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Table of Contents

Chapter 1 Quick Start
Check Hardware ................................................................. 1-2
Install the Battery ............................................................ 1-3
Charge the Reader ............................................................ 1-4
Wireless Interface ............................................................ 1-5
Install ESP ................................................................. 1-6
Select Model ................................................................. 1-7
Connect to the Reader .................................................... 1-8
Configure the Reader ..................................................... 1-9
Save Changes in ESP ...................................................... 1-10

Chapter 2 Using ESP
App Mode ........................................................................... 2-2
Tree Controls ....................................................................... 2-3
Menu Toolbar ....................................................................... 2-4
Send/Receive ....................................................................... 2-14

Chapter 3 Basic Operations
Practice Targeting ............................................................. 3-2
Dual Optics ......................................................................... 3-3
Operational Feedback ....................................................... 3-5

Chapter 4 Communications
Communications by ESP ................................................... 4-2
Communications Overview ................................................ 4-3
Bluetooth ........................................................................... 4-4
Batch Mode ........................................................................ 4-6
Preamble ............................................................................ 4-9
Postamble ........................................................................... 4-10
Preamble and Postamble by ESP ....................................... 4-11
Keyboard Mapping .......................................................... 4-12
USB Keyboard Rate ........................................................ 4-13
Text Command Timeout ................................................... 4-14
Other Communications Mode Commands ....................... 4-15

Chapter 5 Read Cycle
Read Cycle by ESP .......................................................... 5-2
Trigger Active .................................................................... 5-3
Default Continuous Event ............................................... 5-4
Maximum Decodes per Read ............................................. 5-5
Read Cycle Timeout ........................................................ 5-6
Ignore Duplicate Symbol Timeout ..................................... 5-7
Targeting Zone Tolerance ................................................ 5-8
# Table of Contents

Morphological Preprocessing .......................................................... 5-9
Camera Settings ............................................................................ 5-10

## Chapter 6 Symbologies

Symbologies by ESP ................................................................. 6-2
Data Matrix .............................................................................. 6-3
QR Code .................................................................................. 6-4
Aztec Code ............................................................................. 6-5
Code 39 .................................................................................. 6-6
Code 128 ............................................................................... 6-7
BC412 .................................................................................. 6-8
Code 93 .................................................................................. 6-9
Codabar ................................................................................. 6-10
Interleaved 2 of 5 ..................................................................... 6-11
UPC ....................................................................................... 6-12
Postal ..................................................................................... 6-13
Pharmcode ............................................................................. 6-14
GS1 DataBar .......................................................................... 6-16
PDF417 .................................................................................. 6-17
MicroPDF417 ........................................................................ 6-18
Composite .............................................................................. 6-19
Symbology Identifier ............................................................... 6-20

## Chapter 7 I/O Parameters

I/O Parameters by ESP ............................................................. 7-2
No Read Notification ............................................................... 7-3
Targeting ................................................................................ 7-4
Beep and Vibrate ................................................................... 7-5
Button Stay-Down Time ......................................................... 7-6
Button/Trigger Programming .................................................. 7-7
Data Validation ...................................................................... 7-10

## Chapter 8 Advanced Operations

Continuous Read ................................................................. 8-2
Mirroring ............................................................................... 8-3
Bluetooth Keyboard-to-Windows 7 Pairing ......................... 8-4
Bluetooth Keyboard-to-Table Pairing ................................. 8-8
Bluetooth Keyboard-to-Mobile Phone Pairing .................. 8-11
Reader Paging ...................................................................... 8-13
Bluetooth Out-of-Range Notification .................................. 8-14
Cell Phone Reading Enhancement ....................................... 8-15

## Chapter 9 Terminal

Terminal View ......................................................................... 9-2
Find ...................................................................................... 9-3
Send ..................................................................................... 9-4
# Introduction

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macros</td>
<td>9-5</td>
</tr>
<tr>
<td>Terminal Right-Click Menu</td>
<td>9-6</td>
</tr>
<tr>
<td>Terminal Dropdown Menu</td>
<td>9-7</td>
</tr>
</tbody>
</table>

## Chapter 10 Utilities

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differences from Default</td>
<td>10-2</td>
</tr>
<tr>
<td>Firmware</td>
<td>10-3</td>
</tr>
<tr>
<td>Bluetooth</td>
<td>10-5</td>
</tr>
<tr>
<td>Advanced</td>
<td>10-6</td>
</tr>
</tbody>
</table>

## Appendices

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix A General Specifications</td>
<td>A-2</td>
</tr>
<tr>
<td>Appendix B Electrical Specifications</td>
<td>A-5</td>
</tr>
<tr>
<td>Appendix C Configuration Symbols</td>
<td>A-6</td>
</tr>
<tr>
<td>Appendix D Communications Protocol</td>
<td>A-18</td>
</tr>
<tr>
<td>Appendix E ASCII Table</td>
<td>A-19</td>
</tr>
<tr>
<td>Appendix F Maintenance</td>
<td>A-20</td>
</tr>
<tr>
<td>Appendix G Glossary of Terms</td>
<td>A-21</td>
</tr>
</tbody>
</table>
About the HS-51 and HS-51X

The HS-51 Wireless Handheld 2D Reader is a general-purpose 2D reader. Its many features include dual field optics for both High Density and Wide Angle, a ruggedized design, and compact size.

The HS-51X Wireless Handheld DPM Reader is a special-purpose 2D reader for decoding direct part marks. Microscan’s X-Mode decode algorithms make the HS-51X an ideal solution for reading difficult marks on many surfaces, including PCBs, electrical components, castings, and sheet metal. Its tough design makes it a good choice for manufacturing and light industrial applications.

Both readers can be configured and tested easily using the intuitive tree controls and user interface of Microscan’s ESP Software.

Note: The HS-51 and HS-51X Wireless Handheld Readers have unique algorithm licenses, and the HS-51 cannot be field-upgraded to an HS-51X.

About This Manual

This manual provides complete information on setting up, installing, and configuring the HS-51 and HS-51X Wireless Handheld Readers. The chapters are presented in the order in which the reader would be assembled, configured, and optimized.

Highlighting

Cross-references and web addresses are highlighted in blue bold. Bold Initial Caps are used throughout the manual for emphasis.
Statement of Agency Compliance

FCC

The HS-51 and HS-51X Wireless Handheld Readers have been tested for compliance with FCC regulations and were found to be compliant with all applicable FCC Rules and Regulations.

IMPORTANT NOTE: To comply with FCC RF exposure compliance requirements, this device must not be co-located or operate in conjunction with any other antenna or transmitter.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

CE

The HS-51 and HS-51X Wireless Handheld Readers have been tested for compliance to CE (Conformité Européenne) standards and guidelines and were found to conform to applicable CE standards, specifically the EMC requirements EN 55024, ESD EN 61000-4-2, Radiated RF Immunity EN 61000-4-3, ENV 50204, EFT EN 61000-4-4, Conducted RF Immunity EN 61000-4-6, EN 55022, Class B Radiated Emissions, and Class B Conducted Emissions.
Statement of RoHS Compliance

All Microscan readers with a ‘G’ suffix in the FIS number are RoHS-Compliant. All compliant readers were converted prior to March 1, 2007. All standard accessories in the Microscan Product Pricing Catalog are RoHS-Compliant except 20-500013-01 and 98-000039-02. These products meet all the requirements of “Directive 2002/95/EC” European Parliament and the Council of the European Union for RoHS compliance. In accordance with the latest requirements, our RoHS-Compliant products and packaging do not contain intentionally added Deca-BDE, Perfluorooctanes (PFOS) or Perfluorooctanic Acid (PFOA) compounds above the maximum trace levels. To view the document stating these requirements, please visit:


and


Please contact your sales manager for a complete list of Microscan’s RoHS-Compliant products.

This declaration is based upon information obtained from sources which Microscan believes to be reliable, and from random sample testing; however, the information is provided without any representation of warranty, expressed or implied, regarding accuracy or correctness. Microscan does not specifically run any analysis on our raw materials or end product to measure for these substances.

The information provided in this certification notice is correct to the best of Microscan’s knowledge at the date of publication. This notice is not to be considered a warranty or quality specification. Users are responsible for determining the applicability of any RoHS legislation or regulations based on their individual use of the product.

In regards to “RoHS Directive 2011_65_EU” Microscan produces Monitoring and Control Instruments as well as Industrial Monitoring & Control Instruments as defined within the directive. Microscan has developed and is implementing a RoHS2 compliance plan with the intention of bringing all active products listed in our current marketing literature within full compliance as per the directive deadlines.

Key milestones for the transition plan are as follows:

- Complete internal product audit by July 2014.
- Initial “Monitoring and Control Instruments” RoHS2 compliant products available by December 2014
- Initial “Industrial Monitoring & Control Instruments” RoHS2 compliant products available by July 2015
- All new products introduced in 2015 are expected to be WEEE & RoHS2 compliant.

Microscan will mark the products with the ‘CE’ marking that complies with the RoHS2 process to acquire ‘CE’ certification per the example given: Example >> Machinery directive + EMC directive + RoHS2 = Declaration of Conformity.
1 Quick Start

Contents
Check Hardware........................................................................................................................... 1-2
Install the Battery..................................................................................................................... 1-3
Charge the Reader.................................................................................................................... 1-4
Configure Hardware............................................................................................................... 1-5
Install ESP............................................................................................................................... 1-6
Select Model........................................................................................................................... 1-7
Connect to the Reader............................................................................................................ 1-8
Configure the Reader............................................................................................................. 1-9
Save Changes in ESP............................................................................................................. 1-10

This section is designed to get your HS-51 Wireless Handheld 2D Reader or HS-51X Wireless Handheld DPM Reader up and running quickly. Detailed setup information for configuring reader parameters can be found in subsequent sections.
Check Hardware

Hardware for Default Configuration

All required hardware for default configuration is included with the reader and does not need to be purchased separately. This includes a battery, a charging base with embedded Bluetooth modem, and a 3-foot USB cable.

- HS-51 Wireless Handheld 2D or HS-51X Wireless Handheld DPM Reader

- Charging Station with Embedded Modem*

- USB Cable

- Battery

*Charging Station without Embedded Modem available as an accessory.
Install the Battery

**Battery Installation**

Install the battery in the reader as shown below. The latch will snap and the battery will lock into place.

To remove the battery, slide the latch to the right and then pull gently on the cartridge.

---

**Battery Life LEDs**

Press the battery life button to the left of the LEDs to check the amount of battery life remaining. If the battery has less than 10% capacity, the first LED will flash quickly. If the battery has greater than 25% capacity, the LEDs will illuminate and remain illuminated for four seconds.

---

This table shows battery life LED behavior for different levels of battery life.

<table>
<thead>
<tr>
<th>Battery Life</th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>&lt;10%</td>
<td>Rapid flashing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25%</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-50%</td>
<td>ON</td>
<td>ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-75%</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td></td>
</tr>
<tr>
<td>&gt;75%</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>
Charge the Reader

• Plug the USB charge cable into the Charging Station’s USB connector.

• Plug the other end of the USB cable into a USB port on your PC.

• Place the reader into the Charging Station. Be sure that the battery has already been installed in the reader.

Note: Batteries ship with approximately 50% battery life and must be charged to 100% before first use. Approximate time required to charge a depleted battery is four hours via USB cable.

Power-on the reader once it is charged to 100% by pulling and holding the trigger for approximately one second. The reader will beep and vibrate and the LEDs will flash to indicate that it has been powered on.

Note: Pressing and holding the buttons on the top of the reader will also power it on.
Configure Hardware

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HS-51 Wireless Handheld 2D Reader</td>
<td>FIS-HS51-0001G</td>
</tr>
<tr>
<td></td>
<td>HS-51X Wireless Handheld DPM Reader</td>
<td>FIS-HS51X-0002G</td>
</tr>
<tr>
<td>2</td>
<td>Charging Station with Embedded Modem</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lithium-Ion Battery</td>
<td></td>
</tr>
</tbody>
</table>

Charging Station and Handheld Reader

**Installation**

- Connect the Charging Station with Embedded Modem to the PC via the USB Cable.
- Place the Battery in the reader.
- Charge the reader until the battery LEDs show a 100% charge.
- Power-on the reader.
- Decode the Quick Connect Code on the Charging Station to establish a Bluetooth connection between the reader and modem.
- Configure the reader for your application in ESP before use.
- Save Settings using ESP when reader configuration is complete.

![Test Symbol](ABCDEFGHIJKLMNOP)
Install ESP

Esp Software is Microscan’s configuration and testing software. Use ESP to set up your HS-51 or HS-51X Wireless Handheld Reader. ESP can be found on the Microscan Tools Drive that is shipped with the reader upon request.

1. Follow the prompts to install ESP from the Tools Drive.
2. Click on the ESP icon to run the program.

Note: ESP can also be installed from the Download Center at www.microscan.com.

Important: If you intend to use the reader’s Bluetooth functionality, click the Install the Microscan Bluetooth Driver check box when you see this dialog during installation.

Minimum System Requirements

• 233 MHz Pentium PC
• Windows 8, 7, Vista, or XP operating system (32-bit or 64-bit)
• Internet Explorer 6.0 or higher
• 128 MB RAM or greater
• 160 MB free disk space
• 800 x 600 256 color display (1024 x 768 32-bit color recommended)
Select Model

When you start ESP, the following menu will appear:

- Click the HS-51/HS-51X button and then click **OK**. If you do not want to make this selection every time you start ESP, uncheck “Show this dialog at startup”. If you need to select another model later, click the **Switch Model** button at the top of the screen.

  **Note:** You can also type a name of your choice in the **Description** text field and click **OK**.

- Click **Yes** when this dialog appears:
Connect to the Reader

Connect to the Reader

• The **USB** dialog will appear. You will see the device ID in the **Select Device** field. Click **Connect**.

- **Note:** You can also select **Connection Wizard** from the **Connect** dropdown menu or click the **Connect** button to access the USB dialog.

- When you are connected successfully, the **CONNECTED** message will appear in a green box in the status bar at the bottom right of the screen.

You are now ready to configure your reader using **ESP**. Subsequent sections provide more detailed information about **ESP**’s configuration options.
Configure the Reader

The following modes are accessible by clicking the buttons in the first row of App Mode icons:

- Click the **Connect** button to establish communication.
- Click the **Send/Recv** button to send or receive commands.
- Click the **Switch Model** button to open the model menu, or to return to a previous model.
- Click the **Parameters** button to show the tabbed tree controls for Communication, Read Cycle, Symbologies, and I/O Parameters.
- Click the **Terminal** button to display decoded symbol data and to send serial commands to the reader using text or macros.
- Click the **Utilities** button to show the tabbed interfaces for Differences from Default, Firmware, Bluetooth, and Advanced settings.

For further details, see **ESP Help** in the dropdown Help menu.
Save Changes in ESP

To make changes to a configuration setting:

1. **Left-click** on the + to expand the desired tree.
2. **Double-click** on the desired parameter and click once in the selection box to view options.
3. Place your cursor in the selection box, scroll down to the setting you want to change, and **click** once on the setting.
4. **Left-click** again on the open screen to complete your selection.
5. **Right-click** on the open screen and select **Save to Reader** to implement the command in the reader.

**Saving Options**

- **Send, No Save.** Changes will be lost when power is re-applied to the reader.
- **Send and Save.** This activates all changes in current memory and saves to the reader for power-on.
2 Using ESP

Contents
App Mode ..................................................................................................................................... 2-2
Tree Controls................................................................................................................................ 2-3
Menu Toolbar ............................................................................................................................... 2-4
Send/Receive ............................................................................................................................ 2-14

This section is designed to help you understand the ESP interface.

Enter App Mode to access Communications, Read Cycle, Symbologies, I/O Parameters, a Terminal interface, and a Utilities interface.

ESP can be used to configure the HS-51 and HS-51X Wireless Handheld Readers in the following ways:

• **Tree Controls**: Each tree control contains a list of all commands that pertain to that specific category of reader operation. For example, the Communications menu shows a Communications Mode command which contains a dropdown menu showing the available communications modes.

• **Graphic User Interfaces**: Settings can be configured using point-and-click tools – radio buttons, spin boxes, check boxes, and drag-and-drop functions.

• **Terminal**: ESP’s Terminal allows you to send configuration and utility commands directly to the reader by typing them in the Send text field.
**App Mode**

**App Mode**

Click the **App Mode** button to access specific configuration menus, **Utilities** tools, and a **Terminal** window where serial commands can be entered.

![App Mode Diagram]

**Note:** See the corresponding sections of this documentation for specific information on any of the views or modes mentioned above.
Using ESP

**Tree Controls**

To make changes to configuration settings in the tree control menus:

1. **Left click** on the +/- to expand or collapse the tree.

2. **Double click** on the parameter and click once in the selection box to view options.

3. Place your cursor in the selection box, scroll down to the setting you want to change and click once on the setting.

4. **Left click** again on the open screen to complete the selection.

5. **Right click** on the open screen and select *Save to Reader* to implement the command in the reader.

**Hint:** To see the underlying serial command that corresponds with each tree control item, click on the item in the tree control and drag the mouse to the open screen. The command will be displayed between angle brackets.

In this example, the command for *Read Cycle Timeout* is shown.
Menu Toolbar

Menu Toolbar

File > New
Whenever New is selected from the File menu, the default configuration of ESP is loaded.

Open / Save
When Save or Save As is selected, the ESP configuration is saved to the host computer’s hard drive and available whenever the same file is selected under Open.
When you save menu changes to your hard drive, these changes are not saved to your reader. The diagram below shows how settings can be saved and received between ESP and the reader, and ESP and the host hard drive.

Import / Export
Import converts the ASCII settings from a text file to ESP configuration settings. Export converts the active ESP configuration settings to an ASCII text file.
Model
The Model menu allows you to select between reader models. When you choose another model, the current connection with your present model will be terminated.

New Model
To connect to another model, select New Model, choose the model you want, and click OK. All models you have selected and enabled will continue to appear in the dropdown model menu. The New Model option is repeated when you click the Switch Model button on the top row of icons.
Menu Toolbar

**Options**
You can use the Options menu to save memos and set up ESP preferences. Preferences will be saved and loaded into ESP the next time ESP is opened, whether or not you save the ESP file to the host computer.

**Preferences > General Tab**

![Options menu screenshot]

*The Toolbar Style options allow you to determine how ESP will display the mode options in the two rows at the top of the screen.*

**Reload Last File**
At startup, reloads the last file saved to the computer.

**Show Model Prompt**
At startup, remembers the last connected model and displays it in the Connecting... dialog whenever you attempt to connect.

**Show Connect Prompt**
At startup, displays the Would you like to connect... prompt.

**Receive After Connect**
At startup, loads the reader’s settings into ESP. (This is not recommended if you want to preserve your ESP settings for future use.)
Preferences > Terminal Tab

Show Non-Printable Characters
When Show Non-Printable Characters is enabled, characters such as "CRLF" will be displayed in the Terminal window. When Enhanced Format is checked, the characters are displayed with more detailed formatting.

Change Keyboard Macros
Clicking the Change Keyboard Macros button brings up the Function Keys dialog. In this dialog you can select the desired function key and then enter your macro keystrokes in the associated key map. For example, to make Ctrl-F2 the keystroke to send a trigger character, select F2, then in the Ctrl row, enter <trigger character> and click OK. Then whenever the Ctrl-F2 keystroke is pressed, the trigger character will start the read cycle.

Note: The F1 key is reserved for opening ESP Help and the F3 key is reserved for the Find Next function.

Change Font
Allows you to modify the font used for decode data received from the reader on the Terminal screen.

Change Echo Font
Allows you to modify the font used for command characters typed into the Terminal view.

Enable Echo
Allows you to enter command characters in Terminal.

Display Incoming Data Even When Not in Focus
When Display Incoming Data Even When Not in Focus is enabled, data from the reader will continue to appear in the Terminal even when ESP is not the top window.
Preferences > Bar Code Options Tab

The Bar Code Options dialog allows you to set the size of user-created symbols.

**Sizing Information**
Sets the bar width or module width (in **mils**, or thousandths of an inch) of user-created symbols.

*Example:* A bar width of 14 is 0.014 inches.
Preferences > Advanced Tab

The Auto Sync options at the top of the Advanced tab allow the user to determine whether Auto Sync will be enabled automatically in sections of ESP where it is used, or if it will ask before it enables Auto Sync functions.

**Always Ask Before Auto Sync Occurs**
If this option box is checked, specific Auto Sync functions can be enabled. **Receive Settings from the Reader** will automatically send the reader’s settings to ESP when Auto Sync is enabled. **Send ESP Settings to the Reader** will automatically send all reader configuration settings chosen in ESP to the reader. **Do Not Send or Receive Settings** creates a condition in which Auto Sync will not automatically send reader settings to ESP, or send ESP settings to the reader.

**Include Preamble and Postamble with Send Save**
When this option box is checked, the user-configured Preamble and Postamble characters will be sent along with other parameters.
Menu Toolbar

**Ask to Save ESP File when Quitting**
When enabled, prompts the user to save a **.esp** file when ending a session.

The **.esp** file will be saved in the location of your choice.

**Use Default Storage Location**
When enabled, automatically stores data in ESP’s Application Data folder.
Using ESP

Document Memo
The information you type in the Document Memo field will appear in a context-sensitive text box whenever your cursor hovers over the Document Memo item on the Options menu.

Model Memo
Similar to Document Memo, the information you type in the Model Memo field will appear in a context-sensitive text box whenever your cursor hovers over the Model Memo item on the Options menu. Memos created in Model Memo are specific to the model enabled when the message was created.

Note: Memos must be saved in a .esp file if you want them to available in your next session. If you do not save your current session, any memos that you have entered during the session will be discarded, and will be unavailable in your next session.
Menu Toolbar

**Connect**
The Connect dropdown menu allows you to access the Connection Wizard, and also to Disconnect ESP from the reader.

Connection Wizard
To connect using the Connection Wizard:

- Click Connect on ESP’s menu toolbar, and then select Connection Wizard.
- Click Connect when you see the reader’s name and serial number in the Select Device field.

**Note:** If the reader is not yet connected to the modem, the Select Device field will show Bluetooth Modem as the device instead of the reader. Decode the Quick Connect Code on the base of the modem to connect the reader to the modem. The reader ID will then appear. Click Connect to continue.

- When a connection is established, the green indicator in the status bar at the bottom right of the screen will be visible.

| Handheld-1 | HS-51X | CONNECTED | RF (Bluetooth) |
View
The View menu allows the user to move quickly between the Parameters, Terminal, and Utilities interfaces without using the icon buttons on the App Mode toolbar. It also allows the user to access the Bar Code Dialog, shown below.

Bar Code Dialog
Symbols can be created in the Bar Code Dialog by typing the text to be encoded. This is a useful tool for creating configuration symbols, allowing the user to configure the reader by reading the user-created symbols.

- Choose a spatial orientation for the new symbol.
- Drag specific configuration values from the control tree directly into this field to encode new symbols.
- Create a caption for the symbol that matches or describes the encoded data.
- The symbol will be displayed in the field at the bottom of the Bar Code Dialog.
Send/Receive

Send/Receive

To access Receive, Save, Lock, Default, and Advanced options, click the Send/Recv button or right-click in the tree control areas.

![Menu Options]

You can also access these options by right-clicking in any of the configuration views.

Receive Reader Settings

From the Send/Recv menu, select Receive Reader Settings.

This option is useful if you want to receive the reader’s settings and save them as a file for later retrieval. For example, if your reader has settings that you do not want to change, choosing Receive Reader Settings will allow you to load those settings to ESP and save them as an ESP file.

Receiving the reader’s settings also assures that you will not subsequently save any unwanted configuration changes previously made in ESP.

Select this option if you want to upload the reader’s settings to ESP. For example, if your ESP file has a number of custom settings that you want to maintain and download to the reader, you will lose those ESP settings if you choose to receive settings from the reader.

Save to Reader

Send, No Save

This saves ESP settings to current memory.

Send and Save

This activates all changes in current memory and saves to the reader.

Lock Reader

This locks in the most recently sent and saved configuration to the reader.
Using ESP

**Default Current Menu Settings**
This option returns the settings in the current tree control to their defaults.

**Important:** When you select Default Current Menu Settings you are only defaulting settings in ESP. The reader is not affected unless you download new settings.

**Default all ESP Settings**
This option returns all settings in ESP to their defaults.

**Important:** When you select Default all ESP Settings you are only defaulting settings in ESP. The reader is not affected unless you download new settings.

**Advanced Options**

**Send Current View**
This is the same as Save to Reader > Send, No Save except that only the commands in the current tree control are sent.

**Send Current Command**
This is the same as Send Current View except that it only saves the command that is currently selected.
Send/Receive
3 Basic Operations

Contents

Practice Targeting ........................................................................................................................ 3-2
Dual Optics ................................................................................................................................... 3-3
Operational Feedback .................................................................................................................. 3-5

This section explains how to practice targeting and triggering, and also describes the reader’s Dual Optics and Operational Feedback behaviors.
**Practice Targeting**

**Practice Targeting**

When first connecting, allow approximately 3 seconds for the reader to initialize.

1. Hold the reader steady and point it at a test symbol.
2. Squeeze and hold the trigger.
3. Move the reader toward or away from the symbol in a fluid motion until the two side-by-side blue bars converge in the middle of the symbol. When the reader is at the optimal distance (about **4 inches** or **10 cm**), it will decode the symbol and will beep and vibrate while emitting a green LED flash to indicate a Good Read. At this optimal distance, the two blue bars should just be touching. Note that the bars overlap as you continue to draw the reader away from the symbol.
4. If no decode occurs, slowly draw away from or move closer to the symbol while holding the blue bars centered steadily on the symbol.

![Test Symbol](image)

*When the reader is closer to the symbol, you will see two separate bars. As you draw the reader away from the symbol, the two bars converge.*

**Targeting Suggestions**

- Typically, you should not hold the reader exactly perpendicular to the symbol. Position the reader at an angle to avoid specular reflection.
- Use smooth, fluid motion when targeting the symbol. Do not wave the reader side-to-side or up-and-down, or attempt to sweep across a symbol, as sudden movements will create blurred images.
- The reader is omnidirectional and can decode symbols in any orientation. When decoding 1D symbols, be sure that the entire symbol falls well within the field of view.
Dual Optics

The reader's dual field optical system can read small 2D symbols as well as larger 1D symbols. An image is captured from each field. The decoder first operates on the image (High Density or Wide Angle) which was successfully decoded on the last cycle. If unsuccessful, the next image is decoded.

Move the reader closer to decode smaller symbols and farther away to decode larger symbols.

**Imaging Area**

The reader's optics are divided into High Density and Wide Angle decode zones. Each decode zone is 960 x 640 pixels.

- **Wide Angle**
  - Field of View: 50° horiz. by 33.5° vert.
  - Focal Point: Approximately 115 mm

- **High Density**
  - Field of View: 30° horiz. by 20° vert.
  - Focal Point: Approximately 100 mm

(1280)
Dual Optics

**Dual Optics Examples**

- **20 mil Data Matrix**
  - Wide Angle
  - Dual Field
  - High Density

- **5 mil Code 39**
  - Wide Angle
  - Dual Field
  - High Density
## Operational Feedback

<table>
<thead>
<tr>
<th>Condition</th>
<th>Reader LEDs</th>
<th>Sound</th>
<th>Vibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful Power-Up</td>
<td>All LEDs flash</td>
<td>1 Beep</td>
<td>Handle vibrates</td>
</tr>
<tr>
<td>Successful Connection to Host</td>
<td>Wireless icon flashes</td>
<td>1 Beep</td>
<td>Handle vibrates</td>
</tr>
<tr>
<td>Successful Decode and Data Transfer</td>
<td>Good Read indicator flashes</td>
<td>1 Beep</td>
<td>Handle vibrates</td>
</tr>
<tr>
<td>Successful Decode and Processing of Configuration Symbol</td>
<td>Good Read indicator flashes</td>
<td>2 Beeps</td>
<td>Handle vibrates</td>
</tr>
<tr>
<td>Batch Mode Enabled, Data Stored</td>
<td>Storage icon flashes</td>
<td>No sound</td>
<td>No vibration</td>
</tr>
<tr>
<td>Batch Memory Full</td>
<td>Storage icon flashes 5 times per second</td>
<td>No sound</td>
<td>No vibration</td>
</tr>
<tr>
<td>Batch Mode Enabled, No Data Stored</td>
<td>Storage icon off</td>
<td>No sound</td>
<td>No vibration</td>
</tr>
<tr>
<td>No Bluetooth Connection</td>
<td>No change</td>
<td>4 Beeps</td>
<td>No vibration</td>
</tr>
<tr>
<td>Bluetooth Connection Established – Quick Connect Code Scanned</td>
<td>Wireless icon flashes, then remains illuminated</td>
<td>1 Beep</td>
<td>Handle vibrates</td>
</tr>
<tr>
<td>Bluetooth Connection Established – Battery Removed and Replaced, Trigger Pulled</td>
<td>Wireless icon flashes, then remains illuminated</td>
<td>No sound</td>
<td>No vibration</td>
</tr>
<tr>
<td>Data Being Stored</td>
<td>Storage icon flashes</td>
<td>No sound</td>
<td>No vibration</td>
</tr>
</tbody>
</table>
Operational Feedback
4 Communications

Contents

Communications by ESP ................................................................. 4-2
Communications Overview .......................................................... 4-3
Bluetooth .................................................................................. 4-4
Batch Mode ............................................................................. 4-6
Preamble .................................................................................. 4-9
Postamble ............................................................................... 4-10
Preamble and Postamble by ESP ............................................... 4-11
Keyboard Mapping .................................................................. 4-12
USB Keyboard Rate ................................................................. 4-13
Text Command Timeout ......................................................... 4-14
Other Communications Mode Commands .............................. 4-15

This section explains how to set up communications between the reader and a host. 
**ESP** can be used to configure reader parameters and then to send and save those parameters to the reader.

You can also configure reader parameters by decoding the Data Matrix symbols in this section.
Communications by ESP

Communications by ESP

Click this button to bring up the **App Mode** view, then click the **Communication** tab.

To open nested options, **single-click** the +.

To change a setting, **double-click** the setting and use your cursor to scroll through the options.
Communications Overview

The reader’s default communications mode is RF (Bluetooth).

<table>
<thead>
<tr>
<th>Communications Mode</th>
<th>RF (Bluetooth)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>USB Keyboard</td>
</tr>
<tr>
<td></td>
<td>RF (Bluetooth)*</td>
</tr>
<tr>
<td></td>
<td>USB Native (HID)</td>
</tr>
</tbody>
</table>

**RF (Bluetooth)**

RF (Bluetooth) enables wireless two-way communication between the reader and the Charging Station with Embedded Modem and allows you to decode symbols. The reader must be in this mode to communicate with ESP.

**USB Native (HID)**

USB Native (HID) allows the reader to communicate with the PC via a wired connection. You must move the switch on the Charging Station with Embedded Modem to the OFF position (to the left, opposite the direction of the arrow on the switch). This mode of communication is useful when the reader is storing decoded symbol data and will send the data to the PC when placed in the Charging Station with Embedded Modem. It is not possible to connect to ESP in this mode.

**USB Keyboard**

USB Keyboard causes the reader to appear to the PC as a keyboard. You must move the switch on the Charging Station with Embedded Modem to the OFF position (to the left, opposite the direction of the arrow on the switch). This mode allows ASCII characters to be transmitted as keyboard sequences. It is not possible to connect to ESP in this mode.
**Bluetooth**

**Bluetooth**

Decode the Quick Connect Code located on the front of the Charging Station with embedded modem to establish Bluetooth communication.

*Important:* Slide the communication mode switch on the Charging Station to Bluetooth Mode (the direction of the arrow on the switch) before decoding the Quick Connect Code. Sliding the mode switch in the other direction enables USB cabled and USB Virtual COM 1-Way Mode operation.

The wireless icon located at the top of the reader will flash as it attempts to make a connection.

The blue LED on the Charging Station will also flash as it attempts to connect. The blue LED will turn on when the connection is established, the reader will beep once, and the wireless icon will turn on and remain illuminated.
**Important:** If you are using a non-Microscan Bluetooth device:

To connect to a non-Microscan Bluetooth device, you will need the Bluetooth address of that device. The 12-character Bluetooth address can be found on the device near the serial number. Then create a Quick Connect Code in **ESP Utilities** on the **Bluetooth** tab. Decode the new Quick Connect Code to establish a connection with the device.
Batch Mode

The HS-51 and HS-51X can be configured for **Batch Mode**, which allows you to capture, store, and transmit data via standard communication. Decode the Batch Mode symbol below that best suits your application’s data storage needs. Batch Mode is disabled by default.

**Batch Mode Enabled – Send and Log**

When the reader is configured for **Send and Log**, decoded data is immediately sent to the PC and a copy is saved to the reader.

**Batch Mode Enabled – Log Only**

When the reader is configured for **Log Only**, decoded data is only stored in reader memory and not sent to the PC. Decode the **Batch Mode – Transfer All Data in Memory** symbol to send all data that has been saved on the reader to the PC.

![Batch Mode Enabled – Send and Log](image1)

![Batch Mode Enabled – Log Only](image2)

![Batch Mode – Transfer All Data in Memory](image3)

**Batch Mode Disabled**

(Default)

![Batch Mode Disabled](image4)

**Batch Mode Indicators**

- **Wireless Icon**
- **Storage Icon**
- **Good Read Indicator**
Configuring and Using Batch Mode
Follow the procedure below to set up and use Batch Mode.

- Plug in the Charging Station with Embedded Modem.
- Move the switch on the Charging Station with Embedded Modem to the left (opposite the direction of the arrow on the switch).

- Decode the Default Reader Settings symbol.

 Default Reader Settings

- Decode the Clear All Stored Data, Images, and JavaScripts symbol.

 Clear All Stored Data, Images, and JavaScripts

- Decode the Batch Mode Enabled – Log Only symbol.

 Batch Mode Enabled – Log Only

- Decode the USB Keyboard Mode symbol.

 USB Keyboard Mode

- Use the reader to capture symbol data and log it to the reader as needed. The Storage Icon on top of the reader will illuminate as symbols are decoded and logged.
- Place the reader in the Charging Station with Embedded Modem's dock to transfer logged data to the PC. A Microsoft Keyboard driver will load and data will then be sent to the PC after approximately 10 seconds.
Batch Mode

**USB Virtual COM 1-Way Mode (for Serial Emulation)**

USB Virtual COM 1-Way Mode (for Serial Emulation) is available for applications in which the reader must function as a virtual serial COM port. This mode requires installation of a USB Virtual COM driver, which is available in the Download Center on the Microscan website under the red driver icon shown below. You will see this icon at the end of the HS-51 and HS-51X rows.

The USB Virtual COM Port Driver is also available on the Microscan Tools Drive from the Accessories navigation page:

- **HS-51 and HS-51X USB-to-Serial Virtual COM Port Driver**
  - **HS-51 and HS-51X USB-to-Serial Virtual COM Port Driver**

Once the driver is installed, follow the steps below to use this communications mode.

- Switch the Charging Station with Embedded Modem from Bluetooth Mode to USB Mode.
- Scan the **Batch Mode Enabled – Send and Log** configuration symbol below.
- Scan the **USB Virtual COM 1-Way Mode (for Serial Emulation)** configuration symbol below.

The reader can now be used as a virtual serial COM port. Symbol data will be sent to the assigned COM port 5 seconds after the reader is placed in the Charging Station dock.
Communications

Preamble

A preamble is a character that is added to the beginning of a decoded data string. Set the desired preamble by reading the appropriate symbol below.

**Important:** Preamble settings are not concatenated when their configuration symbols are decoded in series. For example, if you set Comma as your preamble and then set Space, the preamble will not be the series Comma and Space – it will simply be Space. The most recently decoded configuration symbol will overwrite the previously decoded configuration symbol.

If you wish to concatenate preamble characters, use Preamble and Postamble by ESP on ESP’s Communications tab.

- **Comma**
- **Space**
- **Tab**
- **Erase/None (Default)**
- **Erase Preamble and Postamble Data**
Postamble

A postamble is a character that is added to the end of a decoded data string. Set the desired postamble by reading the appropriate symbol below.

**Important:** Postamble settings are not concatenated when their configuration symbols are decoded in series. For example, if you set **Comma** as your postamble and then set **Space**, the postamble will not be the series Comma and Space – it will simply be Space. The most recently decoded configuration symbol will overwrite the previously decoded configuration symbol.

If you wish to concatenate postamble characters, use **Preamble and Postamble by ESP** on ESP’s **Communications** tab.

- **Comma**
- **Space**
- **Tab**
- **Enter**
- **Erase/None (Default)**
- **Erase Preamble and Postamble Data**
Preamble and Postamble by ESP

Characters can be added to the beginning and end of data strings using ESP. There are a few different ways to do this using the interface shown below.

You will see the Communications tree control on the left, and the Preamble/Postamble interface on the right.

When you type ASCII characters directly into the Preamble or Postamble text fields and then click Send to Reader, those preamble or postamble characters are enabled and will appear in data output.

Save pre- and postamble settings and send them to the reader.

In addition to typing directly in the text fields and selecting from the dropdown menu, you can also click any of these preset buttons to set a preamble or postamble.

Scroll through a list of all preamble and postamble options, and then click Insert.
Keyboard Mapping

The **Keyboard Mapping** feature provides alternatives for keyboards that do not conform to U.S. English mapping. It also allows you to send control characters for non-printable ASCII.

**Note:** Universal keyboard mapping is slightly slower than the other language-specific options, because it maps data by reference to the full set of ASCII characters. The advantage of Universal keyboard mapping is that it allows any language and keyboard layout to be mapped.

**Important:** Keyboard Mapping is not to be confused with USB Keyboard Mode, which has an entirely different function—namely to enable USB cabled communications.

---

### Keyboard Mapping by ESP

<table>
<thead>
<tr>
<th>Keyboard Mapping</th>
<th>US English (without leading 0 in alt-num)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S., No Leading 0 (Default)</td>
<td>US English (without leading 0 in alt-num)*</td>
</tr>
<tr>
<td>U.S. with Leading 0</td>
<td>ASCII - Universal</td>
</tr>
<tr>
<td>Keyboard Control Characters for Non-Printable ASCII</td>
<td>US English (with leading 0 in alt-num)</td>
</tr>
<tr>
<td>French</td>
<td>French</td>
</tr>
<tr>
<td>German</td>
<td>German</td>
</tr>
<tr>
<td>Japanese</td>
<td>Japanese</td>
</tr>
<tr>
<td>Universal</td>
<td>US English (with ctrl+char)</td>
</tr>
</tbody>
</table>
Communications

USB Keyboard Rate

Requests that the host polls the USB reader at the rate specified (1 to 255 ms).
Text Command Timeout

Text Command Timeout allows you to set the maximum time during which a complete text command from the host must be received. Pending text command data is discarded when the timeout is exceeded.

<table>
<thead>
<tr>
<th>Text Command Timeout</th>
<th>11.000</th>
<th>Seconds</th>
</tr>
</thead>
</table>


Other Communications Mode Commands

Some ESP Communications options are unique to the software, and do not have corresponding programming symbols. These options are explained below.

**Reader Packet Format**

Data that is sent from the reader to the host in **Raw** format is sent without packet framing or check characters.

**Packet** data is sent with framing (a preamble communicating the amount of data to be transmitted, and a postamble containing error detection) and check characters, and a response is expected from the host.

**Packet Mode Version 0** is a similar but more streamlined way of sending packetized data.

**Reader to Host Packet Size**

The **Reader to Host Packet Size** is the amount of data (in bytes) that is sent to the host in packet format. This feature allows you to set the maximum allowable packet size.

**Expect Host Response**

When **Expect Host Response** is enabled, the reader will re-transmit data if it doesn’t receive acknowledgement from the host.

**Reader Send Retry Count**

**Reader Send Retry Count** sets the number of times the reader will re-transmit data before abandoning further send attempts. The minimum retry count is 1, which represents the initial transmission.

**Host Acknowledgement Timeout**

The **Host Acknowledgement Timeout** is the amount of time (in seconds) that the reader will wait for an acknowledgement from the host before re-sending data.
Other Communications Mode Commands

**Text Commands**

When the Text Commands feature is enabled, the reader can accept text commands via USB Virtual COM modes.

**Note:** Text Commands are not supported in USB HID Mode.

### Text Commands by ESP

<table>
<thead>
<tr>
<th>Text Commands</th>
<th>Disabled; enable magic sequence*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled</td>
<td></td>
</tr>
<tr>
<td>Enabled</td>
<td></td>
</tr>
<tr>
<td>Enabled; suppress echo</td>
<td></td>
</tr>
<tr>
<td>Enabled; suppress echo and responses</td>
<td></td>
</tr>
<tr>
<td>Disabled, enable magic sequence*</td>
<td></td>
</tr>
</tbody>
</table>

When Text Commands are set to Enabled; Suppress Echo, text that a user enters in the Terminal will not be shown. When Text Commands are set to Enabled; Suppress Echo and Responses, neither user-entered data or reader responses will be shown, and only decoded symbol data will appear in the Terminal. See Terminal Right-Click Menu for a way to change Echo settings directly in the Terminal view.

**Entering Magic Sequence**

The magic sequence is ;>PA followed by a numeric value of 1, 3, or 7.

1 = Enable Text Commands
3 = Enabled; Suppress Echo
7 = Enabled; Suppress Echo and Responses

In the example below, the magic sequence entered will Enable Text Commands and Suppress Echo and Responses.

Enter the magic sequence in this text field and click **Send**.

Once the magic sequence has been sent, you can send text commands from the same text field.
5 Read Cycle

Contents

Read Cycle by ESP ...................................................................................................................... 5-2
Trigger Active ........................................................................................................................... 5-3
Default Continuous Event ....................................................................................................... 5-4
Maximum Decodes per Read ................................................................................................. 5-5
Read Cycle Timeout ................................................................................................................ 5-6
Ignore Duplicate Symbol Timeout ........................................................................................ 5-7
Targeting Zone Tolerance ...................................................................................................... 5-8
Morphological Preprocessing ............................................................................................... 5-9
Camera Settings ..................................................................................................................... 5-10

This section explains Read Cycle parameters, which can be configured to optimize reader performance in your application.

ESP can be used to configure reader parameters and then to send and save those parameters to the reader.
### Read Cycle by ESP

**Parameters**

<table>
<thead>
<tr>
<th>Setting</th>
<th>ESP Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Read Cycle</strong></td>
<td></td>
</tr>
<tr>
<td>- Trigger Active</td>
<td>Read Once</td>
</tr>
<tr>
<td>- Default Continuous Event</td>
<td>Idle</td>
</tr>
<tr>
<td>- Event Delay</td>
<td>100</td>
</tr>
<tr>
<td>- Maximum Decodes per Read</td>
<td>1</td>
</tr>
<tr>
<td>- Read Cycle Timeout</td>
<td>500</td>
</tr>
<tr>
<td>- Ignore Duplicate Symbol Timeout</td>
<td>0</td>
</tr>
<tr>
<td>- Targeting Zone Tolerance</td>
<td>1600</td>
</tr>
<tr>
<td><strong>Morphological Preprocessing</strong></td>
<td>None</td>
</tr>
<tr>
<td>- Size</td>
<td>Small</td>
</tr>
<tr>
<td><strong>Camera Settings</strong></td>
<td></td>
</tr>
<tr>
<td>- AGC Sampling Mode</td>
<td>Automatic</td>
</tr>
<tr>
<td>- Illumination</td>
<td>Automatic</td>
</tr>
<tr>
<td>- Exposure</td>
<td>Manual</td>
</tr>
<tr>
<td>- Gain</td>
<td>95</td>
</tr>
<tr>
<td>- AGC Frame Adjust Count</td>
<td>0</td>
</tr>
<tr>
<td>- High Density Window of Interest</td>
<td></td>
</tr>
<tr>
<td>- Wide Angle Window of Interest</td>
<td></td>
</tr>
</tbody>
</table>

To open nested options, **single-click** the `+`.  
To change a setting, **double-click** the setting and use your cursor to scroll through the options.
Trigger Active

When a trigger is active, the reader will either decode once and stop or decode continuously, depending on how this parameter is set. **Trigger Active** is set to Read Once by default.

<table>
<thead>
<tr>
<th>Trigger Active</th>
<th>Read Once*</th>
<th>Read Once*</th>
<th>Continuous Read</th>
</tr>
</thead>
</table>

**Important:** **Ignore Duplicate Symbol Timeout** should be set to a value greater than 0 when Trigger Active is set to Continuous Read.
Default Continuous Event

This parameter allows you to determine the default state of the reader.

**Idle (Default)**
When Default Continuous Event is set to **Idle**, the reader will remain inactive until triggered.

**Show Target**
When Default Continuous Event is set to **Show Target**, the reader will display the target LEDs but remain inactive until triggered externally.

**Read High Density and Wide Angle**
Both **High Density** and **Wide Angle** will be continuously activated to capture an image.

**Read High Density**
**High Density** will be continuously activated to capture an image.

**Read Wide Angle**
**Wide Angle** will be continuously activated to capture an image.

**Read Primary Field**
When **Read Primary Field** is selected, the most recent field to have produced a Good Read (**High Density** or **Wide Angle**) will be continuously activated to capture an image.

**Event Delay**
The default Event Delay is 0.100 seconds.
Maximum Decodes per Read

Maximum Decodes per Read allows you to set how many decodes can be performed in a single read cycle.

| Maximum Decodes per Read | 1 | (1 - 100) |
Read Cycle Timeout

Read Cycle Timeout determines the duration of the read cycle. The default Read Cycle Timeout is 0.500 seconds.

| Read Cycle Timeout | 0.500 | Seconds |
Ignore Duplicate Symbol Timeout

Ignore Duplicate Symbol Timeout sets the reader not to output the same symbol data multiple times within the time period designated.

<table>
<thead>
<tr>
<th>Ignore Duplicate Symbol Timeout</th>
<th>0.000</th>
<th>Seconds</th>
</tr>
</thead>
</table>

Targeting Zone Tolerance

**Targeting Zone Tolerance** is particularly useful in environments where closely spaced symbols of various sizes need to be targeted. It allows the reader to narrow the field of view relative to the size of a symbol, and to determine the distance the target must be from the symbol for a decode event to occur.

See **Window of Interest** for more precise control of the active pixel area.

The default Targeting Zone Tolerance is 1600%.

**Formula for Calculating Targeting Zone Tolerance:**

\[
2 \times \frac{\text{distance from target to symbol (in pixels)}}{\text{symbol width or height (in pixels)}} \times 100
\]

| Targeting Zone Tolerance | 1600 | \(\frac{[0 \cdot 1600]}{\%}\) |
Morphological Preprocessing

Morphological Preprocessing allows you to select the method for processing captured images, and to choose the operator size for that method. It is set to None by default.

<table>
<thead>
<tr>
<th>Morphological Preprocessing</th>
<th>None*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>None*</td>
</tr>
<tr>
<td></td>
<td>Erode</td>
</tr>
<tr>
<td></td>
<td>Dilate</td>
</tr>
</tbody>
</table>

Note: This feature is only available in the HS-51X Wireless Handheld Reader.

**Erode**

Erode increases the dark cell size of a symbol. Useful for increasing the dark cell size of a dark-on-light Data Matrix symbol.

**Dilate**

Dilate increases the light cell size of a symbol. Useful for increasing the light cell size of a light-on-dark Data Matrix symbol.

**Size**

Size determines the size of the area or “pixel neighborhood” in which the morphological operation is being performed.
Camera Settings

**Camera Settings** allow you to set AGC Sampling Mode, to set the percentage values for Illumination, Exposure, and Gain, to set the AGC Frame Adjust Count, and also to define Window of Interest dimensions.

### AGC Sampling Mode

When **AGC Sampling Mode** is set to Automatic (default), each time a No Read occurs, the reader adjusts the gain and exposure for the next capture to optimize symbol contrast.

The values for **Illumination**, **Exposure**, and **Gain** can be set to any value between 0% and 100%. The default values are shown below.

<table>
<thead>
<tr>
<th>Camera Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AGC Sampling Mode</strong></td>
</tr>
<tr>
<td><strong>Illumination</strong></td>
</tr>
<tr>
<td><strong>Exposure</strong></td>
</tr>
<tr>
<td><strong>Gain</strong></td>
</tr>
</tbody>
</table>

### AGC Frame Adjust Count

Automatic Gain Control (AGC) is a system that controls gain in order to maintain high performance over a range of input levels. Gain is essentially the ratio of output to input. Gain settings affect how the reader decodes symbols and captures images.

**AGC Frame Adjust Count** sets the number of image frames captured and discarded before the main image capture. This feature gives the gain control time to adjust.

<table>
<thead>
<tr>
<th>AGC Frame Adjust Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Frames</td>
</tr>
</tbody>
</table>
**Window of Interest**

The active pixel area of the image sensor is called the Window of Interest (WOI). The WOI allows the user to select an area of the field of view in which the desired symbol is located. The programmable window of interest increases decode speed, improves threshold, and makes it easy to select specific symbols from among several in the field of view. The user provides the upper-left pixel location and the size of the window to define the Window of Interest.

**Note:** The Window of Interest can be changed, but captured images cannot be viewed.

- **High Density Window of Interest**
  - Top: 0
  - Left: 0
  - Height: 960
  - Width: 640

- **Wide Angle Window of Interest**
  - Top: 0
  - Left: 0
  - Height: 960
  - Width: 640
Camera Settings
This section describes the various symbologies that can be decoded by the HS-51 and HS-51X Wireless Handheld Readers.

**ESP** can be used to configure reader parameters and then to send and save those parameters to the reader.

You can also configure reader parameters by decoding the Data Matrix symbols in this section.
### Symbologies by ESP

To change a setting, double-click the setting and use your cursor to scroll through the options.

Click this button to bring up the **App Mode** view, and then click the **Symbologies** tab.

To open nested options, single-click the +.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>ESP Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symbologies</strong></td>
<td></td>
</tr>
<tr>
<td>2D Symbologies</td>
<td></td>
</tr>
<tr>
<td>- Data Matrix</td>
<td>Enabled</td>
</tr>
<tr>
<td>- QR Code</td>
<td>QR and Micro QR Code</td>
</tr>
<tr>
<td>- Aztec Code</td>
<td>Disabled</td>
</tr>
<tr>
<td>1D Symbologies</td>
<td></td>
</tr>
<tr>
<td>- Code 39</td>
<td>Enabled</td>
</tr>
<tr>
<td>- Code 128</td>
<td>Enabled</td>
</tr>
<tr>
<td>- BC412</td>
<td>Enabled</td>
</tr>
<tr>
<td>- Code 93</td>
<td>Enabled</td>
</tr>
<tr>
<td>- Codabar</td>
<td>Enabled</td>
</tr>
<tr>
<td>- Interleaved 2 of 5</td>
<td>Enabled</td>
</tr>
<tr>
<td>- UPC</td>
<td>Enabled</td>
</tr>
<tr>
<td>- Postal</td>
<td>Disabled</td>
</tr>
<tr>
<td>- Pharmacode</td>
<td>Disabled</td>
</tr>
<tr>
<td>- GS1 DataBar</td>
<td>Enabled (All)</td>
</tr>
<tr>
<td>Stacked Symbologies</td>
<td></td>
</tr>
<tr>
<td>- PDF417</td>
<td>Enabled</td>
</tr>
<tr>
<td>- Micro PDF417</td>
<td>Disabled</td>
</tr>
<tr>
<td>Composite</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

**Symbology Identifier**

- Disabled*
- Disabled
- Enabled

To change a setting, double-click the setting and use your cursor to scroll through the options.
Data Matrix

Symbologies

Data Matrix

<table>
<thead>
<tr>
<th>Data Matrix</th>
<th>Enabled</th>
<th>Disabled</th>
<th>Enabled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data Matrix Enabled (Default)

Data Matrix Inverse Enabled

Data Matrix Disabled

Important: If you disable the Data Matrix symbology, programming symbols will not be decodable by the reader and Data Matrix will need to be re-enabled using ESP. Use the Data Matrix Disabled programming symbol with caution.

Data Matrix Inverse Disabled (Default)

Sample Data Matrix Symbol

(123456789A)
## QR Code

**QR Code**

<table>
<thead>
<tr>
<th>QR Code</th>
<th>QR Code Disabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled</td>
<td>Sample Micro QR Code Symbol (Microscan QR)</td>
</tr>
<tr>
<td>Enabled</td>
<td>Sample QR Code Symbol</td>
</tr>
<tr>
<td>Micro QR Code</td>
<td></td>
</tr>
</tbody>
</table>

**QR Code Enabled (Default)**

![Sample QR Code Symbol](image)

![Sample Micro QR Code Symbol](image)
Symbologies

Aztec Code

<table>
<thead>
<tr>
<th>Aztec Code</th>
<th>Disabled*</th>
<th>Disabled*</th>
<th>Enabled</th>
</tr>
</thead>
</table>

Aztec Code Enabled (Default)  Aztec Code Disabled

Sample Aztec Code Symbol

![Sample Aztec Code Symbol](image-url)
Code 39

Code 39

<table>
<thead>
<tr>
<th>Code 39</th>
<th>Code 39 Checksum Enabled</th>
<th>Code 39 Checksum Disabled (Default)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled</td>
<td>Code 39 Checksum Enabled, Strip from Result</td>
<td></td>
</tr>
<tr>
<td>Enabled</td>
<td>Code 39 Extended Full ASCII Enabled</td>
<td>Code 39 Extended Full ASCII Disabled (Default)</td>
</tr>
</tbody>
</table>

Sample Code 39 Symbol

~123456~
Symbologies

Code 128

<table>
<thead>
<tr>
<th>Symbology</th>
<th>Enabled*</th>
<th>Disabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code 128</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Code 128 Enabled (Default)**

![Sample Code 128 Symbol](M10044_01)

**Sample Code 128 Symbol**

![Sample Code 128 Symbol](M10045_01)
BC412

**BC412**

<table>
<thead>
<tr>
<th>BC412</th>
<th>Enabled*</th>
<th>Disabled</th>
</tr>
</thead>
</table>

- **BC412 Enabled (Default)**
- **BC412 Disabled**

**Sample BC412 Symbol**

![Sample BC412 Symbol]
## Code 93

<table>
<thead>
<tr>
<th>Symbologies</th>
<th>Code 93 Enabled (Default)</th>
<th>Code 93 Disabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code 93</td>
<td>▪ Enabled*</td>
<td>▪ Disabled</td>
</tr>
<tr>
<td></td>
<td>▪ Enabled*</td>
<td></td>
</tr>
</tbody>
</table>

### Sample Code 93 Symbol

```
123456789A
```
## Codabar

### Codabar

<table>
<thead>
<tr>
<th>Codabar</th>
<th>Enabled</th>
<th>Checksum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Enabled</td>
<td>Disabled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Disabled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enabled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enabled and strip from result</td>
</tr>
</tbody>
</table>

### Codabar Enabled (Default)                      Codabar Disabled

![Codabar Enabled (Default)](M10022_01) ![Codabar Disabled](M10023_01)

### Codabar Checksum Enabled                      Codabar Checksum Disabled (Default)

![Codabar Checksum Enabled](Q0011_01) ![Codabar Checksum Disabled (Default)](Q0012_01)

### Codabar Checksum Enabled and Stripped from Result

![Codabar Checksum Enabled and Stripped from Result](Q0030_01)

### Sample Codabar Symbol

![Sample Codabar Symbol](A123456789A)
Symbologies

Interleaved 2 of 5

<table>
<thead>
<tr>
<th>Interleaved 2 of 5</th>
<th>Enabled*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checksum</td>
<td>Disabled</td>
</tr>
<tr>
<td>Length</td>
<td>Enabled*</td>
</tr>
</tbody>
</table>

Interleaved 2 of 5 Enabled (Default)  Interleaved 2 of 5 Disabled

Interleaved 2 of 5 Checksum Stripped from Result

Interleaved 2 of 5 Checksum Disabled  Interleaved 2 of 5 Checksum Enabled

Interleaved 2 of 5 Checksum Enabled and Stripped from Result

Interleaved 2 of 5 Two Digits Off  Interleaved 2 of 5 Two Digits On

Interleaved 2 of 5 Four Digits On

Sample Interleaved 2 of 5 Symbol

0123456789
**UPC**

**Note:** When **Composite** is enabled, UPC/EAN symbols are processed as Composite symbols. The **symbology identifier** ‘e’ (Composite) will be returned instead of ‘E’ (UPC/EAN).

<table>
<thead>
<tr>
<th>UPC</th>
<th>UPC Disabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAN Status</td>
<td>Disabled</td>
</tr>
<tr>
<td>UPC-E as UPC-A</td>
<td>Enabled*</td>
</tr>
</tbody>
</table>

---

**UPC Enabled (Default)**

![Sample UPC-E Symbol](image1)

**UPC-E as UPC-A Enabled**

![Sample UPC-A Symbol](image2)

---

**EAN Status Enabled (Default)**

![Sample UPC-E Symbol](image1)

**UPC-E as UPC-A Disabled (Default)**

![Sample UPC-A Symbol](image2)
Postal

**Postal Enabled**

**Postal Disabled (Default)**

**Supported Postal Symbologies**
- USPS OneCode (4CB)
- POSTNET
- PLANET
- Japanese Post
- Australian Post
- Royal Mail
- KIX Code

**Sample Postnet Symbol**

```
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>-----------------</td>
</tr>
</tbody>
</table>
```

**Sample Royal Mail Symbol**

```
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
```
Pharmacode

Pharmacode

- Pharmacode
  - Symbol Length: Enabled
  - Minimum Bars: 4
  - Bar Width Status: Mixed
  - Direction: Forward
  - Fixed Threshold Value: 10

Pharmacode Enabled

Pharmacode Disabled (Default)

Fixed Symbol Length Enabled

Fixed Symbol Length Disabled (Default)

Bar Width Status: Mixed (Default)

Bar Width Status: All Narrow

Bar Width Status: All Wide

Bar Width Status: Fixed Threshold

Decode Direction: Forward (Default)

Decode Direction: Reverse
Symbologies

Fixed Symbol Length Status
When enabled, the reader will check the symbol length against the symbol length field. If disabled, any length will be considered valid.

Symbol Length
Specifies the exact number of bars that must be present for the reader to recognize and decode the Pharmacode symbol.

Minimum Bars
Sets the minimum number of bars that a Pharmacode symbol must have to be considered valid.

Bar Width Status
If set to Mixed, the reader will autodiscriminate between narrow bars and wide bars. If set to All Narrow, all bars will be considered as narrow bars. If set to All Wide, all bars will be considered as wide bars. If set to Fixed Threshold, it will use the fixed threshold value to determine whether the bars are narrow or wide. The Bar Width Status setting will be ignored when the reader is able to tell the difference between the narrow and the wide bars.

Direction
Specifies the direction in which a symbol can be read.

Fixed Threshold Value
Used when Bar Width Status is set to Fixed Threshold. Defines the minimum difference in pixels that will distinguish a narrow bar from a wide bar.

Sample Pharmacode Symbol

---

12345
### GS1 DataBar

#### GS1 DataBar

<table>
<thead>
<tr>
<th>GS1 DataBar</th>
<th>Enabled (All)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Disabled</td>
</tr>
<tr>
<td></td>
<td>DataBar Expanded</td>
</tr>
<tr>
<td></td>
<td>DataBar Limited</td>
</tr>
<tr>
<td></td>
<td>DataBar-14</td>
</tr>
<tr>
<td>GS1 DataBar-14</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>All GS1 DataBar Enabled (Default)</th>
<th>All GS1 DataBar Disabled</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Sample DataBar-14 Limited Symbol" /></td>
<td><img src="image2.png" alt="Sample DataBar-14 Limited Symbol" /></td>
</tr>
<tr>
<td><img src="image3.png" alt="Sample DataBar Expanded Symbol" /></td>
<td><img src="image4.png" alt="Sample DataBar Expanded Symbol" /></td>
</tr>
<tr>
<td><img src="image5.png" alt="Sample DataBar-14 Symbol" /></td>
<td><img src="image6.png" alt="Sample DataBar-14 Symbol" /></td>
</tr>
</tbody>
</table>
PDF417

PDF417 Enabled* (Default)  PDF417 Disabled

Sample PDF417 Symbol
MicroPDF417

**MicroPDF417**

<table>
<thead>
<tr>
<th>Micro PDF417</th>
<th>Disabled*</th>
<th>Enabled</th>
</tr>
</thead>
</table>

*MicroPDF417 Disabled (Default)  MicroPDF417 Enabled*

Sample MicroPDF417 Symbol
**Composite**

*Composite* consists of a 1D component associated with an adjacent 2D component. A successful decode is required for both the 1D and 2D components before the reader outputs a result. When Composite is enabled, the unit decodes the 1D component first.

*Note:* When Composite is enabled, *UPC/EAN* symbols are processed as Composite symbols. The *symbology identifier* ‘e’ (Composite) will be returned instead of ‘E’ (UPC/EAN).

**Maximum Decodes per Read**

*Maximum Decodes per Read* represents the maximum number of candidate symbols in the field of view (1 - 100) that can be decoded during a read cycle. Note that decode speed will decrease as the Maximum Decodes per Read value is increased.

***Sample Composite Symbol***
### Symbology Identifier

When **Symbology Identifier** is enabled, an AIM (Association for Automatic Identification and Mobility) preamble is added to decoded data output (see the **AIM Symbology Identifiers** list). This preamble identifies what kind of symbology has been decoded.

<table>
<thead>
<tr>
<th>Symbology Identifier</th>
<th>AIM Symbology Identifiers</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Code 39</td>
</tr>
<tr>
<td>C</td>
<td>Code 128</td>
</tr>
<tr>
<td>d</td>
<td>Data Matrix</td>
</tr>
<tr>
<td>e</td>
<td>GS1 DataBar / Composite</td>
</tr>
<tr>
<td>E</td>
<td>UPC/EAN</td>
</tr>
<tr>
<td>F</td>
<td>Codabar</td>
</tr>
<tr>
<td>G</td>
<td>Code 93</td>
</tr>
<tr>
<td>I</td>
<td>Interleaved 2 of 5</td>
</tr>
<tr>
<td>L</td>
<td>PDF417 / MicroPDF417</td>
</tr>
<tr>
<td>Q</td>
<td>QR Code / Micro QR Code</td>
</tr>
<tr>
<td>X</td>
<td>Other (Pharmacode)</td>
</tr>
<tr>
<td>z</td>
<td>Aztec Code</td>
</tr>
</tbody>
</table>

*Disabled* and *Enabled* are selectable options.
7 I/O Parameters

Contents

I/O Parameters by ESP ................................................................. 7-2
No Read Notification ................................................................. 7-3
Targeting ................................................................................. 7-4
Beep and Vibrate ................................................................. 7-5
Button Stay-Down Time .......................................................... 7-6
Button/Trigger Programming .................................................. 7-7
Data Validation ......................................................................... 7-10

This section describes how to optimize triggering, and also how to configure the reader’s beep, vibrate, and LED behavior.

ESP can be used to configure reader parameters and then to send and save those parameters to the reader.

You can also configure reader parameters by decoding the Data Matrix symbols in this section.
I/O Parameters by ESP

To change a setting, double-click the setting and use your cursor to scroll through the options.

Click this button to bring up the App Mode view, and then click the Read Cycle tab.

To open nested options, single-click the +.
No Read Notification

No Read Notification allows you to enable or disable user feedback alerting you when a symbol is not decoded successfully. The No Read message output is `ap/r`, indicating that the reader did not decode the symbol.

<table>
<thead>
<tr>
<th>No Read Notification</th>
<th>Disabled*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Disabled*</td>
</tr>
<tr>
<td></td>
<td>Enabled</td>
</tr>
</tbody>
</table>
**Targeting**

The **Targeting** parameter allows you to turn the targeting LEDs on or off. They are on by default.

<table>
<thead>
<tr>
<th>Targeting</th>
<th>Enabled*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Disabled</td>
</tr>
<tr>
<td></td>
<td>Enabled*</td>
</tr>
</tbody>
</table>

Read the configuration symbols below to enable or disable **Targeting**.

![Targeting On (Default)](image1)  
![Targeting Off](image2)
Beep and Vibrate

The **Beep** and **Vibrate** parameters allow you to configure the beep and vibrate behavior of the reader. Beep and Vibrate are enabled by default. Beep volume is 100% by default.

**Beep Parameters in ESP**

- **Volume**
  - 100

- **Duration**
  - 100

- **Separation**
  - 100

- **Beep on Good Read**
  - Enabled

**Vibrate Parameters in ESP**

- **Vibrate**
  - Enabled

Read the configuration symbols below to configure Beep and Vibrate.

- **Beep On, Vibrate On (Default)**
- **Beep Off, Vibrate On**
- **Beep On, Vibrate Off**
- **Beep Off, Vibrate Off**
- **Beep Volume 0%**
- **Beep Volume 33%**
- **Beep Volume 67%**
- **Beep Volume 100% (Default)**
Button Stay-Down Time

Button Stay-Down Time sets the amount of time (in seconds) that the reader will continue to process the current “decode symbol” event. The reader will behave as if the trigger is being activated for this specified amount of time.

| Button Stay-Down Time | 0.000 | Seconds |
Button/Trigger Programming

Button/Trigger Programming allows you to determine the reader’s behavior when the Handle Trigger, Top Front Button, or Top Back Button are held down.

Handle Trigger Programming

<table>
<thead>
<tr>
<th>Button/Trigger Programming</th>
<th>Handle</th>
<th>Top Front</th>
<th>Top Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handle</td>
<td>Read High Density and Wide Angle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top Front</td>
<td>Read High Density and Wide Angle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top Back</td>
<td>Read High Density and Wide Angle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Handle

The Handle Trigger can be configured as Disabled, or to Show Target, Read High Density and Wide Angle (Default), Read High Density, Read Wide Angle, or Read Primary Field.

<table>
<thead>
<tr>
<th>Button/Trigger Programming</th>
<th>Handle</th>
<th>Top Front</th>
<th>Top Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handle</td>
<td>Read High Density and Wide Angle*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top Front</td>
<td>Disabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top Back</td>
<td>Read High Density and Wide Angle*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Read High Density</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Read Wide Angle</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Read Primary Field</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Disabled

Handle Trigger functionality will be disabled.

Show Target

The target LEDs will illuminate when the Handle Trigger is held down.

Read High Density and Wide Angle (Default)

Both High Density and Wide Angle will be activated to capture an image when the Handle Trigger is held down.

Rear High Density

High Density will be activated to capture an image when the Handle Trigger is held down.

Read Wide Angle

Wide Angle will be activated to capture an image when the Handle Trigger is held down.

Read Primary Field

The most recent field (High Density or Wide Angle) to have produced a Good Read will be activated to capture an image when the Handle Trigger is held down.
Button/Trigger Programming

Top Front

The Top Front Button can be configured as Disabled, or to Show Target, Read High Density and Wide Angle (Default), Read High Density, Read Wide Angle, or Read Primary Field.

<table>
<thead>
<tr>
<th>Handle</th>
<th>Read High Density and Wide Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Front</td>
<td>Read High Density and Wide Angle</td>
</tr>
<tr>
<td>Top Back</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

Disabled
Top Front Button functionality will be disabled.

Show Target
The target LEDs will illuminate when the Top Front Button is held down.

Read High Density and Wide Angle (Default)
Both High Density and Wide Angle will be activated to capture an image when the Top Front Button is held down.

Read High Density
High Density will be activated to capture an image when the Top Front Button is held down.

Read Wide Angle
Wide Angle will be activated to capture an image when the Top Front Button is held down.

Read Primary Field
The most recent field (High Density or Wide Angle) to have produced a Good Read will be activated to capture an image when the Top Front Button is held down.
The Top Back Button can be configured as Disabled, or to Show Target, Read High Density and Wide Angle (default), Read High Density, Read Wide Angle, or Read Primary Field.

<table>
<thead>
<tr>
<th>Button/Trigger Programming</th>
<th>Read High Density and Wide Angle</th>
<th>Read High Density and Wide Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handle</td>
<td>Read High Density and Wide Angle</td>
<td>Read High Density and Wide Angle</td>
</tr>
<tr>
<td>Top Front</td>
<td>Read High Density and Wide Angle</td>
<td>Read High Density and Wide Angle</td>
</tr>
<tr>
<td>Top Back</td>
<td>Read High Density and Wide Angle</td>
<td>Read High Density and Wide Angle</td>
</tr>
<tr>
<td></td>
<td>Disabled</td>
<td>Show Target</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Read High Density</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Read Wide Angle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Read Primary Field</td>
</tr>
</tbody>
</table>

**Disabled**
Top Back Button functionality will be disabled.

**Show Target**
The target LEDs will illuminate when the Top Back Button is held down.

**Read High Density and Wide Angle (Default)**
Both High Density and Wide Angle will be activated to capture an image when the Top Back Button is held down.

**Rear High Density**
High Density will be activated to capture an image when the Top Back Button is held down.

**Read Wide Angle**
Wide Angle will be activated to capture an image when the Top Back Button is held down.

**Read Primary Field**
The most recent field (High Density or Wide Angle) to have produced a Good Read will be activated to capture an image when the Top Back Button is held down.
Data Validation

Data Validation

Data Validation is used to confirm that a decoded string from the imager has complied with a particular company, industry, or ISO standard. HS-51/HS-51X Data Validation is compliant with Department of Defense Unique Identification and ISO/IEC 15434 (Information Technology – Transfer Syntax for High-Capacity ADC Media) requirements.

Unique Identification

Unique Identification is a mandatory Department of Defense (DoD) requirement on all solicitations issued January 1, 2004 or later. This policy mandates the use of Unique Item Identifiers (UIIs) encoded within Data Matrix symbols on equipment and parts procured by DoD. The HS-51/HS-51X complies with Department of Defense Standard Practice Identification (MIL-STD-130).

Once the imager decodes the Data Matrix symbol, and if Unique Item Identifier (UII), Current Part Number (CPN), and Lot/Batch Number (LBN) are turned on, the HS-51/HS-51X checks the ISO/IEC 15434 syntax with ISO/IEC 15418 (ANSI MH10.8.2 – AI and DI) and ISO/IEC 21849 (ATA – TEI) semantics to construct the UII, CPN, and LBN.

Unique Identification Features

The following data output options are applicable to Data Matrix ECC 200 symbols only and have no effect on other symbologies.

| UII Enabled | Allows the imager to read only message streams encoded in Data Matrix ECC 200 symbols, then to construct and output a UII string. The message streams include validation of Unique Item Identifier (UII), Current Part Number (CPN), and Lot/Batch Number (LBN) strings. When the imager decodes a symbol but the symbol data does not comply with UII format, it will stop capturing images and the green LED will illuminate without beeping, vibrating, or outputting the string. |
| UII Enabled with Pass Through | Allows the imager to read UII messages in Data Matrix ECC 200 symbols and non-UII messages in any type of symbols. The imager’s behavior is the same as with UII Enabled. |
| UII Enabled with Error Messages | Allows the imager to read UII messages in Data Matrix ECC 200 symbols and output detailed information such as construction type, data components, or error messages. The imager’s behavior is the same as with UII Enabled. |
| Data Validation Disabled | Disables both UII and ISO/IEC 15434 data validation. |
Unique Identification Output Examples

**UII Enabled**
- UII:UN123456789ABCDEFG
- CPN:87654321
- LBN:87654321
- UII:12345678 CPN:87654321
- UII:12345678 LBN:87654321

**UII Enabled with Pass Through**
- UII:UN123456789ABCDEFG
- CPN:87654321
- LBN:87654321
- UII:12345678 CPN:87654321
- UII:12345678 LBN:87654321
- DATA:Microscan Precision Data Acquisition and Control Solutions

**UII Enabled with Error Messages**
- UII:UN123456789ABCDEFG;Construct_1;25SUN123456789ABCDEFG;;;;;;
- CPN:87654321;PNR;PNR 87654321;;;;;;
- LBN:87654321;30T;30T87654321;;;;;;
- UII:12345678 CPN:87654321;Construct_1_2/PNR;UID 12345678;PNR 87654321;;;;;;
- UII:12345678 LBN:87654321;Construct_1/30T;25S12345678;30T87654321;;;;;;
- (15434 ERROR: HEADER - 1ST POSITION);Microscan Precision Data Acquisition and Control Solutions;;;;;;

**Data Validation Disabled**
The imager will return to normal output behavior without performing data validation.
Data Validation

ISO/IEC 15434

ISO/IEC 15434 specifies a transfer structure, syntax, and coding of messages and data formats when using high capacity automatic data capture (ADC) technologies. The following ISO/IEC 15434 data output options are applicable to Data Matrix ECC 200 symbols only and have no effect on other symbologies.

| ISO/IEC 15434 Enabled | Allows the imager to read only ISO/IEC 15434-compliant message streams in Data Matrix ECC 200 symbols then output the ISO/IEC 15434 string. This implementation only checks the header/trailer format and proper format indicator (00-99 and DD). The output string has a prefix, a format indicator, and data components. |
| ISO/IEC 15434 Enabled with Error Messages | Allows the imager to read only ISO/IEC 15434-compliant messages in Data Matrix ECC 200 symbols and output detailed information such as prefix, format indicator, data components, or error messages. |
| Data Validation Disabled | Disables both UII and ISO/IEC 15434 data validation. |

ISO/IEC 15434 Output Examples

ISO/IEC 15434 Enabled

(15434);05;0100061414199999;211A0B9C3D6;;;;;;
(15434);06;7L0A1B3C;1P4202435;S10936;;;;;;
(15434);06;17V0A1B2;1P4202435;S10936;;;;;;

ISO/IEC 15434 Enabled with Error Messages

(15434);05;0100061414199999;211A0B9C3D6;;;;;;
(15434);06;7L0A1B3C;1P4202435;S10936;;;;;;
(15434);06;17V0A1B2;1P4202435;S10936;;;;;;
(15434 ERROR: HEADER - 3RD POSITION);[<▲DD→CAG 12345→SER67890123▲;;;;;;
(15434 ERROR: TRAILER - END OF TRANSMISSION);[>▲12→CAG 12345→SER67890123▲;;;;;;
(15434 ERROR: HEADER - GROUP SEPARATOR);[>▲12▲CAG 12345●029SER67890123▲;;;;;;

Data Validation Disabled

The imager will return to normal output behavior without performing data validation.
Data Validation Settings

The following symbols control Data Validation functions:

- UUI Enabled
- UUI Enabled with Pass Through
- UUI Enabled with Error Messages
- ISO/IEC 15434 Enabled
- ISO/IEC 15434 Enabled with Error Messages
- Data Validation Disabled (Default)

Save Settings

Data Validation by ESP

Each of the Data Validation Settings can also be enabled in ESP’s I/O Parameters tree control.

<table>
<thead>
<tr>
<th>Data Validation</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled*</td>
<td>UUI Enabled</td>
</tr>
<tr>
<td></td>
<td>ISO/IEC 15434 Enabled</td>
</tr>
<tr>
<td></td>
<td>UUI with Pass Through</td>
</tr>
<tr>
<td></td>
<td>UUI with Error Message</td>
</tr>
<tr>
<td></td>
<td>ISO/IEC 15434 with Error Message</td>
</tr>
</tbody>
</table>
Data Validation

**Detailed Output Format**

The table below describes data validation output in detail.

**Note:** **UII Enabled with Pass Through** will add the prefix **DATA** to non-UII output for all symbologies.

**Note:** **UII Enabled with Error Messages** will output the following format: **UII/CPN/LBN; DF0; DF1; DF2; DF3; DF4; DF5; DF6; DF7.**

**Note:** When ISO/IEC 15434 output is in compliance with the standard, the format is **(15434); DF0; DF1; DF2; DF3; DF4; DF5; DF6; DF7.** When it is not in compliance with the standard, the output is **(15434 ERROR: xxxx);;;;;;;** where DF0 is the format indicator showing which type of data qualifier is in use.

<table>
<thead>
<tr>
<th><strong>UII Enabled</strong></th>
<th><strong>Content of Decoded Data</strong></th>
<th><strong>Matrix Symbol</strong></th>
<th><strong>UII/CPN/LBN</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid UII</td>
<td><strong>UII:</strong> UII_data</td>
<td>Example: UII:12345678</td>
<td></td>
</tr>
<tr>
<td>Valid CPN</td>
<td><strong>CPN:</strong> CPN_data</td>
<td>Example: CPN:87654321</td>
<td></td>
</tr>
<tr>
<td>Valid LBN</td>
<td><strong>LBN:</strong> LBN_data</td>
<td>Example: LBN:87654321</td>
<td></td>
</tr>
<tr>
<td>Valid UII and CPN</td>
<td><strong>UII:</strong> UII_data CPN:CPN_data</td>
<td>Example: UII:12345678 CPN:87654321</td>
<td></td>
</tr>
<tr>
<td>Valid UII and LBN</td>
<td><strong>UII:</strong> UII_data LBN:LBN_data</td>
<td>Example: UII:12345678 LBN:87654321</td>
<td></td>
</tr>
<tr>
<td>Valid UII and Invalid CPN</td>
<td><strong>UII:</strong> UII_data (CPN ERROR)</td>
<td>Example: UII:12345678 (CPN ERROR)</td>
<td></td>
</tr>
<tr>
<td>Valid UII and Invalid LBN</td>
<td><strong>UII:</strong> UII_data (LBN ERROR)</td>
<td>Example: UII:12345678 (LBN ERROR)</td>
<td></td>
</tr>
<tr>
<td>Invalid UII and Valid CPN</td>
<td>(UII ERROR) CPN:CPN_data</td>
<td>Example: (UII ERROR) CPN:87654321</td>
<td></td>
</tr>
<tr>
<td>Invalid UII and Valid LBN</td>
<td>(UII ERROR) LBN:LBN_data</td>
<td>Example: (UII ERROR) LBN:87654321</td>
<td></td>
</tr>
<tr>
<td>None of the above</td>
<td>No output data</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**UII Enabled with Error Messages**

<table>
<thead>
<tr>
<th><strong>Content of Decoded Data</strong></th>
<th><strong>Matrix Symbol</strong></th>
<th><strong>UII/CPN/LBN</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid UII</td>
<td><strong>UII:</strong> UII_data</td>
<td>Example: UII:12345678</td>
</tr>
<tr>
<td></td>
<td>Example: <strong>Contruct_1</strong></td>
<td></td>
</tr>
</tbody>
</table>
### I/O Parameters

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Valid CPN</strong>&lt;br&gt;<strong>Valid LBN</strong></td>
<td>CPN:CPN_data&lt;br&gt;Example: CPN:87654321&lt;br&gt;LBN:LBN_data&lt;br&gt;Example: LBN:87654321</td>
</tr>
<tr>
<td><strong>Constructed CPN type</strong>&lt;br&gt;<strong>Example:</strong> PNR&lt;br&gt;<strong>Constructed LBN type</strong>&lt;br&gt;<strong>Example:</strong> 30T</td>
<td></td>
</tr>
<tr>
<td><strong>Valid UII and CPN</strong>&lt;br&gt;<strong>Valid UII and LBN</strong></td>
<td>UII:UII_data CPN:CPN_data&lt;br&gt;Example: UII:12345678&lt;br&gt;CPN:87654321&lt;br&gt;UII:UII_data LBN:LBN_data&lt;br&gt;Example: UII:12345678&lt;br&gt;LBN:87654321</td>
</tr>
<tr>
<td><strong>Constructed UII/CPN type</strong>&lt;br&gt;<strong>Example:</strong> Construct_1/PNR&lt;br&gt;<strong>Constructed UII/LBN type</strong>&lt;br&gt;<strong>Example:</strong> Construct_1/30T</td>
<td></td>
</tr>
<tr>
<td><strong>Valid UII and Invalid CPN</strong>&lt;br&gt;<strong>Valid UII and Invalid LBN</strong></td>
<td>UII:UII_data (30P ERROR: xxxx)&lt;br&gt;UII:UII_data (PNR ERROR: xxxx)&lt;br&gt;UII:UII_data (240 ERROR: xxxx)&lt;br&gt;UII:UII_data (30T ERROR: xxxx)</td>
</tr>
<tr>
<td><strong>Constructed UII type</strong>&lt;br&gt;<strong>Example:</strong> Construct_1</td>
<td></td>
</tr>
<tr>
<td><strong>Invalid UII and Valid CPN</strong>&lt;br&gt;<strong>Invalid UII and Valid LBN</strong></td>
<td>(UII ERROR: xxxx)&lt;br&gt;CPN:CPN_data&lt;br&gt;Example: (UII ERROR: DATA ELEMENT CHARACTER)</td>
</tr>
<tr>
<td><strong>Invalid UII</strong></td>
<td>(UII ERROR: xxxx)&lt;br&gt;(15434 ERROR: xxxx)&lt;br&gt;<strong>Example:</strong> (UII ERROR: DATA ELEMENT CHARACTER)</td>
</tr>
<tr>
<td><strong>Original decoded data</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Invalid CPN</strong>&lt;br&gt;<strong>Invalid LBN</strong></td>
<td>(30P ERROR:xxxx)&lt;br&gt;(PNR ERROR:xxxx)&lt;br&gt;(240 ERROR:xxxx)&lt;br&gt;(30T ERROR:xxxx)&lt;br&gt;(15434 ERROR: xxxx)</td>
</tr>
<tr>
<td><strong>Original decoded data</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Invalid UII and Invalid CPN</strong>&lt;br&gt;<strong>Invalid UII and Invalid LBN</strong></td>
<td>(UII ERROR: xxxx)&lt;br&gt;(30P ERROR:xxxx)&lt;br&gt;(UII ERROR: xxxx)&lt;br&gt;(PNR ERROR:xxxx)&lt;br&gt;(UII ERROR: xxxx)&lt;br&gt;(240 ERROR:xxxx)&lt;br&gt;(UII ERROR: xxxx)&lt;br&gt;(30T ERROR:xxxx)</td>
</tr>
<tr>
<td><strong>Original decoded data</strong></td>
<td></td>
</tr>
</tbody>
</table>
Data Validation

Error Messages
The following is a list of potential error messages.
15434 ERROR: DATA ELEMENT SEPARATOR
15434 ERROR: DOUBLE TRAILER
15434 ERROR: FORMAT INDICATOR
15434 ERROR: HEADER - 1ST POSITION
15434 ERROR: HEADER - 2ND POSITION
15434 ERROR: HEADER - 3RD POSITION
15434 ERROR: HEADER - 4TH POSITION
15434 ERROR: HEADER - GROUP SEPARATOR
15434 ERROR: TRAILER - END OF TRANSMISSION
15434 ERROR: TRAILER - RECORD SEPARATOR
PNR ERROR: TOO LONG
PNR ERROR: TOO SHORT
PNR ERROR: CHARACTER
30P ERROR: TOO LONG
30P ERROR: TOO SHORT
30P ERROR: CHARACTER
240 ERROR: TOO LONG
240 ERROR: TOO SHORT
240 ERROR: CHARACTER
UII ERROR: DATA ELEMENT CHARACTER
UII ERROR: DATA ELEMENT TOO LONG
UII ERROR: DATA ELEMENT TOO SHORT
UII ERROR: LOWER CASE CHARACTER
UII ERROR: NEED UII ELEMENT FIRST
UII ERROR: SPACE AFTER TEI DATA QUALIFIER
UII ERROR: TEI DATA QUALIFIER
UII ERROR: UII ELEMENT INCOMPLETE
UII ERROR: WRONG FORMAT INDICATOR
UII ERROR: UII STRING TOO LONG

Additional Notes
• DF1 – DF7: If the UII/CPN field is "(15434 ERROR: xxxx)", DF1 – DF7 are filled in with an empty string. Otherwise, the fields are used to display data elements. If there are fewer than seven data elements, an empty string is filled in at the end. If there are more than seven elements, only the first seven elements are displayed.
• There is a space between UII and CPN in both tables (UII:12345678 CPN:87654321).
• The constructed UII type can be Contract_1, Contract_2, Construct_1_2, or IUID_EQUIVALENT.
• The constructed CPN type can be PNR, 30P, or 240. The constructed LBN type can be 30T.
8 Advanced Operations

Contents

Continuous Read.......................................................................................................................... 8-2
Mirroring ....................................................................................................................................... 8-3
Bluetooth Keyboard-to-Windows 7 Pairing................................................................................... 8-4
Bluetooth Keyboard-to-Tablet Pairing........................................................................................... 8-8
Bluetooth Keyboard-to-Mobile Phone Pairing............................................................................. 8-11
Reader Paging............................................................................................................................ 8-13
Bluetooth Out-of-Range Notification........................................................................................... 8-14
Cell Phone Reading Enhancement .............................................................................................. 8-15

This section describes settings that can be configured to speed up processing or to improve symbol readability in various circumstances. You will also find information about how to pair a Bluetooth Keyboard with operating systems and wireless devices.

ESP can be used to configure reader parameters and then to send and save those parameters to the reader.

You can also configure reader parameters by decoding the Data Matrix symbols in this section.
Continuous Read

Continuous Read

Read the following symbols to enable or disable Continuous Read.

Continuous Read On

Continuous Read Off (Default)
Advanced Operations

Mirroring

Mirroring allows the reader to decode symbols that are reversed. When Mirroring is enabled, all other decode functionality is disabled.

Note: Once the reader has been set to Mirroring On, it can only return to its default mode by reading the Mirroring Off symbol below.

Mirroring On

Mirroring Off (Default)
Bluetooth® Keyboard-to-Windows 7 Pairing

This section describes how to pair a Bluetooth Keyboard with the Windows 7 operating system. A Bluetooth USB hardware key may be needed if Bluetooth is not built into the host device.

1. Find and select the Bluetooth icon in the notification tray at the lower right of your screen.

2. Right-click on Bluetooth icon. Select **Add a Device** from the list of options.

3. Scan the symbol below to enable your HS-51/HS-51X to be discoverable by Windows 7.

   **Note:** Once the reader is in discoverable mode, it will beep twice. You will have 30 seconds to initiate a connection to the host device. If 30 seconds elapses without connecting to the host device, repeat steps 1 through 3.

   ![Bluetooth Keyboard Discoverable Mode](image)
4. You will see the HS-51/HS-51X as a device option in the **Add a Device** window. Select the HS-51/HS-51X.

5. Once the HS-51/HS-51X has been selected, a screen will appear containing a PIN.
**Bluetooth® Keyboard-to-Windows 7 Pairing**

6. When the reader beeps twice, it is ready for the entry of the PIN. Using the Bluetooth Keyboard-to-Windows 7 Pin Reference Codes, scan each of the PIN digits with your HS-51/HS-51X. You will have 30 seconds to enter the PIN. Scan the Submit PIN symbol after the pin sequence has been entered.

   **Note:** Failure to complete PIN entry in the allotted 30 seconds will result in the appearance of a Try Again button. Click the Try Again button and repeat steps 3 through 6.

7. Once the installation of the HS-51/HS-51X driver is completed, and if the pin was entered correctly, a **This device has been successfully added to this computer** window will appear.

8. The reader will beep once and the wireless icon LED will remain solid when the reader is successfully connected.

9. To test the connection, open Windows 7 Notepad and scan a series of symbols. If data appears in Notepad after each scan, you have successfully connected to Windows 7. If Notepad is not showing scanned data, remove the Bluetooth device from the Bluetooth device screen and repeat steps 1 through 7.
## Bluetooth Keyboard-to-Windows 7 Pin Reference Codes

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<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><img src="M10262_01" alt="QR Code 1" /></td>
<td><img src="M10263_01" alt="QR Code 2" /></td>
<td><img src="M10264_01" alt="QR Code 3" /></td>
</tr>
</tbody>
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<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td><img src="M10265_01" alt="QR Code 4" /></td>
<td><img src="M10266_01" alt="QR Code 5" /></td>
<td><img src="M10267_01" alt="QR Code 6" /></td>
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<tr>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td><img src="M10268_01" alt="QR Code 7" /></td>
<td><img src="M10269_01" alt="QR Code 8" /></td>
<td><img src="M10270_01" alt="QR Code 9" /></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Submit Pin</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="M10272_01" alt="QR Code Submit Pin" /></td>
<td><img src="M10271_01" alt="QR Code 0" /></td>
</tr>
</tbody>
</table>
Bluetooth® Keyboard-to-Tablet Pairing

Bluetooth® Keyboard-to-Tablet Pairing

This section describes how to pair a Bluetooth Keyboard with a tablet device. The HS-51/HS-51X is compatible with most tablets.

1. In your tablet device’s list of applications, select the Settings icon.
2. Select the Bluetooth setting.
3. Scan the following symbol to enable the HS-51/HS-51X to be discoverable by the tablet.

4. Once the reader is in discoverable mode, it will beep twice. You will have 30 seconds to initiate a connection to the host device. If 30 seconds elapses without connecting to the host device, scan the discoverable mode symbol again.
5. The HS-51/HS-51X will appear on the list of Bluetooth devices on the tablet. Select the reader to initiate connection.
6. A window with a PIN will appear on the tablet.
7. Once the reader beeps twice, it is ready for you to enter the PIN. Using the Bluetooth Keyboard-to-Tablet Pin Reference Codes, scan each of the PIN digits with your reader. You will have 30 seconds to enter the PIN. Scan the Submit PIN symbol when the pin sequence has been entered.
8. The tablet will show a positive connection indicator when the connection is completed. The HS-51/HS-51X will beep once when connected and the wireless icon LED will remain solid.
## Bluetooth Keyboard-to-Tablet Pin Reference Codes

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<td><img src="m10263_01" alt="QR Code" /></td>
<td><img src="m10264_01" alt="QR Code" /></td>
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<tr>
<td>Submit Pin</td>
<td>0</td>
<td></td>
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<td><img src="m10272_01" alt="QR Code" /></td>
<td><img src="m10271_01" alt="QR Code" /></td>
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</tbody>
</table>
**Bluetooth® Keyboard-to-Tablet Pairing**

**Keyboard Display Options or Apple iOS**

**Important:** Keyboard Display Options are only compatible with Apple iOS.

To configure the bottom button on the reader to toggle the host device’s on-screen keyboard, scan the following symbol:

![Keyboard Display Options On](image)

To reset the bottom button to the default setting, scan the following symbol:

![Keyboard Display Options Off](image)

**Re-connect to Other Bluetooth Devices**

To re-establish connection to another host device already paired with the reader, scan the following symbol:

![Switch Host Device](image)

The reader will appear in the list of devices in the Bluetooth menu. Select the reader to initiate the connection.

**Note:** If the reader’s battery has been removed, the reader is out of range (beyond the working range of 10 meters/30 feet), or the reader is powered off while in default connection settings, the reader will initiate connection to the most recent host device when back in service.

**Clear Connection History**

Decode the **Clear Bluetooth Connections** symbol below to clear previous Bluetooth addresses from the reader’s memory. Then decode the **Reboot Reader** symbol.

**Note:** This command does not automatically remove the reader from the list of devices in the Bluetooth menu. You must delete the reader from the list.

To clear connection information from all Bluetooth Keyboard hosts, scan the following symbol:

![Clear Bluetooth Connection](image) ![Reboot Reader](image)

**Note:** To re-establish a connection once the connection history has been cleared, repeat steps 1 through 8.
Bluetooth® Keyboard-to-Mobile Phone Pairing

This section describes how to pair a Bluetooth Keyboard with a mobile phone. The HS-51/HS-51X is able to decode symbols on mobile phones by turning off the reader’s LED illumination, capturing two images of the symbol, comparing those two images, and then choosing the best image. If the reader is unable to decode the best of the two images, the reader’s gain is automatically adjusted and the cycle is repeated.

The HS-51/HS-51X is compatible with most Bluetooth-keyboard-supported smart phones.

1. In your mobile phone’s list of applications, select the Settings icon.
2. Select the Bluetooth setting.
3. Scan the following symbol to enable the HS-51/HS-51X to be discoverable by the phone.

![Bluetooth Keyboard Discoverable Mode](image)

4. Once the reader is in discoverable mode, it will beep twice. You will have 30 seconds to initiate a connection to the host device. If 30 seconds elapses without connecting to the host device, scan the discoverable mode symbol again.
5. The HS-51/HS-51X will appear on the list of Bluetooth devices on the phone. Select the reader to initiate connection. Some smart phones require you to refresh the list of devices before the reader will appear for connection initialization.
6. A window with a PIN will appear on the phone.
7. Once the reader beeps twice, it is ready for you to enter the PIN. Using the Bluetooth Keyboard-to-Mobile Phone Pin Reference Codes, scan each of the PIN digits with your reader. You will have 30 seconds to enter the PIN. Scan the Submit PIN symbol when the pin sequence has been entered.
8. The phone will show a positive connection indicator when the connection is completed. The HS-51/HS-51X will beep once when connected and the wireless icon LED will remain solid.
Bluetooth® Keyboard-to-Mobile Phone Pairing

Bluetooth Keyboard-to-Mobile Phone Pin Reference Codes

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<td></td>
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<td></td>
</tr>
<tr>
<td>Submit Pin</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><img src="M10272_01" alt="QR Code" /></td>
<td><img src="M10271_01" alt="QR Code" /></td>
<td></td>
</tr>
</tbody>
</table>
Reader Paging

**Reader Paging** allows you to locate the reader if it has been misplaced. To page the reader, push the button above the Quick Connect Code on the Charging Station. The reader will beep once every few seconds and the wireless icon and storage icon on the top of the reader will illuminate and remain illuminated until you exit paging mode. Pull the reader’s trigger to exit paging mode.
Bluetooth® Out-of-Range Notification

Bluetooth® Out-of-Range Notification indicates when the reader is out of range and no longer communicating with the modem. The typical working range is 10 meters (30 feet). The configuration symbols below allow you to configure the reader’s out-of-range indicators. The wireless LED will flash by default when the reader is out-of-range.

- **Bluetooth Out-of-Range Beep Only – On**
- **Bluetooth Out-of-Range Vibrate Only – On**
- **Bluetooth Out-of-Range Beep and Vibrate – On**
- **Bluetooth Out-of-Range Beep and Vibrate – Off**
Cell Phone Reading Enhancement

Cell Phone Reading Enhancement improves the reader’s ability to decode symbols on smart phone and tablet screens as well as most PC monitors.

When the reader is in this mode, LED illumination is turned off, two images are captured and compared, and the symbol in the better of the two images is decoded. If the better of the two images results in a No Read, the reader automatically adjusts gain settings and the cycle is repeated.

Cell Phone Reading Enhancement On

Cell Phone Reading Enhancement Off
Cell Phone Reading Enhancement
This section describes the Terminal interface and macro functions in ESP.
Terminal View

Click the Terminal button.

You will see the following view:

The Terminal interface allows you to send commands to the reader by using macros, by copying and pasting, or by typing commands in the Send text field. The Terminal view also displays symbol data or information from the reader. You can also right click on the Terminal screen to bring up a menu of further options.
**Find**

The **Find** function allows you to enter text strings to be searched for in the terminal window. For example, suppose a series of symbols have been scanned into the terminal view and you want to determine if a particular symbol whose data begins with “ABC” has been read.

1. Type “ABC” into the **Find** box.

2. Press **Enter**.
   - The first instance of “ABC” will be highlighted in the terminal window.

3. Click the **Find** button to the left of the text field to locate additional instances of “ABC”.

---

*Terminal*
Send

The Send function allows you to enter text commands and then send them to the reader. (See Text Commands.)

For example, suppose you want to disable the vibrate function in the reader. To disable vibrate using a text command, you would enter “P%A10” (the command that disables vibrate) in the text field and click Send.

Once text commands are initiated, they are saved in a dropdown menu that can be accessed by clicking the arrow to the right of the text field.

You can also send the current command repeatedly by clicking the Send button repeatedly.
Macros

Macros can be stored in a macro selection bar, edited in a separate window, and executed by clicking on the macro name.

Clicking on a macro button executes the related command. The command is also sent to the reader at the same time it is displayed.

**Editing a Macro**

When you click the arrow next to any macro and select **Edit**, the following dialog appears:

You can edit an existing macro or type in the **Macro Name** text field and define it in the **Macro Value** text field.
Terminal Right-Click Menu

Right click in the terminal window to display the following menu:

- Copy selected text to clipboard.
- Paste from terminal or other text.
- Clear all text in terminal window.
- Select All text in the terminal window.
- Save... incoming and outgoing data into a text file.
- Change Font... of data received from the reader.
- Change Echo Font... to change the appearance of user-entered data.
- Disable Echo to hide user-entered data.
- Change Background Color of the terminal window.
- Non-Printable Characters can be shown or hidden in the terminal view in Standard or Enhanced format.
- Default Settings to return all of the above to original settings.
- Keyboard Macros brings up the Function Keys dialog, which allows you to create customized macro functions.

Function Keys

The Function Keys dialog allows you to assign commands to specific function keys on a standard keyboard. Note that the F1 key is reserved for opening ESP Help, and the F3 key is reserved for the Find Next function.

Select the desired function key and then enter your macro keystrokes in the associated key map. For example, to make Ctrl-F2 the keystroke to send a trigger character, select F2, then in the Ctrl text field, enter <trigger character> and click OK. Then whenever Ctrl-F2 is keyed, the trigger character will start the read cycle.

Note: This feature is also available from the Terminal Dropdown Menu and the Terminal tab of the Preferences dialog.
Terminal Dropdown Menu

The terminal dropdown menu allows you to capture and save current text, and it also includes the functions defined for the Terminal Right-Click Menu.

- **Capture Text...** lets you append data in real time to a text file of your choice. While in operation, the text file cannot be opened. You can select **Pause** to interrupt the capture flow or **Stop** to end the flow and open the file.
- **Save Current Text...** saves all text in the terminal window to a text file of your choice.
- **Find Next** locates the next instance of the specified data string in the terminal. This function can also be activated by pressing **F3**.
- **Find Previous** locates the most recently occurring instance of the specified data string in the terminal.
- **Keyboard Macros** brings up the Function Keys dialog, which allows you to create customized macro functions.
Terminal Dropdown Menu
This section explains ESP’s Utilities features. These include Differences from Default, which shows all currently enabled reader settings that are not default settings; Firmware, where you can update and verify your reader’s firmware; Bluetooth, which allows you to create custom Quick Connect Codes; and Advanced, which allows you to collect batch files for customized reader configuration and optimization.
Differences from Default

Clicking the Differences from Default button will cause ESP to check all stored configuration settings and compare them to default settings. All settings that are different than default will appear in the left column (shown below), and descriptions of those settings will appear in the right column.

- To save the Differences from Default report, either as plain text or as a tab-delimited text file, click Save As.
- Click Send and Save to send the settings to the reader and save them, or Send to Reader to send the settings without saving them.

Important: To use the Differences from Default feature, you must connect to the reader and Receive Reader Settings via the Send/Recv button on the toolbar.
Firmware

The Firmware view in ESP Utilities is a simple way to update and verify your reader's firmware and to update batch files.

Choose App Code from the Firmware Update dropdown menu and click Start to install new firmware.

Use this dropdown menu to locate batch files in the host computer's file directory. Download the needed files directly to the reader by clicking the Start button.


Note: The versions shown here are examples only. App Code, Firmware, and Boot versions may vary.
Firmware

**ID and Firmware Version**

Another way to query the reader for its identifying information is by reading the following symbol:

![ID and Firmware Version](image)

The host's text program will output a data string containing the device's identifying information in the format shown below.

**Example:**

i06380456blue0020019795A060000060008001400490002<TAB>35-619200-10 002

<table>
<thead>
<tr>
<th>i</th>
<th>'i' string output</th>
</tr>
</thead>
<tbody>
<tr>
<td>0638</td>
<td>Application firmware version number</td>
</tr>
<tr>
<td>0456</td>
<td>Bootloader firmware version number</td>
</tr>
<tr>
<td>blue</td>
<td>Type</td>
</tr>
<tr>
<td>0020019795</td>
<td>Reader serial number</td>
</tr>
<tr>
<td>A</td>
<td>A = Running application</td>
</tr>
<tr>
<td>06</td>
<td>N/A</td>
</tr>
<tr>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>0000</td>
<td>N/A</td>
</tr>
<tr>
<td>06</td>
<td>Hardware revision</td>
</tr>
<tr>
<td>0008</td>
<td>Hardware type identifier</td>
</tr>
<tr>
<td>0014</td>
<td>Boot application version</td>
</tr>
<tr>
<td>0049</td>
<td>Operating system kernel version</td>
</tr>
<tr>
<td>0002</td>
<td>Root file system version</td>
</tr>
<tr>
<td>&lt;TAB&gt;</td>
<td>ASCII TAB character</td>
</tr>
<tr>
<td>35-619200-10 002</td>
<td>Decoder version</td>
</tr>
</tbody>
</table>
Utilities

Bluetooth

The **Bluetooth** tab allows you to create your own Quick Connect Code to establish wireless communications. This is particularly useful if you are communicating with a non-Microscan Bluetooth device.

To connect to a non-Microscan Bluetooth device, you will need the Bluetooth address of that device. The 12-character Bluetooth address can typically be found on the device near the serial number. Create a Quick Connect Code on the **Bluetooth** tab shown below. Decode the new Quick Connect Code to establish a connection with the device.

```
Enter Quick Connect Code:
000BEF03C5A9
12 characters (0 - 9, A - F)
```

![Bluetooth Tab Image]
Advanced

The Advanced tab in Utilities features an archive of all batch files containing reader configuration commands. Each batch file's extension is .crb, and each file contains the fundamental code for programming the reader. Notice that the names of the batch files correspond with the numbers beneath all the Data Matrix configuration symbols.

This tool allows you to use the batch file data to create your own symbols, or to collect only the files that you use frequently to configure the reader for your application.
Appendices

Contents

Appendix A General Specifications ................................................................. A-2
Appendix B Electrical Specifications ............................................................... A-5
Appendix C Configuration Symbols ................................................................. A-6
Appendix D Communications Protocol ......................................................... A-18
Appendix E ASCII Table .................................................................................. A-19
Appendix F Maintenance ................................................................................ A-20
Appendix G Glossary of Terms ...................................................................... A-21
Appendix A — General Specifications

**Mechanical**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>5.3” (135 mm)</td>
</tr>
<tr>
<td>Width</td>
<td>2.0” (51 mm)</td>
</tr>
<tr>
<td>Depth</td>
<td>5.1” (130 mm)</td>
</tr>
<tr>
<td>Weight</td>
<td>8.0 oz. (170 g)</td>
</tr>
</tbody>
</table>

**Environmental**

- **Enclosure:** IP54 rated
- **Operating temperature:** −20° to 55°C (−4° to 131°F)
- **Storage temperature:** −30° to 65°C (−22° to 150°F)
- **Humidity:** 5 to 95% (non-condensing)
- **Shock:** Withstands multiple drops of 6’ (1.8 meters) to concrete

**CE Standards**

- **Immunity:** EN 55024
- **ESD:** EN 61000-4-2
- **Radiated RF:** EN 61000-4-3
- **Keyed Carrier:** ENV50204
- **EFT:** EN 61000-4-4
- **Conducted RF:** EN 61000-4-6
- **Emissions:** EN 55022, Class B Radiated, Class B Conducted
- **IEC 60825-1: 2007**
- **EN 62471:2008**

**Symbologies**

- **2D Symbologies:** Data Matrix, QR Code, Micro QR Code, Aztec Code
- **Stacked 1D Symbologies:** PDF417, MicroPDF417, GS1 Composite
- **1D Symbologies:** UPC, Code 39, Code 93, Code 128, Interleaved 2 of 5, Codabar, GS1 DataBar, Postal, Pharmacode, BC412

**Light Collection Options**

- **Sensor:** CMOS 1.2 Megapixel grayscale
- **Sensor Array:** 1280 by 960
- **Field Selection:** High Density or Wide Angle
- **Field of View:** High Density: 30° horizontal by 20° vertical; Wide Angle: 50° horizontal by 33.5° vertical
- **Focal Point:** Approximately 100 mm
- **Optical Resolution:** High Density: 960 x 640; Wide Angle: 960 x 640

**Communication Protocols**

- **Interfaces:** USB 2.0 (USB Native HID, USB Keyboard), Bluetooth (Class II) with working range of 10 meters (30 feet), Virtual COM (Batch Mode Only)

**Read Parameters**

- **Pitch:** ±60° (front to back)
- **Skew:** ±60° (from plane parallel to symbol, side-to-side)
- **Rotational Tolerance:** ±180°
- **Print contrast Resolution:** 25% (1D symbologies); 35% (2D symbologies); absolute dark/light reflectance differential measured at 650 nm
- **Ambient Light Immunity:** Sunlight: Up to 9,000 ft.-candles / 96,890 lux
- **Target Beam:** Two bars; one bar when focused (approx. 4” from symbol)

**Indicators**

- **Status Indicators:** Beep, Vibrate, LEDs

**Memory Capacity**

- **128MB Flash ROM, 32MB RAM**

**Data Editing**

- **JavaScript (Additional License Required)**

**Electrical**

- **Power Requirements:**
  - **Reader:** @ 4.2VDC (mA): Typical and Peak: 362 mA; Idle: 80 mA; Sleep: 20 mA
  - **Charging Station with Embedded modem:** @ 5VDC (mA): USB Max Charge Rate: 555 mA; USB Trickle Charge Rate: 165 mA

**Dimensions**

- **Height:** 5.3” (135 mm)
- **Width:** 2.0” (51 mm)
- **Depth:** 5.1” (130 mm)
- **Weight:** 8.0 oz. (170 g)

**Note:** Nominal dimensions shown. Typical tolerances apply.
## Read Ranges

### STANDARD DENSITY

<table>
<thead>
<tr>
<th>Narrow Bar</th>
<th>Read Range</th>
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<tbody>
<tr>
<td><strong>1D</strong></td>
<td></td>
</tr>
<tr>
<td>.0050&quot; (.127 mm)</td>
<td>3.7 to 5.0&quot; (94 to 127 mm)</td>
</tr>
<tr>
<td>.0075&quot; (.191 mm)</td>
<td>2.2 to 6.5&quot; (56 to 165 mm)</td>
</tr>
<tr>
<td>.010&quot; (.254 mm)</td>
<td>1.5 to 8.0&quot; (38 to 203 mm)</td>
</tr>
<tr>
<td>.020 (.508 mm)</td>
<td>2.3 to 15.5&quot; (58 to 394 mm)</td>
</tr>
<tr>
<td><strong>2D</strong></td>
<td></td>
</tr>
<tr>
<td>.0050&quot; (.127 mm)</td>
<td>3.7 to 4.6&quot; (94 to 117 mm)</td>
</tr>
<tr>
<td>.0075&quot; (.191 mm)</td>
<td>1.5 to 6.0&quot; (38 to 152 mm)</td>
</tr>
<tr>
<td>.010&quot; (.254 mm)</td>
<td>1.6 to 7.7&quot; (41 to 196 mm)</td>
</tr>
<tr>
<td>.020 (.508 mm)</td>
<td>1.6 to 9.4&quot; (41 to 239 mm)</td>
</tr>
</tbody>
</table>
General Specifications

**FISes and Accessories**

<table>
<thead>
<tr>
<th>HS-51/HS-51X Wireless Handheld Readers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HS-51 Wireless Handheld 2D Reader</td>
<td>FIS-HS51-0001G</td>
</tr>
<tr>
<td>HS-51X Wireless Handheld DPM Reader</td>
<td>FIS-HS51X-0002G</td>
</tr>
<tr>
<td>Charging Station without Embedded Modem, with USB Cable</td>
<td>98-9000007-01</td>
</tr>
<tr>
<td>Lithium-Ion Battery</td>
<td>98-9000008-01</td>
</tr>
<tr>
<td>Charger, 4 Bay</td>
<td>98-9000009-01</td>
</tr>
<tr>
<td>Power Supply, Wall Mount, U.S.</td>
<td>20-000335-02</td>
</tr>
<tr>
<td>Power Supply, Wall Mount, EU</td>
<td>20-000336-02</td>
</tr>
<tr>
<td>Power Supply, Wall Mount, UK</td>
<td>20-000337-02</td>
</tr>
<tr>
<td>Microscan Tools Drive: Software, Documentation, Links to Microscan Website</td>
<td>37-000010-01</td>
</tr>
</tbody>
</table>

**Safety Certifications**

FCC, CE, RoHS/WEEE, REACH

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All rights reserved. Specifications subject to change.
Product specifications are given for typical performance at 25°C (77°F) using grade A symbols. Performance characteristics may vary at high temperatures or other environmental extremes. Five Year Limited Warranty on parts and labor.
Appendices

Appendix B — Electrical Specifications

Power Requirements

Reader @ 4.2VDC (mA):
Typical and Peak: 362 mA;
Idle: 80 mA;
Sleep: 20 mA

Charging Station with Embedded Modem @ 5VDC (mA):
USB Max Charge Rate: 555 mA;
USB Trickle Charge Rate: 165 mA
# Configuration Symbols

## Appendix C — Configuration Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Reset to RF Defaults</td>
</tr>
<tr>
<td>A2</td>
<td>USB Native (HID)</td>
</tr>
<tr>
<td>A3</td>
<td>Continuous Read Off</td>
</tr>
<tr>
<td>A4</td>
<td>Continuous Read On</td>
</tr>
<tr>
<td>B1</td>
<td>Aztec Code On</td>
</tr>
<tr>
<td>B2</td>
<td>Aztec Code Off</td>
</tr>
<tr>
<td>B4</td>
<td>Codabar On</td>
</tr>
<tr>
<td>C1</td>
<td>Codabar Off</td>
</tr>
<tr>
<td>C2</td>
<td>Code 39 On</td>
</tr>
<tr>
<td>C3</td>
<td>Code 39 Off</td>
</tr>
<tr>
<td>C4</td>
<td>Code 39 Disable Checksum</td>
</tr>
<tr>
<td>D1</td>
<td>Code 39 Enable Checksum</td>
</tr>
<tr>
<td>D2</td>
<td>Code 39 Enable Checksum and Strip from Result</td>
</tr>
<tr>
<td>D3</td>
<td>Code 39 Extended Full ASCII Off</td>
</tr>
<tr>
<td>D4</td>
<td>Code 39 Extended Full ASCII On</td>
</tr>
<tr>
<td>E1</td>
<td>Code 93 On</td>
</tr>
<tr>
<td>E2</td>
<td>Code 93 Off</td>
</tr>
<tr>
<td>E3</td>
<td>Code 128 On</td>
</tr>
<tr>
<td>E4</td>
<td>Code 128 Off</td>
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</tbody>
</table>
### Appendices

<table>
<thead>
<tr>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
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<tr>
<td><img src="M10046_01.png" alt="Composite Off" /></td>
<td><img src="M10047_01.png" alt="Composite On" /></td>
<td><img src="M10054_01.png" alt="All GS1 DataBar On" /></td>
<td><img src="M10055_01.png" alt="All GS1 DataBar Off" /></td>
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<thead>
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<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
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<tbody>
<tr>
<td><img src="M10056_01.png" alt="GS1 DataBar Limited On" /></td>
<td><img src="M10059_01.png" alt="GS1 DataBar Expanded On" /></td>
<td><img src="M10060_01.png" alt="Interleaved 2 of 5 On" /></td>
<td><img src="M10061_01.png" alt="Interleaved 2 of 5 Off" /></td>
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<thead>
<tr>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="M10062_01.png" alt="Interleaved 2 of 5 Two Digits Off" /></td>
<td><img src="M10063_01.png" alt="Interleaved 2 of 5 Two Digits On" /></td>
<td><img src="M10064_01.png" alt="Interleaved 2 of 5 Four Digits On" /></td>
<td><img src="M10065_01.png" alt="Interleaved 2 of 5 Checksum Stripped from Result" /></td>
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<thead>
<tr>
<th>D1</th>
<th>D2</th>
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<th>D4</th>
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<tr>
<td><img src="M10070_01.png" alt="PDF417 On" /></td>
<td><img src="M10071_01.png" alt="PDF417 Off" /></td>
<td><img src="M10072_01.png" alt="MicroPDF417 Off" /></td>
<td><img src="M10073_01.png" alt="MicroPDF417 On" /></td>
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<thead>
<tr>
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<th>E3</th>
<th>E4</th>
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</thead>
<tbody>
<tr>
<td><img src="M10096_01.png" alt="QR Code Off" /></td>
<td><img src="M10098_01.png" alt="QR Code On" /></td>
<td><img src="M10091_01.png" alt="Enable All QR Code" /></td>
<td><img src="M10105_01.png" alt="UPC On" /></td>
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</table>
### Configuration Symbols

<table>
<thead>
<tr>
<th>A1</th>
<th>A2</th>
<th>A3</th>
</tr>
</thead>
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<tr>
<td><img src="image1.png" alt="M10106_01" /></td>
<td><img src="image2.png" alt="Q9019_01" /></td>
<td><img src="image3.png" alt="Q9018_01" /></td>
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<tr>
<td>UPC Off</td>
<td>UPC-E as UPC-A Disabled (Default)</td>
<td>UPC-E as UPC-A Enabled</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
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</thead>
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<td><img src="image4.png" alt="M10124_01" /></td>
<td><img src="image5.png" alt="M10126_01" /></td>
<td><img src="image6.png" alt="M10127_01" /></td>
<td><img src="image7.png" alt="M10128_01" /></td>
</tr>
<tr>
<td>Mirroring Off</td>
<td>Mirroring On</td>
<td>Preamble Erase/None</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image8.png" alt="M10129_01" /></td>
<td><img src="image9.png" alt="M10130_01" /></td>
<td><img src="image10.png" alt="M10131_01" /></td>
<td><img src="image11.png" alt="M10132_01" /></td>
</tr>
<tr>
<td>Preamble Comma</td>
<td>Preamble Space</td>
<td>Preamble Tab</td>
<td>Postamble Erase/None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
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<td><img src="image14.png" alt="M10135_01" /></td>
<td><img src="image15.png" alt="M10136_01" /></td>
</tr>
<tr>
<td>Postamble Comma</td>
<td>Postamble Space</td>
<td>Postamble Tab</td>
<td>Postamble Enter</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>E1</th>
<th>E2</th>
<th>E3</th>
<th>E4</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image16.png" alt="M10137_01" /></td>
<td><img src="image17.png" alt="M10138_01" /></td>
<td><img src="image18.png" alt="M10139_01" /></td>
<td><img src="image19.png" alt="M10140_01" /></td>
</tr>
<tr>
<td>Clear Preamble and Postamble</td>
<td>Clear All Stored Data, Images, and JavaScripts</td>
<td>Beep On, Vibrate On</td>
<td>Beep Off, Vibrate On</td>
</tr>
<tr>
<td></td>
<td>A1</td>
<td>A2</td>
<td>A3</td>
</tr>
<tr>
<td>-----</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>Beep On, Vibrate Off</td>
<td>Beep Off, Vibrate Off</td>
<td>Ignore Duplicate Symbol Timeout</td>
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<td>M10142_01</td>
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<td>Ignore Duplicate Symbol Timeout Delay 2 Seconds</td>
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<td>M10146_01</td>
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<td>Ignore Duplicate Symbol Timeout Delay 30 Seconds</td>
<td>Ignore Duplicate Symbol Timeout Delay 1 Hour</td>
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<td>M10150_01</td>
<td>M10151_01</td>
<td>M10152_01</td>
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<td>Targeting Off</td>
<td>Default Reader Settings</td>
<td>Save Settings</td>
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<td>M10154_01</td>
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<td>M10163_01</td>
<td>M10172_01</td>
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## Configuration Symbols

<table>
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<tr>
<th>Symbol</th>
<th>Description</th>
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<tbody>
<tr>
<td>A1</td>
<td>Bluetooth Radio Out of Range Beep and Vibrate - Off</td>
</tr>
<tr>
<td>A2</td>
<td>Bluetooth Radio Disconnect</td>
</tr>
<tr>
<td>A3</td>
<td>Reboot Reader</td>
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<td>A4</td>
<td>USB Keyboard Mode</td>
</tr>
<tr>
<td>B1</td>
<td>Batch Mode Enabled - Send and Log</td>
</tr>
<tr>
<td>B2</td>
<td>Batch Mode Disabled</td>
</tr>
<tr>
<td>B3</td>
<td>Batch Mode Enabled - Log Only</td>
</tr>
<tr>
<td>B4</td>
<td>Batch Mode - Transfer All Data in Memory</td>
</tr>
<tr>
<td>C2</td>
<td>USB Virtual COM 1-Way Mode</td>
</tr>
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<td>C3</td>
<td>Beep Volume 0</td>
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<tr>
<td>C4</td>
<td>Beep Volume 33%</td>
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<tr>
<td>D1</td>
<td>Beep Volume 67%</td>
</tr>
<tr>
<td>D2</td>
<td>Beep Volume 100%</td>
</tr>
<tr>
<td>D3</td>
<td>Modem ID and Firmware Version</td>
</tr>
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<td>D4</td>
<td>Reader ID and Firmware Version</td>
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<td>Symbology Identifier On</td>
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<td>E2</td>
<td>Symbology Identifier Off</td>
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<td>Interleaved 2 of 5 Checksum Disabled</td>
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<tr>
<td>E4</td>
<td>Interleaved 2 of 5 Checksum Enabled</td>
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### Appendices

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<thead>
<tr>
<th>Code</th>
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<tr>
<td>A1</td>
<td>Bluetooth Keyboard Mode - Prepare to Connect to New Host</td>
</tr>
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<td>A2</td>
<td>Bluetooth Keyboard Mode - Prepare to Switch Hosts</td>
</tr>
<tr>
<td>A3</td>
<td>Toggle Onscreen Keyboard with Bottom Button (Button 1)</td>
</tr>
<tr>
<td>A4</td>
<td>Disable Bottom Button Keyboard Toggle</td>
</tr>
<tr>
<td>B1</td>
<td>Clear All Trusted Bluetooth Connections</td>
</tr>
<tr>
<td>B2</td>
<td>Bluetooth Pin Set Digit 1</td>
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<tr>
<td>B3</td>
<td>Bluetooth Pin Set Digit 2</td>
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<tr>
<td>B4</td>
<td>Bluetooth Pin Set Digit 3</td>
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<tr>
<td>C1</td>
<td>Bluetooth Pin Set Digit 4</td>
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<td>C2</td>
<td>Bluetooth Pin Set Digit 5</td>
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<tr>
<td>C3</td>
<td>Bluetooth Pin Set Digit 6</td>
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<td>Bluetooth Set Pin Complete</td>
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<tr>
<td>E1</td>
<td>Enable Cell Phone Reading Enhancement</td>
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<td>E2</td>
<td>Disable Cell Phone Reading Enhancement</td>
</tr>
<tr>
<td>E3</td>
<td>Keyboard Control Characters for Non-Printable ASCII</td>
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<tr>
<td>E4</td>
<td>Data Matrix Inverse On</td>
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### Configuration Symbols

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<th>Symbol</th>
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<tr>
<td>A2</td>
<td>QR Code Inverse and Standard On</td>
</tr>
<tr>
<td>A3</td>
<td>QR Code Inverse On</td>
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<td>A4</td>
<td>UPC Supplemental On</td>
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<td>B1</td>
<td>UPC Supplemental Off</td>
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<tr>
<td>B2</td>
<td>GS1 DataBar-14 On</td>
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<tr>
<td>B3</td>
<td>BC412 On (Default)</td>
</tr>
<tr>
<td>C1</td>
<td>BC412 Off</td>
</tr>
<tr>
<td>C2</td>
<td>Codabar Checksum Enabled</td>
</tr>
<tr>
<td>C3</td>
<td>Codabar Checksum Disabled (Default)</td>
</tr>
<tr>
<td>C4</td>
<td>Interleaved 2 of 5 Enabled and Stripped from Result</td>
</tr>
<tr>
<td>D1</td>
<td>EAN Status Enabled (Default)</td>
</tr>
<tr>
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<td>EAN Status Disabled</td>
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<td>D3</td>
<td>Pharmacode Enabled</td>
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<td>D4</td>
<td>Pharmacode Disabled (Default)</td>
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<tr>
<td>E1</td>
<td>Pharmacode Fixed Symbol Length Enabled</td>
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<tr>
<td>E2</td>
<td>Pharmacode Fixed Symbol Length Disabled (Default)</td>
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<tr>
<td>E3</td>
<td>Pharmacode Bar Width Status Mixed (Default)</td>
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<tr>
<td>E4</td>
<td>Pharmacode Bar Width Status All Narrow</td>
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## Appendices

<table>
<thead>
<tr>
<th>A1</th>
<th>A2</th>
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<th>A4</th>
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<td><img src="Q0027_01" alt="Pharmacode Bar Width Status Fixed Threshold" /></td>
<td><img src="Q0028_01" alt="Pharmacode Decode Direction Forward (Default)" /></td>
<td><img src="Q0029_01" alt="Pharmacode Decode Direction Reverse" /></td>
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<th>B3</th>
<th>B4</th>
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<tr>
<td><img src="Q0030_01" alt="Codabar Checksum Enabled and Stripped from Result" /></td>
<td><img src="Q0031_01" alt="Postal Enabled" /></td>
<td><img src="Q0034_01" alt="Postal Disabled (Default)" /></td>
<td><img src="Q0035_01" alt="Data Matrix Enabled (Default)" /></td>
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<tr>
<td><img src="Q0033_01" alt="Data Matrix Disabled" /></td>
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**Important:** If you disable the Data Matrix symbology, programming symbols will not be decodable by the reader and Data Matrix will need to be re-enabled using ESP. Use the **Data Matrix Disabled** programming symbol with caution.
### Configuration Symbols

#### Configuration Symbol Reference

**Batch Mode**
- Batch Mode Enabled - Send and Log ........................................... A-10 (B1)
- Batch Mode Disabled (Default) ......................................................... A-10 (B2)
- Batch Mode Enabled - Log Only ...................................................... A-10 (B3)
- Batch Mode - Transfer All Data in Memory .................................. A-10 (B4)

**Bluetooth**
- Bluetooth Radio Out of Range Beep Only - On ................................ A-9 (E2)
- Bluetooth Radio Out of Range Vibrate Only - On .............................. A-9 (E3)
- Bluetooth Radio Out of Range Beep and Vibrate - On ................. A-9 (E4)
- Bluetooth Radio Out of Range Beep and Vibrate - Off (Default) .... A-10 (A1)
- Bluetooth Radio Disconnect (Reconnect via Quick Connect Code) ... A-10 (A2)
- Bluetooth Keyboard Mode - Prepare to Connect to New Host .... A-11 (A1)
- Bluetooth Keyboard Mode - Prepare to Switch Hosts .................. A-11 (A2)
- Toggle Onscreen Keyboard with Bottom Button (Button 1) ...... A-11 (A3)
- Disable Bottom Button Keyboard Toggle ..................................... A-11 (A4)
- Clear All Trusted Bluetooth Connections ........................................ A-11 (B1)
- Bluetooth Pin Set Digit 1 ................................................................. A-11 (B2)
- Bluetooth Pin Set Digit 2 ................................................................. A-11 (B3)
- Bluetooth Pin Set Digit 3 ................................................................. A-11 (B4)
- Bluetooth Pin Set Digit 4 ................................................................. A-11 (C1)
- Bluetooth Pin Set Digit 5 ................................................................. A-11 (C2)
- Bluetooth Pin Set Digit 6 ................................................................. A-11 (C3)
- Bluetooth Pin Set Digit 7 ................................................................. A-11 (C4)
- Bluetooth Pin Set Digit 8 ................................................................. A-11 (D1)
- Bluetooth Pin Set Digit 9 ................................................................. A-11 (D2)
- Bluetooth Pin Set Digit 0 ................................................................. A-11 (D3)
- Bluetooth Set Pin Complete ......................................................... A-11 (D4)

**Cell Phone**
- Enable Cell Phone Reading Enhancement ...................................... A-11 (E1)
- Disable Cell Phone Reading Enhancement ...................................... A-11 (E2)

**Communications**
- USB Native (HID) ........................................................................... A-6 (A2)
- USB Virtual COM 1-Way Mode ...................................................... A-10 (C2)
- USB Keyboard Mode ...................................................................... A-10 (C2)
- High Speed USB 2.0 (Default) ....................................................... A-9 (D4)
- Full Speed USB 2.0 ......................................................................... A-9 (E1)
- Keyboard Control Characters for Non-Printable ASCII ............. A-11 (E3)

**Continuous Read**
- Continuous Read On ................................................................. A-6 (A4)
- Continuous Read Off (Default) .................................................. A-6 (A3)

**Feedback**
- Beep On Vibrate On (Default) ................................................... A-8 (E3)
- Beep Off Vibrate On ................................................................. A-8 (E4)
- Beep On Vibrate Off ................................................................. A-9 (A1)
ID and Firmware Version
- Modem ID and Firmware Version .................................................. A-10 (D3)
- Reader ID and Firmware Version ................................................... A-10 (D4)

Ignore Duplicate Symbol Timeout
- Ignore Duplicate Symbol Timeout .................................................. A-9 (A3)
- Ignore Duplicate Symbol Timeout Delay 1 Second ......................... A-9 (A4)
- Ignore Duplicate Symbol Timeout Delay 2 Seconds ....................... A-9 (B1)
- Ignore Duplicate Symbol Timeout Delay 3 Seconds ....................... A-9 (B2)
- Ignore Duplicate Symbol Timeout Delay 5 Seconds ....................... A-9 (B3)
- Ignore Duplicate Symbol Timeout Delay 10 Seconds.................... A-9 (B4)
- Ignore Duplicate Symbol Timeout Delay 30 Seconds ..................... A-9 (C1)
- Ignore Duplicate Symbol Timeout Delay 1 Hour ............................ A-9 (C2)
- Ignore Duplicate Symbol Timeout Delay 1 Day .............................. A-9 (C3)

Mirroring
- Mirroring Off (Default) ................................................................. A-8 (B2)
- Mirroring On ............................................................................. A-8 (B3)

Preamble/Postamble
- Preamble - Erase/None (Default) ................................................ A-8 (B4)
- Preamble - Comma ................................................................. A-8 (C1)
- Preamble - Space .................................................................. A-8 (C2)
- Preamble - Tab ....................................................................... A-8 (C3)
- Postamble - Erase/None (Default) ............................................. A-8 (C4)
- Postamble - Comma .............................................................. A-8 (D1)
- Postamble - Space ................................................................. A-8 (D2)
- Postamble - Tab ..................................................................... A-8 (D3)
- Postamble - Enter ................................................................. A-8 (D4)
- Clear Preamble and Postamble ............................................... A-8 (E1)

Reset, Reboot, Clear, Default, and Save
- Reset Reader to RF Factory Defaults ................................. A-6 (A1)
- Reboot Reader ................................................................. A-10 (A3)
- Clear All Stored Data, Images, and JavaScripts .................. A-8 (E2)
- Default Reader Settings ..................................................... A-9 (D2)
- Save Settings ..................................................................... A-9 (D3)

Symbolologies
- Aztec Code On (Default) ......................................................... A-6 (B1)
- Aztec Code Off .................................................................. A-6 (B2)
- BC412 On (Default) ............................................................ A-12 (B4)
- BC412 Off ......................................................................... A-12 (B4)
- Codabar On (Default) ......................................................... A-6 (B4)
- Codabar Off ...................................................................... A-6 (C1)
- Codabar Checksum Enabled ............................................... A-12 (C2)
Configuration Symbols

- Codabar Checksum Disabled (Default) ................................................................. A-12 (C3)
- Codabar Checksum Enabled and Stripped from Result ........................................ A-13 (B1)
- Code 39 On (Default) ....................................................................................... A-6 (B1)
- Code 39 Off ......................................................................................................... A-6 (C3)
- Code 39 Enable Checksum ............................................................................... A-6 (D1)
- Code 39 Disable Checksum (Default) ............................................................... A-6 (C4)
- Code 39 Enable Checksum and Strip from Result ........................................... A-6 (D2)
- Code 39 Extended Full ASCII Off (Default) .................................................... A-6 (D3)
- Code 39 Extended Full ASCII On ................................................................. A-6 (D4)
- Code 93 On (Default) ..................................................................................... A-6 (E1)
- Code 93 Off ..................................................................................................... A-6 (E2)
- Code 128 On (Default) ................................................................................ A-6 (E3)
- Code 128 Off .................................................................................................. A-6 (E4)
- Composite On ................................................................................................. A-7 (A2)
- Composite Off (Default) ................................................................................ A-7 (A1)
- Data Matrix Inverse On .................................................................................. A-11 (E4)
- Data Matrix Inverse Off (Default) ................................................................ A-12 (A1)
- All GS1 DataBar On (Default) ...................................................................... A-7 (A3)
- All GS1 DataBar Off ..................................................................................... A-7 (A4)
- GS1 DataBar Limited On ................................................................................ A-7 (B1)
- GS1 DataBar Expanded On ........................................................................... A-7 (B2)
- GS1 DataBar-14 On ....................................................................................... A-12 (B2)
- Interleaved 2 of 5 On (Default) .................................................................... A-7 (B3)
- Interleaved 2 of 5 Off .................................................................................... A-7 (B4)
- Interleaved 2 of 5 Two Digits Off ................................................................. A-7 (C1)
- Interleaved 2 of 5 Two Digits On ................................................................ A-7 (C2)
- Interleaved 2 of 5 Four Digits On ................................................................. A-7 (C3)
- Interleaved 2 of 5 Checksum Stripped from Result ....................................... A-7 (C4)
- Interleaved 2 of 5 Checksum Enabled .......................................................... A-10 (E4)
- Interleaved 2 of 5 Checksum Disabled ......................................................... A-10 (E3)
- Interleaved 2 of 5 Enabled and Stripped from Result .................................... A-12 (C4)
- PDF417 On (Default) .................................................................................. A-7 (D1)
- PDF417 Off .................................................................................................. A-7 (D2)
- Pharmacode Enabled .................................................................................... A-12 (D3)
- Pharmacode Disabled (Default) ................................................................. A-12 (D4)
- Pharmacode Fixed Symbol Length Enabled ............................................. A-12 (E1)
- Pharmacode Fixed Symbol Length Disabled (Default) ............................ A-12 (E2)
- Pharmacode Bar Width Status Mixed (Default) ........................................ A-12 (E3)
- Pharmacode Bar Width Status All Narrow ................................................ A-12 (E4)
- Pharmacode Bar Width Status All Wide .................................................... A-13 (A1)
- Pharmacode Bar Width Status Fixed Threshold ...................................... A-13 (A2)
- Pharmacode Decode Direction Forward (Default) .................................... A-13 (A3)
- Pharmacode Decode Direction Reverse ..................................................... A-13 (A4)
- Postal Enabled .............................................................................................. A-13 (B2)
- Postal Disabled (Default) ........................................................................... A-13 (B3)
- MicroPDF417 Off (Default) ................................................................. A-7 (D3)
- MicroPDF417 On ........................................................................................ A-7 (D4)
- QR Code On (Default) .............................................................................. A-7 (E2)
- QR Code Off ............................................................................................... A-7 (E1)
Appendices

Enable All QR Code............................................................................................................. A-7 (E3)
QR Code Inverse and Standard On......................................................................................... A-12 (A2)
QR Code Inverse On............................................................................................................. A-12 (A3)
UPC On (Default)............................................................................................................. A-7 (E4)
UPC Off.................................................................................................................................... A-8 (A1)
UPC-E as UPC-A Enabled..................................................................................................... A-8 (A3)
UPC-E as UPC-A Disabled (Default).................................................................................... A-8 (A2)
UPC Supplemental On........................................................................................................... A-12 (A4)
UPC Supplemental Off (Default)........................................................................................... A-12 (A1)
EAN Status Enabled (Default).............................................................................................. A-12 (D1)
EAN Status Disabled............................................................................................................ A-12 (D2)
Symbology Identifier On....................................................................................................... A-10 (E1)
Symbology Identifier Off (Default)...................................................................................... A-10 (E2)

Targeting
Targeting On (Default)........................................................................................................... A-9 (C4)
Targeting Off......................................................................................................................... A-9 (D1)
### Appendix D — Communications Protocol

#### Communications Protocol Command Table

<table>
<thead>
<tr>
<th>Protocol Command (Mnemonic displayed on menu)</th>
<th>Control Characters (Entered in menu or serial command)</th>
<th>Hex Value</th>
<th>Effect of Command</th>
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<td>RES</td>
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<td>04</td>
<td>Reset</td>
</tr>
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<td>REQ</td>
<td>^E</td>
<td>05</td>
<td>Request</td>
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<td>^D</td>
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<td>Reset</td>
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<td>STX</td>
<td>^B</td>
<td>02</td>
<td>Start of Text</td>
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<tr>
<td>ETX</td>
<td>^C</td>
<td>03</td>
<td>End of Text</td>
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<td>ACK</td>
<td>^F</td>
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<td>Acknowledge</td>
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<td>NAK</td>
<td>^U</td>
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<td>Negative Acknowledge</td>
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<td>XON</td>
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### Appendix E — ASCII Table

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<th>Ctrl</th>
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Appendix F — Maintenance

The HS-51 and HS-51X Wireless Handheld Readers require only a minimum of maintenance to operate.

Cleaning the HS-51 and HS-51X Wireless Handheld Readers

The following substances are approved for cleaning of the HS-51 and HS-51X.

<table>
<thead>
<tr>
<th>Product</th>
<th>Chemical Content</th>
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<tbody>
<tr>
<td>Alcohol Wipes</td>
<td>Isopropyl Alcohol</td>
</tr>
<tr>
<td>CaviWipes® Disinfecting Towelettes and CaviCide</td>
<td>Isopropyl Alcohol, Ethylene Glycol Monobutyl Ether</td>
</tr>
<tr>
<td>Clorox® Disinfecting Wipes</td>
<td>Isopropyl Alcohol, n-Alkyl Dimethyl-benzyl Ammonium Chloride, n-Alkyl Dimethyl Ethylbenzyl Ammonium Chloride, Alkyl Polyglucoside, Propylene Glycol Propyl Ether</td>
</tr>
<tr>
<td>Clorox® Bleach Solution (10% Clorox bleach, 90% tap water)</td>
<td>Sodium Hypochlorite, Sodium Chloride, Sodium Carbonate, Sodium Hydroxide, Sodium Polyacrylate</td>
</tr>
<tr>
<td>Formula 409® Glass and Surface Cleaner</td>
<td>n-Alkyl Dimethyl Benzyl Ammonium Chloride, n-Propanediol</td>
</tr>
<tr>
<td>Sani-Cloth® HB, Super Sani-Cloth® Germicidal, Sani-Cloth® Plus Germicidal Disposable Wipes</td>
<td>Quaternary Ammonium Compounds/Chlorides</td>
</tr>
<tr>
<td>Virex® II Disinfectant Cleaner</td>
<td>n-Alkyl Dimethyl Benzyl Ammonium Chloride, Didecyl Dimethyl Ammonium Chloride</td>
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<tr>
<td>Gentle dish soap and water</td>
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</tbody>
</table>
Appendix G — Glossary of Terms

AGC — See Automatic Gain Control.

Ambient Light — Light which is present in the environment of the front end of a reader and generated from outside sources. This light, unless used for actual illumination, will be treated as background noise by the reader.

Automatic Gain Control (AGC) — Adjustment to signal strength that seeks to maintain a constant level regardless of the distance between a reader and symbol.

Baud Rate — The number of discrete signal events per second; bits per second.

Check Character — A Modulus 43 or Modulus 10 character that is added to encoded symbol data for additional data integrity.

Connector — A plug or socket on a device or cable providing in/out connectivity for various circuits and pins.

Decode — A Good Read. The successful interpretation and output of the information encoded in a symbol.

Default — Restores ROM or flash settings and initialize serial commands.

Delimited — A delimited command or field is bracketed by predefined characters.

Decode Rate — The number of good reads per second achieved by a reader.

Depth-of-Field — The in-focus range of a reader. Measured from the distance behind an object to the distance in front of the object with all objects appearing in focus.

End of Read Cycle — The time or condition at which the reader stops expecting symbol information to decode.

Firmware — Software hard-coded in non-volatile memory (ROM), and closely tied to specific pieces of hardware.

Fixed Symbol Length — Increases data integrity by ensuring that only a symbol length will be accepted.

Focal Distance — In optics, the distance from the lens to the focal plane.

Focal Plane — Usually found at the image sensor, it is a plane perpendicular to the lens axis at the point of focus (−).

Focus — Any given point in an image at which light converges; the focal point.

Good Read — A decode. The successful scanning and decoding of the information encoded in a bar code symbol.

Host — A computer or other device that is used to execute commands and process data and discrete signals.

Image Sensor — A device that converts a visual image to an electrical signal; a CMOS, for example.

Initialize — Implement serial configuration commands into the reader’s active memory.

Input — A channel or communications line. Decoded data or a discrete signal that is received by a device.

LED (Light-Emitting Diode) — A device that emits light when conducting current.

Lens — A transparent piece of material with curved surfaces which either converge or diverge light rays.
Glossary of Terms

Object Plane — An imaginary plane in the field of view, focused by a reader’s optical system at the corresponding image plane on the sensor.

Output — A channel or communications line. Data or discrete signals that are transmitted or displayed by a device.

Parity — An error detection routine in which one data bit in each character is set to 1 or 0 so that the total number of 1 bits in the data field is even or odd.

Port — Logical circuit for data entry and exit. (One or more ports may be included within a single connector.)

Random Access Memory (RAM) — A data storage system used in computers, composed of integrated circuits that allow access to stored data in any sequence without movement of physical parts.

Read Cycle — A programmed period of time or condition during which a reader will accept symbol input.

Read-Only Memory (ROM) — A data storage medium used in computers and other electronics, primarily used to distribute firmware.

Substrate — The surface upon which a symbol is printed, stamped, or etched.

Symbol Transitions — The transition of bars and spaces on a symbol, used to detect the presence of a symbol on an object.

Symbology — A symbol type, such as Data Matrix or Code 39, with special rules to define the widths and positions of bars and spaces to represent specific numeric or alphanumeric information.