Metalcraft, Inc.

RFID Image Database Tool
User's Guide

Version 4.0

Revision History

Date	Version	Description	Author
February 22, 2002	1.0	Created document	Timothy A. Herrick
March 29, 2002	2.0	Added to Preface section 1	Timothy A. Herrick
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April 24, 2002	4.0	Added Section for Barcode only generator	Timothy A. Herrick

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Preface

1. What is the RFID Image Database Tool

The RFID Image Database Tool is used to create databases of RFID images for use with Metalcraft's RFID Label Read/Write System. Basically, you'll start with a tab-delimited table of information. You'll create a schema to describe how the information is put together to form an RFID image. The tool will then apply the schema to each record in the table and create the RFID Image Database to be used with the Software Processing and Control System (SPCS).

2. A Short History

The Software Processing and Control Subsystem (SPCS) and the RFID Image Database Tool were originally developed by Iowa State's May02-01 senior design team. These combined with Metalcraft's transport subsystem form Metalcraft's RFID Label Read/Write and Transport System.

3. Documentation Resources

1. RFID Image Database Tool User's Guide, DTUG, V4.0, 2002
2. RFID Label Read/Write System Developer's Guide, DEVG, V1.0, 2002
3. Software Processing and Control Subsystem User's Manual, SPCSUM, V1.0, 2002

4. Terminology and Notation

RFID Image
A record containing the binary data to be programmed into RFID tags, a description of where in the tag to put it and the associated barcode (if one exists).

RFID Image Database
A collection of RFID Images

Schema
Description of RFID Image structure

Software Processing and Control System (SPCS)
The software system that controls the devices and web handler that actually writes the RFID labels.

1. Image Schema

1.1 Overview

The image schema is used to describe the format of the images to be generated. The schema is described using a very simple markup language similar to XML and HTML.

1.2 Tags

1.2.1 Barcode

USAGE: <BARCODE>*barcode*</BARCODE>

The barcode tag associates barcode data with the image. The identifier between the tags is the name of the column in the data file that contains the barcode data. Note this information will not be written to the RFID label. It is only used to associate images with barcodes so the Software Processing and Control System can find the right image for each label.

1.2.2 Block

USAGE: <BLOCK Address="*0x00000000*"> </BLOCK>

Everything appearing between the block tags will be written to the RFID transponder starting at the given address.

1.2.3 Field

USAGE: <FIELD Type="*TYPE*">*field*</FIELD>

The field tag inserts data from a field in the data file. The type attribute signifies how data is stored in the RFID transponder.

TYPE can be:

STRING	–	Stored as a null terminated ASCII character string
INTEGER	–	Stored as a 32-bit little endian integer
DOUBLE	–	Stored as a 64-bit double precision floating-point number (Little endian)

The identifier between the tags is the name of the column in the data file that contains the data.

1.2.4 String

USAGE: <STRING>*String data*</STRING>

The string tag inserts static text into the image. The text between the tags is stored as a null terminated ASCII character string in the RFID transponder.

1.2.5 Integer

USAGE: <INTEGER>*1*</INTEGER>

The integer tag inserts a static integer into the image. The number between the tags is stored as a 32-bit little endian integer in the RFID transponder.

1.2.6 Double

USAGE: <DOUBLE>*1.100000*</DOUBLE>

The double tag inserts a static floating point number into the image. The number between the tags is stored as a 64-bit double precision floating-point number in the RFID transponder.

1.3 Save A Schema

You can save a schema by one of four ways:

- Click "Save Schema" under the File menu
- Click "Save As" under the File menu
- Pressing Ctrl+S
- Click on the save schema icon on the toolbar

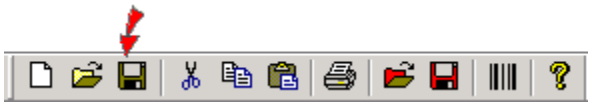


Figure 1-1 Save Schema Icon

1.4 Load A Schema

You can load a previously saved schema three ways:

- Click "Open Schema" under the File menu
- Pressing Ctrl+O
- Click on the open schema icon on the toolbar

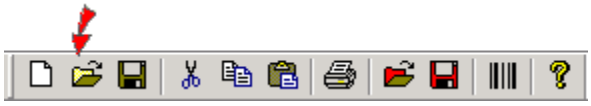


Figure 1-2 Open Schema Icon

1.5 Create A Schema

To create the schema you can use the buttons on the Insert Tag Toolbar or type the schema directly into the edit window.

Figure 1-3 Insert Tag Toolbar

2. Input Data

2.1 File Format

The input data file is a tabbed delimited text file, a format easily exported from Microsoft® Excel and other applications. It is important though, that the first record contains the names of the columns.

2.2 Open the Input Data File

You can load the input data file one of two ways:

- Click “Open Data” under the File menu
- Click on the open data icon on the toolbar

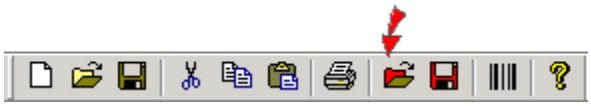


Figure 2-1 Open Input Data File

Once a data file has been loaded the Open Input Data File icon will turn green. Only one data file can be used at a time. To load a new data file, just click on the icon or menu item again. You do not have to close and reopen the program.

3. RFID Image Database

3.1 Save the Database

You can save the RFID Image Database one of two ways:

- Click “Save Data” under the File menu
- Click on the save data icon on the toolbar

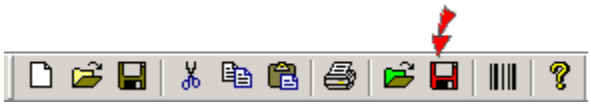


Figure 3-1 Save RFID Image Database

3.2 File Format

3.2.1 Types

Items are stored in the RFID Image Database based on the standard types in the IA32. Specifically the following types are used.

UINT32	–	A little endian, 32-bit, unsigned integer
DOUBLE	–	A 64-bit double precision floating-point number (Little endian)
STRING	–	A null terminated ASCII character string

3.2.2 File Description

The first four bytes in the file contain the number of records in the database stored as a UINT32. Next follows a record descriptor for each record in the database.

```
<UINT32>Number of Records | RECORD | RECORD | …
```

3.2.3 Record Descriptor

The first four bytes of the record descriptor contain the size of the record stored as a UINT32. The record size includes the four bytes that store the size. Next comes the barcode data associated with the record stored as a STRING. If no barcode is associated with the record, the string consists of a single null character. Next comes the number of buffers in the record stored as a UINT32. Next comes a buffer descriptor for each buffer in the record.

```
<UINT32>record size | <STRING>barcodeData | <UINT32>numberOfBuffers |
BUFFER | BUFFER | …
```

3.2.4 Buffer Descriptor

The first four bytes of the buffer descriptor contain the start address for the buffer stored as a UINT32. Next comes the size of the buffer in bytes stored as a UINT32. Note this is the size of the buffer not the size of the buffer descriptor. Last comes the actual buffer data.

```
<UINT32>start address | <UINT32>bufferSize | bufferdata
```

4. Generate a Barcode Only Database

Since a majority of the jobs will require that the barcode be read from the label be written to the RFID tag and nothing else, the RFID Image Database Tool allows the user to quickly generate such a database.

4.1 Start the Generator

You can start the barcode only database generator one of two ways:

- Click “Barcode Only” under the Create menu
- Click on the barcode only icon on the toolbar

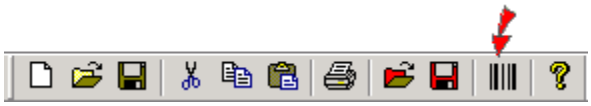


Figure 4-1 Barcode Only Icon

4.2 Input Settings

A window like the one in Figure 4-2 will pop up asking for input settings.

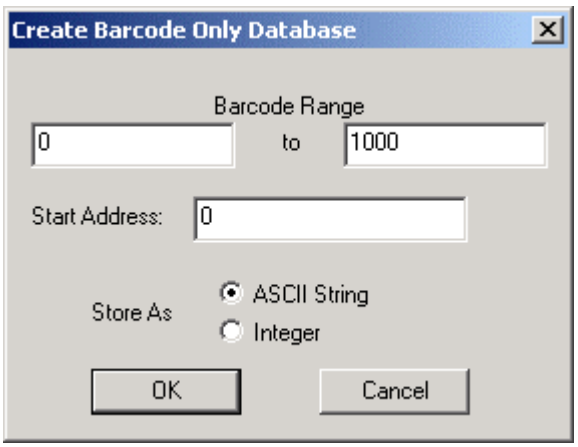


Figure 4-2 Create Barcode Only Database

The barcode range is the range of barcode numbers to create. The “Start Address” is the address where the barcode should be written into the RFID tag. Usually, the customer will want to start at the beginning of the tag, which is address 0. Lastly, the user can select to store the data on the RFID tag as a null terminated ASCII character string or a little endian, 32-bit, unsigned integer.

4.3 Save Database

When the user clicks OK, the program will prompt the user for a file name. The program will notify the user when the database is done saving.

5. Step by Step Tutorial

This tutorial shows you how to create a RFID Image Database using the RFID Image Database Tool by taking you step by step in generating a sample database. In this example, we want to create images that program a label's barcode into the label's RFID Transponder.

5.1 Open The Data File

Click on the open input data file icon and open "SampleData.txt" that was packaged with the RFID Image Database Tool.

Figure 5-1 Open Input Data File

5.2 Create The Schema

5.2.1 Barcode

First we want to associate the barcode with the image so the Software Processing and Control System can find the right image later. To do this, click on the Barcode button. A window will come up containing the list of columns in your data file. In this sample, there is only one column named "BARCODE". Select it and click OK. You should now see **<BARCODE>BARCODE</BARCODE>**in the edit window.

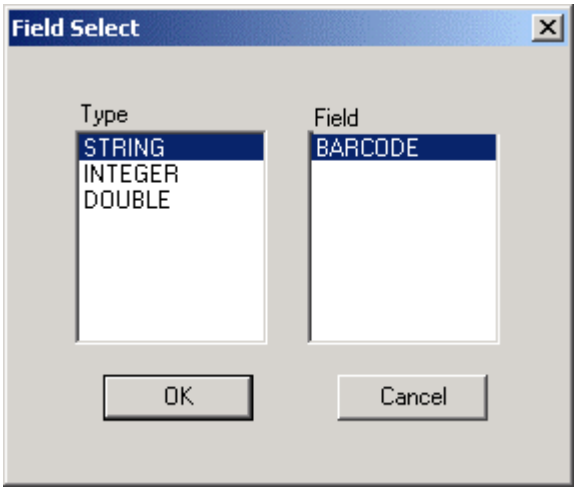
5.2.2 Block

Next, we want to insert a block and state where in the RFID transponder memory we want to start writing data. Click on the Block button. A window will pop up asking for the starting address. We want to start writing information at the beginning of memory so enter "0" (zero) in the edit box and click OK. The edit window should now contain:

```
<BARCODE>BARCODE</BARCODE>
<BLOCK Address="0x00000000">
</BLOCK>
```

5.2.3 Field

Now we want to add the data that will actually get written to the label. First click after **<BLOCK Address="0x00000000">** in the edit window to place the insertion cursor there. The insertion cursor is a vertical blinking bar. Now click the **Field** button. A window comes up which contains two list boxes. The list box on the left contains a list of data types. We want to write our data as an ASCII string so select "STRING". The right list box contains a list of list of columns in your data file. In this sample, there is only one column named "BARCODE", select it. The window should look like this:



Click OK to continue. The edit window should now contain the following:

```
<BARCODE>BARCODE</BARCODE>
<BLOCK Address="0x00000000">
     <FIELD Type="STRING">BARCODE</FIELD>
</BLOCK>
```

5.2.4 Done with the schema

The schema is now done. You could save it if you want to but there really is no need here. Also, you could have typed:

```
<BARCODE>BARCODE</BARCODE>
<BLOCK Address="0x00000000">
     <FIELD Type="STRING">BARCODE</FIELD>
</BLOCK>
```

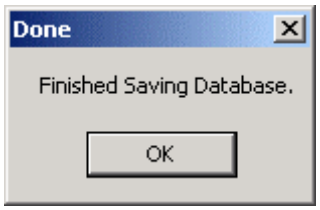
directly into the edit window. This tutorial used the button method just to show you how it worked.

5.3 Save Database

Finally, in order to create the RFID Image Database, click on the save database icon.

Figure 5-2 Save Database

When the save dialog box comes up, give the file a name and click save. When the database is done saving you should see:



Click OK and that's it, you're done! Have fun!