

**MICROSCAN®**

*MS-880  
Industrial  
Long Range Scanner  
User's Manual*



P/N 83-000880 Rev G

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## About the MS-880 Scanner

The MS-880 scanner is designed for versatile, robust operation in an industrial automation environment. It offers wireless programming, autofocus, Windows-based software, linear and 2-D code reading, several connectivity paths, multiple protocol and communications options, and a variety of advanced input/output features.

Its application code resides in an onboard flash memory chip that can be easily updated by downloads.<sup>1</sup> A user interface program, the ESP-MP (Easy Setup Program–Multi-platform), can be downloaded from our web site ([www.microscan.com](http://www.microscan.com)) and runs on Microsoft Windows 95™, Windows 98™, Windows NT™ and Windows 2000™ operating systems. Alternately, configuration commands can be sent from an embedded, menu-driven terminal program, or directly by host serial command strings.

The scanner is offered as a standalone or in combination with a wiring box. Four optional network plug-in protocol cards are also available when using the wiring box option.

1. See your Microscan sales representative to access the latest application codes.

## About This Manual

This manual provides complete information on setting up, installing, and configuring the MS-880 scanner. The chapters are presented in the order in which a scanner might be setup and made ready for industrial operation. Host serial commands are presented side-by-side with ESP and embedded menus.

[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.

[Chapter 6, "Autocalibration"](#) explains in detail the autocalibration procedure and the interpretation of the results.

[Chapter 7, "Calibration Database"](#) tells how to setup a database of the optical settings you gathered in autocalibration.

[Chapter 8, "Optoelectrics"](#) tells how to setup input/output connections for control of calibration database settings and includes gain, tracking, and AGC settings.

[Chapter 9, "Raster/Laser Control"](#) explains raster and laser setup settings.

[Chapter 11, "Matchcode"](#), [Chapter 12, "Outputs"](#), and [Chapter 13, "Output Format and Filtering"](#) provide instructions for setting up matching labels, data output, and data formatting for special operations.

[Chapter 14, "Discrete I/O"](#) lists input/output functions controlled by discrete electrical levels, including diagnostic warning outputs setup in [Chapter 15, "Diagnostics."](#)

[Chapter 16, "Wiring Box Option"](#) describes the wiring box, if used, and its installation and port connections.

[Chapter 17, "Utilities"](#) describes ESP-MP utility commands and their related serial commands for read rate tests, defaulting, etc.

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.

## Host Communications

There are three ways the scanner communicates with a host:

1. Microscan's Windows™ based **ESP-MP™** (Easy Setup Program—Multi-Platform), the preferred method which offers point-and-click ease of use and visual responses to user adjustments.
2. Serial commands such as <K100,r1> can be sent from a terminal program. They can also be sent from the **Terminal** or **Utility** window within ESP-MP.
3. Embedded onboard menus are accessed from a terminal window with a **<D>** command. These menus lack some of the functionality of the ESP-MP, but may be more responsive in older, slower computers.

## *Keystrokes*

Serial commands, selections inside instructions, and menu defaults are highlighted in **red bold**. Cross-references are highlighted in **blue**. 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.

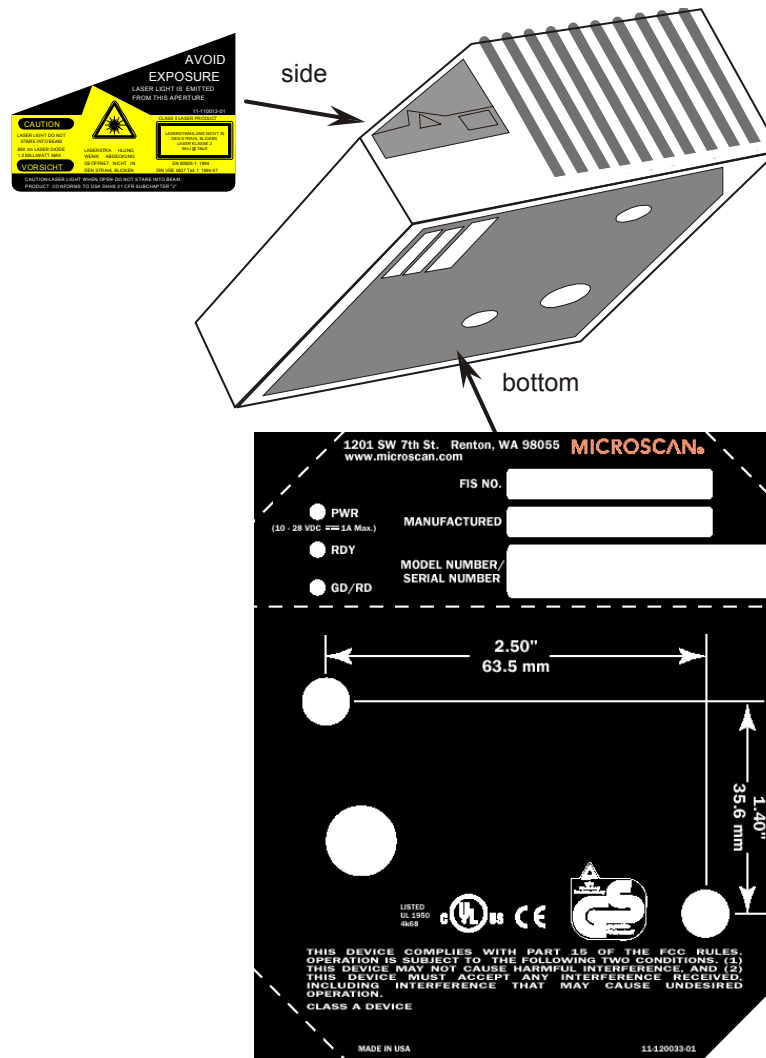
## *Approvals*

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

- CDRH (Center for Devices & Radiological Health)
- UL (Underwriters Laboratories, Inc.)
- cUL (UL mark of Canada)
- TÜV (Technischer Überwachungs-Verein)
- FCC (Federal Communication Commission)
- CE Compliant
- BSMI (Bureau of Standards, Metrology and Inspection)

# Safety Labels

The following labels are located on the side and back of the MS-880 scanner:



# 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 10 to 28 VDC at 6 watts, or greater if using electrical accessories.

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 7 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.*



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This chapter is designed to get your scanner up and running quickly using Microscan's **ESP-MP™** so the user can get a sense of its capabilities and test bar code samples. Detailed setup information for installing the scanner into the actual application can be obtained in the subsequent chapters.

In addition to **ESP**, you can send commands to your scanner by serial commands and through the scanner's embedded menus.

## Step 1 — Hardware Required

(Refer to [figure 1-1](#).)

To get started you will need:

- An MS-880 standalone scanner (**1**) FIS-0880-0001, or an MS-880 scanner with a wiring box (**2**) FIS-0880-0002.
- A host computer (**3**) with either a terminal communications program or Microscan's ESP™ which runs under Windows™ operating system, Windows-95 or higher, including Windows NT™.
- A null modem 9-pin configuration cable (**4**) P/N 61-000010-01.  
(Use cable P/N 61-300026-01 if your computer uses a 25-pin serial port connector.)
- A power supply (**5**), P/N 97-100004-1005 (120V) or P/N 97-100004-06 (240V).

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

**Note:** An optional object detector (**6**) is shown here (P/N 99-440001-10) with the standalone.

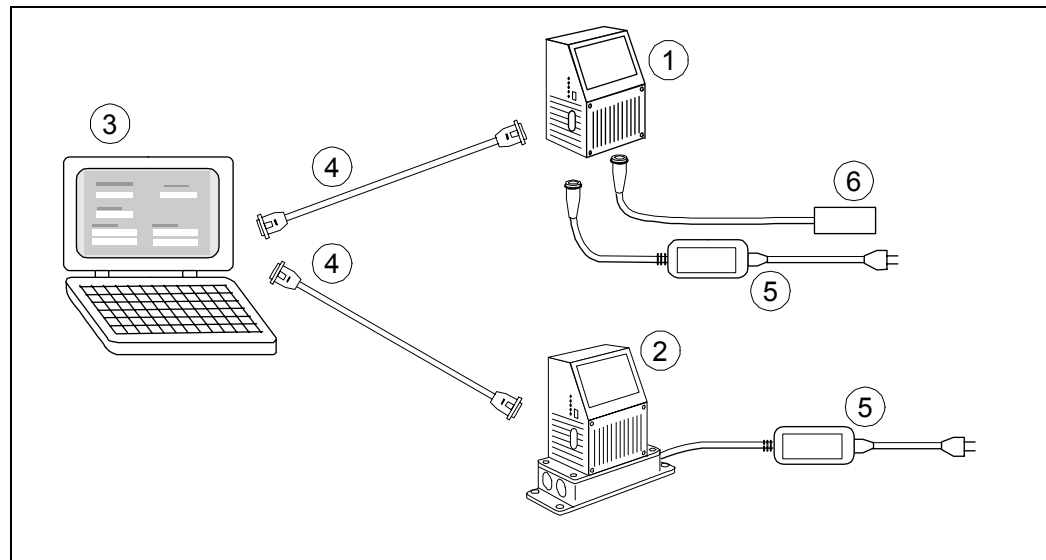


Figure 1-1 Hardware Configuration



# Step 2 — Connect the System

## Using the MS-880 Standalone

1. Attach your computer's host cable to either the 9-pin shown in [figure 1-2](#) or the 25-pin connector shown in [figure 1-3](#).
2. The 9-pin port is used for setting up, testing, and defaulting the scanner.
  - a. Attach power supply to the 3-pin power connector on the bottom of the scanner as shown in [figure 1-3](#).

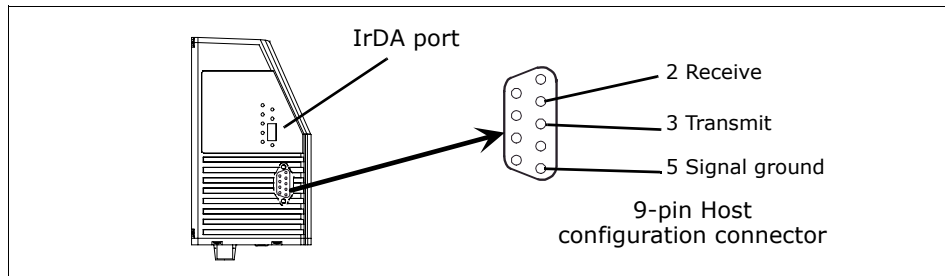


Figure 1-2 Side Connections

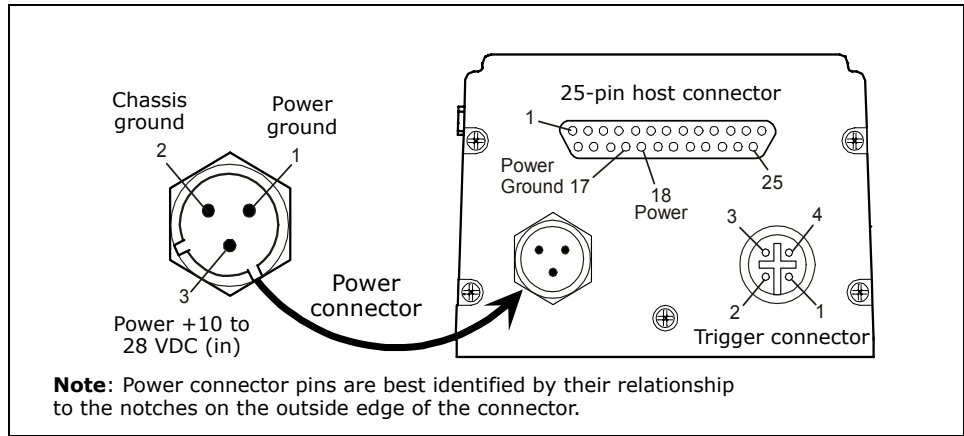


Figure 1-3 Bottom Connections

## Using the MS-880 with the Wiring Box

1. Make certain the wiring box power cord is not plugged in.
2. Connect the scanner to the computer.
3. Use the 9-pin configuration connector shown in [figure 1-4](#) to connect with your computer. This port is useful for setting up, testing, and defaulting the scanner.

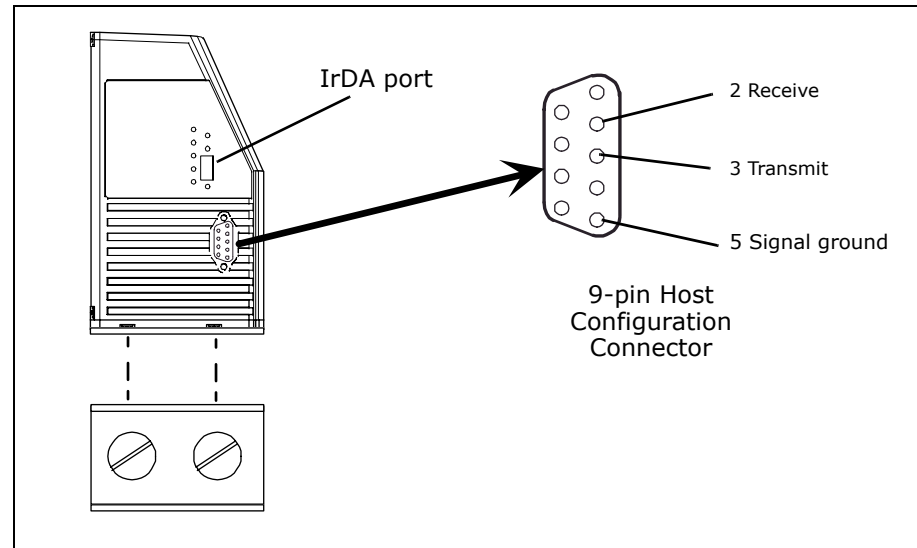


Figure 1-4 MS-880 with Wiring Box

4. Connect power to the wiring box as shown in [figure 1-5 on page 1-5](#).<sup>1</sup>
5. Apply power to the wiring box and confirm that the LED lamp next to right side power terminal is green and not red.<sup>2</sup>
6. Disconnect power.

1. Refer to [Chapter 16, "Wiring Box Option"](#) and [Appendix B – "Electrical Specifications"](#) for complete input/output details.

2. While the MS-880 scanner has reverse polarity protection built in to its circuitry, the wiring box does not protect external circuits that may already be wired in when power is applied.

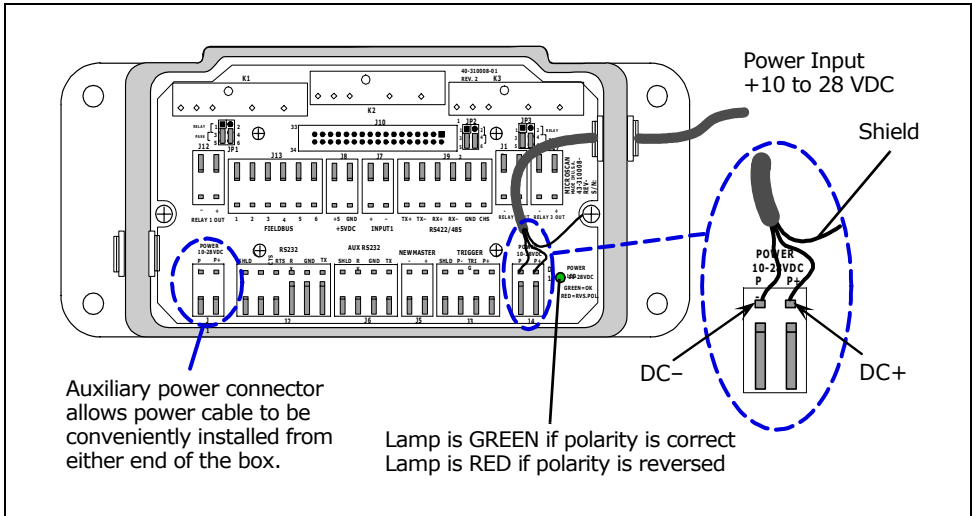


Figure 1-5 Wiring Box Connections

- 7. Plug the ribbon cable (provided with wiring box) into the bottom of the scanner. See [figure 16-2 on page 16-3](#).
- 8. Attach scanner to the wiring box with the 4 screws provided with the scanner. See [figure 16-3 on page 16-4](#).

## Step 3 — Install ESP-MP<sup>1</sup>

(**ESP-MP** is short for *Easy Setup Program-Multi-Platform*.)

1. Insert your Microscan CD into your computer's CD drive.
2. Launch **Setup.exe** under **ESP\_Software\Multi\_Platform** and follow the prompts.<sup>2</sup>

*If downloading from the web:*

- a. Go to <http://www.microscan.com/esp>
  - b. Enter your user name and password.
  - c. Select **ESP-MP** and download to your computer hard drive.
  - d. Extract **ESP-MP 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, you should see the following icon on your desktop:



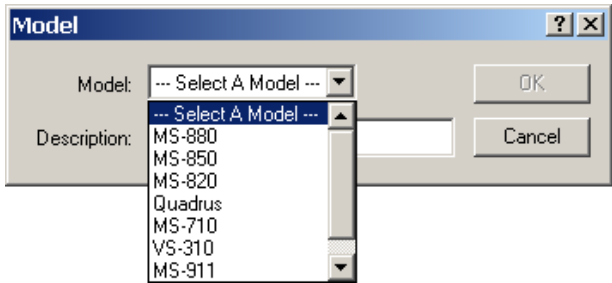
4. Click the **ESP-MP** icon to start the program.

---

1. You can also access the scanner through its embedded menus. See [Appendix H — “Embedded Menus.”](#)  
2. Contact your sales representative

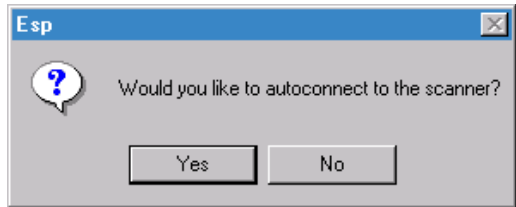
## Step 4 — Select Scanner Model

When you start the program, the following dialog box will appear:



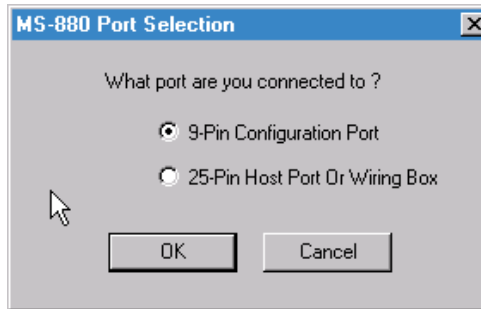
**Note:** If you need to select another model later, you can find it under **Model Select** in the menu bar.

1. In the model dialog box, select your model.
2. Select the default name, **MS-880-1** or type in a new name of your choice.
3. Click **Yes** when the following dialog on the right appears.

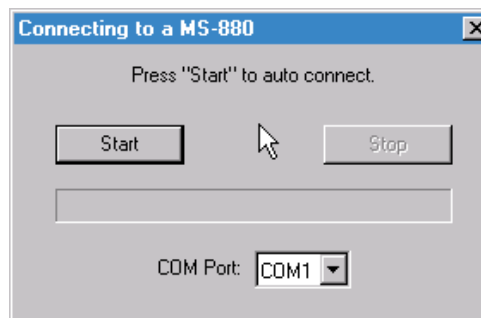


## Step 5 — Select the Communications Ports

When the following dialog appears:



1. Select **9-Pin Configuration Port** or **25-Pin Host Port** and click **OK**.
2. Select your communications port under **COM Port**.



**COM1** is typically used for laptops.  
**COM1** and **COM2** are typically for desktop computers.

3. Click the **Start** button.

## Step 6 — Connect with Auto Connect

After clicking the **Start** button in the **Connecting to...** dialog, allow time for the auto connect 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 you do not see either the CONNECTED or DISCONNECTED message at the bottom of your dialog, try expanding the ESP window horizontally.

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

## Step 7 — Retrieve Scanner Settings

Unless you have unchecked the default **Upload After Autoconnect** under **Options**, the communications values of the scanner will be loaded automatically and displayed under **Scanner Values**.

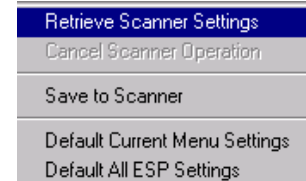
If **Upload After Autoconnect** is not checked, the scanner values will not be loaded and ESP communications values will remain displayed under the heading, **ESP Values**.

**Tip:** Before doing **Retrieve Scanner Settings**, you may want to preserve your current ESP settings to your computer as an ESP file by selecting **Save** or **Save As** in the **File** menu.

At any time you can retrieve **ALL** scanner values by:

1. **Right-clicking** anywhere in the configuration window, and
2. Selecting **Retrieve Scanner Settings**.

You can also retrieve settings by clicking on the **Send/Receive** button.



This is useful if you want to:

- Copy (upload) the scanner's settings and save them as a computer file for later retrieval.
- Ensure that whenever you save ESP settings to the scanner you are not saving any unwanted changes that you or someone else had made previously in ESP. By first doing **Retrieve Scanner Settings**, you eliminate that possibility.



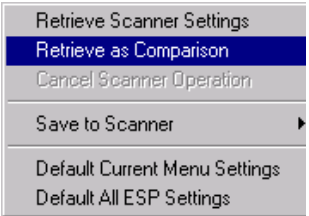
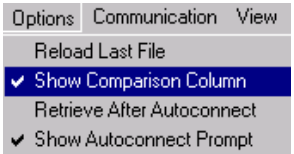
## Step 8 — Compare Scanner Settings

If you want to compare settings in the current scanner side-by-side with those in ESP without changing the ESP values:

1. Under the pull down Options menu check **Show Comparison Column**.
2. **Right-click** anywhere in the configuration window.
3. Select **Retrieve as Comparison**.

After a short pause the scanner's current settings will be displayed under the **Comparison** column. Compare those settings with the ESP values which are displayed under the **ESP Values** column.

For example, if you change **Background Color** to **Black**, but haven't yet saved this to the scanner, you will see the dissimilar program and scanner values highlighted in blue.



Parameters	ESP Values	Comparison
[-] Code Type / Symbologies		
[-] Narrow Margins/Symbology ID		
Narrow Margins	Disabled	Disabled
Symbology ID	Disabled	Disabled
Background Color	Black	White

## Step 9 — Position Scanner and Symbol

Set up a symbol at the scanning distance you will be using in your application.

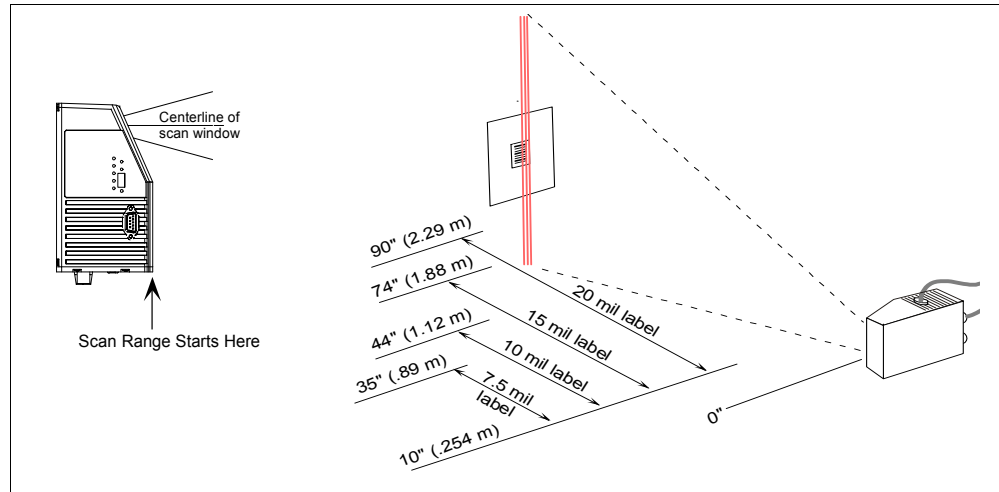


Figure 1-6 Read Ranges

In positioning the scanner and symbols being scanned, consider the following:

- Avoid bright light or IR light from other sources, including other scanners.
- Pitch or skew label or scanner a minimum of  $\pm 15^\circ$  to avoid specular reflection, the return of direct, non-diffused light.

**Note:** For additional tips on positioning the scanner and bar code labels, see ["Position Scanner and Bar Code" on page A-28](#).

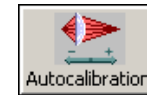
**Code 39** is the default code type enabled. If you are uncertain as to the symbology type, enable all codes, by clicking the **Utilities** menu and enabling **Autodiscriminate** under **Code Types**.

## Step 10 — Autocalibrate Scanner

**Important:** To receive bar code data through the 9-pin configuration port, you must enable the port with the following command: **<K146,,1>**.

The MS-880 has a software routine that will automatically search and test a range of focus, gain and tracking settings and select those that achieve the best reads.

1. With a test label in place, start autocalibration by:
  - a. ESP, clicking the **Autocalibration** button on the overhead toolbar and clicking the **Auto Cal** button to start autocalibration.
  - b. serial command, sending **<@CAL>** from a terminal screen
  - a. embedded menu, opening the autocalibration menu with **<@>** and pressing **A**.



An "Autocalibration in Progress" message will be displayed on your monitor along with the pass number and information on the focus, gain, and tracking.

2. Allow some time for the scanner to cycle through the focus, gain, and tracking settings. Do not move or disturb scanner or label while Autocalibration is in progress. (It might take 2 to 3 minutes to complete.)
3. When completed, the settings that provided the highest read rate will be selected. You will see one of the following messages: "Autocalibration Passed", "Autocalibration Failed," or "Original Settings Were Optimal."

If autocalibration passes, the scanner sends data to your computer and emits a beep (if beeper is enabled) for each good read and you will continue to see the read rate percentage and label data in the window below the scanner image.

**Note:** If you wish to silence the beeper, interrupt reading by removing or blocking the test label, or send a **<K702,0>** command to disable the beeper.

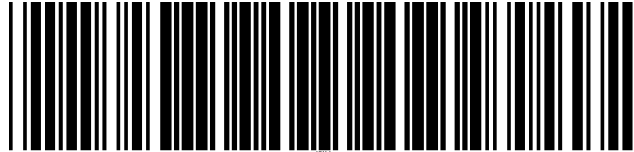
*If calibration fails, try the following:*

- Check the read range for your particular label density.
- Examine label quality and try a different sample label.
- Slightly skew or tilt the label or scanner to minimize specular reflection.
- Ensure that the correct code type is enabled for the label you are scanning.

**Note:** See [Chapter 6, "Autocalibration"](#) for more details on calibration.

## Step 11 — Test Range for Bar Code Label

1. Position a label in front of an operational scanner.<sup>1</sup>



### 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).

2. Click the **Utilities** button.



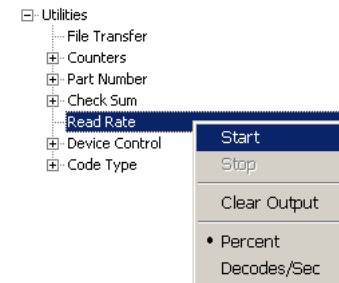
3. Right-click **Read Rate** and select **Start**.

4. Observe rate in terminal window on the right of the **Utilities** screen.

5. Move your bar code label towards the scanner and away from the scanner until the decode rates drop off in each direction as shown in figure 1-7.

This will give you a sense of the depth of field (inner and outer ranges) for your symbol's density and range.

6. To end test, right-click **Read Rate** and select the **Stop** button.



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

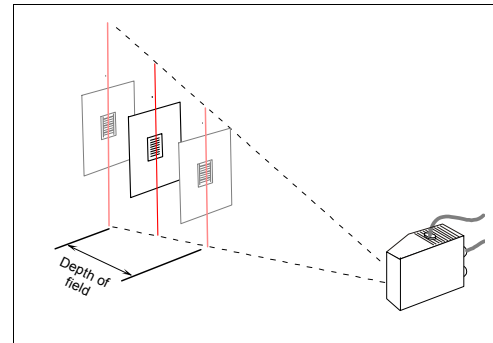


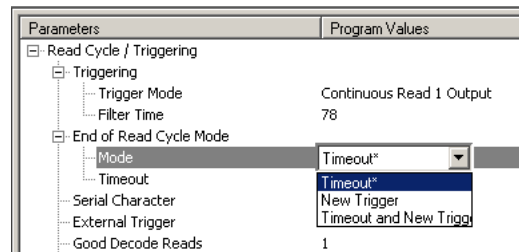
Figure 1-7 Depth of Field

1. If using an I 2/5 label, verify that the number of characters in the label being scanned matches the code length enabled for the I 2/5 code type (default is 10 and 6). See "[Interleaved 2 of 5](#)" on page 5-14.

## Step 12 — Make Changes to Configuration and Save

To make changes to a configuration setting:

1. **Double-click** the setting (for example, **End of Read Cycle**).



2. Place your pointer in the selection box, scroll down to the setting of your choice and **left-click** on the setting.
3. **Left-click** again anywhere in the configuration window to complete the selection.
4. **Right-click** in the configuration window and select **Save to Scanner** to implement the command in the scanner. You have 3 choices:
  - a. **Send, No Save.** This initializes all changes in active memory. These changes will be lost if power to the scanner is cycled.
  - b. **Send and Save.** This will cause the scanner to beep, indicating that the change has been implemented and that all changes have been saved to the scanner's NOVRAM for power-on, except factory settings.<sup>1</sup>
  - c. **Advanced/Send and Save, Including Factory.** Same as above, except that changes to factory settings will also be saved for power-on.

**Note:** For Multidrop setup, see "[Multidrop Communications](#)" on page A-38.

1. Consult your model specific user's manual for a list of factory settings.



## Chapter Contents

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This section tells how to setup communications parameters with the host and an auxiliary terminal.

Chapter 1, "Quick Start" told you how to communicate with the scanner through the 9-pin port. This section presents the parameters needed to communicate with the scanner with the 25-pin Host Port connector or through the internal connections in the wiring box. In addition, the options for auxiliary port connections are fully explored.

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

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

# Communications Options

You can communicate with the scanner through the following ports:

- 9-pin D-sub external connector
- 25-pin D-sub external connector
- Wiring box
- IrDa port

Only one port can be used at a time to receive commands.

## Communications with Host through the 9-pin Host Port

For the 9-pin configuration port, set the host communications settings as follows: **57.6K** baud, **8** data bits, **1** stop bits, and **None** parity. See [Chapter 1, "Quick Start"](#) for more information on using the 9-pin port.

**Note:** The 9-pin configuration port settings are not changeable.

## Communications with Host through the 25-pin Port

The default 25-pin host port configuration settings are as follows: **9600**, **7**, **1**, and **Even**. Making changes to these communications parameters without corresponding changes in linked device(s) can result in the loss of menu access. If this should occur, connect via the 9-pin port and reset your scanner's host parameters to match the 25-pin defaults shown here.

See ["Host Port Parameters" on page 2-5](#).

## Communications with Host through the Wiring Box

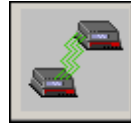
The settings are the same as those of the 25-pin port. See [Chapter 16, "Wiring Box Option"](#) for details on wiring connections.

## Communications with Host through the IrDA Port

See ["IrDA Port" on page 2-18](#) and [Appendix C – "IrDA Configuration Port" on page A-13](#).



## Communications by ESP



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

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

Category	Parameter	Value
Host Port	Baud Rate	9600
	Parity	Even
	Data Bits	Seven
	Stop Bits	One
Aux Port	Mode	Disabled
	Baud Rate	9600
	Parity	Even
	Data Bits	Seven
	Stop Bits	One
Daisy Chain ID	Status	Disabled
	ID	1 /
IrDA port and Text Menus	IrDA status	Disabled
	IrDA Timeout	40 sec
	Menu Mode	TTY

2-Communications

## Communications by Serial Command

Command Title	old cmds	new cmds	Format
Host Port Parameters	<b>Ka</b>	<b>K100,</b>	< <b>K100</b> ,baud,parity,stop bits,data bits>
Aux Port Parameters	<b>Ky</b>	<b>K101,</b>	< <b>K101</b> ,aux port mode,baud,parity,stop bits,data bits,daisy chain status,daisy chain ID>
IrDA Port and Text		<b>K103,</b>	< <b>K103</b> ,IR status,IR timeout,menu mode>
Daisy Chain Auto Configure		<b>K150 DAISY</b>	< <b>K150DAISY</b> >
Daisy Chain Scanner ID		<b>K151,</b>	< <b>K151</b> ,daisy chain scanner,daisy chain scanner ID>
Comm. Status Request	<b>KT?</b>	<b>K199?</b>	< <b>K199?</b> >

## Communications by Embedded Menu

In addition to ESP-MP, Microscan's scanners have an embedded menu that can be accessed from the terminal window within ESP or a separate terminal program. See for instructions on using the embedded menus. For older, slower computers, the embedded menus might be a quicker method of communicating with your scanner.

Send a **<D>** command from your terminal to bring up the main menu:

2-Communications

```

MICROSCAN SYSTEMS, INC.
CONFIGURATION PROGRAM
MAIN MENU
35-558001-12
-----
TOPICS                DESCRIPTION
1) COMMUNICATIONS    HOST PROTOCOL & HOST/AUX PORT CONFIG.
2) OPERATIONS        TRIGGERING, TIMEOUTS, ETC.
3) CODE TYPES 1      CODE 39, I 2 OF 5, CODE 128, CODE 93
4) CODE TYPES 2      PDF417, CODABAR, UPC, CODE PARAMETERS
5) OPTO-ELECT. CONTROL OPTO-ELECT. CONTROL, CONFIG. DATA BASE
6) SCANNER I/O       PROGRAMMABLE I/O
7) SCANNER OUTPUT    BEEPER, LASER, OUTPUT MODES, ETC.
8) SCANNER SETUP     FACTORY, AGC, AND RASTER SETTINGS
9) DIAGNOSTICS SETUP WARNING MESSAGES, OPERATION TIME, ETC.
10) NETWORK CONFIGURATION DEVICE NET, PROFIBUS, ETHERNET, DH, REM. I/O
11) OUTPUT ORDER FILTERS SORT ORDER LABEL OUTPUT FILTERS.
-----
ESC = MAIN MENU OR EXIT  N = NEXT ITEM
M  = PREVIOUS MENU      SP = NEXT ITEM
B  = PREVIOUS ITEM      CR = THIS ITEM
-----
MAIN--> COMMUNICATIONS
    
```

Press the return key (**CR**) to see the communications menu:

```

CURRENT SETTINGS FOR COMMUNICATIONS
-----
HOST PROTOCOL          |PARAMETER  |HOST PORT|AUX PORT
-----|-----|-----|-----
PROTOCOL               = POINT TO POINT |BAUD RATE | 9600    | 9600
PREAMBLE               = <CR>          |PARITY    | EVEN    | EVEN
PREAMBLE               = DISABLED       |STOP BITS | ONE     | ONE
POSTAMBLE              = <CR><LF>      |DATA BITS | SEVEN   | SEVEN
POSTAMBLE              = ENABLED       |AUX MODE  | N/A     | DISABLED
LRC                   = DISABLED     |DAISY CHAIN:
RESPONSE TIMEOUT      = 20ms         |ID STATUS | N/A     | DISABLED
INTERCHAR DELAY       = 0ms          |ID DEFINE | N/A     | 1/
-----
[ADDRESS & CONTROL CHARACTERS]
ADDRESS = 0          || STX = <NUL>
RES     = <NUL>      || ETX = <NUL>
REQ     = <NUL>      || ACK = <NUL>
EOT     = <NUL>      || NAK = <NUL>
-----
ESC = MAIN MENU OR EXIT  N = NEXT ITEM
M  = PREVIOUS MENU      SP = NEXT ITEM
B  = PREVIOUS ITEM      CR = THIS ITEM
-----
COMMUNICATIONS--> HOST PROTOCOL_
    
```

For information on accessing the embedded menus, see ["Embedded Menus" on page - 23.](#)

## Host Port Parameters

**Important:** This applies only to the **25-pin port** and **wiring box** connections (not for 9-pin port).

**Note:** See “[Select the Communications Ports](#)” on page 1-8 for 9-pin host port parameters.

### Baud Rate, Host Port

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

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

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

*Default:* **9600**

*Options:*

1 = 1200	4 = 9600	7 = 57.6K
2 = 2400	5 = 19.2K	8 = 115.2K
3 = 4800	6 = 38.4K	

### Parity, Host Port

*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.

*Usage:* Only changed if necessary to match host setting.

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

*Default:* **Even**

*Options:* 0 = None      1 = Even      2 = Odd

### Stop Bits, Host Port

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

*Usage:* Only changed if necessary to match host setting.

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

*Default:* **One**

*Options:* 0 = One    1 = Two

---

## Host Port Parameters

### Data Bits, Host Port

---

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

*Usage:* Only changed if necessary to match host setting.

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

*Default:* **One**

*Options:* 0 = One 1 = Two

## RS422 Status

*Definition:* Enables RS422. When RS422 is enabled, RS232 is enabled.

*Usage:* Only changed if necessary to match host setting.

*Serial Cmd:* <**K100**,status>

*Default:* **Disabled**

*Options:* 0 = Disabled      1 = Enabled

# Auxiliary Port

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.

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

**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). If the scanner's host port needs to be dedicated to the host, but configuration must be done on the fly, the auxiliary port can be set to accept configuration changes by **Command Processing** (page 2-13).

**Serial Cmd:** <**K101**,aux port mode,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>

## Auxiliary Port Modes

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

**Serial Cmd:** <**K101**,aux port mode,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>

**Default:** **Disabled**

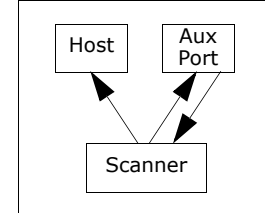
**Options:**

- 0 = Disabled
- 1 = Transparent
- 2 = Half duplex
- 3 = Full duplex
- 4 = Daisy chain
- 5 = Command Processing

## Transparent Mode

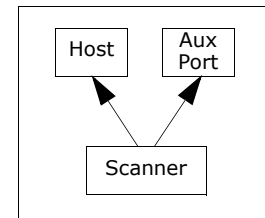
**Definition:** In **Transparent** mode data is passed between the auxiliary port and the host. The scanner buffers data from the auxiliary port and echoes the keyed data on the auxiliary port.

- Auxiliary port data is passed through to the host whenever a return key is pressed at the auxiliary port or whenever bar code data is sent. If sent with bar code data, it is processed on a first-in/first-out basis.
- 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 still pass through.
- **<D>** is the only command accepted by the scanner from the auxiliary port. All other commands will pass through to the host.



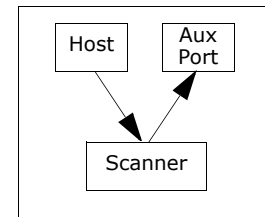
### Data initiated from the Scanner

- 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.



**Usage:** A common application, in conjunction with handheld scanners, is one that employs an auxiliary readout to detect mis-applied bar code labels.

**Serial Cmd:** **<K101,aux port mode,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>**

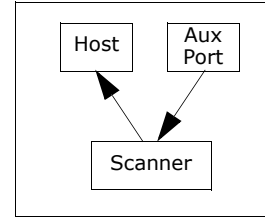
**1 = Transparent**

## Half Duplex Mode

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

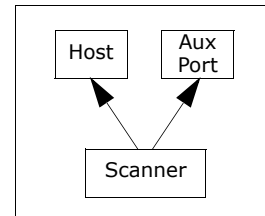
### Data initiated from the Auxiliary Port

- 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.



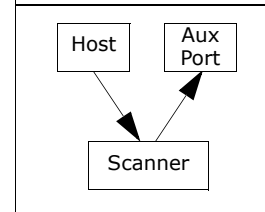
### Data initiated from the Scanner

- 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.



**Usage:** Useful when the user wants bar code data displayed on an auxiliary screen close to the scanner.

**Serial Cmd:** **<K101,aux port mode,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>**

**2 = Half Duplex**

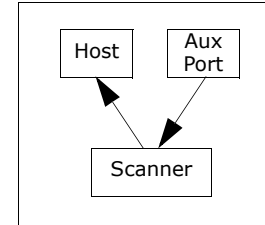


## Full Duplex Mode

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

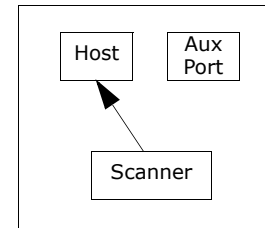
### Data initiated from the Auxiliary Port

- 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.



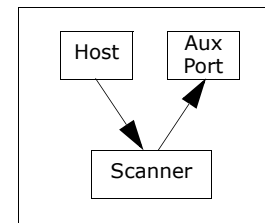
### Data initiated from the Scanner

- 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.



**Usage:** When communication to and from the auxiliary port is required.

**Serial Cmd:** <**K101,aux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>

**3 = Full duplex**

---

## Auxiliary Port

### Daisy Chain Mode

**Note:** See also “[Daisy Chain Autoconfigure](#)” on page 2-27.

---

**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 “slave” scanner in the chain. Thereafter, each slave’s auxiliary port is linked to the host port of the slave 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.

**Usage:** Useful in applications where:

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

**Serial Cmd:** `<K101,aux 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 **30** mS for each slave in the daisy chain. (See “[Timeout Duration](#)” on page 4-15.) 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 slave scanner downstream might be set to 90 ms, the next to 30 ms, and so forth, thus assuring that at least 30 mS elapses between transmissions.<sup>a</sup>

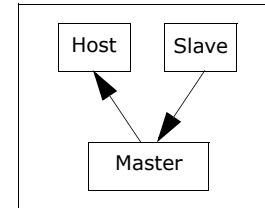
Daisy-chained scanners can send a series of labels by enabling **Multilabel** and a common multilabel separator. If the master scanner does not receive the expected number of labels, noread messages are appended to the data string to make up the difference between the number of labels enabled in **Multilabel**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

For example, a master and two slave scanners have **Number of Labels** set to 3 and **Multilabel Separator** defined as %. If the master and the first slave scanner do not find labels, but the next slave scanner registers a good read, the transmitted results would be: label data % noread % noread.

a. The above example is based on the best case. Other factors such as baud rate, dynamic focus timing, number of characters in a given symbol, and the number of slaves 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 slave 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 slave scanner.
4. Each slave scanner in the daisy chain must be set to send its data no less than **30** 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 **Multilabel** is enabled, **Multilabel Separator** characters must match in all scanners and **Number of Labels** must be set to number large enough to include all the labels it may itself read plus the number of labels 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.



## Command Processing Mode

**Definition:** Command Processing allows commands to be entered via the aux port and direct externally triggered read cycle data in one of two ways:

1. If the last command came from the aux port, then externally triggered read cycle data will be output to both the host and the aux ports.
2. If the last command came from the host port, then externally triggered read cycle data will only be output to the host port.

**Usage:** Allows user to direct externally triggered read cycle data to the host or both the host and aux ports.

**Serial Cmd:** <**K101,aux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>

**Options:** **5 = Command Processing**

---

## Auxiliary Port

### Aux Port Communications Parameters

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

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

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

*Serial Cmd:* <**K101**,aux port mode,**baud rate**,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>

*Default:* **9600**

*Options:*

1 = 1200	4 = 9600	7 = 57.6K
2 = 2400	5 = 19.2K	8 = 115.2K
3 = 4800	6 = 38.4K	

#### Parity, Aux Port

*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.

*Usage:* Only changed if necessary to match host setting.

*Default:* **Even**

*Options:* <**K101**,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

#### Data Bits, Aux Port

*Definition:* Number of bits in each character.

*Usage:* Only changed if necessary to match host setting.

*Serial Cmd:* <**K101**,aux port mode,baud rate,parity,stop bits,**data bits**,daisy chain ID status,daisy chain ID>

*Default:* **Seven**

*Options:* 0 = Seven          1 = Eight

### Stop Bits, Aux Port

---

<i>Definition:</i>	Allows the user to select the last one or two bits in each character to indicate the end of the character.
<i>Usage:</i>	Only changed if necessary to match host setting.
<i>Serial Cmd:</i>	< <b>K101</b> ,aux port mode,baud rate,parity, <b>stop bits</b> ,data bits,daisy chain ID status,daisy chain ID>
<i>Default:</i>	<b>One</b>
<i>Options:</i>	0 = One                      1 = Two

### Daisy Chain ID Status

---

<i>Definition:</i>	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.
<i>Usage:</i>	Used in a daisy chain setup in cases where the host needs to know which scanner in a daisy chain setup sent the data.
<i>Serial Cmd:</i>	< <b>K101</b> ,aux port mode,baud rate,parity,stop bits,data bits, <b>daisy chain ID status</b> ,daisy chain ID>
<i>Default:</i>	<b>Disabled</b>
<i>Options:</i>	0 = Disabled                      1 = Enabled

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

### Daisy Chain ID

---

<i>Definition:</i>	A one or two character prefix which identifies the particular daisy chain scanner from which the data is being sent.
<i>Usage:</i>	Used in a daisy chain setup in cases where the host needs to know which scanner sent the data.
<i>Serial Cmd:</i>	< <b>K101</b> ,aux port mode,baud rate,parity,stop bits,data bits,daisy chain ID status, <b>daisy chain ID</b> >
<i>Default:</i>	<b>1/</b>
<i>Options:</i>	Any one or two ASCII characters.

# Daisy Chain Autoconfigure

**Definition:** **Daisy Chain Autoconfigure** is issued to the master scanner in the daisy chain and the software responds as follows:

- Counts the number of slave scanners in the daisy chain.
- Assigns an internal ID number (1...n) to each slave scanner, where the first slave scanner is number 1 (and it's own ID being a 0).
- Propagates the communications settings and the relevant operating modes of the master scanner to the host and auxiliary ports of each slave scanner.
- Resets each slave scanner.
- Verifies that each slave scanner has acquired the new settings.

**Usage:** For quick setup and configuration of the daisy chain network.

**Serial Cmd:** <**K150DAISY**>

**Note:** All slave scanners must be set to **Serial** for **Daisy Chain** to function. See ["Trigger Mode" on page 4-4](#).

When setting up a daisy chain operation, do the following:

1. Set the master (the scanner connected to the host) scanner to **Serial**. This sets all the scanners in the daisy chain to **Serial** when the command is carried out.

Before **Autoconfigure** you must set the master scanner to **Serial (S)**:



2. Send <**K150DAISY**> command.
3. If necessary, set the master scanner to **Edge**.

After **Autoconfigure** you may set the master scanner to **Edge (E)** but the other scanners must remain in **Serial (S)**:



## Daisy Chain Remote Scanner ID

**Note:** Scanner IDs can also be assigned in “Daisy Chain Mode” on page 2-20.

**Definition:** Assigns a new daisy chain ID to a daisy chain scanner. The command is sent to the master scanner to configure the other scanners.

**Usage:** This command provides a handy way to assign custom daisy chain IDs to specific scanners that were assigned during the daisy chain autoconfigure process.

**Serial Cmd:** <**K151**,daisy chain scanner #,scanner ID>

### Daisy Chain Scanner Number

**Definition:** Specifies the target scanner (by sequential number) which will be receiving the new Daisy Chain ID. The master scanner is always 0 (zero). All slave scanners are numbered 1...n in the order that they are connected.

**Note:** These numbers are for assigning IDs only and are not changeable.

**Serial Cmd:** <**K151**,daisy chain scanner #,scanner ID>

**Options:** 1...n (0 for the master scanner)

### Daisy Chain Scanner ID

**Definition:** A two-character user-defined ASCII message identifying a scanner in the daisy chain.

**Serial Cmd:** <**K151**,daisy chain scanner #,scanner ID>

**Default:** Sequential numbering of scanner units resulting from the Daisy Chain Auto-configure <**K150**> command; for example: ID Master = **1/**; ID Scanner 1 = **2/**; ID Scanner 2 = **3/**; etc.

**Options:** Any two characters except , < > **NUL**.

**Note:** After a slave scanner accepts a new ID, it automatically invokes a reset-with-save command.

---

## IrDA Port

### Status

---

**Definition:** **IrDA**, which stands for the Infrared Data Association, promotes interoperable, infrared data interconnection standards that support a walk-up, point-to-point user model for a broad range of appliances, computing and communications devices.

**Usage:** Allows wireless programming of the MS-880 by devices with IrDA ports such as the Palm Pilot™, laptops, etc. (See [Appendix C – “IrDA Configuration Port”](#) of the MS-880 Industrial Bar Code Scanner User’s Manual and [Appendix D – “IrDA/Ir Comm for Palm Pilot”](#) of the MS-880 Industrial Bar Code Scanner User’s Manual.)

**Serial Cmd:** <**K103**,IR status,IR timeout,menu mode>

**Note:** IrDA port will be disabled automatically whenever the 9-pin host port is in use.

---

**Serial Cmd:** <**K103,IR status**,IR timeout,menu mode>

**Default:** **Disabled**

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

### IrDA Timeout

---

**Definition:** After the loss of the IrDA link, the MS-880 will attempt to re-acquire the same link until **IR Timeout** expires, at which time the software clears the old link and attempts to “discover” any nearby IRDA-equipped devices. Until the timeout period elapses, the scanner will not end the search for the current IRDA terminal even if that terminal is removed and another IrDA terminal is put in its place.

**Serial Cmd:** <**K103**,IR status,**IR timeout**,menu mode>

**Default:** **40 seconds**

**Options:** 0 = 3 sec.  
1 = 12 sec.  
2 = 20 sec.  
3 = 40 sec.



## Menu Mode

**Important Note:** Menu Mode is only used in special cases (see “Usage” below). In normal use the correct mode for your device is automatically selected.

*Definition:* In VT-100 mode, keyboard arrow keys of a VT-100 terminal (or terminal emulation) may be used. TTY uses a teletype protocol.

**Note:** Send this command from the port to be changed.

*Usage:* Only useful in a special cases where a user has a TTY device (desktop computer, laptop, etc.) and wishes to use the space bar and enter keys to navigate through the embedded menus.

*Serial Cmd:* <**K103**,*IR status*,*IR timeout*,**menu mode**>

*Default:* The IrDA port defaults to **VT-100** mode.

*Options:*  
0 = TTY  
1 = VT-100



# Chapter

# 3

# Protocol

## Chapter Contents

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3-Protocol

Protocols are the rules by which devices pass data back and forth. This section includes the basic options available for data communication, including multidrop and user-defined options and output data formats.

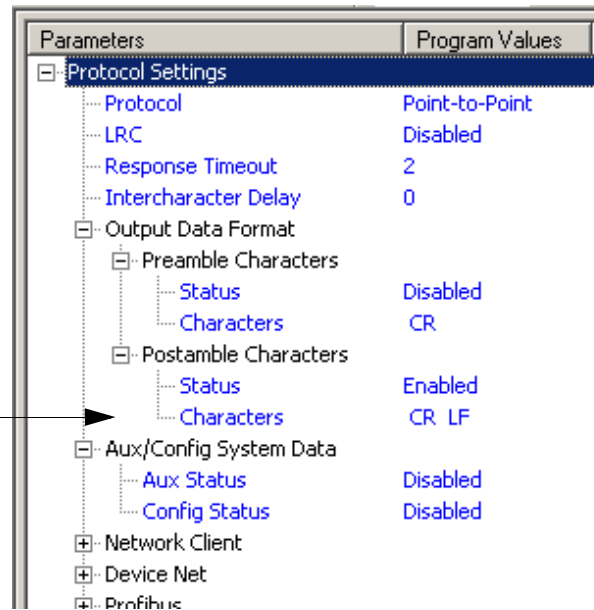
**Note:** The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

## Protocol by ESP



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

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



### 3-Protocol

## Protocol by Serial Command

Command Title	old cmds	new cmds	Format
Host Protocol	<b>Kf</b>	<b>K140,</b>	< <b>K140</b> ,protocol>
Preamble	<b>Kd</b>	<b>K141,</b>	< <b>K141</b> ,status,preamble>
Postamble	<b>Ke</b>	<b>K142,</b>	< <b>K142</b> ,status,postamble>
Response Timeout	<b>KA</b>	<b>K143,</b>	< <b>K143</b> ,timeout>
Intercharacter Delay	<b>KB</b>	<b>K144,</b>	< <b>K144</b> ,time interval>
LRC	<b>Kc</b>	<b>K145,</b>	< <b>K145</b> ,status>
Aux/Config. Port Data		<b>K146,</b>	< <b>K146</b> ,aux status,config status>
Communications Status Request	<b>KT?</b>	<b>K199?</b>	< <b>K199?</b> >

## Protocol by Embedded Menu

For information on accessing the embedded menus, see “[Embedded Menus](#)” on page A-23.

From the Main menu, scroll down through the options and select the following screen:

CURRENT SETTINGS FOR COMMUNICATIONS				
HOST PROTOCOL		PARAMETER	HOST PORT	AUX PORT
PROTOCOL	= POINT TO POINT	BAUD RATE	9600	9600
PREAMBLE	= <CR>	PARITY	EVEN	EVEN
PREAMBLE	= DISABLED	STOP BITS	ONE	ONE
POSTAMBLE	= <CR><LF>	DATA BITS	SEVEN	SEVEN
POSTAMBLE	= ENABLED	AUX MODE	N/A	DISABLED
LRC	= DISABLED	DAISY CHAIN:		
RESPONSE TIMEOUT	= 20ms	ID STATUS	N/A	DISABLED
INTERCHAR DELAY	= 0ms	ID DEFINE	N/A	1/
[ADDRESS & CONTROL CHARACTERS]				
ADDRESS	= 0	STX	= <NUL>	
RES	= <NUL>	ETX	= <NUL>	
REQ	= <NUL>	ACK	= <NUL>	
EOT	= <NUL>	NAK	= <NUL>	
ESC = MAIN MENU OR EXIT		N = NEXT ITEM		
M = PREVIOUS MENU		SP = NEXT ITEM		
B = PREVIOUS ITEM		CR = THIS ITEM		
COMMUNICATIONS--> HOST PROTOCOL				

# Protocol

*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.

*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.

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

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

*Options:*

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

*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.

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

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

---

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

---

*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).

*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.

*Serial Cmd:* <K140,1>

---

### Point-to-Point with RTS/CTS

---

*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.

*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.

*Serial Cmd:* <K140,2>

---

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

---

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

*Usage:* Used only with RS-232.

*Serial Cmd:* <K140,3>

---

### Polling Mode D

---

*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.

*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.

*Serial Cmd:* <K140,4>

---

## Protocol

### Multidrop

Note: See also “Multidrop Communications” on page A-38.

- 
- 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).
- Usage:** The MS-5000 can be used as a concentrator to a single host port connection.  
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) an address must be defined and appended to the command string.  
Format: <**K140,5**,address>

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

### User Defined Point-to-Point

- 
- Definition:** **User Defined Point-to-Point** allows the user to customize the point-to-point protocol.
- Usage:** Useful for developing custom protocols in polled or unpolled mode.
- Serial Cmd:** <**K140,6**,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:** <**K140,6**,RES,address,REQ,EOT,STX,ETX,ACK,NAK,from host>
- Default:** No address
- Options:** Any ASCII character except a null.



### User Defined Example

**Definition:** Example: ACK/NAK protocol can be configured using **User Defined**. The scanner will transmit data to the host, when an **ACK** is received, it will carry on with its business. 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 <K140,6>**.

**Example:** To select an unpolled ACK/NAK **User Defined** protocol with LRC disabled, send **<K140,0><K140,6,,,,,,^F,^U><K145,0>**. ACK and NAK will be displayed in the menu.

**Serial Cmd:** **<K140,6,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:** This option 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:** **<K140,6,RES,address,REQ,EOT,STX,ETX,ACK,NAK,from host>**

**Default:** **Disabled**

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

## User Defined Multidrop

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

**Usage:** This option is used when connecting to a concentrator or other device that does not match standard multidrop 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:** **<K140,7,RES,address,REQ,EOT,STX,ETX,ACK,NAK>**  
For **User Defined Multidrop**, first select **Multidrop <K140,5>**, then **User Defined Multidrop <K140,7...>**.

**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.

**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 "[Communication Protocol Commands](#)" on page A-22.)

**Note:** 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.

# LRC

(Longitudinal Redundancy Check)

*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.

*Usage:* Used when extra data integrity is required.

*Serial Cmd:* <**K145**,status>

*Default:* **Disabled**

*Options:* 0 = Disabled      1 = Enabled

## Response Timeout

---

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

*Usage:* Only used 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.

*Serial Cmd:* <**K143**,response timeout>

*Default:* **2** (in ten mS increments)

*Options:* 0 to 255 (A zero (0) setting causes an indefinite wait.)

## Intercharacter Delay

- Definition:* The time interval in milliseconds between individual characters transmitted from the scanner to the host.
- Usage:* **Intercharacter Delay** is only used where a host cannot receive data quickly enough and there is enough time between labels 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.
- Serial Cmd:* **<K144,intercharacter delay>**  
Example: To change **Intercharacter Delay** to 30 ms, send **<K144,30>**.
- Default:* **0**
- Options:* 0 to 255 (in milliseconds). Zero (0) causes no delay between characters.

---

*Output Data Format*

## Output Data Format

Up to four 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.

Note: See also [Chapter 13, "Output Format and Filtering"](#).

### *Preamble Characters*

#### **Preamble Status**

---

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

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

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

*Default:* **Disabled**

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

#### **Preamble Character(s)**

---

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

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

*Options:* **Within a Serial Command**

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

Example: **<K141,1,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 Characters

### Postamble Status

---

<i>Definition:</i>	Allows the user to enable or disable up to four postamble character(s) that can be added to the end of the decoded data.
<i>Usage:</i>	Useful 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 on its own line.
<i>Serial Cmd:</i>	< <b>K142,status</b> ,postamble character(s)>
<i>Default:</i>	<b>Enabled</b>
<i>Options:</i>	0 = Disabled      1 = Enabled (within any protocol)

### Postamble Character(s)

---

<i>Serial Cmd:</i>	< <b>K142,status</b> , <b>postamble character(s)</b> >
<i>Default:</i>	<b>^M^J</b> . Corresponds to carriage return/line feed/null/null, as displayed in the menu.
<i>Options:</i>	Up to four user-defined ASCII character, including control characters.
	<i>Within a Serial Command</i>
	To enter control characters within a serial command, hold down the control key while typing the desired character.
	Example: < <b>K142,1,CNTL-m CNTL-j</b> > to enter ^M^J.
	<i>Within an Embedded Menu</i>
	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: <b>Space CNTL-m Space CNTL-j</b> to enter ^M^J.

## Auxiliary/Configuration System Data

**Note:** Do not use this with **Daisy Chain** operation.

### Auxiliary Status

**Note:** This command only applies if the Aux Mode is set to **Command Processing**. See "[Command Processing Mode](#)" on page 2-13.

*Definition:* When enabled, system data, including decoded data and diagnostic warning messages, will be routed to the aux port.

*Usage:* To check label data and error messages via the aux port.

*Serial Cmd:* **<K146,aux status,config status>**

*Default:* **Disabled**

*Options:* 0 = Disabled, 1 = Enabled

### Configuration Status

*Definition:* When enabled, system data, including decoded data and diagnostic warning messages, will be routed to the 9-pin configuration port or if active to the IrDA port.

*Usage:* To check label data and error messages via the configuration port.

*Serial Cmd:* **<K146,aux status,config status>**

*Default:* **Disabled**

*Options:* 0 = Disabled, 1 = Enabled

When using the 9-pin configuration port it is important to remember to enable this command.



## Network Client

Network Client is enabled whenever a network protocol card is installed in the MS-880 wiring box and in conjunction with one of the following protocols:

*DeviceNet*

*Profibus-DP*

*DataHighway Plus*

For configuration and installation information on the above protocols and protocol cards, see The [\*Network Protocol Card User's Manual\*](#), part number 83-210015.



*Chapter*

4

# Read Cycle/Trigger

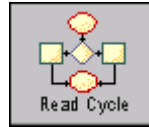
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Read cycles and triggering modes are at the heart of bar code scanning. After you've established communications and completed basic read rate testing, you will need to address the spatial and timing parameters associated with your application. In a 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/Trigger by ESP



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

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

Parameters	Program Values
Read Cycle / Triggering	
Trigger	
Trigger Mode	Continuous Re...
External Trigger	Active Closed
Trigger Filter Time	320
Good Decode Reads	1
Serial Trigger	
Serial Character	GS
User Defined Characters	
End Trigger Character	0 0
Start Trigger Character	0 0
Multilabel	
Number of Labels	1
Separator	,
End of Read Cycle Mode	Timeout
Timeout	100
Opto-Electrical Control	
Scanner Setup	

### 4-Read Cycle/Trig-

## Read Cycle/Trigger by Serial Command

Command Title	old cmds	new cmds	Format
Triggering Mode	<b>Kg</b>	<b>K200,</b>	< <b>K200</b> ,trigger mode,filter time>
Serial Trigger Character	<b>Ki</b>	<b>K201,</b>	< <b>K201</b> ,character>
External Trigger State		<b>K202,</b>	< <b>K202</b> ,external trigger state>
End of Read Cycle	<b>Kh</b>	<b>K220,</b>	< <b>K220</b> ,end of read cycle status,timeout>
Decodes Before Output	<b>Km</b>	<b>K221,</b>	< <b>K221</b> ,decodes before output>
Start Serial Trigger Character		<b>K229,</b>	< <b>K229</b> ,start trigger character>
Stop Serial Trigger Character		<b>K230,</b>	< <b>K230</b> ,end trigger character>
Multilabel	<b>KL</b>	<b>K222,</b>	< <b>K222</b> ,number of labels,multilabel separator>

### Read Cycle/Trigger by Embedded Menu

For information on accessing the embedded menus, see "Embedded Menus" on page A-23.

From the Main menu, scroll down through the options until you reach the following screen:

```

CURRENT SETTINGS FOR OPERATIONS
-----
TRIGGERING MODE      = CONTINUOUS READ      MATCHCODE TYPE      = DISABLED
END OF READ CYCLE   = TIMEOUT                SEQUENTIAL MATCHING = INCREMENT
TIMEOUT in 10ms inc. = 1000ms                MATCH START POSITION = 0
TRIGGER CHARACTER    = <GS>                  MATCH LENGTH        = 1
SINGLE START CHAR     = <NUL>                WILD CARD CHARACTER = *
SINGLE END CHAR       = <NUL>                SEQUENCE ON NOREAD  = ENABLED
EXTERNAL TRIGGER     = ACTIVE CLOSED          SEQUENCE ON MISMATCH = DISABLED
TRIGGER FILTER       = 10000us                MATCH DATABASE SIZE = 1
GOOD DECODE READS    = 1                      VARIABLE SEQUENCE   = 1
NEW MASTER PIN       = DISABLED
NUMBER OF LABELS     = 1
MULTILABEL SEPARATOR = .
BARCODE OUTPUT       = GOOD READ
WHEN TO OUTPUT       = AS SOON AS POSSIBLE

-----
ESC = MAIN MENU OR EXIT  N = NEXT ITEM
M  = PREVIOUS MENU      SP = NEXT ITEM
B  = PREVIOUS ITEM      CR = THIS ITEM
-----
OPERATIONS--> TRIGGERING MODE = CONTINUOUS READ_

```

## Trigger Mode

**Note:** When doing autocalibration or read rate testing, the current trigger setting will be disregarded.

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

*Serial Cmd:* **<K200,trigger mode,trigger filter duration>**

*Default:* **Continuous Read**

*Options:*

0 = Continuous Read	4 = Serial Data
1 = Continuous Read 1 Output	5 = Serial Data & External Edge
2 = External Level	6 = Network Trigger
3 = External Edge	7 = User Defined Read Cycle

### Continuous Read

*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 label.

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

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

*Serial Cmd:* **<K200,0>**

## Continuous Read 1 Output

- Definition:* In **Continuous Read 1 Output** the scanner self-triggers whenever it decodes a new bar code label or a timeout occurs.
- If **End Of Read Cycle** is set to **Timeout** and the label 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 label data immediately and repeats the output at intervals of one second for as long as the label continues to be scanned.
- If **End Of Read Cycle** is set to **New Trigger**, the scanner will send the current label data immediately, but send it only once. A new label appearing in the scanner's range will be read and sent immediately provided it is not identical to the previous label read.
- Usage:* **Continuous Read 1 Output** can be useful in applications where it is not feasible to use a trigger and all succeeding labels contain different information. It is also effective in applications where the objects are hand presented.
- Serial Cmd:* **<K200,1>**

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

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

## External Trigger Level

**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.

**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 no-read has occurred.

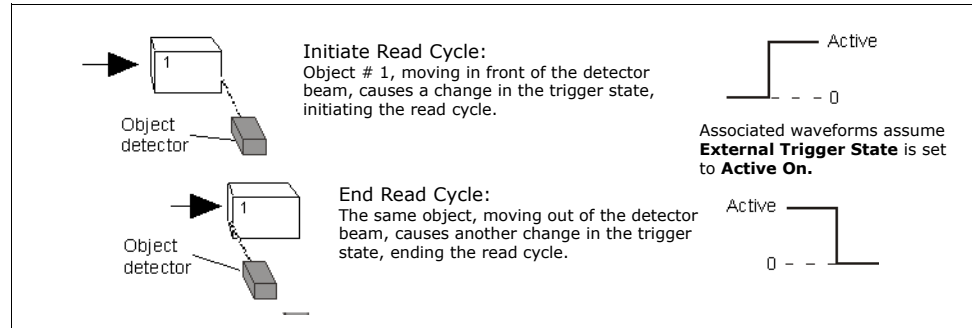


Figure 4-1 Trigger Level

Serial Cmd: **<K200,2>**

**Important: Level and Edge** apply to the active logic state (Active Off ( $I_{OFF}$ ) or Active On ( $I_{ON}$ )) 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.

**Note:** In External Trigger Level, sending a Non-delimited Start Serial Character will start a read cycle and sending a Non-delimited Stop Serial Character will end it. See ["Start and End Trigger Characters \(non-delimited\)"](#) in chapter 4.



## External Trigger Edge

**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.

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

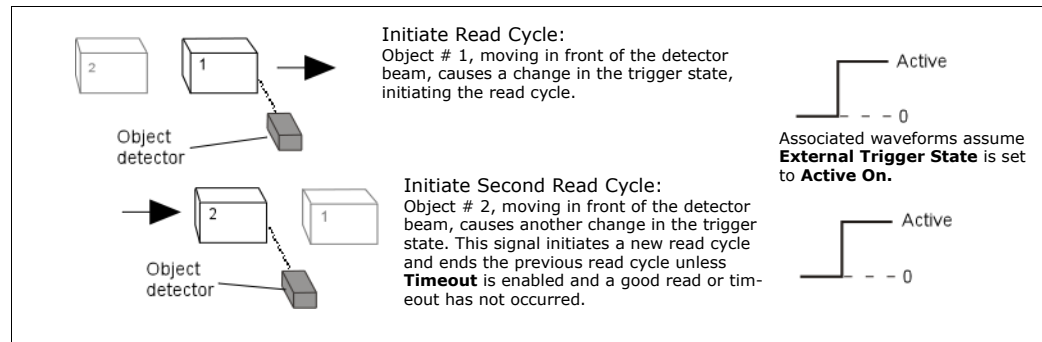


Figure 4-2 Trigger Edge

**Serial Cmd:** <K200,3>

**Important:** **Level** and **Edge** apply to the active logic state (**Active Off** ( $I_{OFF}$ ) or **Active On** ( $I_{ON}$ )) 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.

**Note:** In **External Trigger Edge**, sending a **Non-delimited Start Serial Character** will start a read cycle; however a **Non-delimited Stop Serial Character** has no effect. See "[Start and End Trigger Characters \(non-delimited\)](#)" on page 4-10.

---

## Trigger Mode

### Serial Data

---

- 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>**.
- 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.
- Serial Cmd:** **<K200,4>**

### Serial Data or External Edge

---

- Definition:** In this mode the scanner accepts either a serial ASCII character or an external trigger pulse to start the read cycle.
- Usage:** **Serial Data or External 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.
- Serial Cmd:** **<K200,5>**

**Note:** In **Serial Data or External Edge**, sending a **Non-delimited Start Serial Character** will start a read cycle; however a **Non-delimited Stop Serial Character** has no effect. See "[Start and End Trigger Characters \(non-delimited\)](#)" on page 4-10.

### Network Trigger

---

- Definition:** A trigger can also be sent over the network if installed. A network attribute triggers a pulse that performs similarly to **External Edge**.
- Usage:** **Network Trigger** allows a network command to be entered from a host networked to the scanner. See the [MS-880 Network Protocol Card User's Manual](#) (83-110015).
- Serial Cmd:** **<K200,6>**

## Trigger Filter Duration

- Definition:* **Trigger Filter Duration** can prevent trigger bounce from falsely triggering the scanner by limiting the time in which trigger pulses can be received.
- Usage:* **Trigger Filter Duration** is useful where trigger bounce could cause false triggers.
- Serial Cmd:* **<K200, trigger mode, trigger filter duration>**
- Default:* **320** (x 31.25µs = 10ms)
- Options:* **0 to 65535** (corresponding to 0 to 2.048s in 31.25µs steps)

## Good Decode Reads

- Definition:* The number of decodes (from 1 to 31) required per label before a label's decoded data is sent. It requires the scanner to successfully decode a label 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.
- Usage:* This is a very useful feature to increase reliability of reads for symbologies that do not have internal error checking such as Pharmacode.
- Serial Cmd:* **<K221, decodes before output>**
- 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 label the required number of times.

# Serial Trigger

*Definition:* A single ASCII host serial trigger character that initiates the read cycle. **Serial Trigger Character** is considered an on-line host command and requires the same command format as all host commands: that is, to be entered within angle brackets delimiters **< >**.

## Serial Trigger Character (delimited)

*Definition:* A delimited trigger character is one that either starts or ends the read cycle and is enclosed by delimiters such as **< >**.

*Usage:* Allows the user to define the trigger character that initiates the read cycle.

*Serial Cmd:* **<K201,serial trigger character>**

*Default:* **^]** (corresponds to **<GS>** 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. Control characters entered on the command line are displayed in the menu as mnemonic characters.

**Note:** **Serial Data** or **Serial Data or Edge** triggering mode must be enabled for **Serial Trigger Character** to take effect.

## Start and End Trigger Characters (non-delimited)

*Definition:* A non-delimited trigger character is one that either starts or ends the read cycle and is NOT enclosed by delimiters such as **< >**.

Both **Start** and **End** non-delimited characters can be defined and will function according to the trigger event, as follows:

When defining **Start** and **End** trigger characters, the following rules apply:

- In **External Edge** the scanner looks only for the **Start Trigger Character** and ignores any **End Trigger Character** that may be defined.
- In **External Level**, the **Start Trigger Character** begins the read cycle and **End Trigger Character** ends it. Note that even after a label has been decoded and the label data transmitted, the scanner remains in **External Level** trigger read cycle until a **Stop** character is received.
- In **Serial Data & Edge** trigger mode, command, either a **Start Trigger Character** or a hardware trigger can start an **Edge** trigger read cycle.

*Usage:* It is useful in applications where different characters are required to start and end a read cycle.

**Note:** **Start** and **End** serial trigger characters can be sent through host ports or aux ports, but not the IrDA port.

### Start Serial Trigger Character (non-delimited)

*Definition:* A single ASCII host serial trigger character that starts the read cycle and is not enclosed by delimiters such as < and >.

*Serial Cmd:* <**K229**,*start trigger character*>

*Default:* **Null** (disabled)

*Options:* Two hex digits representing an ASCII character except <, >, XON and XOFF.

**Note:** **Serial Data** or **Serial Data or Edge** triggering mode must be enabled for **Serial Trigger Character** to take effect.

### End Serial Trigger Character (non-delimited)

*Definition:* A single ASCII host serial trigger character that ends the read cycle and is not enclosed by delimiters such as < and >.

*Usage:* It is useful in applications where different characters are required to start and end a read cycle.

*Serial Cmd:* <**K230**,*end trigger character*>

*Default:* **Null** (disabled)

*Options:* Two hex digits representing an ASCII character except <, >, XON and XOFF.

**Note:** **Serial Data** or **Serial Data or Edge** triggering mode must be enabled for **Serial Trigger Character** to take effect.

## External Trigger State

**Definition:** When enabled for **Active On (I<sub>ON</sub>)** (Positive) the triggering device imposes a current on the optoisolator to activate the read cycle. When enabled for **Active Off (I<sub>OFF</sub>)** (Negative) the triggering device interrupts the current to the optoisolator to activate the read cycle.

**Usage:** Allows users to select the trigger state that will operate with their systems.

(If using the Microscan object detector, use **Active Off**.)

**Serial Cmd:** **<K202,external trigger state>**

**Default:** **Active On** (Positive)

**Options:** 0 = Active Off (Negative)

1 = Active On (Positive)

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

# End of Read Cycle

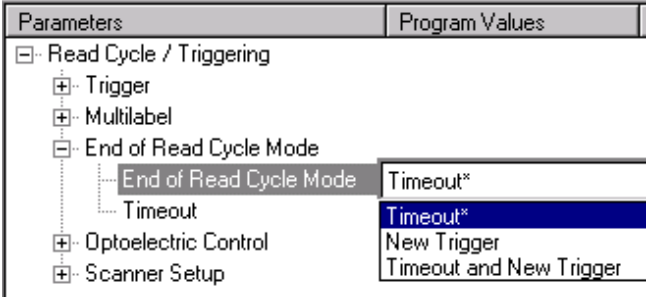
*Definition:* The read cycle is the time during which the scanner will attempt to read and decode a bar code symbol.

*Serial Cmd:* <K220,end of read cycle status,timeout>

## End of Read Cycle Status

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

*ESP:* Double-click on **End of Read Cycle Mode** and make a selection.



*Serial Cmd:* <K220,end of read cycle status,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.

---

## End of Read Cycle

### Timeout

---

**Definition:** **Timeout** ends the read cycle, causing the scanner to stop reading labels and send the label data or noread message when the time set in **Timeout** elapses (times out), if **When to Output** is set to **End of Read Cycle**.

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

With either **External Edge**, **Serial Data**, or **Serial Data & Edge** enabled, a timeout ends the read cycle and label 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.

**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.



## New Trigger

**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 4-6](#) and [figure 4-2 on page 4-7](#).)

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

**Note:** When **New Trigger** is enabled, **Laser On/Off** will have no effect. When no reads occur, the laser will remain on.

## Timeout or New Trigger

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

**Usage:** Useful 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.

## Timeout Duration

**Definition:** **Timeout Duration** 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**.

**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.

**Serial Cmd:** <**K220**,end of read cycle status,**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.

## Multilabel

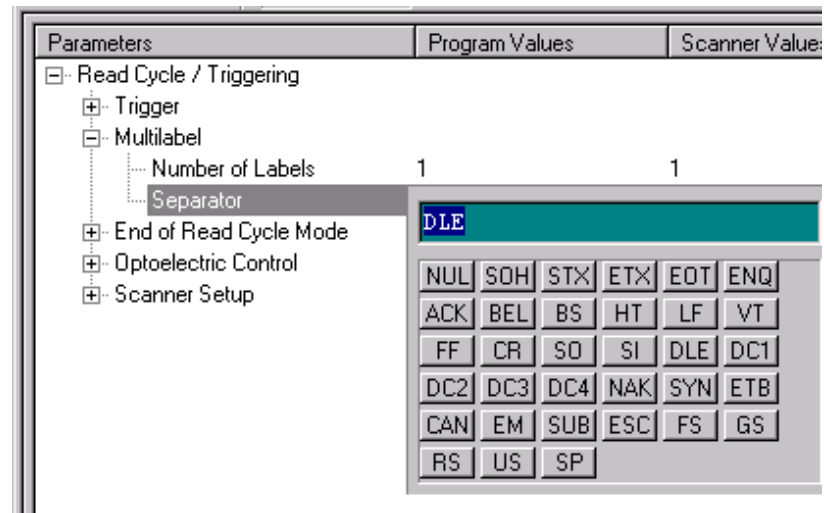
- Definition:* **Multilabel** allows the user to define up to 12 bar code labels that can be read in a single read cycle.
- Usage:* **Multilabel** is commonly used in shipping applications where a shipping label contains individual bar codes for part number, quantity, etc. This feature allows one trigger to pick up all the labels. AIAG and UCC/EAN-128 are two application standards that address this need.
- Conditions:* The following conditions apply:
1. Each bar code label must be different to be read.
  2. The maximum number of characters in a read cycle is 32,520 for all labels.
  3. The maximum number of characters the scanner can transmit is calculated by: Preamble + maximum number of labels \* (aux id + symbology id + maximum label length + quality output + ((number of insertion cells x cell length)+ separator) + postamble + LRC = 37,425.
  4. All noread messages are posted at the end of the data string.
  5. If more than one label is within the scan beam at the same time, label data may not be displayed in the order of appearance.
  6. If **Matchcode Type** is set to **Sequential** or if **Trigger** is set to **Continuous Read 1 Output, Number of Labels** will default to **1** (if set to any number greater than 1).

### Number of Labels

- Definition:* **Number of Labels** is the number of different labels that can be read in a single read cycle.
- Serial Cmd:* **<K222,number of labels,multilabel separator>**
- Default:* **1**
- Options:* 1 to 12

## Multilabel Separator

- Definition:** The character that's inserted between each label scanned when **Multi-label** is set to any number greater than **1**.
- Usage:** Used to delimit or separate data fields with a user defined character.
- ESP:** Double-click on **Separator** and select a character in the popup window.



**Serial Cmd:** <**K222**, number of labels, **multilabel separator**>

**Note:** If **Multilabel Separator** has been changed to any other character 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**.



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This section describes the various bar code 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 Code Type in the Utilities menu and select **Enable**, or send a **<P>** serial command to the scanner from the Terminal window.<sup>1</sup>

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

See [www.aimusa.org/standards](http://www.aimusa.org/standards) for additional information about codes.

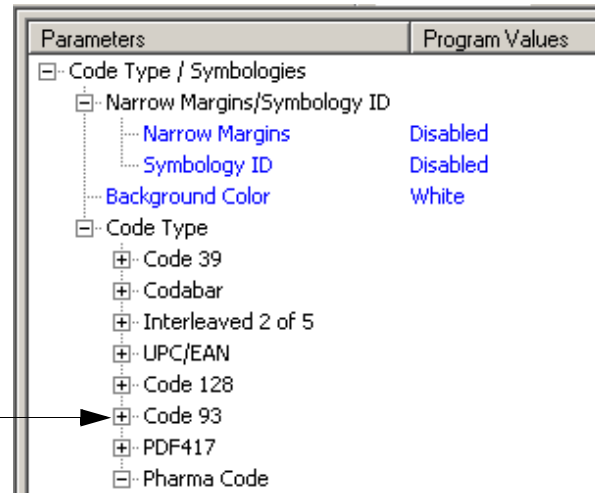
1. If using an I 2/5 label, verify that the number of characters in the label being scanned matches the code length enabled for the I 2/5 code type (default is 10 and 6). See "Interleaved 2 of 5" on page 5-14.

## Code Types by ESP



**Click** this button to bring up the **Code Types** menu.

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



## Code Types by Serial Command

Command Title	old cmds	new cmds	Format
Narrow Margins/ Symbology ID	<b>Ko</b>	<b>K450,</b>	< <b>K450</b> , <i>narrow margins status,symbology ID status</i> >
Background Color	<b>Kx</b>	<b>K451,</b>	< <b>K451</b> , <i>background color</i> >
Code 39	<b>Kp</b>	<b>K470,</b>	< <b>K470</b> , <i>status,check digit status,check digit output status,large intercharacter gap,fixed code length status,fixed code length,full ASCII</i> >
Codabar	<b>Kq</b>	<b>K471,</b>	< <b>K471</b> , <i>status,start &amp; stop match status,start &amp; stop output status,large intercharacter gap,fixed code length status,fixed code length,check digit type,check digit output</i> >
Interleaved 2 of 5	<b>Kr</b>	<b>K472,</b>	< <b>K472</b> , <i>status,check digit,check digit output,length 1,length 2,guard bar</i> >
UPC/EAN	<b>Ks</b>	<b>K473,</b>	< <b>K473</b> , <i>status,EAN status,supplementals status,separator status,separator char. &gt;</i> >
Code 128	<b>Kt</b>	<b>K474,</b>	< <b>K474</b> , <i>status,fixed length,length... &gt;</i> >
UCC/EAN-128	<b>Kt</b>	<b>K474,</b>	< <b>K474</b> , <i>,,,UCC/EAN-128 status,output format,separator status,separator character,application identifier parentheses,record padding</i> >
Code 93	<b>K!</b>	<b>K475,</b>	< <b>K475</b> , <i>status,fixed code length status,fixed code length &gt;</i> >
PDF417	<b>K[</b>	<b>K476,</b>	< <b>K476</b> , <i>status,raster sweeps before decode attempt,fixed code length status,fixed code length &gt;</i> >
Pharma Code		<b>K477,</b>	< <b>K477</b> , <i>status,fixed code length status,fixed code length,min. no. of bars,bar widths,fwd/rev &gt;</i> >
Code Type Status Request	<b>KW?</b>	<b>K499?</b>	< <b>K499?</b> >

## Code Types by Embedded Menu

For information on accessing the embedded menus, see ["Embedded Menus" on page A-23](#).

From the Main menu, scroll down through the options until you reach the following screens:

CURRENT SETTINGS FOR CODE TYPES 1				
	CODE 39	CODE 128	I 2 OF 5	CODE 93
CODE TYPE	ENABLED	DISABLED	DISABLED	DISABLED
FIXED LENGTH	DISABLED	DISABLED	N/A	DISABLED
CODE LENGTH #1	10	10	10	10
CODE LENGTH #2	N/A	N/A	6	N/A
CHECK DIGIT	DISABLED	N/A	DISABLED	N/A
C/D OUTPUT	DISABLED	N/A	DISABLED	N/A
INTERCHAR GAP	DISABLED	N/A	N/A	N/A
FULL ASCII	DISABLED	N/A	N/A	N/A
EAN	N/A	DISABLED	N/A	N/A
UCC/EAN FORMAT	N/A	STANDARD	N/A	N/A
SEPARATOR STATUS	N/A	DISABLED	N/A	N/A
SEPARATOR DEFINE	N/A	N/A	N/A	N/A
AP. REC. BRACKETS	N/A	DISABLED	N/A	N/A
AD. DEF. BARCODE	N/A	ENABLED	N/A	N/A

CURRENT SETTINGS FOR CODE TYPES 2				
	PDF 417	CODABAR	UPC	PHARMACODE
CODE TYPE	DISABLED	DISABLED	DISABLED	DISABLED
FIXED LENGTH	DISABLED	DISABLED	N/A	DISABLED
CODE LENGTH #1	10	10	N/A	10
CHECK DIGIT	N/A	DISABLED	N/A	N/A
C/D OUTPUT	N/A	DISABLED	N/A	N/A
INTERCHAR GAP	N/A	DISABLED	N/A	N/A
S/S MATCH	N/A	ENABLED	N/A	N/A
S/S OUTPUT	N/A	ENABLED	N/A	N/A
RASTER SWEEPS	0	N/A	N/A	N/A
SUPPLEMENTALS	N/A	N/A	DISABLED	N/A
SUPPLEMENTAL TYPE	N/A	N/A	BOTH	N/A
EAN	N/A	N/A	DISABLED	N/A
SEPARATOR STATUS	N/A	N/A	DISABLED	N/A
SEPARATOR DEFINE	N/A	N/A	,	N/A



## Narrow 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.

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

*Serial Cmd:* <**K450,narrow margins status**,symbology identifier>

*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

**Definition:** Symbology ID is an AIM standard prefix character that identifies the bar code type.

When enabled, the scanner analyzes and identifies the bar code 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, F, G, I, L, Q**  
A = Code 39; C = Code 128 or UCC/EAN-128; E = UPC/EAN; F = Codabar; G = Code 93; I = I-2 of 5; L = PDF417; Q = Pharma Code
3. **Modifier**, a single number indicating the status of the check digit character:

If **Check Digit** is not enabled, the output is 0 (Col. 1). If **Check Digit** and **Check Digit Output** are enabled, the output is as shown in Column 2. If **Check Digit** is enabled, but **Check Digit Output** is disabled (Col. 3), the output is as shown in Col. 4, which is the sum of Col. 2 and Col. 3.

**Usage:** Used when host needs to know the symbology type and how it's decoded.

**Serial Cmd:** `<K450,narrow margins status,symbology identifier>`

**Default:** **Disabled**

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

**Example:** For **Code 39**, if **Check Digit** and **Check Digit Output** are both enabled, a 1 will be sent; if **Check Digit Output** is disabled, a 3 (sum of column 1 and column 2) will be sent.

Table 5-1 Symbology Identifier Option Values

Symbology I.D.	Symbology	Column 1 No check character	Column 2 Check digit Output enabled	Column 3 Check digit Output disabled	Column 4 Sum of Column 2 and 3	FNC 1 Character in first position
<b>A</b>	Code 39	0	1	2	3	
<b>C</b>	Code 128	0	0	0	0	
<b>C</b>	UCC/EAN-128	0	0	0	0	1
<b>E</b>	UPC/EAN	0	0	0	0	
<b>F</b>	Codabar	0	1	2	3	
<b>G</b>	Code 93	0	0	0	0	
<b>I</b>	I-2 of 5	0	1	2	3	
<b>L</b>	PDF417	0	0	0	0	
<b>Q</b>	Pharma Code	0	0	0	0	

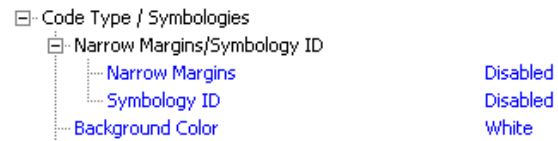
# Background Color

**Definition:** Allows the user to choose which symbol background (white or black) the scanner can read.

**Usage:** If the background is darker than the symbol, then enable black background.

Typically the background is white; but on PCBs for example, they can be black.

**ESP:**



**Serial Cmd:** **<K451,background color>**

**Default:** **White**

**Options:**  
0 = White  
1 = Black

## Code 39

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

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

### Code 39 Status

*Serial Cmd:* <**K470,status**,check digit status,check digit output status,large inter-character gap,fixed code length status,fixed code length,full ASCII set>

*Default:* **Enabled**

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

*Options:* 0 = Disabled      1 = Enabled

### Check Digit Status (Code 39)

*Serial Cmd:* <**K470,status,check digit status**,check digit output,large intercharacter gap,fixed code length status,fixed code length,full ASCII set>

*Default:* **Disabled**

*Options:* 0 = Disabled      1 = Enabled

### Check Digit Output (Code 39)

*Definition:* When enabled, the check digit character is read and compared along with the label data. When disabled, label 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.

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

*Serial Cmd:* <**K470,status,check digit status,check digit output**,large intercharacter gap,fixed code length status,fixed code length,full ASCII set>

*Default:* **Disabled**

*Options:* 0 = Disabled      1 = Enabled

## Large Intercharacter Gap (Code 39)

- Definition:** When enabled, the scanner can read symbols with gaps between bar code characters that exceed three times (3x) the narrow element width.
- 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.
- Serial Cmd:** `<K470, status, check digit status, check digit output, large intercharacter gap, fixed code length status, fixed code length, full ASCII set>`
- Default:** **Disabled**
- Options:** 0 = Disabled      1 = Enabled

## Fixed Code Length Status (Code 39)

- Definition:** When enabled the scanner will check the label length against the code length field. If disabled any length would be considered a valid label.
- Serial Cmd:** `<K470, status, check digit status, check digit output, large intercharacter gap, fixed code length status, fixed code length, full ASCII set>`
- Default:** **Disabled**
- Options:** 0 = Disabled      1 = Enabled

## Fixed Code Length (Code 39)

- 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 code not having the specified length.
- Usage:** **Fixed Code Length** helps prevent truncations and increases data integrity by ensuring that only one label length will be accepted.
- Serial Cmd:** `<K470, status, check digit status, check digit output, large intercharacter gap, fixed code length status, fixed code length, full ASCII set>`
- Default:** **10**
- Options:** 1 to 128

---

## Code 39

### Full ASCII Set (Code 39)

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

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

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

**Serial Cmd:** *<K470,status,check digit status,check digit output,large intercharacter gap,fixed code length status,fixed code length,full ASCII set>*

**Default:** **Disabled**

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

# Codabar

**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.

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

## Codabar Status

**Serial Cmd:** <**K471,status**,start & stop match,start & stop match output,large intercharacter gap,fixed code length status,fixed code length,check digit type,check digit output>

**Default:** **Disabled**

**Options:** 0 = Disable      1 = Enabled

## Start & Stop Match (Codabar)

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

**Usage:** Used to increase security of symbology.

**Serial Cmd:** <**K471,status,start & stop match**,start & stop match output,large intercharacter gap,fixed code length status,fixed code length,check digit type,check digit output>

**Default:** **Enabled**

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

## Start & Stop Output (Codabar)

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

**Usage:** Used to verify matching.

**Serial Cmd:** <**K471,status,start & stop match,start & stop match output**,large intercharacter gap,fixed code length status,fixed code length,check digit type,check digit output>

**Default:** **Enabled**

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

## Large Intercharacter Gap (Codabar)

- Definition:** Instructs the scanner to read symbols with gaps between characters exceeding three times the narrow element width.
- 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.
- Serial Cmd:** *<K471, status, start & stop match, start & stop output match, large intercharacter gap, fixed code length status, fixed fixed code length, check digit type, check digit output>*
- Default:** **Disabled**
- Options:** 0 = Disabled      1 = Enabled

## Fixed Code Length Status (Codabar)

- Definition:** When enabled, the scanner will check the label length against the fixed code length field. If disabled any length would be considered a valid label.
- Serial Cmd:** *<K471, status, start & stop match, start & stop match output, large intercharacter gap, fixed code length status, fixed code length, check digit type, check digit output>*
- Default:** **Disabled**
- Options:** 0 = Disabled      1 = Enabled

## Fixed Code 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 code not having the specified length.
- Usage:** **Fixed Code Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.
- Serial Cmd:** *<K471, status, start & stop match, start & stop match output, large intercharacter gap, fixed code length status, fixed code length, check digit type, check digit output>*
- Default:** **10**
- Options:** 1 to 128

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

**Note:** Because of symbology limitations, setting **Code 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:* <**K471**,*status,start & stop match,start & stop match output,large intercharacter gap,fixed code length status,fixed code length,***check digit type,check digit output**>
- Default:* **Disabled**
- Options:* 0 = Disabled  
1 = Modulus 16  
2 = NW 7  
3 = Both
- Modulus 16:* Used in the photo-finishing market.
- NW 7:* Used in Japanese markets.

### Check Digit Output (Codabar)

- Definition:* When enabled, the check digit character is sent along with the bar code data. When disabled, bar code data is sent without the check digit.
- Usage:* For additional security a check digit can be added to the bar code symbol.
- Serial Cmd:* <**K471**,*status,start & stop match,start & stop match output,large intercharacter gap,fixed code length status,fixed code length,check digit type,***check digit output**>
- Default:* **Disabled**
- Options:* 0 = Disabled 1 = Enabled

## Interleaved 2 of 5

**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 **Code Length** in order to decode I 2/5 symbols.

**Usage:** It has been popular because it is the most dense code 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.

### Interleaved 2 of 5 Status

**Serial Cmd:** <**K472,status,check digit status,check digit output status,code length #1,code length #2,guard bar**>

**Default:** **Disabled**

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

### Check Digit Status (Interleaved 2 of 5)

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

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

**Serial Cmd:** <**K472,status,check digit status,check digit output status,code length #1,code length #2**>

**Default:** **Disabled**

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

### Check Digit Output (Interleaved 2 of 5)

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

**Serial Cmd:** <**K472,status,check digit status,check digit output,code length #1,code length #2,guard bar**>

**Default:** **Disabled**

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

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

- Definition:** Allows user to define the symbol length. Because I 2/5 is a continuous code, it is prone to substitution errors. Hence, a code length must be defined and a bar code symbol must contain an even number of digits.
- Note:** If a start, stop or check digits are used, they are not included in the code length count.
- Usage:** With I 2/5, two code lengths can be defined. When using only one symbol length in an application, setting **Code Length #2** to 0 (zero) to ensure data integrity is recommended.
- Serial Cmd:** <**K472**, status, check digit status, check digit output status, **code length #1**, code length #2, guard bar>
- Default:** **10**
- Options:** 2 to 128, even.
- Since I 2/5 characters are paired, code length must be set to an even number. If **Check Digit** is enabled, add 2 to your code length. For example, if your symbol is 10 characters plus a check digit, then enable **Code Length** for 12.
- Note: Typically, when printing an I 2/5 label with an odd number of digits, a 0 will be added as the first character.
- Note: If both Code Length #1 and Code Length #2 are set to **0**, then I-2 of 5 will be variable.

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

- Definition:** Allows user to define a second code length for I-2 of 5.
- Usage:** If using a second symbol, a zero or any even code length from 2 to 64 may be specified. If not using a second symbol, set Code Length #2 to 0 to ensure data integrity.
- Serial Cmd:** <**K472**, status, check digit status, check digit output status, code length #1, **code length #2**, guard bar>
- Default:** **6**
- Options:** 2 to 128, even.
- Since I 2/5 characters are paired, code length must be set to an even number. If **Check Digit** is enabled, add 2 to your code length. For example, if your symbol is 10 characters plus a check digit, then enable **Code Length** for 12.
- Note: Typically, when printing an I 2/5 label with an odd number of digits, a 0 will be added as the first character.
- Note:** If both **Code Length #1** and **Code Length #2** are set to **0**, then I-2 of 5 will be variable.

## Guard Bar (Interleaved 2 of 5)

- Definition:** A guard bar is a heavy bar, at least 2 times the width of the wide bar, surrounding the printed I 2 of 5 symbol and helping to prevent false reads.
- Usage:** It is useful when I 2 of 5 multilabels are enabled to prevent false data output. This typically occurs with highly tilted or skewed labels.
- Serial Cmd:** `<Kstatus,check digit status,check digit output status,code length #1,code length #2,guard bar>`
- Default:** **Disabled**
- Options:** 0 = Disabled      1 = Enabled

## UPC/EAN

- Definition:* UPC (Universal Product Code) is a fixed length numeric, continuous symbology. UPC can have two or five digit supplemental bar code data following the normal code. 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.
- Usage:* Used primarily in POS application in the retail industry. It is commonly used with Microscan scanners in applications in combination with **Matchcode** when there is a need to verify that the right product is being placed in the right packaging.

### UPC Status

- Serial Cmd:* <**K473**,**UPC status**,*EAN status*,*supplementals status*,*separator status*,*separator character*,supplemental type>
- Default:* **Disabled**
- Options:* 0 = Disabled      1 = Enabled

### EAN Status

- 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 **EAN**.
- Note:** The extra character identifies the country of origin.
- Usage:* **EAN** is the European version of the UPC symbology and is used in European market applications.
- Note:** **UPC** must be enabled for **EAN** to take effect.
- Serial Cmd:* <**K473**,*UPC status*,**EAN status**,*supplementals status*, *separator status*, *separator character*,supplemental type>
- Default:* **Disabled**
- Options:* 0 = Disabled      1 = Enabled

## Supplementals Status (UPC/EAN)

- Definition:** A supplemental is a 2 or 5 digit symbol appended to the main label. When set to **Enabled** or **Required**, the scanner reads supplemental bar code data that has been appended to the standard UPC or EAN codes.
- Usage:** Reads **Supplementals** typically used in publications and documentation.
- Serial Cmd:** <**K473**,UPC status,EAN status,**supplementals status**,separator status, separator character,supplemental type>
- 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 Labels** should be set accordingly.

## Separator Status (UPC/EAN)

- Definition:** Allows the user to insert a character between the standard UPC or EAN code and the supplemental code when **Supplementals** is set to **Enabled** or **Required**.
- Usage:** Allows user to distinguish between the main and **Supplemental** symbols.
- Serial Cmd:** <**K473**,UPC status,EAN status,supplementals status,**separator status**,separator character,supplemental type>
- Default:** **Disabled**
- Options:** 0 = Disabled      1 = Enabled

## Separator Character (UPC/EAN)

<i>Definition:</i>	Allows the user to change the separator character from a comma to a new character.
<i>Usage:</i>	As required by the application.
<i>Serial Cmd:</i>	< <b>K473</b> ,UPC status,EAN status,supplementals status,separator status, <b>separator character</b> ,supplemental type>
<i>Default:</i>	, (comma)
<i>Options:</i>	Any ASCII character

**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 use ESP or the embedded menu.

**Note:** Whenever **Separator Character** is defined as a comma (,) sending a <**K473**,?> command will return the current definitions including the separator character comma which will appear between two serial separator commas.

## Supplementals Type (UPC/EAN)

<i>Definition:</i>	Allows the user to select 2 character or 5 character supplements, or both.
<i>Usage:</i>	As required by symbology used in application.
<i>Serial Cmd:</i>	< <b>K473</b> ,UPC status,EAN status,supplementals status,separator status,separator character, <b>supplemental type</b> >
<i>Default:</i>	<b>Both</b>
<i>Options:</i>	0 = Both 1 = 2 char only 2 = 5 char only
<i>Both:</i>	Either 2 character or 5 character supplementals will be considered valid.
<i>2 Char Only:</i>	Only two character supplementals will be considered valid.
<i>5 Char Only:</i>	Only five character supplementals will be considered valid.

## PDF417

*Definition:* A two-dimensional, multi-row (3 to 90), continuous, variable length symbology that has high data capacity for storing up to 2700 numeric characters, 1800 printable ASCII characters, or 1100 binary character per symbol. Each symbol character consists of 4 bars and 4 spaces in a 17-module structure.

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

*Serial Cmd:* <**K476**,status,raster sweeps before decode attempt,fixed code length status,fixed code length>

### PDF417 Status

*Serial Cmd:* <**K476,status**,raster sweeps before decode attempt,fixed code length status,fixed code length>

*Default:* **Disabled**

*Options:* 0 = Disabled      1 = Enabled

### Fixed Code Length (PDF417)

*Definition:* When enabled, the PDF label must contain the same number of characters as the code length setting before it can be considered a good decode. The scanner will ignore any code not having the specified length.

*Usage:* Used to increase data integrity by ensuring that only one label length will be accepted.



**Fixed Code Length Status (PDF417)**

*Serial Cmd:* <**K476**,*status,raster sweeps before decode attempt*,**fixed code length status**,*fixed code length*>

*Default:* **Disabled**

*Options:* 0 = Disabled      1 = Enabled

**Fixed Code Length (PDF417)**

*Definition:* Specifies the exact number of characters the scanner will recognize.

*Serial Cmd:* <**K476**,*status,raster sweeps before decode attempt*,*fixed code length status*,**fixed code length**>

*Default:* **10**

*Options:* 1 to 2710

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

## Code 128

**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.

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

### Code 128 Status

**Serial Cmd:** **<K474,status,fixed code length status,fixed code length>**

**Default:** **Disabled**

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

### Fixed Code Length Status (Code 128)

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

**Serial Cmd:** **<K474,status,fixed code length status,fixed code length>**

**Default:** **Disabled**

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

### Fixed Code Length (Code 128)

**Definition:** It 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 code not having the specified length.

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

**Serial Cmd:** **<K474,status,fixed code length status,fixed code length>**

**Default:** **10**

**Options:** 1 to 128

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

## UCC/EAN-128

**Definition:** A subset of Code 128, with extended features.

See the Uniform Code Council, Inc. at [www.uc-council.org](http://www.uc-council.org).

**Usage:** Used as a standard for shipping labels.

**Note:** Code 128 must be **Enabled** for UCC/EAN-128 to function.

### UCC/EAN-128 Status

**Serial Cmd:** <**K474**,,,, **UCC/EAN-128 status**, output format, application record separator status, application record separator character, application record brackets, application record padding>

**Note:** Code 128 serial command fields for K474 precede UCC/EAN-128.

**Default:** **Disabled**

**Options:** 0 = Disabled      1 = Enabled      2 = Required

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

**Required:** If set to **Required**, the label must have a function 1 in the first position and conform to EAN format in order to decode the bar code symbol.

### Output Data Format (UCC/EAN-128)

**Definition:** Offers an option between **Standard UCC/EAN-128** and **Application Record** format.

**Usage:** **Application Record** is useful in applications in which the software can utilize application record formatting to help automate the processing of its UCC/EAN-128 data.

**Serial Cmd:** <**K474**,,,, UCC/EAN-128 status, **output format**, application record separator status, application record separator character, application record brackets, application record padding>

**Default:** **Standard**

**Options:** 0 = Standard      1 = Application Record

**Standard:** In **Standard** UCC/EAN-128 application identifiers and data fields are sent, but none of the formatting (separators, parentheses, padding) will be included.

**Application Record:** **Application Record** is a variation of UCC/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.

**Note:** If an illegal **Application Record** format is detected, the scanner will process it as a noread and output a noread message (if enabled).

### Application Record Separator Status (UCC/EAN-128)

*Definition:* When enabled, a separator character is inserted between application records.

*Serial Cmd:* <K474,,,,UCC/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 = Enable

**Note: Output Format** must be set to **Application Record** before this parameter can take effect.

### Application Record Separator Character (UCC/EAN-128)

*Definition:* Allows the user to define an ASCII character as an application record separator.

*Serial Cmd:* <K474,,,,UCC/EAN-128 status,output format,application record separator status,**application record separator character**,application record brackets,application record padding>

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

*Options:* User Defined ASCII character

**Note: Output Format** must be set to **Application Record** before this parameter can take effect.

### Application Record Brackets (UCC/EAN-128)

*Definition:* When enabled, parentheses ( ) are added to enclose application identifiers.

*Serial Cmd:* <K474,,,,UCC/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

**Note: Output Format** must be set to **Application Record** before this parameter can take effect.

## Application Record Padding (UCC/EAN-128)

*Definition:* Padding is the insertion of zeros to make up the maximum length of a variable application record data field, except for the last field which does not require padding.

When enabled, padding is included. When disabled, padding is omitted.

**Note:** Padding is never added to fixed length fields or to the last data field of a label. Enabling or disabling **Record Padding** will have no effect on these.

*Serial Cmd:* <**K474**,,,,UCC/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

**Note: Output Format** must be set to **Application Record** before this parameter can take effect.

## Code 93

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

*Usage:* Used occasionally in clinical industry.

### Code 93 Status

*Serial Cmd:* <**K475,status**,fixed code length status,fixed code length>

*Default:* **Disabled**

*Options:* 0 = Disabled 1 = Enabled

### Fixed Code Length Status (Code 93)

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

*Serial Cmd:* <**K475,status,fixed code length status**,fixed code length>

*Default:* **Disabled**

*Options:* 0 = Disabled 1 = Enabled

### Fixed Code Length (Code 93)

*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 code not having the specified length.

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

*Serial Cmd:* <**K475,status,fixed code length status,fixed code length**>

*Default:* **10**

*Options:* 1 to 128

## Pharma Code

**Definition:** The bar code encodes up to five different numbers, each with its own color which may be entered in decimal or "binary" format with a 1 represented by a thick bar and a 0 represented by a thin bar. Bar width is independent of height.

In decimal format, each part can be up to 999999.

In binary format, each input have up to 19 ones and zeros.

**Usage:** Pharma Code is used mostly with packaging for the pharmaceuticals industry.

**Serial Cmd:** `<K477,status,fixed code length status,fixed code length,min. no. of bars,bar widths,fwd/rev>`

**Note:** It is recommended that you disable AGC before enabling Pharma Code.

### Pharma Code Status

**Serial Cmd:** `<K477,status,fixed bar length status,fixed bar length,min. no. of bars,bar widths,fwd/rev>`

**Default:** **Disabled**

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

### Fixed Bar Length Status (Pharma Code)

**Serial Cmd:** `<K477,status,fixed bar length status,fixed bar length,min. no. of bars,bar widths,fwd/rev>`

**Default:** **Disabled**

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

### Fixed Bar Length (Pharma Code)

**Serial Cmd:** `<K477,status,fixed bar length status,fixed bar length,min. no. of bars,bar widths,fwd/rev>`

**Default:** **10**

**Options:** 4 to 16

---

## Pharma Code

### Minimum Number of Bars (Pharma Code)

Serial Cmd: <**K477**,status,fixed bar length status,fixed bar length,**min. no. of bars**,bar widths,fwd/rev>

Default: **4**

Options: 4 to 16

### Bar Widths (Pharma Code)

Serial Cmd: <**K477**,status,fixed bar length status,fixed bar length,min. no. of bars,**bar widths**,fwd/rev>

Default: **Mixed**

Options: 0 = Mixed  
1 = Narrow  
2 = Wide

### Forward/Reverse Decoding Direction (Pharma Code)

Definition: Specifies the direction that a bar can be read.

Serial Cmd: <**K477**,status,fixed bar length status,fixed bar length,min. no. of bars,bar widths,**fwd/rev**>

Default: **Forward**

Options: 0 = Forward  
1 = Reverse



# Autodiscriminate

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

**Definition:** Enables all available symbology types except PDF417, UCC/EAN 128, and Pharma Code. The user may also individually disable/enable each symbology type.

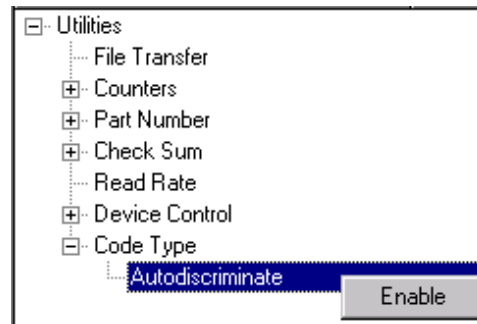
**Usage:** Commonly used for quick setup mode to detect bar code type. This is particularly useful for users who might be unfamiliar with their application's symbology.

**Note:** It does not alter individual fields such as **Start/Stop, Fixed Length**, etc. These need to be setup individually.

**ESP:** To enable all codes, click the **Autodiscrimination** button in the **Advanced Calibration** menu, or type in **<P>** in the **Terminal** screen.

**ESP:** In the **Utilities** menu, right-click on **Autodiscriminate** and select **Enable**.

**Note:** There will be a few seconds delay while the scanner values are retrieved.



**Serial Cmd:** **<P>**

**Default:** **Code 39** (only)

**Options:** <P> Enables all codes except noted above.

<Q> Enable Code 36 only

<R> Enable Codabar only

<S> Enable I 2/5 only

**Note:** If using an I 2/5 label, verify that the number of characters in the label being scanned matches the code length enabled for the I 2/5 code type (default is 10 and 6). See ["Interleaved 2 of 5" on page 5-14](#).

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*Autodiscriminate*

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The purpose of autocalibration is to optimize the scanner's optical settings (focus, gain, and tracking) to obtain the highest read rates in one or several label positions as required by the user's application. This section **includes the overall steps in autocalibration and specific steps for autocalibration by ESP, serial command, and embedded menus.** For most applications autocalibration is the only optical setup required.

Changes to motor speed, focus, speed, gain, tracking, and AGC can also be made individually by manual command.

### Autocalibration Methods

There are three ways to access autocalibration:

1. ESP **Autocalibration** menu.
2. Serial command **<@CAL>**.
3. Embedded menu **<@>**.

## Overview of Autocalibration

When an autocalibration command is sent, the scanner first steps through a coarse grid of focus settings, looking for readable bar code symbols, and recording the highest read rates it encounters. This is "Pass 1," as shown by the blue line in [figure 6-1](#), a screen capture of an actual autocalibration routine in ESP. On "Pass 2" (red line) it returns to the focus position where it found the best read rate and steps through a finer grid of focus, gain and tracking settings. The software evaluates the results and selects the best data. If it passes, it displays an "Autocalibration Passed" message at the top of the window.

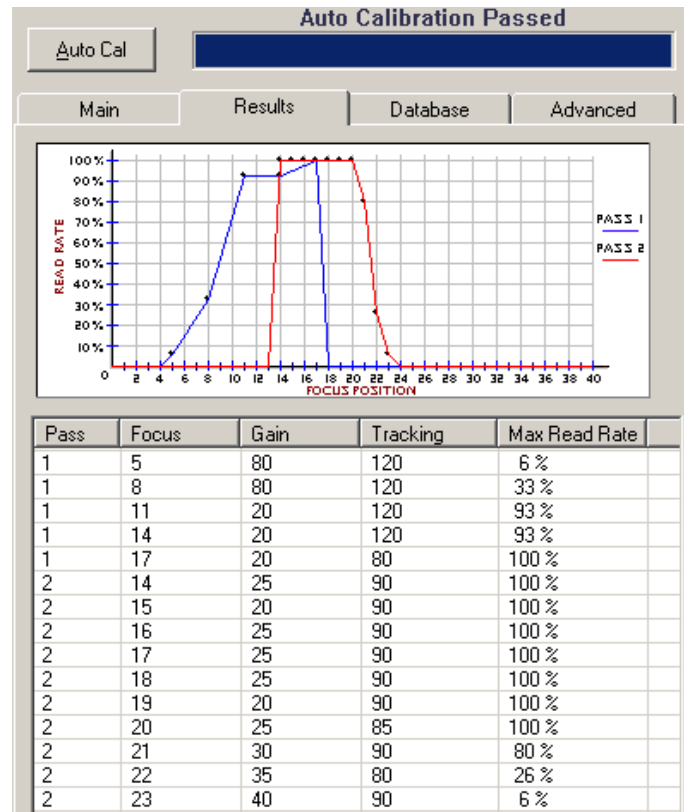


Figure 6-1 Typical Autocalibration Graph

## Autocalibration Steps

Follow this procedure for all three methods of autocalibration:

1. Set your scan rate at the appropriate speed for your application.
2. Position your bar code symbol at the distance used in your application and confirm that it is at a distance within the specifications for that symbol size (see "Position Scanner and Symbol" on page 1-12).
3. If you are not certain of the code type, enable all code types by sending a **<P>** command from the terminal window, or clicking on the **Autodiscrimination** button in **Calibration/Advanced** in ESP.<sup>1</sup>
4. Start the autocalibration procedure.

Note: Once a successful autocalibration is completed, you may want to save those setting to the calibration database (see Chapter 7, "Calibration Database").

5. Repeat autocalibration at other ranges and/or label types you might be scanning in your application.

6. Check your readings at each end of the scan width required for your application, keeping in mind that the scan width testing may not produce results that are entirely symmetrical.

**Note:** If you are setting up for **Laser Framing** (see page 9-6), be sure that you only test for autocalibration in the active areas of the scan beam.

7. To save the new settings (including focus, gain, and tracking) for power-up, send a **<Zp>** command.

**Note:** To silence the beeper, send **<K702,0>** or remove or block the test label.

After autocalibration has passed, the scanner will beep once, automatically exit the autocalibration routine and begin scanning for a label in **Continuous Read** mode, beeping for each good read.

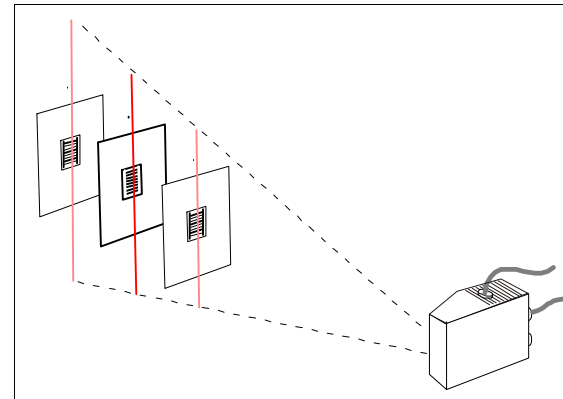
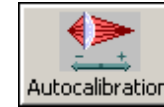


Figure 6-2 Autocalibration Setup

1. **Note:** If using an I 2 of 5 label, verify that the number of characters in the label being scanned matches the code length enabled for the I 2 of 5 code type (default is 10 and 6). See "Interleaved 2 of 5" on page 5-14.

# Autocalibration by ESP



1. Click on the **Autocalibration** button on the overhead toolbar.
2. Click on the **Auto Cal** button to start autocalibration.

An **Autocalibration in Progress** message will be displayed on your monitor along with the pass number and information on the focus, gain, and tracking.

Allow some time for the scanner to cycle through the focus, gain, and tracking settings. Do not move or disturb scanner or label while **Autocalibration** is in progress. (It might take 2 to 3 minutes to complete.)

3. When completed, the settings that provided the highest read rate will be selected. You will see one of the following messages: **Autocalibration Passed**, **Autocalibration Failed**, or **Original Settings Were Optimal**.

If it passes, you will continue to see the read rate percentage and label data in the window below the scanner image.

Note that in the [figure 6-4](#) the focus position remains the same as it was in [figure 6-3](#), but the **Gain** and **Tracking** have been fine-tuned during the second pass.

The graph in [figure 6-4](#) shows the results of this procedure.

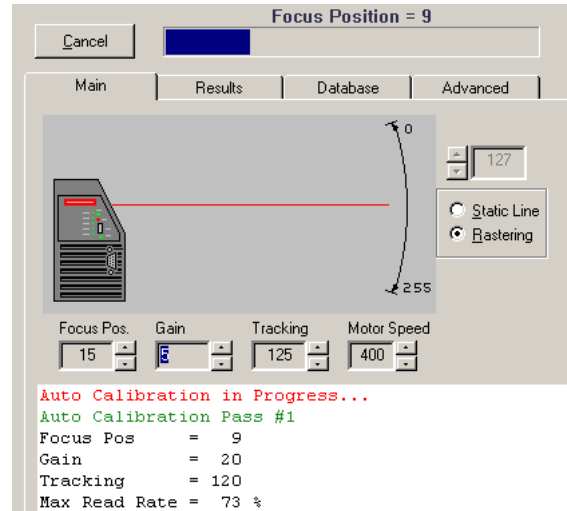


Figure 6-3 Autocalibration In Process

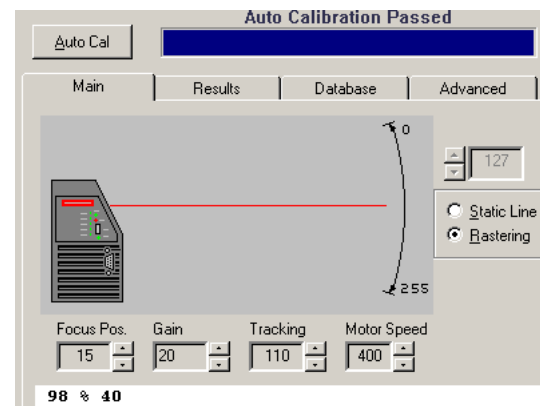


Figure 6-4 Autocalibration Passed

## Advanced ESP Autocalibration Features

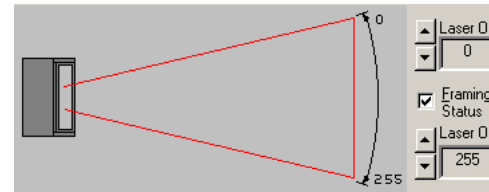
In the advanced tab in the Autocalibration menu you can constrain the scan width of the scan beam with Laser Framing and set up the rules the scanner will follow when making the first pass of the autocalibration procedure.

### Laser Framing

Sets the length of time the laser is ON during each scan so that only a selected portion of the scan width is effectively scanned.

To adjust the scan width:

1. First click on **Framing Status**.
2. Click on the pointers in **Laser Off** and **Laser On** to adjust the shape of your scan beam width to match only the area in which your bar code symbol will appear.

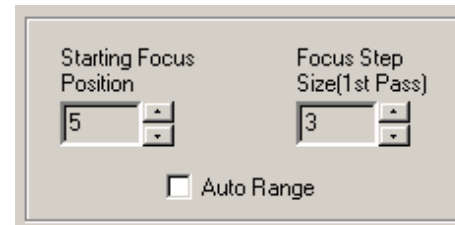
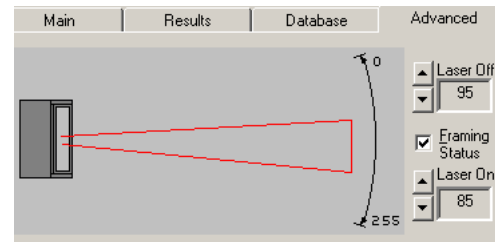


### Focus Stepping

After you've used autocalibration a time or two and observed the progress of the first and second passes in the graph and table in the **Results** tab, you will sense the relationship between focus position and the distance to the bar code symbol. See [figure 6-7](#) for a table on this.

To improve the speed and accuracy of your autocalibration setup:

1. Click on the **Advanced** tab in the **Autocalibration** menu.
2. If **Auto Range** is enabled, click on it to disable it.
3. From previous results, estimate the value of **Starting Focus Position** and drop down one or two positions.



For example, if you estimate the distance to your label to correspond to a **Starting Focus Position** of **6**, enter **5** or **4** to be certain of not missing the peak performance distance.

4. Enter a value in **Focus Step Size**.

This is the number of focus increments that will be stepped through during the first autocalibration pass. The range is **2** to **5**. The higher values will result in fewer readings during the first pass but will increase the risk of missing the peak performance position.

---

## Autocalibration by ESP

### Auto Range

Enabling **Auto Range** will improve speed, but with a caveat. With **Auto Range**, the scanner will focus outward until it senses an object by signal strength and begin looking for a decodable symbol from there. This will result in quicker acquisition, but only if other objects closer to the scanner are not mistaken for the bar-coded object.

Again, the user should experiment with this routine until satisfactory results are achieved. In any case, you can observe the **Results** tab and determine whether **Auto Range** will work smoothly with your application.

To use **Auto Range**:

1. Make certain that no extraneous objects that might fall within the scan beam are between the bar code symbol and the scanner.
2. Click on the **Advanced** tab in the **Autocalibration** menu.
3. If **Auto Range** is not enabled, click on it to enable it.
4. Click on the **Auto Cal** button to start autocalibration.



## Autocalibration by Serial Command

**Note: Autocalibration by Serial Command** is useful for quick calibration; however, to do autocalibration and save your settings to the **Configuration Database**, or to make changes to related parameters, see ["Autocalibration by ESP" on page 6-4](#) or ["Autocalibration by Embedded Menu" on page 6-8](#).

For a quick calibration of your label, send the **<@CAL>** serial command (see ["Autocalibrate Scanner" on page 1-13](#) for details) and observe the results.

For example, an attempt to autocalibrate a bar code symbol yielded the following results:

```
Focus= 24 =>Max Read Rate= 0 % @|Gain= 0|Track= 0|Peak Read Rate= 0 %
Auto Calibration Failed
```

It was well within the recommended range for that size label (see ["Position Scanner and Symbol" on page 1-12](#)) yet it failed to decode.

To find out if a code type other than Code 39 was being used, a **<P>** command was sent to enable all codes and the **<@CAL>** command was repeated.

This time it passed:

```
Focus= 29 =>Max Read Rate= 0 % @|Gain=120|Track= 50|Peak Read Rate=100 %
Auto Calibration Passed
```

**Note:** A user can abort autocalibration at any time by pressing the **ESC** key on the terminal. No other keystroke has any effect while in **Autocalibration**.

### Saving for Power-up

To save focus, tracking, and gain settings changed in **Autocalibration** for power-up, send **<Zp>**.

## Autocalibration by Embedded Menu

To calibrate via the embedded **Autocalibration** menu, do the following:

1. Place the sample label at a fixed position in the center of the read range being tested.
2. Enter **Autocalibration** menu by sending an **<@>** command from a terminal.

```

MICROSCAN SYTEMS INC. 2000 (C)
35-558001-12
AUTO CALIBRATION SETUP MENU
=====
To make changes, press appropriate key from list below:
Motor Speed.....M = INCREMENT.....N = DECREMENT
Gain Setting.....G = INCREMENT.....F = DECREMENT
Tracking.....T = INCREMENT.....R = DECREMENT
Focus Position.....P = INCREMENT.....O = DECREMENT
AGC Status.....S = ENABLE/DISABLE
Laser Power.....L = HIGH/LOW
PDF 417 Decode Test...D = ENABLE/DISABLE
MENU OPTIONS:
START Auto Calibration.....A      MENU Calibration Results.....1
RECALL Initial Settings.....B     MENU Raster/Laser Framing Setup...2
SAVE Settings to Data Base...C    MENU Configuration Data Base.....3
EXIT Calibration Setup.....ESC    MENU Advanced Setup.....4
=====
Laser Power = LOW   AGC = ENABLED   PDF 417 Test = DISABLED
=====
Scan | Motor | Gain | Track | Focus | AGC |
Rate | Level |      |       |       |     |
_401 | 400  | 55  | 30   | 9    | 135 | 0 %

```

Figure 6-5 Embedded Autocalibration Setup Menu

3. If the application requires a change in scan rate, do the motor speed adjustment now with the **M** or **N** commands.

**Note:** All single letter commands must be entered in upper case.

4. Start **Autocalibration** by typing an upper case **A** from your terminal while in the calibration menu.

**Note:** A user can abort autocalibration at any time by pressing the **ESC** key on the terminal. No other keystroke has any effect while in **Autocalibration**.

5. Wait for **Autocalibration** to cycle through its settings.

An "Autocalibration in Progress" message will be displayed. A new text line will appear below the menu displaying the progress of the autocalibration.

6. As with the serial command, repeat the routine at other positions in your scan range and width and save each position to the **Configuration Database**.

7. If not successful an "Autocalibration Failed" message will be displayed. If successful an "Autocalibration Passed" message as shown in the above menu will be displayed along with other settings.

**Note:** Focus positions **Inside**, **Outside** and **Set** posted near the bottom of the above menu are explained more fully in “[Calibration Results Embedded Menu](#)” on page 6-11.

**Note:** If you are using the 9-pin configuration port and doing autocalibration by serial command or embedded menus, you will be able to view scanned bar code data in the menu, but upon exiting the autocalibration menu, you will not be able to see bar code data without sending the following command: **<K146,,1>**. If using the ESP, this is not necessary.

## Scanner Settings

**Motor Speed**, **Gain Setting**, and **Tracking** adjustments affect the read performance. **Focus** controls a stepper motor that physically slides a lens back and forth to control focal length. These settings are adjusted automatically in autocalibration.

The status of these parameters is displayed on the bottom line of the menu under **Motor**, **Gain**, **Track**, and **Focus** (see “[Overview of Optoelectrics](#)” on page 8-4). These settings are incremented or decremented by pressing the indicated key shown on the menu. **PDF-417 Decode**, **AGC Status**, **Laser Power**, and **Raster Status** use single commands to toggle between states.

### AGC Status

Typing **S** toggles **AGC** between **Enable/Disable**, as displayed on a the status line near the bottom of the menu. With **AGC** disabled this value is simply the **Gain** setting. However, with **AGC** enabled, this value represents the gain the scanner has to set to maintain the desired signal amplitude. If a label is in close, the AGC level should be a small value because the scanner does not need much gain to achieve the desired signal amplitude. However, as a label gets farther away from the scanner, this value will increase to maintain the signal amplitude.

### Laser Power

Typing **L** toggles between **High** and **Low** laser settings. See “[Laser Power](#)” on page 9-8 for details.

### PDF417 Decode Test

Typing **D** toggles the **PDF417 Decode Test** between **Enable/Disable**, as displayed on a the status line near the bottom of the menu. Once set to **Enabled**, PDF417 only is enabled and a special test mode is enabled that displays the decodes per second of a full PDF417 label. While autocalibration is not performed in this mode, you can still adjust settings manually.

This special read rate will remain enabled until the Autocalibration menu is exited or PDF417 is disabled with another **D** command.

**Note:** This mode averages decode and capture time over a series of readings, thus assuring for a smooth read-rate output, but at the cost of delayed reaction to label movement and user setting changes.

## *Autocalibration Menu Options*

### *START Autocalibration*

Typing **A** initiates an **Autocalibration** sequence. Once entered, no other keystrokes will be accepted with the exception of the **ESC** key, which terminates the routine.

### *RECALL Initial Settings*

Typing **B** restores the original settings that were present upon entering the **Autocalibration Setup Menu**. These settings include **Motor Speed, Gain, Tracking, and Focus**.

### *SAVE Settings to Database*

Typing **C** saves the current **Gain, Tracking, and Focus** settings to the **Configuration Database**. The database is made up of indexes 1 through 7. Current settings will be saved to the first open index. See [Chapter 8, "Optoelectrics."](#)

### *EXIT Calibration Setup menu*

To exit the **Autocalibration Setup** menu, press the **ESC** key. The following prompt will be displayed:

"Do you want to save calibration settings for power on? (Y=yes N=no)."

Typing **Y** will cause the current settings in the **Calibration Setup** menu to be saved to Flash Memory for recall when the scanner is powered up at a later date. These settings include **Motor Speed, Gain, Tracking, Focus, AGC Status, Laser Power, and Raster Status**. Entering **N** will cause the scanner to be reset without saving the settings to Flash memory.

### *Menu Selections*

Typing **1** will take you to the **Calibration Results** menu ([page 6-11](#)).

Typing **2** will take you to the **Raster/Laser Framing Setup** menu ([page 9-9](#)).

Typing **3** will take you to the **Configuration Database** menu ([page 7-6](#)).

Typing **4** will take you to the **Advanced Setup** menu ([page 6-12](#)).

## Calibration Results Embedded Menu

To access **Calibration Results** menu from within the **Autocalibration Setup** menu, (figure 6-5 on page 6-8) type the number **1**.

CALIBRATION RESULTS MENU													
=====													
To make changes, press appropriate key from list below:													
MENU OPTIONS:							MENU SELECTIONS						
EXIT	Calibration Setup.....ESC						MENU	Calibration Setup.....CR					
=====													
FOCUS POS.	23	24	25	26	27	28	29	30	31	32	33	34	35
=====													
READ RATE													
1st PASS				100									
2nd PASS	40	73	100	100	100	100	100	100	100	100	80	66	46
=====													
GAIN													
1st PASS				120									
2nd PASS	125	140	130	140	140	100	110	100	115	135	115	120	140
=====													
TRACKING													
1st PASS				40									
2nd PASS	50	50	50	50	50	45	50	45	50	45	50	50	50
=====													
FOCAL RANGE				IN			SET				OUT		

Figure 6-6 Embedded Calibration Results Menu

The **Calibration Results** menu (an example shown here) shows the results of the autocalibration process for **Read Rate**, **Gain**, and **Tracking** both the first and second passes. Note that the first pass has only one reading for each parameter.

### Focus Positions

In the example above, the focus position selected from the first calibration pass (position 26) represents the optimal focus position for **Read Rate**, **Gain**, and **Tracking**. The second "fine tune" pass commences 3 focus positions in from this and steps out until the read rate drops off to zero.

### Focal Range

The algorithm selects the best focus position (**SET**) as the midpoint between those positions (**IN** and **OUT**) at which read rates drop off by no more than 6-2/3 percent of the maximum read rate. For example, in the above menu, the read rate for focus position 24 is 73. Since 73 is more than 6-2/3% below the maximum read rate of 100% shown elsewhere, the **IN** range falls under the next focus position, 25. A mirrored calculation is performed to locate the **OUT** focal range.

Press the enter key (**CR**) to return to the main calibration menu or **Esc** to leave the **Auto Calibration Setup** menu entirely.

## Autocalibration by Embedded Menu

### Advanced Autocalibration Setup Embedded Menu

The **Advanced Autocalibration Setup** menu allows you to change the starting focus position and the number of focus steps during the first pass.

For example, if you are preparing to do autocalibration on labels whose minimum distances from the scanner is 40 inches, there is no reason for autocalibration to cycle through all of the focal positions inside 40 inches. [Figure 6-7](#) includes a table that associates several starting focus positions with minimum label distances from the scanner. Use this table to estimate your starting focus position.

To increase **Starting Focus Position**, type **T**. To decrease it, type **R**.

To increase the **First Pass Focus Step**, type **G**. To decrease it, type **F**.

Increasing **First Pass Focus Step** will speed up the autofocus process, but can also cause autofocus to skip over a bar code symbol and not decode it.

**Note:** All single letter commands must be entered in upper case.

```

=====
                          ADVANCED AUTO CALIBRATION SETUP
=====
To make changes, press appropriate key from list below:
Auto Range.....A = ENABLE/DISABLE
Starting Focus Pos....T = INCREMENT.....R = DECREMENT
1st Pass Focus Step....G = INCREMENT.....F = DECREMENT
MENU OPTIONS:                      MENU SELECTIONS
EXIT Calibration Setup.....ESC      MENU Calibration Setup.....CR

STARTING FOCUS POS      MIN LABEL DISTANCE
   0                      10"
   5                      17"
  10                      20"
  15                      25"
  20                      40"
  25                      55"
  30                      75"
  35                      90"
=====
Auto Range = DISABLED
=====
AUTO CALIBRATION 1ST PASS
Start Focus Pos. | Step Size |
   0              |     2     |

```

Figure 6-7 Advanced Autocalibration Menu

**Auto Range** is disabled by default. To enable, press **A**. See [page 6-6](#) for an explanation of auto range.

# Chapter

# 7

# Calibration Database

## Chapter Contents

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Calibration Database by ESP .....	7-3
Calibration Database by Serial Command .....	7-4
Calibration Database by Embedded Menu .....	7-6

This section **explains the** database setup for storing the optical settings derived from autocalibration.

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

## Calibration Database by Serial Command

Command Title	old cmds	new cmds	Format
Optoelectric Calibration Database		<b>K227,</b>	<b>&lt;K227, database index, focus position, gain, tracking&gt;</b>

# Overview of Calibration Database

**Definition:** The configuration database allows the user to save up to seven optical-electrical settings. The database can be used simply to save most commonly used settings to make the scanner easily adaptable to changing applications.

**Usage:** Useful in applications where a variety of optical-electrical settings are required to read and decode more than one label type, position, etc.

**Serial Cmd:** `<K227,database index,focus position,gain,tracking>`

Indexes of optical settings can be entered either as individual optical settings or as an index of settings obtained from the autocalibration procedure. They can be entered in three ways:

- by ESP in the calibration database menu
- by serial commands
- by Embedded menu commands

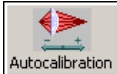
## Calibration with Multilabel

With **Multilabel** enabled for more than one label, the scanner may not locate labels at varying ranges. The reason for this is that once a label is located from the optical database, the scanner will continue to search for labels that meet that index of focus, tracking, and gain settings.



# Calibration Database by ESP

To Load the current settings obtained from autocalibration into the database:  
Perform the autocalibration procedures described in ["Autocalibration by ESP" on page 6-4.](#)

1. **Click** on autocalibration menu  and the **Database** tab as shown in [figure 7-1.](#)
2. Move the **Database Index Indicator** to the Index of your choice by clicking on the arrows in the **Database Index Selector**.
3. Click on the **Load Current to Database** button.  
This will put the **Focus, Gain, and Tracking** settings that reside in the Main tab into the database index.
4. Repeat this procedure for other indexes.

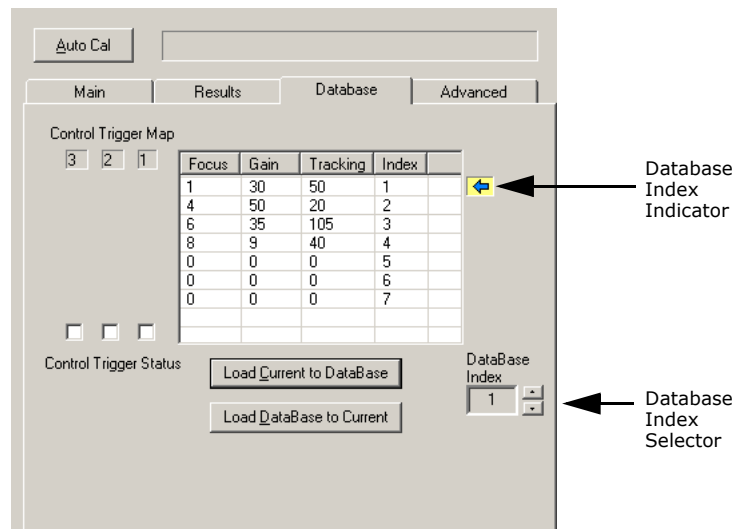


Figure 7-1 Database Menu

You can also enter in individual values in any of the seven indexes by **double-clicking** anywhere on the index row and making changes in the popup window, or by returning to the **Main** tab in **Autocalibration** and typing in the values of your choice. Database index settings can be applied later in operation. See [Chapter 8, "Optoelectrics."](#)

# Calibration Database by Serial Command

**Note:** The Configuration Database is best developed from the ESP **Calibration** menu.

## Database Index

*Definition:* Stores up to 7 user defined database records that can be entered or set from autocalibration and retrieved dynamically. See "[Overview of Opto-electrics](#)" on page 8-4 for instructions on setting up the database.

*Serial Cmd:* <**K227**,*database index*,*focus position*,*gain*,*tracking*>

*Options:* 1 to 7

## Focus Position

*Definition:* Associates a specific focus position with a database index.

*Serial Cmd:* <**K227**,*database index*,**focus position**,*gain*,*tracking*>

*Options:* 0 to 40

## Gain

*Definition:* Associates a specific gain setting with a database index.

*Serial Cmd:* <**K227**,*database index*,*focus position*,**gain**,*tracking*>

*Options:* 0 to 255

## Tracking

*Definition:* Associates a specific tracking setting with a database index.

*Serial Cmd:* <**K227**,*database index*,*focus position*,*gain*,**tracking**>

*Options:* 0 to 127

---

## Save Current Settings to Configuration Database

---

*Definition:* Saves current settings to the configuration database index.

*Serial Cmd:* <K227+,database index>

*Options:* 1 to 7

---

## Load Current Settings from Configuration Database

---

*Definition:* Loads a specific database index.

*Serial Cmd:* <K227-,database index>

*Options:* 1 to 7

---

## Request Database Settings

---

*Definition:* Associates a specific tracking setting with a database index.

*Serial Cmd:* <K227?,database index>

*Options:* 1 to 7

Returns settings for selected Configuration Database Index. Sending <K227?,1> will return the record for the first database index, for example:

<K227,1,32,160,50>

Sending <K227?> Returns settings for the entire Configuration Database in the following format:

<K227,1,32,160,50><K227,2,32,160,50><K227,3,32,160,50><K227,4,0,0,0><K227,5,0,0,0><K227,6,0,0,0><K227,7,0,0,0>

The configuration database allows the user to save multiple scanner configuration settings. The database can be used simply to save most commonly used scanner configurations to allow scanner to be easily adaptable to changing applications, or used in conjunction with the **Optoelectric Control**, to dynamically change configurations.

# Calibration Database by Embedded Menu

To access the **Configuration Database** menu from within the **Autocalibration Setup** menu (page 6-8), type the number **3**.

```

=====
                        CONFIGURATION DATA BASE
=====
    To make changes, press appropriate key from list below:
# Active Settings.....T = INCREMENT.....R = DECREMENT
Select DB Index.....G = INCREMENT.....F = DECREMENT
    MENU OPTIONS:                                MENU SELECTIONS
SAVE  Settings to Data Base....D                MENU  Calibration Setup.....CR
LOAD  Data Base Settings.....L
FIND  Optimal Settings.....Q
EXIT  Calibration Setup.....ESC
=====
Index      Gain      Tracking    Focus
-----
1          100      20         21
2          120      70         24
3          100      55         28
4           0       0          0
5           0       0          0
6           0       0          0
7           0       0          0
=====
# Active |DB  ||CURRENT SETTINGS |
Settings|Index||Gain|Track|Focus|
3       | 4  ||100| 55 | 28 | 90 % 40
    
```

You can save your calibration settings in up to 7 database indexes.

1. Type **D** to save your present settings to the configuration database.
  - Note:** From within the **Autocalibration Setup** menu, type the letter **C**. The current **Gain**, **Tracking**, and **Focus** settings will be saved in **Index 1**.
  - Caution:** Subsequent saves will overwrite your original settings unless you change the **# Active Settings** to a number at least one greater than the number of index settings currently filled.
2. Change the **# Active Settings** to the number of index settings you expect to fill.
3. Press **CR** to return to the **Autocalibration Setup** menu and calculate the next label position (if applicable).
4. Type **D** to save to the next index of autocalibration settings.
  - The database index will automatically increment by 1 and place your settings in the next available index.
  - Note:** See "Focus Position" on page 10-5 for additional ways for saving and recalling database indexes.
5. Press the enter key (**CR**) to return to the main calibration menu or **Esc** to leave the **Autocalibration Setup** menu entirely.

*Chapter*

8

# Optoelectrics

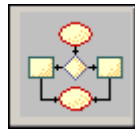
## Chapter Contents

Overview of Optoelectrics.....	8-4
Optoelectric Database Modes .....	8-5

This section tells how to apply optical settings such as **Focus**, **Gain**, and **Tracking** that you learned how to acquire in [Chapter 6, "Autocalibration"](#) and how to store in [Chapter 7, "Calibration Database."](#)

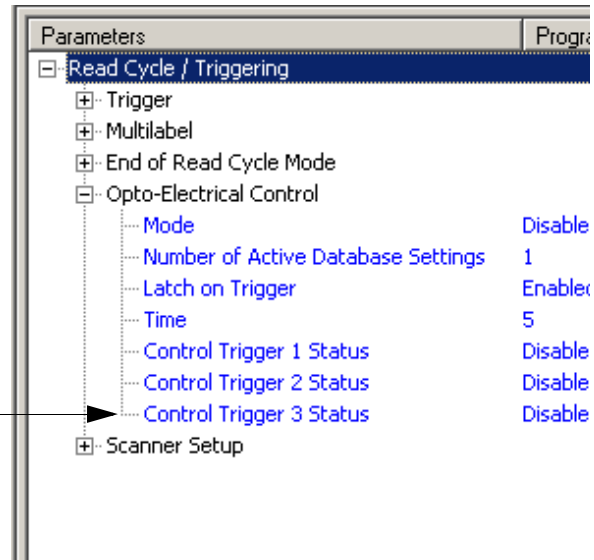
**Note:** The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

## Optoelectric by ESP



**Click** on this button to bring up the **Optoelectric Control** menu.

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



### 8-Optoelectrics

## Optoelectrics by Serial Command

Command Title	old comds	new comds	Format
Optoelectric Control		<b>K226,</b>	< <b>K226</b> ,mode,# active database settings,latch on trigger,timer value, control trigger 1,control trigger 2,control trigger 3>
Scanner Setup Status Request	<b>KU?</b>	<b>K699?</b>	< <b>K699?</b> >

## Optoelectrics by Embedded Menu

For information on accessing the embedded menus, see ["Embedded Menus"](#) on page - 23.

To access the **Configuration Database** menu from within the **Autocalibration Setup** menu ([page 6-8](#)), type the number **3**.

```

=====
                        CONFIGURATION DATA BASE
=====
      To make changes, press appropriate key from list below:
# Active Settings.....T = INCREMENT.....R = DECREMENT
Select DB Index.....G = INCREMENT.....F = DECREMENT
  MENU OPTIONS:                                MENU SELECTIONS
SAVE Settings to Data Base....D      MENU Calibration Setup.....CR
LOAD Data Base Settings.....L
FIND Optimal Settings.....Q
EXIT Calibration Setup.....ESC
=====
Index          Gain          Tracking          Focus
=====
1              180           20              21
2              120           70              24
3              100           55              28
4              0            0               0
5              0            0               0
6              0            0               0
7              0            0               0
=====
# Active |DB  ||CURRENT SETTINGS |
Settings |Index ||Gain |Track|Focus|
3       | 4  || 100 | 55 | 28 | 90 % 40

```

# Overview of Optoelectrics

*Definition:* A database index of up to seven pre-defined optical indexes of settings defining focus, gain, and tracking can be accessed and applied in the following modes:

1. by timer in which all indexes are attempted over a predefined timeout period.
2. by an automatic search for the best database index.
3. by a combination of up to three control trigger inputs to dynamically select the optimum database index.

The index settings can also be saved and recalled selectively, or reviewed with a **Request Database Settings** command.

*Usage:* Useful where different symbol types, sizes, qualities or distances require more than one optical setup (focus, gain, and tracking) for dynamic optical changes.



# Optoelectric Database Modes

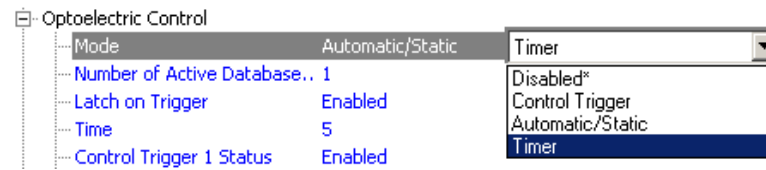
**Definition:** A database index of up to seven pre-defined optical indexes of settings defining focus, gain, and tracking can be accessed and applied in the following modes:

1. by a timer in which all settings cycle throughout the time duration
2. by an automatic search for the best database index
3. by a combination of up to three control trigger inputs to dynamically select the optimum database index

The index settings can also be saved and recalled selectively, or reviewed with a **Request Database Settings** command.

**Usage:** Useful where different symbol types, sizes, qualities or distances require more than one optical setup (focus, gain, and tracking) for dynamic optical changes.

**ESP:**



**Serial Cmd:** <**K226,mode**,# active database settings,latch on trigger,timer value, control trigger 1,control trigger 2,control trigger 3>

**Default:** **Disabled**

**Options:**  
 0 = Disabled  
 1 = Control Trigger  
 2 = Automatic/static mode  
 3 = Timer

## Disabled Mode

**Definition:** When disabled, the scanner uses the current scanner configuration settings.

**Serial Cmd:** <**K226,mode**,# active database settings,latch on trigger,timer value, control trigger 1,control trigger 2,control trigger 3>

## Optoelectric Database Modes

### Timer Mode

**Definition:** When this mode is selected, the scanner cycles through database settings at a time interval determined in **Timer Value** setting. (See “[Timer Value](#)” on page 8-11.)

**Important Note:** The maximum time to move from the most inside focus position to the most outside focus position is **400 ms**. One focus position change takes **10 ms**.

**Usage:** Useful in applications in which there is enough time to cycle through the database index.

**Serial Cmd:** `<K226,mode,# active database settings,latch on trigger,timer value, control trigger 1,control trigger 2,control trigger 3>`

### Calibration with Multilabel

With **Multilabel** enabled for more than one label, and either **Timer** or **Automatic/Static** mode enabled, the scanner may not locate labels that are scanned at various ranges. The reason for this is that once a label is located from the optical database index, the scanner will continue to search for labels that meet that index of focus, tracking and gain settings.

### Automatic/Static Mode

**Definition:** Selects the optimum setting from the **Configuration Database**.

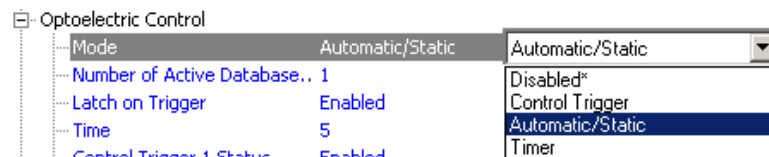
When selected, the scanner cycles once through all the **Configuration Database** settings from the closest to the furthestmost focal position, testing first for optimal signal, then for a successful decode.

**Note:** Since focus positions are tested in ascending order, the closer the symbols are to the scanner, the quicker the best focus position will be found.

**Important Note:** The maximum time to move from the most inside focus position to the most outside focus position is **400 ms**. One focus position change takes **10 ms**.

**Usage:** Useful in a static application in which the bar code symbol is in front of the scanner when the read cycle begins.

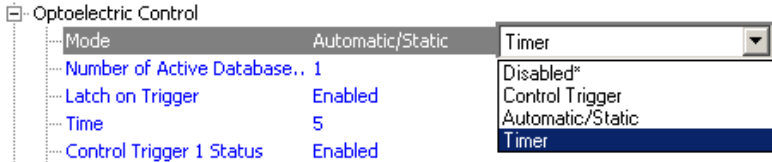
**ESP:**



**Serial Cmd:** `<K226,mode,# active database settings,latch on trigger,timer value, control trigger 1,control trigger 2,control trigger 3>`

### Control Trigger Mode

- Definition:** When **Optoelectric Control** mode is set to **Control Trigger**, input 1, new master pin, and the trigger input pins are de-activated and re-assigned as control triggers. When activated, a read cycle will be triggered and—in accordance with their respective states—select from a database of up to seven pre-defined optical settings of **Focus**, **Gain**, and **Tracking**. (See [Chapter 7](#), “[Calibration Database](#).”)
- Usage:** Useful where different symbol types, sizes, and/or distances benefit from pre-defined optical setups (focus, gain, and tracking) that can be accessed ‘on the fly’ according to the combination of input states.
- Serial Cmd:** <**K226,mode**,# active database settings,latch on trigger,timer value,control trigger 1,control trigger 2,control trigger 3>



- Process: To use Control Trigger:
1. Setup your application's labels by code type/size in the various positions and/or code type/size at which they will likely appear.
  2. Sketch out a diagram as in [figure 8-1](#).
  3. Setup your sensors or other controls. For example, the three object sensors, 1, 2 & 3, are connected to input 1, new master pin, and trigger input respectively. The bar coded packages on the left are numbered here according to their database index numbers. Package #7 will cross all three of the sensors and thus activate the settings for index #7 as shown.

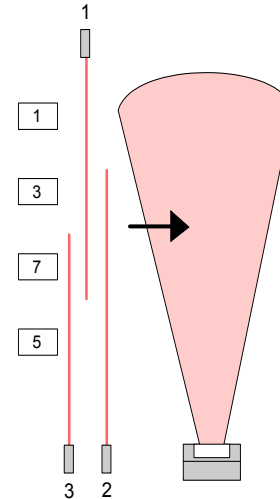


Figure 8-1 Control Trigger Inputs

In this scenario only four index settings are possible. However, up to seven combinations are possible with other input devices such as PLCs.

You can also enable/disable any combination controls by clicking on the **Control Trigger Status** buttons on the bottom of the **Control Trigger Map**. The red buttons indicate active states on the three control triggers. The combination of active/inactive triggers determines the focus, gain, and tracking settings that will be applied during a read cycle. For example, if only Control Trigger 1 is active, the focus, gain, and tracking values that appear in the top row will be applied.

Main		Results		Database		Advanced	
Control Trigger Map							
3	2	1	Focus	Gain	Tracking	Index	
<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	40	40	40	1	
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	0	0	0	2	
<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	25	9	6	3	
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	0	0	0	4	
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	0	0	0	5	
<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	11	21	6	6	
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	34	22	9	7	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					

Figure 8-2 ESP Control Trigger Setup

## Control Trigger #1

- Definition:* When **Control Trigger** mode is enabled, **Control Trigger #1** “hijacks” **Input 1** (see “Discrete I/O” in chapter 14) and uses it to select an optoelectric configuration from the configuration database. Active state is set by **Input 1** serial command.
- Serial Cmd:* <**K226**,mode,# active database settings,latch on trigger,timer value,**control trigger 1**,control trigger 2,control trigger 3>
- Default:* **Disabled**
- Options:* 0 = Disabled  
1 = Enabled

## Control Trigger #2

- Definition:* **New Master Pin** is used for **Control Trigger #2**. When enabled and **Mode** is set to **Control Trigger**, this input is used to select a Optoelectric configuration from **Configuration Database**. Active State is “Active Closed”.
- Serial Cmd:* <**K226**,mode,# active database settings,latch on trigger,timer value,control trigger 1,**control trigger 2**,control trigger 3>
- Default:* **Disabled**
- Options:* 0 = Disabled  
1 = Enabled

## Control Trigger #3

- Definition:* **Trigger** is used for **Control Trigger #3**, and when enabled and mode is set to **Control Trigger**, this input is used to select a Optoelectric configuration from the **Configuration Database**. The active state is set by the **External Trigger State** serial command.
- Serial Cmd:* <**K226**,mode,# active database settings,latch on trigger,timer value,control trigger 1,control trigger 2,**control trigger 3**>
- Default:* **Disabled**
- Options:* 0 = Disabled  
1 = Enabled

## Optoelectric Database Modes

### Number of Active Database Settings

**Definition:** This value sets the number of configuration database settings (in **Data-base Index**) that are active. If **Control Trigger** mode has been selected, this setting is ignored.

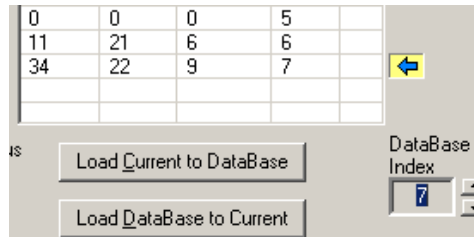
**Usage:** Can be useful when certain settings that are needed in one application are not needed in another and processing time is at a premium.

**Serial Cmd:** <**K226**,mode,# active database settings,latch on trigger,timer value, control trigger 1,control trigger 2,control trigger 3>

**Default:** **1**

**Options:** Any number from 1 to 7.

ESP



### Latch on Trigger

**Definition:** This feature is only used in **Control Trigger** mode. If enabled, the configuration database settings selected at the start of a read cycle will remain active during the entire read cycle. If **Latch on Trigger** is disabled, depending on the control trigger inputs, the scanner's optical settings can change throughout the read cycle.

**Note:** When **Control Trigger #3** is enabled, **Latch on Trigger** is also enabled regardless of its previous setting.

**Usage:** Useful when only one database index is required for the application.

**Serial Cmd:** <**K226**,mode,# active database settings,latch on trigger,timer value, control trigger 1,control trigger 2,control trigger 3>

**Default:** **Enabled**

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

ESP

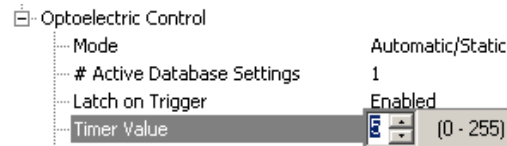


## Timer Value

**Definition:** When **Timer** mode is enabled, **Timer Value** is the time interval in which database index settings are cycled.

**Usage:** Useful in slower applications where there is enough time to cycle through the database index.

**ESP:**



**Serial Cmd:** <**K226**,mode,# active database settings,latch on trigger,**timer value**,control trigger 1,control trigger 2,control trigger 3>

**Default:** **5**

**Options:** 0 to 255 (increments of 10ms)





# Chapter 9

# Raster/Laser Control

## Chapter Contents

Raster Setup .....	9-3
Laser Setup.....	9-6
Raster/Laser by Embedded Menu .....	9-9

This section explains the setup and adjustments for the raster and the laser setups.

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

### Raster/Laser Setup by Serial Command

Command Title	old cmds	new cmds	Format
Raster	<b>KR</b>	<b>K506,</b>	<b>&lt;K506,status,top offset,bottom offset,raster sweep rate,read cycle on/off&gt;</b>
Laser	<b>KC</b>	<b>K700,</b>	<b>&lt;K700,laser on/off status,laser framing status,laser off time,laser on time,laser power&gt;</b>
Scanner Setup Status Request	<b>KU?</b>	<b>K699?</b>	<b>&lt;K699?&gt;</b>

## Raster/Laser Setup by ESP Menus



Click on this button to bring up the Raster/Laser menu.

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

Parameters		Program V
[-] Outputs		
[-] Raster Setup		
...	Status	Enabled
...	Top Offset	127
...	Bottom Offset	127
...	Raster Sweeps	10
...	Read Cycle On/Off	Disabled
[-] Laser Control		
...	Laser Blanking Status	Disabled
...	Laser ON/OFF Status	Disabled
...	Laser Off Time	0
...	Laser On Time	255
...	Laser Pot	Low

**Note:** Setup commands in the ESP-MP are accessed from both the **Read Cycle/Triggering** menu and the **Raster** button on the toolbar.

## Raster/Laser Setup by Embedded Menu

To access the **Raster/Laser** menu from within the **Autocalibration Setup** menu (page 6-8), type the number **2**.

9-Raster/Laser Con-

```

=====
                    RASTER/LASER FRAMING SETUP MENU
=====
To make changes, press appropriate key from list below:
                    RASTER SETTINGS
INCR.  DECR.  RANGE  STATUS
Top Offset..... T ..... R  0-255  Raster Status.....E
Bottom Offset... B ..... V  0-255  Raster On/Off.....F
Sweep Rate..... S ..... A  0-30

                    LASER SETTINGS
INCR.  DECR.  RANGE  STATUS
Laser Off Time.. P ..... O  0-255  Laser Framing Status.....M
Laser On Time... L ..... K  0-255  Laser On/Off.....N

MENU OPTIONS:
EXIT Calibration Setup.....ESC
MENU SELECTIONS
Calibration Setup.....CR
=====
Raster Status = ENABLED      Raster On/Off = DISABLED
Laser Framing = DISABLED    Laser On/Off = DISABLED
=====
  RASTER  || LASER FRAMING|
Top |Bottom|Sweep || Off  |On  |
Offset|Offset|Rate || Time |Time |
127 | 127 | 10 || 0   |255 | 0 %
  
```

## Raster Setup

- Definition:** The user can enable raster scanning and adjust the sweep range (the upper and lower limits of the raster sweep).
- Usage:** Raster scanning is useful when labels vary in placement and a single scan line cannot be counted on to cross the label. Raster scanning is also useful in reading PDF417.
- Serial Cmd:** <**K506**,status,top offset,bottom offset,raster sweep rate,read cycle on/off>

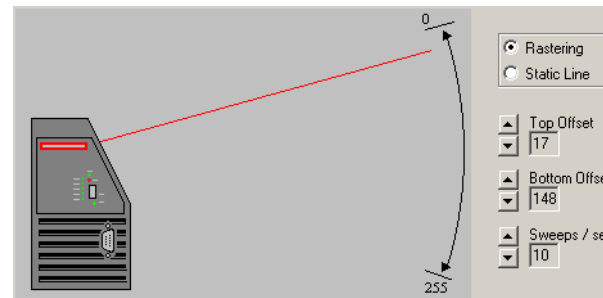
### Raster Status

- Definition:** When disabled, the raster mirror will park at the top of the raster sweep.
- Serial Cmd:** <**K506**,status,top offset,bottom offset,raster sweep rate,read cycle on/off>
- Default:** **Disabled**
- Options:** 0 = Disabled  
1 = Enabled

**Note:** Raster sweeps are only counted during a read cycle (continuous, triggered, and read rate). Raster sweeps are NOT counted when the raster motor is parked, disabled, set to straight line operation (top and bottom are equal), or when performing a self-calibration.

### Top Offset

- Definition:** Decreasing the **Top Offset** value causes the top of the raster pattern to move up.

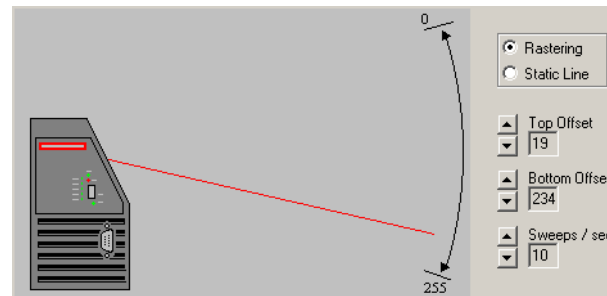


- Serial Cmd:** <**K506**,status,**top offset**,bottom offset,raster sweep rate,read cycle on/off>
- Default:** **127**
- Options:** 0 to 255

## Raster Setup

### Bottom Offset

**Definition:** Increasing the **Bottom Offset** value causes the bottom of the raster pattern to move down.



**Serial Cmd:** <K506,status,top offset,**bottom offset**,raster sweep rate,read cycle on/off>

**Default:** **127**

**Options:** 0 to 255

**Note:** For single scan line operation, set **Top Offset** equal to **Bottom Offset** or click on the **Static Line** option.

**Note:** Assigning a larger value to **Top Offset** than **Bottom Offset** will park the raster mirror in its "home" (default) position.

## Raster Sweep Rate

- Definition:** The raster sweep rate is the number of sweeps per second the raster mirror completes. A sweep is one pass of the raster, up or down. The maximum sweep rate is limited by the size of the arc the raster must move through.
- Usage:** If your application allows it, a slower sweep rate can produce more scans per second and better read rates. To determine the minimum read rate for your application, see ["Raster Picket Fence Calculation" on page A-32](#).
- Serial Cmd:** <**K506**,status,top offset,bottom offset,**raster sweep rate**,read cycle on/off>
- Default:** **10**
- Options:** 0 to 30

Table 9-1 Maximum Sweep Rates at Selected Sweep Arcs

Raster Sweep Arc	Maximum Sweeps per Second
0 to 10°	30
11 to 20°	20
21 to 30°	10

## Laser Setup

The laser can be turned off between read cycles and the duration of the scan and hence the width of the scan can also be adjusted.

### Laser On/Off Status

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

**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.

**Serial Cmd:** <**K700,laser on/off status**,laser framing status,laser off time,laser on time,laser power>

**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.

## Laser Framing Status

- Definition:** Sets the length of time the laser is ON during each scan so that only a selected portion of the scan width is effectively scanned.
- Usage:** This is useful to avoid highly reflective objects, for filtering out unwanted signals and avoiding the wrong symbols.
- Serial Cmd:** <**K700**,laser on/off status,**laser framing status**,laser off time,laser on time,laser power>
- Default:** **Disabled**
- Options:** 0 = Disabled  
1 = Enabled

To adjust laser framing, click the **Raster** button, click the **Laser Setup** tab, and click the **Laser On** and **Laser Off** arrows up or down as shown in [figure 9-1](#).

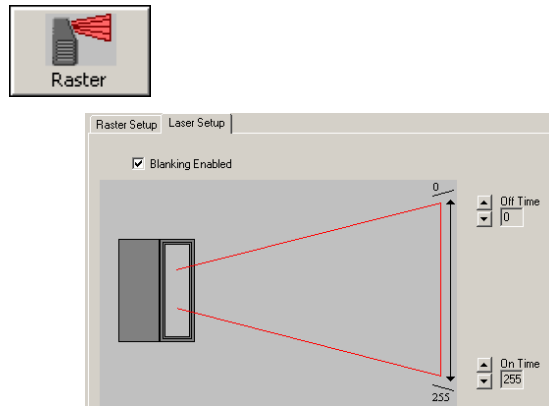


Figure 9-1 ESP Laser Framing Control

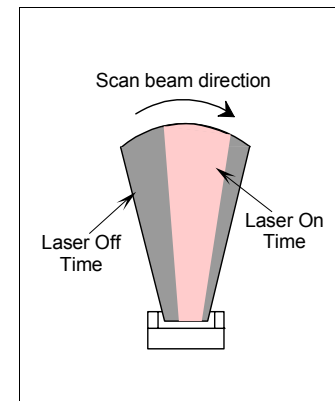


Figure 9-2 Laser Framing Pattern

When **Laser Framing** is not enabled, the scan beam sweeps across the full scan width. When enabled, the laser remains OFF during the **Laser Off** time (see [figure 9-2](#)) beginning at the start of the scan beam sweep and turns ON for the duration of the **Laser On Time**.

Because scan widths are not always perfectly symmetrical, the most effective way to setup laser framing is to experiment with the **Laser On** and **Laser Off** commands until you get the best results.

---

## Laser Setup

### Laser Off Time

*Definition:* Duration of laser off time, in increments of 1/255th of the total scan width.

**Important:** The combined values of **Laser Off Time** and **Laser On Time** cannot exceed 255 which is the duration of one scan.

*Serial Cmd:* <**K700**,laser on/off status,laser framing status,**laser off time**,laser on time,laser power>

*Default:* **0**

*Options:* 0 to 255

When setting up **Laser Framing** in ESP-MP, use the **Off Time** and **On Time** arrows to constrain or expand the laser framing area.

### Laser On Time

*Definition:* Duration of laser on time, in increments of 1/255th of the total scan width.

**Important:** The combined values of **Laser Off Time** and **Laser On Time** cannot exceed 255 which is the duration of one scan.

*Serial Cmd:* <**K700**,laser on/off status,laser framing status,laser off time,**laser on time**,laser power>

*Default:* **255**

*Options:* 0 to 255

### Laser Power

*Definition:* The user can select the **Low** or **High** laser power.

*Usage:* Applications that read past 45 inches typically use **High**.

*Serial Cmd:* <**K700**,laser on/off status,laser framing status,laser off time,laser on time,**laser power**>

*Default:* **Low**

*Options:* 0 = Low (laser power = 2 mW)

1 = High (laser power = 3.25 mW)



## Raster/Laser by Embedded Menu

To access the **Raster/Laser Framing** menu, send **<@>** to open the **Autocalibration Setup** menu (figure 6-5 on page 6-8) and type the number **2**.

```

=====
                      RASTER/LASER FRAMING SETUP MENU
=====
To make changes, press appropriate key from list below:
                      RASTER SETTINGS
Top Offset..... T ..... R 0-255 Raster Status.....E
Bottom Offset... B ..... U 0-255 Raster On/Off.....F
Sweep Rate..... S ..... A 0-30

                      LASER SETTINGS
Laser Off Time.. P ..... 0 0-255 Laser Framing Status.....M
Laser On Time... L ..... K 0-255 Laser On/Off.....N

MENU OPTIONS:                      MENU SELECTIONS
EXIT Calibration Setup.....ESC MENU Calibration Setup.....CR
=====
Raster Status = ENABLED Raster On/Off = DISABLED
Laser Framing = DISABLED Laser On/Off = DISABLED
=====
  RASTER  ||LASER FRAMING|
  Top |Bottom|Sweep ||Off |On |
  Offset|Offset|Rate ||Time |Time |
  _127 | 127 | 10 || 0 | 255 | 0 %

```

Figure 9-3 Embedded Calibration Results Menu

### Raster Settings

Type the letter **T** to increment the **Top Offset** and an **R** to decrement. Notice that the **Top Offset** reading at the bottom of the menu changes accordingly.

Type the letter **B** to increment the **Bottom Offset** and **V** to decrement.

**Sweep Rate**, **Raster Status**, and **Raster On/Off** are explained more fully in “[Raster Setup](#)” on page 9-3.

### Laser Settings

Laser settings are also dynamically updated at the bottom of the menu.

Full instructions and menus for laser operations can be found in “[Laser Setup](#)” on page 9-6.

Press the enter key (**CR**) to return to the main calibration menu or **Esc** to leave the **Auto Calibration Setup** menu entirely.



*Chapter*  
**10**

# Scanner Setup

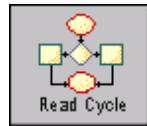
## *Chapter Contents*

Scan Speed .....	10-4
Focus .....	10-5
Gain .....	10-6
Transition Sample Counter .....	10-7
Maximum Element .....	10-8

This section includes AGC and factory settings such as **Focus**, **Gain**, **Tracking**, and **Scan Speed**.

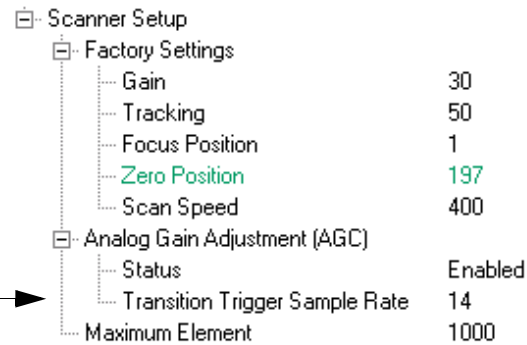
**Note:** The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

## Scanner Setup by ESP



**Click** on this button to bring up the **Scanner Setup** menu.

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



## Scanner Setup by Serial Command

Command Title	old comds	new comds	Format
Scan Speed	<b>KE</b>	<b>K500,</b>	< <b>K500</b> ,scan speed>
Gain/Tracking	<b>KD</b>	<b>K504,</b>	< <b>K504</b> ,gain,tracking>
Transition Counter	<b>KH</b>	<b>K505,</b>	< <b>K505</b> ,transition counter status,transition counter threshold>
Focus	<b>K.</b>	<b>K508,</b>	< <b>K508</b> ,focus position,zero position>
Scanner Setup Status Request	<b>KU?</b>	<b>K699?</b>	< <b>K699?</b> >

**Note:** To save **Factory Settings** changes to NOVRAM, send **<Zp>**, or if in ESP, select **Save to Scanner/Advanced/Send and Save, Including Factory**. (See "Save Active Settings including Factory for Power-on" on page -26.)

## Scanner Setup by Embedded Menu

For information on accessing the embedded menus, see ["Embedded Menus"](#) on page -23.

From the Main menu, scroll down through the options and select the following screen:

```

-----
                          CURRENT SETTINGS FOR SCANNER SETUP
-----
[FACTORY SETTINGS]
GAIN ADJUSTMENT      = 20
TRACKING              = 125
FOCUS POSITION         = 17
SCANS PER SECOND     = 400
MAX ELEMENT SIZE     = 1000
[AGC SETTINGS]
AGC STATUS           = ENABLED
AGC SAMPLING TRANS. = 14
[RASTER SETTINGS]
RASTER STATUS        = ENABLED
RASTER ON/OFF        = DISABLED
RASTER TOP           = 127
RASTER BOTTOM        = 127
RASTER SPEED         = 10
-----
ESC = MAIN MENU OR EXIT  N = NEXT ITEM
M  = PREVIOUS MENU      SP = NEXT ITEM
B  = PREVIOUS ITEM      CR = THIS ITEM
-----
SCANNER SETUP--> FACTORY_

```

---

*Scan Speed*

## Scan Speed

(factory setting)

---

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

*Usage:* Typically, to ensure a minimum number of scans, faster scan speeds are used for fast moving labels and/or longer labels with larger bar widths.

**Note:** Scan beams will be moving faster across labels further out in the scan range since the moving beam is being projected from a spinning mirror.

*Serial Cmd:* <**KE500,scan speed**>

*Default:* **400**

*Options:* 400 to 1000

## Focus

### *Focus Position*

*Definition:* Focus is the act of narrowing the focal spot to its smallest size and sharpest edges at the desired distance from the scanner by moving an internal lens in discrete movement with a stepper motor.

**Focus Position** is the length of the internal lens.

*Usage:* Focus is generally done by the **Autocalibration** routine (see [Chapter 6, "Autocalibration"](#)). However, in certain applications involving specific focal lengths, manual control of focus might be appropriate.

*Serial Cmd:* <**K508,focus position**,zero position>

*Default:* **10** (inside focal length)

*Options:* 0 to 40 (nearest to furthest focal length)

### *Zero Position*

(factory setting)

*Definition:* This field displays the current factory-set zero focus position.

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

*Serial Cmd:* <**K508,focus position**,zero position>

---

## Gain Adjustment

# Gain Adjustment

---

- Definition:* Sets a voltage amplitude value for the analog circuitry.
- 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 in **Autocalibration**. See [Chapter 6, "Autocalibration."](#)
- Serial Cmd:* <**K504,gain,tracking**>
- Default:* Default is **40** (nominal). **Gain** is optimized at the factory before shipment; the default value may not be 40.
- Options:* 0 to 255

## Tracking

---

- Definition:* Tracks peak signals and selects an amplitude reference point to sample the analog signals for converting to digital.
- Usage:* Useful in fine-tuning tracking or when conditions of poor contrast or blurred bar edges exist.
- Caution:** Changes to **Tracking** are typically done in **Autocalibration**. See [Chapter 6, "Autocalibration."](#)
- Serial Cmd:* <**K504,gain,tracking**>
- Default:* **Tracking** is optimized at the factory before shipment; the default value may not be **40**.
- Options:* 0 to 127



---

## Transition Counter

*Definition:* During the read cycle, the scanner counts the number of bar and space transitions defined in the **Transition Counter Threshold**. If the count matches or exceeds the threshold, the scanner will perform AGC routines.

---

### Transition Counter Status

*Serial Cmd:* <**K505**,transition counter status,transition counter threshold>

*Default:* **Enabled**

*Options:* 0 = Disabled      1 = Enabled

---

### Transition Counter Threshold

*Definition:* Determines the number of bar/space transitions that must be read before a label is considered present and AGC can be resolved.

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

*Serial Cmd:* <**K505**,transition counter status,**transition counter threshold**>

*Default:* **14**

*Options:* 0 to 255

---

*Maximum Element*

## Maximum Element

---

- Definition:* Maximum Element represents the maximum bar element width that's allowed before a video reset occurs (default to white).
- Usage:* Useful if having difficulty reading large element symbols like PDF417.
- Caution:** Do not change this parameter unless instructed by a Microscan representative.
- Serial Cmd:* **<K502,maximum element>**
- Default:* **1000** (30.5  $\mu$ s)
- Options:* 1 to 65535

# Chapter

# 11

# Matchcode

## Chapter Contents

Overview of Matchcode .....	11-4
Matchcode Type .....	11-5
Master Label Database .....	11-11
New Master Pin .....	11-16

This section explains the matchcode output functions and the master label database setup.

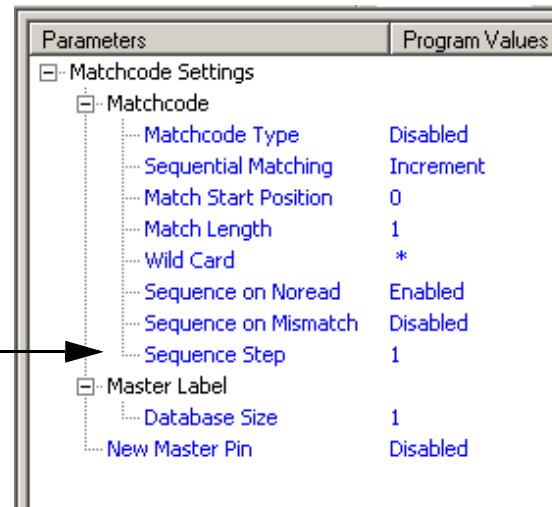
**Note:** The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

## Matchcode by ESP



**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.



11–Matchcode

## Matchcode by Serial Command

Command Title	old cmds	new cmds	Format
Matchcode Type	<b>Kn</b>	<b>K223,</b>	< <b>K223</b> ,type,sequential matching,match start position,match length,wild card character,sequence on noread,sequence on mismatch>
Master Label Database Size	<b>KM</b>	<b>K224,</b>	< <b>K224</b> ,number of master labels>
New Master Pin	<b>Kz</b>	<b>K225,</b>	< <b>K225</b> ,status>
Sequential Step		<b>K228,</b>	< <b>K228</b> ,sequence step>
Enter/Delete Master Label Data	<b>M</b>	<b>K231,</b>	< <b>K231</b> ,master label number,master label data [no data will delete]>
Request Master Label Data	<b>M</b>	<b>K231,</b>	< <b>K231</b> ,?>[for all] or < <b>K231</b> ,master label number?>
Operations Status Request	<b>KV?</b>	<b>K399?</b>	< <b>K399?</b> >

## Matchcode by Embedded Menu

For information on accessing the embedded menus, see “[Embedded Menus](#)” on page A-23.

From the Main menu, scroll down through the options and select the following screen:

```

CURRENT SETTINGS FOR OPERATIONS
-----
TRIGGERING MODE      = CONTINUOUS READ      MATCHCODE TYPE      = DISABLED
END OF READ CYCLE   = TIMEOUT                SEQUENTIAL MATCHING = INCREMENT
TIMEOUT in 10ms inc. = 1000ms                MATCH START POSITION = 0
TRIGGER CHARACTER   = <GS>                  MATCH LENGTH        = 1
SINGLE START CHAR    = <NUL>                WILD CARD CHARACTER = *
SINGLE END CHAR      = <NUL>                SEQUENCE ON NOREAD  = ENABLED
EXTERNAL TRIGGER    = ACTIVE CLOSED        SEQUENCE ON MISMATCH = DISABLED
TRIGGER FILTER      = 10000us                MATCH DATABASE SIZE  = 1
GOOD DECODE READS   = 1                      VARIABLE SEQUENCE   = 1
NEW MASTER PIN      = DISABLED
NUMBER OF LABELS    = 1
MULTILABEL SEPARATOR = .
BARCODE OUTPUT      = GOOD READ
WHEN TO OUTPUT      = AS SOON AS POSSIBLE

-----
ESC = MAIN MENU OR EXIT  N = NEXT ITEM
M  = PREVIOUS MENU      SP = NEXT ITEM
B  = PREVIOUS ITEM      CR = THIS ITEM
-----
OPERATIONS--> TRIGGERING MODE = CONTINUOUS READ_

```

11-Matchcode

## Overview of Matchcode

- Definition:** With **Matchcode** you can store master label data in the scanner's memory, compare this data against the scanned bar codes, and define how label data and/or discrete signal output will be directed. A master label database can be setup for up to 10 master labels. See "[Master Label Database](#)" on page 11-11.
- Note:** **Matchcode** will function with multiple labels (see "[Multilabel](#)" on page 4-16); however if **Matchcode Type** is set to **Sequential** or if **Triggering Mode** is set to **Continuous Read 1 Output**, **Number of Labels** will default back to **1** (if set to any number greater than 1).
- Usage:** **Matchcode** is used in applications to sort, route, or verify data based on matching the specific bar code label 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 bar code.

### Steps for entering and using master labels

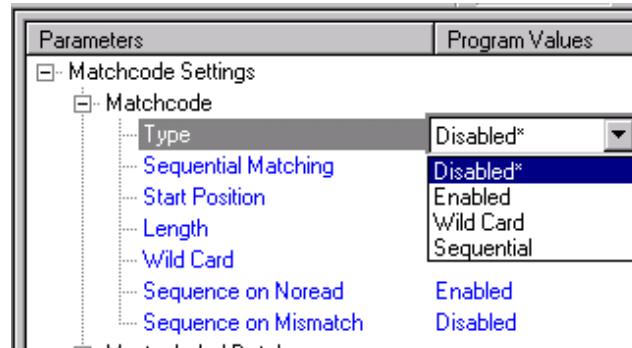
1. Set **Triggering Mode** to **External** or **Serial** ("[Trigger Mode](#)" on page 4-4).
2. Chose the method of label comparison that fits your application ("[Matchcode Type](#)" on page 11-5).
3. Define the output you want to achieve with your matchcode setup:
  - a. Barcode output ("[Bar Code Output](#)" on page 12-5).
  - b. Discrete output ("[Output 1](#)" on page 14-5, "[Output 2](#)" on page 14-10, and "[Output 3](#)" on page 14-10).
3. Select the number of master labels you want to create ("[Master Label Database Size](#)" on page 11-11).
4. Decide which of 4 ways you want enter your master label(s):
  - a. Use **ESP** to type in master label data directly ("[Enter Master Label Data](#)" on page 11-12).
  - b. Send a serial command with label data in the form of **<Mmaster label#,data>**.
  - c. Send a **<G>** (Scan Next Label as Master Label) command.
  - d. Enable the **New Master Pin** command ("[New Master Pin](#)" on page 11-16) and activate a discrete input to store the in the next label scanned as master label.
5. Enter master label data using the method determined in step 4.

# Matchcode Type

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

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

**ESP:**



11-Matchcode

**Serial Cmd:** <**K223,matchcode type,sequential matching,match start position,match length,wild card character,sequence on noread,sequence on mismatch**>

**Default:** **Disabled**

**Options:**  
 0 = Disabled  
 1 = Enabled  
 2 = Sequential  
 3 = Wild Card

**Disabled:** Has no effect on operations.

**Enabled:** Instructs the scanner to compare labels or portions of labels with the master label.

**Wild Card:** Allows the user to enter user defined wild card characters in the master label.

**Sequential Matching:** Instructs the scanner to sequence after each match (numeric only) and compare labels or portions of labels for sequential numbers.

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

---

## Matchcode Type

### Sequential Matching

- Definition:** With **Sequential** enabled, **Sequential Matching** determines if a count is in ascending (incremental) or descending (decremental) order.
- Usage:** Useful in tracking product serial numbers that increment or decrement sequentially.
- Serial Cmd:** *<K223,matchcode type,sequential matching,match start position,match length,wild card character,sequence on noread,sequence on mismatch>*
- Default:** **Increment**
- Options:** 0 = Increment  
1 = Decrement

---

### Match Start Position

- Definition:** **Match Start Position** determines the portions of labels that will be matched by defining the first character in the label (from left to right) that will be compared with those of the master label, when **Matchcode Type** is set to **Enabled** or **Sequential**.
- Function:** 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**.
- 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. With **Match Start Position** the scanner can be set to only sort on the part number and ignore the rest of the characters.
- Serial Cmd:** *<K223,matchcode type,sequential matching,match start position,match length,wild card character,sequence on noread,sequence on mismatch>*
- Default:** **0**
- Options:** 0 to 2710

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



## Match Length

- Definition:** Defines the length of the character string that will be compared with that of the master label when **Match Start Position** is set to **1** or greater. when **Match Start Position** is set to **0**, no comparison will occur.
- 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.
- Serial Cmd:** *<K223,matchcode type,sequential matching,match start position, match length,wild card character,sequence on noread,sequence on mismatch>*
- Default:** **1**
- Options:** 1 to 27102710

## Wild Card Character

- Definition:** **Wild Card Character** allows a user to define a wild card character as part of the master label.
- Usage:** For example, with **Wild Card Character** defined as the default asterisk, defining **CR\*34** as the master label will result in matches for CR134, CR234, but not CR2345. Entering the wild card at the end of the master label as in **CR\*** will result in matches for variable label lengths such as CR1, CR23, CR358, etc.
- Serial Cmd:** *<K223,matchcode type,sequential matching,match start position, match length,wild card character,sequence on noread,sequence on mismatch>*
- Default:** \* (asterisk)
- Options:** Any valid ASCII character

---

## Matchcode Type

### Sequence On Noread

---

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

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

**Serial Cmd:** *<K223,matchcode type,sequential matching,match start position,match length,wild card character,sequence on noread,sequence on mismatch>*

**Default:** **Enabled**

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

As an example of **Sequence on Noread Enabled**, consider the following series of decodes:

Master label	Decoded label	Master label after decode
001	001	002
002	002	003
003	noread	004 (sequenced on noread)
004	004	005
005	noread	006 (sequenced on noread)
006	noread	007 (sequenced on noread)
007	007	008

As an example of **Sequence on Noread Disabled**, consider the following series of decodes:

Master label	Decoded label	Master label after decode
001	001	002
002	002	003
003	noread	003 (not sequenced)
003	003	004
004	noread	004 (not sequenced)
004	noread	004 (not sequenced)
004	004	005

## Sequence On Mismatch

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

**Definition:** When set to **Enabled**, the master label sequences on every decode, match or mismatch.

When set to **Disabled**, the master label will not sequence whenever consecutive mismatches occur.

**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.

**Serial Cmd:** **<K223,matchcode type,sequential matching,match start position,match length,wild card character,sequence on noread,sequence on mismatch>**

**Default:** **Disabled**

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

The scanner will sequence the master to one more/less than the decoded symbol. As an example of **Sequence On Mismatch Enabled**, consider the following decodes:

Master label	Decoded label	Master label after decode
001	001	002
002	002	003
003	abc	004 (sequenced on mismatch)
004	004	005
005	def	006 (sequenced on mismatch)
006	ghi	007 (sequenced on mismatch)
007	007	008

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

Master label	Decoded label	Master label after decode
001	001	002
002	002	003
003	abc	004 (sequenced because of previous match)
004	004	005
005	def	006 (sequenced because of previous match)
006	ghi	006 (not sequenced because of previous mismatch)
006	006	007

---

## Matchcode Type

### Sequence Step

---

**Definition:** Sequencing in **Matchcode** operations can occur in steps from 1 to 32,768.

Sequencing performs like a mechanical counter by displaying positive integers and a specific number of digits after roll-overs. For example,  $000 - 3 = 997$  (not  $-3$ ) and  $999 + 3 = 002$  (not  $1002$ ).

**Usage:** Useful in applications in which it is desirable to count by intervals other than 1.

**Serial Cmd:** <**K228**, sequence step>

**Default:** **1**

**Options:** 1 to 32,768

**Note:** See <**K223**> commands ("[Matchcode Type](#)" on page 11-5) for more information.

As an example of **Sequence Step**, if **Sequence Step** is set to **3** and **Sequential Matching** is set to **Increment**.

Master label	Decoded label	Master label after decode
003	001	003
003	002	003
003	003	006
006	004	006
006	005	006
006	006	009

# Master Label Database

**Important: Master Label Database** is used only for comparing entire bar codes, when **Sequential** and **Wild Card** are NOT enabled, and **Start Position** is equal to **0**.

## Master Label Database Overview

**Definition:** Allows you to define up to 10 master labels as the master label database, which can be entered by keyboard, scanned-in, displayed, or deleted by serial or ESP commands.

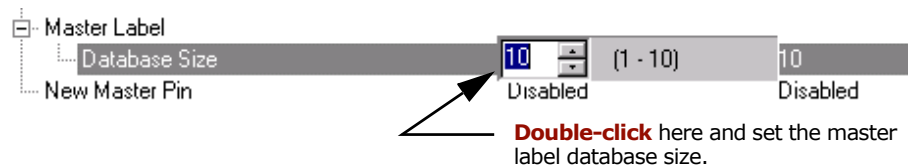
**Usage:** Useful where more than one master label is required, as in a Multilabel setup, for matching and other matchcode operations.

## Master Label Database Size

**Definition:** **Master Label Data Base Size** allows you to select 1 to 10 master labels for the master label database.

**ESP:** Click the **Matchcode** button  to access the master label:

First set the number of master labels you want to include by double-clicking **Database Size** and entering the number.



**Serial Cmd:** <**master label data base size**>

**Note:** You must follow this command with a save command <**A**> or <**Z**>.

**Default:** **1**

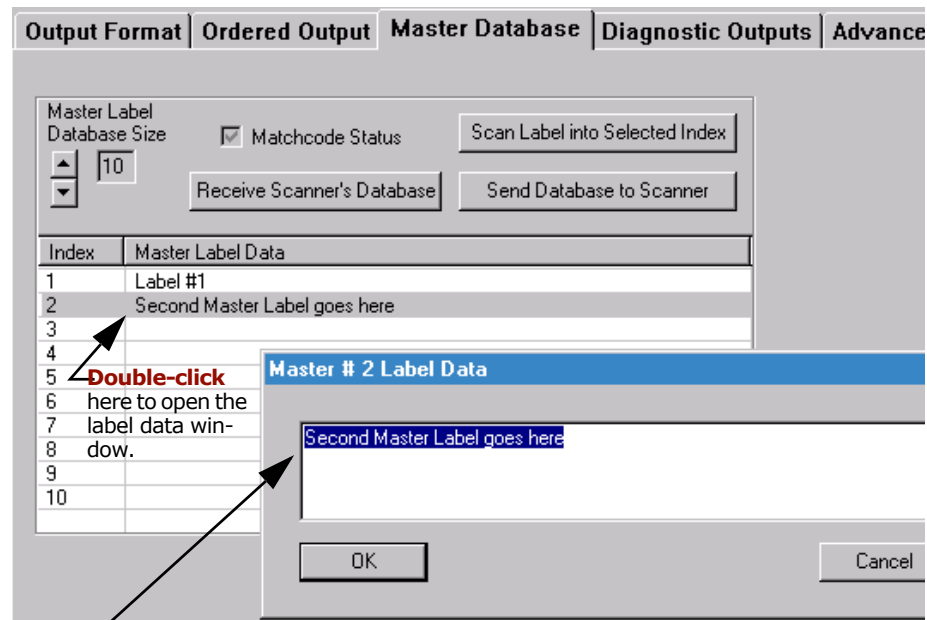
**Options:** 1 to 10

## Master Label Database

### Enter Master Label Data

**Definition:** Allows you to enter master label data for a specific master label index number (1 to 10), provided the index number is not larger than the number of labels enabled by the **Master Label Database Size** (see [page 11-11](#)). For example, if **Master Label Database Size** is set to 2, you will not be able to enter data for labels 3 through 10.

**ESP:** Click the **Output Format** button on the tool bar and click the **Master Database** tab.



Enter data here for label # 2.

**Serial Cmd:** **<K231, master label number, master label data>**

**Default:** **1, blank**

**Options:** 1 to 10, data (any combination of ASCII text up to the maximum indicated in "Maximum Characters for Master Label Database" on [page 11-13](#)). For example, to enter data for master label 9, after making certain that master label database size is enabled for 9 or more labels (see "Master Label Database Size" on [page 11-11](#)), send **<KK231,9,data>**.

**Caution:** Since the total number of characters available for the master label data base is **2710** changes to the **Master Label Data Base Size** will re-allocate the number of characters available for each master label and could cause existing master labels to be deleted (except master label #1 unless it also exceeds the size limitation).

The table below specifies the maximum number of characters available to each label according to the number of master labels defined, from 1 through 10. See ["Master Label Database Size" on page 11-11](#).

Table 11-1 Maximum Characters for Master Label Database

Master Label Number	Maximum Characters	Master Label Number	Maximum Characters
#1	2710	#6	451
#2	1355	#7	387
#3	903	#8	338
#4	677	#9	301
#5	542	#10	271

## Request Master Label Data

*Serial Cmd:* **<K231, master label number?>**

This will display data in the master label number you indicated. For example, to request master label #5, enter **<K231,?>**. The scanner transmits master label #5 data in brackets in the following format: **<K231,5/.....>**. If no master label data available, the output will be: **<K231,5,>**.

*ESP:* Double-clicking the **Master Database** tab, as shown under ["Enter Master Label Data" on page 11-12](#), will display current master label data for all master labels.

## Request All Master Label Data

*Serial Cmd:* **<K231,?>**

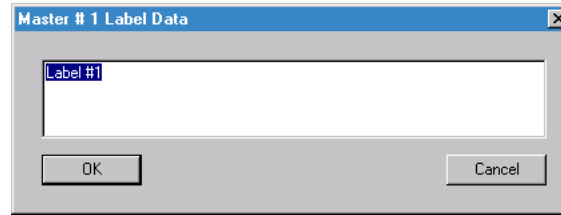
This command will return master label data for all labels enabled (up to 10).

*ESP:* Double-clicking the **Master Database** tab, as shown under ["Enter Master Label Data" on page 11-12](#), will display current master label data for all master labels.

## Delete Master Label Data

**Definition:** You can directly delete the master label data by serial command or ESP.

**ESP:** You can also delete master label data for any master label by erasing the data in the **Master Database** popup window (under **Output Format**) and clicking **OK**, as shown here.



**Serial Cmd:** **<K231, master label number, >**

To delete a master label, enter the database number and a comma, but leave the data field empty. For example, to delete master label #5, send the following **<K231,5,>**. The command is entered with a blank master label data field which tells the scanner to delete the selected master label from the database.

**Default:** **(no data)**

**Options:** Any combination of ASCII text up to the maximum indicated in ["Maximum Characters for Master Label Database" on page 11-13.](#)

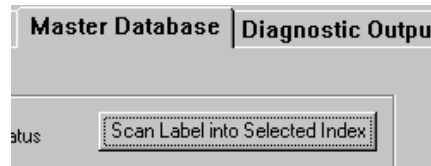


## Store Next Label Scanned as Master Label<sup>1</sup>

**Definition:** After you've set the size in the database ("Master Label Database Size" on page 11-11), you can order the scanner to scan-in the next label as the master label for any given master label number.

**ESP:** In the **Master Database** tab, under the **Output Format** menu

1. Select the master label index number in which you want to store the label data.



2. Click on the **Scan Label into Selected Index**.

**Serial Cmd:** **<G master label number>**

To store the next label scanned as master label #1, send: **<G>** or **<G1>**.

To store next label scanned as the master label for any other master label database number, send: **<Gmaster label number [1-10]>**.

For example, **<G5>** will cause the next label scanned to be entered as master label #5.

**Default:** (no data)

1. While not strictly a configuration command, <G> is included here because it is so closely related to other master label commands.

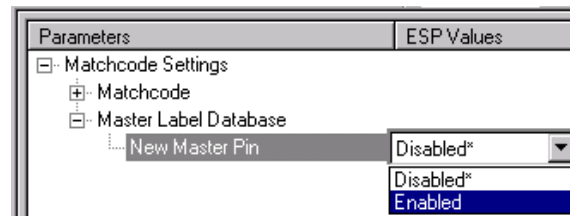
# New Master Pin

**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 bar code label(s) as the new master label(s).

It is important to note that the enabling **New Master Pin** does not in itself cause a master label to be recorded. The master pin must then be activated momentarily (for a minimum of 10 ms) before a master label can be scanned into memory. (See [Table A-7, "Host 25-pin Connector,"](#) on page A-8 and [Figure 16-7, Wiring Box PCB,](#) on page 16- 8.)

**Usage:** Some applications require the line worker to change the master label. 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.

**ESP:** In the **Matchcode** menu, select **New Master Pin**, double-click on **Disabled** and select **Enabled**.



**Serial Cmd:** **<K225,status>**

**Default:** **Disabled**

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

After **New Master Pin** has been enabled and the pin activated, decodes will be saved in the master database beginning with master label #1. If the scanner is configured for a multilabel read cycle (**Number of Labels** is greater than 1), the remaining decodes will be saved in each consecutive master label location. For example, if **Number of Labels** is set to **3** and **New Master Pin** is then activated, at the end of the next read cycle, the decoded bar code labels will be saved as master labels 1, 2, and 3.

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Beeper Status.....	12-10
Quality Output.....	12-11
Serial Verification.....	12-12

This section explains the commands for controlling data and beeper outputs.

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

## Outputs by Serial Command

Command Title	old cmds	new cmds	Format
Serial Verification	<b>KS</b>	<b>K701,</b>	< <b>K701</b> ,serial command echo status,serial command beep status,control/hex output>
Beeper	<b>Ku</b>	<b>K702,</b>	< <b>K702</b> ,status>
Quality Output	<b>KJ</b>	<b>K704,</b>	< <b>K704</b> ,quality output separator,reads/trigger status>
Bar Code Output	<b>KI</b>	<b>K705,</b>	< <b>K705</b> ,status,when to output>
Output During Diagnostic Warning Messages		<b>K713,</b>	< <b>K713</b> ,channel,status1,status2,status3,status4,status5,status6,status7,status8,status9>
Noread Message	<b>Kk</b>	<b>K714,</b>	< <b>K714</b> ,status,message>

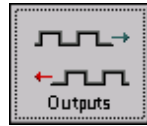
## Outputs by Embedded Menu

For information on accessing the embedded menus, see ["Embedded Menus" on page A-23](#).

From the Main menu, scroll down through the options and select the following screen:

CURRENT SETTINGS FOR SCANNER OUTPUT					
NOREAD OUTPUT	=	ENABLED	LASER ON/OFF	=	DISABLED
NOREAD MESSAGE	=	NOREAD	LASER FRAMING	=	DISABLED
BEEPER STATUS	=	ON GOOD	LASER OFF TIME	=	0
QUALITY SEPARATOR	=		LASER ON TIME	=	255
READS PER TRIG	=	DISABLED	LASER POWER	=	LOW
FULL SCREENS	=	ENABLED			
ECHO K COMMAND	=	DISABLED			
BEEP ON K COMMAND	=	DISABLED			
CTRL/HEX OUTPUT	=	CTRL			
-----					
ESC	=	MAIN MENU OR EXIT	N	=	NEXT ITEM
H	=	PREVIOUS MENU	SP	=	NEXT ITEM
B	=	PREVIOUS ITEM	CR	=	THIS ITEM
-----					
SCANNER OUTPUT--> NOREAD OUTPUT = ENABLED					

## Output Data by ESP Menu



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

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

Parameters	Program Values
[-] Outputs	
+ Raster Setup	
+ Laser Control	
[-] Noread Message	
... Status	Enabled
... Message Output	NOREAD
[-] Bar Code Output	
... Status	Good Read
... When to Output	As Soon As Possible
... Beeper	On Good
[-] Quality Output	
... Separator	DLE
... Reads/Trigger Status	Disabled
[-] Serial Verification	
... Command Echo Status	Disabled
... Command Beep Status	Disabled
... Control/Hex Output	Control

12-Outputs

**Note:** For **Raster Setup** and **Laser Setup**, see [Chapter 9, "Raster/Laser Control."](#)

## Noread Message

*Definition:* When enabled, and if no bar code label has been decoded before time-out or the end of the read cycle, the noread message will be transmitted to the host.

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

### Noread Status

*Serial Cmd:* <K714,**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:* <K714,**status**,**message**>

*Default:* **NOREAD**

*Options:* 0 to 128 ASCII characters.

**Note:** Noread Message will only be transmitted if **Bar Code Output** ([page 12-5](#)) is set to **Match**, **Mismatch** or **Good Read**.

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

# Bar Code Output

**Note: Bar Code Output** relates to data and should not to be confused with **Outputs 1, 2, and 3** listed in the **Outputs Parameters** which describe output states and functions.

## Bar Code Output Status

*Definition:* Defines the conditions under which decoded bar code labels are transmitted to the host.

*Usage:* Useful when the host needs bar code data only under certain conditions.

*Serial Cmd:* <**K705,output status,when to output**>

*Default:* **Good Read**

*Options:*

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

**Note: Bar Code Output Status** if set to **Match** or **Mismatch** will not take effect unless **Matchcode Type** is enabled and a master label is loaded into memory.

### Disabled

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

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

### Match

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

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

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

---

## Bar Code Output

### Mismatch

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

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

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

### Good Read

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

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

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

## When to Output Bar Code Data

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

*Serial Cmd:* <**K705**,*output status*,**when to output**>

*Default:* **As Soon As Possible**

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

### As Soon As Possible

*Definition:* Enabling **As Soon As Possible** causes bar code data to be sent to the host immediately after a bar code 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.

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



## End of Read Cycle

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

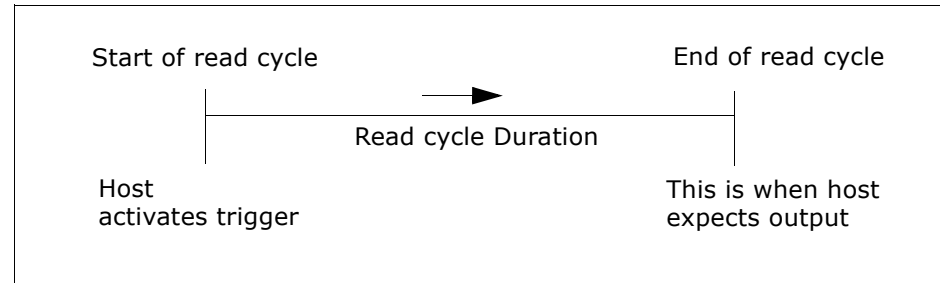


Figure 12-1 Read Cycle

*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.

**Note:** Whenever **Quality Output** is **Enabled**, outputs will always function in **End Of Read Cycle** mode.

## Serial Verification

Allows the user to verify configuration command status.

### Serial Command Echo Status

**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.

**Usage:** This command is useful in removing any doubt about the scanner's interpretation of any configuration command.

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.

**Serial Cmd:** <**K701,serial command echo status,serial command beep status,control/hex output**>

**Default:** **Disabled**

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

### Serial Command Beep Status

**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.

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

**Serial Cmd:** <**K701,serial command echo status,serial command beep status,control/hex output**>

**Default:** **Disabled**

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

## Control/Hex Output

- Definition:** Determines the response to an **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.
- Usage:** Useful for viewing settings with binary characters when using serial command on a terminal.
- Serial Cmd:** **<K701,serial command echo status,serial command beep status,control/hex output>**
- Default:** **Control**
- Options:** 0 = Control      1 = Hex

## Beeper Status

*Definition:* A beep is emitted either after each good read of a bar code label 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 **<K701,,1>** command is sent

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

### Status

*Serial Cmd:* **<K702,status,volume>**

*Default:* **On Good**

*Options:*  
0 = Disabled  
1 = On Good  
2 = On Noread

### Volume

*Serial Cmd:* **<K702,status,volume>**

*Default:* **Level 4**

*Options:*  
0 = Off  
1 = Level 1  
2 = Level 2  
3 = Level 3  
4 = Level 4  
5 = Level 5

# Quality Output

**Definition:** Allows the host to track the number of good reads per trigger by appending a five digit numeric field to the end of bar code label data. When enabled, bar code data is followed by a separator, followed by the five digits in the form of 00000. For example, a certain bar code that has been averaging 00100 reads per read cycle suddenly drops to 00012, this would be a good indication that a problem has arisen even though good reads are still occurring.

**Usage:** Host system can monitor scanning performance (printing process, scanning environment changes, etc.) by setting thresholds in their processing or displaying the outputs for visual verification.

See ["Reads per Trigger Threshold"](#) on page 14-9.

## Separator

**Serial Cmd:** <**K704,quality output separator,reads/trigger status**>

**Default:** , (comma)

**Options:** any ASCII character

**Note:** For all serial configuration commands, the following characters cannot be used: **, < > NUL**

## Reads/Trigger Status

**Serial Cmd:** <**K704,quality output separator,reads/trigger status**>

**Default:** **Disabled**

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



# Output Format and Filtering

## Chapter Contents

Overview of Output Format/Filtering.....	13-4
Extraction Mode .....	13-5
Insertion Mode.....	13-7
Advanced Output Format by ESP .....	13-9
Multilabel Output Format Assignment .....	13-10
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This section has instructions for assigning formatting rules that determine what portions of a bar code label will be read and specific sequence and data that will be inserted in the output.

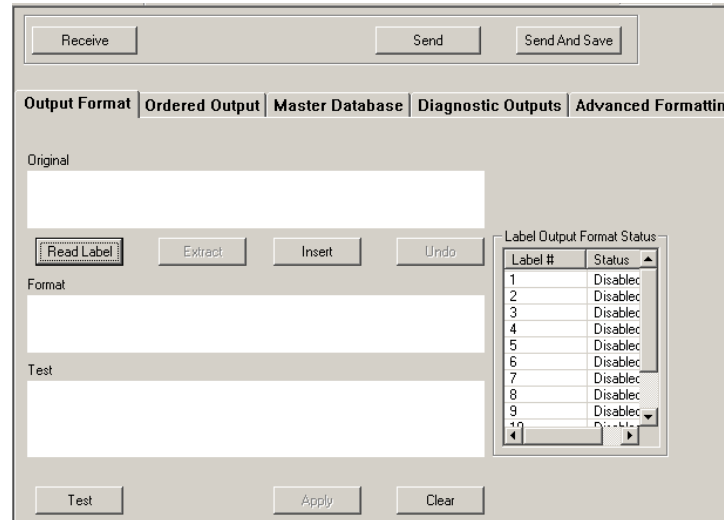
**Note:** The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

## Output Format and Filtering by ESP



**Click** this button to bring up the **Output Format** menu.

**Note:** Allow a few seconds for the menus to display.



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## Output Format/Filtering by Serial Command

Command Title	old cmds	new cmds	Format
Extraction Mode	<b>KS</b>	<b>K740,</b>	<K740,output #,start position,length>
Insertion Mode	<b>Ku</b>	<b>K741,</b>	<K741,output #,length,hex string>
Assignment Command	<b>KJ</b>	<b>K742,</b>	<K742,label number,status>
Output Format Status	<b>KI</b>	<b>K743,</b>	<K743,output format status>
Ordered Output		<b>K744,</b>	<K744, filter #,code type,length,wildcard character,placeholder character,data>
Number of Filters		<b>K745,</b>	<K745,number of filters involved>



## Output Format/Filtering by Embedded Menu

For information on accessing the embedded menus, see [“Embedded Menus” on page A-23](#).

From the Main menu, scroll down through the options and select the following screen:

CURRENT SETTINGS FOR SORTED OUTPUT FILTERS					
FILTER #	CODE TYPE	LENGTH	WILD CARD	PLACEHOLDER	MATCH STRING
1	ANY TYPE	0	*	?	
2	ANY TYPE	0	*	?	
3	ANY TYPE	0	*	?	
4	ANY TYPE	0	*	?	
5	ANY TYPE	0	*	?	
6	ANY TYPE	0	*	?	
7	ANY TYPE	0	*	?	
8	ANY TYPE	0	*	?	
9	ANY TYPE	0	*	?	
10	ANY TYPE	0	*	?	
11	ANY TYPE	0	*	?	
12	ANY TYPE	0	*	?	

ACTIVE FILTERS: = 0

ESC = MAIN MENU OR EXIT    N = NEXT ITEM  
M = PREVIOUS MENU        SP = NEXT ITEM  
B = PREVIOUS ITEM         CR = THIS ITEM

OUTPUT ORDER FILTERS--> ACTIVE FILTERS: = 0

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# Overview of Output Format/Filtering

**Output Format** consists of a set of criteria expressed in **Extraction** and **Insertion** serial or ESP menu commands that can be chained together to control the presentation of data that is transmitted from decoded bar code labels. If a label does not meet the defined criteria, it is treated as a noread.

Note that **Extraction** and **Insertion** functions are independent of **Ordered Output** criteria. The output format control can also work with all standard read modes such as **Matchcode**, **Multilabel** etc.

Commands can be chained together in an array of as many as 100 steps and applied to any label.

## Output Format Status

**Definition:** **Output Format Status** is a "master switch" that controls **Output Format**. **Extraction** and/or **Insertion** commands must be defined before an output occurs.

**ESP:** When you setup **Output Format** in the ESP **Output Format** menu and click on **Apply** in the same menu, **Output Format Status** will be changed to **Enable** in the scanner and displayed as such in the **Outputs** configuration menu after you send a **Retrieve Scanner Settings** command.

You can also enable/disable **Output Format** from the **Outputs** menu by double-clicking on **Output Format**.

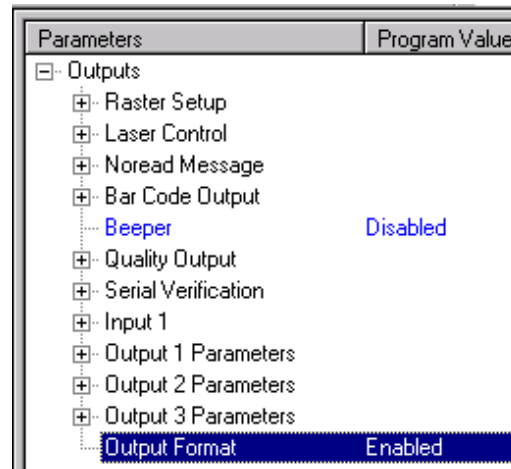
**Serial Cmd:** `<K743,output format status>`

**Default:** **Disabled**

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

**Note:** **Output Format Status** must be enabled in order for any **Output Format** commands to function.

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## Extraction Mode

**Definition:** Selects a portion of a bar code data to be transmitted and ignores the rest.

**Usage:** Useful in scanning labels in which only a portion or portions of the bar code data needs to be transmitted and sorted.

### Extraction by ESP

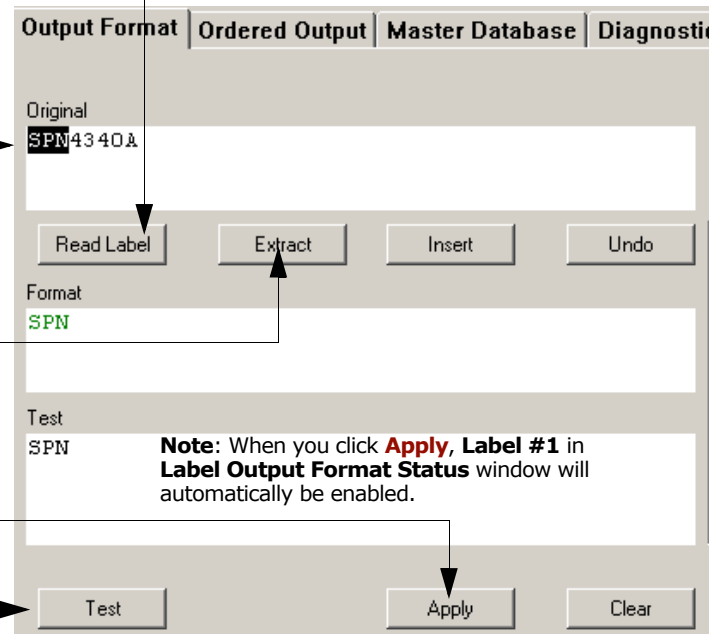
1. Click on **Read Label**. This will display in the current bar code data under **Original**.

2. Select text to be extracted

3. Click on **Extract**

4. Click on **Apply** or proceed with additional extractions and insertions.

5. Click on **Test**



13-Output Format

Figure 13-1 Output Format Extraction

After selecting and entering the extracted portion or portions of a label, you can proceed to **Insertion** mode where user-selectable ASCII text can be inserted. You can perform up to 100 instances in extraction and insertion for all labels being scanned in the read cycle. See ["Advanced Output Format by ESP" on page 13-9](#).

## Extraction by Serial Command

### Output #

*Definition:* An **Output #** identifies the step involved in an output format process. For example, if the routine involves a series of 6 **Extraction** and/or **Insertion** steps, each of these steps is controlled by assigning sequential output numbers from 1 to 4.

*ESP:* Output # appears in the **Advanced Formatting** tab.

*Serial Cmd:* **<K740,output #,start position,length>**

*Default:* (none) Must be entered.

*Options:* 1 to 100

### Start Position

*Definition:* Specifies the precise character in the data sequence (from left to right) where the selection for output begins.

*Serial Cmd:* **<K740,output #,start position,length>**

*Default:* **0** (Zero is disabled. It also marks the end of a format cell array.)

*Options:* 0 to maximum characters per label (zero is disabled)

### Length

*Definition:* Specifies the length of the output string.

*Serial Cmd:* **<K740,output #,start position,length>**

*Default:* **0**

*Options:* 0 to maximum characters per label (zero is disabled)

# Insertion Mode

**Definition:** Inserts up to four characters at a time into a data output string. You can add additional characters by repeating the procedure.

**Usage:** Useful in adding designators or separators to add meaning or content to data in applications where label data needs to be sorted.

**Note:** Insertion by ESP is much simpler than by serial command because the text and sequences can be visually verified.

## Insertion by ESP

Up to 4 ASCII characters can be inserted at any point in bar code input and added to the output. After scanning in a bar code label and selecting the original characters for extraction, as shown in "Extraction by ESP" on page 13-5, do the following:

1. Click on **Insert**.

2. Type in text to be inserted or select ASCII character from the **ASCII** selector and click on **Add to Insertion Data**.

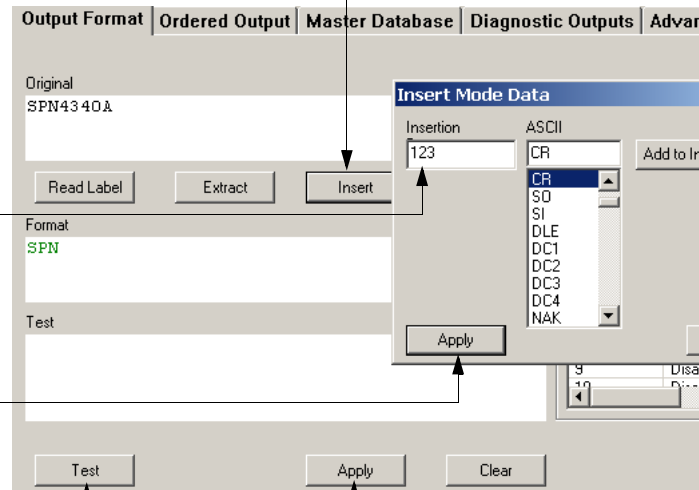
3. Click on **Apply**. This will append the insertion to the end of the extracted data under **Format**. In this case **Format** will read SPN123.

4. You can now add another extraction from the original (for example 40) followed by an insertion and another extraction in any order or sequence that you want it to appear upon output.

**Note:** When you click **Apply**, **Label #1** in **Label Output Format Status** window will automatically be enabled.

5. Click on **Apply** when all insertions and extractions are completed.

6. Click on **Test** to see resulting output.



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Figure 13-2 Output Format Insertion

---

## Insertion Mode

### Insertion by Serial Command

#### Output #

**Definition:** An **Output #** identifies the step involved in an output format process. For example, if the **Output Format** routine involved a series of four **Extraction** and/or **Insertion** steps, each of these steps is controlled by assigning sequential output numbers from 1 to 4.

**Serial Cmd:** **<K741,output #,length,hex string>**

**Default:** (none) Must be entered.

**Options:** 1 to 100

#### Length

**Definition:** Specifies the length of the output string.

**Serial Cmd:** **<K741,output #,length,hex string>**

**Default:** **0** (A zero disables **Length** or can mark the end of a format cell array.)

**Options:** 0 to 4

#### Hex String

**Definition:** A pair of hex digits represent an ASCII character. Each pair of hex digits ranges from 00 to FF. Each hex string has a maximum of 4 pairs.

For example, hex 65 = 'e', 6e = 'n', 64 = 'd', thus 656e64 = "end"

**Serial Cmd:** **<K741,output #,length,hex string>**

**Default:** **00**

**Options:** 00 to FF

#### Output Format Examples by Serial Commands

A label with the data **ABCDEFGH** needs to be manipulated to output:  
**DEFGH@\$ABCend.**

*The following commands are sent to achieve this setup:*

**<K740,1,4,5>** for extraction mode, output# = 1, start position = 4, length = 5.

**<K741,2,2,4024>** for extraction mode, output# = 2, start position = 4, length = 5.

Note that the hex pairs 40 and 24 = @\$ in ASCII.

**<K740,3,,3>** for extraction mode, output# = 3, start position = 4, length = 5.

**<K741,4,3,656e64>** Note that 656e64 = "end".

**<K741,0>** This ends the sequence and could have been done with a 740 command, as well.

## Advanced Output Format by ESP

**Advanced Formatting** allows you to view and edit up to 100 formatting steps. Typically, extraction and insertion entries are made in the **Output Format** screen (figure 13-3) and viewed on the **Advanced Formatting** screen (figure 13-3). You can also make adjustments in the **Advanced Formatting** screen by double-clicking on any of the rows.

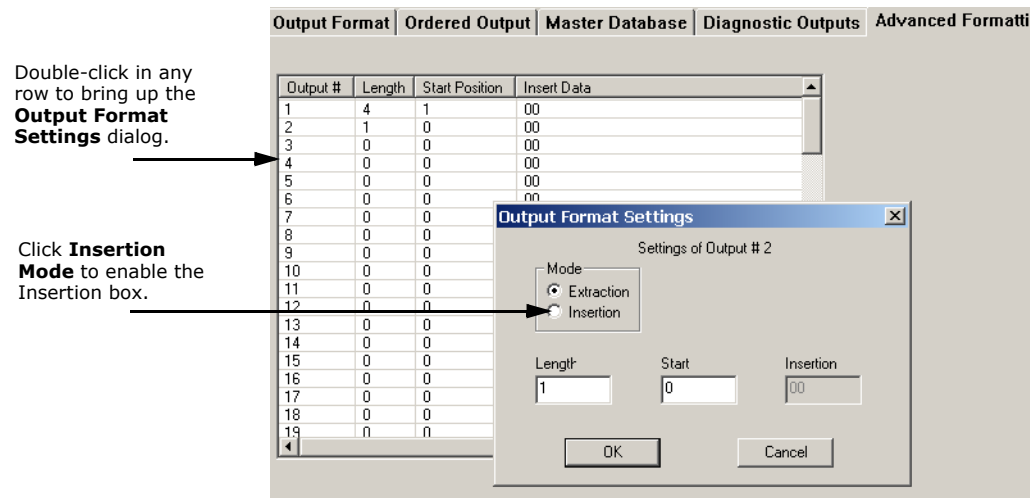


Figure 13-3 Advanced Formatting Screen

You can insert data into the **Insertion** entry box in the **Output Format Settings** dialog. However the data can only be entered as binary hex pairs. These must be even numbers and cannot exceed four pairs. For example, entering 3031323334 in Insertion will result in 1234 when the **Test** button in the **Output Format** tab is clicked.

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# Multilabel Output Format Assignment

**Label Output Format Status** corresponds directly with labels setup in **Multilabel**. If Number of Labels in **Multilabel** is set to the default 1, then only Label #1 in **Label Output Format Status** will be enabled. See "Multilabel" on page 4-16.

**Definition:** Specifies the label in a multilabel operation to which output format status is being applied.

**Usage:** Allows the user to set up as many labels that are already assigned in **Multilabel** for output and filter formatting.

**Serial Cmd:** <K742,label number,status>

**Default:** 0

**Options:** 1 to 12, as applicable to label number.

## Output Format Status by ESP

**Note:** **Label Output Format Status** table is found on the right side of the **Output Format** tab in the **Output Format** menu.

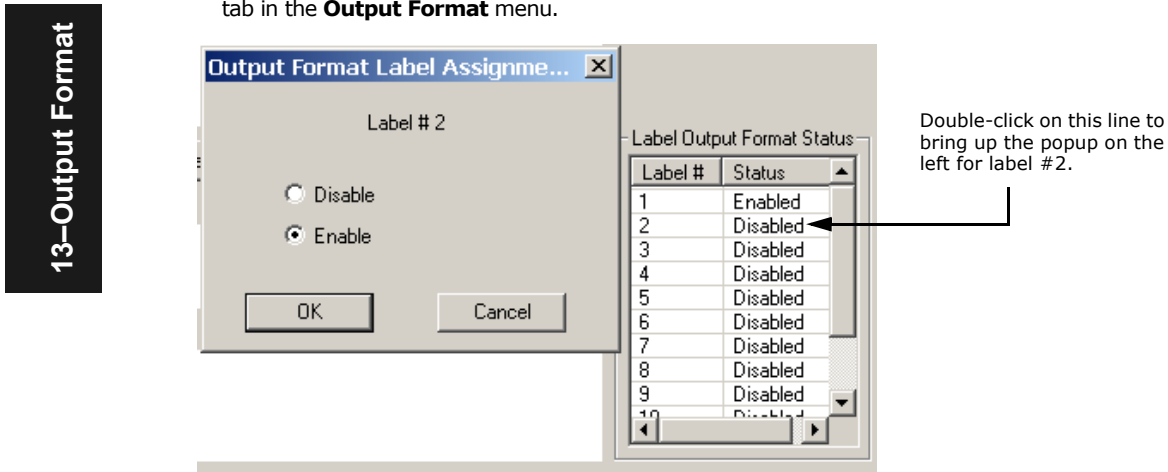


Figure 13-4 Multilabel Output Format Status

## Special Rules for using Multilabel with Output Format

1. Unless you want to assign output formatting to more than one label at a time in your multilabel sequence, disable all labels except the one to which you are applying the output formatting.
2. The 12 labels in **Label Output Format Status** correspond with multilabels; the 12 filters in **Ordered Output** apply only to the order of output and have no relationship to **Multilabel** or **Label Output Format Status**.



# Ordered Output/Filtering

**Definition:** **Ordered Output** involves filtering and ordering.  
 In the filtering stage, each label in a read cycle is read and matched against a user-defined table of up to 12 filters which search on code type, code length and data contents. A given label must meet all three criteria in any one of the filters in order to be included.  
 In the ordering stage, labels are transmitted in the order that they match up with the filters. A label matching filter #1 will transmit first, another matching filter #2 will transmit next, and so forth.

**Usage:** Useful in sorting several bar code labels into multiple categories with specific fields and a defined order of output.

**Serial Cmd:** <**K744**,filter#,code type,length,wildcard character,placeholder character,data>

## Ordered Output/Filtering by ESP

Click on the **Ordered Output** tab.

Click on **Send** to send all settings to the scanner.

Filter #	Code Type	Length	Wildcard	Placeholder	Matching Data
1	Any Type	6	*	?	15*
2	Any Type	6	*	?	TH?R?Y
3	Any Type	0	*	?	
4	Any Type	0	*	?	
5	Any Type	0	*	?	

Double-click on this row to bring up the popup on the left for filter #1

Use this option to limit the code length

Type in data that you want the label to match

Use this option to enter a control character on the **Matching** line above

This allows you to define the wildcard and placeholder

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## Ordered Output/Filtering by Embedded Menu

Embedded Menu:

CURRENT SETTINGS FOR SORTED OUTPUT FILTERS					
FILTER #	CODE TYPE	LENGTH	WILD CARD	PLACEHOLDER	MATCH STRING
1	ANY TYPE	0	*	?	
2	ANY TYPE	0	*	?	
3	ANY TYPE	0	*	?	
4	ANY TYPE	0	*	?	
5	ANY TYPE	0	*	?	
6	ANY TYPE	0	*	?	

INVOLVED FILTER FROM 0 = 0

## Ordered Output/Filtering by Serial Command

### Filter #

**Definition:** The filter sequence number from 1 to 12

**Serial Cmd:** <K744,filter#,code type,length,wildcard character,placeholder character,data>

**Default:** 0

**Options:** Range 1 to 12

### Code Type

**Definition:** User-assigned code type that the scanner will search for.

If a match is found, the scanner then checks **Length**.

**Serial Cmd:** <K744,filter#,code type,length,wildcard character,placeholder character,data>

**Default:** 0

**Options:** (Same as available in the Code Types setup menus)

### Length

**Definition:** User-assigned code length that the scanner will search for.

If the length is found, the scanner then checks **Wild Card**.

**Serial Cmd:** <K744,filter#,code type,length,wildcard character,placeholder character,data>

**Default:** 0 (any length)

**Options:** 0 to 128

## Wildcard Character

- Definition:** **Wildcard Character** indicates that any number of characters that follow the wildcard will be regarded as matches.  
For example, "**123\***" will match "123", "123456", "123ABC", but not "12".  
Filter data "**123\*AB?C**" will be interpreted as "123\*"  
Both **Wildcard Character** and **Placeholder Character** can be mixed in the same filter data.
- Serial Cmd:** `<K744,filter#,code type,length,wildcard character,placeholder character,data>`
- Default:** **2A (\*)**
- Options:** Any pairings of hex digits representing an ASCII character; for example, 2A = \*  
(00 = disabled)

## Placeholder Character

- Definition:** **Placeholder Character** is a type of wild card that requires identical data position.  
For example, Filter data "**123?**", will match all of the "1234", "123A", but not "123", "12345", "1234C".  
Filter data "**123?A**" will match "1234A" and "123BA", but not "123", "1234C" or "1234ABCD"  
Both **Wildcard Character** and **Placeholder Character** can be mixed in the same filter data.
- Serial Cmd:** `<K744,filter#,code type,length,wildcard character,placeholder character,data>`
- Default:** **3F (?)**
- Options:** Any ASCII input as pair of hex digit; e.g., 3F='?'  
(00 = disabled)

### Wildcard/Placeholder Matches

Both **Wildcard Character** and **Placeholder Character** can be mixed in the same filter data.

You can regard wildcard marks as the end of matching, whereas a placeholder requires identical data both before and after the placeholder.

## Ordered Output/Filtering

*For example:*

Filter data "**123\***" matches "123", "123456", "123ABC" but not "12".

Filter data "**123\*AB?C**" will be interpreted as "123\*"

Filter data "**123?A?**" matches "1234AB", "123BAT", but not "1234A" or "123BATS".

Filter data "**12??\***" matches "1234", "123456", "123ABC", but not "12", "123".

Filter data "**123?A\***" matches "1234A", "123BA", "123BATS", but not "1234", "1234C".

*For example:*

<K745,1> enables **Output Filters** #1 setting.

<K745,3> enables **Output Filters** #1 to filter #3's setting.

<K745,0> disables all output filters. The reader will not perform any filtered output.

### Data

*Definition:* User-assigned data that the scanner will search for.

*Serial Cmd:* <**K744**,filter#,code type,length,wildcard character,placeholder character,**data**>

*Default:* **Null**

*Options:* Any pairing of hex digits representing ASCII characters;  
e.g., 41422A = "AB\*"  
(00 = disabled)

### Number of Filters

*Definition:* The number of filters that labels will be compared against, up to the specified number. For example, entering 7 means that filters #1 through #7 will be enabled.

*Serial Cmd:* <**K745,number of filters involved**>

*Default:* **0**

*Options:* 0 to 12

Any number from 1 to 12 enables Output Filtering. A zero (0) disables **Output Filtering**. The reader will not perform any filtered output.

**Examples:**

*Filter #1*

Code type = Code 39, Length = disabled, Wildcard = `\*`, placeholder = `?`,  
data = "AB\*" = 41422A

<K744,1,3,0,2A,3F,41422a>

*Filter #2*

Code type = Code 128, Length = 8, Wildcard = `\*`, placeholder = `?`,  
data = "NBC??FGH" = 4e42433f3f464748.

<K744,2,4,8,2A,3F,4e42433f3f464748>

<K745,2> enables **Ordered Output**. It also enables filter#1 and filter#2.

Let's say we have four labels, "NBCXYFGH", "NBDXYFGH", "123XYZ", "ABCDE". The reader will registered two good reads only and transmit the following: "ABCDE", "NBCXYFGH".

## Master Database in ESP

When you click the **Master Database** tab in the **Output Format** menu, you bring up a table for convenient entry of master label data for up to 10 entries. See ["Master Label Database" on page 11-11](#) for details.

# Chapter

# 14

# Discrete I/O

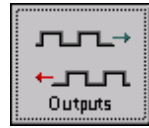
## Chapter Contents

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Output 1.....	14-5
Output 2.....	14-10
Output 3.....	14-10
Diagnostic Outputs .....	14-11

This section includes instructions for setting up conditions for changing input/output electrical transitions for control of internal and external devices. A discrete I/O (in/out) signal is an electrical transition from one voltage level to another so that digital switching can occur.

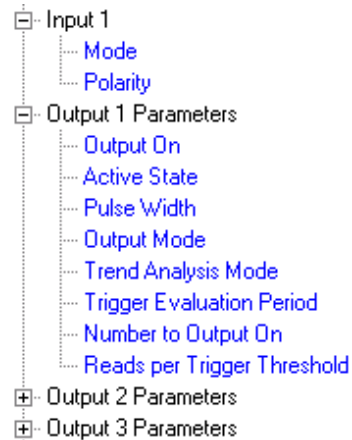
**Note:** The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

## Discrete I/O by ESP Menu



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

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



## Discrete I/O by Serial Command

14-Discrete I/O

Command Title	old cmds	new cmds	Format
Diagnostic Output		<b>K713,</b>	< <b>K713</b> ,output#,status1,status2,status3,status4,status5,status6,status7,status8,status9>
Input 1	<b>KK</b>	<b>K730,</b>	< <b>K730</b> ,mode,active state>
Output 1	<b>Kv</b>	<b>K720,</b>	< <b>K720</b> ,output on,active state,pulse width,output mode,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>
Output 2	<b>Kw</b>	<b>K721,</b>	< <b>K721</b> ,output on,active state,pulse width,output mode,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>
Output 3	<b>K'</b>	<b>K722,</b>	< <b>K722</b> ,output on,active state,pulse width,output mode,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>
Scanner I/O Status Request	<b>KX?</b>	<b>K899?</b>	< <b>K899?</b> >



### Discrete I/O by Embedded Menus

For information on accessing the embedded menus, see "Embedded Menu" on page A-23.

From the Main menu, scroll down through the options and select the following screen:

CURRENT SETTINGS FOR SCANNER I/O			
	OUTPUT-1	OUTPUT-2	OUTPUT-3
OUTPUT ON	NOREAD	NOREAD	NOREAD
OUTPUT STATE	NORMALLY OPEN	NORMALLY OPEN	NORMALLY OPEN
PULSE WIDTH in 10ms inc	50ms	50ms	50ms
OUTPUT MODE	PULSE	PULSE	PULSE
TREND ANALYSIS MODE	NOREAD	NOREAD	NOREAD
TRIGGER EVAL PERIOD	0	0	0
# BEFORE OUTPUT	0	0	0
READS/TRIG THRESHOLD	0	0	0
	INPUT-1		
MODE	DISABLED		
INPUT STATE	ACTIVE CLOSED		
ESC = MAIN MENU OR EXIT		N = NEXT ITEM	
M = PREVIOUS MENU		SP = NEXT ITEM	
B = PREVIOUS ITEM		CR = THIS ITEM	
SCANNER I/O--> OUTPUT-1_			

# Input 1

*Definition:* A programmable, discrete input used to reset counters, outputs or control optoelectrical settings.

*Usage:* For example, an application is setup so that a mismatch stops the production line by using outputs in a latch mode (see "Output Mode"). A push button switch can be connected to the input pin so that when pressed, it unlatches the output, allowing the line to resume operations.

## Input Mode

*Definition:* Determines the functionality of the input.

*Serial Cmd:* <K730,input mode,active state>

*Default:* **Disabled**

*Options:*  
0 = Disabled  
1 = Reset Counts  
2 = Unlatch Output

### Disabled

*Definition:* When set to **Disabled** there is no effect on operation.

### Reset Counts

*Definition:* When set to **Reset Counts**, a transition to the active state of the input will cause the scanner to reset the internal counters. (See "File Transfer").

*Usage:* Primarily used in test mode. Can also be used to reset counters daily.

### Unlatch Output

*Definition:* This setting is used in combination with any of the three discrete outputs that are in **Unlatch Mode 1** (see "Latch Mode 1 (Unlatch on Discrete Input 1)" on page 14-7). A transition to the active state will clear any of the three outputs that were previously latched.

## Active State

*Definition:* Sets the active level of the input pin.

*Serial Cmd:* <K730,input mode,active state>

*Default:* **Active Off (I<sub>OFF</sub>)**

*Options:* 0 = Active On (I<sub>ON</sub>) 1 = Active Off (I<sub>OFF</sub>)

# Output 1

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

## Output On

*Definition:* Allows the user to set the conditions under which an output (or outputs) will be activated.  
*Serial Cmd:* <**K720,output on**,active state,pulse width,output mode,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>  
*Default:* **Noread**  
*Options:* 0 = Mismatch Or Noread  
 1 = Match (or good read)  
 2 = Mismatch  
 3 = Noread  
 4 = Trend Analysis

**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 label is loaded into memory.

### Mismatch or Noread

*Definition:* Activates discrete output when the bar code data does not match that of the master label or the bar code has not been decoded before the end of the read cycle.

### Match

*Definition:* Activates a discrete output when the bar code data matches the master label.  
**Note:** If you want to output for a good read and **Matchcode** is not enabled, you can enable any output for **Match**.

### Mismatch

*Definition:* Activates a discrete output whenever the bar code data does not match that of the master label.

---

## Output 1

### Noread

*Definition:* Activates a discrete output whenever the bar code data is not decoded before the end of the read cycle.

### Trend Analysis

*Definition:* Activates discrete output when a trend analysis condition is met, depending on the trend analysis option enabled.

*Usage:* Typically used when a discrete indication of a low read quality condition occurs.

## Active State

*Definition:* Sets the active state of the discrete output.

*Serial Cmd:* <**K720**,output on,**active state**,pulse width,output mode,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>

*Default:* **Normally Open**

*Options:* 0 = Normally Closed  
1 = Normally Open

## Pulse Width

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

*Serial Cmd:* <**K720**,output on,active state,**pulse width**,output mode,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>

*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.

## Output Mode

*Definition:* Sets the condition in which the discrete output is de-activated.  
*Serial Cmd:* <**K720**,output on,active state,pulse width,**output mode**,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>  
*Default:* **Pulse**  
*Options:* 0 = Pulse 1 = Latch Mode 1  
 2 = Latch Mode 2 3 = Latch Mode 3

### Pulse

*Definition:* This is the default mode of operation in which the programmable output is activated when the **Output On** condition has been met and held active for the duration of the selected pulse width.

### Latch Mode 1 (Unlatch on Discrete Input 1)

*Definition:* The programmable output is active when the **Output On** condition has been met and held active until the discrete **Input 1** has been activated.

### Latch Mode 2 (Unlatch Opposite Condition)

*Definition:* The programmable output is activated when the **Output On** condition has been met and held active until the opposite condition selected under **Output On** has been met.  
 For example, if **Noread** is enabled under **Output On**, the programmable output will go active upon a noread and remain active until the opposite condition, a good read, occurs.

### Latch Mode 3 (Unlatch Enter Read Cycle)

*Definition:* The programmable output is active when the **Output On** condition has been met and is held active until a new read cycle begins.

**NOTE:** All of the **Output On** modes are inhibited when any **Output on Warning** is active for **Output 1** (see <K713> command).

## Trend Analysis Mode

**Definition:** Sets the trend condition (**Mismatch**, **Noread**, or **Reads/Trigger**) that will activate the output.

Parameters associated with **Trend Analysis Mode** are **Number To Output On** and **Trigger Evaluation Period**. The **Number To Output On** setting allows the user to select the number of times that the selected trend condition occurs before activating the output. **Trigger Evaluation Period** sets the number of triggered events to evaluate for trend condition.

Example:

*Trend analysis mode = Noread*

*Number to Output On =4*

*Trigger Evaluation Period=25*

In this example, the scanner will activate the output when 4 noreads occur within a period of 25 trigger events (read cycles).

**Usage:** Useful in cases in which the user doesn't want to shut down for one condition but wants to monitor quality and read conditions.

**Serial Cmd:** *<K720,output on,active state,pulse width,output mode,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>*

**Default:** **Noread**

**Options:**  
0 = Mismatch  
1 = Noread  
2 = Reads/Trigger

### Mismatch

**Definition:** Output will be activated when the number of **Mismatches** equals the value entered for **Number to Output On** within the trigger window selected in **Trigger Evaluation Period**.

### Noread

**Definition:** The output will be activated when the number of noreads equals the value entered for **Number to Output On** within the trigger window selected in **Trigger Evaluation Period**.

### Reads per Trigger Threshold

**Definition:** The **Reads/Trigger** trend monitors the number of good reads per triggered read cycle. If the number of **Reads/Trigger** falls below the value entered in **Reads per Trigger Threshold**, a trend condition is set. If this trend condition matches the number set in **Number to Output On**, the output will be activated.

### Trigger Evaluation Period

*Definition:* The number of trigger events to examine within the trend analysis event.

*Serial Cmd:* <**K720**,output on,active state,pulse width,output mode,trend analysis mode,**trigger evaluation period**,number to output on,reads per trigger threshold>

*Default:* **0**

*Options:* 0 to 255

### Number Before Output

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

*Serial Cmd:* <**K720**,output on,active state,pulse width,output mode,trend analysis mode,trigger evaluation period,**number to output on**,reads per trigger threshold>

*Default:* **0**

*Options:* 0 to 255

### Reads per Trigger Threshold

*Definition:* When **Reads/Trigger** trend analysis mode is enabled, the **Reads per Trigger Threshold** value is the minimum number of successful reads required during a read cycle.

*Helpful Hints:* You can determine the expected number of scans during a read cycle by multiplying the enabled **Number of Scans** per second times the number of seconds in the read cycle. You can also use **Quality Output** (see "Quality Output") to observe the number of successful reads.

*Serial Cmd:* <**K720**,output on,active state,pulse width,output mode,trend analysis mode,trigger evaluation period,number to output on,**reads per trigger threshold**>

*Default:* **0**

*Options:* 0 to 65,535

---

Output 2

## Output 2

*Serial Cmd: <K721,output on,active state,pulse width,output mode,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>*

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

## Output 3

*Serial Cmd: <K722,output on,active state,pulse width,output mode,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>*

**Output 3** has the same parameters and default settings as **Output 1**.



# Diagnostic Outputs

**Note:** See Chapter 15, "Diagnostics" for definitions and setup of Diagnostic Warnings.

**Definition:** Warning messages conditions relating to the MS-880 performance and environment can be programmed to activate selected outputs (**Output 1**, **Output 2**, or **Output 3**) whenever a warning condition occurs.

**Usage:** Useful where output warnings of scanner malfunctions can be integrated to alert users and/or shut down a line.

**ESP:** Click the **Output Format** and select the **Diagnostic Outputs** tab to bring up the table below:

The screenshot shows a software window with four tabs: 'Output Format', 'Ordered Output', 'Master Database', and 'Diagnostic Outputs'. The 'Diagnostic Outputs' tab is active, displaying a table titled 'Activate Output on Diagnostic Warning Table'. The table has four columns: 'Diagnostic Condition', 'Output #1', 'Output #2', and 'Output #3'. All cells in the table are currently set to 'Disabled'. A popup window titled 'Activate Output #1 on Low Laser' is open, showing a dropdown menu with 'Enabled' selected and 'OK' and 'Cancel' buttons. An arrow points from the text below to the 'Output #1' cell for the 'Low Laser' condition in the table.

Diagnostic Condition	Output #1	Output #2	Output #3
Low Laser	Disabled	Disabled	Disabled
High Laser	Disabled	Disabled	Disabled
Low Temperature	Disabled	Disabled	Disabled
High Temperature	Disabled	Disabled	Disabled
Diagnostics Flash Corrupted	Disabled	Disabled	Disabled
Laser Ref. Flash Corrupted	Disabled	Disabled	Disabled
Service Life Exceeded	Disabled	Disabled	Disabled
Factory Flash Defaulted	Disabled	Disabled	Disabled
Customer Flash Defaulted	Disabled	Disabled	Disabled

Double-click the appropriate cell under **Outputs** and enable/disable output in the popup on the left.

**Serial Cmd:** <K713,output #,status1,status2,status3,status4,status5,status6,status7,status8,status9>

A <K?> command returns three separate verification responses, one for each output. A <K713?,n> command returns a verification response for one selected output (n=1,2,3).

For example, in order to cause Output 3 to become active in response to any warning enabled message, issue this command:  
 <K3,1,1,1,1,1,1,1,1,1,1>.

14-Discrete I/O

---

## Diagnostic Outputs

### Output

- Definition:** Selects the status settings for one of three outputs (Output 1, Output 2, or Output 3).
- Function:** Each of the three outputs is independently associated with ten status settings. The settings can be accessed to verify/change one output at a time.
- Serial Cmd:** **<K713, output #, status1, status2, status3, status4, status5, status6, status7, status8, status9>**
- Options:**  
1 = Logic output 1  
2 = Logic output 2  
3 = Logic output 3

### Status

- Definition:** When enabled, the error condition will cause the selected output to become active.
- Serial Cmd:** **<K713, output #, status1, status2, status3, status4, status5, status6, status7, status8, status9>**
- Default:** **Disabled** (each can be independently enabled)
- Options:**  
0 = Disabled  
1 = Enabled

status1 = Laser Current Low  
status2 = Laser Current High  
status3 = Temperature Low  
status4 = Temperature High  
status5 = Diagnostics Flash Corrupt  
status6 = Laser Ref. Corrupt  
status7 = Product lifetime exceeded  
status8 = Factory settings defaulted  
status9 = Customer settings defaulted

**Note:** When enabled, the error condition will override all other operational modes configured for the output.

## Chapter Contents

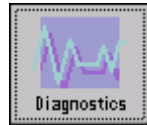
Warning Messages .....	15-4
High Temperature Threshold .....	15-8
Low Temperature Threshold.....	15-9
Lifetime Hours.....	15-10
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Counts .....	15-12
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This section describes warning and operating messages and their settings.

**Important:** Since **Warning Messages** and **NOVRAM Messages** are not enabled by default, these messages will not be displayed. However, if you suspect that erroneous defaults are occurring, enable **Warning Messages** and **NOVRAM Messages** by sending **<K400,1,,,1>**.

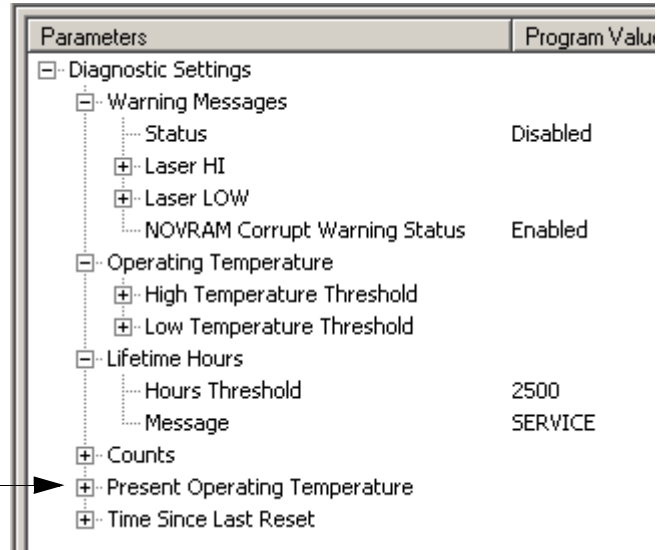
**Note:** The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

## Diagnostics by ESP Menu



Click this button to bring up the Diagnostic menu.

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



## Diagnostics by Serial Command

Command Title	Old Cmds	New Cmds	Format
Warning Message Status	<b>K"</b>	<b>K400,</b>	<K400,warning message status,laser high status,laser low status,novram/reset warning status>
Lifetime Hours	<b>K\$</b>	<b>K401,</b>	<K401,hours10,message>
Over-temperature	<b>K+</b>	<b>K402,</b>	<K402,degrees,message>
Under-temperature	<b>K-</b>	<b>K403,</b>	<K403,degrees,message>
Laser Overcurrent	<b>K;</b>	<b>K404,</b>	<K404,message>
Laser Undercurrent	<b>K:</b>	<b>K405,</b>	<K405,message>
Power-on/Resets Counts	<b>K_</b>	<b>K406,</b>	<K406,powerups,resets>
Time Since Last Reset	<b>K@?</b>	<b>K407?</b>	<K407?> returns: hours,minutes (read only)
Present Operating Temperature	<b>K%?</b>	<b>K408?</b>	<K408?> returns: deg (read only)

### Diagnostics by Embedded Menu

For information on accessing the embedded menus, see ["Embedded Menus"](#) on page A-23.

From the Main menu, scroll down through the options and select the following screen:

```

CURRENT SETTINGS FOR DIAGNOSTICS SETUP
-----
WARNING MESSAGES           = DISABLED
NURAM WARNING MESSAGES    = ENABLED
LIFE WARNING MESSAGE      = SERVICE
LIFE WARNING THRESHOLD    = 25000 HOURS
POWERUP RESET COUNT       = 26
OTHER RESETS COUNT        = 106
HOURS: MINUTES SINCE RESE = 0: 0
-----
CURRENT SETTINGS FOR LASER AND TEMPERATURE
-----
TEMP. LOW MESSAGE = LOW_TEMP || LASER LOW MESSAGE = LOW LASER
TEMP. LOW THRESHOLD = 1 || LASER LOW WARNING = ENABLED
TEMP. HIGH MESSAGE = HIGH_TEMP || LASER HIGH MESSAGE = HIGH LASER
TEMP. HIGH THRESHOLD = 40 || LASER HIGH WARNING = ENABLED
PRESENT TEMPERATURE = 17C ||
||
||
-----
ESC = MAIN MENU OR EXIT N = NEXT ITEM
M = PREVIOUS MENU SP = NEXT ITEM
B = PREVIOUS ITEM CR = THIS ITEM
-----
DIAGNOSTICS SETUP--> WARNING MESSAGES = DISABLED

```

## Warning Messages

**Important Note: Warning Message Status** must be enabled before any warnings in this menu can be displayed.

*Definition:* Warning messages that relate to the environment and condition of the scanner can be defined and set to activate specific outputs.

**Note:** When enabled, the error condition will override all other operational modes configured for the output.

When enabled, laser current and NOVRAM warning messages will be transmitted to the host or any active port whenever the pre-defined conditions are met.

*Usage:* These messages serve as a flag to service a scanner or as an early warning that potential problems could arise. They are particularly useful in factories that run 24/7 and can't afford down time.

*Serial Cmd:* <**K400**,warning message status,laser high status,laser low status,novram/reset warning status>

### Warning Message Status

*Function:* When enabled, warning messages will be transmitted to the host or any active port.

**Note:** This option must be enabled before any other warning messages can be transmitted.

*Usage:* Alerts the user to impending failures or conditions that may soon cause failures.

*Serial Cmd:* <**K400**,warning message status,laser high status,laser low status,novram/reset warning status>

*Default:* **Disabled**

*Options:* 0 = Disabled      1 = Enabled

## Laser High Warning

Transmits a message whenever the laser current exceeds a factory-calibrated reference value which cannot be altered. The message repeats once every 30 minutes until the condition is corrected.

### Laser High Status

*Definition:* Enables the **Laser High** message.

*Usage:* Alerts the user to impending laser failure. (Contact Microscan Service.)

*Serial Cmd:* <**K400**,warning message status,**laser high status**,laser low status,  
novram/reset warning status>

*Default:* **Enabled**

*Options:* 0 = Disabled      1 = Enabled

### Laser High Message

*Definition:* Defines the **Laser High** message.

*Serial Cmd:* <**K404**,**laser high message**>

*Default:* **HIGH-LASER**

*Options:* Any 1 to 10 character ASCII string except NUL, <, or >.

---

## Warning Messages

### Laser Low Warning

When enabled a message up to 10-characters is transmitted whenever the laser current falls below a factory-calibrated reference value which cannot be altered. The message repeats once every 30 minutes until the condition is corrected.

#### Laser Low Status

*Definition:* Enables the **Laser Low** message.

*Usage:* Alerts the user to impending laser failure. (Contact Microscan Service.)

*Serial Cmd:* <**K400**,warning message status,laser high status,**laser low status**,novram/reset warning status>

*Default:* **Enabled**

*Options:* 0 = Disabled      1 = Enabled

#### Laser Low Message

*Definition:* When enabled a message up to 10-characters is transmitted whenever the laser current falls below a factory-calibrated reference value which cannot be altered. The message repeats once every 30 minutes until the condition is corrected.

Defines the **Laser Low** message.

*Serial Cmd:* <**K405**,laser low message>

*Default:* **LOW-LASER**

*Options:* Any 1 to 10 character ASCII string except NUL, <, or >.



## NOVRAM Corrupt Warning Status

When enabled, a 7 character message is sent whenever the system detects a warning condition.

**Important Note: Warning Corrupt Message Status** must be enabled before the **NOVRAM** message in this menu can be transmitted.

*Function:* When enabled, a 7 character message is sent whenever the system detects a warning condition.  
However, if you suspect that erroneous defaults are occurring, enable **NOVRAM Messages** by sending **<K400,1,,,1>**. This will allow the **NOVRAM** messages, if present, to be viewed.

*Usage:* Alerts the user to NOVRAM failure. (Contact Microscan Service.)

*Serial Cmd:* **<K400,warning message status,laser high status,laser low status, novram reset warning status>**

*Default:* **Disabled**

*Options:* 0 = Disabled  
1 = Enabled

*Warning messages for NOVRAM can appear in one of five formats:*

**<NVRAM-C>**

This message indicates an error in user settings. The message repeats once every 30 minutes. If this message is received, restore customer settings and send a **<Z>** command.

If the condition persists, call customer service.

**<NVBAD-D>**

Indicates that diagnostic lifetime hours, power-on counts, and reset counts have been lost. The message repeats once every 30 minutes. (Contact Microscan Service.)

**<NVBAD-L>**

Indicates a problem with laser current factory reference. The message repeats once every 30 minutes. (Contact Microscan Service.)

**<DFALT-C>**

Indicates that the customer NOVRAM settings have been defaulted either by a customer initiated default or by a problem with the scanner. This message is sent ONLY ONCE.

**<DFALT-F>**

Indicates that the factory NOVRAM settings have been defaulted. This message is sent ONLY ONCE upon reset. (Contact Microscan Service.)

## High Temperature Threshold

A message can be defined that will display when a user-set **High Temperature Threshold** has been reached. The message repeats once every 30 minutes until the condition is corrected. This value is a reference to the external ambient temperature in the environment around the scanner.

### High Temperature Degrees

*Definition:* A user can set a temperature value that when exceeded will cause a high temperature message to be displayed. If **High Temperature Threshold** is set to zero, then the warning message will be disabled

*Usage:* Helps ensure that the scanner is being used within its temperature specification. Also, since hotter environments tend to shorten the life of electronics components, a user may want to set the temperature threshold closer to the nominal temperature of 25°.

*Serial Cmd:* <K402,degrees,message>

*Default:* **50° Celsius**

*Options:* 0° to 50°, zero disables.

### High Temperature Message

*Definition:* The user can enter a 10-character message that will be displayed whenever **High Temperature Threshold** is exceeded.

*Serial Cmd:* <K402,degrees,message>

*Default:* **HIGH\_TEMP**

*Options:* Any 1 to 10 character ASCII string except **NUL, <, or >**.

## Low Temperature Threshold

A message can be defined that will display when a user-set **Low Temperature Threshold** has been reached. The message repeats once every 30 minutes until the condition is corrected. This value is a reference to the external ambient temperature in the environment around the scanner.

### *Low Temperature Degrees*

*Definition:* The user can set a low temperature value that whenever the ambient temperature falls below it causes a low temperature message to be displayed. If **Low Temperature Threshold** is set to zero, the warning message will be disabled.

*Usage:* Helps ensure that the scanner is being used within its temperature specification.

*Serial Cmd:* <**K403,degrees,message**>

*Default:* **1°** Celsius

*Options:* 0° to 50°, zero disables.

### *Low Temperature Message*

*Definition:* The user can enter a 10-character message that will be displayed whenever the ambient temperature falls below the **Low Temperature Threshold**.

*Serial Cmd:* <**K403,degrees,message**>

*Default:* **LOW\_TEMP**

*Options:* Any 1 to 10 character ASCII string except NUL, <, or >.

## Lifetime Hours

A message can be defined that will be transmitted whenever the scanner's elapsed time clock exceeds the set hours threshold. The message repeats one time every 30 minutes.

### Hours Threshold

**Definition:** A user can set a time in hours that will cause a message to be sent whenever the scanner's run time exceeds this value.

The elapsed time is the time the scanner is powered up.

**Usage:** Useful for setting up a preventive maintenance program.

**Serial Cmd:** <**K401, hours10, message**>

**Default:** **2500** (actually 25,000 hours)

**Options:** 0 to 65534

Note: Hours entered are 1/10 of the actual hours.

### Message

**Definition:** A user can define message up to 10-characters that will be displayed whenever the hours threshold is reached or exceeded.

**Serial Cmd:** <**K401, hours10, message**>

**Default:** SERVICE

**Options:** Any 1 to 10 character ASCII string except NUL, <, or >.

## Present Ambient Temperature (deg. C)

(This command is READ ONLY.)

- Definition:* Close estimation of external temperature.  
A thermal sensor on the main PCB measures the internal temperature of the scanner. From this a case-differential constant is subtracted to yield an estimated external temperature.
- Usage:* Indicates temperature of the environment immediately outside of the scanner. Useful for setting **Over Temperature Threshold** and **Under Temperature Threshold**.
- Serial Cmd:* Send: **<K408?>**  
Returns **<K408 degrees Celsius>**.

**Note:** When viewing the **Present Operating Temperature**, allow at least 20 minutes after startup for the scanner's inside and outside temperatures to stabilize.

## Counts

(These commands are READ ONLY.)

### Powerups

*Definition* Returns the number of times the scanner has been re-powered or a watchdog reset occurs.

*Usage:* Useful for detecting unwanted resets caused by power supply problems or ESD transients.

*Serial Cmd:* Send **<K406?>**  
Returns **<K powerups,resets>**

*Read Only Ranges:* 0 to 65,535 powerups, 0 to 65,535 resets.

### Resets

*Definition* Resets include watchdog reset, **<A>**, **<Z>**, **<Zd>**, and hardware defaults. A watchdog reset is a reset that is forced whenever the software locks-up.

*Usage:* Useful for detecting unwanted resets caused by power supply problems or ESD transients.

*Serial Cmd:* Send **<K406?>**  
Returns **<K powerups,resets>**

*Read Only Ranges:* 0 to 65,535 powerups, 0 to 65,535 resets.

## Time Since Last Reset

(This command is READ ONLY.)

*Definition:* Records the number of hours and minutes of operation since the last system reset.

*Usage:* Useful as a troubleshooting tool that can help pinpoint the cause of a reset.

*Serial Cmd:* Send **<K407?>**  
Returns **<K407 hours,minutes>**

*Read Only Ranges:* 0 to 23 hours, 0 to 59 minutes.

---

*Time Since Last Reset*



## *Chapter Contents*

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Wiring Box Ports .....	16-5
Wiring Box PCB with Connectors .....	16-8
Mounting Plate .....	16-9

This section has instructions for assembling, wiring and using the MS-880 scanner's optional Wiring Box. When this option is selected, the Ms-880 scanner and wiring box option are shipped as an assembly.

## Wiring Box Description

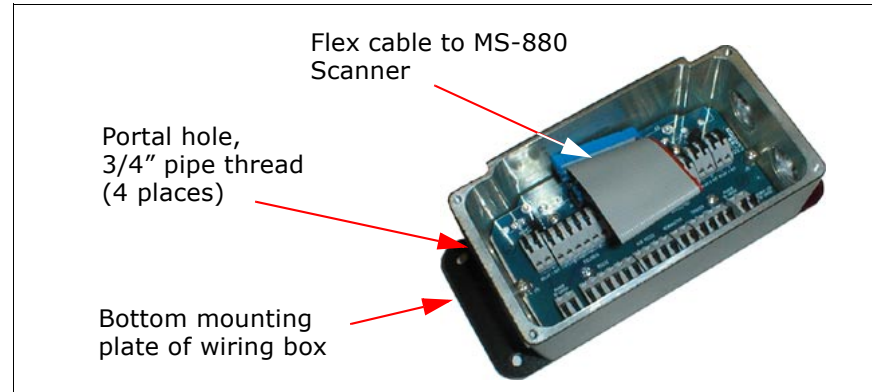


Figure 16-1 Wiring Box

**Note:** Wiring Box PCB and Protocol Card (when used) reside inside the wiring box.

### Portal Holes

The wiring box has four external portal holes which are standard 3/4" pipe thread. Mounting of the box is with four through holes in flanges that extend out over the ends.

### Terminal Strip Specifications

Wire strip length: .24" (6 mm)

Wiring range: 14 - 28 AWG

Current: 13A maximum

## Installation Steps

Note: For terminal details, see [figure 16-2](#).

1. Connect power through portal holes (see ["Connect the System" on page 1-3](#)).
2. Temporarily apply power to the scanner and confirm that light next to input terminal is green and not red.
3. Disconnect power before making remainder of connections.
4. Connect host and trigger port wires through portal holes to appropriate connections.
5. Plug ribbon cable into scanner as shown below (apply pressure back and forth on connector to ensure that it seats inside the receptacle).

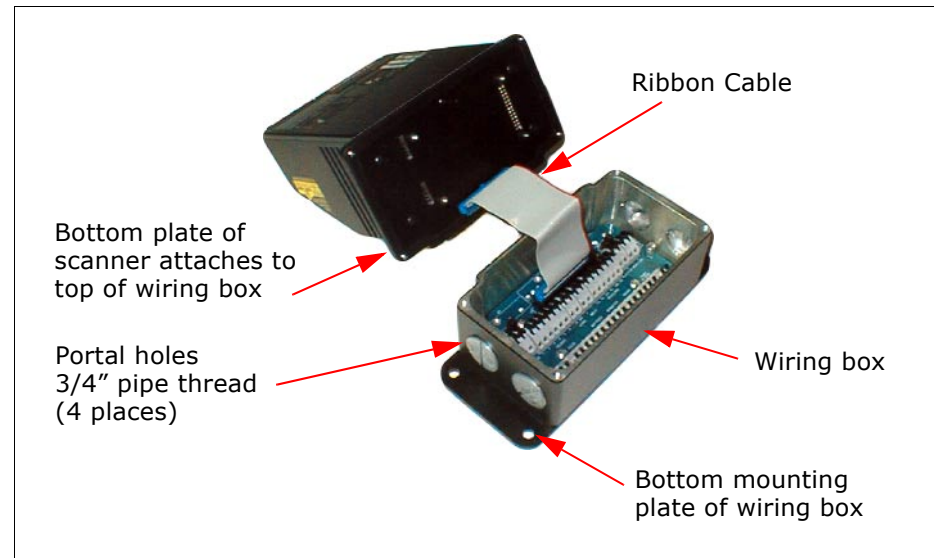


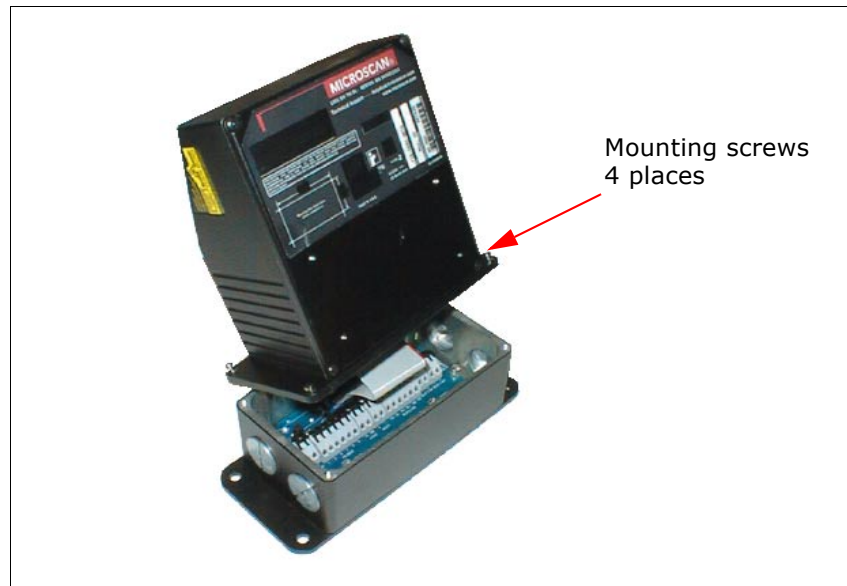
Figure 16-2 Scanner/Wiring Box Assembly

6. If using the network protocol card, connect card to underside of scanner (see the *MS-880 Network Protocol User's Manual (83-110015)* for detailed information about the network protocol cards).

---

*Installation Steps*

7. Attach scanner to wiring box with 4 attached mounting screws in the bottom plate of the scanner, taking care that gasket is evenly seated.



*Figure 16-3 Attaching the Scanner*

8. Mount wiring box (see ["Wiring Box Ports" on page 16-5](#)).

# Wiring Box Ports

(Refer to [Figure 16-7](#) or actual PCB)

## Relay Modules

These can be used as an alternative to the 3 optoisolated outputs from the scanner itself. K1, K2, and K3 are pluggable module sockets for SM off-the-shelf AC/DC output/relay modules. Relay modules are installed as shown in [Figure 16-4](#).

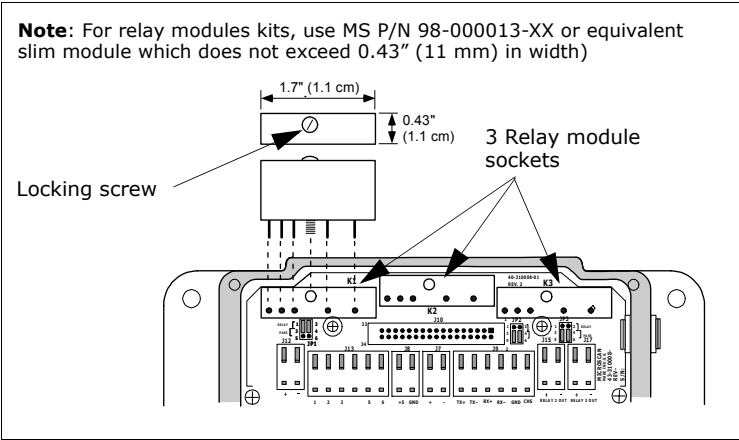


Figure 16-4 Relay Module

## Jumpers

When installing relay modules in K1, K2, and K3, corresponding jumpers (J1, J2, J3) need to be moved as shown in [Figure 16-5](#). Move jumpers from 3-5 to 1-3 and 4-6 to 2-4 for each relay to be installed (K1, K2, K3).

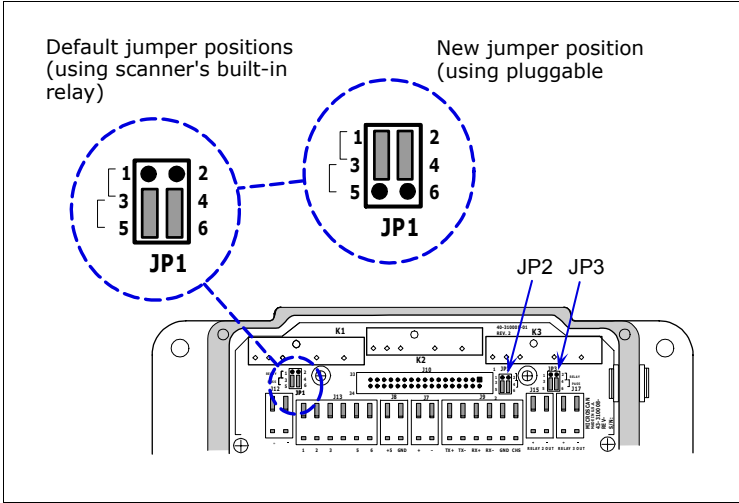


Figure 16-5 Relay Jumpers

## Wiring Box Ports

## Relay Terminals.

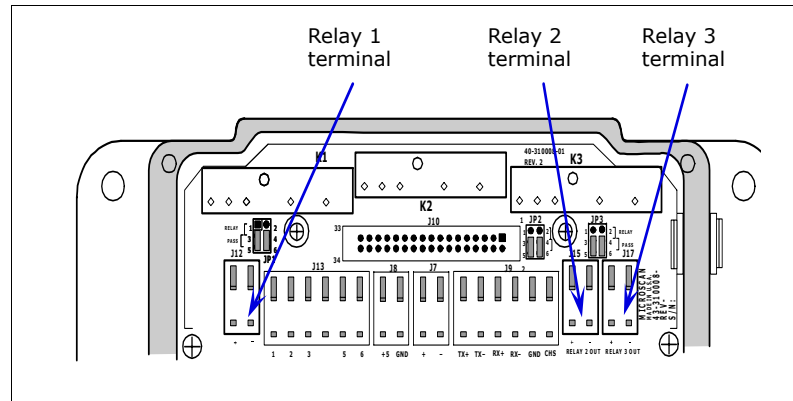


Figure 16-6 Relay Module

Relay terminals 1, 2, and 3 provide output for both internal optoisolated outputs and alternative relay modules that can be installed in modules K1, K2, and K3.

Relay1 Output handles discrete outputs from the scanner that will switch up to 100 mA of opto-isolated current. See *MS-880 Network Protocol Card User's Manual* (83-110015) for connections.

### Field Bus Port (J10)

Used with an optional protocol card to connect as a node from a network wired directly into this terminal strip.

### +5 VDC

Voltage out that can drive a hand held scanner. Maximum current is 5 watts.

### Input 1

Used to wire a switch to reset latch mode or counters.

### RS-422/485

Used for multidrop or 422 port.

### Power 10-28 VDC

Power input port (left side and right side for connectivity convenience).

## **RS-232**

Main serial communication port. (See [Table A-7, "Host 25-pin Connector,"](#) on page A-8.)

## **Aux RS-232**

Daisy chain and auxiliary connections. (See [Table A-7, "Host 25-pin Connector,"](#) on page A-8.)

## **New Master Pin**

Allows you to wire in a switch for New Master Pin. (See ["Optoisolator Inputs"](#) on page A-11.)

## **Trigger Port (NPN)**

To initiate the read cycle. (See ["Optoisolator Inputs"](#) on page A-11.)

## **Power LED**

GREEN means the polarity of the input connections is correct; RED means it is reversed.

**Caution:** While the MS-880 scanner has reverse polarity protection built in to its circuitry, the wiring box does not protect external circuits that may already be wired in when power is applied.

# Wiring Box PCB with Connectors

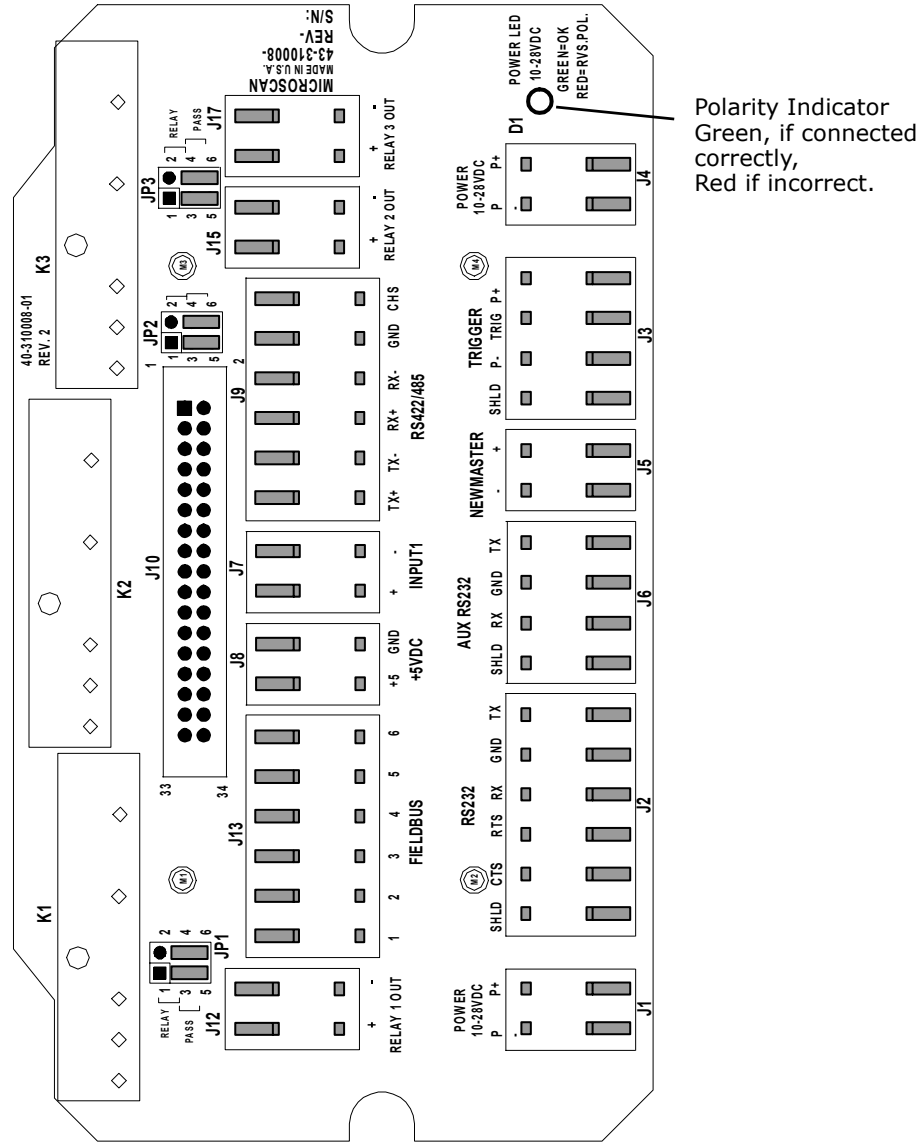


Figure 16-7 Wiring Box PCB



# Mounting Plate

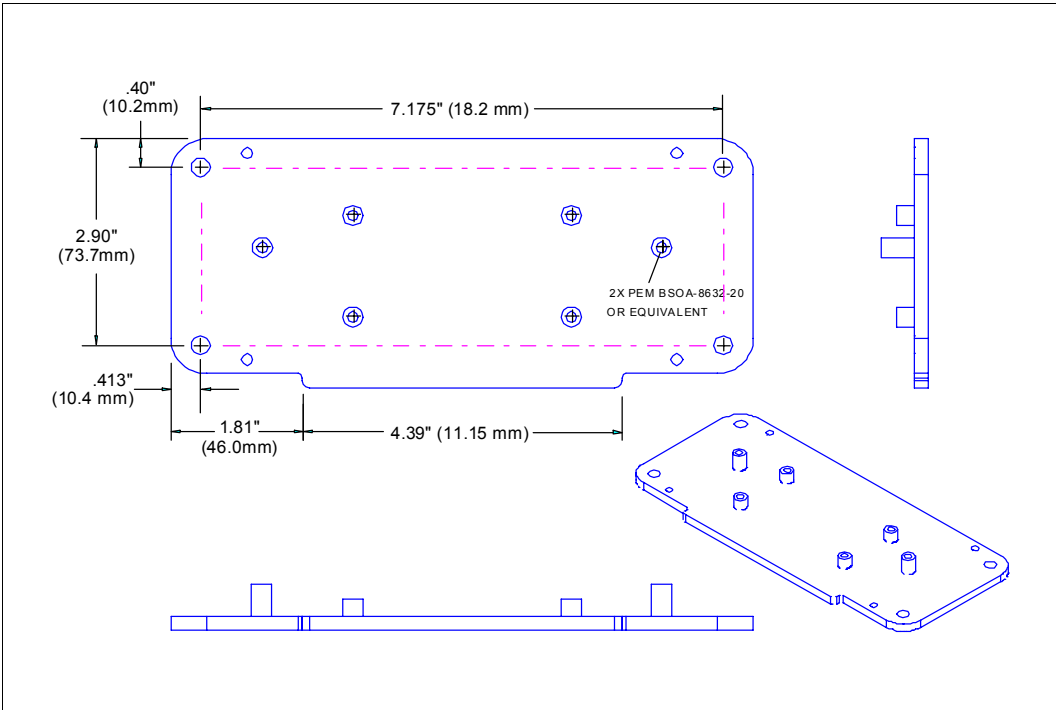


Figure 16-8 Wiring Box Bottom Plate



## Chapter Contents

File Transfer .....	17-5
Counters .....	17-6
Part Number .....	17-8
Checksum .....	17-9
Read Rate .....	17-10
Device Control .....	17-12
Code Type .....	17-13
Defaulting/Saving/Initializing .....	17-13

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" and a numeric code. Nor do they require an initialization command (<A> and <Z>). They can be entered from within any terminal program or from within ESP-MP in the **Terminal** window or the window adjacent to the **Utilities** menu.

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

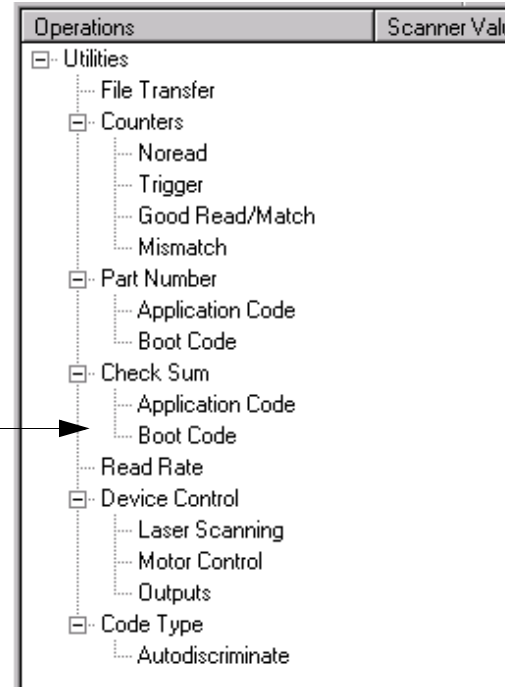
## Utilities by ESP Menu

17-Utilities



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

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



**Note:** Utility commands are not accessible by embedded menus.

## Utilities by Serial Command

Table 17-1 Summary of Utility Serial Commands

Command Type	Command	Name
Counter Request and Clear	<N>	Noread Counter
	<O>	Noread Counter Reset
	<T>	Trigger Counter
	<U>	Trigger Counter Reset
	<V>	Good Read/Match Counter
	<W>	Good Read/Match Counter Reset
	<X>	Mismatch Counter
	<Y>	Mismatch Counter Reset
Part Number Checksum/	<!>	Display all three Checksums of Flash memory
	<!b>	Display Checksum for Boot Code
	<!a>	Display Checksum for Application Code
	<#>	Display both Part Numbers
	<#b>	Display Boot Code Part Number
	<#a>	Display Application Code Part Number
Read Rate	<Cp>	Enter Single Label Percent Rate Test
	<C>	Enter Single Label Decode Rate Test
	<Cm>	Enter Multilabel Percentage Rate Test
	<Cs>	Enter Multilabel Decode Rate Test
	<a1>	PDF Information
	<J>	Exit Decode Rate and Percent Rate Test
Read Rate	<CPDF>	Enter Percent PDF Read Rate Test
Device Control	<H>	Enable Laser Scanning
	<I>	Disable Laser Scanning
	<KE>	Motor On
	<KF>	Motor Off
	<L1>	Programmable Output 1
	<L2>	Programmable Output 2
	<L3>	Programmable Output 3
Code Types Commands	<P>	Autodiscriminate All Codes
	<Q>	Enable Code 39 Only
	<R>	Enable Codabar Only
	<S>	Enable I 2/5 Only
Trigger	<char>	Serial Trigger Character

Default/Reset/ Save	<b>&lt;A&gt;</b>	Reset (does not save for power-on)
	<b>&lt;Ad&gt;</b>	Default
	<b>&lt;An&gt;</b>	Restore Saved Settings
	<b>&lt;Z&gt;</b>	Reset/Save (for power-on)
	<b>&lt;Zp&gt;</b>	Save Factory Settings
	<b>&lt;Zd&gt;</b>	Save/Restore Factory Defaults
Master Label	<b>&lt;E&gt;</b>	Enable Master Label *
	<b>&lt;F&gt;</b>	Disable Master Label*
	<b>&lt;G&gt;</b>	Store next label scanned to database. <sup>a</sup>
	<b>&lt;Mmaster label number,data&gt;</b>	Enter data to database for specified label*
	<b>&lt;M?&gt;</b>	Request master label information*
	<b>&lt;Mmaster label number,&gt;</b>	Delete Master Label*
Network Status	<b>&lt;n&gt;</b>	Network Status Command (See the "Network Protocol Manual" 83-110015)
Status Commands	<b>&lt;-&gt;</b>	Input Status
	<b>&lt;?&gt;</b>	Scanner Status
	<b>&lt;?1&gt;</b>	Extended Scanner Status
	<b>&lt;K?&gt;</b>	Configuration Status

a. If no number is included, the label will be saved to database number 1.

\*Can also be set in the configuration menu or with a serial configuration command. (See [Chapter 11](#), "Matchcode.")

# File Transfer

File transfer is used to download application code to the scanner.

Application code versions are specific to your scanner. Consult with your sales representative before downloading application code. If needed, an application code will be sent to you in the form of a **\*.mot** file.

To download application code:

1. First make sure the host is connected to your scanner.
2. Apply power to the scanner.
3. In the **Utilities** window, right-click on **File Transfer** and select **Download/App Code**.

This will open a file dialog box.

4. Navigate to the appropriate file (a **\*.mot** file) and open the file.

As application code begins to download to the scanner, the scanner will go silent, the scanner's RDY and GD/RD LEDs will flash intermittently, and a progress indicator at the bottom of the ESP window will let you know when the download is complete.

**Caution:** Do not interrupt power or disconnect the host cable while download is in progress.

# Counters

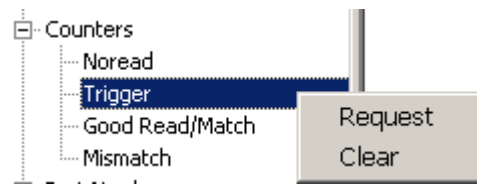
Counter commands can be a numeric value from 00000 to 65,535. After reaching the maximum numeric limit of 65,535, an error message will be displayed and the counter will automatically roll-over and start counting again at 00000. To obtain the cumulative total of counts after the roll-over has occurred, 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.

## By ESP

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

**Right-click** the appropriate counter option and select **Request** to display count or **Clear** to set counter to zero.



## By Serial Command

### 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.

### 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 (or Good Read Counter)

Sending **<V>** displays the total number of good reads matching the master label or, if Master Label 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 Label is enabled. If Master Label 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.

*Mismatch Counter*

Sending **<X>** displays the number of decoded labels since the last reset that do not match the master label.

*Mismatch Counter Reset*

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

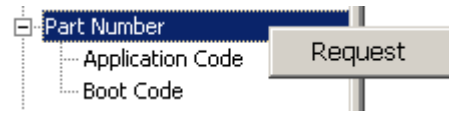
## Part Number

You can send a request to the scanner for part numbers, checksums, boot code, and application and code.

### By ESP

You can access **Part Number** from the **Utilities** menu.

**Right-click** the appropriate option and select **Request** to see the associated part number or check sum number.



### By Serial Command

Upon sending **<#>** the scanner returns software part numbers for application code **<#a/\_\_\_\_>** and boot code **<#b/\_\_\_\_>**.

Individual part numbers for **Application Code** and **Boot Code** are returned when their respective commands **<#a>** and **<#b>** are sent.

# Checksum

You can send a request to the scanner for part numbers, checksums, boot code, and application and code.

## By ESP

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

**Right-click** the appropriate option and select **Request** to see the associated part number or check sum number.



## By Serial Command

Upon sending **<!>** the scanner returns three 4-digit hex numbers that are displayed under **Check Sum**. Checksums verify a scanner's flash memory.

Individual checksums for **Boot Code** and **Application Code** are returned when their respective commands **<!b>** and **<!a>** are sent.

# Read Rate

You can do a read rate test for decode rate or percent by ESP or serial command.

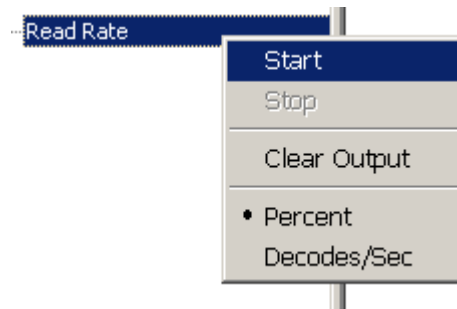
## By ESP

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, right-click **Read Rate** and make the selection.

17-Utilities



## By Serial Command

### *Enter Single Label Decodes/Second Test*

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

### *Enter Single Label Percent Test*

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

### *Enter Multilabel Percent Test*

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

### *Enter Multilabel Decode Rate Test*

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

### *Enter Percent PDF Read Rate Test*

Sending **<CPDF>** instructs the scanner to transmit the number of decodes per second on the full PDF label. This test includes both capture and decode and translation time. Note that the output format of the data is done as a running average of 750 mS windows. This means that you can remove the label from the view of the scanner and it will continue to transmit some history of the label for a few outputs.

### *End Read Rate Test*

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

### *Enable PDF Information*

Sending the **<a1>** check box will cause PDF417 symbology data to be prefaced with information consisting of error correction level, number of rows, number of columns, number of informative code words and the number of data characters.

Explanation of above PDF Info sample of a PDF417:

Level = 5 tells you that the error correction level is level 5. There are 13 rows and 6 columns. There are 14 info code words, and 16 characters in the data.

This feature can be disabled by using the exit read rate command **<J>**.

# Device Control

You can control laser scanning by ESP or serial command.

## By ESP

You can access **Device Control** from the **Utilities** menu.

For any of the **Device Control** commands, **right-click** on the command and make your selection.

17-Utilities



## By Serial Command

### Enable Laser Scanning

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

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

### Disable Laser Scanning

Sending **<I>** will turn the laser off. This feature is useful during extended periods of time when no bar code labels 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.

### Motor On

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

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

### 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.

**Output #1**

Sending **<L1>** activates the link between Output 1(+) and Output 1(-) of the 25-pin host connector (regardless of Master Label or Output 1 status).

**Output #2**

Sending **<L2>** activates the link between Output 2(+) and Output 2(-) of the 25-pin host connector (regardless of Master Label or Output 2 status).

**Output #3**

Sending **<L3>** activates the link between Output 3(+) and Output 3(-) of the 25-pin host connector (regardless of Master Label or Output 3 status).

## Code Type

See also ["Autodiscriminate" on page 5-29](#) for a discussion of **Utility** commands for **Code Types** and **Autodiscrimination**.

*Default:*       **Code 39 (only)**  
*Options:*       **<P>** Enables most code types.  
                  **<Q>** Enable Code 39 only  
                  **<R>** Enable Codabar only  
                  **<S>** Enable I 2/5 only

## Defaulting/Saving/Initializing

See [Appendix I — "Defaulting/Saving/Initializing" on page A-24](#).





# Appendices

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Appendices

# Appendix A — General Specifications

Appendices

## Key Features

- Multiple label and symbology reading
- Extra-long scanning range to 90 inches
- Autofocusing
- Programmable raster scanning
- IrDA (infrared) port (palm pilot compatible)
- 3 programmable outputs
- Industrial IP65 rated enclosures
- Optional wiring box, IB-880

## Mechanical

Depth: 3.5 in (88 mm)

Width: 5" (127 mm)

Height: 6 in. (152 mm)

Weight: 5 lbs. (227 g)

## Environmental

Enclosure rating: IP65 for scanner and wiring box

Operating temperature: 0° to 50°C

Operating temperature: 0° to 40°C

Storage temperature: -50° to 75°C

Humidity: Up to 90% (non-condensing)

## Emissions and Immunity

General immunity for ITE equipment:  
EN 55024:98

General immunity for light industry: EN  
50082:97

General immunity for heavy industry:  
EN 61000-6-2:98

Radiated and conducted emissions  
of ITE equipment: EN 55022:98, Class A

## Laser Light

Semiconductor visible laser diode: 650nm nominal; 780nm nominal (optional)

Safety class: CDRH Class II

Operating Life: 40,000 hours @25°C

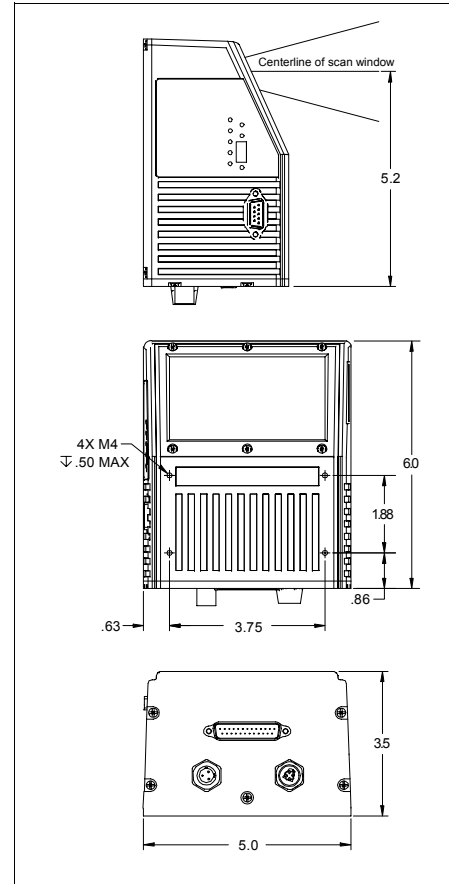


Figure A-1 MS-880 Scanner Dimensions

### Scanning Parameters

Scanning mirror type:  
 Rotating, 14-faceted mirror  
 Scan rate: 400 to 1000 scans per second  
 Scan width angle: Typically 60°; Pitch: ±50° max.; Skew: ±40° max.  
 Label contrast: 25% min. absolute dark to light differential at 650nm wavelength  
 Raster sweep angle: ±15°  
 Raster sweep speed: 1 to 10 sweeps per second

### Communication

RS-232, RS-422/485, Daisy Chain RS-232, RS-422/485, SDS,\* DeviceNet,\* Profibus,\* Ethernet,\* daisy chain/auxiliary port capable, IrDa port\*\*

\*Used in conjunction with an accessory protocol card.  
 \*\*The IrDa port allows communication by Palm and laptop computers.

### Protocol Options with Wiring Box

DeviceNet, Profibus DP, Modicon Ethernet, DH485

### Code Types

Standard offering: Code 128, Code 39, Code 93, Codabar, Interleaved 2 of 5, UPC/EAN, PDF417, Pharma Code  
 Application standards: AIAG, UCC/EAN-128

### FIS Options

Table A-1 MS-880 FIS Options

-001	MS-880 Standalone
-002	MS-880 for Wiring Box

### Read Ranges

Table A-2 MS-880 Read Ranges

Narrow-bar-width	Scanning Distance
.0075" (.190mm)	10" to 35" (.254 to .889m)
.010" (.254mm)	10" to 44" (.254 to 1.118m)
.015" (.381mm)	10" to 74" (.254 to 1.880m)
.020" (.508mm)	10" to 90" (.254 to 2.286m)
.030" (.762mm)	10" to 100" (.254 to 2.540m)
.040" (1.020mm)	10" to 110" (.254 to 2.794m)
.050" (1.27mm)	10" to 120" (.254 to 3.048m)

Mounting Specifications

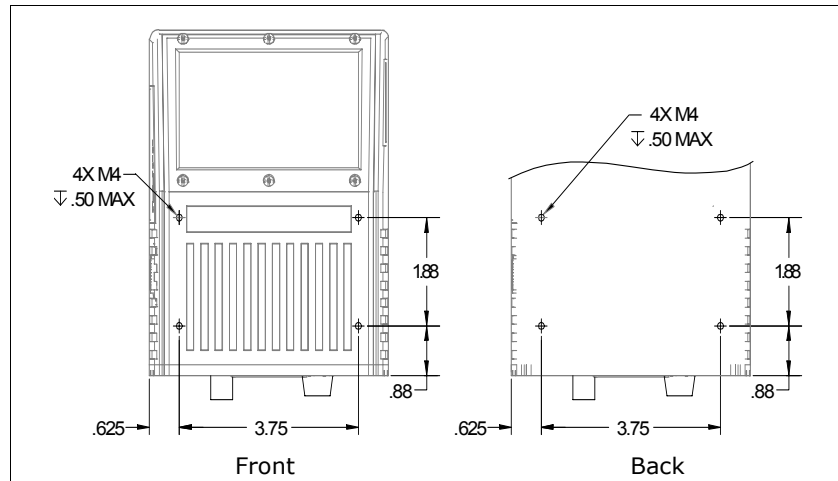


Figure A-2 Mounting Dimensions

Appendices

**Beeper**

Beeps on output (good read, noread, match, or mismatch), serial command confirmation, on/off.

**LED Indicators**

Table A-3 MS-880 Status Lights (on the side of the MS-880)

LED	State	Status
POWER	Green-On	Scanner has power
	Green-Off	No power
GOOD READ (not in read rate test)	On	Scanner is ready to read
	Off	Scanner is not ready to read
STATUS (not in read rate test)	On	Scanner is in a read cycle <sup>a</sup>
	Off	Scanner is not in a read cycle
20%, 40%, 60%, 80%, 100%	On	Represents the percentage of good reads <sup>b</sup>
NETWORK STATUS	This LED is only used with embedded protocols, and its function depends on the protocol used. <sup>c</sup>	
MODULE STATUS	Same as NETWORK STATUS above.	

- a. In **Continuous** and **Continuous1**, the status light is always on.
- b. If these LEDs are flashing in a pattern and the scanner is not in a read rate test, there is an error pattern. Contact Microscan support if this occurs.
- c. Refer to Appendix A of the **MS-880 Network Protocol User's Manual** for a breakdown of the LED modes.

**Power LEDs (inside the wiring box)**

OFF = No power is present  
RED = power is present, but reversed  
GREEN = power is present and correct

**Safety Certifications**

FCC, CDRH, CE, UL/cUL, TÜV, BSMI

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

© Microscan Systems, Inc., Specifications subject to change

## Appendix B — Electrical Specifications

Maximum Operating Power: 24 Watts

Power Input: 10 to 28VDC, 200mV p-p max. ripple, 230 mA @ 24VDC (typical)

Trigger, New Master, Input 1: 4.5 to 28 VDC (optoisolated)

### Pin Assignments

**Note:** See ["Connect the System" on page 1-3](#) for power and host connections.

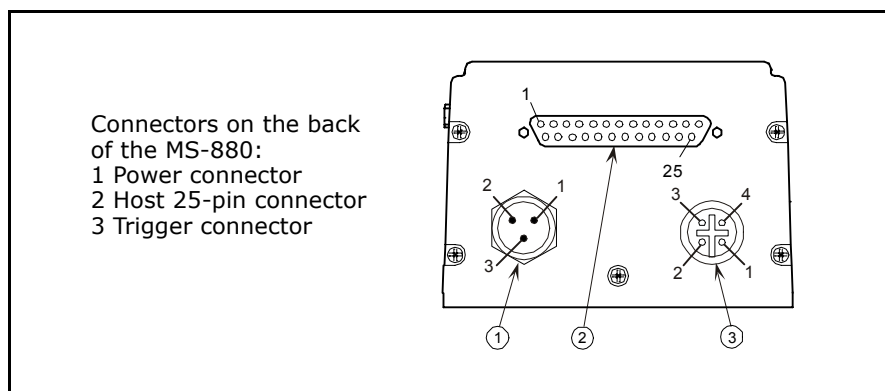


Figure A-3 Electrical Connectors

Table A-4 Power Connector

1	Power ground <sup>a</sup>	
2	Chassis ground	
3	Power + 10 to 28 VDC	In

a. Power ground: Used for power return only.

**Caution:** If using your own power supply, verify correct connection of power and ground lines. Incorrect connections or use of "Chassis ground," "Power ground," and "Signal ground" lines could cause equipment and/or software failure.

Table A-5 Trigger Connector

1	Power +10 to 28 VDC	Out
2	NPN	
3	Power ground <sup>a</sup>	
4	N/C	

a. Power ground: Used for power return only.

Table A-6 Host 9-pin Configuration Connector

2	RxD232	In
3	TxD232	Out
5	Signal ground <sup>a</sup>	
9	Boot Mode	

a. Signal ground: Used for communication and signal line grounds only. Not to be used as power or chassis return.

Table A-7 Host 25-pin Connector<sup>1</sup>

Pin	Host RS232	Host & Aux RS232	Host RS422/485	In/Out
1	Chassis ground <sup>a</sup>			
2	Host TxD			Out
3	Host RxD			In
4	RTS	Aux TxD		Out
5	CTS	Aux RxD		In
6	Output 1 (+)			Out
7	Signal ground <sup>b</sup>			
8	Output 2 (+)			Out
9	Trigger (-)			In
10	Trigger (+)			In
11	N/C			
12	Input 1 (+)			In
13			RxD (+)	In
14			TxD (-)	Out
15	Noread/Output 3 (+)			Out
16			RxD (-)	In
17	Power ground <sup>c</sup>			
18	Power +10 to 28 VDC			In
19			TxD (+)	Out
20	Output 1 (-)			Out
21	Output 2 (-)			Out
22	Noread/Output 3 (-)			Out
23	Input 1 (-)			In
24	New Master (-)			In
25	New Master (+)			In

a. Chassis ground: Used to connect chassis body to earth ground only. Not to be used as power or signal return.

b. Signal ground: Used for communication and signal line grounds only. Not to be used as power or chassis return.

c. Power ground: Used for power return only.

**Caution:** If using your own power supply, verify correct connection of power and ground lines. Incorrect connections or use of "Chassis ground," "Power ground," and "Signal ground" lines could cause equipment and/or software failure.

1. The host can also be accessed by the 9-pin configuration port connector on the side, by the IrDA port connector, or by connections inside the wiring box, if wiring box is used.

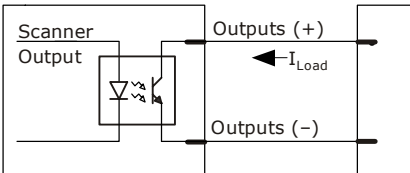


### Optoisolator Outputs

Optoisolator circuits can transfer pulses between the scanner and peripherals with no direct connection with the scanner’s internal circuitry. However, not every optoisolator configuration provides complete isolation. The following diagrams show both fully optoisolated and non-optoisolated circuits. They are only examples and do not represent all the possible wiring configurations.

Generic Output Waveform Characteristics

	$I_{load} = 5\text{ mA}$	$I_{load} = 50\text{ mA}$	$I_{load} = 100\text{ mA}$
$V_{Out-On}$	0.7V	0.9V	1.0V
$t_{On-Typ}$	30 $\mu\text{S}$	20 $\mu\text{S}$	30 $\mu\text{S}$
$t_{Off-Typ}$	1000 $\mu\text{S}$	150 $\mu\text{S}$	75 $\mu\text{S}$

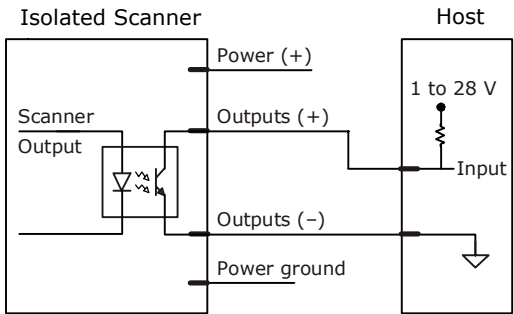


### Output Circuit Examples

#### Fully Optoisolated

This circuit is fully optoisolated and the recommended configuration. It allows the user to apply 1 to 28 VDC to the circuit.

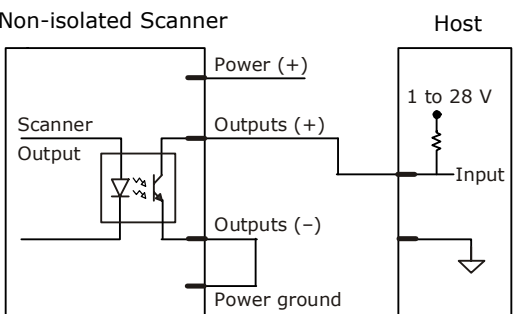
**Caution:** The maximum current that can pass through the optoisolator is 100 mA.



#### Not Optoisolated, Scanner Grounded

In this diagram, power is applied externally, but the scanner’s power ground is used to complete the circuit. This setup involves some risk to the optoisolator if excessive voltages are applied.

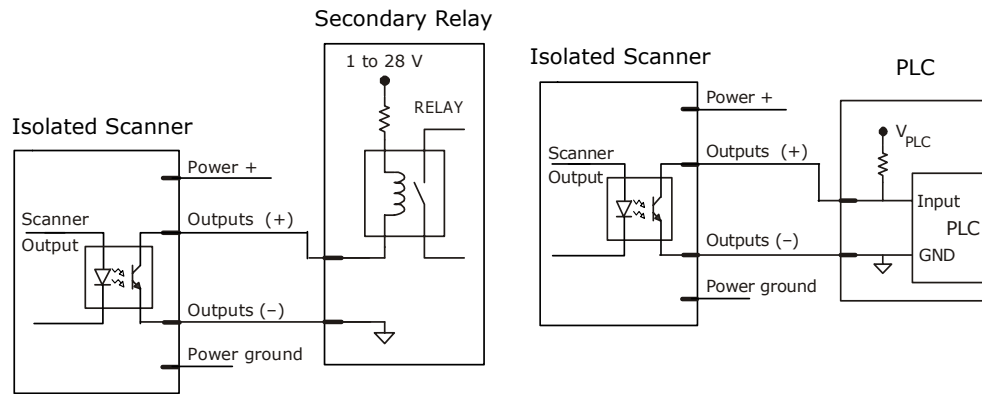
**Caution:** The maximum current that can pass through the optoisolator is 100 mA.



Appendices

Appendix B

Additional Isolated Output Circuit Examples



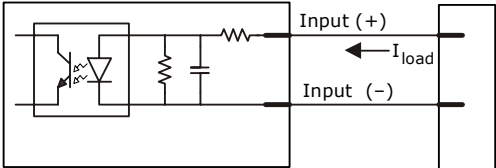
Appendices

### Optoisolator Inputs

All discrete inputs can be fully isolated pulses as PNP or NPN circuits. Inputs include trigger, new master, and other discrete inputs.

Generic Waveform Characteristics

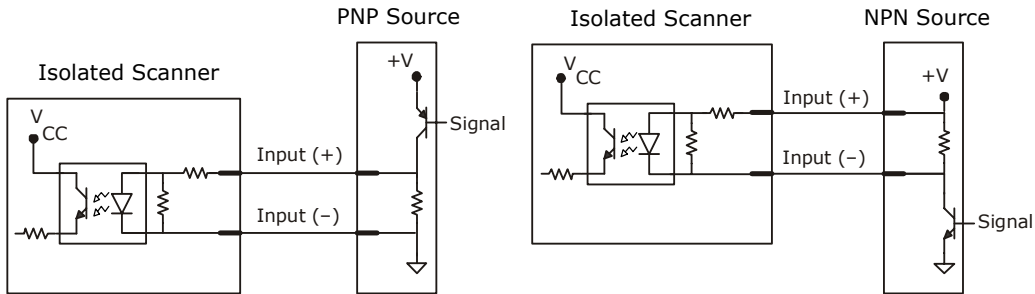
	Minimum	Maximum
$V_{IN-HIGH}/I_{IN-HIGH}$	4.5V/4mA	28V/33mA
$V_{IN-LOW}/I_{IN-LOW}$	0V/0mA	2V/2mA
Pulse Width <sub>min</sub>	48 μS	



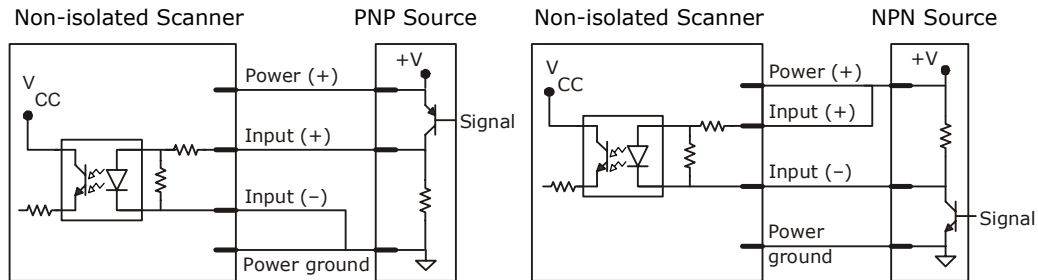
**Note:** Trigger pulses can be sent to the scanner either through the host 25-pin connector or a separate 4-pin trigger connector.

### 25-Pin Connector Input Examples

#### Fully Optoisolated



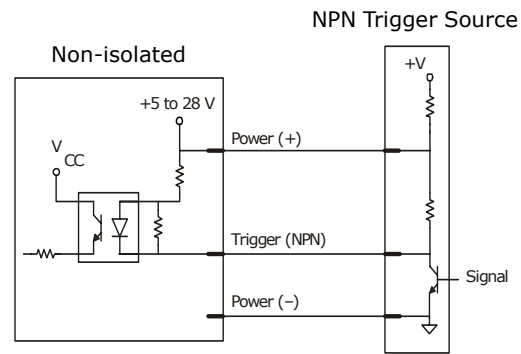
#### Not Optoisolated



Appendices

Appendix B

4-Pin Connector Trigger Input Example



Appendices

# Appendix C — IrDA Configuration Port

Provided the 9-pin configuration port is not being used, the IrDA infrared port is always active and can be used to communicate with an infrared-equipped remote terminal such as a laptop or a palmtop computer. It uses the standard IrCOMM 9-wire modem emulation.

The Configuration Port communications parameters are fixed: **parity = none, stop bits = 1, and data bits = 8**, with the RTS/CTS channel not used. The IrDA port initially connects at a baud rate of **9600 b**, then automatically increases the rate to **115K b**, or to a smaller value as determined by your remote IrDA terminal.

In order to communicate with the scanner's IrDA port, the remote infrared-equipped computer must contain a terminal-emulation software application and the application's serial port setting must redirect serial data to the computer's IrDA port.

**Note:** If the IrDA port is being used to access the embedded menus and the infrared beam is interrupted for longer than the IR timeout time, then the system will exit from the embedded menus and a reset-without-save event will occur.

**Note:** When the scanner's configuration port is connected to an RS-232 serial device, the IrDA channel will be disabled.

### Serial Menu:

Determines the flow of data between the infrared configuration port and a separate IrDA-equipped computer terminal.

Serial Cmd: <**K103**,IR status,IR timeout,menu mode>

### IrDA Status

*Definition:* Enables or disables the IrDA port.

*Usage:* Can be used to disable all IrDA port functions when access by palmtops is not desired, or when the scanner's periodic infrared query pulses interfere with nearby optical sensors.

*Serial Cmd:* <**K103**,IR status,IR timeout,menu mode>

*Default:* **Disabled**

*Options:* 0 = Disabled  
1 = Enabled

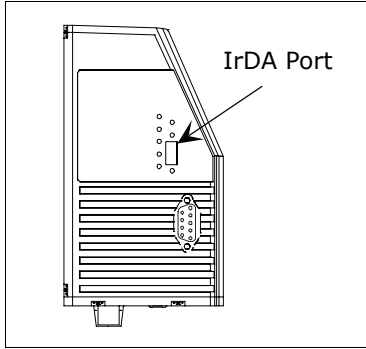


Figure A-4 Trigger Connector

---

## Appendix C

### IR Timeout

*Definition:* If the infrared beam is interrupted for a period longer than the IR timeout, then the scanner's IrDA port will purge any pending data, reset its baud rate to 9600 baud, and begin transmitting a periodic query signal.

*Usage:* If more than one IrDA-equipped computer terminal is to be used in rapid sequence with the same scanner, the scanner will not communicate with a second terminal until the infrared beam is blocked and the default 40-second timeout has expired. To quickly communicate with a second terminal, set the timeout to a smaller value.

*Serial Cmd:* <**K103**,*IR status*,**IR timeout**,*menu mode*>

*Default:* 40 seconds

*Options:*  
0 = 3 seconds  
1 = 12 seconds  
2 = 20 seconds  
3 = 40 seconds

### Embedded Menu Mode

*Definition:* Enables or disables VT100 cursor control sequences for a particular scanner communication port. To change the status of a particular port, issue the command through that port.

**Note:** The IrDA port communicates in VT100, the host, aux, and configuration ports use TTY.

*Usage:* When a VT100-style computer terminal is connected to the host, aux, configuration, or IrDA port, set the port mode from TTY to VT100 in order to use the terminal's cursor control keys within the embedded menus.

*Serial Cmd:* <**K103**,*IR status*,*IR timeout*,**menu mode**>

*Default:* **VT100**

*Options:*  
0 = TTY  
1 = VT100

## Appendix D — IrDA/Ir Comm for Palm Pilot

### Needed:

- Palm Pilot™ with IR port
- PC with internet connection and hotsynch cradle
- IrComm drivers
- VT100 Terminal Emulator application (shareware)

### Obtaining the drivers:

The IrDA drivers are found in the "irenhanc.zip" file available from Palm at:  
<http://www.palm.com/support/downloads/irenhanc.html>

### Installing the drivers:

(Read the "readme.txt" file in the zip file for complete instructions.)

1. Extract the file using a standard unzip utility. Save the 4 files in the your Palm (or Pilot) directory. (usually found at C:\Palm or C:\Pilot)
2. Put the Palm Pilot™ in its cradle.
3. Launch **Palm Desktop 3.0** on your PC.
4. Select the **Install Tool** icon.
5. Select the correct user name from the User list. Select the **Add** button.
6. Locate AMX.prc, IrLib.prc, SerialIrPanel.prc and SerIrCommLib.prc in the Palm (or Pilot) directory. Select the **Add** button for each of these files.
7. Select **Done**.
8. Perform a Hotsynch to load drivers in the Palm unit.
9. Select **OK**.
10. Use a paperclip to perform a soft reset on your Palm III. For more details, see "Soft Reset" in index of the **Basic Handbook** manual included with your Palm III.
11. Go to the **Prefs** app, and select **Serial/IR** from the drop down list in the upper right hand corner. Tap the **Infrared** box to select infrared communications. You must restore the setting to **Cradle** in order to use the Hot sync cradle.

**Note:** An option for transferring IrDA drivers by "beaming" from one IrDA-equipped Palm to another has been accompanied with problems. It is recommended that drivers be installed via Palm Desktop and the cradle.

## Appendix E — Serial Configuration Commands

The following table is a list of all the available serial configuration commands, presented in numeric order. These commands are also listed at the beginning of each applicable chapter. For utility (operational) commands see [Table 17-1, "Summary of Utility Serial Commands,"](#) on page 17-3.

Table A-8 Serial Configuration Commands in Numeric Order

Command Title	old cmds	new cmds	Format
Host Port Parameters	<b>Ka</b>	<b>K100,</b>	< <b>K100</b> ,baud,parity,stop bits,data bits>
Aux Port Parameters	<b>Ky</b>	<b>K101,</b>	< <b>K101</b> ,aux port mode,baud,parity,stop bits,data bits,daisy chain status,daisy chain ID>
IrDA Port and Text		<b>K103,</b>	< <b>K103</b> ,IR status,IR timeout,menu mode>
Host Protocol	<b>Kf</b>	<b>K140,</b>	< <b>K140</b> ,protocol>
Preamble	<b>Kd</b>	<b>K141,</b>	< <b>K141</b> ,status,preamble>
Postamble	<b>Ke</b>	<b>K142,</b>	< <b>K142</b> ,status,postamble>
Response Timeout	<b>KA</b>	<b>K143,</b>	< <b>K143</b> ,timeout>
Intercharacter Delay	<b>KB</b>	<b>K144,</b>	< <b>K144</b> ,time interval>
LRC	<b>Kc</b>	<b>K145,</b>	< <b>K145</b> ,status>
Aux/Config. Port Data		<b>K146,</b>	< <b>K146</b> ,aux status,config status>
Daisy Chain Auto Configure		<b>K150 DAISY</b>	< <b>K150DAISY</b> >
Daisy Chain Scanner ID		<b>K151,</b>	< <b>K151</b> ,daisy chain scanner,daisy chain scanner ID>
Communications Status Request	<b>KT?</b>	<b>K199?</b>	< <b>K199?</b> >
Triggering Mode	<b>Kg</b>	<b>K200,</b>	< <b>K200</b> ,trigger mode,filter time>
Serial Trigger Character	<b>Ki</b>	<b>K201,</b>	< <b>K201</b> ,character>
External Trigger State	<b>Kj</b>	<b>K202,</b>	< <b>K202</b> ,external trigger state>
End of Read Cycle	<b>Kh</b>	<b>K220,</b>	< <b>K220</b> ,end of read cycle status,timeout>
Decodes Before Output	<b>Km</b>	<b>K221,</b>	< <b>K221</b> ,decodes before output>
Multilabel	<b>KL</b>	<b>K222,</b>	< <b>K222</b> ,number of labels,multilabel separator>
Matchcode Type	<b>Kn</b>	<b>K223,</b>	< <b>K223</b> ,type,sequential matching,match start position,match length,wild card character,sequence on noread,sequence on every mismatch>
Master Label Database Size	<b>KM</b>	<b>K224,</b>	< <b>K224</b> ,number of master labels>
New Master Pin	<b>Kz</b>	<b>K225,</b>	< <b>K225</b> ,status>
Optoelectric Control		<b>K226,</b>	< <b>K226</b> ,mode,# active database settings,latch on trigger,timer value, control trigger 1,control trigger 2,control trigger 3>
Optoelectric Calibration Database		<b>K227,</b>	< <b>K227</b> ,database index,focus position,gain,tracking>



## Serial Configuration Commands

Command Title	old cmds	new cmds	Format
Sequential Step		<b>K228,</b>	< <b>K228</b> ,sequence step>
Start Serial Trigger Character		<b>K229,</b>	< <b>K229</b> ,start trigger character>
End Serial Trigger Character		<b>K230,</b>	< <b>K230</b> ,end trigger character>
Enter/Delete Master Label Data	<b>M</b>	<b>K231,</b>	< <b>K231</b> ,master label number,master label data [no data will delete current master label data]>
Request Master Label Data	<b>M</b>	<b>K231,</b>	< <b>K231</b> ,?>[for all] or < <b>K231</b> ,master label number?>
Operations Status Request	<b>KV?</b>	<b>K399?</b>	< <b>K399?</b> >
Warning Message Status	<b>K"</b>	<b>K400,</b>	< <b>K400</b> ,warning message status,laser high status,laser low status,novram/reset warning status>
Lifetime Hours	<b>K\$</b>	<b>K401,</b>	< <b>K401</b> ,hours10,message>
Over-temperature	<b>K+</b>	<b>K402,</b>	< <b>K402</b> ,degrees,message>
Under-temperature	<b>K-</b>	<b>K403,</b>	< <b>K403</b> ,degrees,message>
Laser Overcurrent	<b>K;</b>	<b>K404,</b>	< <b>K404</b> ,message>
Laser Undercurrent	<b>K:</b>	<b>K405,</b>	< <b>K405</b> ,message>
Power-on/Resets Counts	<b>K_</b>	<b>K406,</b>	< <b>K406</b> ,powerups,resets>
Time Since Last Reset	<b>K@?</b>	<b>K407?</b>	< <b>K407?</b> > returns: hours,minutes (read only)
Present Operating Temperature	<b>K%?</b>	<b>K408?</b>	< <b>K408?</b> > returns: deg (read only)
Narrow Margins/Symbol-ogy ID	<b>Ko</b>	<b>K450,</b>	< <b>K450</b> ,narrow margins status,symbology ID status>
Background Color	<b>Kx</b>	<b>K451,</b>	< <b>K451</b> ,background color>
Code 39	<b>Kp</b>	<b>K470,</b>	< <b>K470</b> ,status,check digit status,check digit output status,large intercharacter gap,fixed code length status,fixed code length,full ASCII>
Codabar	<b>Kq</b>	<b>K471,</b>	< <b>K471</b> ,status,start & stop match status,start & stop output status,large intercharacter gap,fixed code length status,fixed code length,check digit type,check digit output>
Interleaved 2 of 5	<b>Kr</b>	<b>K472,</b>	< <b>K472</b> ,status,check digit,check digit output,length 1,length 2,guard bar>
UPC/EAN	<b>Ks</b>	<b>K473,</b>	< <b>K473</b> ,status,EAN status,supplementals status,separator status,separator char,supplemental type>
Code 128	<b>Kt</b>	<b>K474,</b>	< <b>K474</b> ,status,fixed length,length...>
UCC/EAN-128	<b>Kt</b>	<b>K474,</b>	< <b>K474</b> ,,,,UCC/EAN-128 status,output format,separator status,separator character,application identifier parentheses,record padding>
Code 93	<b>K!</b>	<b>K475,</b>	< <b>K475</b> ,status,fixed code length status,fixed code length>
PDF417	<b>K[</b>	<b>K476,</b>	< <b>K476</b> ,status,raster sweeps before decode attempt,fixed code length status,fixed code length>

Appendices

## Appendix E

Command Title	old cmds	new cmds	Format
Pharma Code		<b>K477,</b>	< <b>K477</b> ,status,fixed code length status,fixed code length,min. no. of bars,bar widths,fwd/rev>
Code Type Status Request	<b>KW?</b>	<b>K499?</b>	< <b>K499?</b> >
Scan Speed	<b>KE</b>	<b>K500,</b>	< <b>K500</b> ,scan speed>
Maximum Element	<b>KI</b>	<b>K502,</b>	< <b>K502</b> ,max element>
Gain/Tracking	<b>KD</b>	<b>K504,</b>	< <b>K504</b> ,gain,tracking>
AGC Settings	<b>KH</b>	<b>K505,</b>	< <b>K505</b> ,transition counter status,transition counter threshold>>
Raster	<b>KR</b>	<b>K506,</b>	< <b>K506</b> ,status,top offset,bottom offset,raster sweep rate,read cycle on/off>
Focus	<b>K.</b>	<b>K508,</b>	< <b>K508</b> ,focusposition,zero position>
Scanner Setup Status Request	<b>KU?</b>	<b>K699?</b>	< <b>K699?</b> >
Laser	<b>KC</b>	<b>K700,</b>	< <b>K700</b> ,laser on/off status,laser framing status,laser off time,laser on time,laser power>
Serial Verification	<b>KS</b>	<b>K701,</b>	< <b>K701</b> ,serial command echo status,serial command beep status,control/hex output>
Beeper	<b>Ku</b>	<b>K702,</b>	< <b>K702</b> ,status>
Quality Output	<b>KJ</b>	<b>K704,</b>	< <b>K704</b> ,quality output separator,reads/trigger status>
Bar Code Output	<b>KI</b>	<b>K705,</b>	< <b>K705</b> ,status,when to output>
Output During Diagnostic Warning Messages		<b>K713,</b>	< <b>K713</b> ,output#,status1,status2,status3,status4,status5,status6,status7,status8,status9>
Noread Message	<b>Kk</b>	<b>K714,</b>	< <b>K714</b> ,status,message>
Output 1	<b>Kv</b>	<b>K720,</b>	< <b>K720</b> ,output on,active state,pulse width,output mode,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>
Output 2	<b>Kw</b>	<b>K721,</b>	< <b>K721</b> ,output on,active state,pulse width,output mode,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>
Output 3	<b>K'</b>	<b>K722,</b>	< <b>K722</b> ,output on,active state,pulse width,output mode,trend analysis mode,trigger evaluation period,number to output on,reads per trigger threshold>
Input 1	<b>KK</b>	<b>K730,</b>	< <b>K730</b> ,mode,active state>
Extraction Mode	<b>KS</b>	<b>K740,</b>	< <b>K740</b> ,output #,start position,length>
Insertion Mode	<b>Ku</b>	<b>K741,</b>	< <b>K741</b> ,output #,length,hex string>
Assignment Command	<b>KJ</b>	<b>K742,</b>	< <b>K742</b> ,label number,status>
Output Format Status	<b>KI</b>	<b>K743,</b>	< <b>K743</b> ,output format status>
Ordered Output		<b>K744,</b>	< <b>K744</b> ,filter#,code type,length,wildcard character,placeholder character,data>
Number of Filters		<b>K745,</b>	< <b>K745</b> ,number of filters involved>
Scanner Interface Status Request	<b>KX?</b>	<b>K899?</b>	< <b>K899?</b> >

## Appendix F — 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 17-1, “Summary of Utility Serial Commands,” on page 17-3.](#)

### Serial Configuration “K” Commands

See [Appendix F — “Serial Command Format” on page A-19.](#)

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

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

An initializing command <A> or <Z> always follows 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 <K473,1><Z>.

To change **Baud Rate** and reset without saving changes for power-on, send <K100,a3><A>.

**Note:** Previous serial commands had alphabetic parameters following the **K** and did not insert a comma before the 1st field, as in <Kf5>. The new “numeric” commands include a comma *after* the numeric parameter, as in <K140,5>.

### 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, <K100,4,1,0,0> can be entered as <K100,,,,0>.
- All fields *following* a modified field can be omitted. For example, to change **Baud Rate**, send <K100,3>.

### Concatenating Configuration Commands

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

### Serial Command Status Request

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

The status of a specific serial command can be requested by entering the command followed by a question mark. For example, send **<K142?>** to request the status of **Postamble**. Commands **<K199?>**, **<K399?>**, **<K499?>**, **<K899?>**, and **<K699?>** are used to request the status of groups of serial commands. Note that there is no comma between the numeric and the 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.

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

### 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 G — ASCII Table

Table A-9 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

Appendices

Table A-10 Communication Protocol Commands

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

## Appendix H — Embedded Menus

In addition to **ESP-MP**, you can also use a communications menu such as Microsoft's HyperTerminal™ to establish communication with Microscan's embedded menus.<sup>1</sup>

1. With your host connected to the 9-pin configuration port, set your host communications settings as follows: **57.6K** baud, **8** Data Bits, **1** Stop Bits, and **None** Parity. With your host connected to the 25-pin 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.)
4. Upon connection, send a **<D>** command to bring up the main menu.

MICROSCAN SYSTEMS, INC. CONFIGURATION PROGRAM MAIN MENU 35-558001-12	
TOPICS	DESCRIPTION
1) COMMUNICATIONS	HOST PROTOCOL & HOST/AUX PORT CONFIG.
2) OPERATIONS	TRIGGERING, TIMEOUTS, ETC.
3) CODE TYPES 1	CODE 39, I 2 OF 5, CODE 128, CODE 93
4) CODE TYPES 2	PDF417, CODABAR, UPC, CODE PARAMETERS
5) OPTO-ELECT. CONTROL	OPTO-ELECT. CONTROL, CONFIG. DATA BASE
6) SCANNER I/O	PROGRAMMABLE I/O
7) SCANNER OUTPUT	BEEPER, LASER, OUTPUT MODES, ETC.
8) SCANNER SETUP	FACTORY, AGC, AND RASTER SETTINGS
9) DIAGNOSTICS SETUP	WARNING MESSAGES, OPERATION TIME, ETC.
10) NETWORK CONFIGURATION	DEVICE NET, PROFIBUS, ETHERNET, DH, REM. I/O
11) OUTPUT ORDER FILTERS	SORT ORDER LABEL OUTPUT FILTERS.

ESC = MAIN MENU OR EXIT	N = NEXT ITEM
M = PREVIOUS MENU	SP = NEXT ITEM
B = PREVIOUS ITEM	CR = THIS ITEM

MAIN--> COMMUNICATIONS

Appendices

**Note:** The 9-pin configuration port settings are not changeable.

**Important:** To receive bar code data through the 9-pin configuration port, you must enable the port with the following command: **<K146,,1>**.

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

**Defaults** are original or saved settings. **Defaulting** occurs when default settings (from flash or user-saved NOVRAM) are restored. Defaulting might be necessary if you have made 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).

**Initializing** occurs whenever any command or set of commands is implemented.

**Active Memory** (SRAM) is where the scanner's active settings are stored during use. These are not available on power-up.

**User-saved NOVRAM** (*non-volatile random access memory*) is where the scanner's operating parameters are stored for power-on. It can be changed by user command.

**Flash Defaults** is where the scanner's default download/boot programs are stored. It can only be changed by downloading application/boot codes.<sup>1</sup>

### Defaulting

#### Restore NOVRAM Defaults to Active Memory

- Restores user-defined NOVRAM 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 Flash Defaults to Active Memory

- Restores flash defaults to memory.
- Initializes serial configuration commands in active memory and resets counters to zero.
- Does not save settings to NOVRAM for power-on.

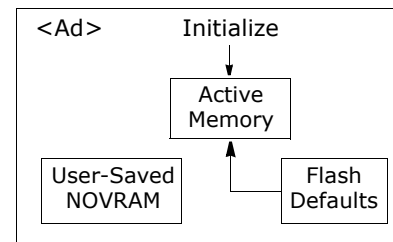
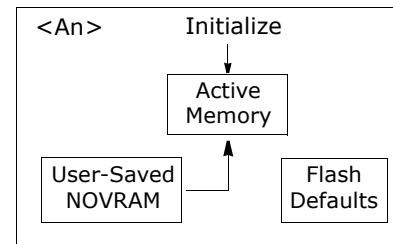
##### By Serial Command

Send **<Ad>** command to the scanner.

##### By ESP

- Right-click** in the configuration window and select **Default All ESP Settings**.
- Right-click** and select **Save to Scanner, Send and Save**.

1. See your Microscan sales representative to access the latest application codes.

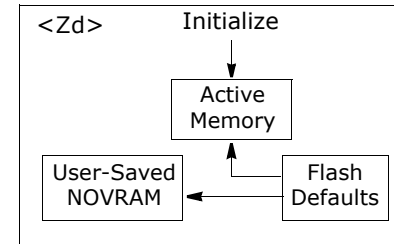




### Restore Flash Defaults to Active Memory and for Power-on

**Caution:** Defaulting the scanner to flash default settings will overwrite user-saved NOVRAM settings.

- Restores flash defaults to memory.
- Restores flash defaults to user-saved NOVRAM 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 Scanner, Send and Save**.

#### By Hardware Default

There is no hardware default for the MS-880. Default commands can be entered from any of the host connectors. Since the default communications settings on the 9-pin connector are fixed, you can always send a default the scanner through this port with a software command.

## Saving

### Save Active Settings except Factory for Power-on

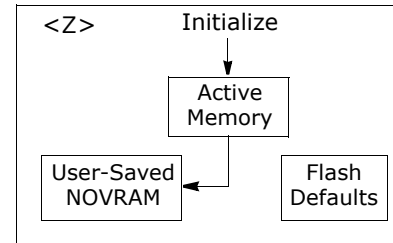
- Initializes serial configuration commands in active memory and resets counters to zero.
- Saves all active settings except factory settings to NOVRAM for power-on.

#### By Software Command

Send **<Z>** command to the scanner.

#### By ESP

**Right-click** in the configuration window and select **Save to Scanner, Send and Save**.



### Save Active Settings including Factory for Power-on

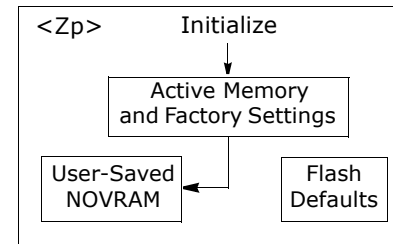
- Initializes serial configuration commands in active memory and resets counters to zero.
- Saves all active settings including factory settings to NOVRAM for power-on (factory settings include but are not limited to **Focus, Gain, Tracking, and Scan Speed**).

#### By Serial Command

Send **<Zp>** command to the scanner.

#### By ESP

**Right-click** in the configuration window and select **Advanced, Send and Save, Including Factory**.



## Initializing

Initializing is a part of all save and default functions. It is also used as a follow-on to implement serial configuration commands into active memory.

- Initializes serial configuration commands in active memory and resets counters to zero.
- Does not save settings to NOVRAM.

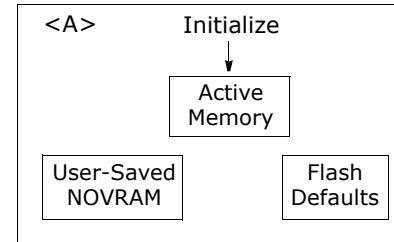
### By Serial Command

Send **<A>** after a serial configuration command or a string of serial configuration commands, for example, **<K141,1><A>**.

### By ESP

**Right-click** in the configuration window and select **Save to Scanner, Send No Save**.

This will initialize all serial configuration changes that have been made in the current ESP session.



## 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 the 25-pin port and wiring box connections. If this should occur, connect the scanner to the 9-pin port and set your host communications settings as follows: **57.6K** baud, **8** Data Bits, **1** Stop Bits, and **None** Parity. These settings for this port are fixed and cannot be changed. you should restore the scanner's defaults. If you wish to return to the 25-pin host port, you'll first need to change the scanner's communications settings by sending: **<K100,4,1,0,0><Z>**.

## Appendix J — Position Scanner and Bar Code

In positioning the scanner in relation to the bar codes being scanned, consider the following:

- Position the scanner in a place devoid of sunlight, bright lights, or laser light from other sources.
- Avoid excessive tilt, skew, or pitch. Maximum tilt is determined by label characteristics and the number of decodes required. Maximum skew is  $\pm 40^\circ$ ; maximum pitch is  $\pm 50^\circ$ .<sup>1</sup>
- Pitch or skew label or scanner a minimum of  $\pm 5^\circ$  to avoid specular reflection, the return of direct, non-diffused light.<sup>2</sup> For the MS-880, specular reflection is avoided by pitching labels at least  $5^\circ$  plus or minus from a line perpendicular to the default position of the **Bottom Offset** and **Top Offset**.

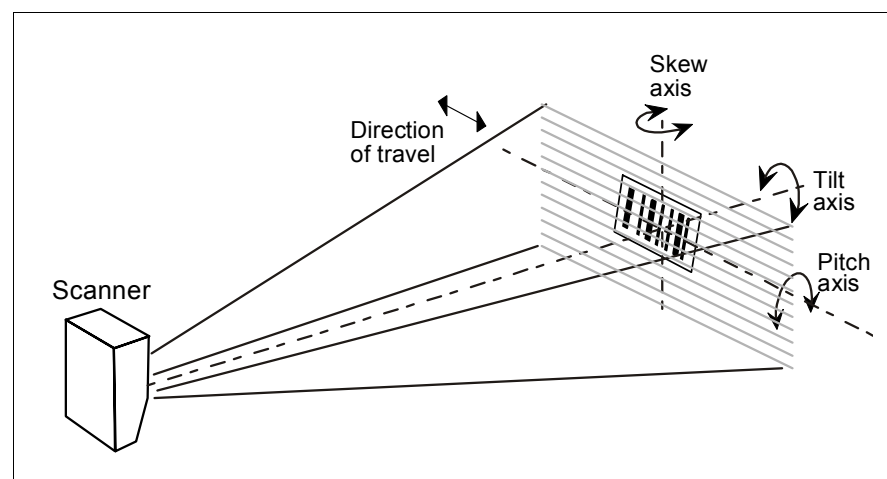


Figure A-5 Scanner/Label Position

1. Maximum tilt is determined by label characteristics and number of decodes required.
2. The specular reflection zone is a narrow zone straight out from the scanner in which direct reflected light from a label can distort the scanner's ability to distinguish bars from spaces.

## Appendix K — Position Object Detector

In a typical operation, a scanner will wait for bar code data only during a triggered read cycle. A read cycle is initiated by a “trigger” and can be in the form of a serial command from the host (internal trigger) or a signal from an object detector (external trigger).

When an object detector (also called a sensor, package detector, etc.) is used, it is set up so that its beam will bounce off the approaching object and the resulting pulse will be sent to the scanner to begin the read cycle. Typically, a detector is positioned so that it will detect the presence of an object before its label can be scanned.

An object detector is mounted in almost any position relative to the object as long as (1) the object passes within range of the detector and (2) direct or reflected light from the detector does not interfere with the scanner’s reception.

As the item continues to move down the line, its label moves into the scanner beam and is read by the scanner.

The drawing below shows a label in the picket fence direction with the object detector positioned so as not to cause interference.

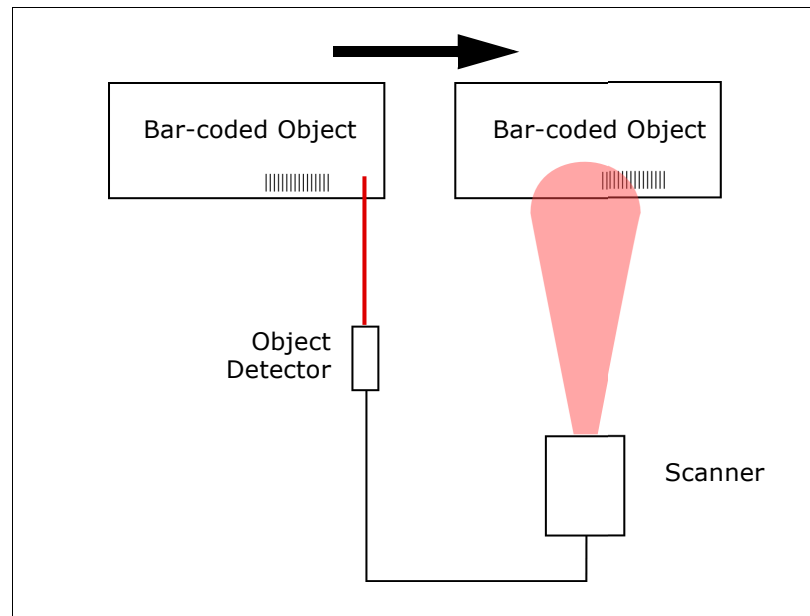


Figure A-6 Object Detector

## Appendix L — Test Decode Rate

### With a Static Label

1. Position a stationary bar code in front of a functioning scanner at the scan distance used in your application.
2. Set for single scan line scanning (**Top Offset** setting equal to **Bottom Offset**).
3. Enter a **<C>** command to see the decodes per second.

The decode rate is the number of decoded scans per total number of scan. It will appear at the beginning of the data strings.

**Note:** You can also enter a **<Cp>** command to see the percentage of decodes per scans.

4. Make a note of the decode rate. You will need this when calculating the number of decodes (see [Appendix M — “Formulas for Number of Decodes” on page A-31](#)).
5. End the test by sending the **<J>** command.

### Number of Decodes

To ensure reliable scanning, you need to apply a minimum of five decodes to each bar code. This means that all variables, label speed, read range, etc. are significant.

**Note:** Variations between labels are common. For this reason, the greater number of sample bar codes tested, the more likely you are to achieve optimum decode rates.

In general, the number of decodes of a given bar code can be increased by:

- Increasing label height
- Decreasing label length
- Increasing scan rate (spinning mirror speed)
- Slowing label speed
- Decreasing raster sweep rate
- Decreasing raster height

### With a Moving Label

Before testing with a moving label, it is highly recommended that you calculate the expected number of decodes by using the formulas in [Appendix M — “Formulas for Number of Decodes” on page A-31](#).

Once you’ve mounted the scanner, established a good read rate with a stationary label, and calculated the number of decodes for your label speed, you can begin decoding with moving labels.

## Appendix M — Formulas for Number of Decodes

To ensure reliable scanning, apply a minimum of *five* decodes to each bar code. Use the formulas below to calculate the number of decodes that your label will receive.

If the number of decodes you derive from one of these calculations is less than the minimum for your application, plug in the minimum number of decodes (5) and solve for another parameter that might be changed, such as label 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 label speed, label length, etc.

### Single Line Ladder Calculation

Ladder scanning is seldom done with raster scanning unless the raster is set for single scan line scanning (**Top Offset** setting equal to **Bottom Offset**) or bar codes are presented as stop-and-go.

For single scan line ladder scanning, use the following formula:

$$\left(\frac{LH}{LS} \times DR\right) - 3 = NS \text{ (number of decodes)}^1$$

**LH** (Label Height) (ladder formula only) is a measurement of the height of individual bars.

**LS** (Label Speed) is the distance per second that a bar code moves through the scan.

**DR** (Decode Rate) is the number of decodes per second that a given bar code receives (as derived from a stationary scan test in [Appendix L — “Test Decode Rate”](#) on [page A-30](#)).

Example 1:

LH = 1 inch

LS = 100 inches per second

DR = 900 scans per second

$$ND = \left(\frac{1}{100} \times 900\right) - 3 = 6 \text{ complete decodes}$$

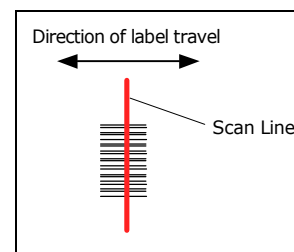


Figure A-7 Ladder

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.

## Raster Picket Fence Calculation

For raster picket fence scanning, the number of decodes (ND) is calculated in two formulas, one for sweep rate and the other for number of decodes.

### Sweep Rate.

Since the speed of the raster (SwR) cannot exceed 10 you first need to ensure that you can achieve this by solving for sweep rate (SwR). Sweep rate is the number of raster sweeps (up or down) that occur in a second. Sweeps per second should generally be as few as possible in order to maximize the number of decodes applied to a given label.

The formula for finding **Sweep Rate** (SwR) is as follows:<sup>1</sup>

$$SwR = \frac{2 \times LS}{(SW - LL)}$$

**SwR** = Sweep Rate, the number of passes, up or down, that are described by the arc of the raster mirror.

**LS** = Label Speed, the inches per second that a bar code moves through the scan.

**SW** = Scan Width, the width across the scan beam, at a given distance from the scanner, in which a label can be read (picket fence formula only).

**LL** = Label Length, the length of the longest printed label to be read plus the length of the quiet zones (picket fence formula only).

Example

SW = 5 inches

LS = 2 inches per second

LL = 1 inch

$$SwR = \frac{2 \times 2}{(5 - 1)} = 1$$

**Important:** The maximum sweep rate that your can set the scanner to is 10. If your solution is greater than 10, you must change another parameter such as label speed, etc. and recalculate.

Since SwR can only be entered into the software as whole numbers, round off fractions of SwR to the next higher number, for example enter 0.4 as 1 and 3.5 as 4.

### Number of Decodes

Number of decodes (ND) for a picket fence bar code is calculated by the following formula:

$$\text{Example: } ND = \frac{1 \times 900}{10 \times 1} - 3 = 87 \text{ decodes}$$

**DR** = Decode Rate is the number of decodes per second.

**RH** = Raster height

**LH** = Label height

LH = 1

DR = 900

RH = 10

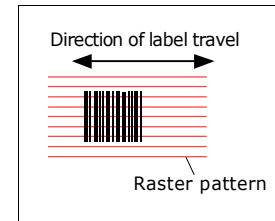


Figure A-8 Raster Picket Fence

1. The number 2 in the SPS formula ensures that each label receives two full raster sweeps.



### Single Scan Line Picket Fence Calculation

For single scan line picket fence scanning (**Top Offset** setting equal to **Bottom Offset**), use the following formula:

$$\left(\frac{(SW - LL)}{LS} \times DR\right) - 3 = \text{number of complete decodes}^1$$

**Example:**

LL = 2 inches (including quiet zones)

LS = 100 inches per second

SW = 4 inches

DR = 1000 decodes per second

$$\left(\frac{(4 - 2)}{100} \times 1000\right) - 3 = 17 \text{ complete decodes}$$

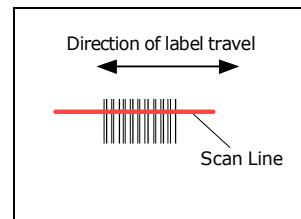


Figure A-9 Picket Fence

### 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-10 Angled Picket Fence

Appendices

### Improving the Number of Decodes

After changing any of the parameters described in this section, recalculate the number of decodes.

#### Scan Rate

Scan rate is a function of motor speed and is adjustable. A slower scan rate may allow greater label range and/or higher decode rates, but at the cost of fewer scans per label.

#### Range

Adjusting the label'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.

---

## Appendix M

### *Label Speed*

Applies to both picket fence and ladder oriented labels. If your application allows it, slowing label speed (the time in seconds that a label is fully within the scan width of the scanner) is an effective way to increase the number of decodes.

### *Raster Height*

When using the raster features, you can increase the decode rate by decreasing the height of the raster image.

### *Raster Sweep Rate*

Slowing the number of sweeps per second to the minimum needed will result in more scan lines passing over the label and a higher decode rate.

### *Laser Framing*

Narrowing the laser frame may not increase the decode rate, but it will minimize the opportunity of extraneous reads.

### *Label Dimensions, Label Density, and Label Ratio*

Not usually an option in most applications, but changes to label parameters can affect number of decodes calculations and possibly decode rates.

If your application allows it, shortening the length of a picket fence label means the label will be in the scan range longer and hence receive a greater number of scans. Increasing the height of a ladder label means it will receive more scans. Changing label density and/or bar code ratio is another way ranges, decode rates, etc. can be altered.

### *Gain and Tracking*

These adjustments, typically made by qualified technicians, are referenced in the Scanner Setup menu (see ["Save Active Settings including Factory for Power-on" on page A-26](#)). Changes to tracking will generally have a limited affect on decode rates.

## Appendix N — Operational Tips

### Do:

- Check inputs (label speed, length, height, etc.) to ensure the desired number of decodes per label.
- For optimum decodes, mount scanner so that your labels pass through the center of the depth-of-field (minimum/maximum range). You find the center by moving your label in and out during a read rate test.
- Avoid excessive tilt, pitch, and skew of the bar code label.
- Check the bar code label for readability by doing a decode rate test. If there is any question about the label's readability, contact your Microscan representative at [helpdesk@microscan.com](mailto: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 O — 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, for example, 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 differentially; 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.

### DeviceNet

DeviceNet is a versatile, general purpose FieldBus designed to satisfy 80% of the most common machine- and cell-level wiring requirements. One of DeviceNet's major benefits is its multiple messaging formats, which allow the bus to 'work smart' instead of work hard.

### **ProfiBus DP**

PROFIBUS is a vendor-independent, open field bus standard for a wide range of applications in manufacturing and process automation. Vendor-independence and openness are ensured by the international standards EN 50170 and EN 50254. PROFIBUS allows communication between devices of different manufacturers without any special interface adjustment. PROFIBUS can be used for both high-speed time critical applications and complex communication tasks.

### **Modicon Ethernet**

The Modicon Ethernet system consists of three basic elements:

1. the physical medium used to carry Ethernet signals between computers
2. a set of medium access control rules embedded in each Ethernet interface that allow multiple computers to fairly arbitrate access to the shared Ethernet channel
3. an Ethernet frame that consists of a standardized set of bits used to carry data over the system

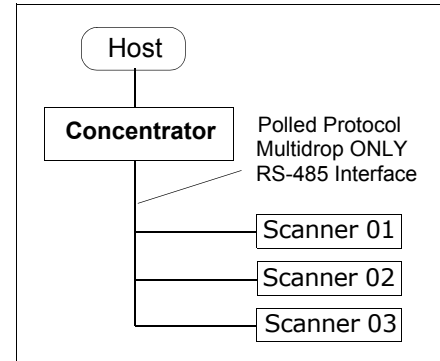
### **DH485**

The DH485 network offers: intercommunication of up to 32 devices, peer-to-peer capability, the ability to add or remove nodes without disrupting the network maximum network length of 1219m (4000 ft.), can be extended to 2438m (8000 ft.) with 2 AIC+ units.

## Appendix P — 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 Your Scanner for Multidrop

1. With the scanner connected to the host, do **Retrieve Scanner Settings** as in [Step 5 —“Retrieve Scanner Settings” on page 2-6](#).

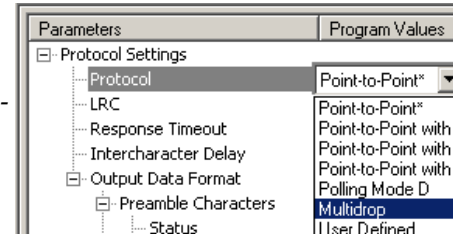
2. Select **Multidrop** in the **Protocol** configuration menu.

You will see the following message:

**Warning.** 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-39](#).



## 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 on the next page.

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**.

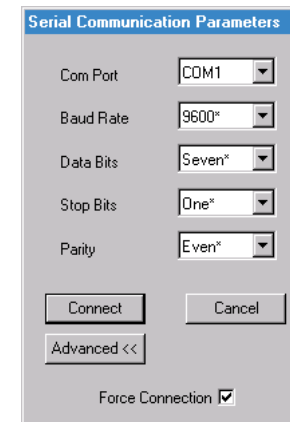
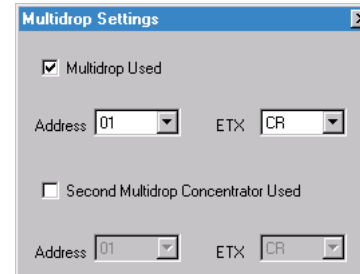
6. You should see the **CONNECTED** message in green at the bottom of the window along with the scanner's **Multidrop** address.



7. Do **Retrieve Scanner Settings** to upload scanner's configuration (**Step 5**). 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 (bar code data, noread messages, counters, etc.) via concentrators is solicited by poll requests from the host.

The polling sequence example 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).

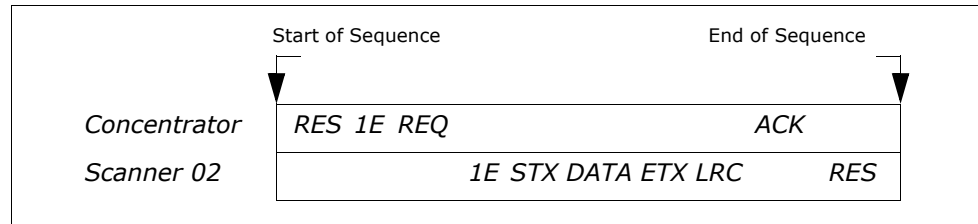


Figure A-11 Polling Sequence

### 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 Multi-drop. The scanner complies with the command when it is polled during the cycle.

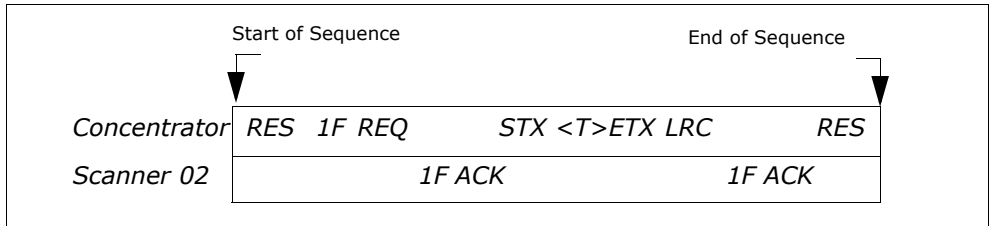


Figure A-12 Polling Sequence

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-11 Multidrop Addresses

Multidrop Address	Poll Character		Select Character		Multidrop Address	Poll Character		Select Character	
	ASCII	HEX	ASCII	HEX		ASCII	HEX	ASCII	HEX
01	^\ 	1C	^] 	1D	26	N	4E	O	4F
02	^^	1E	^-	1F	27	P	50	Q	51
03	SP	20	!	21	28	R	52	S	53
04	"	22	#	23	29	T	54	U	55
05	\$	24	%	25	30	V	56	W	57
06	&	26	'	27	31	X	58	Y	59
07	(	28	)	29	32	Z	5A	[	5B
08	*	2A	+	2B	33	\	5C	]	5D
09	,	2C	-	2D	34	^	5E	_	5F
10	.	2E	/	2F	35	`	60	a	61
11	0	30	1	31	36	b	62	c	63
12	2	32	3	33	37	d	64	e	65
13	4	34	5	35	38	f	66	g	67
14	6	36	7	37	39	h	68	i	69
15	8	38	9	39	40	j	6A	k	6B
16	:	3A	;	3B	41	l	6C	m	6D
17	<	3C	=	3D	42	n	6E	o	6F
18	>	3E	?	3F	43	p	70	q	71
19	@	40	A	41	44	r	72	s	73
20	B	42	C	43	45	t	74	u	75
21	D	44	E	45	46	v	76	w	77
22	F	46	G	47	47	x	78	y	79
23	H	48	I	49	48	z	7A	{	7B
24	J	4A	K	4B	49		7C	}	7D
25	L	4C	M	4D	50	~	7E	D	7F

## Appendix Q — Glossary of Terms

**Active On (I<sub>ON</sub>).** An optoisolated input that's logically "on" when current flows through the connection points.

**Active Off (I<sub>OFF</sub>).** 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 bar code label.

**Application Record.** A variation of UCC/EAN-128 which adds an application identifier to label data, including user-definable separators, brackets, and padding.

**Autocalibration.** A routine that cycles through various optical settings and selects the combination that produce the best read rate.

**Autodiscriminate.** The ability to decode several different bar code symbologies without changing configuration.

**Auto Range.** Outward focus of the scanner until an object is sensed by signal strength. The scanner then begins searching for a decodable label.

**Auxiliary Port.** RS-232 connections to an auxiliary terminal or device for remote viewing, the transfer of data to and from the host, and under certain conditions a configuration port.

**Bar Code.** The symbol used for recognition by a bar code scanner. An array of parallel bars and spaces of varying widths that conform to recognized standards and can be decoded and displayed as serial data.

**Bar Code Data.** The information that is transmitted from a decoded bar code symbol.

**Bar Code Label.** The physical media on which a bar code symbol is presented.

**Bar Code Density.** Number of characters per inch or other unit of measure.

**Baud Rate.** The number of discrete signal events per second. Bits per second.

**Capture.** The act of grabbing or recording a frame by an sensor. A frame or succession of frames that are captured.

**Channel.** A high-speed pathway between the computer and the control units of the peripheral devices.

**Check Digit.** A Modulus 43 or Modulus 10 digit that is added to the bar code message for additional data integrity.

**Command Processing.** Allows the user to enter the ESP program from the auxiliary port or send serial string commands from the auxiliary port.

**Configuration.** A setup or process of changing a scanner's settings to conform to a specific application.

**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 slave 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 a bar code label.

**Default.** Restores ROM or Flash settings, initializes serial commands and resets all counters.

**Delimited.** A command or field that is bracketed by pre-defined characters.

**Decode Rate.** The number of good reads per second decoded by the scanner.

**Depth of Field.** The distance between the minimum and maximum range in which a scanner can read bar code labels.

**Discrete I/O.** Inputs and outputs characterized by discrete signal transitions from one voltage level to another so that digital switching can occur.

**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 label information to decode.

**External Edge.** Allows a read cycle to be initiated by a trigger signal from an object detector when it detects the appearance of an object (rising edge). The read cycle ends with a good read, a timeout, or a new trigger.

**External Level.** Allows a read cycle to be initiated by a trigger signal from an object detector. The read cycle ends when the object moves out of the detector's range.

**Falling Edge.** A change of state (to inactive) associated with a level trigger in which the scanner stops searching for bar code symbols. (See **Rising Edge**.)

**Fixed Code Length.** Increases data integrity by ensuring that only one label length will be accepted.

**Flash Memory.** Memory that can be changed by downloading new code.

**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.

**Frame.** The total area scanned in an image sensor.

**Full Duplex.** Auxiliary port data is sent directly to the host but not displayed on the auxiliary port screen.

**Gain.** Optimal signal strength.

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

**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.
- IrDA.** Infrared Data Association which promotes interoperable, infrared data interconnection standards.
- Label Height.** Regardless of orientation, the measurement taken along the length of a label's individual bars.
- Label Length.** Regardless of orientation, the measurement taken across the label's bars from one end to the other, including the quiet zone.
- Label Speed (LS)** is the distance per second that a label moves as it travels through the scan lines.
- Label Transitions.** The transition of bars and spaces on a label, used to detect the presence of a label on an object.
- Ladder Label Orientation.** A bar code label in which the bars are parallel to the label's direction of travel.
- Large Intercharacter Gap.** Allows the scanner to read symbols with gaps between bar code characters that exceed three times (3x) the narrow element width.
- Laser Framing.** Setting scan width size by adjusting the on/off duration of the laser beam.
- 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.
- Longitudinal Redundancy Check (LRC).** An error-checking routine that verifies the accuracy of transmissions.
- Master Scanner.** First scanner in a daisy chain mode and linked directly to the host and in tandem to slave scanners.
- Matchcode.** The ability to compare bar code labels being scanned against a master label that is stored in the memory of the scanner.
- Embedded Menu.** Configuration options embedded in the scanner's erasable memory.
- ESP-MP Menu.** Easy Setup Program—Multiple Platform. 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 bar code label by the width of its narrowest element.

**Mismatch.** An event that occurs when the scanned bar code label does not match the master label that is stored in the memory of the scanner.

**Multilabel.** A scanner mode which allows a scanner to read more than one bar code label 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 given label, expressed in thousands of an inch (or mils).

**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.

**Non-volatile RAM (NOVRAM).** Random Access Memory that is available on power-on; that is, after power to the unit has been recycled.

**Noread.** A non-read. A condition that occurs when the scanner is set up to decode labels but no label 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.

**Number of Decodes.** The number of times a bar code label 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 Label Orientation.** A bar code label in which the bars are perpendicular to the label's direction of travel.

**Pitch.** Label (or scanner) rotation around the center of a line perpendicular to the label's bars.

**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 bar code) 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 bar code label input.

**Read Range.** The distances in which a label 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 Rate (SR)** The number of decodes per second that a given scanner is capable of casting.

**Scan Width (SW)** is the width across the scan beam at a given distance from the scanner in which a label can be read.

**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 command specifically for changing configuration and distinguished from operational command by the fact that they modify the non-volatile for power up configuration.

**Skew.** Label (or scanner) rotation around the center of the skew axis.

**Slave Scanner.** Linked to the master or preceding scanner in a daisy chain and relays bar code data to the host. See "Daisy Chain."

**Specular Reflection Zone.** The narrow zone straight out from the scanner in which direct reflected light from a label can distort the scanner's ability to distinguish bars from spaces.

**Supplemental.** A character or data string that is appended to the main bar code symbol.

---

## Appendix Q

**Sweep.** One pass of the raster, up or down.

**Sweep Rate** (SwR) is the number of passes per second, up or down, describing the raster image.

**Symbol.** A bar code. A decodable unit of information that is recognized by a bar code scanner.

**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.

**Symbology ID.** An AIM standard prefix character that identifies the bar code type.

**Tilt.** Label (or scanner) rotation around the centerline of the scan beam.

**Timeout.** A user-selected period of time that ends a scanner's read cycle.

**Tracking.** Adjustment of the precision of analog-to-digital conversion.

**Transmission.** The transfer of data over a communications channel.

**Transmit.** Send or convey signals or information from one device to another.

**Transparent.** Data is 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 label to permit matches with variable characters.



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