performed, and no tags were read.
  - i. **Send Complete** – Occurs when reader sends a tag to the destination that matches the set condition.
  - j. **Tag Event Any** – Occurs with any type of tag event including Visible, Not Visible, Visible again.
  - k. **Tag Event Not Visible** – Occurs only with a tag event type of No Longer Visible.
  - l. **Tag Event Visible** – Occurs only with a tag event type of Visible.
  - m. **Tag Read** – Occurs when the source of data is populated with a new row. This will occur when an RFID tag is read by the reader.
3. **Port State** – Set to **True** or **False**, controls whether the port is turned on or off on the trigger.
4. **Duration** – This value (in ms) is the amount of time the output will run each time it is triggered.
5. **Profile ID** – This ID specifies the configured profile which will trigger the alert type and power up the port. Not used for **API**, **Inventory Started**, **Inventory Stopped**, **Moderated Tag in Buffer**, **No Tag Read During Inventory**, **Send Complete**, **Tag Event Any**, **Tag Event Not Visible**, **Tag Event Visible**, and **Tag Read** alert types.
6. **Process ID** – This ID specifies the configured process which will trigger the alert type and power up the port. Not used for **API**, **Inventory Started**, **Inventory Stopped**, **Moderated Tag in Buffer**, **No Tag Read**



**During Inventory, Send Complete, Tag Event Any, Tag Event Not Visible, Tag Event Visible, and Tag Read** alert types.

7. **Condition** – The value that must be met for the alert to be triggered. This is typically a 1 for condition met or 0 for condition not met. Not used for **API, Inventory Started, Inventory Stopped, No Tag Read During Inventory, Tag Event Any, Tag Event Not Visible, Tag Event Visible, and Tag Read** alert types.
8. To delete an **Alert**, highlight the **Alert** and click the **Remove** button.

**Example:** Using a combination of an **Alert** with an output trigger, you can sound an audible alarm when an item passes an entry point that is not an authorized item listed in your destination data source.

**Example 2:** Using **Send Complete** to turn on a light if a reader was started but no tags were read. Using a GPI Input to trigger the reader to start and run for a set duration, with a condition set to 0, a light can be turned on if no tags were sent to the destination after the read has completed.

**Note:** Since the number of devices that can be controlled by GPIO is limitless, feel free to contact us directly for assistance when using this function.

### 6.7 Device Options (Zebra/Feig/Alien Readers, Beacon Gateways, Custom Devices Only)

The **Device** tab is customized based on the current type selected. Currently, **Device** options are only available for Zebra, Feig and Alien RFID Readers, Bluetooth Beacon Gateways or Custom Devices.

#### 6.7.1 Zebra Device Options

##### 6.7.1.1 Tag Reporting

The **Tag Reporting** options allow the reader to send tag events to a database field identifying the type of read event that occurred. These tag events are made up of three different types: **New tag**, **Tag invisible**, and **Back to visible**. These event types are described below. To disable tag reporting, uncheck the **Enable tag event reporting** checkbox. We recommend using the [ClearStream Tag Events](#) option instead of the built-in reader functionality as it offers more functionality and flexibility in moderating tag reads.

- **New tag** – Occurs when a currently unseen tag is read by the reader.
- **Tag invisible** – Occurs when a tag has not been seen by the specified timeout period.
- **Back to visible** – Occurs when a tag that was once seen by the reader comes back into range and is read again by the reader.

The following options can be set for each **Tag Reporting** type:

- **Tag Events** – Controls when or if the event should be written to the database.
  - **Immediate** – Event is immediately reported back to the database.
  - **Moderated** – Event is reported after the specified **Timeout** value set.
  - **Never** – Event is not reported back to the database.

- **Description** – Description of the tag event. This gets posted to the tag event field in the database identifying the type of tag event that occurred. This can be customized or left at the default setting.
- **Timeout** – Used with **Moderated** only, sets the timeout (in ms) for the event to occur.

### 6.7.1.2 Tag Masks

**Tag Masks** allow the reader to pre filter tags that are included in an inventory process based on a **Tag Mask** of the EPC memory bank. This will block tags that do not match the mask from being reported to the destination. It can also help in an environment where only a certain subset of tags should be scanned. Note, when converting EPC values to ASCII, the ASCII value of the Mask must be entered.

- **(+) Add Mask** – Click the **Add (+) Mask** button to add a new mask to the list. The Mask is made up of two things, the mask value, and the antenna that should use the mask. The mask value should be a tag prefix that should be used for the filter. For example, if only tags that start with **E200** should be included in the inventory scan, then a tag mask of **E200** should be entered as the tag mask. The Antenna should be set to the port of the Antenna you wish to apply the tag mask to. Please note that this antenna must be entered in the Antenna List.
- **(-) Remove Mask** – Click the **Remove (-) Mask** button to remove the selected Tag Mask.

### 6.7.1.3 Reader Management

This option allows you to restart your RFID reader directly from the **ClearStream RFID** software. This enables you to reset your reader without having to unplug the device or login to its management console. Located on the **Management** tab, the following options are available:

- **Username** – This is the username initially set for your RFID reader.
- **Password** – This is the password initially set for your RFID reader.
- **Secure Mode** – Choose from **HTTP** or **HTTPS**.
- **Reader Type** – Choose between **FX**, **RD** or **XR**. (These are models of Zebra RFID readers)
- **Restart Reader** – Press this button to proceed with the Restart. You will be prompted to confirm the restart and then prompted again when the restart has finished.
- **Restart reader if connection fails** – When enabled, if a connection is lost to the reader and a reconnection attempt fails, ClearStream will attempt to reboot the reader. When the reboot is complete, it will attempt to restart the reader.

**Note:** In order for this to function, it must be a Zebra RFID reader and requires that you have previously set up a username and password. The username and password must also be entered here for this to work.

## 6.7.2 Alien Device Options

### 6.7.2.1 Restart Reader

Click this button to restart the Alien reader from within **ClearStream**.

- **Restart reader if connection fails** – When enabled, if a connection is lost to the reader and a reconnection attempt fails, ClearStream will attempt to reboot the reader. When the reboot is complete, it will attempt to restart the reader.

### 6.7.2.2 Ports

You can set what ports the Alien reader events servers will listen for events on. Click **Apply** to make the changes take effect.

- **Tag Events:** Set the port for the tag events server. The default is **7798**.
- **IO Events:** Set the port for the IO events server. The default is **7799**.

### 6.7.3 Feig Device Options

#### 6.7.3.1 Restart Reader

Click this button to restart the Feig reader from within ClearStream.

- **Restart reader if connection fails** – When enabled, if a connection is lost to the reader and a reconnection attempt fails, ClearStream will attempt to reboot the reader. When the reboot is complete, it will attempt to restart the reader.

#### 6.7.3.2 Network Settings

The network settings allow you to adjust the IP address, Subnet mask, and whether or not DHCP is enabled on the reader. These can be configured as required to connect the reader to a network.

#### 6.7.3.3 Operating Mode

Feig readers can run in different modes. This affects how tags are captured and recorded by the reader.

- **Host Mode** – All commands are issued by ClearStream and performed on the reader in a single call. This is the default mode.
- **Buffered read mode** – In **Buffered read mode**, the reader will store all tags it scans on the reader itself until ClearStream requests all tags scanned. This mode is faster than **Host mode**, however when a reader is stopped using the ClearStream interface, the Feig reader will continue to scan for tags. The tags it scans won't be sent to ClearStream until they are Started again using the ClearStream interface.
- **Notification Mode** – Similar to the Buffered Read Mode, however the reader itself will initiate the connection and remotely send the tag data back to the **IP address** and **Port** specified. This IP and port combination should be a PC running **ClearStream**, and the port should be unique for each reader configured. Make sure all Ports used are open. This mode is useful for a remote installation of the reader where direct network access from the PC might otherwise not be possible. The **Keepalive** option tells the reader to communicate home at a set interval so **ClearStream** can detect a lost connection.

### 6.7.4 Bluetooth Beacon Gateway Device Options

#### Gateway type

Used to set the Gateway Type sending Beacons to ClearStream RFID. The currently supported options are gateways manufactured by **BluEpyc**, **Minew**, and **BlueCats**. Select the Type matching the gateway being used.

#### Listening Port

The port that ClearStream will listen on for Beacons reported by the Gateway. This must match the port configured using the Gateway's web console configuration. ClearStream will default this value to the default set by the manufacturer.

#### Scan for iBeacon

When checked the Bluetooth Gateway will scan for and report Bluetooth beacons which follow the iBeacon protocol.

##### iBeacon Filtering

The **iBeacon Filtering** options allow filters to be applied to iBeacons. Only beacons that match the filter will be reported.

- **UUID** – If a value is present, only iBeacons with a matching **UUID** will be scanned for and reported.
- **Major** – When the value is greater than or equal to 0, only iBeacons with a matching **Major** number will be scanned for and reported.
- **Minor** - When the value is greater than or equal to 0, only iBeacons with a matching **Minor** number will be scanned for and reported.

#### Scan for Eddystone URL

When checked the Bluetooth Gateway will scan for and report beacons with an Eddystone URL frame-type.

#### Scan for Eddystone TLM

When checked the Bluetooth Gateway will scan for and report beacons with an Eddystone TLM frame-type.

#### Scan for Eddystone UID

When checked the Bluetooth Gateway will scan for and report beacons with an Eddystone UID frame-type.

##### Eddystone Filtering

The **Eddystone Filtering** options allow filters to be applied for Eddystone UID beacons. Only beacons that match the filter will be reported.

- **Namespace** – When a value is present, only Eddystone UID beacons will be reported with a matching **Namespace**.
- **Instance** – When a value is present only Eddystone UID beacons will be reported with a matching **Instance**.

### 6.7.4.1 Gateway Device ID and Registration

Bluetooth gateways have different ways of reporting their identification. This identification is required for use in ClearStream registration as well as reporting an accurate location when Bluetooth beacons are recorded. Depending on the type of gateway being used the process of retrieving the Device ID can differ.

#### **BluEpyc**

ClearStream can retrieve the Device ID (Board ID) of a **BluEpyc** Gateway by connecting to it after a valid IP address has been entered. This Device ID is called the Board ID within the **BluEpyc** configuration utility. The Board ID should be set uniquely for each gateway by using this **BluEpyc** configuration utility. To access the **BluEpyc** configuration utility, use a web browser to navigate to the IP address of the gateway. The Board ID will be displayed on the home page of this utility, and can be changed from any value between 1 and 255. After changing the ID click the **Save and Apply** button.

#### **BlueCats**

When using a **BlueCats** Gateway the Device ID should be set to the MAC address of the gateway. This can be found printed on the bottom of the gateway, or it can be found using the web configuration utility under the Network→Interfaces section.

#### **Minew**

When using a **Minew** gateway the Device ID should be set to the MAC address of the gateway. This can be found printed on the underside of the gateway, or by using the web configuration utility found in the Network settings.

### 6.7.5 ClearStream On-Board Device Options

ClearStream On-Board is an embedded application that runs on the reader itself. This application allows for a highly reliable distributed setup of a ClearStream client, and is highly optimized for installations that may not always have data connectivity to the destination database or system. The application has the capability to “store and forward” tag data when a remote connection is available. ClearStream On-Board requires a subscription service to the online web portal to operate. This gives access to an online portal where a user can configure and access all of the readers in an environment. The web portal displays device status so a user can quickly see devices that are online or disconnected.

#### **Configuration Settings**

The configuration for a ClearStream On-board client is performed using the ClearStream Web Portal. This configuration requires a subscription account, and allows remote configuration and viewing of device status through a web browser.

#### **Device ID**

The Device ID needs to be configured in the Reader List so that ClearStream knows which reader is supplying the tag data. You can find the Device ID using the online web portal. Copy the Device ID listed into the Device ID field within the reader list configuration for each device used in the configuration.

#### **Date End Point**

When using ClearStream RFID to stream the data coming from ClearStream On-Board, the **Data End Point** setting within the web console needs to be set to one of the options displayed in the settings for an **On-Board** reader. Copy the appropriate End Point listed into the web portal for the reader you would like to

configure. If using the Management Studio, select the **Management Studio** Data End Point URL. If using the Windows Service, select the **Windows Service** Data End Point URL.

Connecting to an Onboard reader through the ClearStream software enables users to stream RFID tag data to the supported destination types covered in [Chapter 7](#). There are some limitations to using an On-Board reader vs. a directly connected reader in the ClearStream software and are outlined below:

- On-Board does not support the ability to set a [Daily Schedule](#) designating when the reader should be started/stopped.
- On-Board only supports one [GPI \(General Purpose Input\) Trigger](#) per reader for starting/stopping a reader.
- On-Board does not support the use of [Custom Events](#) defining how/when tags are sent to the destination.
- On-Board can only report the EPC and User Memory banks of an RFID tag and does not read the TID.
- On-Board does not support the use of [Custom Fields](#) for sending additional data with tag reads.
- On-Board [GPO \(General Purpose Outputs\)](#) cannot be triggered upon Destination Data Insert, Update, or Delete.

### 6.7.6 Cognex and Custom Device Options

**ClearStream** supports the streaming of Cognex scanners along with custom data that is sent to the application. This can be data sent over a few communication channels which include **HTTP**, **TCP**, or **UDP**. These options are configured using the **Cognex** or **Custom Device Options** form as appropriate.

#### Listener type

The **Listener type** option specifies how **ClearStream** should be listening for the custom device's data. The three options are **HTTP**, **TCP**, and **UDP** and are outlined below.

#### HTTP

When selected, the HTTP option causes **ClearStream** to start listening for http web requests. The URL for making these requests will be shown on the dialog when selected. Data can be sent to **ClearStream** using either a **GET** or a **POST** request. When sending via a **GET** request the field data is supplied as a Key-Value pair as the URL parameters. When sent as a **POST** request the data needs to be structure as a JSON array, made up of Key-Value pairs for each field. In both cases the Key values need to match the fields that are added to the device. Examples of this can be seen in [Appendix E: Custom Devices with ClearStream RFID](#)

#### TCP/UDP

When selected, **ClearStream** will start a **TCP**, or **UDP** listening server on the **Listening port** specified. Make sure this port is open. The data structure sent in this connection must be a JSON array of Key-Value pairs. The Keys must match the fields specified in the Custom device. A sample of JSON structure can be found in [Appendix E: Custom Devices with ClearStream RFID](#)

### 6.7.7 Group Options

A **ClearStream Group** allows a number of devices to be added to a logical grouping. Every device that is a member of the group will send their reported events to the Group. The Group can then be mapped to a

destination as a single unit. This eases the mapping of many devices that all require the same destination and field mappings. Groups are also used when configuring a PTS RTLS system. Use the **Device** tab of the Group to add the devices that should be members of that Group. To remove a device, right click on the device from the **Devices Tree** and click **Remove**.

### **Generate RTLS Data**

When enabled, the data that is sent to the Group from the members of that Group will be processed to generate RTLS data.

### **RTLS Environment Settings**

Click to open the **RTLS Environment Settings** dialog. This dialog allows for customization of the RTLS processing algorithm. These values will affect the accuracy of the RTLS data and can be customized for each environment.

#### **Settings**

The Settings tab contains values that can be adjusted to try and improve the RTLS location accuracy. These values can be adjusted based on the results of some RTLS testing. The defaults will work in most cases.

#### **Process tag delay**

Defines the length of time between each RTLS processing, and send to the server, in milliseconds. The minimum time is 30 seconds, and the default is 5 minutes. Increasing this time will allow for more tag data to be processed potentially resulting in more accurate location data.

#### **Tag valid time**

The length of time in milliseconds that a tag read will be remembered and used in the RTLS calculation. The longer this time is set the slower the tag will react to movement.

#### **Max tag temps per cell**

The maximum number of tags reads to remember per cell/antenna. This can be used in high population environments to reduce the tag load.

#### **Min tag temps per cell**

The required number of tag reads per cell/antenna to be used in the RTLS calculation.

#### **Minimum RSSI**

The minimum RSSI value of a tag read that will be recorded and used in the RTLS calculation. This can be used to filter out faint tag reads if needed.

#### **Max RSSI diff from strongest**

Defines the maximum difference between the strongest tag read and any new tags being recorded for a cell/antenna. This can be used to throw away faint tag reads, if a stronger tag read has already been recorded.

#### **Number of temps to sample**

When this value is set the calculation will switch to only accumulate RTLS averages until this value is hit. This can help with accuracy of the RTLS but can result in reduced reads in certain environments.

### **Median**

When enabled the RTLS engine will determine position based on a median calculation rather than the default average.

### **Consider Neighbor cells**

When enabled the RTLS engine will include neighboring cells/antennas to try and determine best position. This can help improve accuracy in certain environments, but slow the processing down, especially with large populations of tags.

### **Enabled time weight**

When enabled the RTLS engine will gradually decay the weight of a tag read as the read gets older. This has the effect of dropping the importance of tag reads on the calculation the further they are from the present

### **Tag full weight time**

The length of time in milliseconds that a tag read is considered full weight (most effect on the result).

### **Decay rate**

The rate of decay, as a decimal percent, of weight after the full weight time.

### **Min elevation change**

The minimum amount of elevation change from one RTLS calculation to the next before the tag is reported to the destination. Increasing this value can help reduce the amount of data sent to the destination and the flicker of tag movement due to variations in the RTLS calculation.

### **Min azimuth change**

The minimum amount of azimuth change from one RTLS calculation to the next before the tag is reported to the destination. Increasing this value can help reduce the amount of data sent to the destination and the flicker of tag movement due to variations in the RTLS calculation.

### **Enable RSSI Adjustments**

When enabled tag read RSSI values will be adjusted by the specified amount for the selected elevation. This can help reduce tag signal strength for certain elevations if the read power is generally stronger. This can help with tag movement by making the tag move faster passed these stronger elevations.

### **Filters**

The **Filters** tab contains a text area to add filters that define the EPC values to use in the RTLS engine. One EPC should be added per line, and only matching EPCs will be considered. Leave it blank to scan for all RFID tags.

### **Detail**

The **Detail** tab is used for debugging purposes.



### Chapter 7: Data Integration Settings

**ClearStream RFID** allows you to stream data read by your readers to the data destination of your choice. These options include SQL Server, ODBC databases, Microsoft Excel spreadsheets, Text files, and SMTP/URL Endpoints.

#### 7.1 Destination Type

Available choices are **ODBC**, **SQL Server**, **Excel**, **Text** and **Template**. You are presented with different configuration options based on the **Type** chosen. The sections below explain each **Type** in more detail.

##### 7.1.1 ODBC

Choosing **ODBC** allows you stream data to most ODBC databases including (but not limited to) SQL Server, MySQL, Oracle and MS Access. When **ODBC** is selected, the following parameters can be set:

- **ODBC Datasource** – This is a list of available data sources already configured in the **Data Sources (ODBC)** component of your Windows operating system. Select your desired data source here.
- **Schema** – Enter your database Schema name (Optional).
- **Username** – If your database requires a username enter it here.
- **Password** – If your database requires a password enter it here.
- **Login** – Click this button after entering the **Username** and **Password**.
- **Table** – Populated after selecting your **ODBC Datasource** and entering the **Username** and **Password**, this allows you to select the specific table, query, view or stored procedure you want to stream the data reads to.

**Note:** To create a new Windows data source, see [APPENDIX C: Creating a Windows Data Source](#).

##### 7.1.2 SQL Server

Choosing **SQL Server** allows you to sync data to and from a SQL Server database. This can also be accomplished using the **ODBC Type** described above, however there are some speed improvements when using the **SQL Server** type. When **SQL Server** is selected, the following parameters can be set:

- **Server** – The SQL Server data source specified by IP address or host name.
- **Database** – The database instance required for the process.
- **Schema** – Enter your database Schema name (Optional).
- **Authentication** – The user authentication type to use to access the SQL Server database.
- **Username** – If the database requires a username enter it here.
- **Password** – If the database requires a password enter it here.
- **Login** – Click this button after entering the **Username** and **Password**.
- **Table** – Populated after entering the **Username** and **Password**, this allows you to select the specific table, view or stored procedure you want to stream the data reads to.
- Configure **Advanced** options as needed.

### 7.1.3 Excel

Choosing **Excel** allows you to stream your data to a Microsoft Excel spreadsheet. When **Excel** is selected, the following parameters can be set:

- **Excel Workbook** – Click the **Folder** icon and select the Excel workbook you wish to stream data to.
- **Worksheet** – Populated after selecting your **Excel Workbook**, this allows you to select the specific sheet within the workbook to stream the data to.
- **Advanced** – After clicking the **Advanced** button, you can set the **Start Row** in which the data streamed should start in the excel sheet. This is useful if you have column names and want to start on row 2.

**Note 1:** When streaming data to an excel sheet, the workbook must be closed for the process to run properly.

**Note 2:** When using Excel, it is not recommended to use a Continuous read cycle for your RFID reader.

### 7.1.4 Text

Choosing **Text** allows you to stream data to a text file in a configurable format. When **Text** is selected, the following parameters can be set:

- **Select Folder** – Click the **Folder** icon and specify the folder where your text file resides.
- **Filename** – Populated after a folder is selected, this will display all .txt files found in the specified directory. Select the text file you wish to stream data to.
- **Create File** – If the text file does not exist, you can enter the name here and click this button to create the file. This file can be named with a **.txt** or **.csv** file extension.

#### 7.1.4.1 Advanced Text Options

In this area, you can specify the type of delimiter to use, set file uniqueness and define field attributes. See below for the settings available in this section.

- **Delimited** – Sets the type of delimiter to use.
  - **Tab** – Data fields are separated by a tab.
  - **Semicolon** – Data fields are separated by a Semicolon (;).
  - **Comma** – Data fields are separated by a Comma (,).
  - **Space** – Data fields are separated by a single space.
  - **Other** – Data fields are separated by the character of your choice.
  - **Text Qualifier** – Surrounds each field of data with an Apostrophe (') or Quote (").
- **Fixed Width** – Each field is separated by a set width and is defined in the **Text File Fields** section.
- **Static File Suffix** – Will append the value defined here to the text file name.
- **Create Unique File Suffix** – Creates a unique file for each data stream. This is based on a **FileCounter** or **DateTime** and is appended to the file name.

- **Text File Fields** – Define field names and **Fixed Width** settings here. Fields can be added, removed or moved up/down using the navigation bar buttons.
  - **Name** – Specify a field name for each field. This is useful when mapping fields.
  - **Width** – Specify the width to be used for each field and is used with the **Fixed Width** option.
  - **Alignment** – Data can be aligned to the **Left** or **Right** when using the **Fixed Width** option.

**Note:** Creating unique files is only recommended for use when using the Timed Interval Scan Mode. If used in any other mode, you may end up with a large number of unique files.

### 7.1.5 Custom Endpoint

Choosing **Custom Endpoint** (previously **Template**) allows you to stream data to a number of different destinations. These currently include SMTP Email servers, HTTP servers, and Keyboard Emulation (HID). When the **Custom Endpoint** destination is selected, the following parameters can be set.

- **Report** – This is the template file that defines the layout of the data that will be sent to the Endpoint. This file is an XML document that describes the layout of the generated template. The configuration options for this are described in [Appendix D](#).
- **Sender** – The Sender field is used to select where the generated template file will be sent when tags are read. The Sender currently includes sending the template to an SMTP or HTTP Server. To add senders to this list, click on the **Endpoints** button and follow the steps in **Section 7.1.5.1** below.

#### 7.1.5.1 Endpoints

An Endpoint is a location in which the generated template can be sent. These include HTTP web servers or an SMTP mail server. The Configurations are detailed below.

##### SMTP Server

After selecting an SMTP Server as an Endpoint, the generated template will be sent in an Email to the configured SMTP Server. The settings for the SMTP server depend on the settings required for the SMTP Server being used.

- **Host** – The Host or Address of the SMTP Server.
- **Port** – The listening port of the SMTP Server.
- **Username** – The username for a valid account of the SMTP Server.
- **Password** – The password of the user.
- **Sender** – The Email account from which the Email will be sent from.
- **Recipients** – A comma separated list of Email addresses the email will be sent to.
- **Subject** – The Subject of the Email.

### URL

The URL Endpoint option will make a web request to a URL when the template is generated and sent to the Endpoint. This allows a user to send web service requests to a server in a customized format such as JSON using standard web verbs such as GET, POST, PUT, etc.

- **URL** – The web server to use in the request.
- **Method** – The web server verb to use in the request. This allows REST type requests to be made with the generated template.
- **Content-Type** – The content type HTTP header sent in the request.
- **Headers** – Use the **Headers** grid to specify custom HTTP headers to be sent in the request. Use the + button to add a head and set the **Name** and **Value**. Press the **X** button to remove the select HTTP header.
- **Username** – If required, the username of the web server.
- **Password** – If required, the password of the web server username from above.
- **Logged in user** – when enabled, this uses the current logged in Windows user to access the web server. This can be used when connecting to a Microsoft IIS web server that requires Active Directory credentials.

### Keyboard Emulation (HID)

The **Keyboard Emulation** endpoint will send the generated template as Keyboard Input to any window that currently has focus. For example, an RFID tag read can be sent to **Microsoft Notepad** if notepad currently has focus.

#### 7.1.6 PTS RTLS Cloud

The **PTS RTLS Cloud** destination is used to send ClearStream processed real-time location service (RTLS) data to the **PTS RTLS Cloud** (subscription and internet connection required). This service allows a user to upload maps and floorplans, position RTLS devices, and create zones to map and locate tagged assets in real-time. To configure the PTS RTLS Cloud select it as the destination, then make sure the **Field Mappings** are configured as needed. The username and password for the PTS RTLS Cloud will also need to be set on the Tools->Registration/Subscription dialog.

### 7.2 Field Mapping

Once your data **Destination** has been defined, you will then be able to associate the fields or columns in your selected **Destination** to the fields available from the **RFID/Bluetooth Source**. You are also presented with a toolbar which is explained below.

- **Add Field** – This adds an additional field to the mapping for both the Source and Destination.
- **Remove Field** – If a particular field is selected, it removes this from the mapping and shift all fields up. To remove an entire row, select the row from the left-hand column.
- **Move Up/Down** – If a particular field is selected, it moves this field up or down in order. To move the entire row, select the row from the left-hand column.

- **Reset Mappings** – This resets the field mappings to the default state.
- **Clear Mappings** – This removes all field mappings.

### 7.3 Advanced Field Mapping Options

Clicking the **Advanced** checkbox in the field mappings area exposes some additional settings. If you have the **UpdateExisting** or **UpdateExistingAppendIfNotFound** option set (See **Section 7.4** below), you can choose what happens with data when it is synced from the **Source** to the **Destination**. The options are described below.

- **Overwrite** – This is the default behavior. If the “**Advanced**” checkbox is not selected, all source fields will overwrite their respective destination fields. Please note that these field mapping options are retained even if the advanced checkbox is un-enabled.
- **Sum** – This option adds the source field data value to the destination field data during a sync. This option only works with numeric values. This can be used to determine the number of times a tag has been read.
- **Subtract** – This option subtracts the source field data value from the destination field data value during a sync. This option only works with numeric values.
- **Do Nothing** – This option does nothing to the field during a sync.
- **Do Nothing when Null** – This option does nothing to the field during a sync if the source is blank (null).

### 7.4 Setting Update Options

The **Update Options** allow you to control how the data is posted to your destination. The options available are **Append**, **Overwrite**, **UpdateExisting**, **UpdateExistingAppendIfNotFound** or **Delete Existing** and are explained below.

- **Append** – This takes the streamed data and adds it to the existing data in your **Destination**.
- **Overwrite** – This takes the streamed data and overwrites any existing data in your **Destination**.
- **UpdateExisting** – This takes streamed data and updates rows in your **Destination** based on the **Update Fields** chosen. This does not add any new data if a row is not found.
- **UpdateExistingAppendIfNotFound** – This takes streamed data and updates rows in your **Destination** based on the **Update Fields** chosen. This will also add any data rows not found in the **Destination**.
- **Delete Existing** – This takes streamed data and deletes rows in your **Destination** based on the **Update Fields** chosen. Data that does not match is ignored.

**Note:** When selecting one of the two **UpdateExisting** options you will need to specify fields in which to update the row based on. In most cases, this field will be set to the Tag ID field of your Destination. Fields can be added and removed by using the Add and Remove buttons.

**Note 2:** When selecting **Overwrite**, you have the ability to add Destination Filtering. If used, you can specify a filter definition to use when deciding which rows in your destination to be overwritten. Rows that match this filter will be overwritten. If a filter is not specified, then all rows in the Destination will be overwritten.

### 7.5 Adding Source Filters

Located in the **Options** tab of the **Source** settings, adding a **Source Filter** allows you to control which data is streamed to the **Destination**. A typical use for this is allowing only tags read by antenna 1 to stream data to the **Destination**. To setup **Source Filtering** follow the steps below.

1. Click the **Add** button to create a new filter.
2. Select a field to filter on from the **Field** drop down.
3. Select a **Comparison Type**:
  - a. **Equals (=)** – Data is only streamed when it matches the entered **Value**.
  - b. **Not Equal (<>)** – Data is only streamed when it does not match the entered **Value**.
  - c. **LIKE** – Data is only streamed when it is similar to the entered **Value**.
  - d. **NOT LIKE** – Data is only streamed when it is NOT similar to the entered **Value**.
  - e. **Greater Than (>)** – Data is only streamed when it is greater than the entered **Value**.
  - f. **Greater Than or Equal to (>=)** – Data is only streamed when it is greater than or equal to the entered **Value**.
  - g. **Less Than (<)** – Data is only streamed when it is less than the entered **Value**.
  - h. **Less Than or Equal to (<=)** – Data is only streamed when it is less than or equal to the entered **Value**.
4. Enter a **Value** that you want the filter to match.
5. To remove a filter, highlight it and click the **Remove** button.

**Example:** Setting a filter where “Antenna = 1” will only stream data captured by the antenna connected to port 1 on your RFID reader.

### Chapter 8: Application Preferences

These **Preferences** allow you to set the default project path, choose the sync server port and set the level of logging. This area is also used in configuring the **ClearStream RFID Service** explained further in [Chapter 9](#).

#### 8.1 Server Settings

Located in the **Tools** menu under **Preferences**, the following options can be set under the **ClearStream RFID Management Studio Settings** section:

##### 8.1.1 General Settings

###### ClearStream RFID Management Studio Settings

- **Default ClearStream Project Location** – Set this to the location you would like your projects to save.
- **Sync Server Port** – The port number **ClearStream RFID** will listen for Web Service API requests. (Default setting is **4405**)
- **Sync Server Logging Level** – Sets the level of detail written to the **ClearStream RFID** log file. More information on logging can be found in **Section 8.2** below.
- **Minimize to System Tray** – When enabled, the application will hide the task bar shortcut and show an icon in the System Tray. From the system tray the device can be started and stopped.
- **Start Minimized** – When enabled, the application's window will start in the minimized state.

###### ClearStream RFID Sync Service

See [Section 9.1](#) below for more information on setting up the Windows Service with ClearStream.

##### 8.1.2 Notifications

You can add notifications via email for events such as reader connectivity loss, critical errors and when a reader starts/stops. To add a new notification, click the **Plus (+)** button and configure the below settings. Click the **Minus (-)** button to remove an existing notification.

- **SMTP Host** – Set your email account's host address.
- **SMTP Port** – Set your email account's port number.
- **Username** – Set your email account's username.
- **Password** – Set your email account's password.
- **Require SSL** – Enable if your email account requires SSL.
- **Sender** – Set to an email address you would like the notification to come from. This account must have Send As permission.
- **Recipient(s)** – Set to who should receive this notification email. For multiple emails separate with a semi-colon (;).
- **Subject** – The email subject of the notification email.
- **Notifications to send** – The types of notifications to be sent. Each type will send a separate email.
  - **Critical Error** – A notification is sent whenever there is a critical error during the read process.

- **Reader Connection Lost** – A notifications is sent whenever ClearStream loses connectivity with a reader.
- **Reader Connection Reestablished** – A notifications is sent whenever ClearStream reestablishes connectivity with a reader after a connection loss.
- **Reader(s) Started** – A notification is sent whenever a reader is Started.
- **Reader(s) Stopped** – A notification is sent whenever a reader is Stopped.

### 8.1.3 Accept command messages

Enabled by default, this allows ClearStream RFID to accept external command messages such as the Start/Stop of a reader through the ClearStream Web API.

### Cross-Origin Resource Sharing (CORS)

Cross-Origin Resource Sharing (CORS) is a mechanism that uses additional HTTP headers to tell a browser that a web application has permission to access resources from a different origin. The different origin in this case is the ClearStream Web Service. This value should be set to a web server that is going to make requests to the ClearStream Web Service API. If this is not set, a browser will block the request and write an exception to the console similar to the following: **Cross-Origin Read Blocking (CORB) blocked cross-origin response /device with MIME type application/json**. See <https://www.chromestatus.com/feature/5629709824032768> for more details.

## 8.2 Event Log

The **Event Log** provides users with different levels of information that can be used in troubleshooting connectivity or data streaming issues. To open the log window, select **Event Log...** from the **View** menu. You are presented with the following options:

- **Logging Level** – Choose from the options below:
  - **None** – No information will be logged.
  - **CriticalError** – Errors relating to significant data stream problems or connection loss are logged.
  - **Error** – Both significant and smaller errors are logged.
  - **Warning** – Additional information regarding network issues are logged.
  - **Info** – The default level of logging, all primary connection and streaming events are logged.
  - **Verbose** – All actions taken by **ClearStream RFID** are logged in full detail.
- **Clear** – Will clear the contents of the **Event Log** window.
- **Open log file** – Allows you to open the stored log file and view all activity. This file can also be found here: **C:\ProgramData\PTS\ClearStream RFID\SystemInfo\System**
- **Always on top** – When checked, the **Event Log** window will remain on top of all other open windows.



### Chapter 9: Running as a Windows Service

**ClearStream RFID** can be run as a windows service allowing data streams to take place unattended. This is useful when installing to environments that require minimal user interaction and does not require the **ClearStream RFID** software to be open.

#### 9.1 Connecting to your Project

In order to use the **ClearStream RFID Service**, you must first associate a project for use with the service and set your desired port. This is done by following the instructions below.

1. Select **Preferences** from the **Tools** menu.
2. In the **ClearStream RFID Sync Service** section, click the **Folder** icon in the **Active ClearStream Project (.tcproj)** field; select your desired project and then click **Open**. Alternatively, you can click the **Use Current Project** button to associate the currently opened project to the Windows Service.
3. Set the desired **Sync Service Port**. Typically, this is left at the default of **4406**.
4. Choose the **Sync Service Logging Level** to use for the service.
5. Select **OK** to save the settings.
6. Proceed to **Section 9.2** below to learn how to **Start** and **Stop** the service.

**Note:** When making changes to the project used for the service, it is recommended you **Stop** the service if it is currently running.

#### 9.2 Start/Stop the Service

To start the Windows Service, use one of the options below.

- Using the **Start/Stop Service** options under **Start→All Programs→PTS→ClearStream RFID**.
- Using the **Services** console from within **Windows** and right-clicking the **ClearStream RFID Service**.
- Right-clicking the **ClearStream RFID** system tray icon when enabled. (This is enabled by double-clicking the **clearstream\_tm.exe** icon located in the **ClearStream RFID** install directory.)

When the **ClearStream RFID Service** is started, the streaming of tags can be started in three ways.

- If the **Auto Start Readers On Start** option within the **Application Preferences** dialog is enabled, all readers are automatically started when the Windows Service starts.
- Right click on the **ClearStream RFID Tray Monitor** and select **Readers→Start All**.
- Use the **ClearStream API** via any web enabled device.

**Note:** If the ClearStream RFID Service is set to **Automatic** or **Automatic (Delayed Start)**, the service will start automatically when Windows starts. If you do not want to start the service when Windows starts, simply set it to **Manual**.

### Chapter 10: Virtual Site Survey

The **Virtual Site Survey** tool offers the ability to set up a virtual RFID environment. A basic floor plan can be laid out using this tool along with tagged items, fixed readers and antennas. The environment can be animated to show the movement of items throughout the virtual environment and how these items can be scanned using the virtual fixed RFID readers. Factors that can affect read performance are also taken into consideration; including distance from antenna, tag type, and tagged item material type.

#### 10.1 Designing and Building the Virtual Environment

To configure a virtual environment, select **Tools→Virtual Site Survey** from the menu.

##### Building the Floor Plan

1. Use the **Add Floor Space** button to build out the floor plan of the environment.
2. To remove existing floor space, use the **Remove Floor Space** button.

##### Adding tagged items

1. Click the **Tag Container** button to add tagged items to the environment.
2. Click within the created floor space to add items.
3. Use the property grid on the right-hand side to change tag properties including **Type**, **Material**, **TagType**, **TagCount**, **TagList**, **Size** and **Animation Cycle**.

##### Adding readers

1. Click the **Reader** button to add fixed readers to the environment.
2. Click within the created floor space to add readers.
3. Use the property grid on the right-hand side to change reader properties.

##### Adding Reader Antennas

1. Right click on a Fixed RFID Reader already added to the environment and select **Add Antenna**.
2. Add the required number of antennas to the RFID reader.
3. Aim the antennas to the desired location using the antennas target icon.

##### Adding GPO Device (LightStack)

1. Right click on a Fixed RFID Reader already added to the environment and select **Add GPO Device**.
2. Click the newly added GPO device and then select a Type from the Selected Object's Properties. Choices are **LightStack\_OneLight**, **LightStack\_TwoLight** or **LightStack\_ThreeLight**.
3. Based on this selection, a number of ports will display below. Note the port numbers when setting up GPO in your Sync process.
4. Position the light stack where desired.

# Chapter 10: Virtual Site Survey

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## Adding Text

1. Click the **Text** button from the **Toolbox**.
2. Click within the created floor space to add text.
3. Use the property grid on the right-hand side to change the text.

## 10.2 Reading Virtual Tags

To begin reading tags in the virtual environment, the RFID readers need to be powered on. Follow the steps described in [Chapter 5](#) to configure the reader and select where the virtual tag data is to be sent.

**Note:** Only readers configured as **Emulated** readers can be used with the **Virtual Site Survey**.

1. Select the readers in your environment, making sure the IDs match the IDs of the configured readers in the **Reader Configuration** dialog.
2. Use the **Start/Stop** form to power up the virtual readers.
3. Drag tagged items into the field of view of the antennas. As the tags pass through these fields, they will trigger a read, and the tag information is sent to the selected destination.

## 10.3 Configuring an Animation

The **Virtual Site Survey Animation** feature allows for an automated test of the tagged items moving within the virtual environment. Tagged items within the field of view of an active antenna will be read by that antenna and transferred to the data destination.

### To configure an Animation.

1. Add **Animation Areas** to the environment using the **Area Toolbox** item. Animation areas are added sequentially to the environment. All items follow the path created by the **Animation Areas** during the animation process.
2. Select the desired animation type using the **Animation** drop down at the top right of the **Virtual Site Survey** window.
  - **CradleGrave** – All items start at **Animation Area 1** and move to the final **Animation Area**. When tagged items reach the final **Animation Area**, they are removed from the animation.
  - **Cycle** – All Items start at **Animation Area 1** and move to the final **Animation Area**. When tagged items reach the final **Animation Area** they continue on to the first **Animation Area** and the animation continues indefinitely.
3. Use the **Play** button to start the animation.
4. Use the **Stop** button to stop the animation.
5. Use the **Speed** text box to change the speed of the animation.

## Chapter 11: Web Service API

The Web Service API allows an outside application or web page to control the configured devices and interact with the tags and beacons in its field of view. It exposes a simple to use REST interface that can be implemented in any programming language capable of working with Web. This API replaces the legacy ClearStream .NET API in older versions.

The web service API exposes the following operations:

- Start and Stop RFID/BLE readers and gateways
- Start and Stop GPOs on devices that support GPOs
- Get, Update, Clear, and Post the buffer of a Reader or Gateway

Service URL: **http://(IP Address of ClearStream Server):4406/api/v1**

### Web Service Port

The default port used by the web service is 4405 when using the Management Studio, and 4406 when using the ClearStream Windows Service. This can be changed using Tools->Preferences described in [Chapter 8](#).

### 11.1 Requests

The ClearStream Web API is based on REST principles: data resources are accessed via standard HTTP requests to an API endpoint. Note that in most cases a single device can be specified by placing the device index after the /device/ portion of the service's URL. When this is omitted all of the devices will be configured. Alternatively, the device index can be specified in many of the JSON properties.

### 11.2 Responses

All responses are returned as JSON objects to the requestor.

```
Example
HTTP/1.1 200 OK
Content-Type: application/json; charset=utf-8
{
  "result":"true"
}
```

```
Example 2
HTTP/1.1 200 OK
Content-Type:application/json; charset=utf-8
{
  "devices":[{"
    "name":"MRU",
    "deviceid":"5656572",
    "started":true,
    "inventory":true,
    "bufferactive":false,
    "buffer":[{"
```

```
"EPC":"0000000000000000000000001784",  
    "TID": "",  
    "UserMemoryBank": "",  
    "Antenna": "Antenna: 4",  
    "PeakRSSI": "0",  
    "DateTime": "8/20/2018 10:56:20 AM",  
    "ReaderName": "MRU",  
    "StartEvent": "Management Studio Start/Stop Form",  
    "Count": "1",  
    "TagEvent": "",  
    "Direction": "Direction not enabled."},  
{"EPC":"0000000000000000000000001783",  
    "TID": "",  
    "UserMemoryBank": "",  
    "Antenna": "Antenna: 4",  
    "PeakRSSI": "0",  
    "DateTime": "8/20/2018 10:56:21 AM",  
    "ReaderName": "MRU",  
    "StartEvent": "Management Studio Start/Stop Form",  
    "Count": "1",  
    "TagEvent": "",  
    "Direction": "Direction not enabled.",  
    "gpsos": []  
}  
  
]  
  
}
```

### 11.3 Error Responses

When an error occurs the following HTTP error codes will be returned: the body will contain a JSON response with the error code and a message describing the issue in more detail. If an error code of 500 is returned, the ClearStream event log will contain additional information on the error.

- **200 Success:** The request has succeeded. The response body will contain the result.
- **400 Bad Request:** The request failed due to invalid syntax, missing parameters, or malformed requests. The message body will contain more information.
- **404 Invalid Address:** The requested resource was not found on the server.
- **500 Internal Server Error:** Check the event log for additional information.

Example 1:

```
{
  "result":false,
  "code":404,
  "message":"Invalid address"
}
```

Example 2:

```
{"devices": [{
```

## Chapter 11: Web Service API

---

```
"deviceindex": "1",
"result": false,
"gps": [{
  "port": 1,
  "result": false,
  "message": "Requested port is not configured for this reader."
}]
}]
}
```

### 11.4 Operations

#### /device

##### Method: GET

Used to get the full device status and data buffer. If no device index is specified the status of all devices will be returned.

Example:

Request

```
URL: /device/0
METHOD: GET
```

Response

```
{ "devices": [{
  "name": "Loading Dock A",
  "deviceid": "12:3A:12:06:BE",
  "started": true,
  "inventory": true,
  "bufferactive": true,

  "buffer": [
    { "EPC": "0015126387354843", "ReaderName": " Loading Dock A " }, /* Row 1 */
    { " EPC ": "0022106387354843", " ReaderName ": " Loading Dock A " } /* Row 2 */
  ],

  "gps": [
    { "port": 0, "on": false }, /* GPO 1 - off */
    { "port": 1, "on": true } /* GPO 2 - on */
  ]
}]
}
```

##### Method: POST

Used to change the status of the device. This includes device enabled state, and GPO state.

Example:

Request

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---

```
URL: /device
Method: POST
Body: {"devices": [{"start": true, "index": 0}, {"start": true, "index": 1}]}
```

Response

```
{"devices": [
  {"deviceindex": "0", "result": true},
  {"deviceindex": "1", "result": true}
]}
```

### **/device/status**

#### **Method: GET**

Used to get the current status of a device without the tag buffer data. If no device index is specified the status of all devices will be returned.

Example:

Request

```
URL: /device/2/status
METHOD: GET
```

Response

```
{
  "devices": [
    {
      "name": "Loading Dock B",
      "deviceid": "12:3A:12:06:BE",
      "started": true,
      "inventory": true,
      "bufferactive": true,
      "gpos": [
        { "port": 0, "on": false }, /* GPO 1 - off */
        { "port": 1, "on": true }  /* GPO 2 - on */
      ]
    }
  ]
}
```

### **/device/{deviceindex}/buffer**

Used to get or delete the current device buffer. A device index is required in the resource request.

#### **Method: GET**

Returns the current device buffer for the requested device index.

Example:

Request

```
URL: /device/0/buffer
METHOD: GET
```

## Chapter 11: Web Service API

---

Response

```
{
  "buffer":[
    {"EPC":"0015126387354843", "ReaderName":"Loading Dock A"}, /* Row 1 */
    {"EPC ":"0022106387354843", "ReaderName ":"Loading Dock A"} /* Row 2 */
  ]
}
```

### Method: DELETE

Clears the device buffer of the requested device index.

Example:

Request

URL: /device/3/buffer  
Method: DELETE

Response

```
{"result":true,"code":200,"message":"Success"}
```

### /device/{deviceindex}/gpo

Used to get or set the current GPO state. A device index is required in the resource request.

### Method: GET

Gets the current state of the GPOs for the requested device.

Example:

Request

URL: /device/0/gpo  
METHOD: GET

Response

```
{
  "gpos":[
    {"port":0, "on": false}, /* GPO 1 - off */
    {"port":1, "on": true} /* GPO 2 - on */
  ]
}
```

### Method: POST

Sets the state of the GPOs for the requested device to On or Off.

Example

Request

URL: /device/2/gpo  
Method: POST  
Body: {"devices":[{"index":"2","gpos":[{"port": 1, "on":true}]}]}



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---

```
Response
  {gpos":[{"port":1, "result": true}]}
```

### **/version**

Used to retrieve the current version information of the ClearStream server.

#### **Method: GET**

Requests the version information from the server.

Example:

Request

```
URL: /version
METHOD: GET
```

Response

```
{"version":"4.1.0.442","api_version":"1.0"}
```

### **/device/{deviceindex}/buffer/active**

Used to change the state of the device's buffer to active or inactive. When set to inactive the buffer will not be changed by anything. The body of the request should contain the requested state. A device index is required in the resource request.

#### **Method: POST**

Used to change the device's buffer state to active or inactive.

Example:

Request

```
URL: /device/0/buffer/pause
Method: POST
Body: {"isactive":false}
```

Response

```
{"result":true}
```

### **/device/buffer/row**

Used to Insert or Update rows in the device's buffer. The rows to be added are sent in the body and is made up of an array called buffer. This array contains the rows to be added to the devices buffer. To update a row in the buffer, the device's key field value must match what is supplied in the body. For UHF/HF readers this is the EPC field, and for BLE Gateways this is the UID field. A device index is required for this method, if none is supplied the request will fail.

#### **Method: POST**

Example:

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```
Request
URL: /device/1/buffer/flush
Method: PUT
Body: {"buffer":[{"epc":"400000000000000000001782",
                  "SalesOrder":"1000096778"}]}

Response

{
  "results":[{"deviceindex":"1",
              "epc":"hh000000000000000000001782",
              "SalesOrder":"1000096778",
              "result":true}]}
}
```

**/device/buffer/flush**

Used to push the current buffer to the configured destination. This can also accept a filter in the request body to push only matching rows. This filter is an array called filters which must specify the device, a matching column name (from the buffer), and a value. If no device index is supplied all device's buffers will be flushed.

**Method: PUT**

Used to flush the buffer

```
Example:

Request

URL: /device/1/buffer/flush
Method: PUT
Body: {"filters":[{"SalesOrder":"1994553"}]}

Response

{"results":[{"deviceindex":1, "result":true}]}
```

```
/device/{deviceindex/name/deviceid/deviceuuid}properties
```

Used to Select, Insert, Update or Delete custom device name value properties. These properties can be used in different ways for each device. They can be used to set Custom Field values, or to set Custom Tag event values.

**Method: GET**

Gets the current list of custom properties from the device.

Example:

Request

URL: /device/1/properties

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---

Method: GET

Response

```
[{"custom_property": "value of custom property"}]
```

### Method: POST/PUT

Adds a custom property to the device, updates an existing property if it already exists.

Example:

Request

URL: /device/1/properties

Method: POST

Body: [{"custom\_property": "value of custom property"}]

Response

```
{"result": true, "message": "Success."}
```

### Method: DELETE

Removes a custom property by name from the device.

Example:

Request

URL: /device/1/properties

Method: DELETE

Body: ["custom\_property"]

Response

```
{"result": true, "message": "Success."}
```

### Appendix A: Moving ClearStream RFID to a New Host PC

When using a subscription license of **ClearStream RFID** the client list can be moved to a new installation by simply entering your subscription login credentials on the **Tools→Registration/Subscription** dialog. The device list will be automatically pulled from the subscription account.

A **ClearStream RFID** perpetual license allows you to export your list of registered/un-registered seats making it easy to move the installation to a new PC. This is only required for a Perpetual Registration. If you have a Subscription, enter an account admin Username and Password on the **Tools→Registration/Subscription...** dialog. All of the existing devices will be automatically downloaded.

#### To Export the license file from ClearStream RFID (Perpetual Licenses Only):

1. Launch **ClearStream RFID**.
2. Select **Registration/Subscription** from the **Tools** menu and select the **Import/Export** tab.
3. Click the **Export** button.
4. Select a location and filename for the **Export** file and click **Save**.

**Note:** A registration file can only be exported from a fully licensed install of ClearStream RFID.

#### To Import the license file to your ClearStream RFID installation (Perpetual Licenses Only):

1. Launch **ClearStream RFID**.
2. Select **Registration/Subscription** from the **Tools** menu and select the **Import/Export** tab.
3. Click the **Import** button and locate the previously created **Export** file.
4. Select the file and click **Open**.
5. You will receive confirmation of a successful import.
6. The **Registration** tab should now be updated with the correct information.

**Note:** A registration file can only be imported to a fully licensed install of ClearStream RFID.

### Appendix B: Terms and Concepts

#### Terms and Phrases

As with most technologies, RFID and **ClearStream RFID** use industry accepted terms and phrases as well as terms that are unique to **ClearStream RFID**.

**RFID Reader:** A transmitter/receiver that reads the contents of RFID tags in the vicinity.

**Bluetooth Low Energy (BLE):** A wireless personal area network, designed to use very low power with a long transmission range.

**Beacon Gateway:** A device used to collect Beacon pings and transmit them to a user defined location.

**Read Range:** The distance in which an RFID reader and antenna can read an RFID tag reliably.

**Passive RFID Tag:** An **RFID Tag** that does not contain a battery; the power is supplied by the reader. When radio waves from the reader are encountered by a passive RFID tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tag's memory.

**Active RFID Tag:** An **RFID Tag** equipped with a battery that can be used as a partial or complete source of power for the tag's circuitry and antenna. Some active tags contain replaceable batteries for years of use; others are sealed units.

**RFID Tag Inlay:** Comprises the chip and aluminum, copper or silver antenna bonded to a polyethylene terephthalate (PET) layer that is delivered to the label maker "dry" (without adhesive) or "wet" (attached to a pressure sensitive liner). The inlay is adhered to the back side of the label and printed and encoded by an RFID printer.

**Bluetooth Beacon:** A battery powered Bluetooth Low Energy transmitter.

**LLRP:** The acronym of '**Low Level Reader Protocol**', ratified by EPCGlobal in April 2007. LLRP is the RFID-aware protocol that is intended to standardize the network interface of the RFID readers. It is designed as a standard in order for developers to have a common programmatic interface to RFID readers from different manufacturers.

**Stream:** The ability of **ClearStream RFID** to constantly send data from RFID readers to a predefined destination.

**Profile:** A **Profile** is simply a term used to describe the collection of individual processes. This **Profile** also determines the order in which a **Process** is run.

**Process:** A **Process** is the most basic level of configurations for **ClearStream RFID** and represents the transfer/streaming of data. These processes are configured to send data in one direction; from a **Source** to a **Destination**.

## Appendix B: Terms and Concepts

---

**Source:** The Source is the collection of information used to update the destination in a given streaming **Process**. In **ClearStream RFID**, the source is set to the RFID reader(s) being used in a **Process**.

**Destination:** The **Destination** is simply the endpoint or database designated to receive streaming data from the reader(s). The **Destination** is determined by the type of file you wish to send data to.

**ClearStream RFID Project:** A **ClearStream RFID Project** is a collection of profiles and processes.

**ClearStream RFID Project Export:** This file encompasses all the settings within a **ClearStream RFID** project allowing for easy sharing but requires the file to be imported back into **ClearStream RFID** rather than simply opened.

### **Primary ClearStream RFID File Extensions:**

#### **ClearStream RFID Project file - .tcproj**

The file used by **ClearStream RFID** to save projects. This file requires associated files in sub folders that contain configuration information. These files and folders are created whenever a new **Project** is saved.

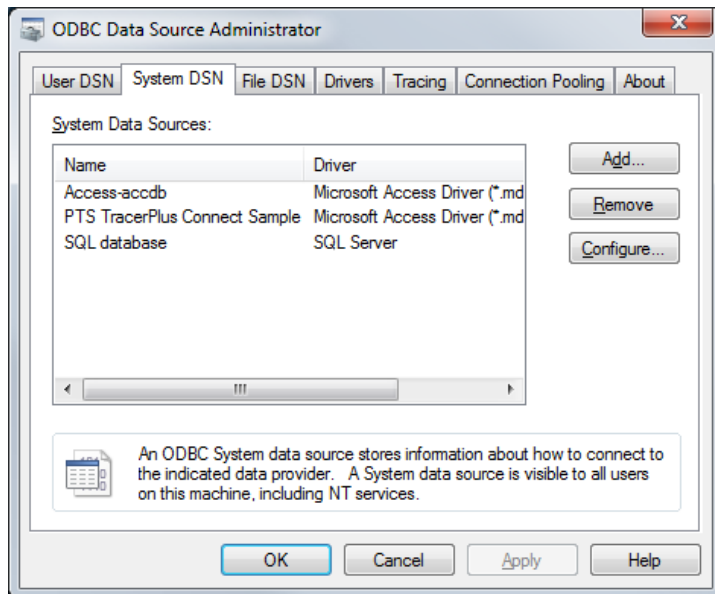
#### **ClearStream RFID Profile Export file - .tce**

This file is a sharable version of the .tcproj file. This manually created exported file contains all the info normally stored in the .tcproj file along with the associated folders. Once shared and imported back into **ClearStream RFID**, this file would be saved as a **.tcproj** for editing or use.

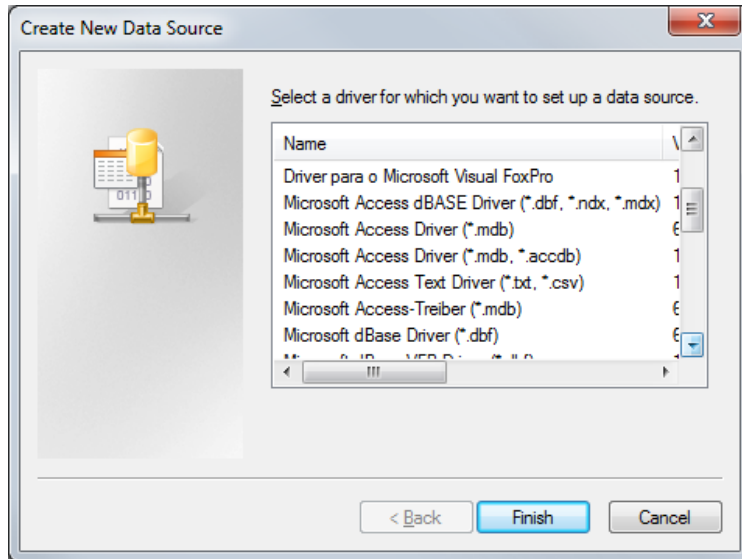
### Appendix C: Creating a Windows Data Source


#### Creating a New Data Source to Connect to an Existing ODBC Database

1. Click the Windows Start Menu at the lower left corner of your PC.
2. Navigate to and open the Control Panel window.
3. If your Control Panel is set to *Icon View*, then double click the **Administrative Tools** icon.
4. If your Control Panel is set to *Category View*, first Select **System and Security**, then double click the **Administrative Tools** icon.
5. Double click the **Data Sources (ODBC)** icon.
6. The **ODBC Data Source Administrator** window will open.



7. Select the **System DSN** tab, then click the **Add** button.
8. The **Create a New Data Source** window will open.



9. Select the appropriate driver based on the database type you wish to use. If the desired driver is not present, consult your database user guide on how to manually install the proper driver.
10. Click **Finish**
11. This will open the database **Configuration** window. Enter the relevant information about your DSN, and select the database file. The method for selecting the database will vary based on which type you are using. Refer to the built-in Windows Help or your database user guide for additional information.
12. After completing the configuration, Click **OK** to close the **ODBC Data Source Administrator** control panel.
13. The database is now configured and will appear in the **OBDC Datasource** dropdown in **ClearStream RFID**. If the database name is not visible, click the **Refresh Button**  to update the dropdown list.



### Appendix D: ClearStream Report Sample

#### Sample format using advanced features

The following is a sample report that will generate a template that is sent to an Endpoint.

```
<format>
<definevars>
  <var name ="epc"           type="DB" source="EPC"/>
  <var name ="datetime"      type="DB" source="DateTime"/>
  <var name ="device"        type="DB" source="Device"/>
  <var name ="antenna"        type="DB" source="Antenna"/>
  <var name ="tagevent"      type="DB" source="TagEvent"/>
</definevars>
<printerdata>
  <formatheader max_records_per_page="1">
    </formatheader>
<pageheader>
<br/>
RFID Tags Read<br/>
Date: <var name="datetime"/><asc>0D</asc>
Location: <var name="device"/><asc>0D</asc>
<br/>
Inspection Items:<br/>
</pageheader>
<record>
Tag: <var name="epc"/><asc>0D</asc>
Read on antenna: <var name="antenna"/><asc>0D</asc>
Event: <var name="tagevent"/><asc>0D</asc>
</record>
<pagefooter>
<br/>
<asc>0C</asc>
</pagefooter>
<formatfooter>
</formatfooter>
</printerdata>
</format>
```

#### <definevars>

This section of a report defines the variable data for a report. These definitions allow you to define variables that are assigned to specific fields within the ClearStream field mappings. In this example, we have defined the following variables:

### **EPC, DateTime, Device, Antenna and Tag Event**

Each variable definition contains information about the datatype along with the ClearStream field to be used in the template. These fields will be loaded into the ClearStream Field Mappings area when the report is selected. At the time of generating the Template the fields in this section will be populated with the data being sent from the Source.

#### **<formatheader>**

Every report contains a format header which typically contains additional elements relative to the overall report. In the example above, the only setting required in this area is the number of records to include in this report. Since this report is only emailing data on one specific tag at a time, this value should be “1” as shown.

#### **<pageheader>**

Every report also contains a page header section which allows you to define elements that appear on every page. In the example above, since there is only one page, this contains simple header type information for the body of the generated template. The title of this sample template is “RFID Tags Read”. Also included in this header are the date/time, and location of this particular tag read. It is worth noting that both of these values are referencing data from ClearStream via the respective variable definitions.

#### **<record>**

The record section of a report allows you to define the section(s) of the report that will send for every record included in this template. In the example above, this will only represent one record since we are only creating one template from a single record.

#### **<pagefooter>**

The pagefooter allows any summary type data to be generated in the template.

### Appendix E: Custom Devices with ClearStream RFID

This section describes how to add devices to ClearStream that utilize the Custom device type. Devices that can be configured to send data to custom end points can utilize this device type to stream data to a user selected destination in the same way that core RFID, and BLE devices can stream data. The support end point communication options are HTTP, TCP, and UDP, and the data must be structured as a JSON array of name value pairs, that match the Source devices field names. The configuration of some supported devices are described below.

#### E.1 Cognex Barcode Scanner

Barcode scanners developed by **Cognex** can be configured to send data to ClearStream, and then ClearStream will stream the barcode data to the user selected destination. To configure a **Cognex** barcode scanner follow the steps below.

- Install the **Cognex DataMan Setup Utility**.
- Open the setup utility and allow it to find your **Cognex** barcode reader.
- Double click on the barcode reader to configure it (take note of the serial number at this step).
- Navigate to the **Communication** category within the setup utility.
- Set the **Destination** to 'Ethernet/IP', set the **Type** to **TCP**, and set the **IP address** to the IP address where ClearStream is running. If required, you can also set the port that ClearStream should be listening on to receive the barcode TCP data (make sure this port is open on the PC running ClearStream).

**Note:** To set the destination IP/Port, you need to disable the option in order for you to be able to change the settings, and then you need to re-enable the setting once done.

- Navigate to the **Data Formatting** category of the setup utility and select the **Custom Script** section. Enter the script as below:

```
function onResult (decodeResults, readerProperties, output){
    var mac = dmccGet('DEVICE.MAC-ADDRESS').response
    var serial = dmccGet('DEVICE.SERIAL-NUMBER').response;

    if (decodeResults[0].decoded){
        output.content = '{"MAC":"' + mac + '", "DeviceID":"' + serial + '", "barcode":"' + decodeResults[0].content + '"}';
    }
}
```

- Save your settings and allow the device to reboot.

At this point the barcode scanner is configured to send all barcode data to the IP address specified. ClearStream will now need to be configured to listen for this data, and map it to a destination following the steps below:

- Install/Open ClearStream RFID.
- Create a new project and add a **Profile/Process**.
- From the source side of the configuration screen click on the **Devices** button.
- Add a new Device to the configuration of type **Cognex**.
- Set the **Device ID** to match the serial number that was noted in the earlier step. This is used to verify the scanned data from the barcode data, as well as indicate which reader the scanned data is being sent from.
- Add a **Custom Field** called **barcode** to the **Custom field list**. You will note that this matched the JSON field from the custom script section.
- On the **Data Settings** tab select the **barcode** field as the **Key Field**.
- From the **Device** tab, set the **Listener Type** to **TCP**, and set the port to match what you selected during the barcode reader setup.
- Configure a destination for the barcode device and map the columns as appropriate. Refer to [Chapter 7: Data Integration Settings](#) for information regarding the destination options.
- Save the project.

ClearStream can now be started by navigating to the form **Start/Stop**, and clicking the **Start Selected** on this device. Anytime a barcode is decoded by the **Cognex** reader, it will be sent to ClearStream and streamed to the selected destination.