

**MICROSCAN®**

# ***HS-1 Handheld Scanner User's Manual***



P/N 83-10001 Rev A

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Microscan Systems, Inc.

Tel: 425.226.5700 / 800.762.1149  
Fax: 425.226.8250

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### **Microscan Systems, Inc.**

#### **Renton Headquarters**

Tel: 425.226.5700 / 800.762.1149  
Fax: 425.226.8250

#### **Nashua Office**

Tel: 603.598.8400  
Fax: 603.577.5947

#### **Microscan Europe**

Tel: 011 31 172 423360  
Fax: 011 31 172 423366

#### **Microscan Asia Pacific**

Tel: 65 6846 1214  
Fax: 65 6846 4641

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# About the HS-1 Handheld Scanner

The key features of the HS-1 Handheld Scanner are:

- Compact size
- CCD image sensor
- LED illumination
- No moving parts
- Low power draw
- ESP and K command support

## Highlighting

Serial commands, highlighted command fields, and default command settings are highlighted in **rust bold**. Cross-references and web links are highlighted in **blue bold**. References to **ESP**, its toolbar headings (**Communications**, **Read Cycle**, **Symbologies**, etc.), menu topics, and other points of emphasis, are highlighted in **Bold Initial Caps**.

## Host Communications

There are three ways to configure and test the HS-1:

- Microscan's Windows-based **ESP** (Easy Setup Program) Software, which offers point-and-click ease of use and visual responses to user adjustments;
- Serial commands, such as **<K200,0>**, that can be sent from **ESP's Terminal** or another terminal program;
- Bar Code Configuration Mode, using symbols that can be created in **ESP**, and which are available throughout this manual.

## How To Use This Manual

This manual provides complete information on setting up, integrating, and configuring the HS-1. The sections are presented in the order in which the HS-1 might be set up and made ready for operation.

If you choose to configure the HS-1 using the configuration symbols provided, be sure to follow this process every time:

1. Read the **Bar Code Configuration Mode** symbol;
2. Read the configuration symbol for the parameter you wish to set;
3. Read the **Save Settings** symbol.

## Statement of Agency Compliance



The HS-1 has been tested for compliance with FCC (Federal Communications Commission) regulations and has been found to conform to all applicable FCC Rules and Regulations.

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.

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



The HS-1 has been tested for compliance with CE (Conformité Européenne) standards and guidelines, and has been found to conform to applicable CE standards, specifically the EMC requirements EN 55024:1998+A1:2001+A2:2003, 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 55022:1998+A1:2000+A2:2003 for Class A products, Class B Radiated Emissions, and Class B Conducted Emissions.

The HS-1 has been tested by an independent electromagnetic compatibility laboratory in accordance with the applicable specifications and instructions.

## **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 the 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 Perfluorooctanoic Acid (PFOA) compounds above the maximum trace levels. To view the documents stating these requirements, please visit:

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0095:EN:HTML>

and

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:372:0032:0034:EN:PDF>

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.

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# 1 Quick Start

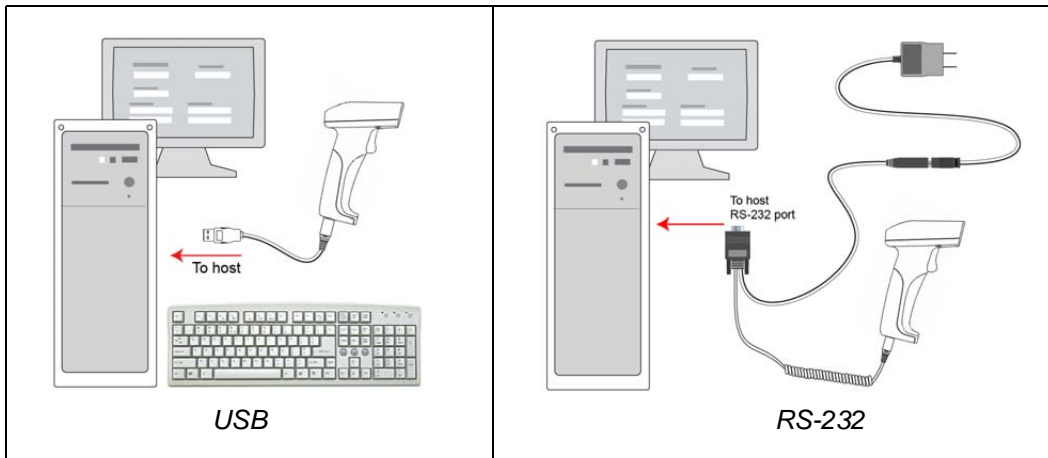
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This section is designed to get your HS-1 up and running quickly. Following these steps will allow you to get a sense of the HS-1's capabilities and to test symbol decode performance. Detailed setup information for installing the HS-1 into your application can be found in the subsequent sections.

# Check Hardware

Item	Description	Part Number
1	HS-1 Handheld Scanner	98-000106-01
2	RS-232 Kit	98-000111-01
3	USB Virtual Comm Cable	98-000112-01
4	Mounting Stand (optional; not shown)	98-000108-01

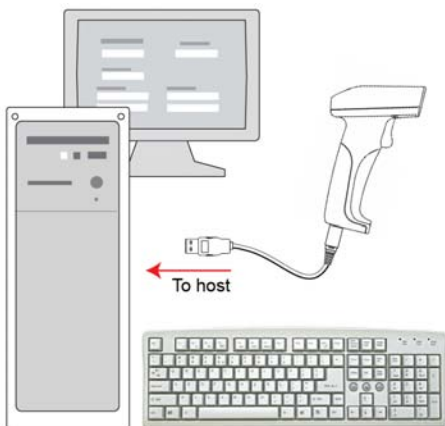


*Hardware Required*

**Caution:** Be sure that all cables are connected **BEFORE** applying power to the system. Always power down **BEFORE** disconnecting any cables.

# Connect the System

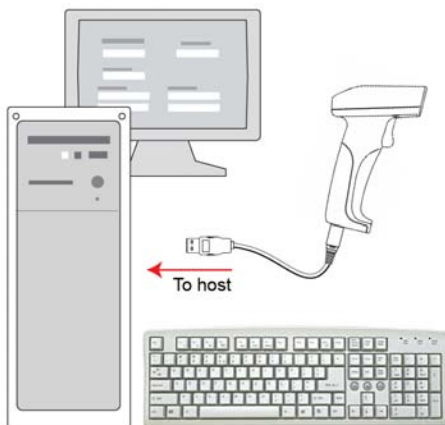
## USB



- Attach the RJ45 end of the scanner cable to the bottom of the handle.
- Attach the USB end of the cable to a USB port on the host computer.
- Read the symbols below in the order provided to set the scanner to **USB Native (HID) Communications Mode**.



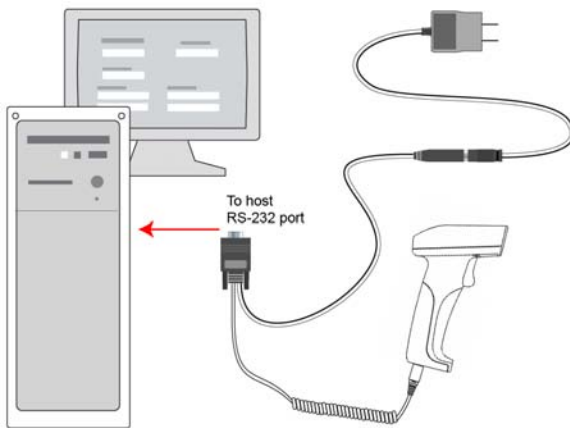
## USB Virtual Comm



- Attach the RJ45 end of the scanner cable to the bottom of the handle.
- Attach the USB end of the cable to a USB port on the host computer. The host computer will detect the device and prompt you to install drivers.
- Download drivers from the Microscan **Download Center** at [www.microscan.com](http://www.microscan.com) and follow the installation instructions included with the drivers.
- Read the symbols below in the order provided to set the scanner to **USB Virtual Comm Mode**.



## RS-232



- Attach the RJ45 end of the scanner cable to the bottom of the handle.
- Attach the 15-pin Dsub end of the scanner cable to the host computer and then plug in the power supply.
- Read the symbols below in the order provided to set the scanner to **RS-232 Communications Mode**.



**Caution:** Be sure that all cables are connected **BEFORE** applying power to the system. Always power down **BEFORE** disconnecting any cables.

## **Install ESP**

**ESP Software** can be found on the Microscan Tools CD that is packaged with the HS-1.

- Follow the prompts to install ESP from the CD.
- Click on the ESP icon to run the program.



**Note:** ESP can also be installed from the **Download Center** at [www.microscan.com](http://www.microscan.com).

### ***Minimum System Requirements***

- 166 MHz Pentium processor (Pentium II processor recommended)
- Windows Vista, XP, or 2000 operating system
- Internet Explorer 5.0 or higher
- 64 MB minimum RAM (128+ MB RAM recommended)
- 80 MB hard drive space
- 800 x 600 minimum 256 color display (1024 x 768 32-bit color recommended)

## Select Model

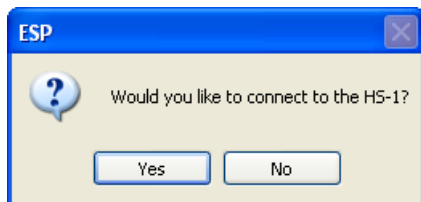
When you start **ESP**, the following menu will appear:



If you need to select another model later, click **Switch Model** at the top of the screen.



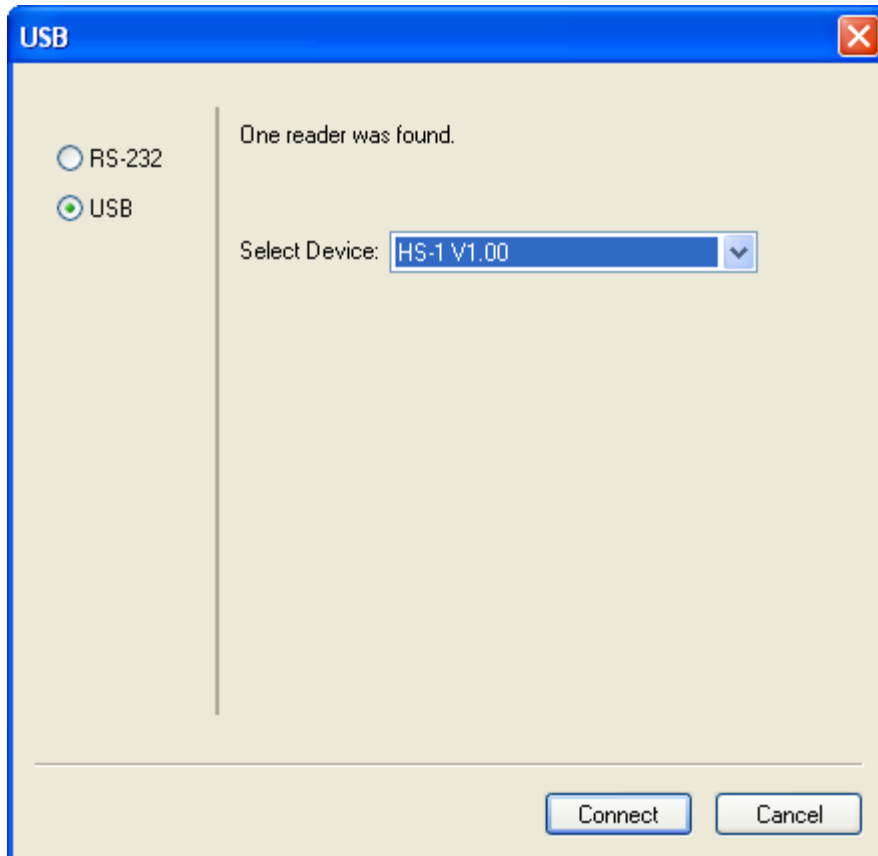
- Click the HS-1 button and then click **OK**. If you do not want to make this selection every time you start **ESP**, uncheck “Show this dialog at startup”.
- Select the default scanner name (**HS-1-1**), or type a name of your choice in the **Description** text field and click **OK**.
- Click **Yes** when this dialog appears:



# Select Protocol and Connect to Scanner

## USB

- **ESP** will detect the scanner. The **Select Device** dialog will show the name of the scanner and the firmware version:



- Click **Connect**.
- 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.

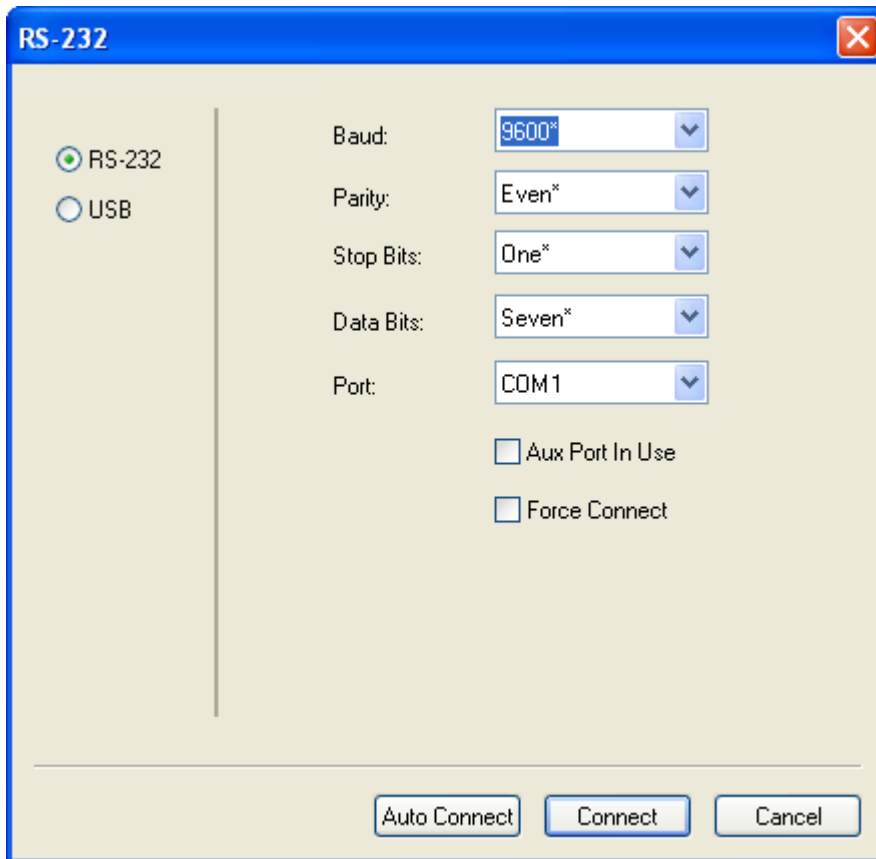


You are now ready to configure your scanner using **ESP**. Subsequent sections provide more detailed information about **ESP**'s configuration options.



## RS-232 or USB Virtual Comm

- In the **Select Protocol** dialog box, select **RS-232**.



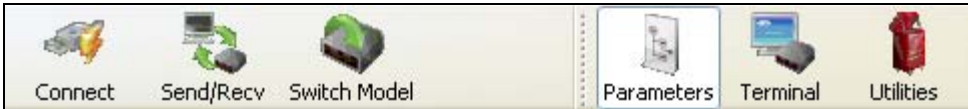
- Check Baud Rate, Parity, Stop Bits, Data Bits, and Port, and click **Connect**.
- When you are connected successfully, the **CONNECTED** message will appear in a green box in the status bar at the bottom right of the screen.

**CONNECTED** Point-to-Point COM1

If the connection attempt fails, enable a different communications port, check your port connections, and try again.

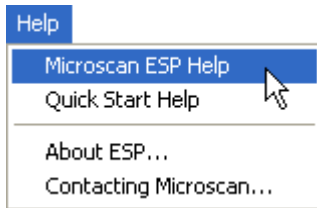
You are now ready to configure your scanner using **ESP**. Subsequent sections provide more detailed information about **ESP**'s configuration options.

# Configure the HS-1



- Click the **Connect** button to establish communications between **ESP** and the HS-1.
- 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, and Symbologies.
- Click the **Terminal** button to display decoded symbol data, and to send serial commands to the HS-1 using text or macros.
- Click the **Utilities** button to determine the Differences from Default in the current settings and to identify the HS-1's firmware.

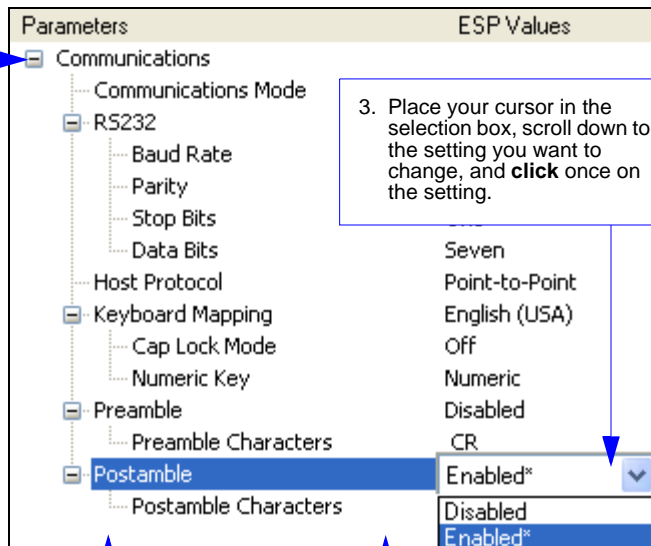
For further details, see **Microscan ESP Help** in the dropdown Help menu.



# Save Configuration 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 HS-1.

## Saving Options

- **Send, No Save.** Changes will be lost when power is re-applied to the HS-1.
- **Send and Save.** This activates all changes in current memory *and* saves to the HS-1 for power-on.

---

*Save Configuration in ESP*

# 2 Using ESP

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This section is designed to help you understand the basic structure and elements of **ESP** (Easy Setup Program).

When you open **ESP**, unless otherwise specified in the **ESP Preferences** dialog accessible from the **Options** heading on the menu toolbar, you will enter **Application Mode (App Mode)** where you can access three configuration menus (**Communications**, **Read Cycle**, and **Symbologies**), a **Terminal** interface, and a **Utilities** interface.

**ESP** can be used to configure the HS-1 in three main ways:

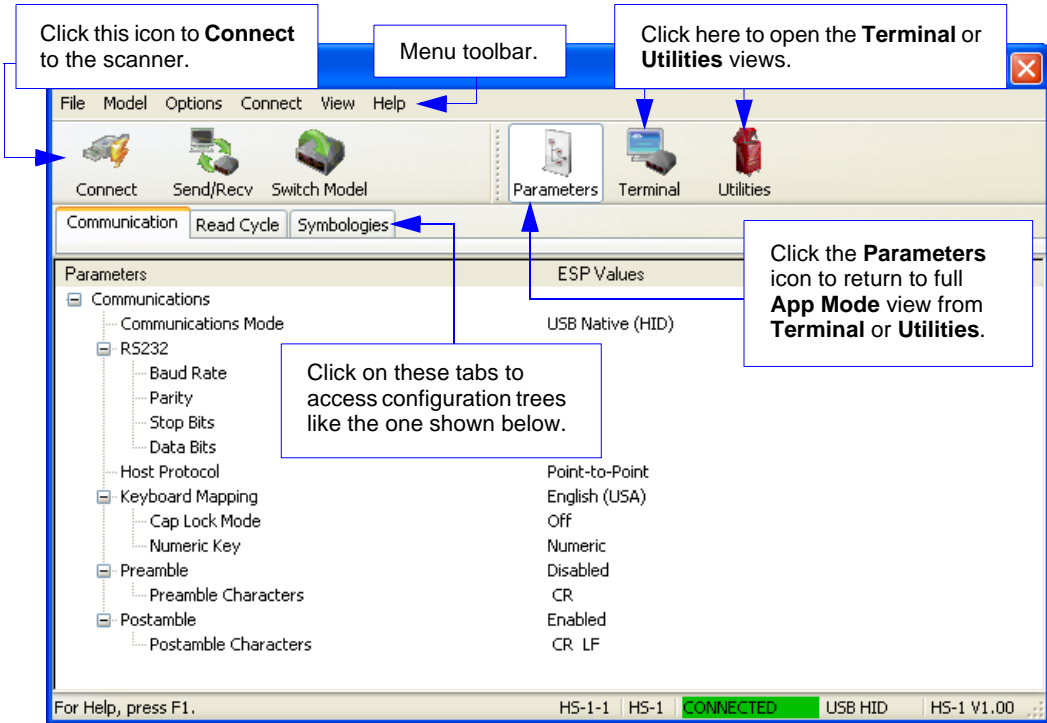
- **Tree Controls:** Each configuration menu contains a list of all option settings that pertain to that specific element of HS-1 operation. For example, the **Communications** menu shows a **Host Port Connections** option, and then a list of the sub-options **Baud Rate**, **Parity**, **Stop Bits**, and **Data Bits**. Each of these sub-options is configurable by using dropdown menus.
- **Graphic User Interfaces:** HS-1 settings can be configured using such point-and-click tools as radio buttons, zoom in/zoom out sliders, spin boxes, check boxes, and drag-and-drop functions.
- **Terminal:** **ESP's Terminal** allows you to send serial configuration and utility commands directly to the HS-1 by typing them in the provided text field.

Information about using **ESP** in specific applications is provided in subsequent sections.

For **ESP** system requirements, see [Minimum System Requirements](#).

# Application Mode

**App Mode** allows you to access configuration menus, **Utilities** tools, and a **Terminal** where serial commands can be entered.



## Menu Toolbar

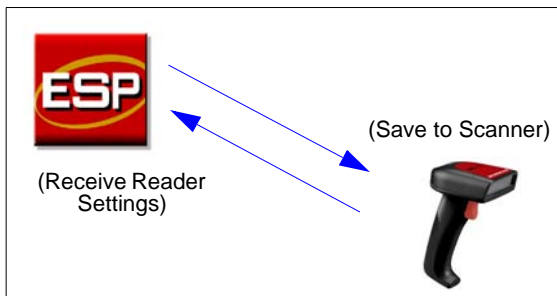
### **File > New**

Whenever **New** is selected, 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**.

**Important:** When you save menu changes to your hard drive, these changes are not saved to the HS-1. The illustration below shows how settings can be saved and received between **ESP** and the HS-1, and **ESP** and the host hard drive.



### **Import/Export**

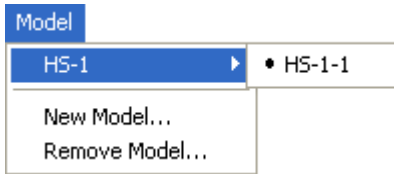
**Import** converts the ASCII settings from a text file to **ESP** configuration settings.

**Export** converts the active **ESP** configuration settings to an ASCII text file.

File	
New	Ctrl+N
Open...	Ctrl+O
Save	Ctrl+S
Save As...	
Print...	Ctrl+P
Import...	
Export...	
Recent File	
Exit	

## Model

In the **Model** menu you can select any of the models supported by **ESP**. When you choose a different model, the connection to your present model will be terminated.



To connect to another model, select **New Model**, choose a new model from the **pop-up menu** that appears, and click **OK**.

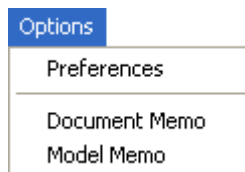
**Note:** When you save an **ESP** file, you are saving the settings of all the models defined in that file.



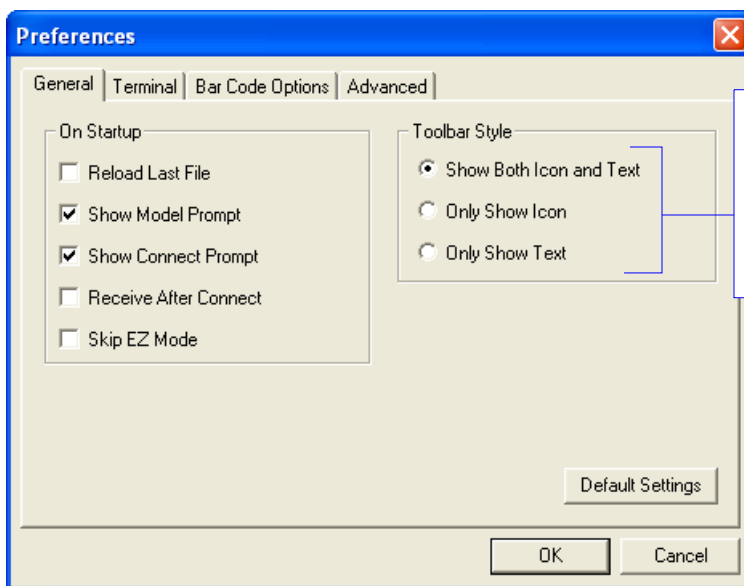
## Options

The **Options** menu allows you to save memos and set up **ESP Preferences**.

**Note:** Preferences will be saved and loaded into **ESP** whenever **ESP** is opened next, whether or not you save the **ESP** file.



### Preferences > General Tab



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 host computer's hard drive.

#### **Show Model Prompt**

At startup, shows the model menu displaying all supported readers.

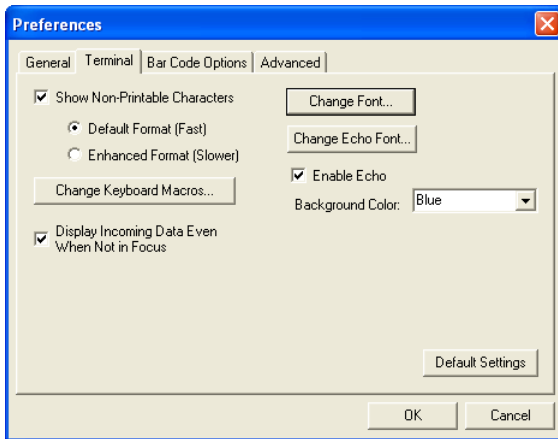
#### **Show Connect Prompt**

At startup, displays the **Would you like to connect to the HS-1?** prompt.

#### **Receive After Connect**

At startup, loads the HS-1's settings into **ESP**. (This is not recommended if you want to preserve your **ESP** settings for future use.)

## Preferences > Terminal Tab

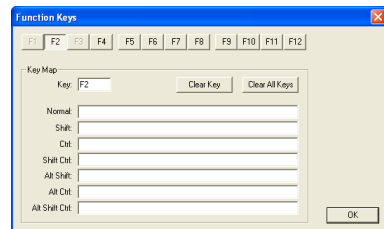


### Show Non-Printable Characters

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 Macro

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 HS-1 on the Terminal screen.

### Change Echo Font

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

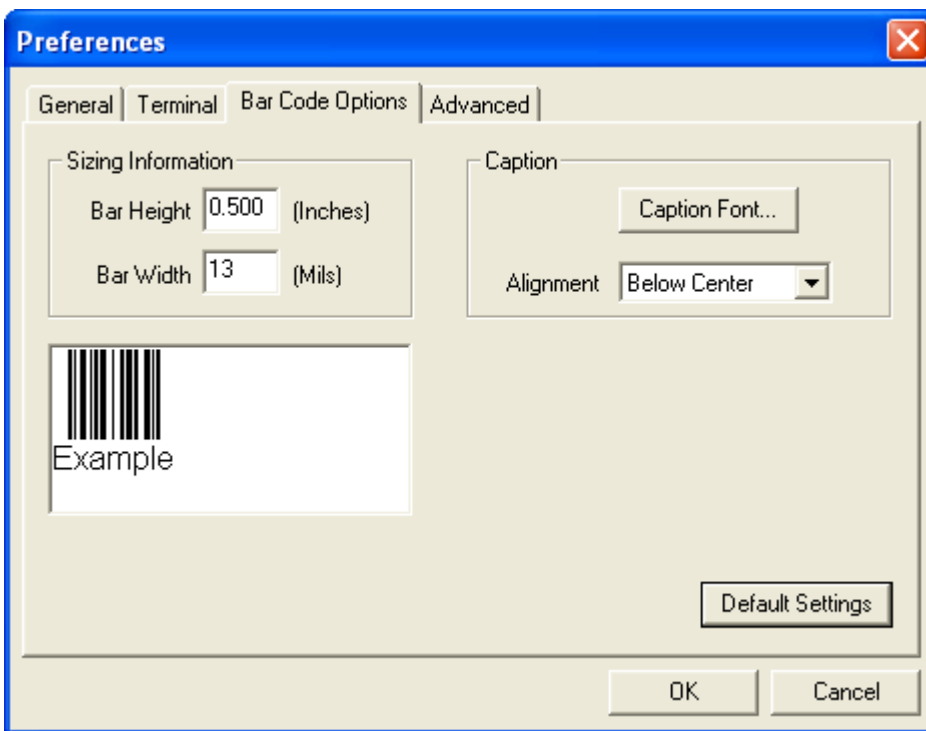
### Enable Echo

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 HS-1 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***

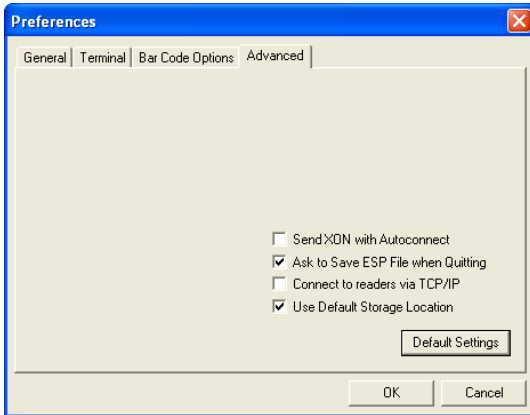
Sets the bar width or module width (in **mils**, or thousandths of an inch) of user-created symbols.

*Example:* A bar width of 14 is 0.014 inches.

### ***Caption***

Allows you to define and position a human-readable caption for the symbol you create.

## Preferences > Advanced Tab

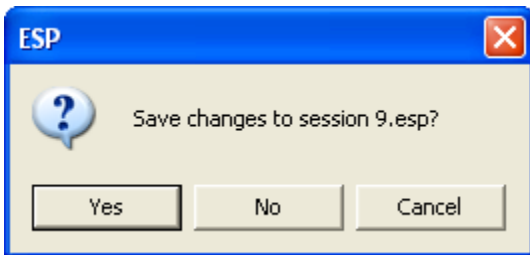


### Send XON with Autoconnect

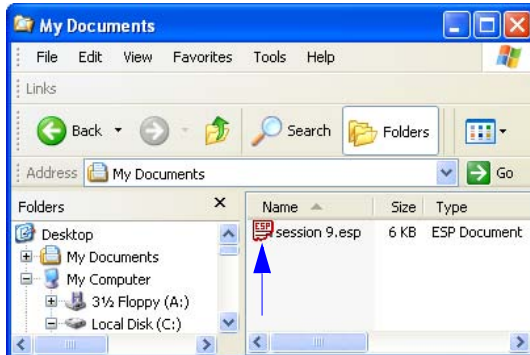
Sends an **XON (Begin Transmission)** command to the HS-1 before starting the **Autoconnect** routine.

### 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.

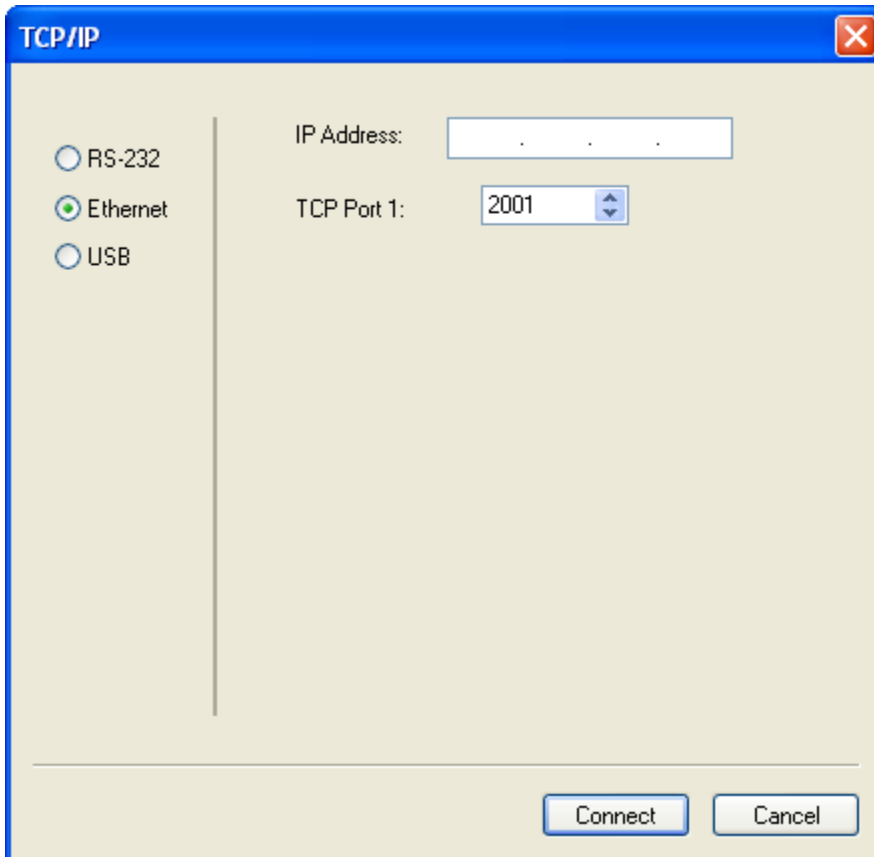


## Preferences > Advanced Tab (cont.)

### Connect to Reader via TCP/IP

When enabled, shows an **Ethernet** option on the **Select Protocol** dialog.

**Note:** This option should only be selected if you intend to connect using an Ethernet adapter.

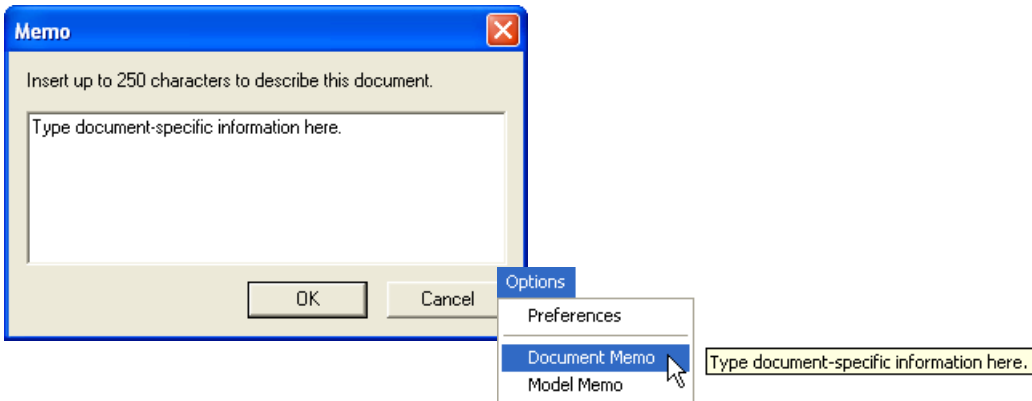


### Use Default Storage Location

When enabled, automatically stores data in **ESP's** Application Data folder.

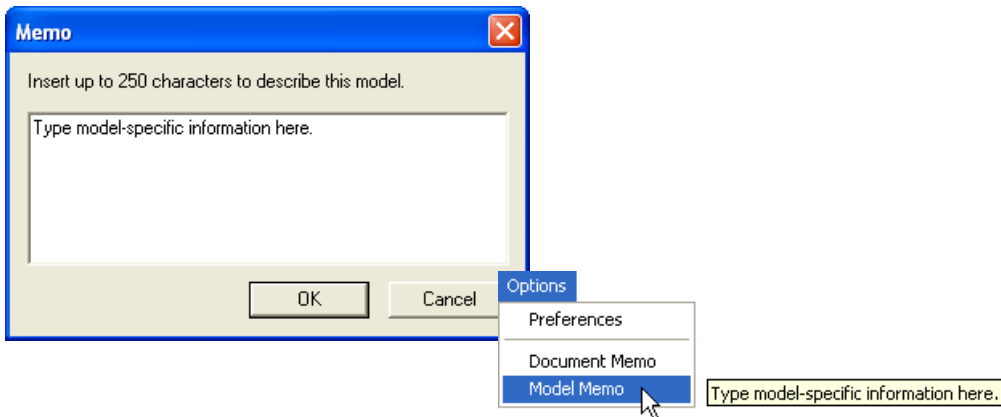
## Document Memo

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

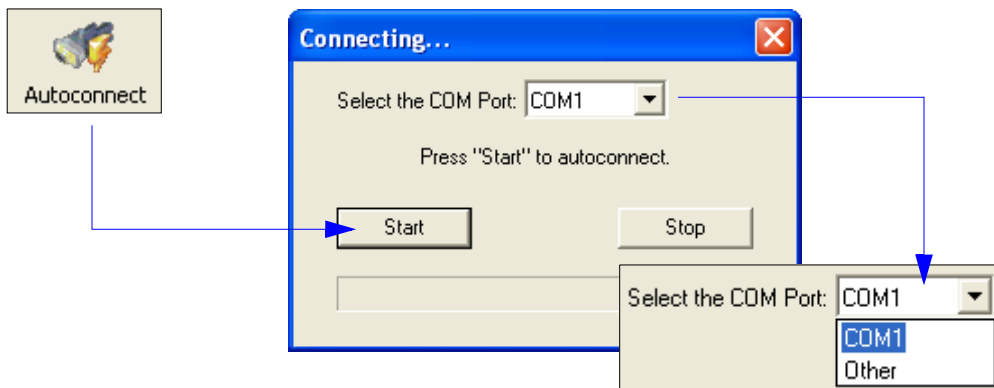
Similar to **Document Memo**, the information you type in the **Model Memo** field will appear in a context-sensitive text box whenever your cursor hovers over the **Model Memo** item on the **Options** menu. Memos created in **Model Memo** are specific to the model enabled when the message was created.



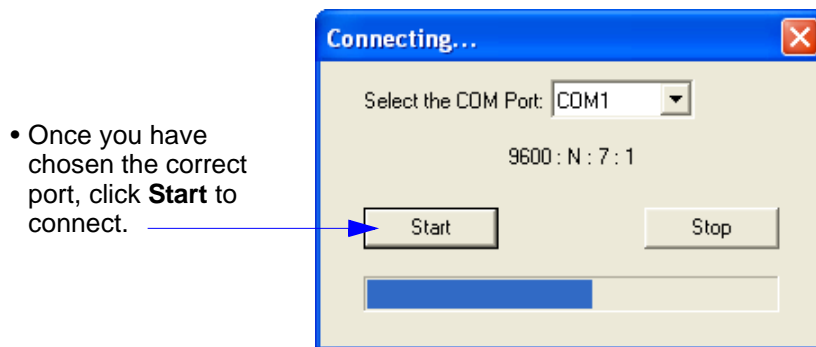
**Note:** Memos must be saved in a **.esp** file if you want them to be available in your next session. If you do not save your current session, any memos that you have entered during the session will be discarded, and will be unavailable in your next session.

## Autoconnect

- If your RS-232 connection attempt fails, you can use **Autoconnect** to establish a connection between the HS-1 and the host.



- If your communications port is not the default **COM1**, use the dropdown menu to change your port.



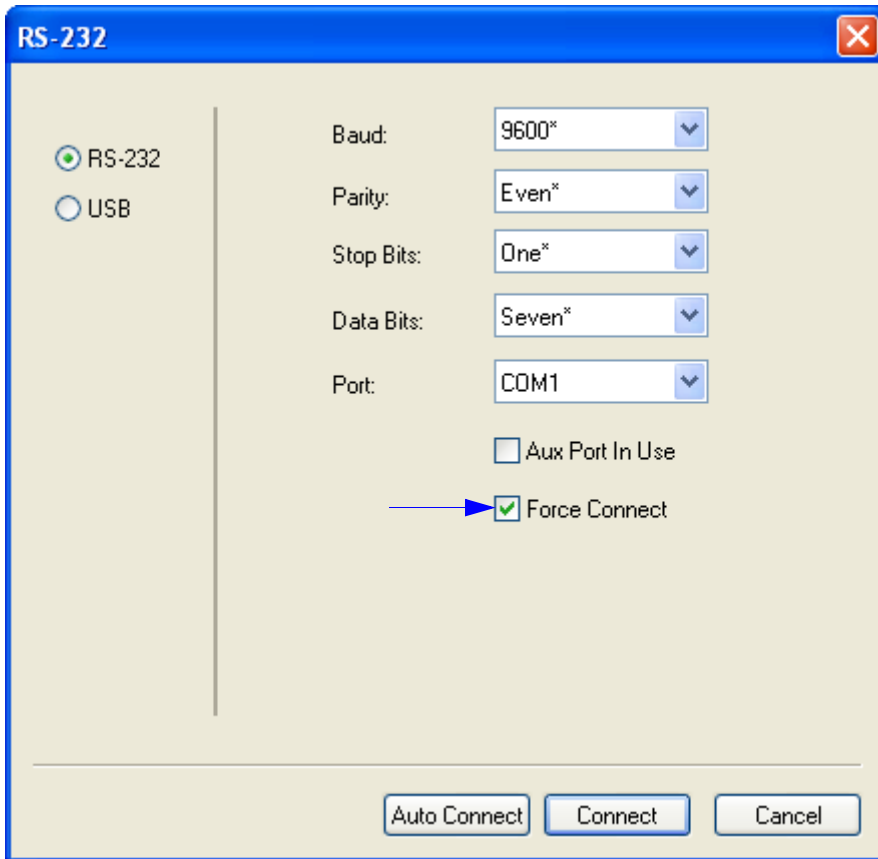
When you are connected, you will see the green connection indicator in the status bar at the bottom right of your screen:



## Autoconnect (cont.)

If your RS-232 host settings cannot be changed to match the HS-1's settings:

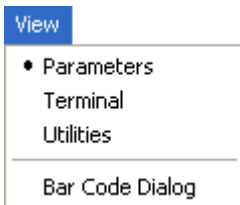
- Click **Connect** on **ESP**'s menu toolbar, and then select **Connect** on the dropdown menu.
- When the **Connection Settings** dialog appears, check the **Force Connect** box and click **Connect**.





## View

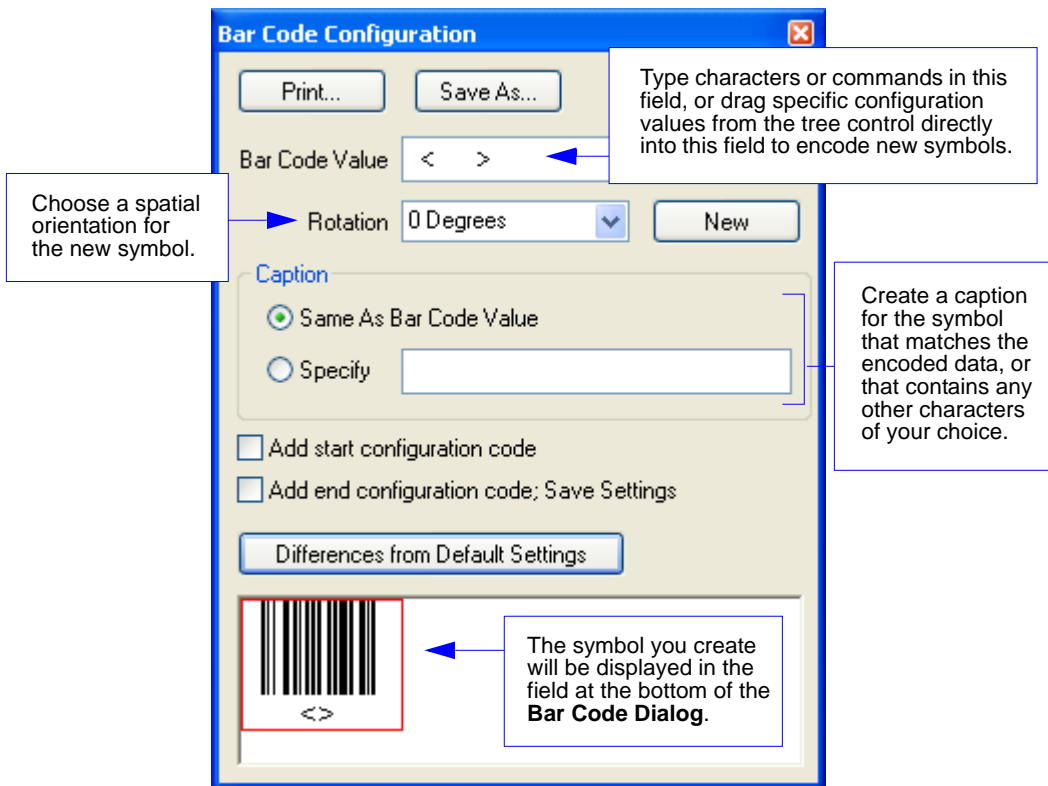
The **View** menu allows you to move quickly between interfaces without using the icon buttons on the **App Mode** toolbar.



Notice that each menu item corresponds with the icon buttons at the top of the ESP window.

## Bar Code Dialog

In the **Bar Code Dialog** you can create symbols by typing the characters you wish to encode. This is a useful tool for creating configuration symbols, allowing you to configure the scanner by decoding the symbols you create.



# Navigating in ESP

To make changes to configuration settings in the tree controls:

1. **Left-click** on the **+** to expand menu items.
2. **Double-click** the desired parameter and **single-click** 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 **single-click** the setting.

Parameters	ESP Values
[-] Communications	
[-] Communications Mode	USB Native (HID)
[-] RS232	
Baud Rate	9600
Parity	Even
Stop Bits	One
Data Bits	Seven
Host Protocol	Point-to-Point
[-] Keyboard Mapping	English (USA)
Cap Lock Mode	Off
Numeric Key	Numeric
[-] Preamble	Disabled
Preamble Characters	CR
[-] Postamble	Enabled*
Postamble Characters	Disabled
	Enabled*

The **X** indicates that the setting is **default**.

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 HS-1. You can send the command without saving it, or you can send and save the command simultaneously.

Receive Reader Settings	
<b>Save to Reader</b>	Send, No Save Send and Save
Default Current Menu Settings	
Default all ESP Settings	
Advanced Options	

## Send/Receive Options

To access **Receive**, **Save**, and **Default** options, click the **Send/Recv** button. You can also access these options by right-clicking in any of the configuration views.



### Receiving

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

**Caution:** Do not select this option if you do not want to upload the HS-1's settings. For example, if your **ESP** file has a number of custom settings that you want to maintain and download into the HS-1, these settings would be lost by choosing **Yes**.

This is useful if you want to receive (upload) the HS-1's settings and save them as a file for future use. For example, if your HS-1 has settings that you do not want to change, choosing **Yes** would allow you to load those settings to **ESP** and save them in an **ESP** file for later retrieval.

Receiving the HS-1's settings will also assure that you will not be subsequently saving any unwanted changes that you or someone else has made previously in **ESP**.

### Saving



#### Send, No Save (<A>)

Saves **ESP** settings to current memory.

#### Send and Save (<Z>)

Activates all changes in current memory *and* saves to the HS-1 for power-on.

## Defaulting

When you select **Default Current Menu Settings** or **Default all ESP Settings**, you are only defaulting the **ESP** settings.

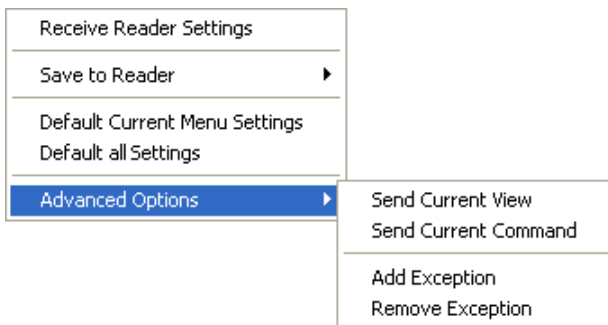
## Advanced Options

### 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

Saves only the command that is currently selected in the tree control.



# 3 *Communications*

## **Contents**

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This section explains how to set up communications between the HS-1 and a host.

With Microscan's **ESP** (Easy Setup Program), configuration changes can be made in the **ESP** tree controls and then sent and saved to the HS-1. The user can also send serial commands to the HS-1 via **ESP's Terminal**.

# Communications by ESP

Parameters	ESP Values
[-] Communications	
... Communications Mode	USB Native (HID)
[-] RS232	
... Baud Rate	9600
... Parity	Even
... Stop Bits	One
... Data Bits	Seven
... Host Protocol	Point-to-Point
[-] Keyboard Mapping	English (USA)
... Cap Lock Mode	Off
... Numeric Key	Numeric
[-] Preamble	Disabled
... Preamble Characters	CR
[-] Postamble	Enabled*
... Postamble Characters	Disabled
	Enabled*

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 Serial Commands

Host Port Connections	< <b>K100</b> , <i>baud rate,parity,stop bits,data bits</i> >
Keyboard Mapping	< <b>K116</b> , <i>keyboard mapping,caps lock mode,numeric key</i> >
Communications Mode	< <b>K117</b> , <i>communications mode</i> >
Host Port Protocol	< <b>K140</b> , <i>protocol</i> >
Preamble	< <b>K141</b> , <i>status,preamble character(s)</i> >
Postamble	< <b>K142</b> , <i>status,postamble character(s)</i> >

# Communications Mode

*Usage:* Allows the user to determine the unit's communications mode.

*Serial Cmd:* **<K117,communications mode>**

*Default:* **USB HID**

*Options:* 0 = RS-232

**1 = USB HID**

2 = USB Virtual Comm

**Note:** Each communications mode requires different cabling, which is included with the product.

- The RS-232 interface requires an RS-232 cable (part of the RS-232 Kit, 98-000111-01).
- The USB HID interface requires a USB cable.
- The USB Virtual Comm interface requires an RS-232 cable or USB Virtual Comm cable (98-000112-01).



**Bar Code  
Configuration  
Mode**

**< \_CFG >**



**<K117,0>**

**RS-232**



**<K117,1>**

**USB HID (Default)**



**<K117,2>**

**USB Virtual Comm**



**<Z>**

**Save Settings**



## Host Port Connections

The following settings define the basic transmission speeds and digital standards that ensure common formatting.

### ***Baud Rate, Host Port***

**Usage:** Can be used to transfer data faster or to match host port settings.

**Definition:** The rate at which the HS-1 and host transfer data back and forth.

**Serial Cmd:** **<K100,baud rate,parity,stop bits,data bits>**

**Default:** **9600**

**Options:**

- 0 = 600
- 1 = 1200
- 2 = 2400
- 3 = 4800
- 4 = 9600**
- 5 = 19.2K
- 6 = 38.4K



**Bar Code  
Configuration  
Mode**

**< \_ CFG >**



**<K100,0>  
600**



**<K100,1>  
1200**



**<K100,2>  
2400**



**<K100,3>  
4800**



**<K100,4>  
9600 (Default)**



**<K100,5>  
19.2K**



**<K100,6>  
38.4K**



**<Z>  
Save Settings**





## Data Bits, Host Port

Usage: Only changed if necessary to match host setting.

Definition: One or two bits added to the end of each character to indicate the end of the character.

Serial Cmd: <K100,baud rate,parity,stop bits,**data bits**>

Default: **Seven**

Options: **0 = Seven**                      1 = Eight



**Bar Code  
Configuration  
Mode**

<\_CFG>



<K100,,,0>

**Seven (Default)**



<K100,,,1>

**Eight**



<Z>

**Save Settings**

# Host Port Protocol

**Usage:** In general, the point-to-point protocols will work well in most applications. They require no address and must use RS-232 or RS-422 communications standards.

**Definition:** Protocols define the sequence and format in which information is transferred between the HS-1 and the host.

**Serial Cmd:** **<K140,protocol>**

**Default:** **Point-to-Point**

**Options:** **0 = Point-to-Point**

1 = Point-to-Point with RTS/CTS

**Note:** The preamble **<K141>** and postamble **<K142>** character strings can be used to frame the decoded data in both protocol modes.

## Point-to-Point (Standard)

**Usage:** Used only with RS-232 or RS-422.

**Definition:** Standard **Point-to-Point** requires no address and sends the data to the host whenever it is available, without a request or handshake from the host.

**Serial Cmd:** **<K140,0>**



<\_CFG>

**Bar Code Configuration Mode**



<K140,0>

**Point-to-Point (Default)**



<Z>

**Save Settings**

## Point-to-Point with RTS/CTS

**Usage:** An HS-1 initiates a data transfer with an RTS (request-to-send) transmission. The host, when ready, responds with a CTS (clear-to-send) and the data is transmitted. RTS and CTS signals are transmitted over two dedicated wires as defined in the RS-232 standard. Used only with RS-232.

**Definition:** **Point-to-Point with RTS/CTS** (request-to-send/clear-to-send) is a simple hardware handshake protocol that allows an HS-1 to initiate data transfers to the host.

**Serial Cmd:** **<K140,1>**



<\_CFG>

**Bar Code Configuration Mode**



<K140,1>

**Point-to-Point with  
RTS/CTS**



<Z>

**Save Settings**

# Keyboard Mapping

**Usage:** Allows the user to determine the language layout of the keyboard.

**Serial Cmd:** <K116,keyboard mapping,caps lock mode,numeric key>

**Default:** **English (U.S.)**

**Options:** **0 = English (U.S.)**

- 1 = English (UK)
- 2 = German
- 3 = French
- 4 = Japanese
- 5 = Spanish
- 6 = Italian
- 7 = Universal
- 8 = Swiss
- 9 = Czech



<\_CFG>

**Bar Code Configuration Mode**



<K116,0>

**U.S. English (Default)**



<K116,1>

**UK English**



<K116,2>

**German**



<K116,3>

**French**



<K116,4>

**Japanese**



<K116,5>

**Spanish**



<K116,6>

**Italian**



<K116,7>

**Universal**



<K116,8>

**Swiss**



<K116,9>

**Czech**



<Z>

**Save Settings**

## Caps Lock Mode

**Usage:** Allows the user to turn Caps Lock on or off.

**Serial Cmd:** <K116,keyboard mapping,caps lock mode,numeric key>

**Default:** **Off**

**Options:** **0 = Off**  
 1 = On  
 2 = Free



**Bar Code  
 Configuration  
 Mode**

< \_CFG >



<K116,,0>  
**Off (Default)**



<K116,,1>  
**On**



<K116,,2>  
**Free**



<Z>  
**Save Settings**

## Numeric Key

Usage: Allows the user to select numeric or alphanumeric characters.

Serial Cmd: <K116,keyboard mapping,caps lock mode,**numeric key**>

Default: **Alphanumeric Key**

Options: 0 = Numeric Key

**1 = Alphanumeric Key**



**Bar Code  
Configuration  
Mode**

<\_CFG>



<K116,..0>

**Numeric**



<K116,..1>

**Alphanumeric (Default)**



<Z>

**Save Settings**



# Preamble

## Preamble Status

**Usage:** Useful for identifying and controlling incoming data. For example, defining the preamble as a carriage return and a line feed causes each decoded message to be displayed on its own line.

**Definition:** Defines a one to four character data string that can be added to the beginning of the decoded data.

**Serial Cmd:** `<K141,status,preamble character(s)>`

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled (within any protocol)



`<_CFG>`

**Bar Code Configuration Mode**



`<K141,0>`

**Disabled (Default)**



`<K141,1>`

**Enabled**



**Save  
Settings**



## Preamble Characters

**Serial Cmd:** `<K141,status,preamble character(s)>`

**Default:** **^M (carriage return)**

**Options:** To enter control characters within a serial command, hold down the **Ctrl** key while typing the desired character.

*Example:* `<K141,1,CTRL-m>` to enter the control character **^M**.



`<_CFG>`

**Bar Code Configuration Mode**



`<K141h,,0D>`

**Carriage Return (Default)**



**Save  
Settings**





# 4 Read Cycle

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No Read Message ..... 4-6  
Beeper Volume ..... 4-7

After you've established communications you will need to address the timing and output parameters associated with your application. This section explains those parameters.

# Read Cycle by ESP

Parameters	ESP Values
[-] Read Cycle	
Trigger Mode	Triggered
[-] Hand Presentation Timing	
Time Between Identical Decodes	0
+ No Read Message	Enabled
Beeper Volume	High*
	Off
	Medium
	High*

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

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

## Read Cycle Serial Commands

Trigger Mode	<K203,trigger mode>
Hand Presentation Timing	<K205,time between identical decodes>
No Read Message	<K714,status,No Read message>
Beeper Volume	<K752,beeper mode>

# Trigger Mode

**Definition:** Allows the user to determine whether the scanner will be in a continuous read mode or a triggered mode.

**Serial Cmd:** **<K203,trigger mode>**

**Default:** **Triggered Mode**

**Options:** 0 = Continuous / Hand Presentation Mode

**1 = Triggered Mode**

## Continuous / Hand Presentation Mode

The trigger is disabled, the scanner is always in the read cycle, and it will attempt to decode and output every scan. The **Hand Presentation Timing** parameters, **<K205>**, take effect to control how often the scanner will output the same symbol data, and how long the illumination will stay on.



<\_CFG>

**Bar Code Configuration Mode**



<K203,0>

**Continuous / Hand  
Presentation Mode**



<Z>

**Save  
Settings**

## Triggered Mode

A read cycle is initiated by activating the handle trigger. The read cycle ends and illumination turns off when the trigger is released or when a symbol is decoded.



<\_CFG>

**Bar Code Configuration Mode**



<K203,1>

**Triggered Mode (Default)**



<Z>

**Save  
Settings**

# Hand Presentation Timing

## *Time Between Identical Decodes*

**Definition:** In **Continuous / Hand Presentation Mode**, this parameter specifies how often the scanner will output the same symbol data. When a symbol is read, it is output immediately, and the **Time Between Identical Decodes** timer is started. The same symbol will not be output again until the Time Between Identical Decodes timer expires.  
When set to **0**, the reader will output every decode, as fast as possible, with no delay.

**Serial Cmd:** **<K205,time between identical decodes>**

**Default:** **0**

**Options:** 0 – 65535 (0.1 second increments)



**Bar Code  
Configuration  
Mode**

<\_CFG>



<K205,0>  
**0 (Default)**



<Z>

**Save Settings**

# No Read Message

**Usage:** Used in applications where the host needs serial verification that a symbol has not been read.

**Definition:** When enabled, and if no symbol has been decoded before timeout or the end of the read cycle, the No Read message will be transmitted to the host.

## No Read Status

**Serial Cmd:** <K714,status,No Read message>

**Default:** Enabled

**Options:** 0 = Disabled                    1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K714,0>  
**Disabled**



<K714,1>  
**Enabled (Default)**



**Save  
Settings**

<Z>

## No Read Message

**Definition:** Any combination of ASCII characters can be defined as the No Read message.

**Serial Cmd:** <K714,status,No Read message>

**Default:** NOREAD

**Options:** 1 to 20 ASCII characters.



<\_CFG>

**Bar Code Configuration Mode**



<K714,,NOREAD>  
**NOREAD (Default)**



**Save  
Settings**

<Z>



# Beeper Volume

*Definition:* Allows the user to determine beeper volume.

*Serial Cmd:* <K752,beeper mode>

*Default:* **High**

*Options:* 0 = Off  
1 = Medium  
**2 = High**



*Bar Code  
Configuration  
Mode*

<\_CFG>



<K752,0>

**Off**



<K752,1>

**Medium**



<K752,2>

**High (Default)**



<Z>

**Save Settings**





# 5 Symbologies

## Contents

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This section describes the various symbol types that can be decoded by the HS-1.

See the following sites for additional symbology information:

<http://www.aimglobal.org/standards/aimpubs.asp>

[http://barcodes.gs1us.org/dnn\\_bcec/Default.aspx?tabid=82](http://barcodes.gs1us.org/dnn_bcec/Default.aspx?tabid=82)

# Symbologies by ESP

Parameters	ESP Values
[-] Symbologies	
[-] 1D Symbologies	
+ Code 39	Enabled
+ Code 128/EAN	Enabled
+ Interleaved 2 of 5	Enabled
+ Codabar	Enabled
+ UPC/EAN	
+ Code 93	Enabled
+ Industrial 2 of 5	Disabled
+ MSI Code	Disabled
+ Plessey Code	Disabled
DataBar Expanded	Disabled
DataBar Limited	Disabled
DataBar Omnidirectional	Disabled
+ China Postal Code	Disabled
[-] Stacked Symbologies	
PDF417	Enabled
Symbology Identifier	Disabled*
	Disabled*
	Enabled AIM ID

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

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

# Symbologies Serial Commands

Code 128/EAN 128	< <b>K464</b> ,status,0,minimum symbol length,1,1,0,application record separator character>
Code 39	< <b>K470</b> ,status,check character status,check character output status,0,0,minimum symbol length,full ASCII set>
Codabar	< <b>K471</b> ,status,0,start/stop match output status,0,symbol length status,symbol length,check character status,check character output status>
Interleaved 2 of 5	< <b>K472</b> ,status,check character status,check character output status,symbol length #1,symbol length #2,guard bar,range mode status>
Code 93	< <b>K475</b> ,status,0,minimum symbol length>
PDF417	< <b>K476</b> ,status>
DataBar Omnidirectional (RSS-14)	< <b>K482</b> ,status>
DataBar Limited (RSS Limited)	< <b>K483</b> ,status>
DataBar Expanded (RSS Expanded)	< <b>K484</b> ,status>
MSI Code	< <b>K486</b> ,status,check character mode,check character output status,0,minimum symbol length>
Plessey Code	< <b>K487</b> ,status,check character output status,0,minimum symbol length>
Industrial 2 of 5	< <b>K488</b> ,status,check character status,check character output status,format,symbol length #1,symbol length #2>
UPC/EAN	< <b>K489</b> ,UPC-A status,UPC-E status,EAN-8 status,EAN-13 status,supplementals required,supplemental 2 status,supplemental 5 status,UPC-A as EAN-13,UPC-E as UPC-A,EAN-8 as EAN-13>
China Postal Code	< <b>K498</b> ,status,check digit mode,min length,max length>
Symbology Identifier	< <b>K753</b> ,0,symbology identifier status>

## Code 39

*Usage:* **Code 39** is the most widely used non-retail 1D symbology.

*Definition:* An alphanumeric symbology with unique start/stop code patterns, composed of 9 black and white elements per character, 3 of which are wide.

*Serial Cmd:* **<K470,status>**, check character status, check character output status, 0, 0, minimum symbol length, full ASCII set

*Default:* **Enabled**

*Options:* 0 = Disabled                      **1 = Enabled**



<\_CFG>

**Bar Code Configuration Mode**



<K470,0>

**Disabled**



<K470,1>

**Enabled (Default)**



<Z>

**Save Settings**

## Check Character Status (Code 39)

**Definition:** When enabled, the HS-1 will verify a Modulus 10 check character in order to identify the decode as successful.

**Serial Cmd:** <K470,status,check character status,check character output status,0,0,minimum symbol length,full ASCII set>

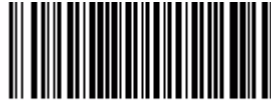
**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K470,,0>

**Disabled (Default)**



<K470,,1>

**Enabled**



<Z>

**Save Settings**

## Check Character Output Status (Code 39)

**Usage:** **Check Character Output Status**, when added to the symbol, provides additional data security.

**Definition:** When enabled, the check character is read and output along with the symbol data. When disabled, symbol data is output without the check character.

**Note:** With **Check Character Output Status** and an **External** or **Serial** trigger option enabled, an invalid check character calculation will cause a No Read message to be transmitted at the end of the read cycle.

**Serial Cmd:** **<K470,status,check character status,check character output status,0,0,minimum symbol length,full ASCII set>**

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



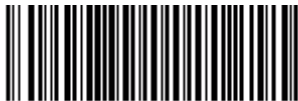
<\_CFG>

**Bar Code Configuration Mode**



<K470,,,0>

**Disabled (Default)**



<K470,,,1>

**Enabled**



<Z>

**Save Settings**



## Minimum Symbol Length (Code 39)

- Usage:** **Minimum Symbol Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.
- Definition:** Specifies the exact number of characters that the HS-1 will recognize (this does not include start and stop characters and check characters). The HS-1 ignores any symbology that is less than the specified length.
- Serial Cmd:** `<K470,status,check character status,check character output status,0,0,minimum symbol length,full ASCII set>`
- Default:** **0**
- Options:** 0 to 32



<\_CFG>

**Bar Code Configuration Mode**



<K470,,,,,0>  
0 (Default)



<Z>

**Save Settings**

## Full ASCII Set (Code 39)

**Usage:** Must be enabled when reading characters outside the standard character set (0-9, A-Z, etc.)

The user must know in advance whether or not to use the **Full ASCII Set** option. Since **Full ASCII Set** requires two code words to encode one character, it is less efficient.

**Definition:** Standard Code 39 encodes 43 characters; zero through nine, capital “A” through capital “Z”, minus symbol, plus symbol, forward slash, space, decimal point, dollar sign, and percent symbol. When **Full ASCII Set** is enabled, the HS-1 can read the full ASCII character set, from 0 to 255.

**Serial Cmd:** *<K470,status,check character status,check character output status,0,0,minimum symbol length,full ASCII set>*

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



*<\_CFG>*

**Bar Code Configuration Mode**



*<K470,.....,0>*

**Disabled (Default)**



*<K470,.....,1>*

**Enabled**



*<Z>*

**Save Settings**

# Codabar

**Usage:** Used in photo-finishing and library applications. Previously used in medical applications, but not typically used in newer medical applications.

**Definition:** Codabar is a 16-bit character set (0 through 9, and the characters \$, :, /, ., +, and -) with start/stop codes and at least two distinctly different bar widths.

**Serial Cmd:** **<K471,status,0,start/stop output status,0,symbol length status,symbol length,check character status,check character output>**

**Default:** **Enabled**

**Options:** 0 = Disabled                      **1 = Enabled**



<\_CFG>

**Bar Code Configuration Mode**



<K471,0>

**Disabled**



<K471,1>

**Enabled (Default)**



<Z>

**Save Settings**

## Start/Stop Output Status (Codabar)

**Definition:** When enabled, the start and stop characters *will* be present in the data output of the decoded symbol.

When disabled, the start and stop characters will *not* be present in the data output of the decoded symbol.

**Note:** Because the start and stop characters are included as part of the data, the characters must be included as part of the length in a fixed length mode of operation.

**Serial Cmd:** <K471,status,0,**start/stop output status**,0,symbol length status,symbol length,check character status,check character output>

**Default:** **Enabled**

**Options:** 0 = Disabled                      **1 = Enabled**



<\_CFG>

**Bar Code Configuration Mode**



<K471,,,0>

**Disabled**



<K471,,,1>

**Enabled (Default)**



<Z>

**Save Settings**

## Symbol Length Status (Codabar)

**Definition:** When set to **Any/Minimum**, any symbol length is considered valid.  
When set to **Fixed**, the HS-1 will check the symbol length against the **Symbol Length Status** parameter.

**Serial Cmd:** <K471,status,0,start/stop output status,0,symbol length status,symbol length,check character status,check character output>

**Default:** **Any/Minimum**

**Options:** **0 = Any/Minimum**      1 = Fixed



<\_CFG>

**Bar Code Configuration Mode**



<K471,,,0>

**Any/Minimum (Default)**



<K471,,,1>

**Fixed**



<Z>

**Save Settings**

## Symbol Length (Codabar)

**Definition:** Specifies the number of characters that the HS-1 will recognize, including start and stop check characters. The

**Note:** When setting **Symbol Length** to any value other than **0**, add **2** to account for reserved spaces. For example, if your symbol has **3** characters, set Symbol Length to **5**.

**Note:** If Symbol Length is set to **0** and Symbol Length Status is set to **Any/Minimum**, all symbol lengths are decoded.

**Serial Cmd:** *<K471,status,0,start/stop output status,0,symbol length status,symbol length,check character status,check character output>*

**Default:** **6**

**Options:** 0 to 32



<\_CFG>

**Bar Code Configuration Mode**



<K471,.....6>  
**6 (Default)**



<Z>

**Save Settings**

## Check Character Status (Codabar)

**Definition:** When disabled, the HS-1 will not perform any character checking calculations on decoded Codabar symbols.

When set to **Modulus 16**, the HS-1 will perform a Modulus 16 check character calculation on the symbol. If the symbol does not pass this calculation, it will not be decoded.

**Serial Cmd:** <K471,status,0,start/stop output status,0,symbol length status,symbol length,**check character status**,check character output>

**Default:** **Disabled**

**Options:** **0 = Disabled**  
1 = Enabled (Modulus 16)



<\_CFG>

**Bar Code Configuration Mode**



<K471,.....,0>

**Disabled (Default)**



<K471,.....,1>

**Enabled (Modulus 16)**



<Z>

**Save Settings**

## Check Character Output (Codabar)

**Definition:** When this field is disabled and a check character calculation is enabled, the HS-1 will strip the verified check character from the symbol data output. This condition must be accounted for if a minimum length is also being used. When enabled, the HS-1 will output the check character as part of the symbol data. This condition must be accounted for if a minimum length is also being used.

**Serial Cmd:** `<K471,status,0,start/stop output status,0,symbol length status,symbol length,check character status,check character output>`

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



< CFG >

**Bar Code Configuration Mode**



<K471,.....0>

**Disabled (Default)**



<K471,.....1>

**Enabled**



<Z>

**Save Settings**



## Interleaved 2 of 5

**Usage:** **Interleaved 2 of 5** has been popular because it is the most dense symbology for printing numeric characters less than 10 characters in length; however, Microscan does not recommend this symbology for any new applications because of inherent problems such as truncation.

**Definition:** A dense, continuous, self-checking, numeric symbology. Characters are paired together so that each character has five elements, two wide and three narrow, representing numbers 0 through 9, with the bars representing the first character and the interleaved spaces representing the second character. (A check character is highly recommended).

**Serial Cmd:** **<K472,status>**,check character status,check character output status,symbol length #1,symbol length #2,guard bar,range mode status>

**Default:** **Enabled**

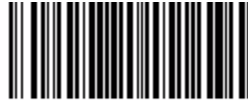
**Options:** 0 = Disabled

**1 = Enabled**



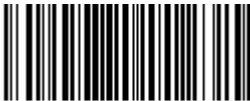
<\_CFG>

**Bar Code Configuration Mode**



<K472,0>

**Disabled**



<K472,1>

**Enabled (Default)**



<Z>

**Save Settings**

## Check Character Status (Interleaved 2 of 5)

**Usage:** This option is not typically used, but it can be enabled for additional security in applications where the host requires redundant check character verification.

**Definition:** An error correcting routine in which the check character is added.

**Serial Cmd:** <K472,status,**check character status**,check character output status,symbol length #1,symbol length #2,guard bar,range mode status>

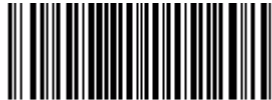
**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K472,,0>

**Disabled (Default)**



<K472,,1>

**Enabled**



<Z>

**Save Settings**

## Check Character Output Status (Interleaved 2 of 5)

**Definition:** When enabled, a check character is sent along with the symbol data for added data security.

**Serial Cmd:** <K472,status,check character status,**check character output status**,symbol length #1,symbol length #2,guard bar,range mode status>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K472,,0>

**Disabled (Default)**



<K472,,1>

**Enabled**



<Z>

**Save Settings**

## Symbol Length #1 (Interleaved 2 of 5)

**Usage:** Useful in applications where I 2/5 symbols of a specific length are required.

**Definition:** The **Symbol Length # 1** field is one of two fields against which the decoded symbol is compared before accepting it as valid or rejecting it.

**Serial Cmd:** <K472,status,check character status,check character output status,**symbol length #1**,symbol length #2,guard bar,range mode status>

**Default:** **16**

**Options:** 0 to 128



<\_CFG>

**Bar Code Configuration Mode**



<K472,,,16>

**16 (Default)**



<Z>

**Save Settings**

## Symbol Length #2 (Interleaved 2 of 5)

**Usage:** Useful in applications where 1 2/5 symbols of a specific length are required.

**Definition:** The **Symbol Length # 2** field is one of two fields against which the decoded symbol is compared before accepting it as valid or rejecting it.

**Serial Cmd:** <K472,status,check character status,check character output status,symbol length #1,**symbol length #2**,guard bar,range mode status>

**Default:** 6

**Options:** 0 to 128



<\_CFG>

**Bar Code Configuration Mode**



<K472,...6>

**6 (Default)**



<Z>

**Save Settings**

## Rules

The Range Mode and Symbol Length parameters define several symbol length requirement options.

Range Mode	Length 1	Length 2	Required Symbol Length
Disable	0	0	Any
Disable	>0	0	Exactly Length 1
Disable	0	>0	Exactly Length 2
Disable	>0	>0	Exactly Length 1 or Length 2
Enable	0	0	Any
Enable	>0	0	0 to Length 1
Enable	0	>0	0 to Length 2
Enable	>0	Same value as Length 1	Length 1 to maximum symbol length
Enable	>0	>0 and not the same as Length 1	Length 1 < or = required length < or = Length 2 <b>or</b> Length 2 < or = required length < or = Length 1

## Guard Bar (Interleaved 2 of 5)

**Definition:** A **guard bar** is a heavy bar surrounding the printed Interleaved 2 of 5 symbol. It is usually 2x to 4x the width of the wide bar, and creates a quiet zone of 8x to 15x the minimum space element. This is useful to prevent false data output, which can occur with highly tilted or skewed symbols.

**Serial Cmd:** `<K472,status,check character status,check character output status,symbol length #1,symbol length #2,guard bar,range mode status>`

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



`<_CFG>`

**Bar Code Configuration Mode**



`<K472,.....0>`

**Disabled (Default)**



`<K472,.....1>`

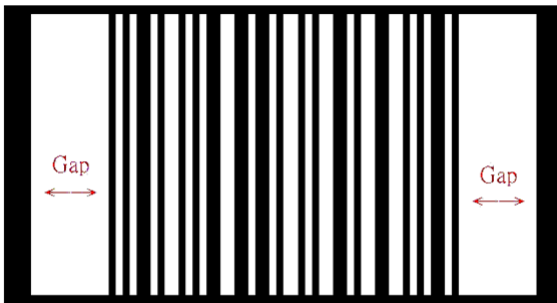
**Enabled**



`<Z>`

**Save Settings**

### Guard Bar Example



width = 2x to 4x max bar

width = 8x to 15x min space

## Range Mode Status (Interleaved 2 of 5)

**Definition:** The **Range Mode** and **Length** parameters define several symbol length requirement options.

**Serial Cmd:** <K472,status,check character status,check character output status,symbol length #1,symbol length #2,guard bar,**range mode status**>

**Default:** **Enabled**

**Options:** 0 = Disabled                      **1 = Enabled**

### Disabled

The Length parameters define the exact symbol length required. If neither matches the decoded symbol then the symbol is rejected.



<\_CFG>

**Bar Code Configuration Mode**



<K472,.....,0>

**Disabled**



<Z>

**Save Settings**

### Enabled

Symbol Length # 1 and Symbol Length # 2 are combined to form a range of lengths that are considered valid symbol lengths for Interleaved 2 of 5. Symbols that fall outside this range are rejected. Either length can form the start or end of the range.



<\_CFG>

**Bar Code Configuration Mode**



<K472,.....,1>

**Enabled (Default)**



<Z>

**Save Settings**

# Code 128/EAN 128

**Usage:** Code 128 is a smaller symbology useful in applications with limited space and high-security requirements.

**Definition:** A very dense alphanumeric symbology. It encodes all 128 ASCII characters, it is continuous, has variable length, and uses multiple element widths measured edge to edge.

**Serial Cmd:** <K464,status,min length,max length,function 1 output status,function 1 output character>

**Default:** Enabled

**Options:** 0 = Disabled                      1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K464,0>

**Disabled**



<K464,1>

**Enabled (Default)**



<Z>

**Save Settings**

## Enabled

The following conditions are true when Code 128/EAN 128 is Enabled:

- All Code 128-based symbols, including EAN/UCC-128, are decoded and output.
- If Symbology ID output is enabled, the symbology identifier always follows the AIM standard.
- Function 1 parameters only take effect if an EAN/UCC-128 symbol is decoded. They apply optional formatting to EAN/UCC-128 symbols by outputting the specified character wherever an identifier separator is found.



## Minimum Length (Code 128/EAN 128)

**Definition:** This field specifies the number of characters that the scanner will recognize, not counting start, stop and check digit characters. The scanner ignores any symbol smaller than the specified length.

**Serial Cmd:** <K464,status,min length,max length,function 1 output status,function 1 output character>

**Default:** 1

**Options:** 1 to 48



<\_CFG>

**Bar Code Configuration Mode**



<K464,,1>

**1 (Default)**



<Z>

**Save Settings**

## Maximum Length (Code 128/EAN 128)

**Definition:** This field specifies the number of characters that the scanner will recognize, not counting start, stop and check digit characters. The scanner ignores any symbol longer than the specified length.

**Serial Cmd:** <K464,status,min length,max length,function 1 output status,function 1 output character>

**Default:** 48

**Options:** 1 to 48



<\_CFG>

**Bar Code Configuration Mode**



<K464,,,48>

**48 (Default)**



<Z>

**Save Settings**

## Function 1 Output Status

Serial Cmd: <K464,status,min length,max length,function 1 output status,function 1 output character>

Default: **Enabled**

Options: 0 = Disabled **1 = Enabled**



<\_CFG>

**Bar Code Configuration Mode**



<K464,,,0>

**Disabled**



<K464,,,1>

**Enabled (Default)**



<Z>

**Save Settings**

## Function 1 Output Character

Serial Cmd: <K464,status,min length,max length,function 1 output status,function 1 output character>

Default: ,

Options: Any ASCII character



<\_CFG>

**Bar Code Configuration Mode**



<K464,,,,,>

**, (comma) (Default)**



<Z>

**Save Settings**

## Code 93

**Usage:** Used in some clinical applications.

**Definition:** Code 93 is a variable-length, continuous symbology employing four element widths. Each Code 93 character has nine modules that may be either black or white. Each character contains three bars and three spaces.

**Serial Cmd:** **<K475,status,0,minimum symbol length>**

**Default:** **Enabled**

**Options:** 0 = Disabled                      **1 = Enabled**



<\_CFG>

**Bar Code Configuration Mode**



<K475,0>

**Disabled**



<K475,1>

**Enabled (Default)**



<Z>

**Save Settings**

## Minimum Symbol Length (Code 93)

**Definition:** Specifies the minimum number of characters that the HS-1 will recognize, not including the start and stop check characters. The HS-1 ignores any symbol smaller than the specified length.

**Note:** When setting **Minimum Symbol Length** to any value other than **0**, add **1** to account for a reserved space. For example, if your symbol has **3** characters, set Symbol Length to **4**.

**Serial Cmd:** `<K475,status,0,minimum symbol length>`

**Default:** **10**

**Options:** 0 to 32



`<_CFG>`

**Bar Code Configuration Mode**



`<K475,,,10>`  
**10 (Default)**



`<Z>`

**Save Settings**

## GS1 DataBar (RSS)

**Note:** GS1 DataBar symbologies were previously known as “Reduced Space Symbology”, or “RSS”.

### ***DataBar Omnidirectional (RSS-14)***

**Note:** DataBar Omnidirectional was previously known as “RSS-14”.

**Usage:** Used in the grocery, retail, and prescription drug industries where 14-digit EAN item identification may be needed.

**Definition:** DataBar Omnidirectional is a minimum length symbology that encodes 14 digits, including a 1-digit indicator. DataBar Omnidirectional is 96 modules wide. It can be stacked in two rows, it can read omnidirectionally if printed in full height, or horizontally if height-truncated for small marking.

**Serial Cmd:** <**K482,status**>

**Default:** **Disabled**

**Options:** **0 = Disabled**  
1 = Enabled



<CFG>

**Bar Code Configuration Mode**



<K482,0>

**Disabled (Default)**



<K482,1>

**Enabled**



<Z>

**Save Settings**

## DataBar Limited (RSS Limited)

**Note:** DataBar Limited was previously known as “RSS Limited”.

**Usage:** DataBar Limited is designed to be read by laser scanners and CCD readers. It is not recommended for omnidirectional slot scanners.

**Definition:** Encodes a smaller 14-digit symbol (74 modules wide) that is not omnidirectional.

**Serial Cmd:** <K483,status>

**Default:** Disabled

**Options:** 0 = Disabled

1 = Enabled



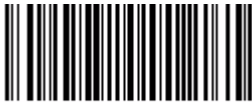
<\_CFG>

**Bar Code Configuration Mode**



<K483,0>

**Disabled (Default)**



<K483,1>

**Enabled**



<Z>

**Save Settings**

## DataBar Expanded (RSS Expanded)

**Note:** DataBar Expanded was previously known as "RSS Expanded".

**Usage:** Used to encode primary and supplementary data in retail point-of-sale and other applications.

**Definition:** DataBar Expanded is a variable length symbology that can encode supplementary information in addition to the 14-digit EAN item identification number and is capable of encoding up to 74 numeric or 41 alphabetic characters.

**Serial Cmd:** <K484,status>

**Default:** Disabled

**Options:** 0 = Disabled

1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K484,0>

**Disabled (Default)**



<K484,1>

**Enabled**



<Z>

**Save Settings**

# MSI Code

## Status (MSI Code)

**Usage:** Used for inventory control and the identification of storage containers and locations in warehouse environments.

**Definition:** **MSI Code** is a numeric, continuous symbology in which each character consists of four bits in a binary format.

**Serial Cmd:** **<K486,status>**,check character mode,check character output status, 0,minimum symbol length>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K486,0>

**Disabled (Default)**



<K486,1>

**Enabled**



<Z>

**Save Settings**



## Check Character Mode (MSI Code)

**Definition:** This field is set to perform a Modulus 10 calculation by default. It can also be set to perform a Double Modulus 10 calculation.

**Serial Cmd:** <K486,status,check character mode,check character output status,0,minimum symbol length>

**Default:** **Modulus 10**

**Options:** **1 = Modulus 10**                      2 = Double Modulus 10



<\_CFG>

**Bar Code Configuration Mode**



<K486,,1>

**Modulus 10 (Default)**



<K486,,2>

**Double Modulus 10**



<Z>

**Save Settings**

## Check Character Output Status (MSI Code)

**Definition:** When this field is enabled, the HS-1 will output the check digit with symbol data. When disabled, the HS-1 will not output the check digit with symbol data.

**Serial Cmd:** <K486,status,check character mode,**check character output status**, 0,minimum symbol length>

**Default:** Disabled

**Options:** 0 = Disabled 1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K486,,0>

**Disabled (Default)**



<K486,,1>

**Enabled**



<Z>

**Save Settings**

## Minimum Symbol Length (MSI Code)

**Definition:** This field specifies the minimum number of characters the HS-1 will recognize, including a check character.

**Serial Cmd:** <K486,status,check character mode,check character output status,0,**minimum symbol length**>

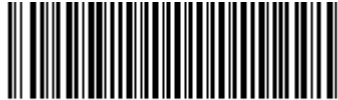
**Default:** 6

**Options:** 0 to 32



<\_CFG>

**Bar Code Configuration Mode**



<K486,....6>  
6 (Default)



<Z>

**Save Settings**

# Plessey Code

## Status (Plessey Code)

**Usage:** Used primarily in library and retail applications.

**Definition:** Plessey Code consists of pairs of wide and narrow bars representing binary data which, taken in units of 12, define hexadecimal characters.

**Serial Cmd:** <K487,status,check character output status,0,minimum symbol length>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K487,0>

**Disabled (Default)**



<K487,1>

**Enabled**



<Z>

**Save Settings**

## Check Character Output Status (Plessey Code)

**Definition:** When this field is enabled, the check character will be output with symbol data. When disabled, the check character will not be output with symbol data.

**Serial Cmd:** <K487,status,check character output status,0,minimum symbol length>

**Default:** Disabled

**Options:** 0 = Disabled                      1 = Enabled



<CFG>

**Bar Code Configuration Mode**



<K487,0>

**Disabled (Default)**



<K487,1>

**Enabled**



<Z>

**Save Settings**

## Minimum Symbol Length (Plessey Code)

**Definition:** This field specifies the minimum number of characters the HS-1 will recognize, including a check character.

**Serial Cmd:** <K487,status,check character output status,0,**minimum symbol length**>

**Default:** 0

**Options:** 0 to 32



< CFG >

**Bar Code Configuration Mode**



<K487,,,0>  
0 (Default)



<Z>

**Save Settings**

## Industrial 2 of 5

### Status (Industrial 2 of 5)

**Usage:** Used primarily in warehouse sortation, photo finishing, and the sequential numbering of airline tickets.

**Definition:** Microscan recommends that Industrial 2 of 5 always be used with fixed symbol length settings in any application. **Symbol Length # 1** and **Symbol Length # 2** can both be set to **0** to allow the HS-1 to decode Industrial 2 of 5 symbols of varying lengths.

**Serial Cmd:** **<K488,status>**, check character status, check character output status, format, symbol length #1, symbol length #2>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K488,0>

**Disabled (Default)**



<K488,1>

**Enabled**



<Z>

**Save Settings**

## Check Character Status (Industrial 2 of 5)

**Definition:** When this field is enabled, a check character is added.

**Serial Cmd:** <K488,status,check character status,check character output status,format,symbol length #1,symbol length #2>

**Default:** Disabled

**Options:** 0 = Disabled                      1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K488,,0>

**Disabled (Default)**



<K488,,1>

**Enabled**



<Z>

**Save Settings**



## Check Character Output Status (Industrial 2 of 5)

**Definition:** When this field is enabled, the check character will be output with symbol data. When disabled, the check character will not be output with symbol data.

**Serial Cmd:** <K488,status,check character status,**check character output status**,format,symbol length #1,symbol length #2>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K488,...,0>

**Disabled (Default)**



<K488,...,1>

**Enabled**



<Z>

**Save Settings**

## Format (Industrial 2 of 5)

**Definition:** Defines the number of start and stop check characters.

**Serial Cmd:** <K488,status,check character status,check character output status,**format**,symbol length #1,symbol length #2>

**Default**      **3 start / 3 stop**

**Options:**      0 = 3 start / 3 stop      1 = 2 start / 2 stop



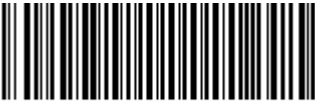
< CFG >

**Bar Code Configuration Mode**



<K488,...0>

**3 start / 3 stop (Default)**



<K488,...1>

**2 start / 2 stop (Default)**



<Z>

**Save Settings**

## Symbol Length # 1 (Industrial 2 of 5)

**Definition:** This field specifies the number of characters that the HS-1 will recognize, including start and stop characters and check characters. The HS-1 ignores any symbol with fewer than the specified number of characters. Because Industrial 2 of 5 is a continuous symbology, it is prone to substitution errors. Therefore, a symbol length must be defined and a symbol must contain an even number of characters.

**Serial Cmd:** <K488,status,check character status,check character output status,format,**symbol length #1**,symbol length #2>

**Default:** 10

**Options:** 0 to 32



<\_CFG>

**Bar Code Configuration Mode**



<K488,.....10>

**10 (Default)**



<Z>

**Save Settings**

## Symbol Length # 2 (Industrial 2 of 5)

**Definition:** This field specifies the number of characters that the HS-1 will recognize, including start and stop characters and check characters. The HS-1 ignores any symbol with fewer than the specified number of characters. Because Industrial 2 of 5 is a continuous symbology, it is prone to substitution errors. Therefore, a symbol length must be defined and a symbol must contain an even number of characters.

**Serial Cmd:** <K488,status,check character status,check character output status,format,symbol length #1,**symbol length #2**>

**Default:** 6

**Options:** 0 to 32



<\_CFG>

**Bar Code Configuration Mode**



<K488,.....6>

**6 (Default)**



<Z>

**Save Settings**

## ***Range Modes (Industrial 2 of 5)***

### **Variable Length**

To set for any length, **Symbol Length # 1** and **Symbol Length # 2** must both equal zero.

### **Minimum Length**

To set for minimum length, both **Symbol Length # 1** and **Symbol Length # 2** must be equal to each other and be any number other than zero.

### **Fixed Length**

To set for a fixed length, **Symbol Length #1** and **Symbol Length #2** must not be equal to each other.

# UPC/EAN

## UPC-A Status (UPC/EAN)

**Usage:** Used primarily in point-of-sale applications in the retail industry.

**Definition:** **UPC** (Universal Product Code) is a minimum length, numeric, continuous symbology. UPC can have two- or five-digit supplemental bar code data following the normal code. The UPC Version A (UPC-A) symbol is used to encode a 12-digit number. The first digit is the number system character, the next five are the manufacturer number, the next five are the product number, and the last digit is the checksum character.

**EAN** is the European version of the UPC symbology and is used in European market applications.

When enabled, the HS-1 will read UPC-A symbols.

**Serial Cmd:** **<K489,UPC-A status,UPC-E status,EAN-8 status,EAN-13 status,supplementals required,supplemental 2 status,supplemental 5 status,UPC-A as EAN-13,UPC-E as UPC-A,EAN-8 as EAN-13>**

**Default:** **Enabled**

**Options:** 0 = Disabled

**1 = Enabled**



<\_CFG>

**Bar Code Configuration Mode**



<K489,0>

**Disabled**



<K489,1>

**Enabled (Default)**



<Z>

**Save Settings**

## UPC-E Status (UPC/EAN)

**Definition:** This field is enabled by default and will decode all UPC-E symbols.

**Serial Cmd:** <K489,UPC-A status,**UPC-E status**,EAN-8 status,EAN-13 status,supplementals required,supplemental 2 status,supplemental 5 status,UPC-A as EAN-13,UPC-E as UPC-A,EAN-8 as EAN-13>

**Default:** **Enabled**

**Options:** 0 = Disabled                      **1 = Enabled**



<\_CFG>

**Bar Code Configuration Mode**



<K489,0>

**Disabled**



<K489,1>

**Enabled (Default)**



<Z>

**Save Settings**

## **EAN-8 Status (UPC/EAN)**

**Definition:** This field is enabled by default and will decode all EAN-8 symbols.

**Serial Cmd:** <K489,UPC-A status,UPC-E status,**EAN-8 status**,EAN-13 status,supplementals required,supplemental 2 status,supplemental 5 status,UPC-A as EAN-13,UPC-E as UPC-A,EAN-8 as EAN-13>

**Default:** **Enabled**

**Options:** 0 = Disabled

**1 = Enabled**



<\_CFG>

**Bar Code Configuration Mode**



<K489,,0>

**Disabled**



<K489,,1>

**Enabled (Default)**



<Z>

**Save Settings**

## **EAN-13 Status (UPC/EAN)**

**Definition:** This field is enabled by default and will decode all EAN-13 symbols.

**Serial Cmd:** <K489,UPC-A status,UPC-E status,EAN-8 status,**EAN-13 status**,supplementals required,supplemental 2 status,supplemental 5 status,UPC-A as EAN-13,UPC-E as UPC-A,EAN-8 as EAN-13>

**Default:** **Enabled**

**Options:** 0 = Disabled                      **1 = Enabled**



<\_CFG>

**Bar Code Configuration Mode**



<K489,,,0>

**Disabled**



<K489,,,1>

**Enabled (Default)**



<I>

**Save Settings**



## Supplementals Required (UPC/EAN)

**Definition:** A supplemental is a 2 or 5-character symbol appended to the main symbol. When enabled, the HS-1 decodes supplemental symbol data that has been appended to the standard UPC or EAN symbol.

**Serial Cmd:** <K489,UPC-A status,UPC-E status,EAN-8 status,EAN-13 status,**supplementals required**,supplemental 2 status,supplemental 5 status,UPC-A as EAN-13,UPC-E as UPC-A,EAN-8 as EAN-13>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



<CFG>

**Bar Code Configuration Mode**



<K489,,,,,0>

**Disabled (Default)**



<K489,,,,,1>

**Enabled**



<Z>

**Save Settings**

## Supplemental 2 Status (UPC/EAN)

**Definition:** A 2-character symbol appended to the main symbol.

**Serial Cmd:** <K489,UPC-A status,UPC-E status,EAN-8 status,EAN-13 status,supplementals required,**supplemental 2 status**,supplemental 5 status,UPC-A as EAN-13,UPC-E as UPC-A,EAN-8 as EAN-13>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K489,.....,0>

**Disabled (Default)**



<K489,.....,1>

**Enabled**



<Z>

**Save Settings**

## Supplemental 5 Status (UPC/EAN)

**Definition:** A 5-character symbol appended to the main symbol.

**Serial Cmd:** <K489,UPC-A status,UPC-E status,EAN-8 status,EAN-13 status,supplementals required,supplemental 2 status,**supplemental 5 status**,UPC-A as EAN-13,UPC-E as UPC-A,EAN-8 as EAN-13>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K489,.....0>

**Disabled (Default)**



<K489,.....1>

**Enabled**



<Z>

**Save Settings**

## UPC-A as EAN-13 (UPC/EAN)

**Definition:** When enabled, UPC-A will be transmitted as EAN-13.

**Serial Cmd:** <K489,UPC-A status,UPC-E status,EAN-8 status,EAN-13 status,supplementals required,supplemental 2 status,supplemental 5 status,**UPC-A as EAN-13**,UPC-E as UPC-A,EAN-8 as EAN-13>

**Default:** Disabled

**Options:** 0 = Disabled 1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K489,,,,,,0>

**Disabled (Default)**



<K489,,,,,,1>

**Enabled**



<Z>

**Save Settings**

## UPC-E as UPC-A (UPC/EAN)

**Definition:** When enabled, UPC-E will be transmitted as UPC-A.

**Serial Cmd:** <K489,UPC-A status,UPC-E status,EAN-8 status,EAN-13 status,supplementals required,supplemental 2 status,supplemental 5 status,UPC-A as EAN-13,UPC-E as UPC-A,EAN-8 as EAN-13>

**Default:** Disabled

**Options:** 0 = Disabled 1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K489,,,,,,0>

**Disabled (Default)**



<K489,,,,,,1>

**Enabled**



<Z>

**Save Settings**

## **EAN-8 as EAN-13 (UPC/EAN)**

**Definition:** When enabled, EAN-8 will be transmitted as EAN-13.

**Serial Cmd:** <K489,UPC-A status,UPC-E status,EAN-8 status,EAN-13 status,supplementals required,supplemental 2 status,supplemental 5 status,UPC-A as EAN-13,UPC-E as UPC-A,**EAN-8 as EAN-13**>

**Default:** Disabled

**Options:** 0 = Disabled 1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K489.....0>

**Disabled (Default)**



<K489.....1>

**Enabled**



<Z>

**Save Settings**

# China Postal Code

Serial Cmd: <K498,status,check digit mode,min length,max length>

Default: **Disabled**

Options: **0 = Disabled**

1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K498,0>

**Disabled (Default)**



<K498,1>

**Enabled**



<Z>

**Save Settings**

## Check Digit Mode

Serial Cmd: <K498,status,check digit mode,min length,max length>

Default: **Disabled**

Options: **0 = Disabled**      1 = Enable, No Output      2 = Enable, Output



<\_CFG>

### Bar Code Configuration Mode



<K498,,0>

**Disabled (Default)**



<K498,,1>

**Enable, No Output**



<K498,,2>

**Enable, Output**



<Z>

### Save Settings



## Minimum Symbol Length

Serial Cmd: <K498,status,check digit mode,min length,max length>

Default: **11**

Options: 1 – 48



<\_CFG>

Bar Code Configuration Mode



<K498,,,11>  
11 (Default)



<Z>

Save Settings

## Maximum Symbol Length

Serial Cmd: <K498,status,check digit mode,min length,max length>

Default: **48**

Options: 1 – 48



<\_CFG>

Bar Code Configuration Mode



<K498,,,48>  
48 (Default)



<Z>

Save Settings

# PDF417

**Note:** The HS-1 may make a “grinding” sound while attempting to decode PDF417 symbols. This is normal, and does not cause damage to the scanner.

**Usage:** Used in applications where a large amount of information (over 32 characters) needs to be encoded within a symbol, typically where the symbol is transported from one facility to another. For example, an automobile assembly line might use a single symbol with multiple fields of information that will be read at several stations along the way, without reference to a database.

**Definition:** A two-dimensional, multi-row (3 to 90), continuous, variable length symbology that has high data capacity for storing up to 2,700 numeric characters, 1,800 printable ASCII characters, or 1,100 binary characters per symbol. Each symbol character consists of 4 bars and 4 spaces in a 17-module structure.

**Serial Cmd:** **<K476,status>**

**Default:** **Enabled**

**Options:** 0 = Disabled                      **1 = Enabled**



<\_CFG>

**Bar Code Configuration Mode**



<K476,0>

**Disabled**



<K476,1>

**Enabled (Default)**



<Z>

**Save Settings**

# Symbology Identifier

- Definition:** The **Symbology Identifier** is a standard prefix set of characters that identifies the symbol type.  
When enabled, the HS-1 analyzes and identifies the symbology and adds a three-character identifying prefix to the data:
- ] (closed bracket character) indicating the presence of a symbology identifier.
  - A, C, E, F, G, I, e, P, M  
(A = Code 39; C = Code 128/EAN-128; E = UPC/EAN; F = Codabar; G = Code 93; I = Interleaved 2 of 5; e = GS1 DataBar (RSS); P = Plessey Code; M = MSI Code)
  - Modifier

**Serial Cmd:** <K753,0,symbology identifier status>

**Default:** **Disabled**

**Options:** **0 = Disabled**                      1 = Enabled



<\_CFG>

**Bar Code Configuration Mode**



<K753,0>

**Disabled (Default)**



<K753,1>

**Enabled**



<Z>

**Save Settings**

## Explanation of Modifiers for Code 39, Codabar, and I-2/5

- For Code 39, Codabar, and Interleaved 2 of 5, the modifier indicates **Check Character** and **Check Character Output** status.
- For Code 39 only, Full ASCII must be enabled to see modifiers **4**, **5**, and **7**.

<b>Modifier</b>	<b>Check Character</b>	<b>Check Character Output</b>	<b>Full ASCII conversion performed (Code 39 only)</b>
<b>0</b>	Disabled	N/A	No
<b>1</b>	Enabled	Enabled	No
<b>3</b>	Enabled	Disabled	No
<b>4</b>	Disabled	N/A	Yes
<b>5</b>	Enabled	Enabled	Yes
<b>7</b>	Enabled	Disabled	Yes

*Example:* **JA5** indicates a **Code 39** symbol with **Check Character** and **Check Character Output** enabled and Full ASCII conversion performed.

## Explanation of Modifiers for Other Symbologies

- For Code 128/EAN-128, a **1** indicates EAN-128; otherwise the modifier is **0**.
- For all other symbologies, the modifier is **0**.



# 6 Terminal

**Contents**

Terminal Window..... 6-2  
Find ..... 6-3  
Send ..... 6-4  
Macros..... 6-5  
Terminal Window Menus..... 6-6

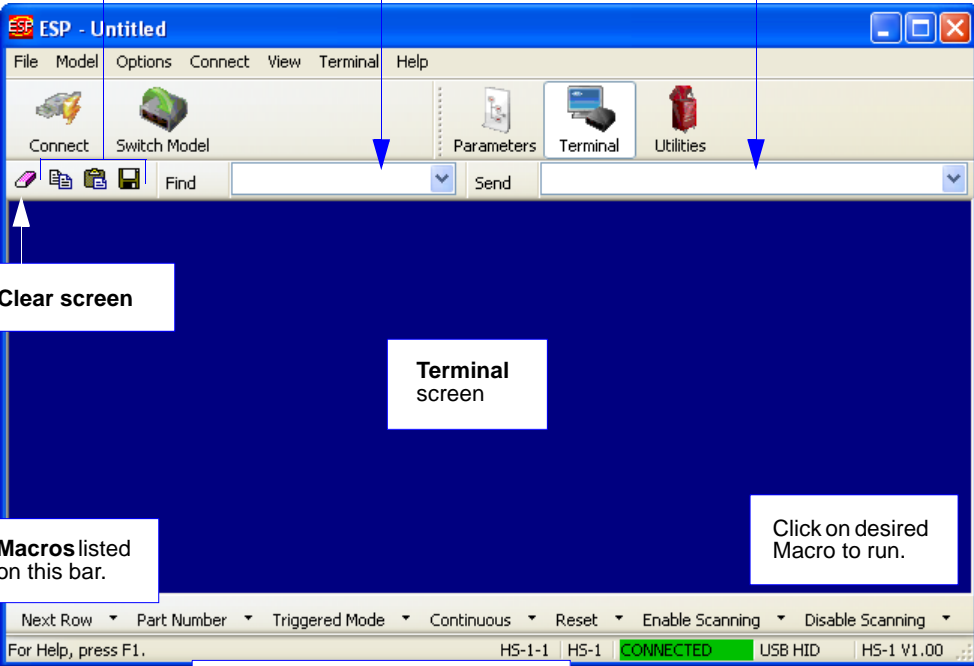
This section describes the **Terminal** window and **Macro** functions in **ESP**.

# Terminal Window



Click this button to display the **Terminal** view.

The following view will appear:



**Copy, paste, save**

Type text here to find matching text in the **Terminal** window.

Type serial commands here, or directly in the terminal screen.

**Clear screen**

**Terminal screen**

**Macros listed on this bar.**

Click on desired Macro to run.

Click on arrows to **Add Macro**, **Remove Macro**, or **Edit Macro**.

The screenshot shows the ESP software interface with a blue title bar and menu bar. The menu bar includes File, Model, Options, Connect, View, Terminal, and Help. Below the menu bar are icons for Connect, Switch Model, Parameters, Terminal, and Utilities. A toolbar contains icons for file operations and a 'Send' button. The main area is a dark blue 'Terminal screen'. At the bottom, a status bar shows 'HS-1-1 | HS-1 | CONNECTED | USB HID | HS-1 V1.00'.

The **Terminal** allows you to send serial commands to the HS-1 by typing commands in the **Send** text field or directly in the Terminal screen, by copying and pasting, or by using Macros.

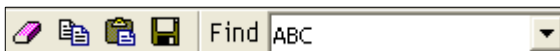
The Terminal screen also displays symbol data or information from the HS-1.

You can right-click on the screen to bring up a menu of several options for managing data in the Terminal view.

# Find

The **Find** function allows you to enter text strings to be searched for in the Terminal window. For example, data from a series of symbols has been sent to the Terminal and you want to determine if a particular symbol whose data begins with “ABC” has been decoded.

- Type “ABC” into the **Find** field.

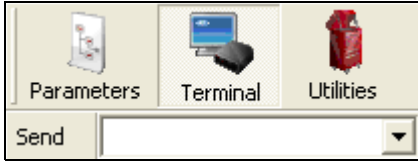


- Press **Enter**.  
The first instance of “ABC” will be highlighted in the Terminal window.
- Click the **Find** button to the left of the text field to locate additional instances of “ABC”.

# Send

The **Send** function allows you to enter serial commands and then send them to the HS-1.

- Type the command into the **Send** box.

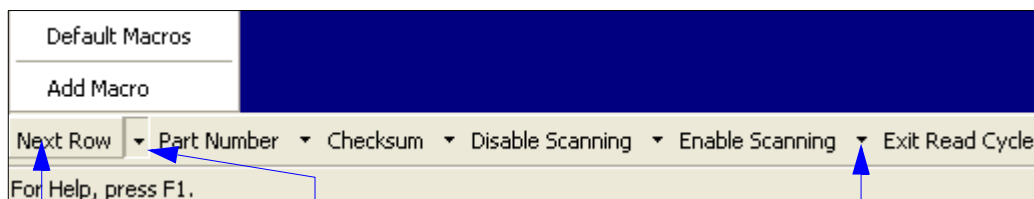


- Press **Enter** to send the command to the HS-1.
- Click the **Send** button to the left of the text field to send the command again.



## Macros

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



Click on **Next Row** to see the next row of macros

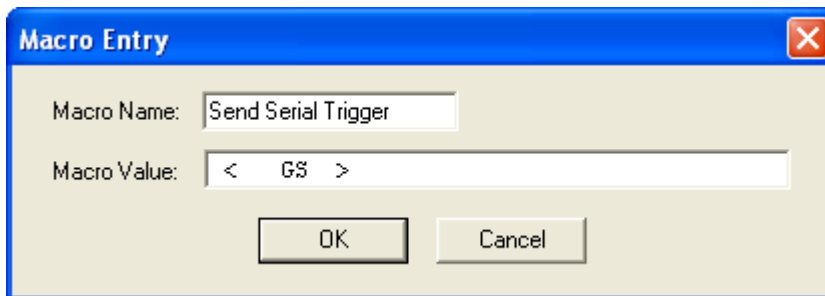
Click on the first arrow here to see **Add Macro** or **Default Macros**. When you default macros, the entire macros set is restored to their original macro commands.

Click on subsequent arrows to edit macros.

When you click on the macro name, the macro is executed in the Terminal window. If the macro is a command, it is sent to the HS-1 at the same time that it is displayed.

### *Editing a Macro*

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



You can edit an existing **Macro Name** or **Macro Value** by typing a new name or value in the corresponding text field and clicking **OK**.

# Terminal Window Menus

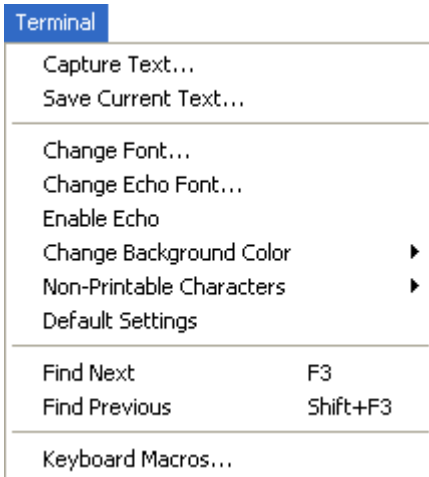
Right-click on the **Terminal** window to display the following menu:



- **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...** brings up a **Save As** dialog.
- **Change Font...** of text in Terminal; brings up a **Font** dialog.
- **Change Echo Font...** to change typed text; brings up a **Font** dialog.
- **Enable Echo** enables Echo text (typed by user).
- **Change Background Color** of Terminal window.
- **Non-Printable Characters** allows you to hide non-printable characters, or to show them in **Standard** or **Enhanced** format.
- **Default Settings** returns all of the above settings to default.
- **Keyboard Macros** allows you to create new keyboard macro commands that can be sent from function keys (F2, F4, F5, etc.).

## Terminal Dropdown Menu

The dropdown **Terminal** menu has **Capture Text**, **Save Current Text**, **Send File**, **Find Next**, and **Find Previous** functions, as well as the same functions defined above.



- **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.
- **Find Next** searches for a user-defined section of text in the Terminal.
- **Find Previous** operates in the same way as Find Next, but searches backward through Terminal text.



# 7 Utilities

## Contents

- Serial Utility Commands ..... 7-2
- Differences from Default..... 7-3
- Firmware..... 7-4
- Default/Reset/Save..... 7-5
- Scanner Status Request..... 7-6
- Bar Code Configuration Mode ..... 7-7

Utility commands are generally commands that can be sent during HS-1 operations to perform miscellaneous operations on HS-1 hardware. Serial utility commands are not prefaced with a "K" and a numeric value, nor do they require an initialization command (<A> and <Z>). They can be entered from **ESP's Terminal** or **Utilities** views.

# Serial Utility Commands

**Note:** For a list of all K commands, see [Serial Configuration Commands](#) on page A-8.

Type	Command	Name
Part Number	<#>	Display Firmware Part Number
Device Control	<H>	Enable Scanner
	<I>	Disable Scanner (Continuous, external trigger)
Default/Reset/Save	<A>	Reset (does not save for power-on)
	<Z>	Save Current Settings for Power-On
	<Zrd>	Recall Microscan Default Parameters and Save for Power-On
Scanner Status Request	<K?>	Configuration Command Status
Trigger	<char>	Serial Trigger Character

## Bar Code Utility Commands



< CFG >

### Bar Code Configuration Mode



<A>

**Reset (Does Not Save for Power-On)**



<Z>

**Save Current Settings for Power-On**

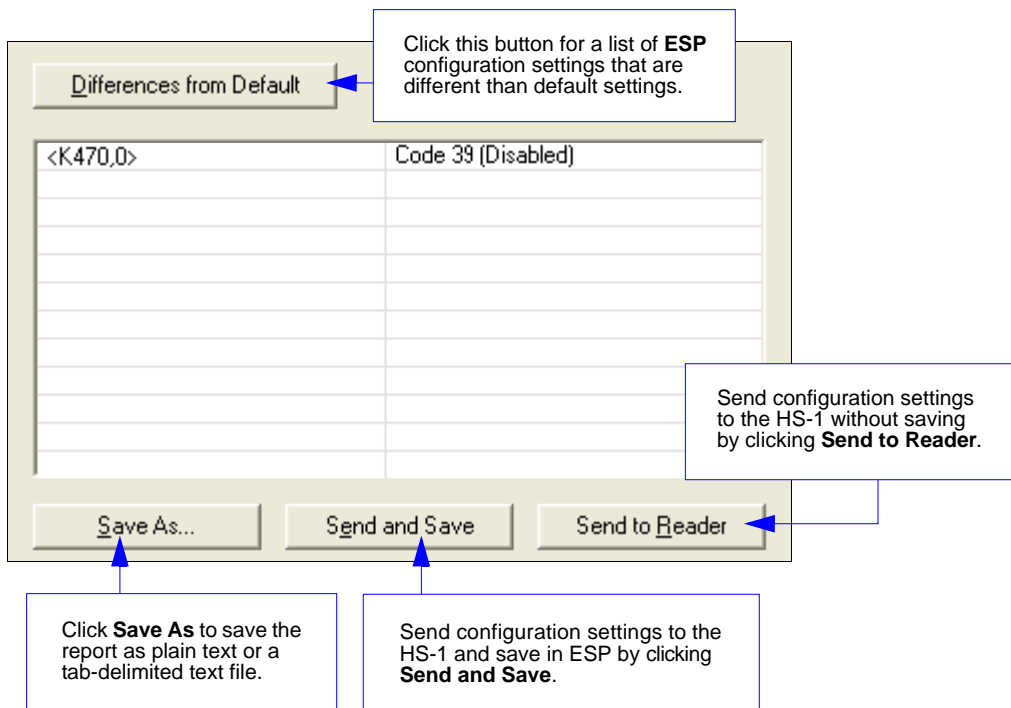


<Zrd>

**Recall Microscan Default Parameters and Save for Power-On**

## 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 HS-1 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 HS-1 and **Receive Reader Settings** via the **Send/Recv** button on the toolbar.

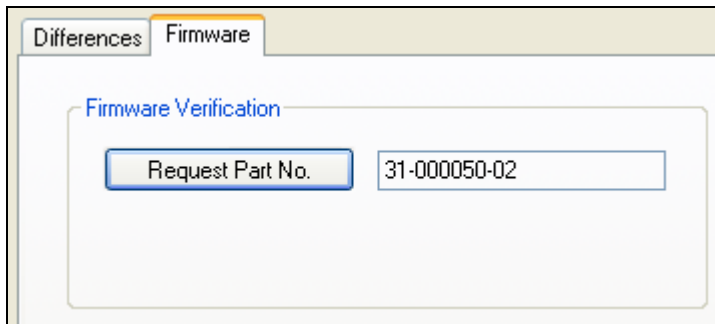


# Firmware

## ***Firmware Verification***

ESP allows you to send a request to the HS-1 for the application code part number.

- Click the **Firmware** tab.
- Click the **Request Part No.** button.
- The application code part number will be displayed in the text field to the right of the **Request Part No.** button.



## Default/Reset/Save

Understanding and controlling your HS-1's active, saved, and default settings is critical to its successful operation.

	<i>Function</i>	<i>Serial Cmd</i>	<i>ESP (first, right-click in any menu tree)<sup>a</sup></i>
<b>Reset (not saved for power-on)</b>	Reset	<A>	Save to Reader, Send No Save
<b>Save for Power-on</b>	Save Current Settings for Power-On	<Z>	Save to Reader, Send and Save
	Recall Microscan Default Parameters and Save for Power-On	<Zrd>	No

- a. When you right-click in a menu tree and select **Default Current Menu Settings** or **Default All ESP Settings**, it is important to note that only **ESP** settings are defaulted. To save these defaults to the HS-1 itself, you need to follow up with a **Save to Reader, Send and Save** command.

### Reset

Reset ("**A**" command) affects only current settings (active memory) and does not save for power-on.

### Save for Power-On

Power-on parameters ("**Z**" commands) are saved, recalled, and loaded into current parameters when power is cycled to the HS-1.

**Important:** The following commands must be followed by a <Z> to be saved for power-on: **Host Protocol, Baud Rate, Data Bits, Stop Bits, Parity, Trigger Characters (Delimited, Start, Stop), Preamble, Postamble, and No Read Message.**

All other parameters are saved for power-on without a <Z>. However, a <Zrd> affects all parameters.

## **Scanner Status Request**

### **<K?> Configuration Command Status**

This is the fastest way to learn the HS-1's current configuration. Sending this request will return the current settings of all commands, starting with the lowest K command value and ending with the highest K command value.



## Bar Code Configuration Mode

**Bar Code Configuration Mode** is enabled when the scanner decodes the following symbol:



After reading this symbol, the scanner remains in Bar Code Configuration Mode until it decodes a symbol containing the **<A>**, **<Z>**, or **<Zrd>** (Reset, Save Current Settings for Power-On, or Recall Microscan Default Parameters and Save for Power-On) command, or receives one of these commands from the communication port.

While in Bar Code Configuration Mode, the reader decodes symbols and processes the symbol data as if they were serial commands.

Configuration symbols can be created in ESP, using the [Bar Code Dialog](#).



# Appendices

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Appendix A General Specifications ..... A-2  
Appendix B Electrical Specifications ..... A-5  
Appendix C Serial Configuration Commands ..... A-8  
Appendix D Communications Protocol ..... A-11  
Appendix E ASCII Table ..... A-12  
Appendix F Glossary of Terms ..... A-13

# Appendix A — General Specifications

## Mechanical

**Height:** 6.3" (160 mm)

**Width:** 2.8" (68 mm)

**Depth:** 3.5" (88 mm)

**Weight:** 7.8 oz. (220 g) including cable

## Environmental

**Operating Temperature:** 0° to 50° C (32° to 122° F)

**Storage Temperature:** -20° to 60° C (-4° to 140° F)

**Humidity:** 20% to 85% (non-condensing)

**Shock:** Withstands drops of 6' (1.8 meters) to concrete

## Symbologies

UPC/EAN, Code 39, Code 128/EAN-128, Interleaved 2 of 5, Industrial 2 of 5, Codabar, Code 93, MSI Code, Plessey Code, China Postal Code, GS1 DataBar, PDF417

## Light Collection Options

**Sensor:** 2,048 pixel CCD image sensor

**Optics:** 660 nm visible LED

## Communications

**Standard Interface:** USB, RS-232

## Read Parameters

**Decode Rate:** 230 decodes/second

**Depth of Field:** 2.8 to 3.5" (70 to 90 mm)

**Ambient Light Immunity:** Sunlight: up to 278 ft. candles (3,000 lux)

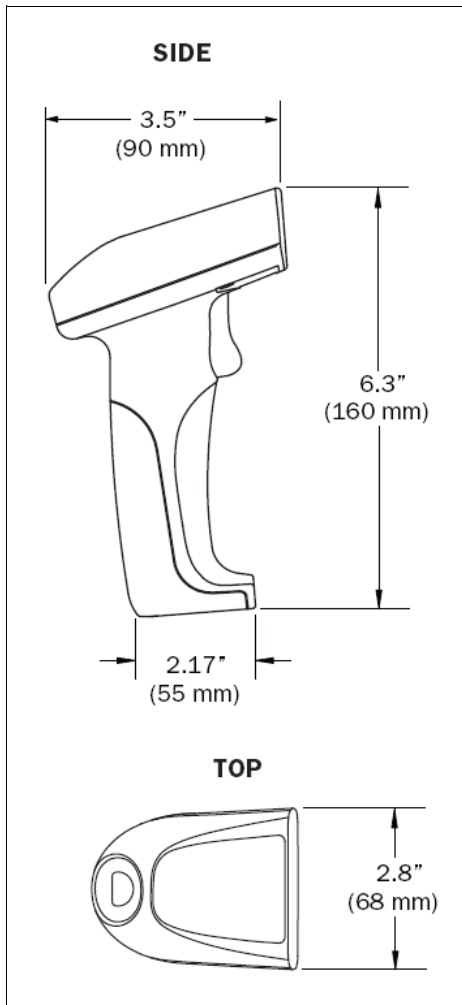
## Indicators

**Status Indicators:** Audible tones, visible feedback with multi-color LED

## Electrical

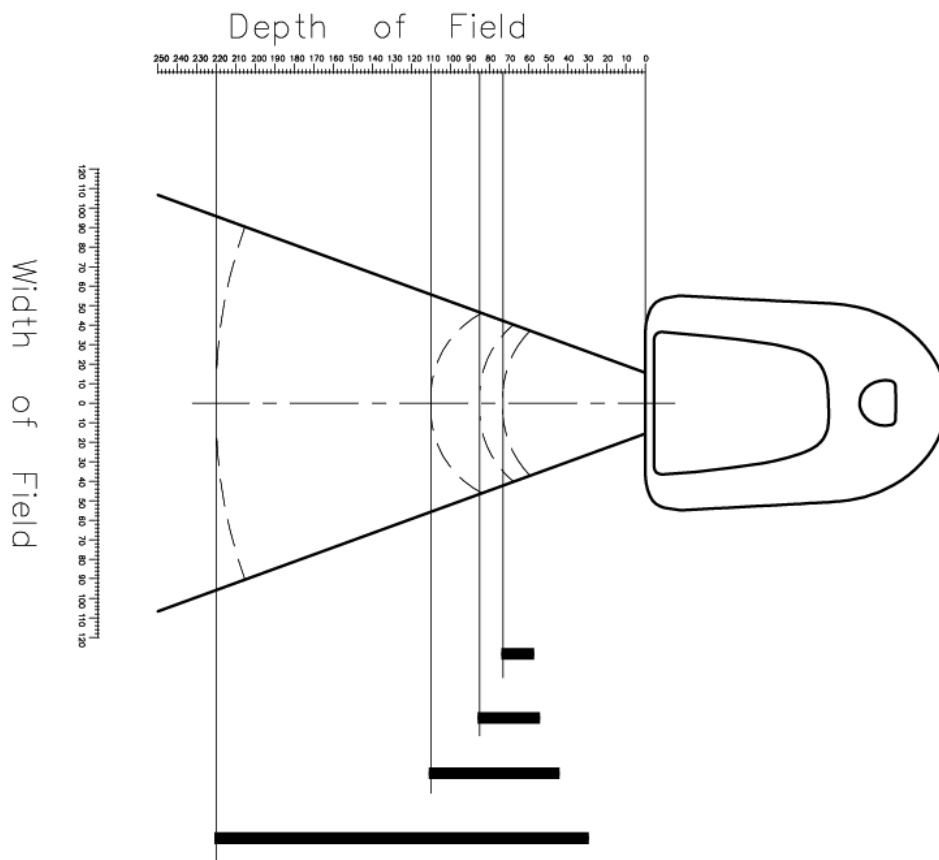
**Power:** 5VDC

**Typical:** 240mA **Peak:** 750mA **Idle:** 95mA



**HS-1 Dimensions**

**Read Ranges**



Narrow Bar Width	Read Range Distance
3 mil (0.076 mm)	2.28 to 2.87" (58 to 73 mm)
4 mil (0.102 mm)	2.17 to 3.35" (55 to 85 mm)
5 mil (0.127 mm)	1.77 to 4.33" (45 to 110 mm)
15.6 mil (0.396 mm)	1.18 to 8.66" (30 to 220 mm)

**Note:** All read range values based on a Grade A Code 39 symbols except the 15.6 mil read range value, which is based on a Grade A EAN 128 symbol.

---

## General Specifications

### Safety Certifications

FCC, CE, RoHS/WEEE



### ISO Certification

ISO 9001:2000 Certified Quality Management System

Issued by TUV USA Inc., Member of TUV NORD Group, Cert. No. 06-1080



ISO 9001:2000  
Certified QMS



©2009 Microscan Systems, Inc.

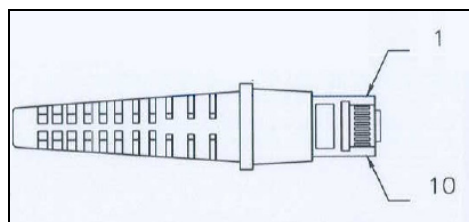
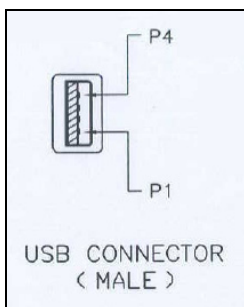
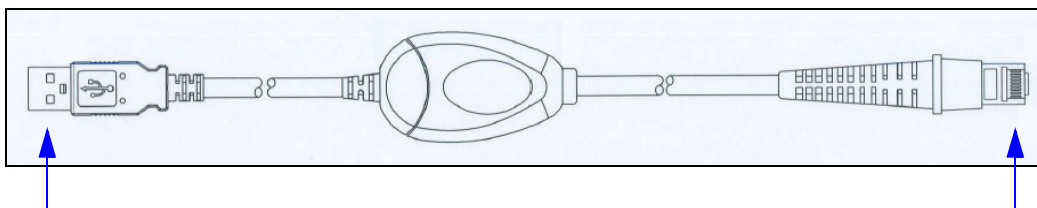
All rights reserved. Specifications subject to change.

Product specifications are given for typical performance at 25°C (77°F) using grade A labels. Performance characteristics may vary at high temperatures or other environmental extremes. Warranty—One year limited warranty on parts and labor. Extended warranty available.

# Appendix B — Electrical Specifications

Power: 5VDC  
 Typical: 240mA Peak: 750mA Idle: 95mA

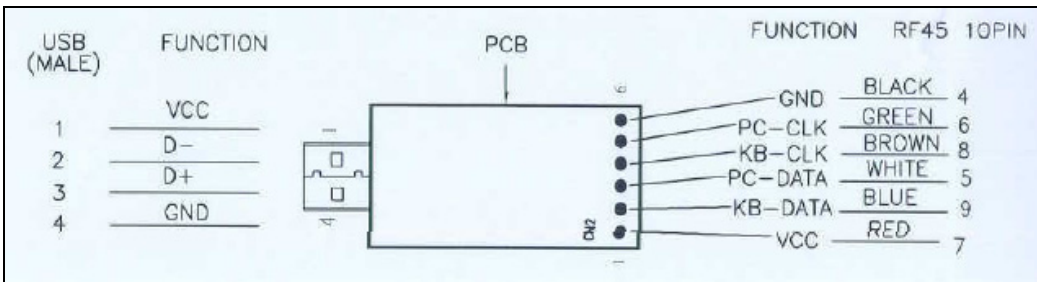
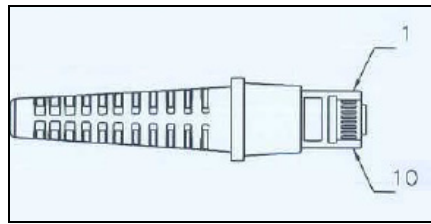
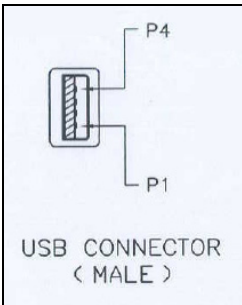
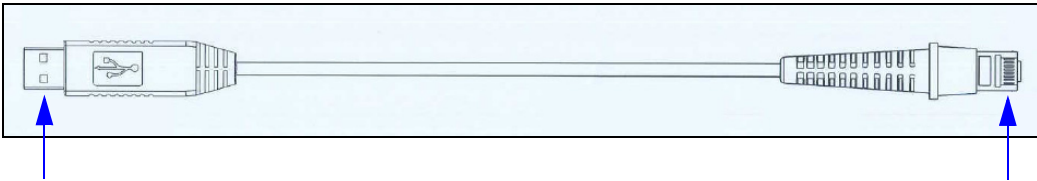
## USB Cable Pinouts



USB MALE	FUNCTION
4	GND
3	D+
2	D-
1	VCC
SHELL	SHIELD

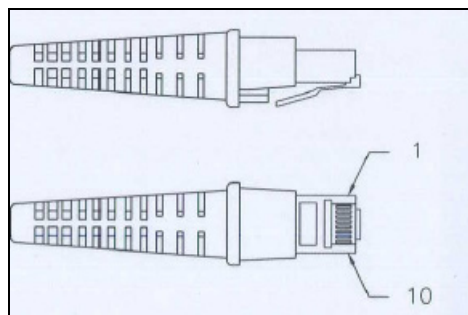
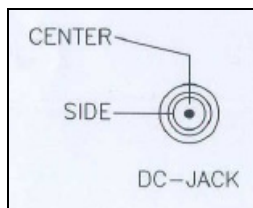
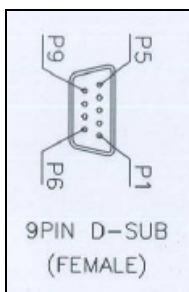
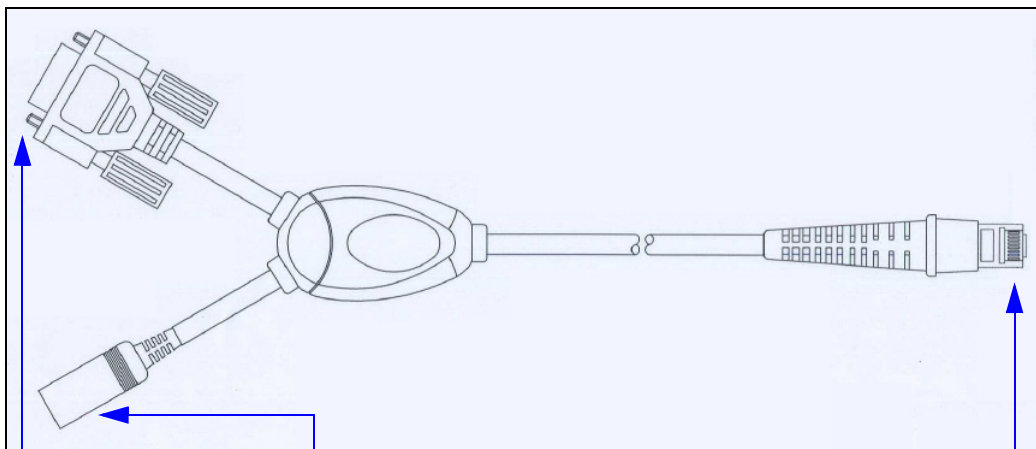
FUNCTION	RJ 45
GND	4
PC-DATA	5
PC-CLK	6
VCC	7
KB-CLK	8
KB-DATA	9
SHIELD	NC

## USB Virtual Comm Cable Pinouts





## RS-232 Cable Pinouts



9PIN (F)	FUNCTION	RJ 45
NC	RESV-0	3
5	GND	4
3(RXD)	PC-DATA	5
2(TXD)	PC-CLK	6
NC	VCC	7
7(CTS)	KB-CLK	8
8(RTS)	KB-DATA	9
SHELL	SHIELD	NC

## Appendix C — Serial Configuration Commands

**Note:** For a list of utility commands such as read rate requests, device control options, and scanner status requests, see [Serial Utility Commands](#) on page 7-2.

<b>Communications</b>	
Host Port Connections	<K100,baud rate,parity,stop bits,data bits>
Keyboard Mapping	<K116,keyboard mapping,caps lock mode,numeric key>
Communications Mode	<K117,communications mode>
Host Port Protocol	<K140,protocol>
Preamble	<K141,status,preamble characters>
Postamble	<K142,status,postamble characters>
<b>Read Cycle</b>	
Trigger Mode	<K203,trigger mode>
Hand Presentation Timing	<K205,time between identical decodes>
No Read Message	<K714,status,No Read message>
Beeper Volume	<K752,beeper mode>
<b>Symbologies</b>	
Code 128/EAN 128	<K464,status,0,minimum symbol length,1,1,0,application record separator character>
Code 39	<K470,status,check character status,check character output status,0,0,minimum symbol length,full ASCII set>
Codabar	<K471,status,0,start/stop match output status,0,symbol length status,symbol length,check character status,check character output status>
Interleaved 2 of 5	<K472,status,check character status,check character output status,symbol length #1,symbol length #2,guard bar,range mode status>
Code 93	<K475,status,0,minimum symbol length>
PDF417	<K476,status>
DataBar Omnidirectional (RSS-14)	<K482,status>
DataBar Limited (RSS Limited)	<K483,status>
DataBar Expanded (RSS Expanded)	<K484,status>
MSI Code	<K486,status,check character mode,check character output status,0,minimum symbol length>
Plessey Code	<K487,status,check character output status,0,minimum symbol length>
Industrial 2 of 5	<K488,status,check character status,check character output status,format,symbol length #1,symbol length #2>
UPC/EAN	<K489,UPC-A status,UPC-E status,EAN-8 status,EAN-13 status,supplementals required,supplemental 2 status,supplemental 5 status,UPC-A as EAN-13,UPC-E as UPC-A,EAN-8 as EAN-13>
China Postal Code	<K498,status,check digit mode,min length,max length>
Symbology Identifier	<K753,0,symbology identifier status>

## Serial Command Format

Serial commands are of two types: utility and configuration.

### Rules that apply to both utility and configuration commands

- A less than < and greater than > character enclose the commands.
- Commands and data are “case sensitive.” That is, characters must be entered as upper or lower case, as specified.

### Serial Utility Commands

These are sent during operations and are not followed by <A> or <Z>.

### Serial Configuration “K” Commands

These begin with a single “K” character followed by a 3-digit numeric character, data fields, and an initializing command, as follows:

<Knumeric parameter,data,data,...etc.><initializing command>

An initializing command <A> or <Z> may follow the command. A <Z> initializes the HS-1’s memory and saves for power-on; an <A> initializes the HS-1’s memory but does not save for power-on.

For example, to enable **UPC** and save the change for power-on, send <K473,1><Z>.

To change **Baud Rate** and reset without saving changes for power-on, send <K100,3><A>.

### Serial Configuration Command Conventions

- All data fields (except the last) must be followed by a comma (*without a space*).
- NUL cannot be used. The characters <, >, and , can be used, but only if entered as hex pairs.
- All fields preceding a modified field must be included.
- If there is no change in preceding fields, then commas alone can be entered in these fields. For example, if only the last field in the following command is changing, <K100,4,1,0,0> can be entered as <K100,,,,0>.
- All fields *following* a modified field can be omitted. For example, to change **Baud Rate** only, send <K100,3>.

## Concatenating Configuration Commands

Commands can be concatenated (added together) in a single string or data block. For example, **<K145,1><K220,1><K450,1><A>** enables **LRC**, sets **End of Read Cycle** mode to **New Trigger**, enables **Narrow Margins**, and resets the data buffers (without saving the changes for power-on).

## Serial Command Status Request

To ensure that any command was received and accepted, you can send the **Show Scanner Status** command: **<?>**.

The status of a specific serial command can be requested by entering the command followed by a question mark. For example, send **<K142?>** to request the status of **Postamble**.

## Entering Control Characters in Serial Commands

To enter control characters within a serial command, hold down the **Ctrl** key while typing the desired character.

*Example:* To enter a carriage return and line feed (**^M^J**), enter **<K141,1,CNTL-m CNTL-j>**

## Appendix D — Communications Protocol

### Communications Protocol Command Table

Protocol Command (Mnemonic displayed on menu)	Control Characters (Entered in menu or serial command)	Hex Value	Effect of Command
RES	^D	04	Reset
REQ	^E	05	Request
EOT	^D	04	Reset
STX	^B	02	Start of Text
ETX	^C	03	End of Text
ACK	^F	06	Acknowledge
NAK	^U	15	Negative Acknowledge
XON	^Q	11	Begin Transmission
XOFF	^S	13	Stop Transmission

# Appendix E — ASCII Table

Dec	Hex	Mne	Ctrl	Dec	Hex	Ch	Dec	Hex	Ch	Dec	Hex	Ch
00	00	NUL	^@	32	20	SP	64	40	@	96	60	`
01	01	SOH	^A	33	21	!	65	41	A	97	61	a
02	02	STX	^B	34	22	"	66	42	B	98	62	b
03	03	ETX	^C	35	23	#	67	43	C	99	63	c
04	04	EOT	^D	36	24	\$	68	44	D	100	64	d
05	05	ENQ	^E	37	25	%	69	45	E	101	65	e
06	06	ACK	^F	38	26	&	70	46	F	102	66	f
07	07	BEL	^G	39	27	'	71	47	G	103	67	g
08	08	BS	^H	40	28	(	72	48	H	104	68	h
09	09	HT	^I	41	29	)	73	49	I	105	69	i
10	0A	LF	^J	42	2A	*	74	4A	J	106	6A	j
11	0B	VT	^K	43	2B	+	75	4B	K	107	6B	k
12	0C	FF	^L	44	2C	,	76	4C	L	108	6C	l
13	0D	CR	^M	45	2D	-	77	4D	M	109	6D	m
14	0E	SO	^N	46	2E	.	78	4E	N	110	6E	n
15	0F	SI	^O	47	2F	/	79	4F	O	111	6F	o
16	10	DLE	^P	48	30	0	80	50	P	112	70	p
17	11	DC1	^Q	49	31	1	81	51	Q	113	71	q
18	12	DC2	^R	50	32	2	82	52	R	114	72	r
19	13	DC3	^S	51	33	3	83	53	S	115	73	s
20	14	DC4	^T	52	34	4	84	54	T	116	74	t
21	15	NAK	^U	53	35	5	85	55	U	117	75	u
22	16	SYN	^V	54	36	6	86	56	V	118	76	v
23	17	ETB	^W	55	37	7	87	57	W	119	77	w
24	18	CAN	^X	56	38	8	88	58	X	120	78	x
25	19	EM	^Y	57	39	9	89	59	Y	121	79	y
26	1A	SUB	^Z	58	3A	:	90	5A	Z	122	7A	z
27	1B	ESC	^[	59	3B	;	91	5B	[	123	7B	{
28	1C	FS	^\	60	3C	<	92	5C	\	124	7C	
29	1D	GS	^]	61	3D	=	93	5D	]	125	7D	}
30	1E	RS	^^	62	3E	>	94	5E	^	126	7E	~
31	1F	US	^_	63	3F	?	95	5F	_	127	7F	D

## Appendix F — Glossary of Terms

**Aberration** — The failure of an optical lens to produce an exact point-to-point correspondence between the object and its resulting image. Various types are chromatic, spherical, coma, astigmatism and distortion.

**Absorption** — The loss of light of certain wavelengths as it passes through a material and is converted to heat or other forms of energy. (–)

**Active Illumination** — Lighting an area with a light source coordinated with the acquisition of an image. Strobed flash tubes and pulsed lasers are examples.

**ADC** — See **Analog-to-Digital Converter**.

**A/D Converter** — See **Analog-to-Digital Converter**.

**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.

**Analog** — A smooth, continuous voltage or current signal or function whose magnitude (value) is the information.

**Analog-to-Digital Converter (A/D Converter or ADC)** — A device that converts an analog voltage or current signal to a discrete series of digitally encoded numbers (signal) for computer processing.

**Application-Specific Integrated Circuit (ASIC)** — An integrated circuit that is customized for a particular kind of use, rather than general use. All vision system elements including firmware can be integrated into one ASIC.

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

**Auxiliary Port** — RS-232 connection to an auxiliary terminal or device for remote viewing.

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

**CCD** — See **Charge-Coupled Device**.

**Charge-Coupled Device (CCD)** — A semiconductor device with an array of light-sensitive elements that converts light images into electrical signals.

**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.

**Concentrator** — Intermediary device that relays data from readers to a host and commands from the host to the readers or other devices.

**DAC** — See **Digital-to-Analog Converter**.

**Daisy Chain** — Linkage of primary and secondary readers allowing data to be relayed up to the host via auxiliary port connections.

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

**Default** — Restores **ROM** or flash settings and initializes 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.
- Darkfield Illumination** — Lighting of objects, surfaces, or particles at very shallow or low angles, so that light does not directly enter a reader's optical hardware.
- 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.
- Diffused Lighting** — Scattered soft lighting from a wide variety of angles used to eliminate shadows and specular glints from profiled, highly reflective surfaces.
- Digital-to-Analog Converter (DAC)** — A **VLSI** circuit used to convert digitally processed images to analog for display on a monitor.
- Digital Signal Processor (DSP)** — A **VLSI** chip designed for ultra-high-speed arithmetic processing.
- Discrete I/O** — Inputs and outputs characterized by discrete signal transitions from one voltage level to another so that digital switching can occur.
- Direct Memory Access (DMA)** — A capability provided by some computer bus architectures that allows data to be sent directly to memory from an attached device.
- DSP** — See **Digital Signal Processor**.
- EPROM** — See **Erasable Programmable Read-Only Memory**.
- Embedded Memory** — Onboard memory device such as **EPROM** or flash.
- End of Read Cycle** — The time or condition at which the reader stops expecting symbol information to decode.
- Erasable Programmable Read-Only Memory (EPROM)** — A memory chip that retains data when its power supply is turned off; "non-volatile memory".
- External Edge** — Allows a read cycle to be initiated by a trigger signal from an object detector when it detects the appearance of an object (rising edge). The read cycle ends with a good read, a timeout, or a new trigger.
- External Level** — Allows a read cycle to be initiated by a trigger signal from an object detector. The read cycle ends when the object moves out of the detector's range.
- Falling Edge** — A change of state (to inactive) associated with a level trigger.
- Field-Programmable Gate Array (FPGA)** — A semiconductor device containing programmable interconnects and logic components.
- 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.
- FPGA** — See **Field-Programmable Gate Array**.
- Full Duplex** — A communications system in which signals can travel simultaneously between devices.



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

**Half Duplex** — A communications system in which signals can travel between devices in both directions, but not simultaneously.

**Host** — A computer, **PLC**, 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 **CCD**, 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.

**Ladder Orientation** — A linear symbol orientation in which the bars are parallel to the symbol's direction of travel.

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

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

**Multidrop** — A communications protocol for networking two or more readers or other devices with a concentrator (or controller) and characterized by the use of individual device addresses and the RS-485 standard.

**Normally Closed** — A discrete output state that is only active when open.

**Normally Open** — A discrete output state that is only active when closed.

**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.

**Picket Fence Orientation** — A linear symbol orientation in which the bars are perpendicular to the symbol's direction of travel.

**Pitch** — Rotation of a linear or 2D symbol around an axis parallel to the symbol length on the substrate. **PLC** — **See Programmable Logic Controller.**

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

**Programmable Logic Controller (PLC)** — An electronic device used in industrial automation environments such as factory assembly lines and automotive manufacturing facilities.

**Protocol** — The rules for communication between devices, providing a means to control the orderly flow of information between linked devices.

**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.

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## *Glossary of Terms*

**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.

**Skew** — Rotation of a linear or 2D symbol around an axis parallel to the symbol height on the substrate. See the illustration under the definition of **Pitch**.

**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 Code 39 or Code 128, with special rules to define the widths and positions of bars and spaces to represent specific numeric or alphanumeric information.

**Tilt** — Rotation of a linear or 2D symbol around an axis perpendicular to the substrate. See the illustration under the definition of **Pitch**.

**Trigger** — A signal, transition, or character string that initiates a read cycle.

**Very Large-Scale Integration (VLSI)** — The creation of integrated circuits by combining thousands of transistor-based circuits on a single chip.

**VLSI** — See **Very Large-Scale Integration**.