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MICROSCAN.

MS-710 Scanner User's Manual



P/N 83-000700 Rev T

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About the MS-710 Scanner

The MS-710 is a programmable, fixed-mount, high-speed scanner that reads and decodes a wide variety of bar code symbols using a 10-sided spinning mirror to project laser beams over a wide scan angle.

A user interface program, the ESP (Easy Setup Program), can be downloaded from our web site (***www.microscan.com***) and runs on Windows 2000 or Windows XP operating systems. Alternately, configuration commands can be sent from an embedded, menu-driven terminal program, or directly by host serial command strings.

About This Manual

This manual provides complete information on setting up, installing, and configuring the MS-710 scanner. The chapters follow the ESP menus which are presented in the order in which a scanner might be setup and made ready for industrial operation.

Chapter 1, "Quick Start" provides overall step-by-step instructions for getting your scanner operational with specific "go to" references to other chapters and appendices.

The appendices include specifications, reference tables of serial commands, ASCII characters, multidrop setup and addresses, as well as other useful information relating to bar coding and electrical and mechanical setups for the scanner.

Highlighting

Serial commands, selections inside instructions, and menu defaults are highlighted in **red bold**. Cross-references are highlighted in **blue bold**. Web links and outside references are highlighted in ***blue bold italics***. References to menu topics are highlighted in **Bold Initial Caps**. References to topic headings within this manual or other documents are enclosed in quotation marks.

Host Communications

There are three ways the scanner can communicate with a host:

1. Microscan's Windows™ based **ESP™**, the preferred method which offers point-and-click ease of use and visual responses to user adjustments.
2. Serial commands such as **<Kr1>** can be sent from a terminal program. They can also be sent from the **Terminal** window within ESP.
3. Embedded onboard menus are accessed from a terminal window with a **<D>** command.

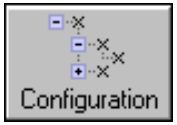
About ESP

ESP is composed of two basic modes **Setup Mode** and **App Mode** (applications). The icons shown here are used to move between these modes and are located in the upper left corner of the ESP window.





In the **App Mode**, click the **Configuration** icon to bring up the configuration views for **Read Cycle**, **Symbologies**, **I/O**, **Matchcode** and **Diagnostics**.



Note: Throughout ESP, the term "reader" applies to both readers and scanners.

For more information, see **"Using ESP" in chapter 2**.

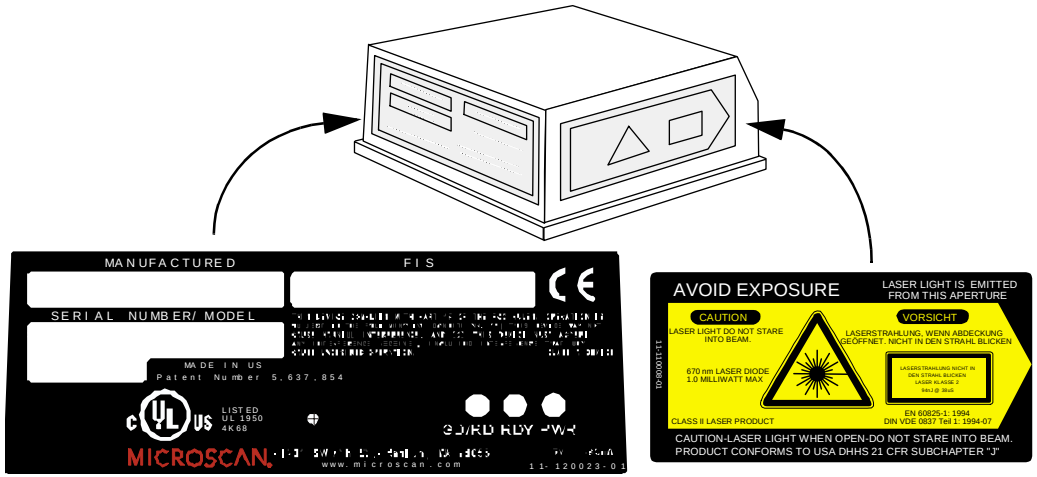
Approvals

This equipment is in compliance or approved by the following organizations:

- UL (Underwriters Laboratories, Inc.)
- cUL (UL mark of Canada)
- FCC (Federal Communication Commission)
- CE Compliant
- BSMI (Bureau of Standards, Metrology and Inspection)

Safety Labels

These Class II labels are located on the MS-710 scanner.



Back Side

Warning and Caution Summary

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

For connection to a UL Listed direct plug-in power unit marked Class II and rated at 5VDC at 2 amps or greater.European models must use a similarly rated Class I or Class II power supply that is certified to comply with standard for safety EN 60950.



WARNING

Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous laser light radiation exposure.



WARNING

There are no user serviceable parts in the scanner. Opening the scanner voids the Microscan Systems warranty and could expose the user to laser diode power of up to 5 mW.



WARNING

The laser beam can be harmful to eyesight. Avoid eye contact with the laser beam. Never point the beam at other people, or in a direction where people may be passing.

Chapter

1

Quick Start

Chapter Contents

Step 1 Hardware Required 1-2
Step 2 Connect the System 1-3
Step 3 Install ESP 1-4
Step 4 Select Scanner Model 1-5
Step 5 Autoconnect 1-6
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This chapter is designed to get your scanner up and running quickly using Microscan's **ESP™** so the user can get a sense of its capabilities and test bar code symbol samples. Detailed setup information for installing the scanner into the actual application can be obtained in the subsequent chapters. **ESP**™ is Microscan's proprietary **E**asy **S**etup **P**rogram, a Windows™ based graphic user interface that resides on the user's host computer and allows the user to fully configure, test, and operate Microscan's 1D and 2D symbology readers

As an alternative to **ESP**, you can setup the scanner by sending serial commands or by using the scanner's embedded menus.

Step 1 — Hardware Required

(Refer to **figure 1-1**.)

Item	Part Number	Description
1	FIS-0710-XXXX	MS- scanner
2		A host computer[a]
3	61-300026-01	Cable, Communication, DB-25 Plug to DB-9 Socket, 6 foot.[b]
4		IB-105 interface Box
5	97-100002-01 (120V) 97-100002-02 (240V)	Power supply
6	99-4400021-03	Optional object detector

a. With either a terminal communications program or Microscan's ESP™ which runs under Windows™ operating system, Windows-95 or higher, including Windows NT™ and Windows XT.

b. If using another host cable, make certain it does not have RTS/CTS connected to the host.

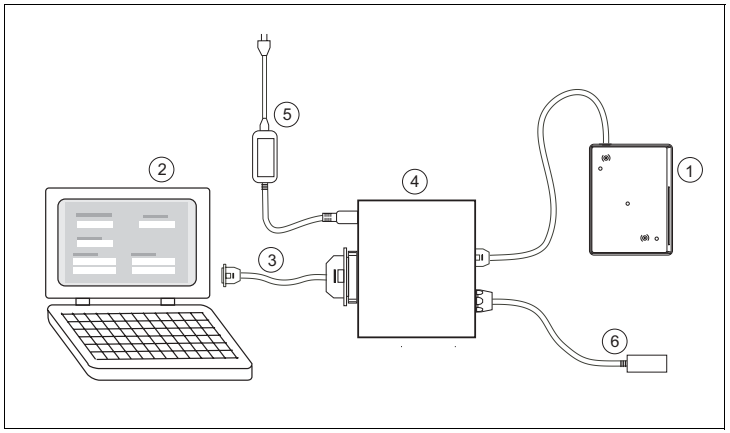


Figure 1-1 MS-710 Hardware Configuration

Caution: If using your own power supply, be certain that it is wired correctly and supplies voltage is 5VDC is within the +10 to 28VDC limits. Incorrect wiring or voltage can cause software or equipment failures.

Step 2 — Connect the System

(Refer to **figure 1-1**.)

1. Connect the scanner to the 15-pin connector of the IB-105 interface box, using the attached 3-foot cable custom cable or Microscan's P/N 61-130019-03.[1]

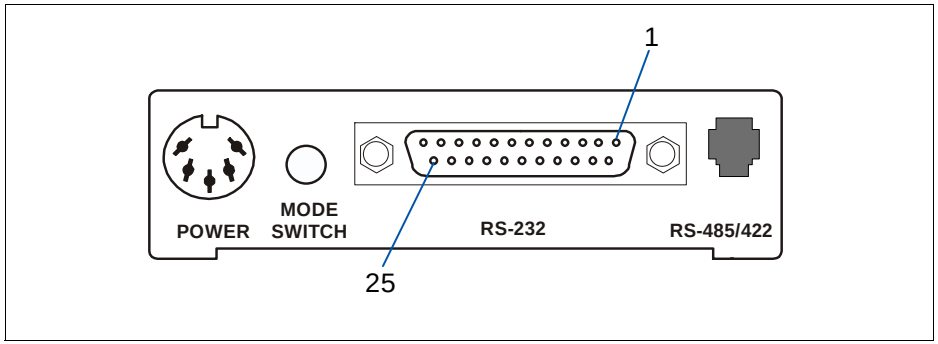


Figure 1-2 IB-105 showing Host 25-pin Connector

2. Connect the IB-105's "RS-232" 25-pin connector to the host computer.[2]
   (Refer to tables in **"IB-105 Connectors and Pinouts" on page A-10** for pin connections.)
3. Connect the power supply to the IB-105's POWER connector.
4. Connect power to the system.

Caution:
1. Be sure all cables are connected **BEFORE** applying power.
2. Always power down **BEFORE** disconnecting any cables.

1. Since +5 VDC power supply is included in the single cabling assembly, the scanner cable should not exceed 3 feet. RS-232 cabling from the 15-pin connector to the host can be up to 47 feet provided it does not include 5 VDC input
2. If using your own null modem RS-232 host cable, be certain that the host's TxD connects to the scanner's RxD and the scanner's TxD connects to the host's RxD.

Step 3 — Install ESP[1]

(**ESP** is short for *Easy Setup Program*.)

With your scanner connected to a host computer with Windows™ operating system, you can use the ESP to configure and control the scanner.

1. Insert your Microscan CD into your computer's CD drive.
2. Launch **Setup.exe** under **ESP** and follow the prompts.

   If downloading from the web:

   a) Go to ***http://www.microscan.com/esp***

   b) Enter company information.

   c) Select **ESP** and download to your computer hard drive.

   d) Extract **ESP WinZip** files to a directory of your choice.
3. Note where your ESP.exe file is stored on your hard drive.

   At the end of the install process, copy a shortcut of the ESP icon to the desktop.

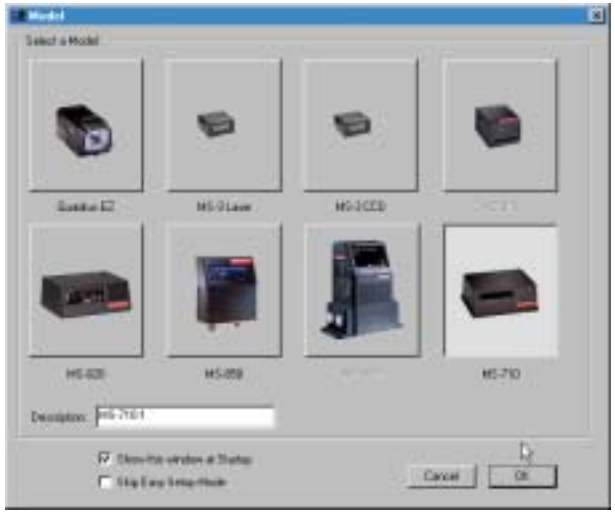


4. Click the **ESP** icon to start the program.

1. You can also access the scanner through its embedded menus. See **"Embedded Menus" on page A-19**.

Step 4 — Select Scanner Model

When you start the program, the following menu will appear:

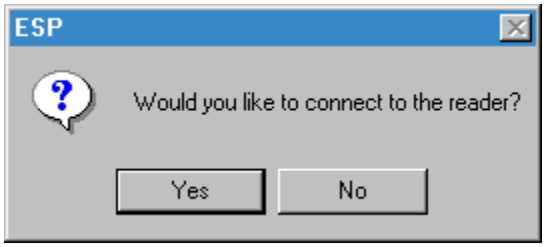


Note: If you need to select another model later, you can find it in the **App Mode** under **Model** on the menu bar.

1. In the **Model** dialog box, select your model.

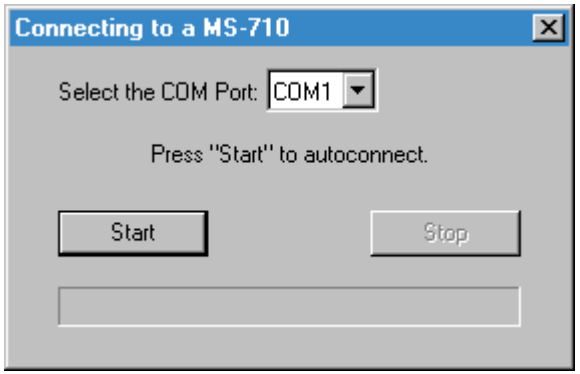
   If you do not want to make this selection every time you load ESP, uncheck **Show this window at Startup**.

2. Select the default name, for example **MS-710-1**, or type in a file name of your choice and click **OK.**
3. Click **Yes** when the **connect to the scanner** dialog appears.



Step 5 — Autoconnect

1. In the **Connecting to...** dialog, select your communications port under **COM Port**.



2. Click the **Start** button.
3. Allow time for the autoconnect routine to test all of the combinations. You will see a blue progress bar fill across the **Connecting to...** dialog.

   When connected, the **CONNECTED** message will appear in a green box in the status bar on the bottom right of the dialog.



Tip: If connection fails, enable a different Com port and try again.

Tip: If you do not see either the CONNECTED or DISCONNECTED message at the bottom of your dialog, try expanding the ESP window horizontally.

Step 6 — Position Symbol and Scanner

1. Set up a bar code symbol[1] at the scanning distance you will be using in your application.[2]
2. Avoid bright light or IR light from other sources, including other scanners.
3. Pitch symbol or scanner a minimum of ±15° to avoid specular reflection, the return of direct, non-diffused light.

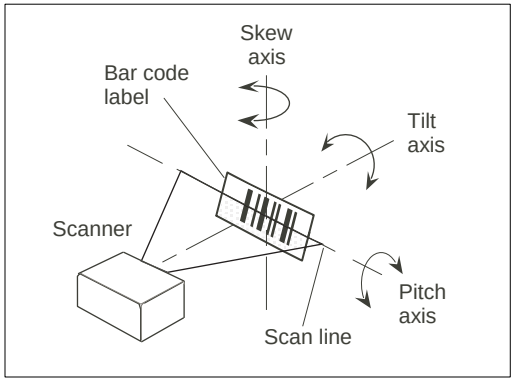


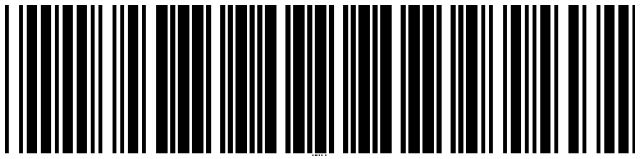
Figure 1-3 Symbol/Scanner Position

Code 39 is the default symbol type enabled. If you are uncertain as to your symbology type, enable all codes (see **"Autodiscriminate" on page 5-17**).

1. If using an I 2/5 symbol, verify that the number of characters in the symbol being scanned matches the symbol length enabled for the I 2/5 symbol type (default is 10 and 6). See **"Interleaved 2 of 5" on page 5-7**.
2. Consult **"LED Indicators" on page A-3**.

Step 7 — Test for Read Rate

If you don't have a test symbol, print out this page and use the symbol here for testing.



20 mil Code 39 Test Symbol

You can also find test symbols on the back of the Microscan Marketing CD jacket. The 20 mil refers to the width of the narrowest bar (e.g., 7.5 mil = .0075" or .1905 mm).

By ESP

After connecting to the scanner, ESP will open in **Easy Setup Mode**.

1. Click the **Test** button in Easy Setup Mode to begin the read rate test.



2. Follow the instructions in **Easy Setup Mode** screen.
3. To end the **Read Rate** test, click the **Stop** button.

Note: If the scanner is in the default **Continuous Read** mode, it will read and beep repeatedly as long as a readable symbol remains in the read range and the read cycle configuration has not changed.

Note: See **"Formulas for Number of Decodes" on page A-24** for additional information on scan width and depth of field.

By Serial Commands

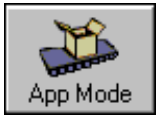
Send an **<C>** to begin the read rate test.

Send a **<J>** to end the read rate test.

Step 8 — Configure the Scanner

By ESP

To make change scanner settings, or to access the utilities or terminal window, click on the **App Mode** button.



To return to the **Easy Setup Mode**, click on the **Setup Mode** button.



See **Chapter 2, "Using ESP"** for detailed explanation of ESP features.

By Serial Commands

From your terminal program or the terminal screen in ESP, you can enter serial string commands configuration and utility commands as described herein.

See **"Serial Configuration Commands" on page A-11** and **"Summary of Utility Serial Commands" on page 9-3**.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<KA?>** To see all "K" commands, send **<K?>**.

By Embedded Menu

From your terminal program you can send a **<D>** command to access the embedded menus.

See **"Embedded Menus" on page A-19**.

Chapter

2

Using ESP

Chapter Contents

Easy Setup Mode 2-2
Application Mode 2-3
Pulldown Menus 2-4
Making Changes in ESP 2-6
Send/Receive Options 2-7

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

When you start up ESP, unless otherwise specified, you will enter the **Easy Setup** mode for initial setup. From there, you move easily into the **App Mode** (application mode) where you can access several configuration and utilities menus.

Easy Setup Mode

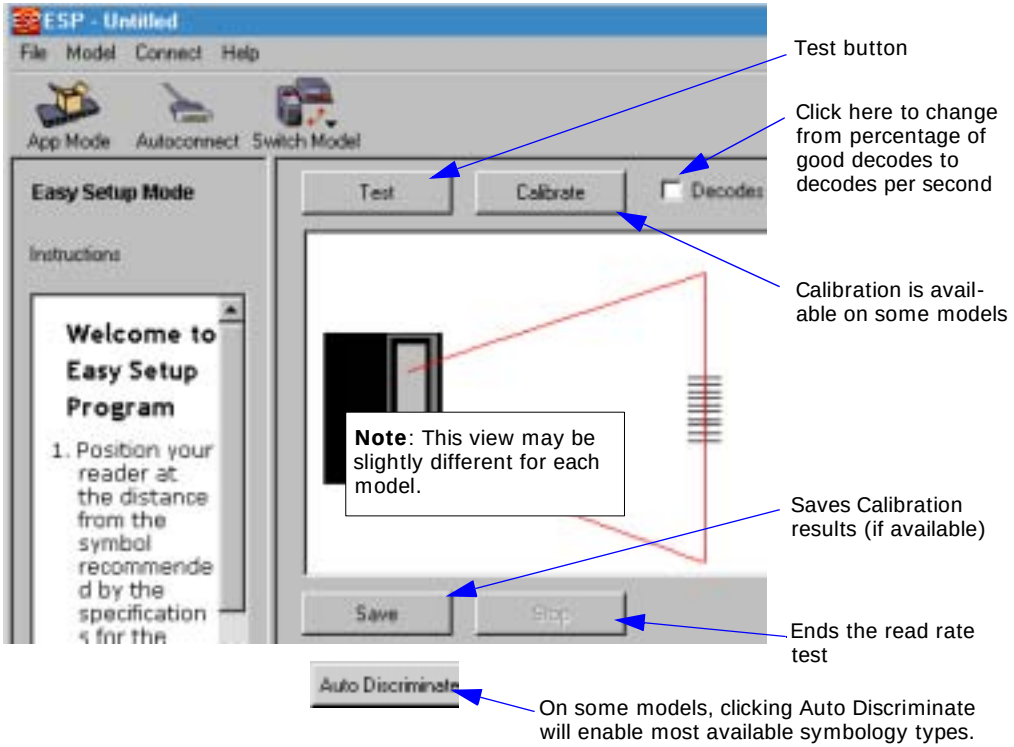
In **Easy Setup Mode** you are presented with the **Test** option and if appropriate for your application, **Calibration**. After connecting to your scanner (or reader) the **Setup Mode** will first appear. This will provide you with instructions specific to your model that will help you in positioning, testing, and if appropriate, calibrating.

Test

Click the **Test** button to start the read rate test for a quick indication of the read capabilities and the limits of your application. When **Decodes per Second** is unchecked, the test will count the percentage of decodes relative to the number of actual scans. Click **Stop** to end the test.

Calibrate

Some models include a calibration routine that will optimize reads by comparing read rates at various settings in focal lengths, scan speeds, and gain settings.

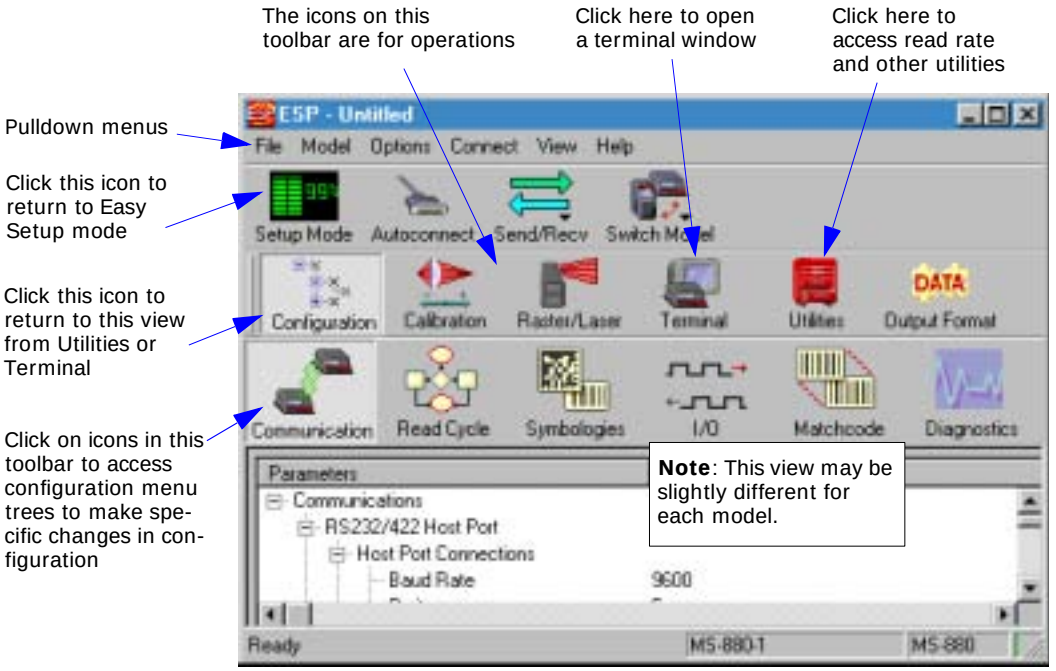


Application Mode

From **Easy Setup Mode**, you can click on the **App Mode** button to access specific configuration menus, utilities, and a terminal window where serial commands can be entered.



Note that the **App Mode** and **Setup Mode** buttons appear in the same position to allow easy switching between these primary modes.



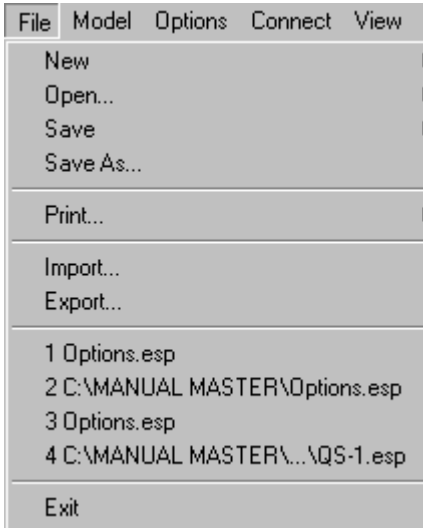
Note: For specific information on any of the icons shown above in the operations bar or configuration bar, see specific chapters in this document.

Pulldown Menus

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 your scanner. **Figure 2-1** shows how settings can be saved and received between ESP and the scanner and ESP and the host hard drive.

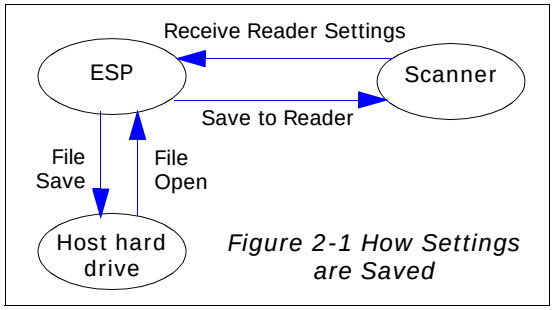


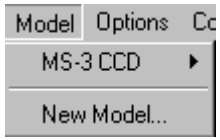
Figure 2-1 How Settings are Saved

Import/Export

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

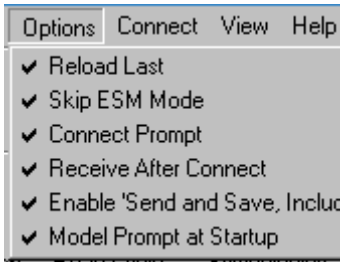
Model

When you select **New Model,** you can define configuration settings for another model. When you save to the hard drive, you will be saving the settings of all the models defined in a single ESP file.



Options

You can use the **Options** menu to tell ESP how you wish it to perform at startup.



Note: The settings you select here will be saved and be loaded into ESP when ESP is opened next, whether or not you save the ESP file to the computer.

Reload Last

At startup, reloads the last file saved to the computer.

Skip ESM Mode

Skips the **Easy Setup Mode** and opens directly in the **App Mode**.

Connect Prompt (enabled by default)

At startup, asks if you would like to connect to the scanner.

Receive After Connect

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

Enable 'Send and Save, Including Factory'

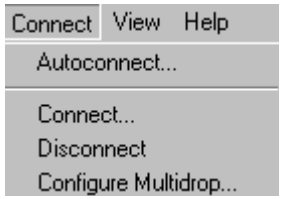
Enables the 'Send and Save, Including Factory' option in the Send/Recv command.

Model Prompt at Startup (enabled by default)

At startup, prompts you to select a scanner model. If this is unchecked, then ESP will automatically load the last model accessed.

Connect

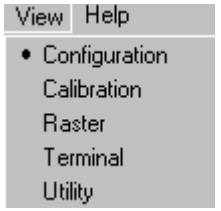
Generally **Autoconnect** will be the quickest way that ESP can get connected to a scanner. **Autoconnect** will try connecting at the most common communications settings and step through the various settings until they match up with the host's settings.



When you select **Connect**, you will need to manually select the communications settings from a popup dialog.

View

View tells you what view is current and allows you to quickly move to other views which are also accessed by clicking the icons on the toolbars.



Making Changes in ESP

To change scanner settings, or to access the utilities or terminal window, click on the **App Mode** button.



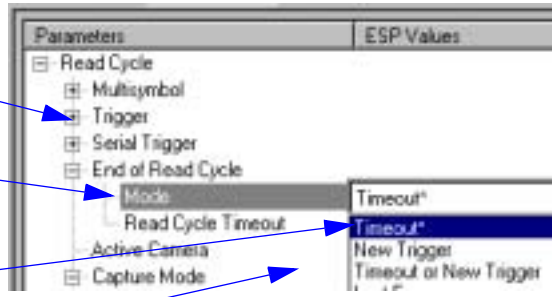
To return to the **Easy Setup Mode**, click on the **Setup Mode** button.



See the succeeding chapters and Appendices to see specific configuration command explanations for both ESP and serial commands.

To make changes to a configuration setting in the menu trees:

1. **Left click** on the **+** to expand tree
2. **Double click** on parameter and click once in selection box to view options.
3. Place your curser in the selection box, scroll down to the setting you want to change and **click** once on the setting.
4. **Left click** again on the open screen to complete the selection.

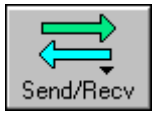


5. **Right click** on the open screen and select **Save to Scanner** to implement the command in the scanner.

Send/Receive Options

To access save and receive options, from the **Configuration** views click the **Send/Recv** button:

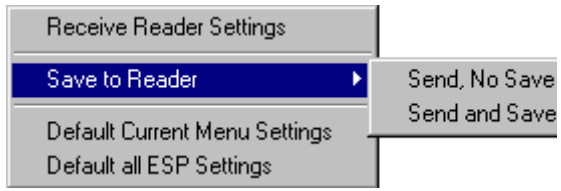




You can also access this selector by right-clicking in any of the configuration views.

Saving

You have 3 choices for saving:



1. **Send, No Save**.

This saves ESP settings to current memory.

2. **Send and Save**.

This activates all changes in current memory ***and*** saves to the scanner for power-on. (Similar to the <Z> command.)

3. **Send and Save, Including Factory.** Includes all settings including changes to factory settings.

For **Multidrop** setup, see **"Multidrop Communications" on page A-29**.

For **Matchcode** setup, see **Chapter 7, "Matchcode."**

For more on defaulting and saving settings, see **"Defaulting/Saving/Initializing" on page A-20**.

Receiving

From the **Send/Recv** selector select **Receive Reader Settings.**

This is useful if you want to receive (upload) the scanner's settings and save them as a computer file for later retrieval and to verify that your ESP settings have been saved or that you have not saved any unwanted changes that you or someone else previously made in ESP.

Defaulting

When you select **Default Current...** or **Default all ESP...** you are only defaulting the ESP settings. To default the scanner, see **"Defaulting/Saving/Resetting" on page A-21** for a more information.

Chapter 3 Communications

Chapter Contents

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Preamble.....3-18
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With Microscan's ESP™ (Easy Setup Program), configuration changes can be made in the ESP menus, then sent and saved to your scanner. The user can also send serial commands to the scanner via the ESP's Terminal window.

This section includes connecting parameters and options for communicating by the auxiliary port and various interfaces.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: Default settings for establishing communications are:

Baud = **9600**
Parity = **Even**
Stop Bits = **One**
Data Bits = **Seven**
Flow Control = **None**

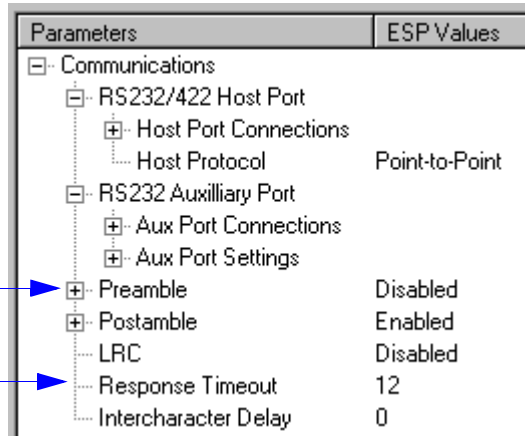
Communications by ESP



Click this button to bring up the **Communications** menu.

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 by Serial Command

Command Title	Format
Host Port Connections	<**Ka***baud,parity,stop bits,data bits*>
Host Protocol	<**Kf***protocol*>
Auxiliary Port	<**Ky***aux port mode,baud,parity,stop bits,data bits,daisy chain status,daisy chain ID*>
Preamble	<**Kd***status,preamble*>
Postamble	<**Ke***status,postamble*>
LRC	<**Kc***status*>
Response Timeout	<**KA***response timeout*>
Intercharacter Delay	<**KB***intercharacter delay*>

RS-232/422 Host Port

Includes host port connections and host protocols.

Host Port Connections

Baud Rate, Host Port

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

Definition: The rate at which the scanner and host transfer data back and forth.

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

Default: **9600**

Options:

0 = 600	3 = 4800	6 = 38.4K
1 = 1200	4 = 9600	7 = 76.8K[a]
2 = 2400	5 = 19.2K	8 = 300

a. Not available in ESP.

Parity, Host Port

Usage: Only changed if necessary to match host setting.

Definition: 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.

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

Default: **Even**

Options: 0 = None 1 = Even 2 = Odd

Stop 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: <**Ka***baud rate*,*parity*,***stop bits***,*data bits*>

Default: **One**

Options: 0 = One 1 = Two

Data Bits, Host Port

Usage: Only changed if necessary to match host setting.

Definition: Number of bits in each character.

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

Default: **Seven**

Options: 0 = Seven 1 = Eight

Host 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 scanner and the host, or in the case of **Multidrop**, between scanners and a concentrator.

Serial Cmd: <**Kf***protocol*>

Default: **Point-to-Point**

Options:

0 = Point-to-Point	4 = Polling Mode D
1 = Point-to-Point with RTS/CTS	5 = Multidrop
2 = Point-to-Point with XON/XOFF	6 = User Defined
3 = Point-to-Point with RTS/CTS & XON/XOFF	7 = User Defined Multidrop

If selecting one of the options from 0 to 4 (**Point-to-Point**, **Point-to-Point with RTS/CTS**, **Point-to-Point with XON/XOFF**, **Point-to-Point with RTS/CTS and XON/XOFF**, or **Polling Mode D**), use the <**K140,***protocol*> format.

Option 5 through 7 are special cases and discussed later in this section.

Point-to-Point (standard)

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

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

Serial Cmd: <**Kf*0***>

Point-to-Point with RTS/CTS

Usage: A scanner 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. CTS and RTS 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 handshaking protocol that allows a scanner to initiate data transfers to the host.

Serial Cmd: <**Kf*1***>

Point-to-Point with XON/XOFF (Transmitter On/Off)

Usage: If an XOFF has been received from the host, data will not be sent to the host until the host sends an XON. During the XOFF phase, the host is free to carry on other chores and accept data from other devices.

Used only with RS-232.

Definition: This option enables the host to send the XON and XOFF command as a single byte transmission command of start (^Q) or stop (^S).

Serial Cmd: <**Kf*2***>

Point-to-Point with RTS/CTS & XON/XOFF

Usage: Used only with RS-232.

Definition: This option is a combination of **Point-to-Point with RTS/CTS** and **Point-to-Point with XON/XOFF.**

Serial Cmd: <**Kf*3***>

Polling Mode D

Usage: When in **Polling Mode D,** an address of 1 is automatically displayed on the configuration screen. However, during transmission, a 1C hex poll address (FS) and a 1D hex select address (GS) are substituted for the 1.

Definition: Like **Point-to-Point**, **Polling Mode D** requires a dedicated connection to the host; but unlike **Point-to-Point**, it requires an address and must wait for a poll from the host before sending data.

Serial Cmd: <**Kf*4***>

Multidrop

Note: See also **"Multidrop Communications" on page A-29**.

Usage: The MS-5000 can be used as a concentrator to a single host port connection.

Definition: **Multidrop** allows up to 50 devices to be connected to a single RS-485 host, with the scanner assigned an unique address (from 01 to 50). When **Multidrop** is selected, the protocol characters for RES, REQ, etc. are assigned automatically.

Multidrop Addresses: Each address has its own separate poll and select address (from 1C to 7F hex).

Options: 01 through 50

Serial Cmd: If selecting **Multidrop** <K140,5> fan address must be defined and appended to the command string.

Format: <**Kf5**,*address[01 to 50]*>Format: <**K140,5**,*address[01 to 50]*>

Note: Scanners linking up to a Microscan MS-5000 multidrop concentrator must be configured in standard multidrop protocol.

User Defined Point-to-Point

Usage: Used for developing custom protocols in polled or unpolled mode.

Definition: **User Defined Point-to-Point** allows the user to customize the point-to-point protocol.

Serial Cmd: <**Kf6**,*RES,address,REQ,EOT,STX,ETX,ACK,NAK,from host*>

User Defined Address

Definition: **User Defined** is considered to be in a polled mode only if an address has been assigned.

Serial Cmd: <**Kf6**,*RES,**address**,REQ,EOT,STX,ETX,ACK,NAK,from host*>

Default: No address

Options: Any ASCII character except a null.

User Defined Example

Example: An ACK/NAK protocol can be configured using **User Defined**. The scanner will transmit data to the host when an **ACK** is received. If a **NAK** or response timeout occurs, the scanner will re-send the data to the host up to 3 more times before aborting.

Tip: To use **User Defined Point-to-Point**, first select **Point-to-Point <K140,*0*>** and then **User Defined <K140,f*6*>**.

Example: To select an unpolled ACK/NAK **User Defined** protocol with LRC disabled, send **<Kf*0*><Kf*6*,,,,,,,^F,^U><Kc*0*>**. ACK and NAK will be displayed in the menu.**Tip**: To use **User Defined Point-to-Point**, first select **Point-to-Point <Kf*0*>** and then **User Defined <Kf*6*>**.

Example: To select an unpolled ACK/NAK **User Defined** protocol with LRC disabled, send **<Kf*0*><Kf*6*,,,,,,,^F,^U><Kc*0*>**. ACK and NAK will be displayed in the menu.

Serial Cmd: <**Kf*6***,*RES,address,**REQ,EOT,STX,ETX,ACK,NAK***,*from host*>

Default: **No assignment**

Options: Any ASCII character except a null. Control characters can be used to define RES through NAK in serial commands.

From Host

Definition: Allows the handshaking protocol to be initiated from the host, if not configured in an unpolled mode. Messages sent to the host will include the scanner's defined protocol. The status of **From Host** determines if messages sent from the host to the scanner must include the defined protocol. If **From Host** is disabled, the defined protocol is not included. If **From Host** is enabled, the defined protocol must be included.

Serial Cmd: <**Kf*6***,*RES,address,REQ,EOT,STX,ETX,ACK,NAK,**from host***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

User Defined Multidrop

Note: Any ASCII character except a null (00) and a ^A (01) can be assigned as an address. Control characters can be used to define RES through NAK in serial commands. See (See **"Communication Protocol Commands" on page A-18.**)**Note**:

Usage: Used when connecting to a concentrator or other device that does not match standard multidrop protocol.

Definition: **User Defined Multidrop** allows the user to customize the polling protocol.

If selecting **User Defined Multidrop** (7), complete the format by either choosing new parameters or place commas where unchanged data fields occur.

Serial Cmd: <**Kf7**,*RES,address,REQ,EOT,STX,ETX,ACK,NAK*>

For **User Defined Multidrop**, first select **Multidrop <K5>**, then **User Defined Multidrop <K7...>**.

Address: Any single character (02 hex to 7E hex) in the ASCII table can be assigned as the address character. The character chosen is used as the poll character and the subsequent ASCII character becomes the select character. For example, if a **^B** (02 hex) is selected as the address, **^C** (03 hex) becomes the select address that the host will use in sending host select commands.

Definitions of commands in **User Defined** and **User Defined Multidrop** must be duplicated in host applications to enable poll and select sequences to execute correctly during transmission.

Note: Typically, parameters in **User Defined Multidrop** are defined by first enabling **Multidrop**, then enabling **User Defined Multidrop**. This pre-loads multidrop characters into the parameters. Then changes are made to individual characters to match the host or other requirements.

RS-232 Auxiliary Port

Note: The aux port cannot be used when the host port is set to **RS-422** or **Multidrop**.

As with the host port parameters, the auxiliary terminal's settings (baud rate, parity, stop bits, and data bits) must be identical with those of the auxiliary device.

Usage: These commands set the communication parameters with the auxiliary port which can be used to configure menus, send data to the host, display data transmissions originating from the host of the scanner, and relay data from other scanners set in tandem (daisy chained).

Definition: An auxiliary port connects the scanner to a remote display or to other scanners that can display or transfer data.

Aux Port Connections

As with the host port parameters, the auxiliary terminal's settings (baud rate, parity, stop bits, and data bits) must be identical with those of the auxiliary device.

Baud Rate, Aux Port

Usage: Can be used to transfer data faster or match an auxiliary device.

Definition: The rate at which the scanner and host transfer data back and forth.

Serial Cmd: *<**Ky**aux port mode,**baud rate**,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

Default: **9600**

Options:

0 = 600	3 = 4800	6 = 38.4K
1 = 1200	4 = 9600	7 = 76.8K[a]
2 = 2400	5 = 19.2K	8 = 300

a. Not available in ESP.

Parity, Aux Port

Usage: Only changed if necessary to match host setting.

Definition: 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.

Default: **Even**

Options: *<**Ky**aux port mode,baud rate,**parity**,stop bits,data bits,daisy chain ID status,daisy chain ID>*

Serial Cmd: 0 = None 1 = Even 2 = Odd

Stop Bits, Aux Port

Usage: Only changed if necessary to match host setting.

Definition: Allows the user to select the last one or two bits in each character to indicate the end of the character.

Serial Cmd: <**Ky***aux port mode,baud rate,parity,**stop bits**,data bits,daisy chain ID status,daisy chain ID>*

Default: **One**

Options: 0 = One 1 = Two

Data Bits, Aux Port

Usage: Only changed if necessary to match host setting.

Definition: Number of bits in each character.

Serial Cmd: <**Ky***aux port mode,baud rate,parity,stop bits,**data bits**,daisy chain ID status,daisy chain ID>*

Default: **Seven**

Options: 0 = Seven 1 = Eight

Aux Port Mode

Note: The aux port interacts only with the host port via the 25-pin port except when in **Daisy Chain** mode. When in **Daisy Chain** mode, the aux port will also interact with the configuration port (9-pin port) or the wiring box network ports.

Definition: Determines the flow of data between the auxiliary port device(s), the scanner, and the host.

Serial Cmd: <**Ky***aux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

Default: **Disabled**

Options:

0 = Disabled
1 = Transparent
2 = Half duplex
3 = Full duplex
4 = Daisy chain

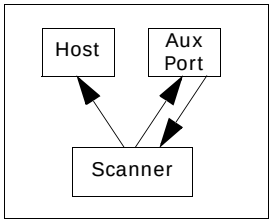
Transparent Mode

Usage: Often used in conjunction with handheld scanners. Employs an auxiliary readout to detect mis-applied bar code symbols.

Definition: In **Transparent** mode data is passed between the auxiliary port and the host. The scanner buffers data from the auxiliary port and echoes the keyed data on the auxiliary port. I

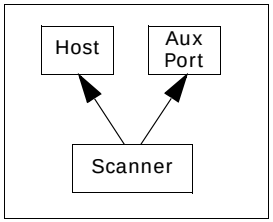
Data initiated from the Auxiliary Port

- Auxiliary port data is passed through to the host whenever a return key is pressed at the auxiliary port or symbol data is sent.
- Whenever aux port data is sent with symbol data, the aux port data will appear between the preamble and the symbol data.
- Auxiliary port data to the host is always sent with a preamble and a postamble.
- If the scanner is in a polled mode to the host, auxiliary port data will NOT pass through.
- **<D>** is the only command accepted by the scanner from the auxiliary port. All other commands will pass through to the host.



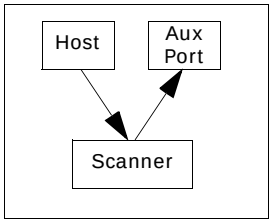
Data initiated from the Scanner

- Transmission to the auxiliary port occurs immediately upon a good read.
- Scan data to the auxiliary port does not include a preamble or a postamble.
- Communications with the auxiliary port is always in Point-to-Point protocol, even if the host is in a polled protocol mode.



Data initiated from the Host

- All host data is echoed to the auxiliary port in unpolled mode.



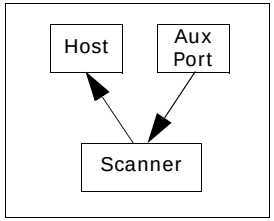
Serial Cmd: *<**Kyaux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*
1 = Transparent

Half Duplex Mode

Usage: Used to display symbol data on an auxiliary screen close to the scanner.

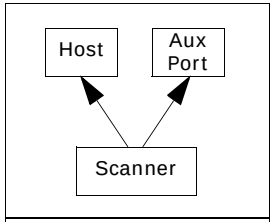
Definition: In **Half Duplex** mode all auxiliary port data and symbol data is sent directly to the host. Symbol data is displayed on the auxiliary port screen at the same time the data is sent to the host.

Data initiated from the Auxiliary Port



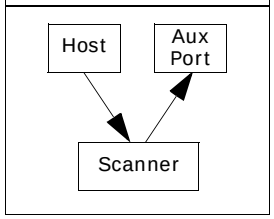
- Auxiliary port data to the host is ignored if the scanner is in a polled mode.
- Auxiliary port data or scanned data is sent to the host whenever it is received.
- Auxiliary port data is not echoed.
- Auxiliary port data to the host is always sent without a preamble or a postamble.
- **<D>** is the only command that is accepted by the scanner from the auxiliary port. All other commands are passed through to the host.

Data initiated from the Scanner



- Scan data is transmitted to the auxiliary port at the same time it is transmitted to the host.
- Data transmission conforms with all parameters specified in the configuration menu (e.g., **Preamble**, **Postamble**, **End of Read Cycle**).

Data is initiated from the Host



- All host data is echoed to the auxiliary port in unpolled mode.

Serial Cmd: <**Ky*aux port mode*,***baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

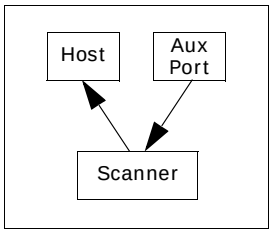
2 = Half Duplex

Full Duplex Mode

Usage: Used when communication to and from the auxiliary port is required.

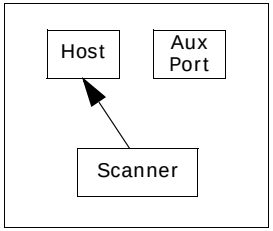
Definition: In **Full Duplex** mode all auxiliary port data and symbol data is sent directly to the host. Symbol data is not displayed on the auxiliary port screen.

Data initiated from the Auxiliary Port.



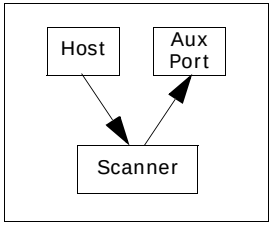
- Auxiliary port data to the host is ignored if the scanner is in a polled mode.
- Auxiliary port data or scanned data is sent to the host whenever it is received.
- Auxiliary port data is not echoed.
- Auxiliary port data to the host is always sent without a preamble or a postamble.
- **<D>** is the only command that is accepted by the scanner from the auxiliary port. All other commands are passed through to the host.

Data initiated from the Scanner.



- Scan data is not sent to the auxiliary port.

Data initiated from the Host



All host data is echoed to the auxiliary port in unpolled mode.

•

Serial Cmd: *<**Kyaux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

3 = Full duplex

Daisy Chain Mode

Usage: Used in applications where:

- A symbol might be scanned in both ladder and picket fence directions.
- A bar code symbol may be present on multiple sides of a package.
- Bar code symbols are presented at different depths.

Definition: In a daisy chain application, scanners are connected in tandem or “daisy chain” and decoded data is relayed from one scanner to another on up to the host.

A master scanner has its host port linked to the host computer and its auxiliary port linked to the host port of the first secondary scanner in the chain. Thereafter, each secondary’s auxiliary port is linked to the host port of the secondary that is further from the host in the daisy chain.

Each scanner in the daisy chain can be assigned an ID that accompanies any data that it sends.

Serial Cmd: *<**Kyaux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

Options: **4 = Daisy chain**

Function: Before the master scanner times out, it checks its auxiliary port for data. It should be set to wait at least mS for each secondary in the daisy chain. If no data is received within the read cycle timeout, the master sends a noread message to the host. Otherwise the complete data is sent.

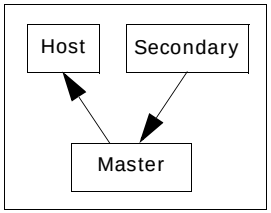
If for example the master scanner is set to timeout in 120 mS, the first secondary scanner downstream might be set to 100 mS, the next to 80 mS, and so forth, thus assuring that at least 20 mS elapses between transmissions.[a]

Daisy-chained scanners can send a series of symbols by enabling **Multi-symbol** and a common multisymbol separator. If the master scanner does not receive the expected number of symbols, noread messages are appended to the data string to make up the difference between the number of symbols enabled in **Multisymbol** and the number of symbols read.

For example, a master and two secondary scanners have **Number of Symbols** set to 3 and **Multisymbol Separator** defined as %. If the master and the first secondary scanner do not find symbols, but the next secondary scanner registers a good read, the transmitted results would be: symbol data % noread % noread.

a. The above example is based on the best case. Other factors such as baud rate, number of characters in a given symbol, and the number of secondaries in the daisy chain can affect timing and may need to be included in your calculations for complete accuracy.

Conditions: The conditions for a daisy chain application are as follows:



1. The master scanner's trigger must be **Serial** or **External**; the secondary scanners' triggers are configured for **Serial**.
2. All scanners are enabled to **Daisy Chain** mode.
3. Each scanner's auxiliary port must be connected to the Host port of its secondary scanner.
4. Each secondary scanner in the daisy chain must be set to send its data no less than **20** mS before its preceding scanner.
5. All but the master scanner must have **Postamble** enabled and set to **CR** (^M) only.
6. All but the master scanner must have their noread messages disabled.
7. If **Multisymbol** is enabled, **Multisymbol Separator** characters must match in all scanners and **Number of Symbols** must be set to number large enough to include all the symbols it may itself read plus the number of symbols that it will be expected to relay to the host or the next scanner up the line.
8. **Symbology ID** enable/disable must be the same in all scanners.
9. All but the master scanner must have their diagnostic warning messages disabled.
10. **Daisy Chain ID Status** enable/disable and the number of characters in **Daisy Chain ID** must be the same in all scanners.

Daisy Chain ID Status

Note: Enable/disable and length must be the same in all scanners.

Usage: Used in a daisy chain setup in cases where the host needs to know which scanner in a daisy chain setup sent the data.

Definition: Each scanner in a daisy chain can be assigned a one or two character ID that will appear in front of decoded data and identify its source.

Serial Cmd: <**Ky***aux port mode,baud rate,parity,stop bits,data bits,**daisy chain ID status**,daisy chain ID*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Daisy Chain ID

Usage: Used in a daisy chain setup in cases where the host needs to know which scanner sent the data.

Definition: A one or two character prefix which identifies the particular daisy chain scanner from which the data is being sent.

Serial Cmd: <**Ky***aux port mode,baud rate,parity,stop bits,data bits,daisy chain ID status,**daisy chain ID***>

Default: **1***/*

Options: Any one or two ASCII characters.

Preamble

Preamble Status

Usage: Used 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 of on its own line.

Definition: Up to two user defined ASCII characters, including control characters, can be defined and added to the front or end of the data string that is sent from the scanner to the host.

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

Default: **Disabled**

Options: 0 = Disabled

1 = Enabled (within any protocol)

Preamble Character(s)

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

Default: **^M** corresponds to: **carriage return / null / null / null**.

Options: Up to two user-defined ASCII characters, including control characters.

Within a Serial Command

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

Example: **<K141,CNTL-m>** to enter **^M**

Within an Embedded Menu

Control characters entered on the command line are displayed in the menu as mnemonic characters, such as: <CR><NUL><NUL><NUL>.

To enter a control character from within an embedded menu, first type in a space (with the space key). This has the effect of allowing the control key to be recognized as a part of the control character. Next hold down the control key while typing the desired character.

Example: **Space CNTL-m** to enter **^M.**

Postamble

Postamble Status

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

Definition: Defines a one- or two character data string that can be added to the end of the decoded data.

Serial Cmd: <**Ke*status***,*postamble character(s)*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Postamble Character(s)

Serial Cmd: <**Ke***status*,***postamble character(s)***>

Default: **^M^J**. Corresponds to carriage return/line feed/null/null, as displayed in the menu.

Options: Up to two user-defined ASCII characters, including control characters.

Within a Serial Command

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

Example: **<K140,CNTL-m CNTL-j>** to enter ^M^J.

Within an Embedded Menu

Control characters entered on the command line are displayed in the menu as mnemonic characters, such as: <CR><LF><NUL><NUL>

To enter a control character from within an embedded menu, first type in a space (with the space key). This has the effect of allowing the control key to be recognized as a part of the control character. Next hold down the control key while typing the desired character.

Example: **Space CNTL-m Space CNTL-j** to enter ^M^J.

LRC Status

(Longitudinal Redundancy Check)

Usage: Used when extra data integrity is required.

Definition: An error-checking routine that verifies the accuracy of transmissions. It is the exclusive OR of all characters following the **STX** (start of text) up to and including the **ETX** (end of text). What this means is that the binary representation of all the characters in a transmissions are cumulatively added in a column and each resulting odd integer is assigned a 1 and each even integer a 0 (two 1s = 0, two 0s = 0, a 1 and a 0 = 1). The extra **LRC** character is then appended to the transmission and the receiver (usually the host) performs the same addition and compares the results.

Serial Cmd: <**Kc***status*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Response Timeout

Usage: Used only when a response is required from the host. While in **Multi-drop**, if the scanner does not receive an **ACK** or **NAK** from the host after sending polled data, it will act on a fault. The scanner can be set to wait indefinitely by setting **Response Timeout** to zero.

Definition: Time the scanner will wait before timing out if **ACK**, **NAK**, and **ETX** are enabled, and a host response is expected.

Serial Cmd: <**KA***response timeout*>

Default: **12** mS (in 1 mS increments)

Options: 0 to 65000 (0 to 65 seconds)
(A zero (0) setting causes an indefinite wait.)

Intercharacter Delay

Usage: Used only when a host cannot receive data quickly enough and there is enough time between symbols to allow data to be completely transferred. It is rarely used since any setting other than zero will slow down communications. For example, a 200 setting will result in a 1/5 second delay between each character that is transmitted.

Definition: The time interval in milliseconds between individual characters transmitted from the scanner to the host.

Serial Cmd: <**KB***intercharacter delay*>

Default: **0**

Options: 0 to 255 (in milliseconds). Zero (0) causes no delay between characters.

Chapter

4

Read Cycle

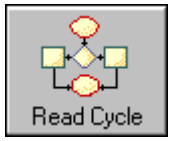
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Good Decode Reads 3-15

Read cycles and triggering modes are at the heart of bar code scanning. After you've established communications and completed basic read rate testing, you will need to address the spatial and timing parameters associated with your application. In a typical operation a bar coded item moves along a line past a scanner. A sensor or timer activates a read cycle during which the scanner actively searches for bar code symbols. You will need to decide how to initiate the read cycle and how and when to end it. This section addresses these issues.

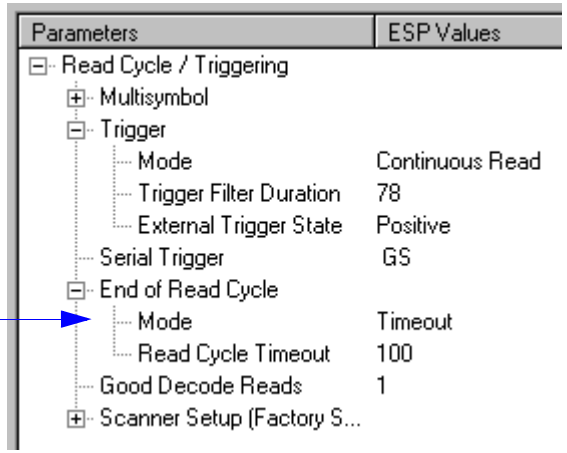
Note: The characters **NULL < >** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Read Cycle by ESP



Click this Button to bring up the **Read Cycle** menu.

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



Read Cycle by Serial Command

Command Title	Format
Multisymbol	<**KL***number of symbols,multisymbol separator*>
Trigger Mode	<**Kg***trigger mode,trigger filter duration*>
External Trigger State	<**Kj***external trigger state*>
Serial Trigger	<**Ki***serial trigger character*>
End of Read Cycle	<**Kh***end of read cycle,read cycle timeout*>
Good Decode Reads	<**Km***good decode reads*>
Automatic Gain Control	<**KD***gain,AGC sampling*>
Transition Counter	<**KH***symbol detect status,transition counter,reflectance threshold*>
Scan Speed	<**KE***scan speed*>
Scanner Type	<**KP***density*>

Multisymbol

Usage: **Multisymbol** is commonly used in shipping applications where a shipping symbol contains individual symbols for part number, quantity, etc. This feature allows one trigger to pick up all the symbols. AIAG and EAN- 128 are two application standards that address this need.

Definition: **Multisymbol** allows the user to define up to 6 bar code symbols that can be read in a single read cycle.

Number of Symbols

Definition: **Number of Symbols** is the number of different symbols that can be read in a single read cycle.

Serial Cmd: <**KL*number of symbols***,*multisymbol separator*>

Default: **1**

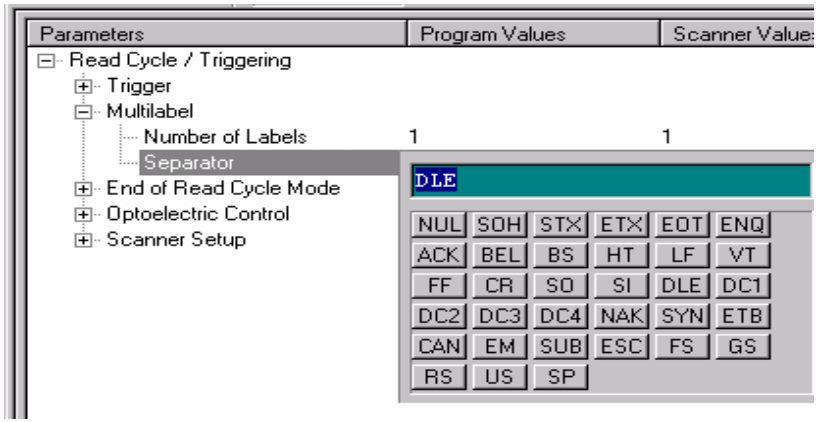
Options: 1 to 6

Multisymbol Separator

Usage: Used to delimit or separate data fields with a user defined character.

Definition: The character that's inserted between each symbol scanned when **Multi-symbol** is set to any number greater than **1**.

ESP: To select a new multisymbol separator, double-click on **Separator** and select a character in the popup window.



Serial Cmd: <**KL***number of symbols*,***multisymbol separator***>

Note: If **Multisymbol Separator** has been changed to any character other than the default comma and you wish to re-define the separator as a comma, use ESP (as shown below) or the embedded menu.

Default: **,** (comma)

Options: Any available ASCII character, except **< > NUL**.

Trigger

Trigger Mode

Note: This command does not need to be followed by an <A> command.

Definition: The type of trigger event that will initiate the read cycle.

Serial Cmd: <**Kg*trigger mode,****trigger filter duration***>

Default: **Continuous Read**

Options:

0 = Continuous Read	3 = External Edge
1 = Continuous Read 1 Output	4 = Serial Data
2 = External Level	5 = Serial Data & Edge

Continuous Read

Usage: **Continuous Read** is useful in testing bar code symbol readability or scanner functions. It is not recommended for normal operations.

Definition: In **Continuous Read**, trigger input options are disabled, the scanner is always in the read cycle, and it will attempt to decode and transmit every scan crossing a symbol.

When To Output and **Noread** options have no affect on **Continuous Read**.

Serial Cmd: <**Kg*0***>

Continuous Read 1 Output

Usage: **Continuous Read 1 Output** can be useful in applications where it is not feasible to use a trigger and all succeeding symbols contain different information. It is also effective in applications where the objects are hand-presented.

Definition: In **Continuous Read 1 Output** the scanner self-triggers whenever it decodes a new bar code symbol or a timeout occurs.

If **End Of Read Cycle** is set to **Timeout** and the symbol doesn't change, the scanner will repeat the output at the end of each timeout period. For example, if **Timeout** is set to one second, the scanner sends the symbol data immediately and repeats the output at intervals of one second for as long as the symbol continues to be scanned.

If **End Of Read Cycle** is set to **New Trigger**, the scanner will send the current symbol data immediately, but send it only once. A new symbol appearing in the scanner's range will be read and sent immediately provided it is not identical to the previous symbol read.

Serial Cmd: <**Kg*1***>

Caution: In automated environments, **Continuous Read 1 Output** is not recommended because there is no one to verify that a symbol was missed.

Note: If **Trigger** is set to **Continuous Read 1 Output**, **Number of Symbols** will default back to **1** (if set to any number greater than 1).

External Trigger Level

Usage: This mode is effective in an application where the speeds of the conveying apparatus are variable and the time the scanner spends scanning each object is not predictable. It also allows the user to determine if a noread has occurred.

Definition: **External Trigger Level** allows the read cycle (active state) to begin when a trigger (change of state) from an external sensing device is received. The read cycle endures until the object moves out of the sensor range and the active trigger state changes again.

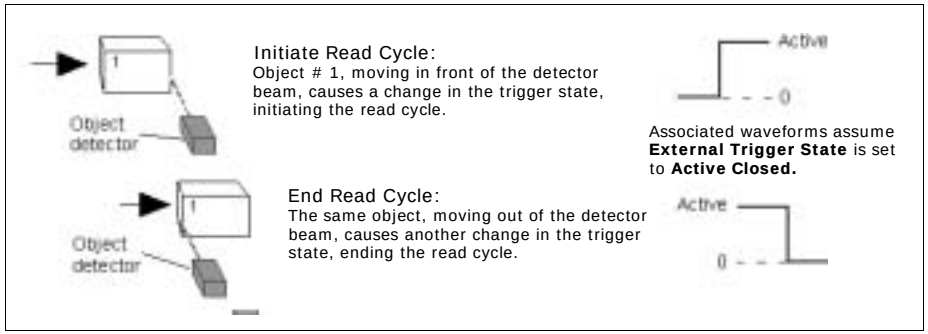


Figure 4-1 Trigger Level

Serial Cmd: <**Kg2**>

Important: Level and **Edge** apply to the active logic state (Active Open or Active Closed) that exists while the object is in a read cycle, between the rising edge and falling edge. *Rising edge* is the trigger signal associated with the appearance of an object. *Falling edge* is the trigger signal associated with the subsequent disappearance of the object.

External Trigger Edge

Usage: This mode is highly recommended in any application where conveying speed is constant or if spacing, object size, or timeouts are consistent.

Definition: **External Trigger Edge**, as with Level, allows the read cycle (active state) to begin when a trigger (change of state) from an external sensing device is received. However, the passing of an object out of sensor range does not end the read cycle. The read cycle ends with a good read output or, depending on **End of Read Cycle** setting, a timeout or new trigger occurs.

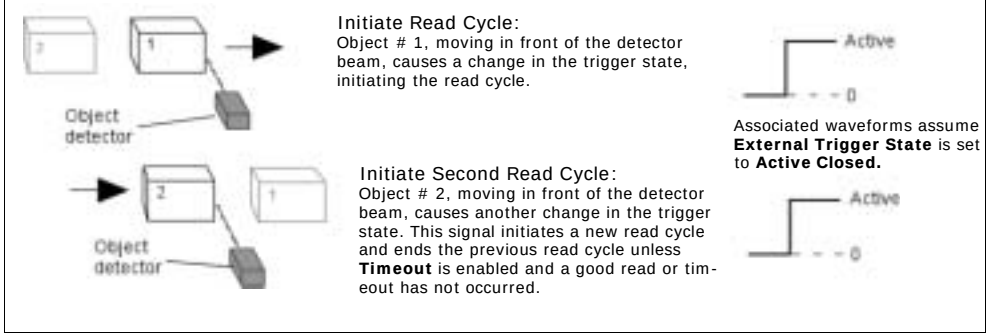


Figure 4-2 Trigger Edge

Serial Cmd: <**Kg3**>

Important: Level and **Edge** apply to the active logic state (**Active Open** or **Active Closed**) that exists while the object is in a read cycle, between the rising edge and falling edge. *Rising edge* is the trigger signal associated with the appearance of an object. *Falling edge* is the trigger signal associated with the subsequent disappearance of the object.

Serial Data

Usage: **Serial Data** is effective in a highly controlled environment where the host knows precisely when the object is in the scan zone. It is also useful in determining if a noread has occurred.

Definition: In **Serial Data**, the scanner accepts an ASCII character from the host or controlling device as a trigger to start a read cycle. A **Serial Data** trigger behaves the same as an **External Edge** trigger.

Serial commands are entered inside corner brackets, such as **<t>**.

Serial Cmd: <**Kg*4***>

Serial Data or Edge

Usage: **Serial Data or Edge** is seldom used but can be useful in an application that primarily uses an external sensing device but occasionally needs to be manually triggered.

An auxiliary terminal can be connected to the aux port so the user can send the serial trigger character through the scanner to the host.

Definition: In this mode the scanner accepts either a serial ASCII character or an external trigger pulse to start the read cycle.

Serial Cmd: <**Kg*5***>

Trigger Filter Duration

Usage: **Trigger Filter Duration** is useful where trigger bounce could cause false triggers.

Definition: **Trigger Filter Duration** can prevent trigger bounce from falsely triggering the scanner by limiting the time in which trigger pulses can be received.

Serial Cmd: <**Kg***trigger mode*,***trigger filter duration***>

Default: **78** (x 128µS = 9984µS)

Options: **2 to 255** (corresponding to 256µS to .03s in 128µS steps)

External Trigger State

Note: External Level, **External Edge**, or **Serial Data or Edge** trigger mode must be enabled for **External Trigger** to take effect.

Usage: Users can select the trigger state that will operate with their systems. (If using the Microscan object detector, use **Positive**.)

Definition: When enabled for **Positive** the triggering device imposes a current to activate the read cycle. When enabled for **Negative** the triggering device interrupts the current to activate the read cycle.

Serial Cmd: <**Kj*external trigger state***>

Default: **Positive**

Options: 0 = Negative 1 = Positive

Serial Trigger

Usage: Useful in applications where a read cycle needs to be initiated and/or ended by user-defined serial characters.

Definition: An on-line host command composed of a single ASCII host serial trigger character that initiates or ends the read cycle.

Serial Trigger Character

Usage: Useful in applications where a single serial character enclosed in angle brackets initiates the read cycle.

Definition: A trigger character is one that starts the read cycle, is enclosed by delimiters < > and can only be sent when the trigger mode is set to **Serial Data** or **Serial Data & Edge**.

Serial Cmd: <**Ki*serial trigger character***>

Default: **GS** (corresponds to ^] displayed in the embedded menu)

Options: Any single ASCII character, including control characters, except NUL (00H), an existing host command character, or an on-line protocol character.

End of Read Cycle

Note: **When to Output** must be set to **End of Read Cycle** before this command can be active.

Definition: The read cycle is the time during which the scanner will attempt to read and decode a bar code symbol. At the end of a read cycle the scanner stops reading symbols and sends the symbol data or noread message to the host.

End of Read Cycle Mode

Definition: A read cycle can be terminated by a new trigger, a timeout, or a combination of both.

Serial Cmd: <**Kh*end of read cycle mode***,*read cycle timeout*>

Default: **Timeout**

Options: 0 = Timeout
1 = New Trigger
2 = Timeout & New Trigger

Note: When operating in **Continuous Read** or **Continuous Read 1 Output**, the scanner is always in the read cycle.

Timeout

Usage: Typically used with **Serial** or **Edge** and **Continuous One**.

It is effective in highly controlled applications when the maximum length of time between objects can be predicted. It assures that a read cycle ends before the next bar coded object appears, giving the system extra time to decode and transmit the data to the host.

Definition: **Timeout** ends the read cycle when the time set in **Timeout** elapses or "times out."

If in **Continuous Read 1 Output**, a timeout initiates a new read cycle and allows the same symbol to be read again.

With either **External Edge**, **Serial Data**, or **Serial Data & Edge** enabled, a timeout ends the read cycle and symbol data or a noread message is sent to the host.

With **External Level** enabled, the read cycle does not end until the falling edge trigger or a timeout occurs. The next read cycle does not begin until the next rising edge trigger.

New Trigger

Usage: **New Trigger** is an effective way to end a read cycle when objects move past the scanner at irregular intervals (not timing dependent).

Definition: **New Trigger** ends the current read cycle and initiates a new one when a new trigger occurs. **New Trigger** refers only to a "rising edge" trigger.

With either **External Edge**, **Serial**, or **Serial or Edge** enabled, an edge or serial trigger ends a read cycle and initiates the next read cycle.

In the case of **External Level**, a falling edge trigger ends the read cycle but the next read cycle does not begin until the occurrence of the next rising edge trigger.

(See **Figure 4-1 on page 4-7** and **Figure 4-2 on page 4-8**.)

Note: When **New Trigger** is enabled and if not in **External Level** mode, **Laser On/Off** will have no effect. When noreads occur, the laser will remain on.

Timeout or New Trigger

Usage: Used in applications that require an alternative way to end the read cycle. For example, if an assembly line should stop completely or the intervals between objects are highly irregular.

Definition: **Timeout or New Trigger** is identical to **Timeout**, except that a timeout *or* a new trigger (whichever occurs first) ends the read cycle.

Read Cycle Timeout

Usage: It is useful in many tightly controlled applications which require a read cycle to end before the next object appears and therefore need the flexibility of a timeout adjustment.

Definition: **Read Cycle Timeout** is the time span of the read cycle and is represented in 10 mS increments. It is used in conjunction with **External Edge** or **Serial Trigger.**

Serial Cmd: <**Kh***end of read cycle mode,****read cycle timeout***>

Default: **100** (Corresponds to one second or 1000 mS)

Options: 0 to 65535. (Divide any positive number entered by 100 to determine the time in seconds)

Note: A minimum setting of **2** is recommended.

Note: **Timeout** or **Timeout or New Trigger** under **End of Read Cycle** must be enabled for **Timeout Duration** to take effect.

Good Decode Reads

Usage:	This is a very useful feature to increase reliability of reads for symbologies that do not have internal error checking such as Pharmacode.
Definition:	The number of decodes (from 1 to 31) required per symbol before a symbol's decoded data is sent. It requires the scanner to successfully decode a symbol a designated number of times (not necessarily consecutively) before it is sent. If it doesn't achieve the number of good reads during the read cycle, then a noread will be sent. **Note**: Higher settings will decrease throughput speed.
Serial Cmd:	<**Km*good decode reads***>
Default:	**1**
Options:	1 to 31

Note: When setting up, be sure to determine if the scanner's scan rate is capable of scanning your longest symbol the required number of times.

Scanner Setup

The settings in this section are typically adjusted by qualified technicians. They time are included here for special applications. Before making changes to individual commands in this section, it would be advisable to make a written record of current settings.

Gain Level

(Factory Setting)

Usage: Can be useful for fine-tuning gain or when portions of analog signals spike as in the case of specular reflection or extraneous noise.

Caution: Changes to **Gain** are typically done by qualified technicians i.

Definition: Sets a voltage amplitude value for the analog circuitry.

Serial Cmd: <**KD*gain***,*AGC sampling*>

Default: **45** (nominal). Gain is optimized at the factory before shipment; the default value may not be 45.

Options: 10 to 255

Scan Speed

Usage: To ensure a minimum number of scans, faster scan speeds are typically used for fast moving symbols and/or longer symbols with larger bar widths.

Note: Scan beams move faster across symbols further out in the scan range since the moving beam is being projected from a spinning mirror.

Definition: Allows the user to set the number of scans per second by controlling the spinning mirror motor speed.

Serial Cmd: <**KE*scan speed***>

Default: **40** (x 10 = 400 scans per second)

Options: 30 to 55 (x 10 scans per second)

Automatic Gain Control (AGC)

Important: AGC settings apply to both AGC gain control and symbol detection.

AGC Sampling Mode

Usage: **AGC Sampling** allows you to specify how automatic gain control sampling will be done.

Definition: AGC is the acronym for Automatic Gain Control. AGC increases the depth of field by attempting to maintain signal strength at a constant level regardless of the range of the bar code symbol.

Serial Cmd: <**KD***gain*,***AGC sampling***>

Default: **Continuous**

Options: 0 = Disabled 1 = Leading Edge 2 = Continuous

Disabled

Definition: When **AGC Sampling** is set to **Disabled**, gain levels can only be manually controlled by the **Gain** command.

Usage: **Disabled** is not recommended, but can be useful in certain applications in which symbols do not require a large depth of field.

Leading Edge

Usage: **Leading Edge** is rarely used, but in some cases can improve scan rates when symbols are skewed and the leading edge of a symbol is difficult to locate.

Definition: Finds the leading edge of a symbol by looking for a 40µS quiet zone followed by the number of transitions, stores the highest value of the samples, and adjusts the AGC accordingly at the end of the scan.

Continuous

Usage: **Continuous** is the default and the preferred mode for sampling analog signal amplitude.

Definition: Samples AGC throughout the scan at the rate averages the sample values, and adjusts the AGC value at the end of the scan.

Symbol Detect Status

Usage: Used for both AGC and symbol detection routines (see also **"No Object Message" on page 5-10**).

Serial Cmd: <**KH*symbol detect status***,*transition counter,reflectance threshold*>

Options: 0 = Disabled 1 = Enabled

Transition Counter

Usage: Can be useful in certain application where extraneous objects in the field of view might require a higher threshold.

Definition: Determines the number of bar/space transitions that are sampled before AGC can be resolved.

Serial Cmd: <**KH***symbol detect status*,***transition counter***,*reflectance threshold*>

Default: **14**

Options: 3 to 255

Reflectance Threshold

Note: **Reflectance Threshold** applies only to those MS-710 models that include an MS-Sensor. See **"MS-Sensor" on page A-24**.

Definition: The number is derived by testing the reflectivity of empty space.

Usage: Allows you to set the reflectance threshold—the level at which an object is detected.

Serial Cmd: <**KH***symbol detect status*,*transition counter*,***reflectance threshold***>

Default: **40**

Options: 0 to 255

To setup the MS-Sensor, select a number that is one or two numbers greater than the value posted when nothing is in the scanner's beam. See **"MS-Sensor" on page A-24**.[1]

Scanner Type

Usage: This field is **READ ONLY**, and is set by a qualified technician during factory setup.

Definition: This field displays the current factory-set scanner density type.

Serial Cmd: <**KP*density***>

Default: The default depends on the type of scanner that was ordered.

Options: 0 = Standard 1 = High Density

1. Reflectance can also be modified by sending the <KQ*offset*> test command which samples 50 scans for the highest reflectance value and adds a user-defined offset to this value.

Chapter

5

Symbologies

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This section describes the various symbol types that can be read and decoded by the scanner.

Code 39 is enabled by default. To enable all codes, right-click **Autodiscrimination** under **Symbol Type** in the **Utilities** menu and select **Enable**, or send a **<P>** serial command to the scanner from the Terminal window.[1]

Note: The characters **NULL < >** and **,** can only be entered through embedded menus, not through ESP or serial commands.

See ***www.aimusa.org/standards*** for additional information about symbologies.

1. If using an I 2/5 symbol, verify that the number of characters in the symbol being scanned matches the symbol length enabled for the I 2/5 symbology type (default is 10 and 6).

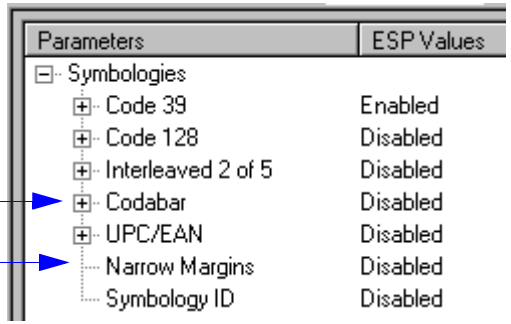
Symbologies by ESP



Click this button to bring up the **Symbologies** menu.

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 by Serial Command

Command Title	Format
Code 39	<**Kp***status,check digit status,check digit output status,large intercharacter gap,fixed code length status,fixed code length*>
Code 128	<**Kt***status,fixed symbol length status,fixed symbol length,EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding*>
Interleaved 2 of 5	<**Kr***status,check digit status,check digit output,symbol length 1,symbol length 2*>
Codabar	<**Kq***status,start & stop match status,start & stop output status,large intercharacter gap,fixed symbol length status,fixed symbol length,check digit type,check digit output*>
UPC/EAN	<**Ks***UPC/EAN status,UPC status,supplementals status,separator status,separator character*>
PDF417	<**K***status,,fixed symbol length status,fixed symbol length*>
Narrow Margins/ Symbology Identifier	<**Ko***narrow margins,symbology identifier status*>
Background Color	<**Kx***background color*>

1D Symbologies

Code 39

Usage: **Code 39** is considered the standard for non-retail symbology.

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

Code 39 Status

Serial Cmd: <**Kp*status***,*check digit status,check digit output status,large intercharacter gap,fixed symbol length status,fixed symbol length,full ASCII set*>

Default: **Enabled**

Note: This is the only symbol type enabled by default.

Options: 0 = Disabled 1 = Enabled

Check Digit Status (Code 39)

Serial Cmd: <**Kp***status*,***check digit status***,*check digit output,large intercharacter gap,fixed symbol length status,fixed symbol length,full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Check Digit Output Status (Code 39)

Usage: **Check digit Output**, added to the symbol, provides additional security.

Definition: When enabled, the check digit character is read and compared along with the symbol data. When disabled, symbol data is sent without the check digit.

Note: With **Check Digit Output** and an **External** or **Serial** trigger option enabled, an invalid check digit calculation will cause a noread message to be transmitted at the end of the read cycle.

Serial Cmd: <**Kp***status,check digit status*,***check digit output***,*large intercharacter gap,fixed symbol length status,fixed symbol length,full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Large Intercharacter Gap (Code 39)

Usage: **Large Intercharacter Gap** is helpful for reading symbols that are printed out of specification.

Caution: Do not use **Large Intercharacter Gap** with **Narrow Margins** enabled since a large intercharacter gap (over 3x) could cause a narrow margins (5x) to be interpreted as an intercharacter gap.

Definition: When enabled, the scanner can read symbols with gaps between symbol characters that exceed three times (3x) the narrow element width.

Serial Cmd: <**Kp***status,check digit status,check digit output,**large intercharacter gap**,fixed symbol length status,fixed symbol length,full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length Status (Code 39)

Definition: When enabled, the scanner will check the symbol length against the symbol length field. If disabled, any length would be considered a valid symbol.

Serial Cmd: <**Kp***status,check digit status,check digit output,large intercharacter gap,**fixed symbol length status**,fixed symbol length,full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Symbol Length (Code 39)

Usage: **Fixed 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 scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any symbol not having the specified length.

Serial Cmd: <**Kp***status,check digit status,check digit output,large intercharacter gap,fixed symbol length status,**fixed symbol length**,full ASCII set*>

Default: **10**

Options: 1 to 64

Code 128

Usage: **Code 128** is a smaller symbology useful in applications with tight spots and high security needs.

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.

Code 128 Status

Serial Cmd: *<**Kt*status*,fixed symbol length status,fixed symbol length,EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length Status (Code 128)

Definition: When enabled the scanner will check the symbol length against the symbol length field. When disabled any length would be considered a valid symbol.

Serial Cmd: *<**Kt**status*,***fixed symbol length status**,fixed symbol length,EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Symbol Length (Code 128)

Usage: **Fixed 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 scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any symbol not having the specified length.

Serial Cmd: *<**Kt**status,fixed symbol length status,**fixed symbol length**,EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding>*

Default: **10**

Options: 1 to 64

Note: **Fixed Symbol Length Status** must be enabled for **Symbol Length** to take effect.

If **Enabled,** the scanner can read symbols with or without a function 1 character in the first position.

Note: The reply from a <Kt?> request may appear to have an extra field, e.g.: `<Kt?><Kt0,0,10,0,0,0,,,0,0>` However, the third comma in from the right is actually the application record separator character in the default setting.

When set to **Standard**, EAN-128 application identifiers and data fields are sent, but none of the formatting (separators, parentheses, padding) will be included.

Application Record

A variation of EAN-128 that allows the user to define separators between data fields, enclose application identifiers in parentheses, and enable padding (zeros) for variable length fields.

Interleaved 2 of 5

Usage: It is 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 digit is highly recommended.)

Important: You must set **Symbol Length** in order to decode I 2/5 symbols.

Interleaved 2 of 5 Status

Serial Cmd: *<**Kr**status**,check digit status,check digit output,symbol length #1,symbol length #2>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Check Digit Status (Interleaved 2 of 5)

Usage: It is typically not used but can be enabled for additional security in applications where the host requires redundant check digit verification.

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

Serial Cmd: *<**Kr**status,**check digit status**,check digit output,symbol length #1,symbol length #2>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Check Digit Output Status (Interleaved 2 of 5)

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

Serial Cmd: *<**Kr**status,check digit status,**check digit output**,symbol length #1,symbol length #2>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Symbol Length #1 (Interleaved 2 of 5)

Usage: With I 2/5, two symbol lengths can be defined. When using only one symbol length in an application, setting **Symbol Length #2** to 0 (zero) to ensure data integrity is recommended.

Definition: Allows user to define the symbol length. Because I 2/5 is a continuous symbology, it is prone to substitution errors. Hence, a symbol length must be defined and a symbol must contain an even number of digits.

Note: If start, stop or check digits are used, they are not included in the symbol length count.

Serial Cmd: <**Kr***status,check digit status,check digit output,**symbol length #1**,symbol length #2*>

Default: **10**

Options: 2 to 64, even

Since I 2/5 characters are paired, symbol length must be set to an even number. If **Check Digit** is enabled, add 2 to your symbol length. For example, if your symbol is 10 characters plus a check digit, then enable **Symbol Length** for 12.

Note: Typically, when printing an I 2/5 symbol with an odd number of digits, a 0 will be added as the first character.

Symbol Length #2 (Interleaved 2 of 5)

Usage: If using a second symbol, a zero or any even symbol length from 2 to 64 may be specified. If not using a second symbol, set **Symbol Length #2** to 0 to ensure data integrity.

Definition: Allows user to define a second symbol length for I–2 of 5.

Serial Cmd: <**Kr***status,check digit status,check digit output,symbol length #1,**symbol length #2*>

Default: **6**

Options: 2 to 64, even

Since I 2/5 characters are paired, symbol length must be set to an even number. If **Check Digit** is enabled, add 2 to your symbol length. For example, if your symbol is 10 characters plus a check digit, then enable **Symbol Length** for 12.

Note: Typically, when printing an I 2/5 symbol with an odd number of digits, a 0 will be added as the first character.

Codabar

Usage: Used in photo-finishing and library applications. Formerly used in some medical applications but not typically used in newer applications.

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

Codabar Status

Serial Cmd: <**Kq*status***,*start & stop match,start & stop match output,large interchar-acter gap,fixed symbol length status,fixed symbol length,check digit type,check digit output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Start & Stop Match Status (Codabar)

Usage: Used to increase security of symbology.

Definition: Requires the Codabar start and stop characters (a, b, c, or d) to match before a valid read can occur.

Serial Cmd: <**Kq***status*,***start & stop match***,*start & stop match output,large inter-character gap,fixed symbol length status,fixed symbol length,check digit type,check digit output*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Start & Stop Output Status (Codabar)

Usage: Used to verify matching.

Definition: Causes the start and stop characters to be transmitted with bar symbol data.

Serial Cmd: <**Kq***status,start & stop match,****start & stop match output****,large inter-character gap,fixed symbol length status,fixed symbol length,check digit type,check digit output*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Large Intercharacter Gap (Codabar)

Usage: It is helpful for reading symbols that are printed out of specification.

Caution: Do not use **Large Intercharacter Gap** with **Narrow Margins** enabled since enabling **Large Intercharacter Gap** (over 3x) could cause a narrow margins (5x) to be interpreted as an intercharacter gap.

Definition: Instructs the scanner to read symbols with gaps between characters exceeding three times the narrow element width.

Serial Cmd: <**Kq***status,start & stop match,start & stop output match,**large intercharacter gap**,fixed symbol length status,fixed fixed symbol length,check digit type,check digit output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length Status (Codabar)

Usage: **Fixed Symbol Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.

Definition: When enabled, the scanner will check the symbol length against the fixed symbol length field. When disabled, any length would be considered a valid symbol.

Serial Cmd: <**Kq***status,start & stop match,start & stop match output,large intercharacter gap,**fixed symbol length status**,fixed symbol length,check digit type,check digit output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Symbol Length (Codabar)

Definition: Specifies the exact number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any symbol not having the specified length.

Serial Cmd: <**Kq***status,start & stop match,start & stop match output,large intercharacter gap,fixed symbol length status,**fixed symbol length**,check digit type,check digit output*>

Default: **10**

Options: 1 to 64

Note: Fixed Symbol Length Status must be enabled for Fixed Symbol Length to take effect.

Note: Because of symbology limitations, setting **Symbol Length** to any number less than four will produce undetermined results.

Check Digit Type (Codabar)

Definition: Allows the user to select the check digit type Codabar will use.

Serial Cmd: *<**Kq**status,start & stop match,start & stop match output,large inter-character gap,fixed symbol length status,fixed symbol length,**check digit type**,check digit output>*

Default: **Disabled**

Options:

0 = Disabled	2 = NW 7
1 = Modulus 16	3 = Both

Modulus 16

Used in the photo-finishing market.

NW 7

Used in Japanese markets.

Check Digit Output Status (Codabar)

Usage: For additional security a check digit can be added to the symbol.

Definition: When enabled, the check digit character is sent along with the symbol data. When disabled, symbol data is sent without the check digit.

Serial Cmd: *<**Kq**status,start & stop match,start & stop match output,large interchar-acter gap,fixed symbol length status,fixed symbol length,check digit type,**check digit output**>*

Default: **Disabled**

Options:

0 = Disabled	1 = Enabled

UPC/EAN

Usage: Used primarily in POS application in the retail industry. It is commonly used with Microscan scanners in applications in combination with **Match-code** when there is a need to verify that the right product is being placed in the right packaging.

Definition: UPC (Universal Product Code) is a fixed length numeric, continuous symbology. UPC can have two- or five-digit supplemental symbol data following the normal symbol. The U.P.C., Version A (U.P.C., 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.

When enabled, the scanner will read UPC version A and UPC version E only.

UPC/EAN Status

Serial Cmd: <Ks***UPC/EAN status****,EAN status,supplementals status,separator status,separator character>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

EAN Status

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

Note: **UPC/EAN** must be enabled for **EAN** to take effect.

Definition: EAN is a subset of UPC. When enabled, the scanner will read UPC version A, UPC version E, EAN 13, and EAN 8. It also appends a leading zero to UPC version A symbol information and transmits 13 digits. If transmitting 13 digits when reading UPC version A symbols is not desired, disable **UPC/EAN**.

Note: The extra character identifies the country of origin.

Serial Cmd: <Ks*UPC/EAN status,****EAN status****,supplementals status, separator status, separator character>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Supplementals Status (UPC/EAN)

Usage: Reads **Supplementals** typically used in publications and documentation.

Definition: A supplemental is a 2 or 5 digit symbol appended to the main symbol. When set to **Enabled** or **Required**, the scanner reads supplemental symbol data that has been appended to the standard UPC or EAN symbols.

Serial Cmd: *<**Ks**UPC/EAN status,EAN status,**supplementals status**,separator status, separator character>*

Default: **Disabled**

Options: 0 = Disabled
1 = Enabled
2 = Required

Disabled

UPC **Supplementals** will not be decoded.

Enabled

When enabled, the scanner will try to decode a main and a supplemental. However, if a supplemental is not decoded, at the end of the read cycle, the main will be sent by itself. The UPC main and supplemental symbols are considered to be one symbol and will be treated as such.

Required

When set to **Required** and either the main or supplemental symbol is not read, a single noread condition results. The UPC main and supplemental symbols are treated as one symbol.

For example, if **Supplementals** is set to **Required**, **Separator** is enabled, and an asterisk is defined as the UPC separator character, then the data will be displayed as: MAIN * SUPPLEMENTAL.

Note: Under no circumstances will supplemental symbol data be sent without a main symbol.

Note: If additional symbols—other than the main or supplemental—will be read in the same read cycle, **Number of Symbols** should be set accordingly.

Separator Status (UPC/EAN)

Usage: Allows user to distinguish between the main and **Supplemental** symbols.

Definition: Allows the user to insert a character between the standard UPC or UPC/EAN symbologies and the supplemental symbol when **Supplementals** is set to **Enabled** or **Required**.

Serial Cmd: <**Ks***UPC status,UPC/EAN status,supplementals status,**separator status**,separator character*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Separator Character (UPC/EAN)

Note: If Separator Character has been changed to any other character and you wish to re-define the separator as a comma, you will need to define it in the embedded menu or default the scanner by a <Zd> command.

Usage: As required by the application.

Definition: Allows the user to change the separator character from a comma to a new character.

Serial Cmd: <**Ks***UPC/EAN status,UPC status,supplementals status,separator status,**separator character***>

Default: **,** (**comma**)

Options: Any ASCII character

Note: Whenever Separator Character is defined as a comma (,) sending a <**Ks?**> command will return the current settings including the separator character comma which appears after the separator status comma.

Narrow Margins

Usage: Used when the leading and trailing edges of the symbols are smaller than the standard margin or when other objects encroach into the margins.

Definition: Allows the scanner to read symbols with quiet zones less than 8 times the width of the narrow bar element. “Quiet zone” is the space at the leading and trailing ends of a symbol. Each quiet zone can be as narrow as only five times the width of the narrow bar element when **Narrow Margins** is enabled.

Serial Cmd: <**Konarrow margins status**,*symbology identifier status*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: Do not use **Narrow Margins** with **Large Intercharacter Gap** enabled in **Code 39** or **Codabar**.

Symbology ID

Usage: Used when the symbology type and how it's decoded needs to be known.

Definition: Symbology ID is an AIM standard prefix set of characters that identify the symbol type.

When enabled, the scanner analyzes and identifies the symbology and adds a three character identifying prefix to the data:

1. **]** (close bracket character) indicating the presence of a symbology ID
2. **A, C, E, I, L, Q, b, d, p**
   A = Code 39; C = Code 128 or EAN; E = UPC/EAN; F = Codabar; I = I–2/5
3. **Modifier** (see **Explanation of Modifiers** below)

Serial Cmd: <**Ko***narrow margins,****symbology identifier status***>

Default: **Disabled**

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

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

- For **Code 39**, **Codabar** and **I 2/5**, the modifier indicates **Check Digit** and **Check Digit Output** status.
- For **Code 39** only, **Full ASCII** needs to be enabled to see modifiers **4**, **5**, and **7**.

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

Example:**]A5** indicates a Code 39 symbol with **Check Digit** and **Check Digit Output** enabled and Full ASCII conversion performed.

For Other Symbologies

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

Autodiscriminate

Although **Autodiscriminate** is not a configuration command, but it is included here as a convenient tool for enabling most symbol types.

Usage:	Commonly used for quick setup mode to detect symbol type. This is particularly useful for users who might be unfamiliar with their application's symbology. **Note**: It does not alter individual fields such as **Start/Stop**, **Fixed Length**, etc. These need to be setup individually.
Definition:	Enables all available symbology types except PDF417, UCC/EAN 128. The user may also individually disable/enable each symbology type.
Serial Cmd:	**<P>** Enables all symbologies except noted above
Default:	**Code 39** (only)
Other Options:	<Q> Enables Code 39 only <R> Enables Codabar only <S> Enables I 2/5 only

Note: If using an I 2/5 symbol, verify that the number of characters in the symbol being scanned matches the symbol length enabled for the I 2/5 symbol type (default is 10 and 6).

Chapter

6

I/0 Parameters

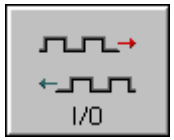
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This section includes instructions for setting up data and discrete I/O controls of internal and external devices.

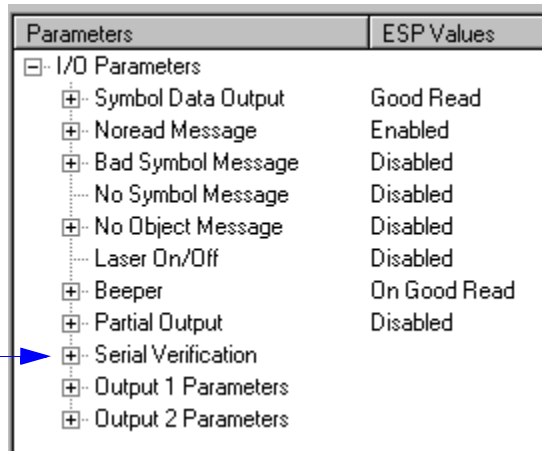
Note: The characters **NULL < >** and **,** can only be entered through embedded menus, not through ESP or serial commands.

I/O Parameters by ESP



Click this button to bring up the **I/O Parameters** menu.

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



I/O Parameters by Serial Command

Command Title	Format
Symbol Data Output	<**KI***symbol data output mode,when to output*>
Noread Message	<**Kk***status,message*>
Bad Symbol Message	<**KM***status,message*>
No Symbol Message	<**KN***status,message*>
No Object Message[a]	<**KO***status,message*>
Laser ON/OFF Status	<**KC***laser on/off status*>
Beeper	<**Ku***status, volume*>
Partial Output	<**KY***status,start postion,length*>
Serial Verification	<**KS***command echo status,beep status,control/hex output*>
Output 1	<**Kv***output on,active state,pulse width,number to output on*>
Output 2	<**Kw***output on,active state,pulse width,number to output on*>
Output 3	<**K‘***output on,active state,pulse width,number to output on*>

a. For MS-710s with MS-Sensors.

Symbol Data Output

Usage: Used when the host needs symbol data only under certain conditions.

Definition: Defines the conditions under which decoded symbols are transmitted to the host.

Symbol Data Output Mode

Serial Cmd: <**KIsymboldata output mode**,*when to output*>

Default: **Good Read**

Options:

0 = Disabled	2 = Mismatch
1 = Match	3 = Good Read

Disabled

Usage: **Disabled** is useful when an application only needs to use the discrete outputs and can allow the scanner to do the decision-making. When set to **Disabled**, the host does not need the symbol data and the communication lines are used only for setup and status checks.

Definition: When set to **Disabled**, the scanner will not transmit any data that is generated during a read cycle (symbols, noreads, etc.).

Match

Usage: **Match** is used in an application that requires specific symbol data information and needs to sort, route or verify based on matching the specific symbol data.

Definition: When set to **Match**, the scanner transmits symbol data whenever a symbol data matches a master symbol. However, if **Matchcode Type** is set to **Disabled**, it transmits on any good read.

Note: A noread can still be transmitted if **Enabled**.

Mismatch

Usage: **Mismatch** is typically used as a flag within the host system to prevent an item from being routed in the wrong container.

Definition: With **Mismatch** enabled, the scanner transmits symbol data whenever the symbol data information does NOT match the master symbol.

Note: A noread can still be transmitted if enabled.

Good Read

Usage: **Good Read** is used when an application requires all symbol data to be transmitted. It's typically used in tracking applications in which each object is uniquely identified.

Definition: With **Good Read** enabled, the scanner transmits symbol data on any good read regardless of **Matchcode Type** setting.

Note: A noread can still be transmitted if enabled.

When to Output Symbol Data

Definition: This command allows the user to choose when symbol data can be sent to the host.

Serial Cmd: <**KI***symbol data output mode,**when to output***>

Default: **As Soon As Possible**

Options: 0 = As Soon As Possible 1 = End of Read Cycle

As Soon As Possible

Usage: **As Soon As Possible** is useful in applications in which symbol data needs to be moved quickly to the host, typically when the host is making decisions based on symbol data.

Definition: Enabling **As Soon As Possible** causes symbol data to be sent to the host immediately after a symbol has been successfully decoded.

Note: More than one decode might in fact be required to qualify as a good decode, depending on how **Decodes Before Output** is set.

End of Read Cycle

Note: See **"End of Read Cycle" on page 4-12** for options to end the read cycle.

Usage: **End of Read Cycle** is useful in timing-based systems in which the host is not ready to accept data at the time it is decoded.

Definition: Enabling **End of Read Cycle** means that symbol data does not get sent to the host until the read cycle ends with a timeout or new trigger.

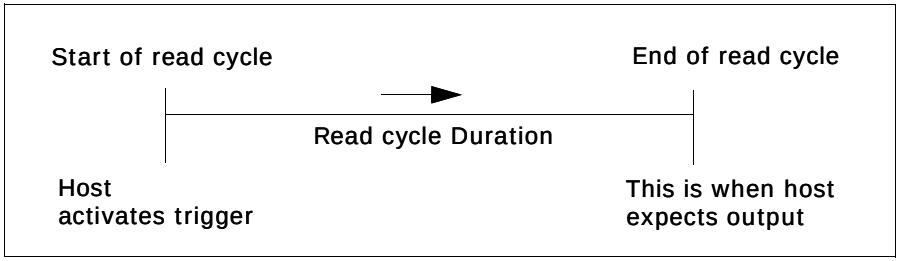
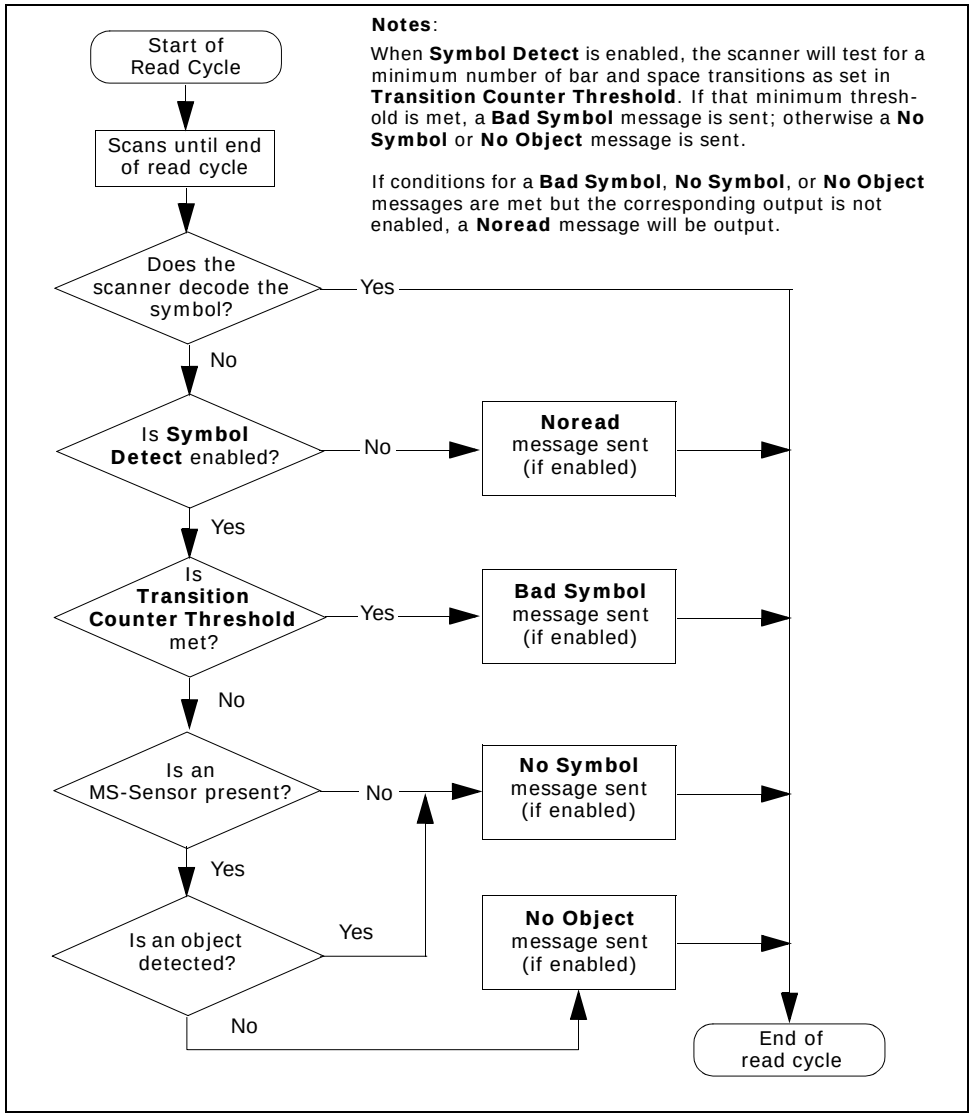


Figure 6-1 Read Cycle

Data Output Message Flow

The following flow chart explains the logic paths taken for **Noread**, **Bad Symbol**, **No Symbol**, and **No Object** outputs.



Noread Message

Usage: Used in applications where the host needs serial verification that a symbol has not been read and especially useful in new print verification.

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

Noread Status

Serial Cmd: <**Kk*status***,*message*>

Default: **MISSING**

Options: Up to seven ASCII characters (except NUL)

Serial Cmd: <**Kk*status***,*message*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Noread Message

Definition: Any combination of ASCII characters can be defined as the noread message.

Serial Cmd: <**Kk***status*,***message***>

Default: **NOREAD**

Options: 0 to 7 ASCII characters.

Note: Noread Message will only be transmitted if **Symbol Data Output** (**"Symbol Data Output" on page 6-3**) is set to **Match**, **Mismatch** or **Good Read**.

Noread Message can be set to any ASCII characters except **NULL < >** and **,** (comma).

Bad Symbol Message

Note: **Bad Symbol Message** does not apply to multisymbol operations.

Usage: Used in verifying the presence of a symbol that has not been decoded.

Definition: When enabled, a message is sent to the host when a symbol is detected but not decoded. See **"Transition Counter Threshold" on page 6-8.**

The **Bad Symbol** output is tied to the transition counter. If during a read cycle no symbol is decoded and the required setting for the **Transition Sample Threshold** is met, a user defined message will be sent to the host. See **"Output Message Flow" on page 9-8.**

Bad Symbol Status

Serial Cmd: <**KM*status,****message***>

Serial Cmd: <**K'*status,****message***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Bad Symbol Message

Serial Cmd: <**KM***status,****message***>

Serial Cmd: <**K'***status,****message***>

Default: **BADCODE**

Options: Up to seven ASCII characters (except NUL)

The **Bad Symbol** output is tied to the transition counter. If during a read cycle no symbol is decoded and the required setting for the **Transition Sample Threshold** is met, a user defined message will be sent to the host.

No Symbol Message

Note: **No Symbol Message** does not apply to multisymbol operations.

Usage: Used in determining if an object has an attached symbol.

Definition: When enabled, sends a message to the host whenever an object is detected but no symbol is detected. See **"Transition Counter Threshold" on page 6-8.**

The **No Symbol** output is tied to the transition counter. If during a read cycle no symbol is decoded and the required setting for the **Transition Sample Threshold** is NOT met, a user defined message will be sent to the host. See **"Output Message Flow" on page 9-8.**

No Symbol Status

Serial Cmd: <**KN*status***,*message*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

No Symbol Message

Serial Cmd: <**KN***status*,***message***>

Default: **NOLABEL**

Options: Up to seven ASCII characters (except NUL)

No Object Message

Note: **No Object Message** is only output if for scanners with an MS-Sensor.

Definition: When enabled, sends a message to the host at the end of a read cycle whenever no object is detected.

The **No Object** output is tied to the MS-Sensor (**"MS-Sensor" on page A-15**) and the reflectance threshold setting (**"Reflectance Threshold" on page 4-17**).

Usage: Useful in determining if an expected object has actually passed by during a read cycle.

No Object Status

Serial Cmd: <**KO*status***,message>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

No Object Message

Serial Cmd: <**KO***status*,***message***>

Default: **MISSING**

Options: Up to seven ASCII characters (except NUL)

Beeper

Usage: Can be used as an audible verification that either a good read or a noread has occurred.

Definition: A beep is emitted either after each good read of a bar code symbol or after each noread.

Note: Beeper will also sound if any of the following occur:

- the scanner is defaulted
- a send/save command from **ESP** or an **Exit** command from any embedded menu
- a **<Z>**, **<Zp>**, **<Zd>**, or **<K,1>** command is sent

Beeper Status

Serial Cmd: <**Ku*status*,***volume***>

Default: **On Good**

Options: 0 = On Good Read
1 = On Noread

Beeper Volume

Serial Cmd: <**Ku***status*,***volume***>

Default: **Level 4**

Options:

0 = Off	3 = Level 3
1 = Level 1	4 = Level 4
2 = Level 2	5 = Level 5

Partial Output

Usage: In **Multisymbol** mode, partial output is performed on each separate symbol. For example, if **Start Position** is set to 3 and **Partial Length** is set to 5, the following symbols are transmitted as follows:

1234567890 as 34567

1234 as 34

123456789,abcde as “34567,cde” (two symbols with separator)

12 as [blank]

Definition: When enabled, allows you to pre-select portions of symbols to be transmitted by the scanner.

Partial Output Status

Serial Cmd: <**KY*status***,*start postion,length*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Start Position (Partial Output)

Definition: Allows you to determine the first character from the beginning of a symbol to transmit.

Serial Cmd: <**KY***status*,***start postion***,*length*>

Default: **1**

Options: 1 to 63

Length (Partial Output)

Definition: Allows you to determine the number of characters to be transmitted.

Serial Cmd: <**KY***status,start postion*,***length***>

Default: **63**

Options: 1 to 63

Serial Verification

Usage: These commands are useful in removing any doubt about the scanner's acceptance and response to host configuration commands.

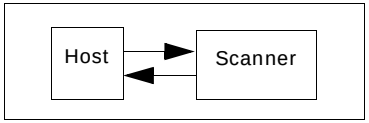
For example, if the current preamble is "SOM" and <Kd1, START> is entered, the scanner will echo back <Kd1, SOM> since the attempted entry "START" exceeds the four character limit for that command. Therefore it is rejected and the existing "SOM" message is echoed back and remains the preamble message.

Definition: Allows the user to verify configuration command status.

Serial Command Echo Status

Important: ESP will not function whenever this command is enabled.

Definition: When enabled, a configuration command received from the host is echoed back to the host with the resultant settings.



Function: If a command with multiple fields is processed, some of the fields may have been processed properly while others were not. The changes will appear in the string echoed back so that the user will know which fields did or did not change.

Serial Cmd: <**KS*command echo status***,*command beep status,control/hex output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Serial Command Beep Status

Important: ESP will not function whenever this command is enabled.

Usage: Used to audibly verify the acceptance and validity of a command.

Definition: Causes the scanner to beep once whenever a K command is entered to indicate that the command was accepted and processed.

Function: If an invalid command is entered, the scanner beeps 5 times to indicate an invalid entry. However, this does not necessarily mean that all data fields have been entered incorrectly. Only one bad field needs to be found in order to activate the 5 beep response.

Serial Cmd: <**KS***serial command echo status,****serial command beep status****,control/hex output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Control/Hex Output

Usage: Used for viewing settings with binary characters when using serial command on a terminal.

Definition: Determines the response to a **Serial Command Echo** or status request command.

When set to **Control**, two characters are transmitted to represent a non-displayable character. For example, a carriage return will be shown as the two characters: **^M**.

When set to **Hex**, the output is the hex character.

Serial Cmd: <**KS***serial command echo status,serial command beep status,****control/hex output***>

Default: **Control**

Options: 0 = Control 1 = Hex

Laser On/Off Status

Usage: **Laser ON/OFF** extends the life of the laser. It is useful where there are significant time gaps between symbols. It also provides visual confirmation of a read cycle duration and minimizes laser exposure to people.

Definition: When enabled, the laser is ON only during the read cycle. When disabled, the laser operates continuously.

Serial Cmd: <**KC*laser on/off status***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: A serial or external trigger must be enabled for **Laser ON/OFF** to take effect.

Note: Laser ON/OFF is not recommended when **New Trigger** is enabled, since the laser will effectively remain on continuously.

Output 1 Parameters

Usage: This option provides switching to host software to control external devices such as PLCs and relays. It is useful for routing and sorting and to prevent mis-packaging and mis-routing.

Definition: Sets the discrete output functions for specific user-selected conditions.

Output On

Definition: Allows the user to set the conditions under which an output (or outputs) will be activated.

Serial Cmd: <**Kv*output on***,*polarity*,*pulse width*,*number to output on*>

Default: **Noread**

Options:

0 = Mismatch or Noread	2 = Mismatch
1 = Match	3 = Noread

Note: If **Output On** is set to **Mismatch or Noread**, **Match**, or **Mismatch**, a transition (switching) will not occur unless **Matchcode Type** is enabled and a master symbol is loaded into memory.

Mismatch or Noread

Activates discrete output when the symbol data does not match that of the master symbol or the symbol has not been decoded before the end of the read cycle.

Match

Activates a discrete output when the symbol data matches the master symbol.

Note: If you want to output for a good read and **Matchcode** is not enabled, you can enable any output for **Match**.

Mismatch

Activates a discrete output whenever the symbol data does not match that of the master symbol.

Noread

Activates a discrete output whenever the symbol data is not decoded before the end of the read cycle.

Polarity

Definition: Sets the polarity of the discrete output.

Serial Cmd: <**Kv***output on*,***polarity***,*pulse width*,*number to output on*>

Default: **Negative**

Options: 0 = Negative 1 = Positive

Pulse Width

Definition: Sets the time in 10 mS increments that the discrete output remains active.

Serial Cmd: <**Kv***output on*,*polarity*,***pulse width***,*number to output on*>

Default: **5** (.05 seconds). Corresponds to 50 mS displayed in the menu.

Options: 1 to 255 (0.01 to 2.55 seconds). Divide the number entered on the command line by 100 for time in seconds.

Number to Output On

Definition: Sets the number of events (matches, mismatches, noreads, etc. as configured by **Output On**) that must occur before activating the associated output.

Serial Cmd: <**Kv***output on*,*polarity*,*pulse width*,***number to output on***>

Default: **1**

Options: 0 to 255

Note: The number of matches, etc. for this setting does not need to be sequential.

Output 2 Parameters

Serial Cmd: <**Kw***output on,polarity,pulse width,number to output on*>

Output 2 has the same parameters and default settings as **Output 1**.

Chapter 7 Matchcode

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Matchcode by Serial Command 7-3
Overview of Matchcode 7-4
Using Master Symbols 7-5
Matchcode Type 7-6
Sequential Matching 7-7
Match Start Position 7-8
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Wild Card 7-10
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New Master Pin 7-13

This section explains the matchcode output functions and setup.

See also **"Master Symbol" on page 9-11** for more information details on using ESP for entering, requesting, and deleting master symbols.

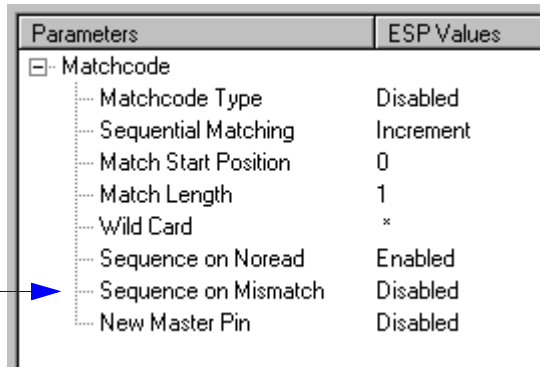
Note: The characters **NULL < >** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Matchcode by ESP Menu



Click this button to bring up the **Matchcode** menu.

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



Matchcode by Serial Command

Command Title	Format
Matchcode Type	<**Kn***type,sequential matching,match start position,match length,wild card character, sequence on noread,sequence on mismatch*>
New Master Pin	<**Kz***status*>

Related Utility Commands	Format
Set Matchcode Type to Enabled	<**E**>
Set Matchcode Type to Disabled	<**F**>
Enter data as master symbol #1	<**)*data*)**>
Scan in next symbol as Master Symbol	<**G**>
Request master symbol #1	<**)**>
Delete master symbol #1	<**))**>

Overview of Matchcode

Usage: **Matchcode** is used in applications to sort, route, or verify data based on matching the specific symbol in a variety of ways as defined in this section. For example, a manufacturer might sort a product based on dates that are embedded in the symbol.

Definition: With **Matchcode** you can store master symbol data in the scanner's memory, compare this data against the scanned symbols, and define how symbol data and/or discrete signal output will be directed.

Using Master Symbols

1. Set **Triggering Mode** to **External** or **Serial** (see **"Trigger" on page 4-5**).
2. Set **Matchcode Type** to an option that fits your application (see **"Matchcode Type" on page 7-4**).
3. Define the output you want with your matchcode setup:
   a) Data output (**"Symbol Data Output" on page 6-3**).
   b) Discrete output (see **Chapter 6, "Output 1 Parameters""Output 1 Parameters" on page 6-16**).
4. Enter master symbol data in one of the following ways:
   a) Use **ESP** to type in master symbol data directly into the **Utilities** menu.
   b) Send a **<G>** command to scan next symbol in as the master symbol.

Enable the **New Master Pin** command and activate a discrete input to store the next symbol scanned as the master symbol (see **"New Master Pin" on page 7-9**).

Other Master Symbol Serial Commands

Sending **<)>** will return the current master.

Sending **<))>** will delete the current master symbol.

See also **"Master Symbol" on page 9-11** for more information details on using ESP for entering, requesting, and deleting master symbols.

Matchcode Type

Note: If **Matchcode** is set to **Wild Card** or **Sequential**, **Number of Symbols** will default back to **1** (if set to any number greater than 1).

Definition: Allows the user to choose the way that master symbols will be compared with subsequently scanned symbols.

Note: First set **Triggering Mode** to **External** or **Serial**.

Serial Cmd: <**Kn*matchcode type***,*sequential matching,match start position, match length,wild card,sequence on noread,sequence on mismatch*>

Default: **Disabled**

Options:

0 = Disabled	2 = Wild Card
1 = Enabled	3 = Sequential

Options

Has no effect on operations.

Enabled

Instructs the scanner to compare symbols or portions of symbols with the master symbol.

Wild Card

Allows the user to enter user defined wild card characters in the master symbol.

Sequential

Instructs the scanner to sequence after each match (numeric only) and compare symbols or portions of symbols for sequential numbers.

Sequential Matching

Usage: Used in tracking product serial numbers that increment or decrement sequentially.

Definition: With **Sequential** enabled under **Matchcode Type**, **Sequential Matching** determines if a count is in ascending (incremental) or descending (decremental) order.

Serial Cmd: <**Kn***matchcode type,**sequential matching**,match start position, match length,wild card,sequence on noread,sequence on mismatch>*

Default: **Increment**

Options: 0 = Increment 1 = Decrement

Match Start Position

Usage: **Match Start Position** is useful in defining specific portions of a symbol for comparisons. For example, if a symbol contains a part number, manufacturing date, and lot code info but the user is only interested in the part number information, **Match Start Position** can be set to only sort on the part number and ignore the rest of the characters.

Definition: **Match Start Position** determines the portions of symbols that will be matched by defining the first character in the symbol (from left to right) that will be compared with those of the master symbol, when **Matchcode Type** is set to **Enabled** or **Sequential**.

Example: For example, if **Match Start Position** is set to 3, the first 2 characters read in the symbol will be ignored and only the 3rd and subsequent characters to the right will be compared, up to the number of characters specified by **Match Length**.

Serial Cmd: <**Kn***matchcode type,sequential matching,**match start position**, match length,wild card,sequence on noread,sequence on mismatch>*

Default: **0**

Options: 0 to 31

Note: **Match Start Position** must be set to **1** or greater to enable this feature. A **0** (zero) setting will disable this feature.

Match Length

Usage: For example, if **Match Length** is set to **6** in a 10 character symbol, and **Match Start Position** is set for **2**, only the 2nd through 7th characters (from left to right) will be compared.

Definition: Defines the length of the character string that will be compared with that of the master symbol when **Match Start Position** is set to **1** or greater. When **Match Start Position** is set to **0**, no comparison will occur.

Serial Cmd: <**Kn***matchcode type,sequential matching,match start position,* ***match length****,wild card,sequence on noread,sequence on mismatch*>

Default: **1**

Options: 1 to 31

Wild Card

Usage: For example, with **Wild Card** character defined as the default asterisk, defining **CR*34** as the master symbol will result in matches for CR**1**34, CR**2**34, but not CR2345. Entering the wild card at the end of the master symbol as in **CR*** will result in matches for variable symbol lengths such as CR**1**, CR**23**, CR**358**, etc.

Definition: **Wild Card** character allows a user to define a wild card character as part of the master symbol.

Serial Cmd: <**Kn***matchcode type,sequential matching,match start position, match length,* ***wild card****,sequence on noread,sequence on mismatch*>

Default: ***** (asterisk)

Options: Any valid ASCII character

Sequence On Noread

Usage: **Sequence On Noread** is useful when the scanner needs to stay in sequence even if no decode occurs.

Definition: When **Sequence On Noread** is **Enabled** and **Matchcode** is set to **Sequential**, the scanner sequences on every match or noread. When disabled, it does not sequence on a noread.

Serial Cmd: <**Kn***matchcode type,sequential matching,match start position, match length,wild card,**sequence on noread**,sequence on mismatch*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

When **Sequence On Noread** is enabled, the master symbol will increment by one if either a match or a noread occurs.

If both **Sequence On Noread** and **Sequence On Mismatch** are enabled, the master symbol will increment in every event (match, mismatch, or noread).

In the special case, where the expected number is missed by only 1, the sequence skips over the next number in order to resume the sequence. For example, a 002 is expected but a 003 is read. The next master symbol will be 004.See the tables under **"Sequence On Mismatch" on page 7-8** for examples of this.

Sequence On Mismatch

Note: **Matchcode** must be set to **Sequential** for this command to function.

Usage: Enable this parameter if every trigger event should have a decode *and* more than one consecutive mismatch may occur.

Disable this parameter if every trigger event should have a decode but no more than one consecutive mismatch may occur.

Definition: When set to **Enabled**, the master symbol sequences on every decode, match or mismatch. When set to **Disabled**, the master symbol will not sequence whenever consecutive mismatches occur.

Serial Cmd: <**Kn***matchcode type,sequential matching,match start position, match length,wild card,sequence on noread,**sequence on mismatch***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

As an example of **Sequence On Mismatch Enabled**, consider the following decodes:[1]

Master Symbol	Decoded Symbol	Master After Decode	Action
001	001	002	Sequenced on match
002	abc	003	Sequenced on mismatch
003	def	004	Sequenced on mismatch
004	005	006	Sequence skipped
006	ghi	007	Sequenced on mismatch
007	007	008	Sequenced on match

As an example of **Sequence On Mismatch Disabled**, consider the following decodes:

Master Symbol	Decoded Symbol	Master After Decode	Action
001	001	002	Sequenced on match
002	abc	003	Sequenced because of previous match
003	def	003	Not sequenced
003	003	004	Sequenced on match
004	005	006	Sequence skipped
006	006	007	Sequenced on match

You can access **Master Symbol Database** operations from the **Utilities** menu.

1. In both tables, when the expected number is missed by only 1, the sequence skips over the next number in order to resume the sequence.

New Master Pin

Usage: Some applications require the line worker to change the master symbol. This can be done by installing a switch at the location of the scanner. It is very common to have a keyed switch so that accidental switching does not occur.

Definition: After **New Master Pin** is enabled, a pulse can be received on the new master pin which will cause the scanner to record the next decoded symbol symbol(s) as the new master symbol(s).

It is important to note that the enabling **New Master Pin** does not in itself cause a master symbol to be recorded. The master pin must then be activated momentarily (for a minimum of 10 ms) before a master symbol can be scanned into memory. (See **"Electrical Specifications" on page A-5**.)

Serial Cmd: <**Kz*status***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Chapter

8

Terminal Mode

Chapter Contents

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Find Function 8-3
Macros 8-4
Terminal Window Functions 8-5

This section describes the terminal window and macro functions.

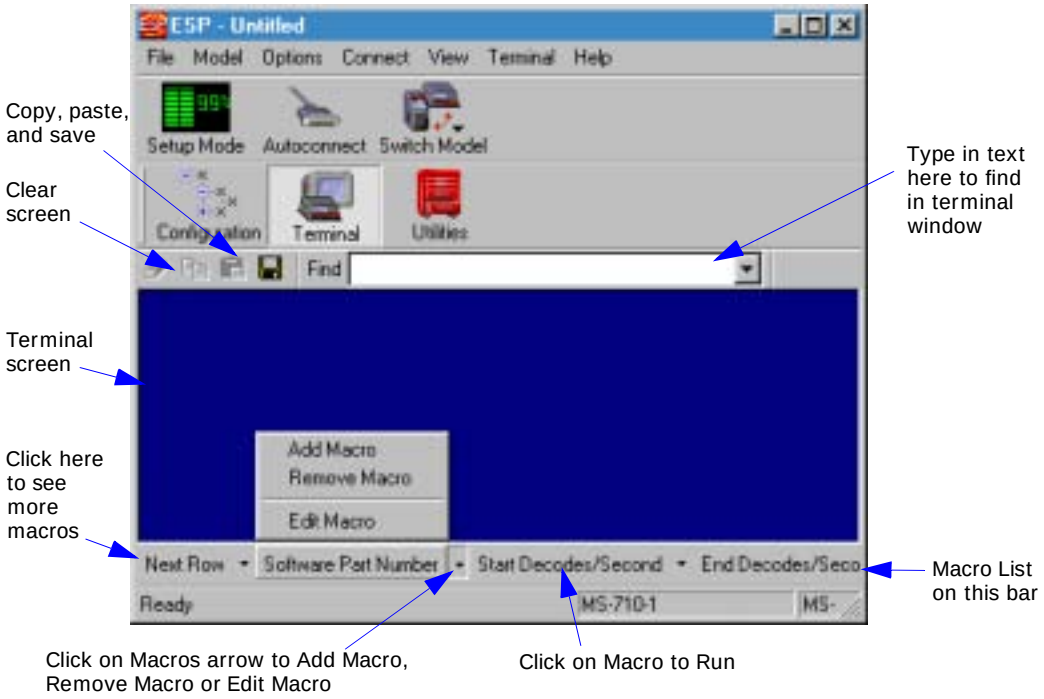
Note: The characters **NULL < >** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Terminal Window

To use the terminal mode, click on the **Terminal** button.



You will see the following window:



The terminal screen allows you to enter serial commands (in **red**) from the macro box, by copying, or directly from your keyboard.

The terminal screen also displays symbol data or information from the scanner (in **blue**).

You can also right click in the terminal screen to bring up a handy option box.

Find Function

The **Find** box allows you to enter text strings to be searched for in the terminal window. For example a series of symbols have been scanned into the terminal view and you want to determine if a particular symbol starting with ABC has been read.

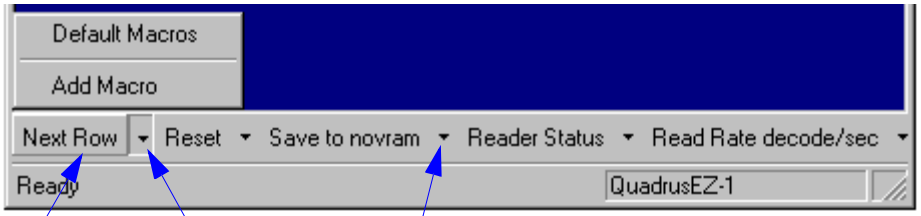
1. Type **ABC** into the **Find** box.



2. Press the **return key**.
   The first instance of **ABC** will be high-lighted in the terminal window.
3. Press the **F3** key to search again for the next instance of **ABC**.
4. Press **Shift-F3** to search for the previous instance of **ABC**.

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

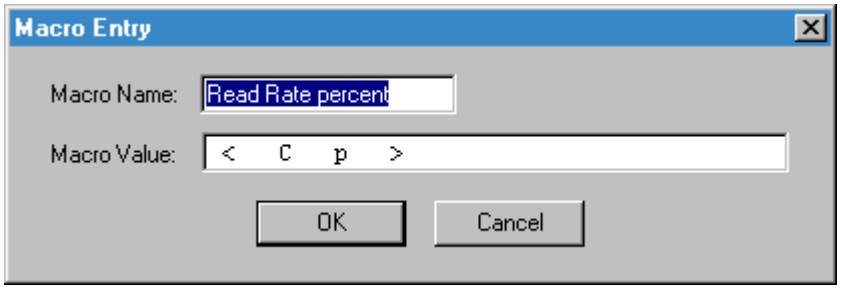
Click on any arrow to **Add**, **Default** or **Edit** macros. When you default macros, the entire macros set is restored to their original macro commands.

When you click on the macro name, the macro is executed in the terminal window.

If this is a serial command, the command is also sent to the scanner at the same time it is displayed.

Editing a Macro

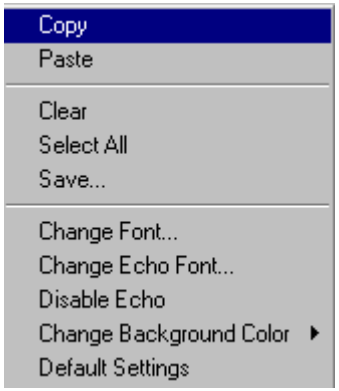
When you click the arrow next to a any macro and select **Edit**, the following appears:



You can edit an existing macro or type in a new macro name and define it in the **Macro Value** text box. Click **OK**.

Terminal Window Functions

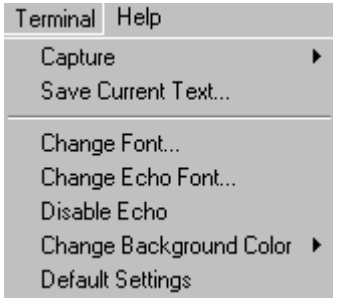
Right-click on the terminal window to display the following:



- **Copy** selected text to clipboard.
- **Paste** from terminal or computer text.
- **Clear** all text in terminal window.
- **Select All** text in the terminal window.
- **Save...** brings up a save as dialog box.
- **Change Font...** of data text, brings up a text dialog.
- **Change Echo Font...** to change typed in text or commands.
- **Change Background Color** of terminal window.
- **Default Settings** changes all the above back to default settings.

Terminal Pulldown Menu

The pulldown **Terminal** menu has **Capture and Save Current Text** as well as the functions defined above.



- **Capture** lets you append data in real time to a text file of your choice. While in operation, the text file cannot be opened. You can select **Pause** to interrupt the capture flow or **Stop** to end the flow and open the file.
- **Save Current Text...** saves all text in the terminal window to a text file of your choice.

Chapter

9

Utilities

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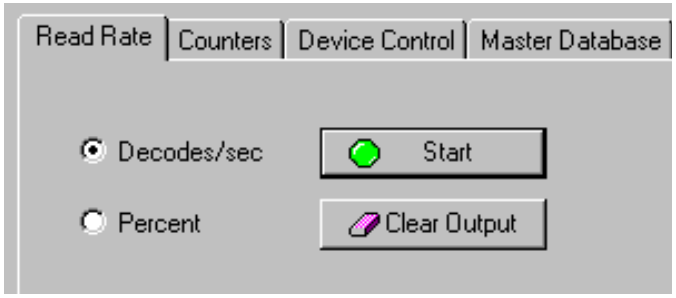
Utility commands are generally commands that are performed during scanner operations to check read rates, determine read rates or perform miscellaneous operations on scanner hardware. Serial utility commands are not prefaced with a “K”, nor do they require an initialization command (<A> and <Z>). They can be entered from within any terminal program or from within ESP in the **Terminal** window.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Utilities by ESP Menu



Click this button to bring up the **Utilities** menu



Utilities by Serial Command

Table 9-1 Summary of Utility Serial Commands

Command Type	Command	Name
Read Rate	**<Cp>**	Enter Single Symbol Percent Rate Test
	<C>	Enter Single Symbol Decode Rate Test
	<Cm>	Enter Multisymbol Percentage Rate Test
	<Cs>	Enter Multisymbol Decode Rate Test
	<Ce>	Extended Read Rate
	<J>	Exit Decode Rate and Percent Rate Test
Counters	**<T>**	Trigger Counter
	<U>	Trigger Counter Reset
	<V>	Good Read/Match Counter
	<W>	Good Read/Match Counter Reset
	<N>	Noread Counter
	<O>	Noread Counter Reset
	<X>	Mismatch Counter
	<Y>	Mismatch Counter Reset
Device Control	**<L1>**	Output #1 Pulse
	<L2>	Output #2 Pulse
	<L3>	Output #3 Pulse
	<I>	Disable Scanner
	<H>	Enable Scanner
	<KF>	Send Motor Off
	<KE>	Send Motor On
Master Database	**<#>**	Master Symbol Database Size
	<E>	Enable Master Symbol
	<F>	Disable Master Symbol
	<G>	Store next symbol scanned as the master symbol
	<)*data***)>**	Enter symbol data as master symbol.
	<)>	Request Information for Master Symbol #1
	<))>	Delete Master Symbol #1
Firmware	**<!>**	Display Checksums of EPROM
	<#>	Display Part Number
Symbol Types	**<P>**	Autodiscriminate All Codes
	<Q>	Enable Code 39 Only
	<R>	Enable Codabar Only
	<S>	Enable I 2/5 Only
Trigger	**<***char***>**	Serial Trigger Character
Restore/Save[a]	**<A>**	Reset (does not save for power-on)
	<Ad>	Restore Default Settings
	<An>	Restore Saved Settings

Table 9-1 Summary of Utility Serial Commands

	<Z>	Reset/Save (for power-on)
	<Zp>	Save Factory Settings
	<Zd>	Save/Restore Factory Defaults
Status Requests	**<?>**	Scanner Status
	<?1>	Extended Scanner Status
	<K?>	Configuration Status

a. See **Appendix I — "Defaulting/Saving/Initializing"**.

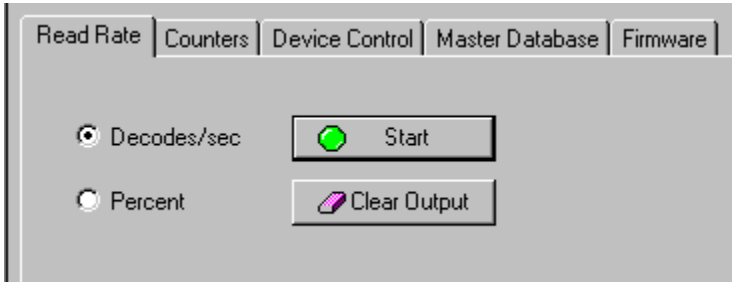
Read Rate

By ESP

You can access **Read Rate** from the **Utilities** menu.

To start or end a read rate test, right-click **Read Rate** and select **Start** or **Stop**.

To change from percent read rate to decodes per second, first end the read rate by selecting **Stop**, then right-click select **Decodes/Sec**.



Read Rate by Serial Command

Enter Single Symbol Percent Test

Sending **<Cp>** instructs the scanner to transmit the percentage of decodes and any scanned symbol data.

Enter Multisymbol Percent Enter Single Symbol Decodes/Second Test

Sending **<C>** instructs the scanner to transmit the decodes per second and symbol data (if any). The decode rate can vary dramatically due to the angle and location of the symbol in relation to the scan line. This test is very useful in aligning and timing the scanning device during installation.

Test

Sending **<Cm>** instructs the scanner to transmit the percentage of scans decoded and symbol data (if any) for multiple symbols.

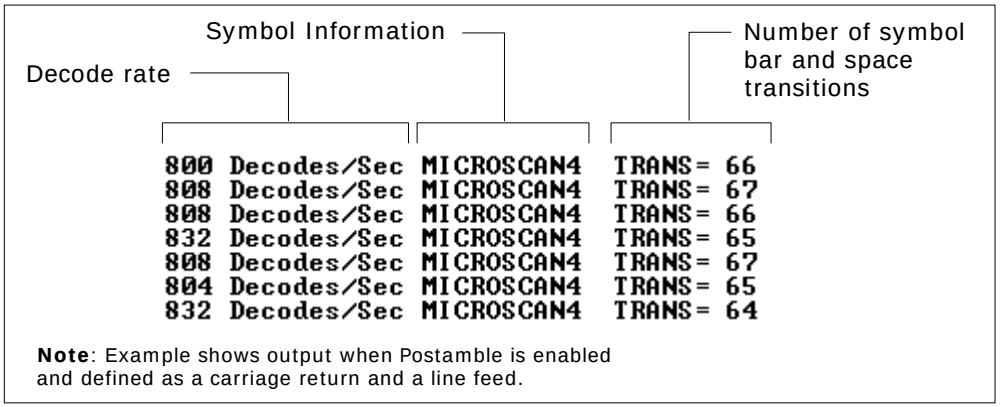
Enter Multisymbol Decode Rate Test

Sending **<Cs>** instructs the scanner to transmit the decode rate and symbol data (if any) for multiple symbols.

Enable Extended Rate Test for Single and Multisymbol

Sending **<Ce>** after **<C>** or **<Cs>** will generate a an extended mode that applies to both single and multiple symbols.

Extended mode instructs the scanner to output the decode rate, the symbol data, and the transition data.



Note: Example shows output when Postamble is enabled and defined as a carriage return and a line feed.

Note: The <Ce> command has no immediate effect if not preceded by <C> or <Cs>.

End Read Rate Test

Sending **<J>** ends both the **Percent** test and the **Decodes/Second** test for both single and multi-symbol.

Counters

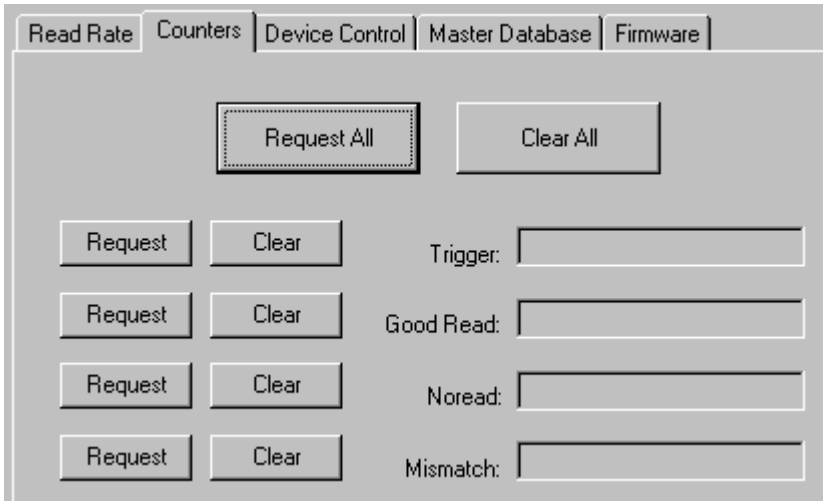
Counter commands can be a numeric value from 00000 to 65,535. After reaching the maximum numeric limit of 65,535, the counter will automatically roll-over and start counting again at 00000. To obtain the cumulative total of counts after the roll-over has occurred, add 65,536 per each roll-over (the scanner does not keep track of the number of roll-overs) to the current count.

Note: All counter values will be lost if power is recycled to the scanner or the scanner receives a reset or save command.

Counters By ESP

You can access **Counters** from the **Utilities** menu.

Click **Request All** or **Request** for a specific counter to display count. Click **Clear** to set counter to zero.



Counters by Serial Command

Trigger Counter

Sending **<T>** displays the total number of triggers since the last reset.

Trigger Counter Reset

Sending **<U>** sets the trigger counter to 00000.

Good Read/Match Counter

Sending **<V>** displays the total number of good reads matching the master symbol or, if Master Symbol is not enabled, the number of good reads since the last reset. This counter is always enabled, but will only work as a match count when Master Symbol is enabled. If Master Symbol is not enabled, this counter records the number of good reads. This count can be requested at any time.

Good Read/Match Counter Reset

Sending **<W>** sets the Match Counter to 00000.

Noread Counter

Sending **<N>** displays the total number of noreads that have occurred since the last reset.

Noread Counter Reset

Sending **<O>** sets Noread Counter to 00000.

Mismatch Counter

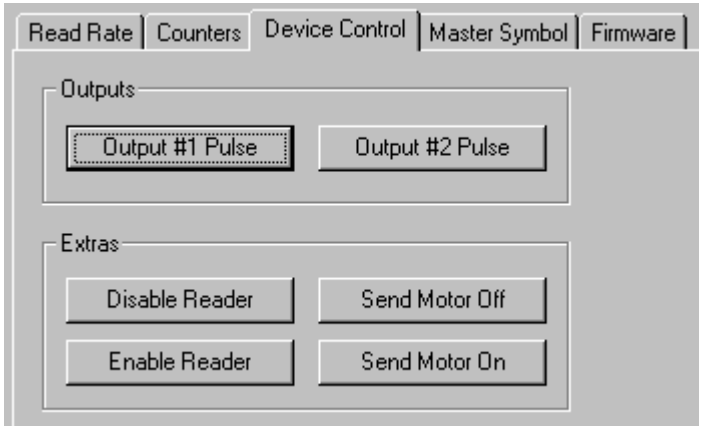
With Matchcode enabled, sending **<X>** displays the number of decoded symbols since the last reset that do not match the master symbol.

Mismatch Counter Reset

Sending **<Y>** sets the Mismatch Counter to zero.

Device Control

By ESP



Device Control By Serial Command

Output #1 Pulse

Sending **<L1>** pulses Output 1 (regardless of Master Symbol or Output 1 status).

Output #2 Pulse

Sending **<L2>** **pulses** Output 2 (regardless of Master Symbol or Output 2 status).

Disable Reader

Sending **<I>** will turn the laser off and end the current read cycle. This feature is useful during extended periods of time when no symbols are being scanned or the scanner is being configured. Disabling laser scanning will not affect any downloaded commands to the scanner.

Note: Disable Laser Scanning does not relate to **Laser On/Off**, which when enabled also turns off the laser but only between read cycles.

Enable Reader

Sending **<H>** will turn the laser on continuously.

Note: Enable Laser Scanning does not relate to **Laser On/Off** command.

Send Motor Off

Sending **<KF>** turns the spinning mirror motor off. This command is useful for long idle periods.

Note: Laser turns off whenever motor is off.

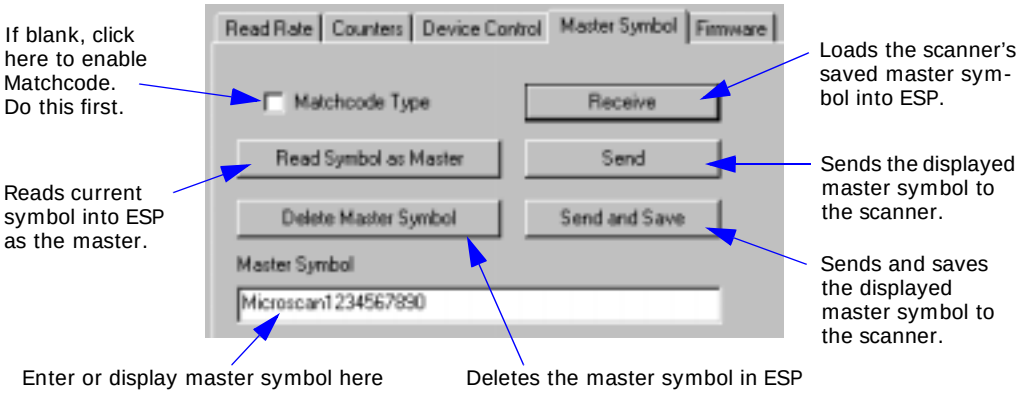
Send Motor On

Sending **<KE>** turns the spinning mirror on (if not already running).

Note: The spinning mirror reaches full speed after a short time delay.

Master Symbol

You can enter, edit, delete, and send and receive master symbol data that can be stored in your scanner and ESP for matchcode operations. For matchcode setup, see **Chapter 7, "Matchcode."**



Enter Master Symbol Data

Definition: This command allows the user to enter text as the master symbol.

ESP:

1. To access, click the **Master Symbol** tab.
2. Click the **Matchcode Type** check box if not checked.
3. Do one of the following to enter master symbol data:
   a) Type data directly into text block and click **Send** or **Send and Save**.
   b) Click **Read Symbol as Master** to enter the next decoded symbol as the master symbol in ESP and the scanner.

Serial Cmd: <***)data)***> (Enter text in place of *data*.)

Store Next Symbol Decoded as Master Symbol

Definition: Stores the next symbol decoded as the master symbol.

Serial Cmd: **<G>**

ESP: In the **Master Symbol** tab in the **Utilities** menu, click **Read Symbol as Master**.

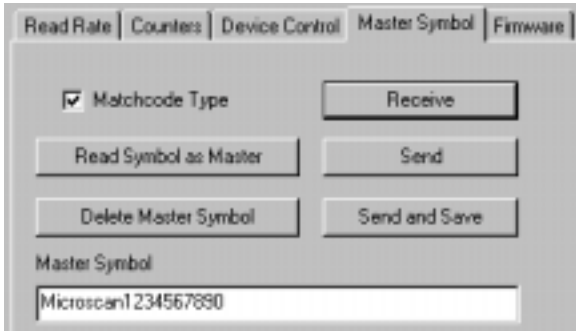


Note: Utility commands are not accessible by embedded menus.

Request Master Symbol Data

Definition: Returns the current master symbol data.

ESP:
1. Click the **Utilities** button and the **Master Symbol** tab.
2. Click **Receive** to see the current master symbol.



Serial Cmd: Send <**)**> to request the current master symbol.

Delete Master Symbol Data

Definition: This command will delete the current master symbol data.

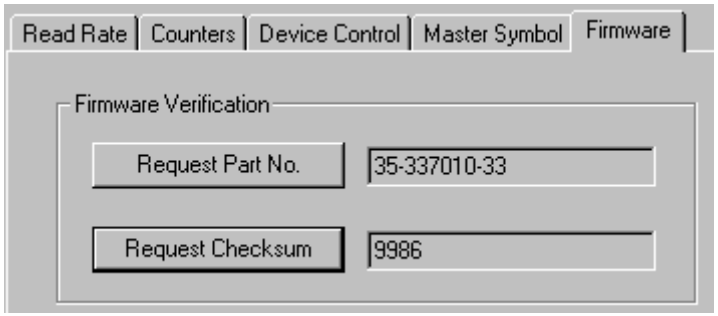
ESP:

1. Click the **Utilities** button.
2. Click the **Master Symbol** tab and double-click the symbol number you want to delete.
3. Click **Delete Master Symbol** button to delete the master symbol in both ESP and the scanner.



Serial Cmd: Send <**))**> to delete the master symbol.

Firmware



Firmware Verification — Part Number

You can send a request for scanner's current firmware part numbers.

By ESP

1. From the **Utilities** menu you can access **Firmware Verification** from the **Firmware** tab.
2. Select the firmware code you want to check and click **Request Part No.** to see the associated part number.



By Serial Command

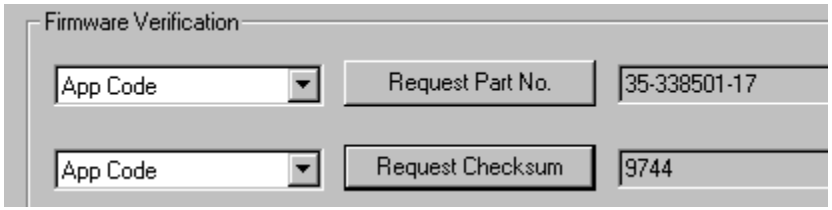
Upon sending **< # >** the scanner returns software part numbers for application code.

Firmware Verification — Checksum

A checksum verifies a scanner's firmware.

By ESP

1. From the **Utilities** menu you can access **Firmware Verification** from the **Firmware** tab.
2. Select the firmware code you want to check and click **Request Checksum** to see the associated part number.



By Serial Command

Upon sending **<!>** the scanner returns two 4-digit hex numbers that are the check sums for the application code.

Autodiscrimination

You can enable most or specific symbol types by the following operational commands.

Default: **Code 39 (only)**

Options:
- **<P>** Enables most symbol types.
- **<Q>** Enable Code 39 only
- **<R>** Enable Codabar only
- **<S>** Enable I 2/5 only

Scanner Status Requests

<?> Scanner Status Byte

The scanner responds to a status request **<?>** with a single ASCII character, for example a symbol **F**.

To determine the status:

1. Look up the hex conversion in an ASCII to hex table, **Table A-8, "ASCII Table with Control Characters," on page A-17**. The ASCII **F** character corresponds to **46** in hex.
2. Look up the binary conversion for **46** in **table 9-2**.

   For example, the **4** in binary would be **0 1 0 0** as read from binary digits 3 through 0; the **6** the binary digits 7 through 4 which is **0 1 1 0**. Note that for this example, the binary bits are read from left to right.

3. Next, enter your binary values in **table 9-3** in the "Binary" column next to the appropriate bit.

Table 9-3 Scanner Status

Bit	Binary	Scanner Status
0	***0***	Command error detected
1	***1***	Command received
2	***0***	Communication error detected
3	***0***	Flash sector unprotect failure
4	***0***	Scan motor or reading disable
5	***1***	Scanner is in a read cycle
6	***1***	Always 1
7	***0***	Always 0

4. Under "Binary," interpret ***1***s as true and the ***0***s as not true. For example, bit 1 has a ***1*** in the "Binary" column, indicating "Command Received." Bit 5 is also a ***1*** indicating that the "Scanner is in a read cycle."

Table 9-2 Hex Value to Binary Conversion

Hex Value	Binary Bit Digits 7 6 5 4 / 3 2 1 0
0	0 0 0 0
1	0 0 0 1
2	0 0 1 0
3	0 0 1 1
4	0 1 0 0
5	0 1 0 1
6	0 1 1 0
7	0 1 1 1
8	1 0 0 0
9	1 0 0 1
A	1 0 1 0
B	1 0 1 1
C	1 1 0 0
D	1 1 0 1
E	1 1 1 0
F	1 1 1 1

<?1 > Extended Status

The scanner responds to an extended status request **<?1>** with several fields, for example: **<p><35-337010-33,9986,9986,51,51>**.

These represent: the status byte **<p>**, the application part number (<**35-337010-33**), the checksum (**9986,9986**), current RAM parameter checksum (**51,51**>).

<K?> Configuration Command Status

Returns the current status of all configuration commands.

Appendices

Appendix

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Appendix A — General Specifications

Key Features

- Multiple symbol and symbology reading

Mechanical

Depth: 2.59" (65.8mm)
Width: 3.47" (88.1mm)
Height: 1.36" (35.5mm)
Weight: 9 oz. (255g)

Environmental

Ambient Light Immunity:
450 foot candles (indoor: fluorescent, incandescent, mercury vapor, sodium vapor); 1800 foot candles (soft outdoors)
Enclosure rating: IP54 Operating temperature: 0° to 50°C (32° to 122°F)
Storage Temperature: –29° to 70°C (–20° to 158)
Humidity: Up to 90% (non-condensing)

Emissions and Immunity

General immunity for light industry:
EN 50082:97
Radiated and conducted emissions of ITE equipment: EN 55022:98, Class A

Laser Light

Type: Laser Diode
Output Wavelength: 670nM nominal;
Safety class:
CDRH Class II, 1.0mW max.
Operating Life: 50,000 hours @25°C

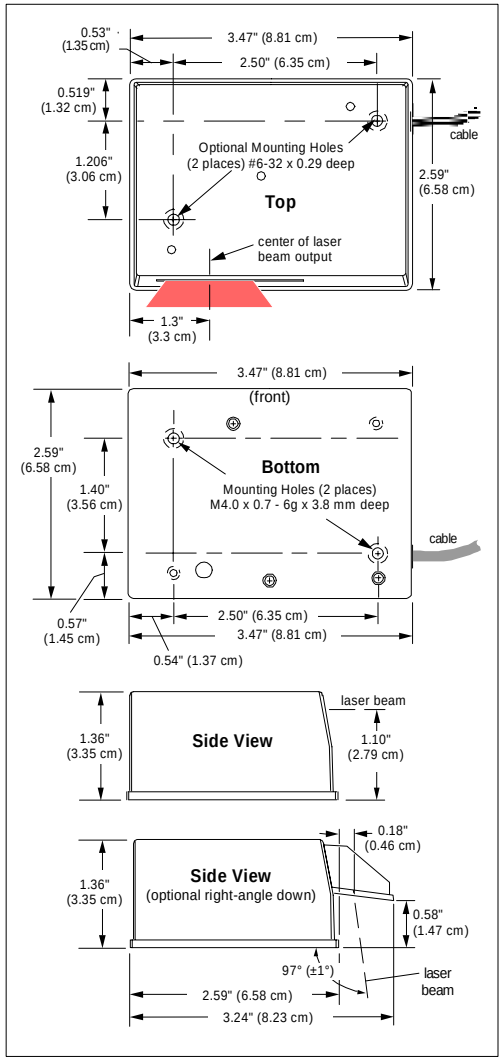


Figure A-1 MS-710 Dimensions

Scanning Parameters

Scanning mirror type: Rotating, 10-faceted

Options: Single line/raster300 to 550*Scan Rate:* scans per second

Scan width angle: Typically 60°; Pitch: ±50°*Optional raster mirror image:* 10 raster scan lines over a 2-degree arc (or 0.24 inch raster at 6-inch distance)

Scan Range	Raster Height
2 inches (50.8 mm)	0.10 inch (2.54 mm)
4 inches (101.6 mm)	0.17 inch (4.32 mm)
6 inches (152.4 mm)	0.24 inch (6.1 mm)
8 inches (203.2 mm)	0.31 inch (7.87 mm)
10 inches (254 mm)	0.38 inch (9.65 mm)

Communication

RS-232, RS-422/485, Daisy chain

Symbologies

Standard offering: Code 128, Code 39, Code 93, Codabar, Interleaved 2 of 5, UPC/EAN

FIS Options

Each MS-710 model is identified by an FIS (final instruction sheet) number that refer to a set of options. The following are the standard options available at this time:

Hardware

- Single line / Raster scanning
- Straight out / Right angle
- Bottom mount / Top mount
- Low density / High density
- RS-232 / RS-422 and RS-485
- Second relay for noread option
- MS-Sensor

Software

- Wand emulation
- Full ASCII code 39 software
- Code 49 software
- PDF-417
- Extended hold relay
- Photo finishing software
- MSI software
- Long line software
- Long symbol software
- Plessy code
- Pharmacode

LED Indicators

Table A-1 MS-710 Status Lights

LED	State	Status[a]
PWR	On	Scanner has power
RDY	Green On	Scanner is ready to read
GD/RD	Green On	Symbol is qualified as good

a. In menu status both green lights will flash on and off.

Read Ranges

The table and graphs that follow show scan widths and read range minimum and maximums for several bar code densities.

Table A-1 Range Data

Narrow-bar-width	Read Range	Maximum Scan Width[a]
High Density		
.005" (.127 mm)	2 to 3.1" (5.08 to 7.87 cm)	2.1" (5.33 cm)
.0075" (.191 mm)	2 to 4" (5.08 to 10.2 cm)	3.6" (9.14 cm)
Low Density		
.0075" (.191 mm)	2.5 to 5.5" (6.35 to 14.0 cm)	4" (10.2 cm)
.010" (.254 mm)	2 to 6.5" (5.08 to 16.5 cm)	5" (12.7 cm)
.015" (.381 mm)	2 to 7.5" (5.08 to 19.0 cm)	6" (15.2 cm)
.020" (.508 mm)	2 to 10" (5.08 to 25.4 cm)	7" (17.8 cm)
.030" (.762 mm)	2 to 10" (5.08 to 25.4 cm)	7" (17.8 cm)
.040" (1.02 mm)	2 to 10" (5.08 to 25.4 cm)	7" (17.8 cm)
Right-angle Down		
.0075" (.191 mm)	1.25 to 4" (3.18 to 10.2 cm)	4" (10.2 cm)
.010" (.254 mm)	1 to 5" (2.54 to 12.7 cm)	5" (12.7 cm)
.015" (.381 mm)	1 to 6" (2.54 to 15.2 cm)	6" (15.2 cm)
.020" (.508 mm)	1 to 8.5" (2.54 to 21.6 cm)	7" (17.8 cm)
.030" (.762 mm)	1 to 8.5" (2.54 to 21.6 cm)	7" (17.8 cm)
.040" (1.02 mm)	1 to 8.5" (2.54 to 21.6 cm)	7" (17.8 cm)

a. At 500 decodes per second using Code 39 grade A symbol.

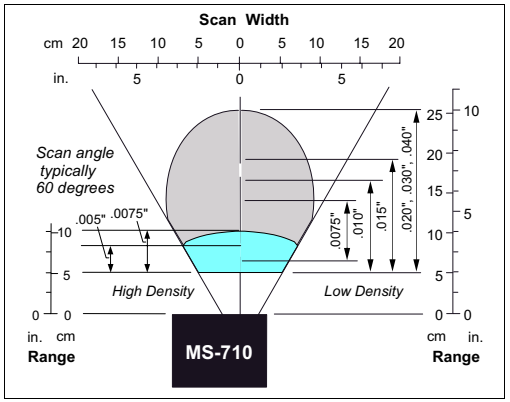


Figure A-2 Low Density and High Density Scan Range/Width Graph

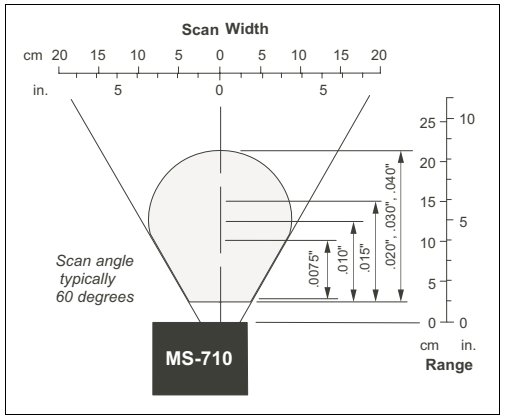


Figure A-3 Right-angle Down Scan Range/Width Graph

Safety Certifications

FCC, CDRH, CE, UL/cUL, BSMI

Product specifications are given for typical performance at 25°C (77°F) using grade A symbols. Some performance characteristics may vary at high temperatures or other environmental extremes.

©2007 Microscan Systems, Inc. Specifications subject to change.

Appendix B — Electrical Specifications

Power Input: +5VDC ±4% regulated @480 mA with 200mV p-p max. ripple
Cabling: 3-foot cable terminated with a 15-pin high density D-Sub connector socket.

Table A-1 MS-710 Host Connector, 15-pin

Pin	Host RS-232	Host & Aux RS-232	Host RS-422/485	In/ Out
1	Power +5 VDC			In
2	Host TxD	Host TxD	TxD (–)	Out
3	Host RxD	Host RxD	RxD (–)	In
4	Power/signal ground			
5	NC			
6	RTS (5V only)	NC	TxD (+)	Out
7	Output 1 TTL (+)[a]			Out
8	Default configuration[b]			In
9	Trigger (NPN)[c]			In
10	CTS (5V only)	NC	RxD (+)	In
11	NC			
12	New master (NPN)			In
13	Chassis ground[d]			
14	Output 2 TTL (+)[e]			Out
15	NC			

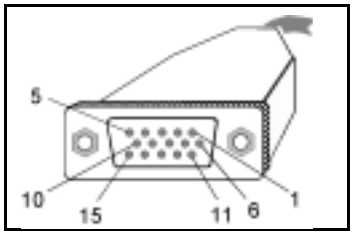


Figure A-1 MS-710 Connector

Caution:

1. Be sure all cables are connected **BEFORE** applying power.
2. Always power down **BEFORE** disconnecting any cables.

a. Can sink 10 mA and source 2mA. Also causes closure of a relay in the IB-105 box, accessible through pin 15 of the IB-105 host connector (see **Table A-5, "25-pin D-sub Host Connector," on page A-10**).

b. The default is activated by connecting pin 8 to ground pin 4. See **"By Hardware Default" on page A-21**.

c. Can tolerate up to 24VDC.

d. Chassis ground: Connects chassis body to earth ground only. Not to be used as power or signal return.

e. Can sink 10 mA and source 2 mA.

Note: Since +5 VDC power supply is included in the single cabling assembly, the scanner cable should not exceed 3 feet. RS-232 cabling from the 15-pin connector to the host can be up to 47 feet provided it does not include 5VDC input.

Appendix

Appendix C — Connectivity with the IB-105

The IB-105, Microscan P/N 99-420001, is a separately sold item that can be used to enhance the operation of the MS-710. See also **"Hardware Required" on page 1-2.**

Specifications of IB-105

Mechanical

Length: 4.5 in. (114.3mm)

Width: 3 in. (76.2mm)

Height: 1.5 in. (38.1mm)

Internal Relay

Uses the scanner's output 1 signal to drive a one watt internal relay that internally connects pins 15 and 17 of the host connector and pins 2 and 6 on the trigger connector. The normally open relay contacts are closed when output 1 is high.

Environmental

Operating Temperature: 0 to 50°C

Humidity: 90% @ 40°C maximum

Electrical

Supply Voltage Input: Regulated +5VDC @20mA

Maximum ripple:200mV p–p with MS-710 +5VDC @500mA

Communications

RS-232, RS-422, RS-485

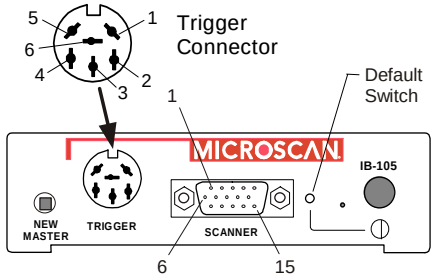


Figure A-2 Front of IB-105

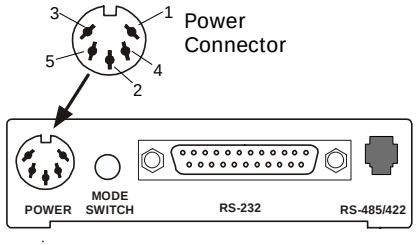


Figure A-3 Back of IB-105

IB-105 Connectors

Scanner Connector. A 15-pin connector provides connectivity to the scanner.

25-pin (host) "RS-232" Connector. The 25-pin host connector, symboled "RS-232" on the box, can also be used in certain configurations to route RS-422/485.

RS-485/422 (LAN) Connector. See **Table A-6 on page A-10** for pinouts.

Power Connector. Designed to accept the standard +5V Microscan power supply. Chassis ground must be properly connected for the IB-105 and scanner to pass all regulatory requirements (FCC, CE, CISPER-22).

Trigger Connector. Connects to an object detector.

IB-105 Switches

New Master Switch. Used in match symbol operations to indicate that the next symbol will be read as the new master symbol. Momentarily press the switch to activate it.

Default Switch. Provides a convenient way to restore factory configuration settings to the scanner. This switch is recessed to prevent accidentally defaults. See **"Defaulting/Saving/Initializing" on page A-20**.

Power Switch. Accesses +5V power supply (pin 3 of power connector).

Mode Switch. **IN** or **OUT** according to configuration.

IB-105 Configuration Options

Note: See tables starting on **page A-10** for IB-105 pinouts and mode switch settings.

Because the IB-105 is a very flexible device used with more than one scanner model, you need to verify cable type, IB-105 model, and mode switch setting for your option.

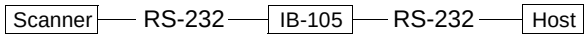
Configuration	Description	Internal Dip Switches							
		8	7	6	5	4	3	2	1
1	RS-232 with RTS/CTS or RS-485	■						■	
2	RS-232 with RTS/CTS or RS-422							■	
3	RS-422 with Aux RS-232 or RS-232				■				■
4	RS-422 (MS-710) to RS-232			■					■
5	RS-422 LAN to RS-232 converter					■	■		

■ = ON □ = OFF

Configuration 1: RS-232 w/RTS-CTS to RS-485 or Second RS-232 Port

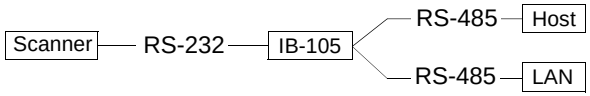
Mode switch toggles the host port between RS-232 and RS-485.

- When mode switch is **OUT** RS-232 signals go through the 25-pin (host) connector.



- When mode switch is **IN** the IB-105 converts RS-232 signals (TxD, pin 2, RXD, pin 3) to RS-485 levels. The RS-485 levels are present at both the RS-485/422 (LAN) connector and the 25-pin (host) connector.

Note: In this mode the scanner must be set to multidrop communications.



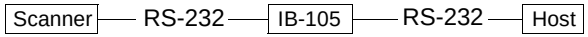
Note: The second RS-232 TxD (pin 4, host connector) is not available in this mode.

Configuration 2: RS-232/422 with RTS/CTS or Second RS-232 Serial Port

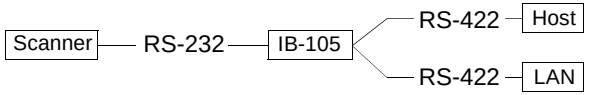
Mode switch toggles the host port between RS-232 and RS-422.

- When mode switch is **OUT**, RS-232 signals go through the 25-pin (host) connector.

Note: The second RS-232 TXD pin is available in this mode.



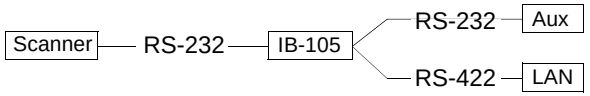
- When mode switch is **IN**, the IB-105 converts RS-232 signals (TXD, RXD) to RS-422 levels. RS-422 levels are present at both the RS-485/422 (LAN) connector and the 25-pin RS-232 connector.



Configuration 3: RS-422 with Second RS-232 Serial Port on Pins 2 and 3

Mode switch must be **IN** for proper operation.

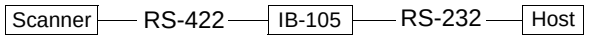
Identical to “Option 2" except that the second serial port (aux) is present on pins 2 and 3 of the 25-pin (host) connector. This allows a standard RS-232 cable to connect to the second serial port.



Configuration 4: RS-422 to RS-232

Mode switch must be **OUT** for proper operation.

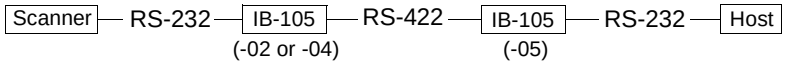
Same features as the previous configurations except that the scanner connector pins for TXD, RXD, CTS, RTS are used by the MS-710 for RS-422 communications. So to connect an RS-232 terminal to the MS-710, the IB-105 converts these signals to RS-232 levels and back. Pins 2 and 3 on the 25-pin (host) connector are the only communications pins that are active in this configuration.



Configuration 5: RS-422 LAN to RS-232 Terminal[1]

Mode switch must be **IN** for proper operation.

This is a special configuration to convert RS-422 signals back to RS-232. This setting is used primarily in conjunction with two IB-105's, one to convert the scanner communications to RS-422 and the other to convert these signals back to RS-232 (this configuration) for long distance communications (up to 4000 feet).



Scanner and trigger connectors are not used in this configuration.

LAN cable connections must be as follows:

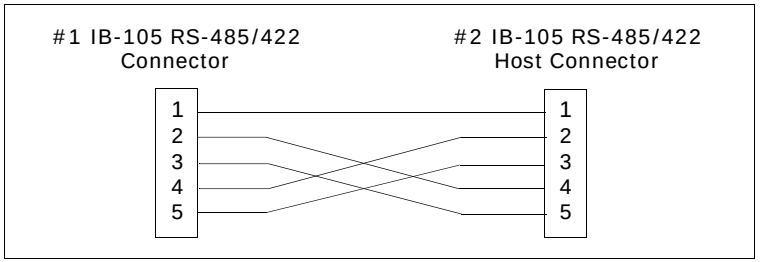


Figure A-4 LAN RJ-11 Cable

1. Access to the configuration menus of a scanner that is in a polled mode can be forced (without defaulting) by sending the <D> command from an auxiliary terminal via the auxiliary RS-232 port.

IB-105 Connectors and Pinouts

Table A-2 6-pin Trigger Connector

Pin	Function
1	Trigger in to pin 9 of scanner connector
2	Relay contact normally open (up to 1watt)
3	VCC (+5V)
4	VBB (+12V, if using Microscan's standard object detector[a])
5	Ground
6	Relay common

a. P/N 99-440001-03

Table A-3 15-pin Scanner Connector

Pin	Function
1	+5 VDC (in)
2	Transmit data (RS-232) (out)
3	Receive data (RS-232) (in)
4	Signal ground (RS-232)
5	NC
6	RTS (5V only)
7	Output-1 Driver (out). Can sink 10 mA and source 2 mA.[a]
8	Default configuration (in)
9	Trigger (in) from 3V to 24V
10	CTS (5V only)
11	NC
12	New master (in)
13	Chassis ground
14	Output-2 Driver (out). Can sink 10 mA and source 2 mA.
15	NC

a. Relay-1 output also causes closure of an isolated relay between pin 15 and pin 17 of the IB-105 host connector.

Table A-4 5-pin Power Connector

Pin	Function
1	Signal ground
2	Chassis ground
3	+5 VDC
4	NC
5	NC

(See also scanner pinouts on **Table A-1 on page A-5**.)

Table A-5 25-pin D-sub Host Connector

Pin	Function
1	Chassis ground
2	Host RS-232 TXD (RS-232)
3	Host RS-232 RXD (RS-232)
4	Host RS-232 RTS or under software control aux RS-232 TXD, or RS-485 transmitter enable (out)
5	Host RS-232 CTS or under software control aux RS-232 RXD (in)
6	Output 2 from pin 14 of scanner connector.
7	Signal ground
8	Output 1 from pin 7 of scanner connector.
9	VCC (+5V)
10	Trigger input; same as pin 1 of trigger connector
11	Default configuration pin goes to pin 8 of the scanner connector and the default switch
12	NC
13	Host RS-422/RS-485 (+in)
14	Host RS-422/RS-485 (–out)
15	Relay contact normally open (up to 1watt) (common with pin 17)
16	Host RS-422/RS-485 (–in)
17	Relay contact normally open (up to 1watt) (common with pin 15)
18	NC
19	Host RS-422/RS-485 (+out)
20	NC
21	NC
22	Ground
23	NC
24	NC
25	New master input to pin 12 of the scanner connector and new master button

Table A-6 6-pin LAN (RJ11) Connector

Pin	Function
1	Chassis ground
2	RS-422/485 (+in)
3	RS-422/485 (–in)
4	RS-422/485 (+out)
5	RS-422/485 (–out)
6	Chassis ground

Appendix D — Serial Configuration Commands

The following table is a list of all the available serial configuration commands (also called “K commands”). These commands are also listed at the beginning of each applicable chapter. For utility (operational) commands see **Table 9-1, “Summary of Utility Serial Commands,” on page 9-3.**

Table A-7 Complete List of Serial Configuration Commands

Command Title	Format
COMMUNICATIONS	
Host Port Connections	<**Ka***baud,parity,stop bits,data bits*>
Host Protocol	<**Kf***protocol*>
Auxiliary Port	<**Ky***aux port mode,baud,parity,stop bits,data bits,daisy chain status,daisy chain ID*>
Preamble	<**Kd***status,preamble*>
Postamble	<**Ke***status,postamble*>
LRC	<**Kc***status*>
Response Timeout	<**KA***response timeout*>
Intercharacter Delay	<**KB***intercharacter delay*>
READ CYCLE	
Multisymbol	<**KL***number of symbols,multisymbol separator*>
Trigger Mode	<**Kg***trigger mode,filter time*>
External Trigger State	<**Kj***external trigger state*>
Serial Trigger Character	<**Ki***serial trigger character*>
End of Read Cycle	<**Kh***end of read cycle,read cycle timeout*>
Good Decode Reads	<**Km***good decode reads*>
Scan Speed	<**KE***scan speed*>

Table A-7 Complete List of Serial Configuration Commands

Command Title	Format
Transition Counter	<**KH***symbol detect status,transition counter,reflectance threshold*>
Scanner Type	<**KP***density*>
SYMBOLOGIES	
Code 39	<**Kp***status,check digit status,check digit output status,large intercharacter gap,fixed code length status,fixed code length*>
Code 128	<**Kt***code 128 status,fixed symbol length status,symbol length,UCC/EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding*>
Interleaved 2 of 5	<**Kr***status,check digit status,check digit output,symbol length 1,symbol length 2*>
Codabar	<**Kq***status,start & stop match status,start & stop output status,large intercharacter gap,fixed symbol length status,symbol length,check digit type,check digit output*>
UPC/EAN	<**Ks***UPCstatus,EAN status,supplementals status,separator status,separator character*>
Narrow Margins/ Symbology Identifier	<**Ko***narrow margins,symbology identifier status*>
Background Color	<**Kx***background color*>
I/O PARAMETERS	
Symbol Data Output	<**Kl***symbol output status,when to output*>
Noread Message	<**Kk***status,message*>
Bad Symbol Message	<**KM***status,message*>
No Symbol Message	<**KN***status,message*>
No Object Message[a]	<**KO***status,message*>
Laser On/Off Status	<**KC***laser on/off status*>
Beeper	<**Ku***status,volume*>
Partial Output	<**KY***status,start postion,length*>
Serial Verification	<**KS***command echo status,command beep status,control/hex output*>
MATCHCODE	
Matchcode	<**Kn***matchcode type,sequential matching,match start position, match length,wild card character,sequence on noread,sequence on mismatch*>
New Master Pin	<**Kz***status*>

a. For MS-710s with MS-Sensors.

Appendix E — 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 **>** characters 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 **<A>** or **<Z>.** See **Table 9-1, “Summary of Utility Serial Commands,” on page 9-3.**

Serial Configuration “K” Commands

These begin with a single **K** character followed by a single character, data fields, and an initializing command, as follows:

<**K***parameterdata,data,...etc.*><*initializing command*>

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

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

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

Note: Allow a **1** second delay after sending the <A> command before resuming communications.

Serial Configuration Command Conventions:

- All data fields (except the last) must be followed by a comma (without a space).
- The following characters cannot be used: , < > NUL.
- 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, **<Ka*4,1,0,0*>** can be entered as **<Ka,,,*0*>**.
- All fields *following* a modified field can be omitted. For example, to change **Baud Rate**, send **<Ka*3*>**.

Concatenating Configuration Commands

Commands can be concatenated (added together) in a single string or data block.

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.

Entering Special Characters in Serial Commands

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

Entering Special Characters in Embedded Menus

Control Characters

Control characters entered on the command line are displayed in the menu as mnemonic characters, such as: <CR><LF><NUL><NUL>.

Press **SP** (the space bar) once, then enter the control character by holding down the control key and simultaneously pressing the desired character. For example to define a line feed, press **SP**, then **Control** and **J** simultaneously. It is displayed as ^J on the command line and as <LF> in the menu when the screen is refreshed.

To Define a Carriage Return as a Character

Press **SP**, then **CR**. It is displayed as ^M on the command line and as <CR> in the menu when the screen is refreshed.

To Define a Space as a Character

Press **SP** twice. It is displayed as a blank space in the menu when the screen is refreshed. While it appears that nothing has been assigned, the hex value 20 will be sent during data transmission.

To Select NUL as the Character

Press **SP**, then a **0** (zero). It is displayed as <NUL> in the menu when the screen is refreshed.

Appendix F — MS-Sensor

Note: The **MS-Sensor** is an optional FIS feature.

The MS-Sensor is a patented specular sensor that interprets reflected light from the laser beam. Once adjusted to your environment, it indicates why the scanner might fail to decode a symbol within the triggered read cycle and outputs the appropriate message to you. The following three conditions are possible:

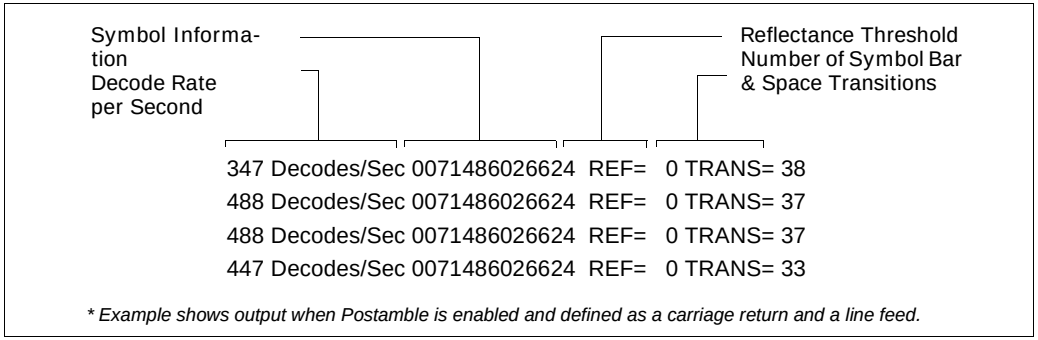
- the object's symbol is defective (you receive a bad bar code message)
- there is no bar code on the object (you receive a no bar code message)
- there is no object (you receive a no object message)

To properly configure the MS-Sensor, you must first enter the extended decode rate test to view the readouts for reflectance (REF) and transitions (TRANS), the number of symbol bar and space transitions. These readouts are the basis for configuring **Reflectance Threshold** and **Transition Counter**, which affect the MS-Sensor's operation.

Note: Prior to beginning the extended decode rate test, make sure that the lighting conditions are equivalent to what they will be during normal operations and that the sensor's field of view is clear of all objects that are not to be sensed.

a) To begin the extended decode rate test, enter **<Ce>**.

The extended decode rate test also displays decode rate and symbol data (if any exists) as well as reflectance and transition readings.



** Example shows output when Postamble is enabled and defined as a carriage return and a line feed.*

As shown in **figure A-5 on page A-16**, the results for **Transition Counter** and **Reflectance Threshold** is sensed from directly in front of the scanner at an optimum detection range of 3 inches for diffused objects and 5 inches for specular objects.

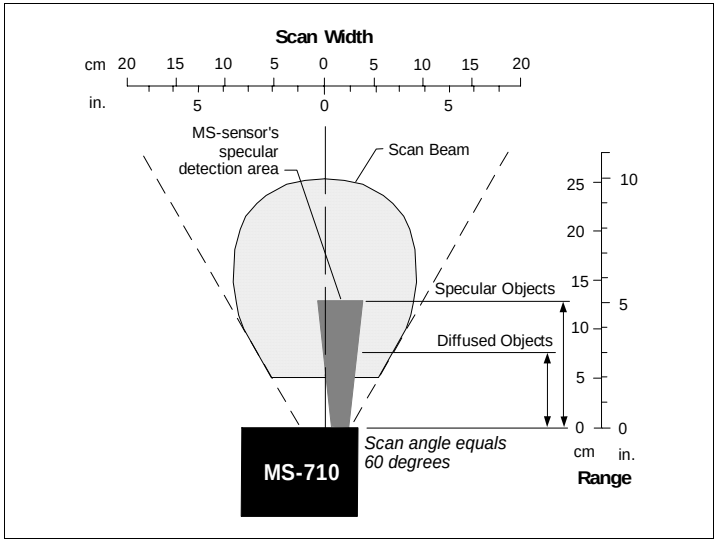


Figure A-5 MS-Sensor Range

a) Determine the setting for **Reflectance Threshold** (the minimum reflective level at which an object is detected) by selecting a value that is one or two numbers greater than the value posted next to REF when nothing is in the scanner's beam.[1]

b) Determine the setting for **Transition Counter** (each bar and space along a bar code symbol is counted as a "transition") by testing the TRANS readout for several objects with symbols and then selecting a value that is one or two numbers less than the smallest value that was posted next to TRANS during the test period.

c) Enter **<J>** to exit the extended decode rate test.

d) Set **Transition Counter** and **Reflectance Threshold** (see **"Automatic Gain Control (AGC)" on page 4-16**) to the numbers you have selected during the extended decode rate test.

e) Activate the triggering event. The scanner will either output the symbol's data or the sensor will display a message signifying that the bar code symbol is defective, that no symbol is present, or that no object is present.

1. Reflectance can also be modified by sending the <KQ*offset*> test command which samples 50 scans for the highest reflectance value and adds a user-defined offset to this value.

Appendix G — ASCII Table

Table A-7 ASCII Table with Control Characters

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

Table A-8 Communication Protocol Commands

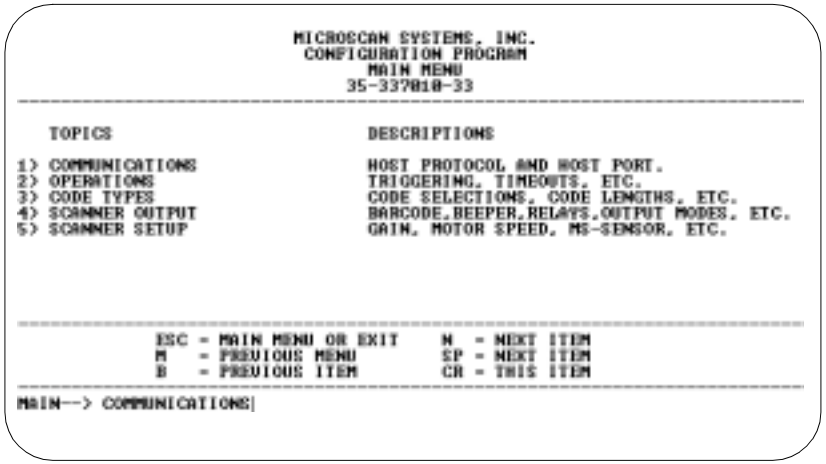
Protocol Command (Mnemonic displayed on Microscan menu)	*Control Characters (Entered in menu or serial command)*	*Hex Code*	*Effect of Command*
RES	*^D*	*04*	*Reset*
REQ	*^E*	*05*	*Request*
EOT	*^D*	*04*	*Reset*
STX	*^B*	*02*	*Start of Text*
ETX	*^C*	*03*	*End of Text*
ACK	*^F*	*06*	*Acknowledge*
NAK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

Appendix H — Embedded Menus

In addition to **ESP**, you can also use a communications menu such as Microsoft's HyperTerminal™ to establish communication with Microscan's embedded menus.[1]

1. With your host connected to the configuration port, set your host communications settings as follows: **9600**, **7**, **1**, and **Even**.
2. Set **Flow Control** to **None**.
3. Make the communications port selection. (Usually **COM 1** or **COM 2** for desktops and **COM 1** for laptops.)

Upon connection, send a **<D>** command to bring up the main menu.



4. Press the return key (**CR**) to see the communications menu:

Menu navigation commands are case sensitive. Use the space bar or N to advance to the next item, CR (return key) to select a highlighted item, B to return to the previous item, M to return to the previous menu, and ESC to return to the Main menu or to exit the program. When exiting the program, you will be prompted to save your active settings for power up (Y or N). Typing Y will be equivalent to saving with a <Z> command.

1. If you are using Microsoft's HyperTerminal program, you may find that the initial screen is unviewable when you call up the program with the **<D>** command. If this occurs, simply exit the embedded menu with a **ESC**, **E**, and **N** sequence and repeat the **<D>** command.

Appendix I — Defaulting/Saving/Initializing

Active Memory is where the scanner's settings are stored during current use and are initialized by an **<A>** command.

Microscan ***Defaults*** are where the scanner's default application/boot programs are stored. They can only be changed by changing the application/boot codes.[1]

User-Saved Settings are where user-defined settings are saved for power-on.

Defaulting

Defaulting occurs when default settings (either Microscan or user-saved) are restored. Defaulting might be necessary if you have to make temporary changes, communications between the scanner and another device are lost or interrupted, or you are using incompatible equipment (for example, a terminal that is set at 9600 baud communicating with a scanner that is set at 38.4K baud).

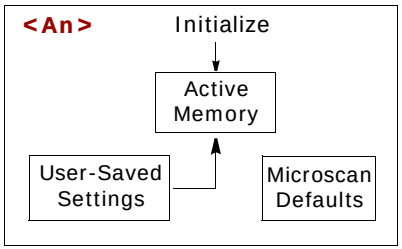
Restore User-saved Settings to Active Memory

- Restores user-defined settings to active memory.
- Initializes serial configuration commands in active memory and resets counters to zero.

By Serial Command

Send **<An>** command to the scanner.

By ESP (There is no equivalent ESP command.)



Restore Microscan Defaults to Active Memory

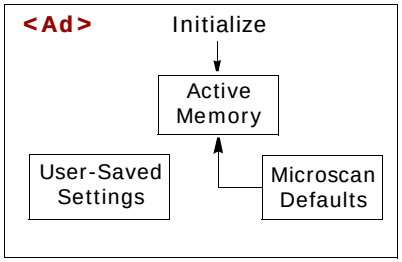
- Restores Microscan defaults to active memory.
- Initializes serial configuration commands in active memory and resets counters to zero.
- Does not save settings for power-on.

By Serial Command

Send **<Ad>** command to the scanner.

By ESP

Right-click in the configuration window and select **Default all ESP Settings.**

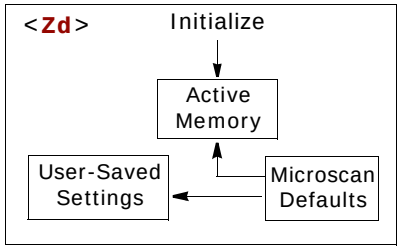


1. See your Microscan sales representative to access the latest application codes.

Restore Microscan Defaults to Active Memory and for Power-on

Caution: Defaulting the scanner to Microscan default settings will overwrite user-saved settings.

- Restores Microscan defaults to memory.
- Restores Microscan defaults to user-saved settings for power-on.
- Initializes serial configuration commands in active memory and resets counters to zero.



By Serial Command

Send **<Zd>** command to the scanner.

By ESP

1. **Right-click** in the configuration window and select **Default all ESP Settings**.
2. **Right-click** and select **Save to Reader** and **Send and Save**.

By Hardware Default

If a software default reset is not possible, it may be necessary to reset the scanner by shorting (connecting) specific pins. This procedure has the same effect as the <Zd> software command.

1. Apply power to the scanner.
2. If using an IB-105, insert a pin or straightened paper clip into the default switch (see **"Connectivity with the IB-105" on page A-6**).

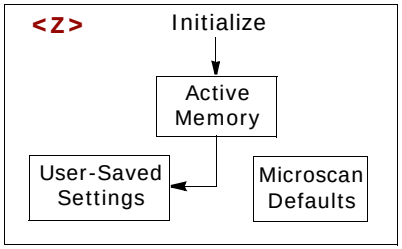
   Caution: Be certain that the correct pins are located. Connecting the wrong pins could cause serious damage to the unit.
3. Momentarily connect these wires (or pins) and listen for a series of short beeps.
4. Within 3 seconds, connect them again. A longer beep should be heard. If not, repeat the process.

Saving

Power-on settings are those that are saved by a **<Z>** or <**Zp**> command and are loaded into active memory whenever power to the scanner is recycled.

Save Active Settings, except Factory, for Power-on

- Initializes serial configuration commands into active memory and resets counters to zero.
- Saves all current settings except factory settings to user-saved settings for power-on.



By Software Command

Send **<Z>** command to the scanner.

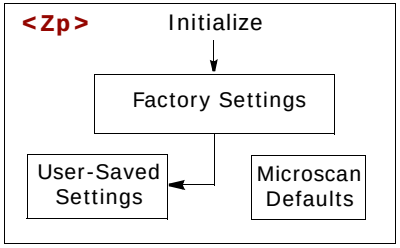
By ESP

Right-click in the configuration window and select **Save to Reader,** then **Send and Save**.

Note: Allow a **1** second delay after sending the <Z> command before resuming operations.

Save Only Factory Settings for Power-on

- Initializes serial configuration commands in active memory and resets counters to zero.
- Saves all factory settings for power-on (factory settings include but are not limited to Focus, Gain, Tracking, and Scan Speed).



By Serial Command

Send **<Zp>** command to the scanner.

By ESP

Right-click in the configuration window and select **Save to Reader,** then **Send and Save, Including Factory**.

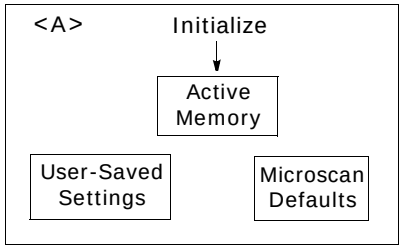
Note: Allow a **1** second delay after sending the <Z> command before resuming operations.

Initializing

Initializing occurs whenever any command or set of commands is implemented.

Initializing is a part of all save and default functions. It is also used as a follow-on to implement serial configuration commands.

- Initializes serial configuration commands into active memory and resets counters to zero.
- Does not save settings for power-on.



By Serial Command

Send **<A>** after a serial configuration command or a string of serial configuration commands, for example, **<Kd1><A>**.

By ESP

Right-click in the configuration window and select **Save to Reader, Send No Save.**

This will initialize all serial configuration changes that have been made in the current ESP session.

Note: Allow a **1** second delay after sending the <A> command before resuming communications.

Loss of Communications

Making changes to communications with the host such as **Baud Rate, Parity, Stop Bits, LRC**, etc. without corresponding changes in linked device(s) can result in the loss of menu access through If this should occur, you should restore the scanner's defaults.

Appendix J — Formulas for Number of Decodes

To ensure reliable scanning, the scanner should apply a minimum of *five* scans to each symbol. Use the formulas below to predict the number of decodes that your symbol will receive.

If the number of decodes you derive from one of these calculations is less than the minimum, plug in the minimum number of decodes (5) and solve for another parameter that might be changed such as symbol speed or scans per second.

Note: While the formulas given here solve for the predicted number of decodes, you may also use the formulas to solve for other parameters that might be changed, such as symbol speed, symbol length, etc.

Single Line Ladder Calculation

For single scan line ladder scanning, use the following formula:[1]

$$ND = \left(\frac{SH}{SS} \times DR\right) - 3$$

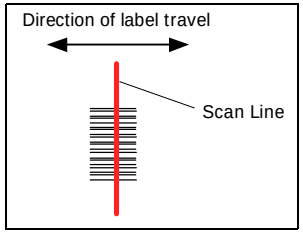


Figure A-6 Ladder

Example:

SH = 1 inch

SS = 10 inches per second

SR = 500 scans per second

$\left(\frac{1}{10} \times 500\right) - 3 = 47$ complete scans

***ND** (Number of Decodes) is the number of decodes that a given symbol can be expected to achieve in a given application.*
***SH** (Symbol Height) is a measurement of the height of individual bars.*
***SS** (Symbol Speed) is the distance per second that a symbol moves through the scan.*
***DR** (Decode Rate) is the number of scans per second that a given symbol receives.*

1. The -3 component in the formula is included to allow for AGC acquisition, an incomplete first scan, and an incomplete last scan. This applies only if the number inside the parentheses equals 4 or more. If the number equals 3, then only subtract 2 to derive 1 good scan.

Single Scan Line Picket Fence Calculation

For single scan line picket fence scanning use the following formula:

$$ND = \left(\frac{(SW - SL)}{SS} \times DR\right) - 3$$

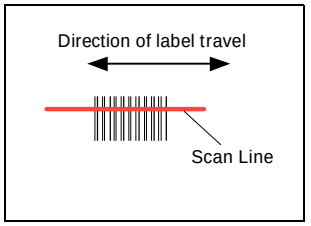


Figure A-7 Picket Fence

Example:

LL = 2 inch (including quiet zones)
LS = 10 inches per second
SW = 8 inches
SR = 500 scans per second

$$\left(\frac{(8 - 2)}{10} \times 500\right) - 3 = 297 \text{ complete scans}$$

Angled Picket Fence Calculation

The number of complete scans for angled picket fence is calculated the same as that for picket fence, with the exception that the scan width is shortened in proportion to scan tilt.

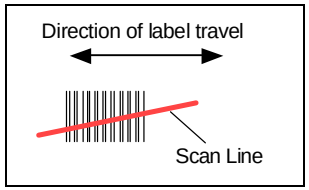


Figure A-8 Angled Picket Fence

Improving the Number of Decodes

After changing any of the parameters described here, recalculate number of decodes.

Scan Speed

Scan speed is a function of motor speed and is adjustable. A slower scan rate may allow greater symbol range and/or higher decode rates, but at the cost of a lower decode rate scans. When you lower scan speed, you lower the decode rate.

Range

Adjusting the symbol's range, if possible, is one of the quickest and most effective ways to improve decode rates. However, in some applications you may need to select a less than optimum range, or one that is beyond the fringes of the ranges.

Scan Width

Increasing scan width will increase the number of scans in a picket fence oriented application. Scan width is linked with scan range and changing one will usually require a change in the other.

Symbol Speed

Applies to both picket fence and ladder oriented symbols. If your application allows it, slowing symbol speed (the time in seconds that a symbol is fully within the scan width of the scanner) is an effective way to increase the number of decodes.

Symbol Dimensions, Symbol Density, and Symbol Ratio

Not usually an option in most applications, but changes to symbol parameters can affect number of decodes calculations and possibly decode rates.

If your application allows, shortening the length of a picket fence symbol means the symbol will be in the read range longer and hence receive a greater number of scans. Increasing the height of a ladder symbol means it will receive more scans. Changing symbol density and/or symbol ratio is another way ranges, decode rates can be altered.

Gain

This adjustment, typically made by qualified technicians, is referenced in the Scanner Setup menu under Read Cycle. (See **"Scanner Setup" on page 4-15**.)

Appendix K — Operational Tips

Do:

- Check inputs (symbol speed, length, height, etc.) to ensure the desired number of decodes per symbol.
- For optimum decodes, mount scanner so that your symbols pass through the center of the depth-of-field (minimum/maximum range). You find the center by moving your symbol in and out during a read rate test.
- Avoid excessive tilt, pitch, and skew of the bar code symbol.
- Check the bar code symbol for readability by doing a decode rate test. If there is any question about the symbol's readability, contact your Microscan representative at ***helpdesk@microscan.com***.
- After changing any parameter that might affect decode rate, repeat decode rate test.
- Clean the scanner window with a clean, dry Q-tip or cotton cloth on a regular basis.

Do Not:

- Aim the scanner into direct light or sunlight.
- Aim the scanner into an external object detector or other light-emitting device.
- Obstruct the scanner window with mounting hardware or other objects.
- Connect chassis of scanner and host to different ground potentials.
- Operate the scanner in excessive temperature environments.

Appendix L — Interface Standards

Interface Standards, established by the Electronic Industries Association (EIA), specify such things as the signaling voltage levels, maximum cable lengths, and number of drivers. With Microscan devices, selection of interface is made by pin assignment and, in the case of the host communications, by software switching between RS-232 and RS-422. Microscan devices use RS-232, RS-422, and RS-485 multidrop.

RS-232

RS-232 defines an interface between two devices, such as the scanner and host. It differs from the other interfaces by dedicating individual pins to specific functions and by requiring both devices to share a common ground line. Since both device chassis are connected to a common ground, a ground loop potential and the possibility of noise interference exists; therefore, cable lengths are limited to a maximum of 50 feet (19.7m). Despite being the most limited, this interface is used frequently because of the large installed base of RS-232 equipment.

RS-422

RS-422, unlike RS-232, measures signals deferentially; that is, the receiver looks at the potentials between the two receive (or transmit) wires rather than the potential between signal and ground. As a result, cables, if shielded, can be up to 4000 feet (1219m) in length. Like RS-232, RS-422 communication is designed for only two devices on a single line and must have a common ground. It can be used wherever RS-232 is used.

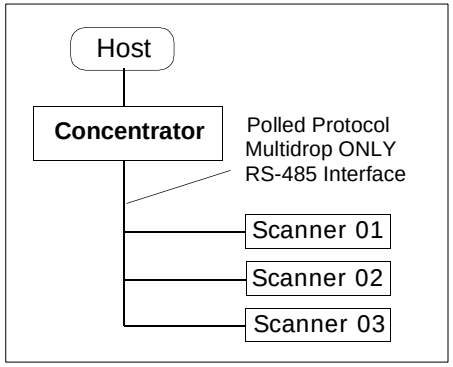
RS-485

RS-485, like RS-422, can transmit up to 4000 feet (1219 m) using differential voltages, but unlike RS-422, its transmitters are turned off until a request for data is received from the host. RS-485 is used exclusively in multidrop protocol.

Appendix M — Multidrop Communications

This appendix describes the rules for setting up a concentrator or controller to communicate with a scanner in standard Multidrop protocol.

The diagram to the right shows a typical Multidrop network in which 1 to 50 scanners can communicate with a host via an intermediary device, a concentrator or a controller.



Configure the Scanner for Multidrop

1. With the scanner connected to the host, do **Retrieve Scanner Settings**.
2. Select **Multidrop** in the **Protocol** configuration menu.

   You will see the following message:

   Important. You must change your preamble and postamble characters so that they are not CR or NULL.

   This allows data to move through the concentrator without interference.



3. Click **OK**.
4. Next, go to **Preamble Characters** (still in the **Protocol** menu) and double-click on **Characters**.
5. This will open up an ASCII character table. Select any character other than **CR**. For example, select **LF**.
6. Repeat the above for **Postamble**.
7. Check the multidrop address. Enter a number from **01** to **50**.
8. Right-click in the window and select **Save to Scanner** and **Send and Save**.
9. Your scanner is now in multidrop. From here on, you will need to use the concentrator to relay commands and data between the scanner or scanners and the host.
10. Next, go to **"Connect to Scanner via the Concentrator" on page A-30.**

Connect to Scanner via the Concentrator

You will need a multidrop concentrator and the required power supplies and cabling to communicate with your scanner(s).

1. From the **Communications** drop down menu, select **Configure Multidrop** to bring up the **Multidrop Settings** dialog.



2. If necessary, change the default address to match the address of your multidropped scanner and click **OK**.

   If the host serial port is not connected in ESP, you will see the following popup message:

   ESP is not currently connected to the multidrop concentrator. Do you wish to establish a connection now?

3. Click **Yes**.

   You will see a **Serial Communication Parameters** dialog as shown.

   Notice that the **Force Connection** option is checked. Do not change this.

4. Select the concentrator's host port communications settings.

   When you click **Connect**, you will be connecting to your concentrator, which can then relay commands to the scanner whose address was set in the **Multidrop Settings** dialog.



5. Click **Connect**.
6. You should see the **CONNECTED** message in green at the bottom of the window along with the scanner's **Multidrop** address.



7. Click **Retrieve Scanner Settings** to upload scanner's configuration. If upload fails, return to the **Serial Communication Parameters** dialog and make the corrections.
8. Follow the same procedure for connecting other scanners to your multidrop network.

Note: For more information, see your scanner user's manual or Microscan's ***MS-5000 Multidrop Concentrator User's Manual*, *83-005000*.**

Polling Sequence

Data that is transmitted to the host (symbol data, noread messages, counters, etc.) via concentrators is solicited by poll requests from the host.

The polling sequence example is by poll address 1E (ASCII hex value for Scanner 02) and a REQ (request). The scanner responds by first transmitting its own address, 1E, followed by a STX (start of text) character, and then the data. Next it transmits an ETX (end of text) character and an LRC (longitudinal redundancy check) character.

If the concentrator (or controller) receives the data from the scanner and is able to validate it with an LRC calculation, it responds with an ACK (acknowledgment). If the scanner in turn receives the ACK, the scanner ends this exchange with a RES (reset).

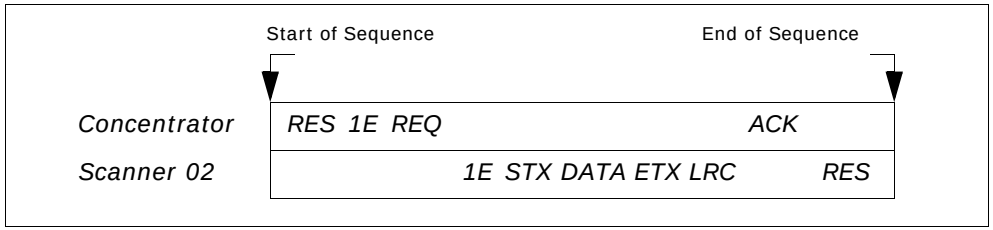


Figure A-9 Polling Sequence

Polling Reset

- If the scanner has no information, it responds to a poll request by transmitting a RES (reset).
- If the scanner receives a NAK instead of the ACK after transmitting its data string, it will re-attempt to send the data string up to three times. If the scanner still does not receive an ACK, it will send a RES (reset) and discard the data in its buffers.
- If the scanner transmits data to the concentrator and the concentrator responds with an ACK or NAK, but the scanner doesn't receive the concentrator's response, the scanner will timeout and send a REQ to the concentrator and request another response. If after three retries (the number of times it transmits a REQ to the concentrator) the scanner receives no response, it ends the transmission with a RES (reset).

Select Sequence

Unlike poll requests, select commands always originate from the host and consist of serial configuration or operation commands to devices that are configured in Multidrop. The scanner complies with the command when it is polled during the cycle.

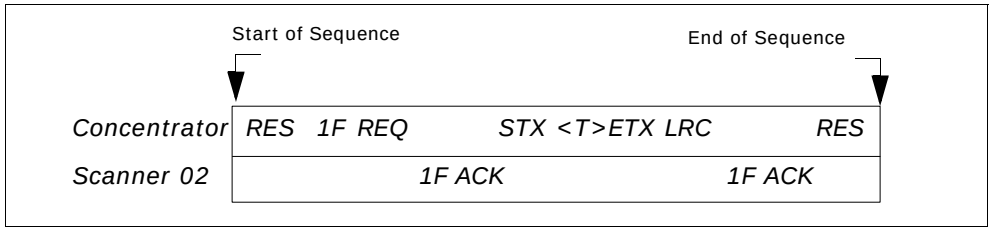


Figure A-10 Polling Sequence

A RES (reset) is the first command in the select sequence. The 1F hex is the select address associated with Scanner 02 address. It is followed by a REQ (request). The scanner responds with its own select address, 1F hex, and an ACK (acknowledge). The concentrator then transmits an STX (start of text), the data (in this case a <T>), an ETX (end of text), and an LRC character.

The scanner replies by transmitting its own address, followed by an ACK, acknowledging receipt of the command. Upon receipt of an ACK, the concentrator concludes the successful exchange with a RES.

In the example above, the scanner only acknowledges a trigger counter request from the concentrator. It does not respond to the trigger counter request until a subsequent poll. For example, if the scanner's trigger count was 12 at the time the trigger counter request was received, on a subsequent poll it would send 02T/00012. (The 02 at the beginning of the string is the scanner's address.)

Select Reset

If the scanner receives bad data from the concentrator, it transmits a SEL (its select address) and a NAK to the concentrator. The concentrator re-transmits the data up to three times. The concentrator will end the sequence with a RES (reset) if no ACK is received.

Table A-9 Multidrop Addresses

Multidrop Address	Poll Character		Select Character	
	ASCII	HEX	ASCII	HEX
01	^\	1C	^]	1D
02	^ ^	1E	^-	1F
03	SP	20	!	21
04	“	22	#	23
05	$	24	%	25
06	&	26	'	27
07	(	28	)	29
08	*	2A	+	2B
09	,	2C	-	2D
10	.	2E	/	2F
11	0	30	1	31
12	2	32	3	33
13	4	34	5	35
14	6	36	7	37
15	8	38	9	39
16	:	3A	;	3B
17	<	3C	=	3D
18	>	3E	?	3F
19	@	40	A	41
20	B	42	C	43
21	D	44	E	45
22	F	46	G	47
23	H	48	I	49
24	J	4A	K	4B
25	L	4C	M	4D

Multidrop Address	Poll Character		Select Character	
	ASCII	HEX	ASCII	HEX
26	N	4E	O	4F
27	P	50	Q	51
28	R	52	S	53
29	T	54	U	55
30	V	56	W	57
31	X	58	Y	59
32	Z	5A	[	5B
33	\	5C	]	5D
34	^	5E	_	5F
35	`	60	a	61
36	b	62	c	63
37	d	64	e	65
38	f	66	g	67
39	h	68	i	69
40	j	6A	k	6B
41	l	6C	m	6D
42	n	6E	o	6F
43	p	70	q	71
44	r	72	s	73
45	t	74	u	75
46	v	76	w	77
47	x	78	y	79
48	z	7A	{	7B
49	|	7C	}	7D
50	~	7E	D	7F

Appendix N — Glossary of Terms

Active Closed. An optoisolated input that's logically "on" when current flows through the connection points.

Active Open. An optoisolated input that's logically "on" when *no* current flows through the connection points.

Analog Gain Adjustment (AGC). Adjustment to signal strength that seeks to maintain a constant level regardless of the range of the symbol.

Application Record. A variation of UCC/EAN-128 which adds an application identifier to symbol data, including user-definable separators, brackets, and padding.

Autodiscriminate. The ability to decode several different symbologies without changing configuration.

Auxiliary Port. Provides RS-232 connections to an auxiliary terminal or device for remote viewing, for the transfer of data to and from the host, and under certain conditions as a configuration port.

Bar Code. The medium or symbol on which a symbol is printed or etched.

Bar Code Data. The information that is transmitted from a decoded bar code symbol.

Baud Rate. The number of discrete signal events per second. Bits per second.

Capture. The act of grabbing or recording a frame by a sensor. A frame or succession of frames that are captured.

Check Digit. A Modulus 43 or Modulus 10 digit that is added to the symbol message for additional data integrity.

Configuration. A setup or process of changing a scanner's settings to conform to a specific application. A physical arrangement of components.

Concentrator. Intermediary device that relays data from scanners to a host and commands from the host to the scanner or other devices.

Connector. Physical device (plug or socket) on a device or cable to provide in/out connectivity for various circuits and pins.

Counter. Memory space provided to keep track of scanner events.

Daisy Chain. Linkage of master and secondary scanners to allow data to be relayed up to the host via auxiliary port connections.

Decode. A good read. The successful scanning and decoding of the information encoded in symbol.

Default. (verb) Restore Microscan or customer default settings, initialize serial commands and reset all counters.

Defaults. (noun) The settings that are restored whenever a default takes place.

Delimited. A command or field that is bracketed by pre-defined characters.

Decode Rate (DR) The number of decodes per second that a given scanner is capable of receiving.

Depth of Field. The distance between the minimum and maximum range in which symbols have been read.

Discrete I/O. Inputs and outputs characterized by discrete signal transitions from one voltage level to another so that digital switching can occur.

Dynamic Setup. Testing and configuration done with symbols in motion.

EPROM. 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 scanner stops expecting symbol information to decode.

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.

ESP. Easy Setup Program. A portable proprietary Windows/NT based program developed by Microscan Systems, Inc.

Falling Edge. A change of state (to inactive) associated with a level trigger in which the scanner stops searching for symbols. (See **Rising Edge**.)

Fixed Code Length. Increases data integrity by ensuring that only one symbol length will be accepted.

Flash Memory. Memory that can be changed by downloading new code and recalled on power-on.

Focal Length. The distance measured from the scanner to the center of the depth of field, or *focal* point.

Focus. The point at which the tip of the scan beam is at its narrowest.

Full Duplex. Auxiliary port data is sent directly to the host but not displayed on the auxiliary port screen.

Gain. Optimal signal strength.

Good Match. The event occurring when a scanned symbol matches the master symbol information that is stored in the memory of the device.

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

Half Duplex. Auxiliary port data is sent directly to the host and displayed on the auxiliary port screen.

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

Host Port. The pins or connections on a scanner or other device that physically connect with a host and—using the RS-232, RS-422, or RS-485 standards—pass data and serial commands from one device to another.

Initialize. Implement serial configuration commands into the scanner's active memory.

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

Intercharacter Delay. The time interval in milliseconds between individual characters transmitted from the scanner to the host.

Intercharacter Gap. The extra space between the last element of one character and the first element of the adjacent character of a specific bar code symbol.

Ladder Symbol Orientation. A bar code symbol in which the bars are parallel to the symbol's direction of travel.

Large Intercharacter Gap. Allows the scanner to read symbols with gaps between symbol characters that exceed three times (3x) the narrow element width.

Laser On/Off. When enabled, the laser is ON only during the read cycle, provided the scanner is enabled for a Serial or External trigger.

LED. Light emitting diode.

Level. The condition in which a read cycle initiated by a trigger signal from an object detector remains active and ends when the object moves out of the detector's range.

Longitudinal Redundancy Check (LRC). An error-checking routine that verifies the accuracy of transmissions.

Master Symbol. A symbol or symbol data that is stored in a scanner or reader's memory and is compared with subsequently read symbols.

Master Scanner. First scanner in a daisy chain mode and linked directly to the host and in tandem to secondary scanners.

Matchcode. The ability to compare symbol data being scanned against a master symbol that is stored in the memory of the scanner.

Embedded Menu. Configuration options embedded in the scanner's erasable memory.

ESP Menu. Easy Setup Program. Configuration program that runs in Windows-based operating systems 95 and above.

Mil. One thousandths of an inch or 0.0254 mm. In bar-coding, a measurement standard that identifies a symbol by the width of its narrowest element.

Mismatch. An event that occurs when the scanned symbol does not match the master symbol that is stored in the memory of the scanner.

Multisymbol. A scanner mode which allows a scanner to read more than one symbol in a single read cycle.

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

Narrow-bar-width. The width of the narrowest bar of a specific bar code symbol, expressed in thousands of an inch (or mils) as defined by standard code types.

Narrow Margins. Allows the scanner to read symbols with quiet zones less than 8 times the width of the narrow bar element.

Non-delimited. A command that is not bracketed by pre-defined characters.

Noread. A non-read. A condition that occurs when the scanner is set up to decode symbols but no symbol is scanned during the read cycle.

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

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

NOVRAM. Non-volatile random access memory. Data that is "saved for power-on" is saved to NOVRAM.

Null. Also spelled "Nul." A non-printed ASCII character that acts as a space-holder.

Number of Decodes. The number of times a symbol is scanned by the scanner during one pass through the laser beam.

Object Detector. A photo electric device used to sense the presence or absence of an object (also referred to as a package detector).

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

Output Format. The modification of data output according to a user-defined index of **Extraction** and **Insertion** commands.

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

Picket Fence Symbol Orientation. A bar code symbol in which the bars are perpendicular to the symbol's direction of travel.

Pitch. Symbol (or scanner) rotation around the center of a line parallel to the scan beam.

Point-to-Point. A protocol consisting of a single communications event, typically used to connect a bar code scanner to a terminal or host computer.

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

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

Quiet Zones. Specified "clear" (non printed) areas immediately before and after the bar code symbol. The area is usually white (for black and white symbol) and at least 10 times the width of the narrowest bar, as measured in thousands of an inch. The zones can be other than white as long as their densities remain consistent and they have the required contrast relative to the bars.

RAM. (Random Access Memory) Memory that is lost after power is recycled to the unit.

Raster. Multiple, stacked scans produced by a separate oscillating mirror or by a spinning mirror with varying facet angles.

Read Cycle. A programmed period of time or condition during which the scanner will accept symbol input.

Reader. (1) A scanner, a bar code device that can read and decode symbols.
(2) A device that reads and decodes 2D matrix codes.

Read Range. The distances in which a symbol can be reliably read, as measured from the front of the scanner. See "Depth of Field."

Reed-Solomon Error Correction Code. A linear, error correcting block code, suited to the correction of character errors which could be, in bar or matrix codes, the obliteration or removal of part of the symbol.

Read Range. The distances in which a symbol can be reliably read, as measured from the front of the scanner. See “Depth of Field.”

Relay. An electrical switch that allows a low power to control a higher one.

Reset. Sets all counters to zero.

Rising Edge. A change of state (to active) that initiates (and in some cases ends) a read cycle with a new trigger, an edge trigger, or the leading edge of a level trigger. (See **Falling Edge**.)

ROM. (Read Only Memory) Memory that cannot be changed.

Scanner. A scanning device that is comprised of a scan head and a decoder integrated in one package.

Scan Speed. The number of scans per second that a scanner projects from the spinning mirror.

Scan Width (SW) is the width across the scan beam at a given distance from the scanner in which a symbol can be read.

Secondary Scanner. A scanner linked to the master or preceding scanner in a daisy chain which relays symbol data to the host. See “Daisy Chain.”

Send. Transmit data from one device to another.

Separator. A character that separates data fields.

Serial Commands. Online data strings such as <D> or <P> sent from a host or auxiliary terminal to a scanner or other device.

Serial Configuration (Host Configuration). Serial commands that change configuration; distinguished from operational command by the fact that they can modify non-volatile memory for power-on configuration.

Skew. Symbol (or scanner) rotation around the center of the skew axis which is perpendicular to the plane of the scan beam.

Specular Reflection. The direct, mirror-like reflection of light back to the source causing saturation and bad reads.

Supplemental. A character or data string that is appended to the main bar code symbol.

Symbol. A one or two dimensional decodable pattern that can be recognized and decoded by a bar code scanner or 2D reader.

Symbology. A code 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.

Symbol Density. Symbol size as measured by the narrow bar width.

Symbol Height. (SH) Regardless of orientation, the measurement taken along the length of a symbol’s individual bars.

Symbol Length. (SL) Regardless of orientation, the measurement taken across the symbol's bars from one end to the other, including the quiet zone.

Symbol Speed. (SS) the distance per second that a symbol moves in a dynamic application.

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

Tilt. Symbol (or scanner) rotation around the centerline of the scan beam.

Timeout. The termination of a read cycle or other routine by time.

Timeout Duration. The actual time that elapses during a read cycle or other timed routine.

Tracking. Adjustment of the precision of analog-to-digital conversion.

Transmit. Send or convey signals or information from one device to another.

Transparent. Data that passed between the auxiliary port and the host with keyed data echoed to the auxiliary port

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

Watchdog Timer. A security device that detects system crashes and attempts to reset the scanner.

Watchdog Reset. A reset that is forced whenever the software locks up.

Wild Card. User-defined character entered into a master symbol to permit matches with variable characters.

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