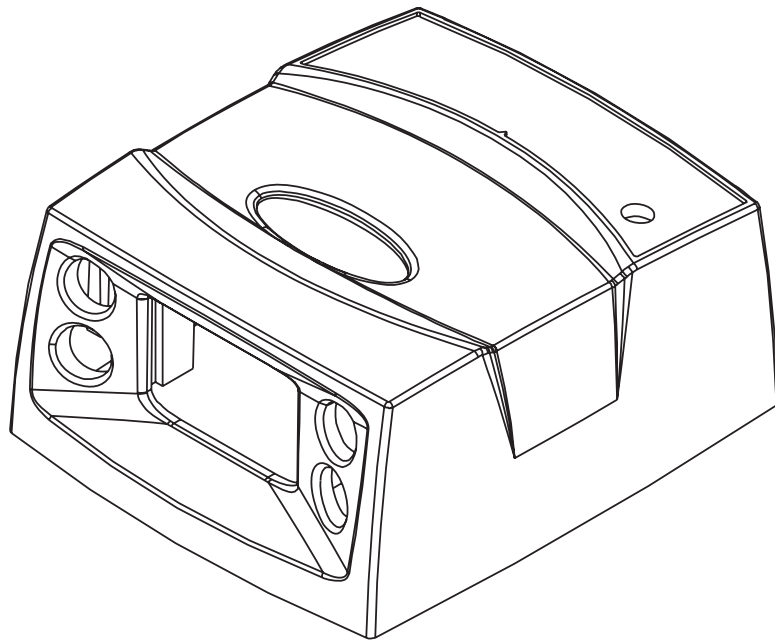




Symbol MS4404/MS4407

Integration Guide



**Symbol MS4404/MS4407
Integration Guide**

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Revision A

August 2007

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Revision History

Changes to the original manual are listed below:

Change	Date	Description
-01 Rev A	8/2006	Initial Release.
-02 Rev A	8/2007	Updated service information, updated drop specification, added DPM information including decode ranges/zones and parameter, added SSI Interface chapter, added new UPC/EAN supplemental options, changed RSS references to GS1 DataBar, added following parameters: Bookland ISBN format, 4State Postal, Inverse 1D, Data Matrix Inverse, Micro QR, QR Inverse, Aztec, Aztec Inverse.

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Glossary

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About This Guide

Overview

The *Symbol MS4404/MS4407 Integration Guide* provides general instructions for mounting and setting up the Symbol MS4404 and MS4407 MiniScan imagers.



NOTE Unless otherwise noted, all instructions, drawings, bar codes, theory of operation, and features documented in this guide apply to both the Symbol MS4404 and MS4407.

Chapter Descriptions

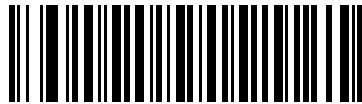
- [Chapter 1, Getting Started](#) provides an overview of the Symbol MS4404 and MS4407 imagers, including a theory of operation.
- [Chapter 2, Installation](#) provides information on unpacking, mounting, and installing the Symbol MS440X.
- [Chapter 3, Imaging](#) provides information on aiming, illumination, focus control, data capture, beeper and decode LED signals, supported symbologies and operating modes.
- [Chapter 4, Symbol MS4404/MS4407 Specifications](#) includes technical specifications, electrical interface, mechanical drawings and decode zones.
- [Chapter 5, Maintenance & Troubleshooting](#) includes maintenance requirements and troubleshooting.
- [Chapter 6, User Preferences](#) provides programming bar codes for selecting user preference features.
- [Chapter 7, Imager Preferences](#) provides programming bar codes for selecting imager preference features.
- [Chapter 8, SSI Interface](#) describes the system requirements of the Simple Serial Interface (SSI), which provides a communications link between Motorola decoders (e.g., scan engines, slot scanners, hand-held scanners, two-dimensional scanners, hands-free scanners, and RF base stations) and a serial host.
- [Chapter 9, Symbol MS4404 - RS-232 \(Serial\) Interface](#) describes how to set up the Symbol MS4404 with a serial host. The serial interface is used to connect the imager to point-of-sale devices, host computers, or other devices with an available serial port (e.g., com port).
- [Chapter 10, Symbol MS4407 - USB Interface](#) describes how to set up the Symbol MS4407 with a USB host. The imager connects directly to a USB host, or a powered USB hub, and is powered by it. No additional power supply is required.

- [Chapter 11, Symbologies](#) describes all symbology features and provides the programming bar codes necessary for selecting these features.
- [Chapter 12, Miscellaneous Imager Options](#) includes commonly used bar codes to customize how data is transmitted to the host device.
- [Chapter 13, Mounting Template](#) provide the mounting templates for the Symbol MS440X imager.
- [Appendix A, Standard Defaults](#) provides a table of all host devices and miscellaneous defaults.
- [Appendix B, Programming Reference](#) provides a table of AIM code identifiers, ASCII character conversions, and keyboard maps.
- [Appendix C, Sample Bar Codes](#) includes sample bar codes.
- [Appendix D, Numeric Bar Codes](#) includes numeric bar codes to use with parameters requiring specific numeric values. This chapter also includes the Cancel bar code.
- [Appendix E, ASCII Character Sets](#) provides ASCII character value tables.

Notational Conventions

The following conventions are used in this document:

- The terms “MS440X,” “imager,” and “MiniScan” refer to both the Symbol MS4404 and MS4407.
- *Italics* are used to highlight the following:
 - Chapters and sections in this and related documents
- bullets (•) indicate:
 - Action items
 - Lists of alternatives
 - Lists of required steps that are not necessarily sequential
- Sequential lists (e.g., those that describe step-by-step procedures) appear as numbered lists.
- Throughout the programming bar code menus, asterisks (*) are used to denote default parameter settings.



* Indicates Default — ***Baud Rate 9600** — Feature/Option
 (06h) — Option Hex Value for programming via SSI command

Related Documents

The following documents provide more information for the MiniScan Series imagers.

- *MiniScan Family of Scanners Quick Reference Guide*, p/n 72-58809-xx
- *Simple Serial Interface (SSI) Programmer's Guide*, p/n 72-40451-xx
- *Simple Serial Interface (SSI) Developer's Guide*, p/n 72-50705-xx

For the latest version of this guide and all guides, go to: <http://support.symbol.com>.

Service Information

If you have a problem with your equipment, contact Motorola Enterprise Mobility Support for your region. Contact information is available at: <http://www.symbol.com/customersupport>. If you purchased your Enterprise Mobility business product from a Motorola business partner, contact that business partner for support.

Before contacting, have the model number and serial number at hand. If your problem cannot be solved by Motorola Enterprise Mobility Support, you may need to return your equipment for servicing and will be given specific directions.

Motorola is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty.

Chapter 1 Getting Started

Overview



CAUTION Use of controls, adjustments or procedures other than those specified here can result in hazardous laser light exposure.

The Symbol MS440X fixed-mount imager is specifically designed for stand-alone applications, and OEM applications such as kiosks. The imager is extremely compact, provides easy and flexible integration of bar code imaging into a host device, and offers high-performance imaging on 1-D and 2-D bar codes. The Symbol MS440X is ideal for medical instruments and manufacturing applications.

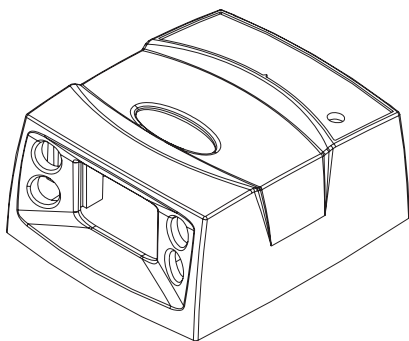


Figure 1-1 *Symbol MS440X MiniScan Imager*

This integration guide includes parameters and describes the theory of operation, installation, specifications, and configuration.

Symbol MS440X Features

- Stand-alone or OEM applications
- Quick and easy integration for OEM devices
- Excellent imaging performance on all 1-D and 2-D bar codes
- RS-232 (Serial) or USB Interface
- Direct part mark (DPM) support (DPM version only). Scan 2D symbols etched directly onto an item's surface (via laser etching and dot peening) for permanent identification.
- Easy programming and configuration
- Flexible mounting options
- LEDs indicating power status and successful decodes.

Typical Applications

Fixed Mount Standalone Applications

- Clinical diagnostics
- Medical instruments
- Work stations
- Assembly lines.

OEM Applications

- Kiosks / ATMs
- Music listening stations
- Medical instruments
- Clinical diagnostics
- Lottery terminals / gaming
- Airline gate check-in.

Theory of Operation

During image capture:

1. The imager sensor array contained in the SE4400 captures the image of the bar code through the optical system.
2. The PL4407 controls the SE4400 imager to obtain the best possible image quality.
3. The PL4407 transfers the decoded data or image data to the host system.

The result is a monochrome digital image similar to that of a digital camera. The output from the SE4400 is byte wide pixel data that is sent to the PL4407.

Block Diagrams

The MiniScan block diagrams illustrate the functional relationship of the MiniScan components. A detailed description of each component in the block diagrams is also provided.

Block Diagrams

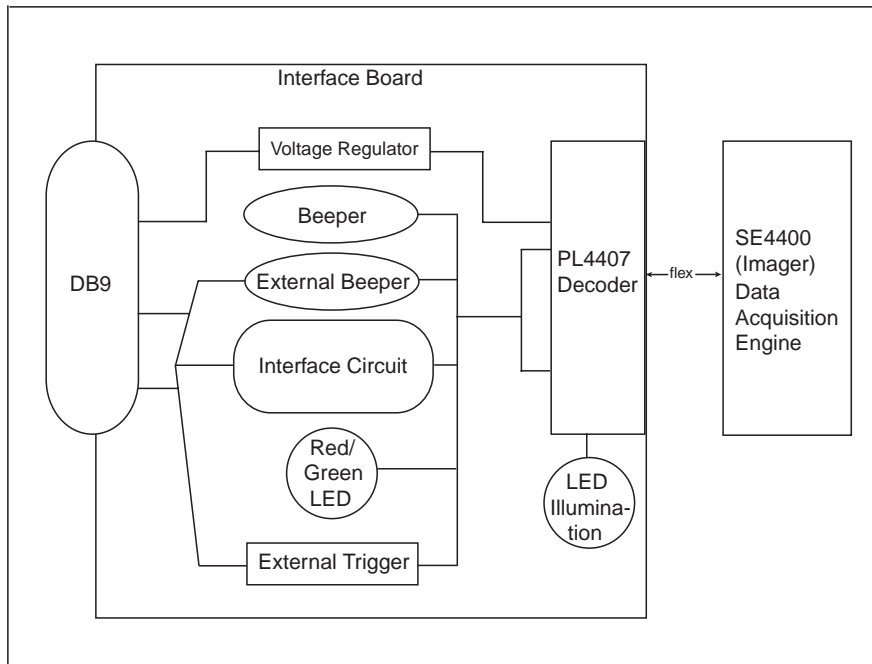


Figure 1-2 Symbol MS4404 Block Diagram

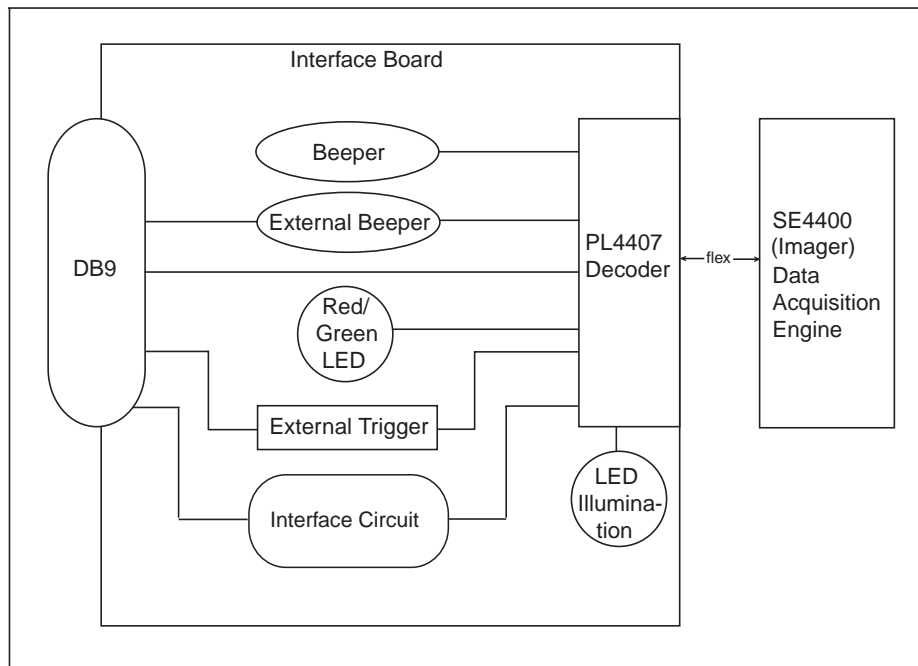


Figure 1-3 Symbol MS4407 Block Diagram

Miniscan Block Diagram Descriptions

Imager Engine - The SE4400 engine provides digital images which can be transmitted to a decoder to decode a bar code of any format supported by the decoding software. The engine utilizes laser aiming and an LED illumination system, and can switch between two focus positions for extended working range or for more precise focusing in high-density bar code decoding or digital picture taking.

Interface Board - The interface board adapts the imager engine's interface into usable signals and data for the host. It also contains a beeper, LED illumination and red/green LED for audio/visual feedback, and provides for an external trigger and external beeper.

The Symbol MS4404 interface board converts TTL level SSI signals to proper RS-232 levels for connection to any RS-232 compliant host, and the Symbol MS4407 interface board allows connection to logic level serial and USB hosts.

Voltage Regulator (Symbol MS4404 only) - The power supply allows the Symbol MS4404 to operate of the extended input voltages of 5 - 12 Vdc.

DB9 - The DB9 connector provides an outlet for the various interface signals used between a MiniScan and the host. It also maintains pin compatibility with MiniScan (MSXXXX) host cables.

PL4407 Decoder

ARM9-Based Processor

The digital system is built on an ARM9 Harvard architecture core, 32 bit RISC engine with a five-stage pipeline. The major features of the core are:

- Programmable speed up to 150 MHz with an adjustable external bus speed up to 96 MHz.
- 16K instruction and data cache (64-way set associative).
- Flexible internal bus architecture that supports DMA operations from any peripheral module to the core or to another peripheral port including main memory.
- Implementation of an enhanced Memory Management Unit (MMU).

Main Memory

The two available PL4407 microprocessor designs are:

- **PL4407-x100**: 32-bit external bus interface to 8 MB of PC100-compliant SDRAM, classified as Mobile SDRAM due to its lower operating current and enhanced power-down modes; internally configured as 4 banks of 512 kb x 32 bits.
- **PL4407-x200**: 32-bit external bus interface to 16 MB of Mobile SDRAM; internally configured as 4 banks of 1024 Kb x 32 bits.

Power Management (Symbol MS4404 Only)



NOTE This section does not apply to the USB interface. USB supports low power mode as defined by the USB specification.

The Symbol MS4404 has two power modes:

- Continuous Power
- Low Power.

In Continuous Power mode, the Symbol MS4404 system is always running even when not in a decode session.

In Low Power mode (the default power mode), the Symbol MS4404 draw less current than when in Continuous Power mode, and is more suitable for battery-powered applications. In this mode the Symbol MS4404 enter Low Power mode whenever possible. The Symbol MS4404 must be awakened from Low Power mode before performing any functions.

[Table 1-1](#) describes how to put the Symbol MS4404 into Low Power mode; [Table 1-2](#) describes how to awaken it. Completely removing power from the Symbol MS4404 is **not** recommended; this should not be necessary as in Low Power mode the Symbol MS4404 consume very little power (see [Table 1-1](#)).

Table 1-1 *Placing the Symbol MS4404 into Low Power Mode*

Action	Behavior
Set the Power Mode parameter to Low Power (see Power Mode on page 6-8).	The Symbol MS4404 enters Low Power mode automatically whenever possible.
Send the serial SLEEP command (see the <i>Simple Serial Interface (SSI) Programmer Guide</i>).	The Symbol MS4404 enters Low Power mode only once, as soon as possible.

Note: All Wake Up signals (see [Table 1-2](#)) must be inactive to enter Low Power mode. Once the Symbol MS4404 is awakened, at least 1 second (programmable time) must elapse before it re-enters Low Power mode.

Table 1-2 *Waking Up the Symbol MS4404*

Signal	State to Wake Up
AIM/WKUP*	Low
TRIG*	Low
CTS*	Low
RXD	Send 0x00

When the Symbol MS4404 is awakened, it remains awake for at least 1 second (programmable time) before re-entering Low Power mode; the host must perform its first action within this time period.

Serial I/O

Simple Serial Interface (SSI) Protocol is a half-duplex asynchronous serial interface with two hardware handshaking lines. The four SSI-specific interface signals are:

- TXD - Transmitted Data
- RXD - Received Data
- RTS* - Request to Send
- CTS* - Clear to Send

Signal names with the "*" modifier are asserted when at the positive logic 0 state (active low). Signal names without the "*" modifier are asserted when at the positive logic 1 state (active high).

The TXD line transmits asynchronous serial data from the Symbol MS440X to the host.

The RXD line is used by the Symbol MS440X to receive asynchronous serial data from the host. The SSI protocol does not support full-duplex data transfers; data is either transmitted or received by the Symbol MS440X, but never both simultaneously.

The RTS* and CTS* signals help coordinate data transfers between the Symbol MS440X and the host.

Chapter 2 Installation



Overview

This chapter provides information on unpacking, mounting, and installing the MiniScan imager.

Unpacking

Remove the MiniScan from its packing and inspect for damage. If the imager is damaged, call Motorola Enterprise Mobility Support on [page xv](#).

KEEP THE PACKING. It is the approved shipping container and should be used if the equipment needs to be returned for servicing.

Mounting

There are two mounting holes (threaded inserts) on the bottom of the Symbol MS440X chassis.

The following figures provide mounting dimensions for the MiniScan housings. For a mounting template, see [Chapter 13, Mounting Template](#).



NOTE Use only non-magnetic M3x.5 screws with a maximum length of 3.6mm to mount the MiniScan imager chassis.

Symbol MS440X Mounting Dimensions

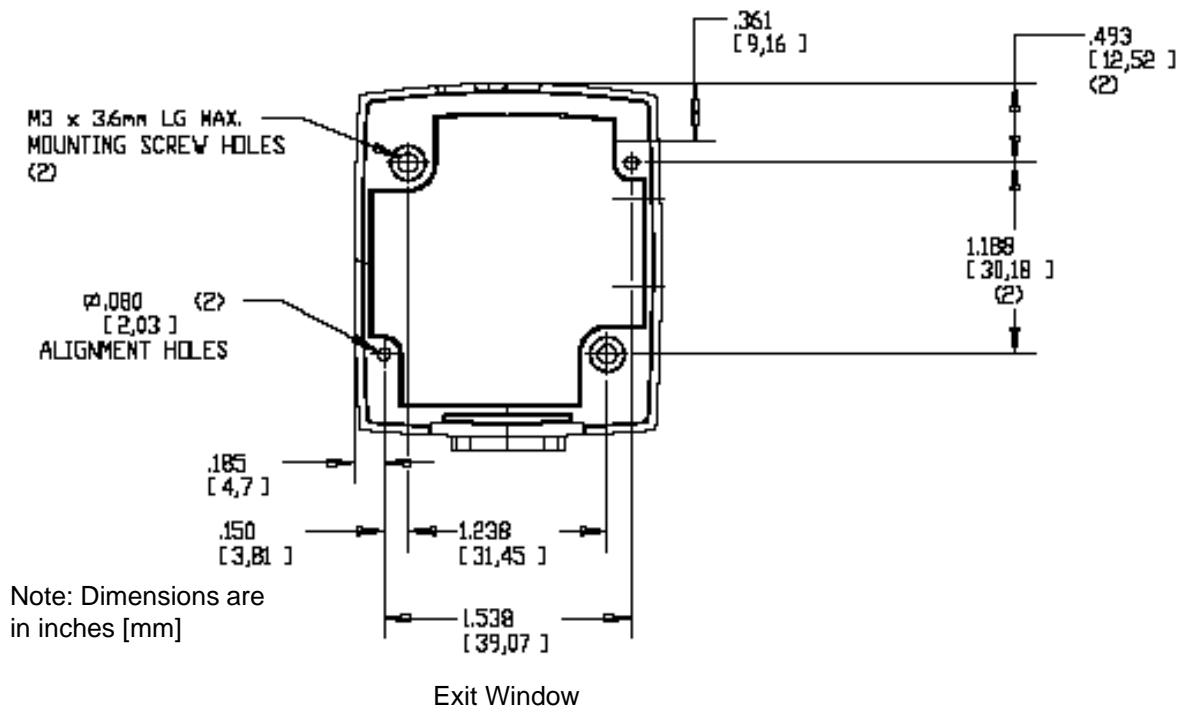


Figure 2-1 Symbol MS440X Mounting Dimensions

Connecting the MiniScan

To connect the MiniScan to the host, connect the imager cables in the order shown in [Figure 2-2](#).

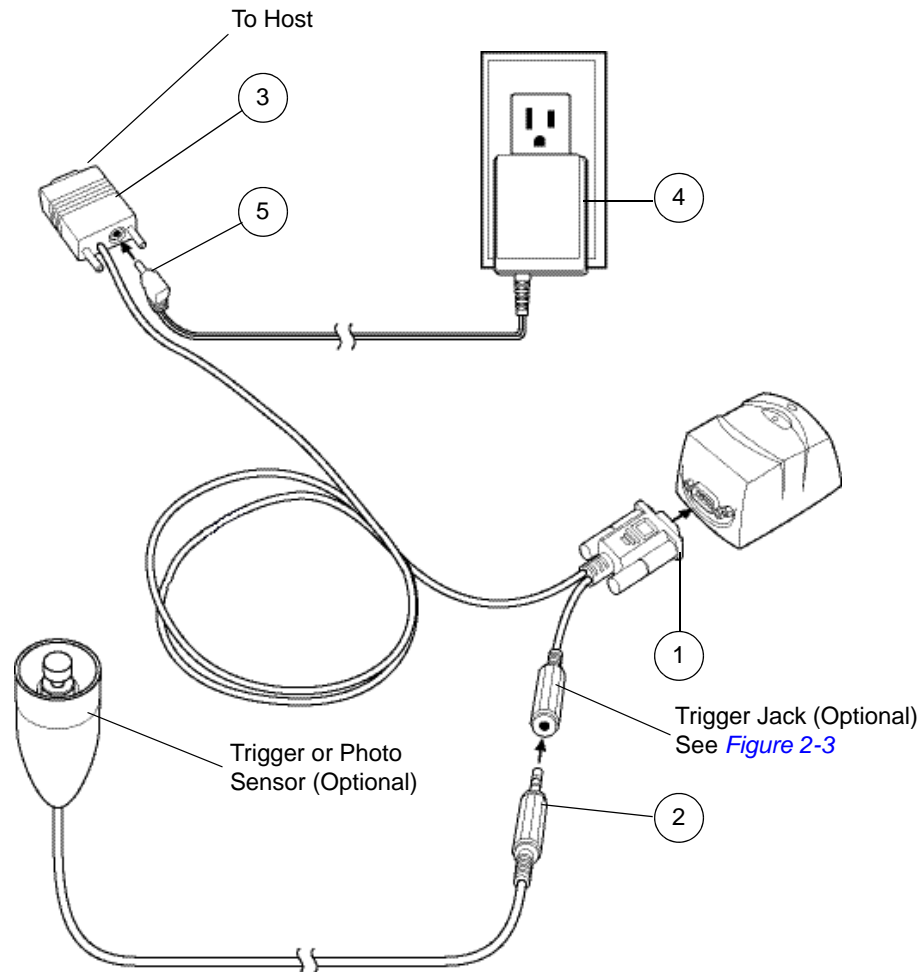


Figure 2-2 Typical Connection Diagram

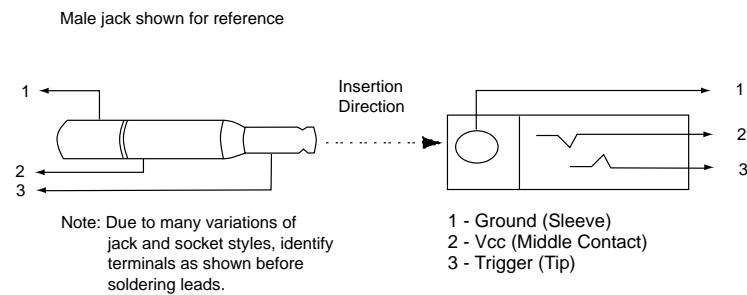


Figure 2-3 Trigger Jack Connector Pins

Location and Positioning

The location and positioning guidelines provided do not consider unique application characteristics. It is recommended that an opto-mechanical engineer perform an opto-mechanical analysis prior to integration.



NOTE Integrate the imager in an environment no more extreme than the product's specification, where the imager will not exceed its temperature range. For instance, do not mount the imager onto or next to a large heat source. When placing the imager with another device, ensure there is proper convection or venting for heat. Follow these suggestions to ensure product longevity, warranty, and overall satisfaction with the imager.

Embedded Applications Requiring a Window

Use the following guidelines for applications that require a window in front of the MiniScan.



NOTE Motorola does not recommend placing an exit window in front of the MiniScan; however, the following information is provided for applications that require such a window.

Window Material



NOTE The window placement and material recommendations that follow should be considered if the Symbol MS440X is mounted within a product with its own window.

Many window materials that look perfectly clear can contain stresses and distortions that can reduce imager performance. For this reason, optical glass or cell-cast acrylic with an anti-reflection coating is highly recommended. Following is a description of acrylic, and CR-39, another popular window material. [Table 2-1](#) outlines the suggested window properties.



CAUTION Consult an opto-mechanical engineer to recommend an appropriate window material and to determine if coatings are appropriate for the specific application.



NOTE Do not use polycarbonate material.

Acrylic

When fabricated by cell-casting, acrylic has very good optical quality and low initial cost. However, protect the surface from the environment as acrylic is susceptible to attack by chemicals, mechanical stresses, and UV light. Acrylic has reasonably good impact resistance and can be ultrasonically welded.

CR-39

CR-39 is a thermal-setting plastic produced by the cell-casting process, and is commonly used in plastic eye glasses lenses. CR-39 has excellent chemical and environmental resistance, including good surface hardness. Typically it does not require hard-coating, but can be hard coated for severe environments. CR-39 has reasonably good impact resistance and cannot be ultrasonically welded.

Chemically Tempered Float Glass

Glass is a hard material which provides excellent scratch and abrasion resistance. However, unannealed glass is brittle. Increasing flexibility strength with minimal optical distortion requires chemical tempering. Glass cannot be ultrasonically welded and is difficult to cut into odd shapes.

Table 2-1 *Suggested Window Properties*

Property	Description
Material	Clear cell-cast acrylic.
Spectral Transmission	85% minimum from 640 to 690 nanometers.
Thickness	0.059 ± 0.005
Wavefront Distortion (transmission)	0.2 wavelengths peak-to-valley maximum over any 0.08 in. diameter within the clear aperture.
Clear Aperture	To extend to within 0.04 in. of the edges all around.
Surface Quality	60-20 scratch/dig
Coating	Both sides to be anti-reflection coated to provide 0.5% max reflectivity (each side) from 640 to 690 nanometers at nominal window tilt angle. Coatings must comply with the hardness adherence requirements of MIL-M-13508.

Window Coatings

[Table 2-2](#) lists some exit window manufacturers and anti-reflection coaters.

Anti-Reflection Coatings

Apply an anti-reflection coating to the inside and/or outside of the window to significantly reduce the amount of light reflected off the window, back into the imager engine. The coating can also improve the range of acceptable window positions and minimize performance degradation due to signal loss as the light passes through the window. Using anti-reflection coatings on both the inside and outside of the window is highly recommended.

Polysiloxane Coating

Polysiloxane type coatings are applied to plastic surfaces to improve the surface resistance to both scratch and abrasion. They are usually applied by dipping, then air-drying in an oven with filtered hot air.

Table 2-2 Window Manufacturers and Coaters

Company	Discipline	Specifics
Evaporated Coatings, Inc. 2365 Maryland Road Willow Grove, PA 19090 (215) 659-3080	Anti-reflection coater	Acrylic window supplier Anti-reflection coater
Fosta-Tek Optics, Inc. 320 Hamilton Street Leominster, MA 01453 (978) 534-6511	Cell-caster, hard coater, laser cutter	CR39 exit window manufacturer
Glasflex Corporation 4 Sterling Road Sterling, NJ 07980 (908) 647-4100	Cell-caster	Acrylic exit window manufacturer
Optical Polymers Int. (OPI) 110 West Main Street Milford, CT 06460 (203) 882-9093	CR-39 cell-caster, coater, laser cutter	CR39 exit window manufacturer
Polycast 70 Carlisle Place Stamford, CT 06902 (800) 243-9002	acrylic cell-caster, hard coater, laser cutter	Acrylic exit window manufacturer
TSP 2009 Glen Parkway Batavia, OH 45103 (800) 277-9778	acrylic cell-caster, coater, laser cutter	Acrylic exit window manufacturer

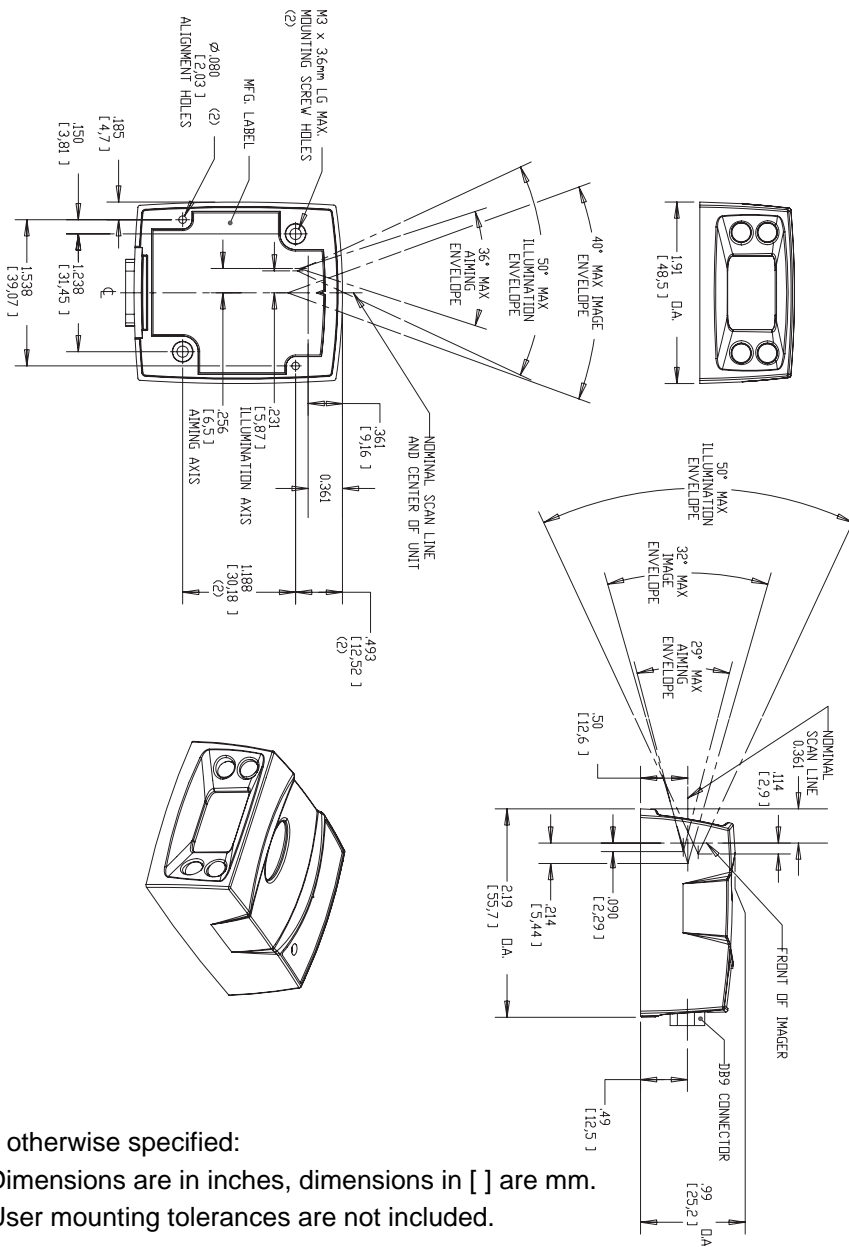
Embedded Window Angle and Position

If a window is placed between the MiniScan and the item to be imaged, observe the following guidelines:

- **Window Clear Opening** - Make the clear opening of the window large enough so that the entire imager field of view passes through the window. Cutting off any part of the field of view can degrade decode range performance. Ensure that window placement relative to the MiniScan accounts for tolerances on all parts involved in that assembly.
- **Window Angle** - Angle the window at least 2° more than the tilt of the window on the imager (see [Table 2-3](#)). Further tilting the window is acceptable and decreases the possibility of a secondary reflection from that window degrading the imager's performance.
- **Optical Working Range** - Adding a window can reduce the working range of the imager since there is a signal loss when passing through window material. To minimize this reduction, use a special coating described in [Window Coatings on page 2-5](#). To understand the difference, test the imager in the desired orientation and see if the difference affects imager performance.

Table 2-3 Secondary Window Angles

MiniScan Model	MiniScan Exit Window Angle from Vertical	Minimum Secondary Window Angle from Vertical (distance > 2 mm)
MS4404/MS4407	0.5°	35°



Notes:

Unless otherwise specified:

- Dimensions are in inches, dimensions in [] are mm.
- User mounting tolerances are not included.

Figure 2-4 Symbol MS440X Optical Path and Exit Window

Accessories

The following accessories are available for the MiniScan imager, and can be found in Symbol's Solution Builder (ordering guide).

Table 2-4 *MiniScan Imager Accessories*

Accessory	Standard Part Number	ROHS Part Number
Power Supplies*		
110V power supply, US	50-14000-008	50-14000-008R
220V power supply, Europe	50-14000-009	50-14000-009R
100V power supply, Asia	50-14000-010	50-14000-010R
264V Universal power supply (also order cables below)	50-14001-001	50-14001-001R
DC line cord (power supply to imager)	50-16002-009	50-16002-009R
AC line cord (wall outlet to power supply)	23844-00-00	N/A
RS-232		
Female DB9 with straight connector to RS-232 host (female DB9), with trigger jack and no beeper	25-13227-XX	25-13227-XXR
Female DB9 with straight connector to RS-232 host (female DB9), with trigger jack and beeper*	25-13228-XX	25-13228-XXR
Female DB9 with straight connector to RS-232 host (female DB9)	25-58918-XX	25-58918-XXR
Female DB9 with straight connector to RS-232 host (female DB9), with trigger jack and no hardware handshaking	25-63736-XX	25-63736-XXR
USB		
Female DB9 with straight connector with trigger jack and beeper to USB (Type A connector)	25-58925-XX	25-58925-XXR
Female DB9 straight to USB	25-58926-XX	25-58926-XXR
Cable Adapters		
Female 25 pin D, TxD on pin 2	50-12100-378	N/A
Female 25 pin D, TxD on pin 3	50-12100-377	N/A
Male 25 pin D, TxD on pin 2	50-12100-380	N/A
Male 25 pin D, TxD on pin 3	50-12100-379	N/A

***For power connection, this device must be connected to a limited power source.
Note: DO NOT use cables with an integrated beeper when operating at 12 VDC.**

Table 2-4 *MiniScan Imager Accessories (Continued)*

Accessory	Standard Part Number	ROHS Part Number
Optional Accessories		
Push button trigger cable	25-04950-XX	N/A
Photo sensor trigger cable	25-13176-XX	N/A
Software		
Software Developer's CD	SW-60371-XX	N/A
*For power connection, this device must be connected to a limited power source. Note: DO NOT use cables with an integrated beeper when operating at 12 VDC.		

Software Developer CD (Symbol MS4404 Only)

The Software Developer CD provides the software tools required to integrate and communicate with the MiniScan imagers, including:

- Sample Windows® program with source code
- DLL with source code for building user applications
- ActiveX component (including help file) for easy integration into VisualBasic programs
- Simple Serial Interface documentation.

With over 70 programmable parameters, you can configure MiniScan imagers using bar code menus, or through the serial interface using Symbol's Simple Serial Interface protocol.

For Windows®, DOS, and embedded system environments, the CD enables the user to take full advantage of the imager's features and obtain maximum performance.

Chapter 3 Imaging

Overview

This chapter provides information on aiming, illumination, focus control, data capture, beeper and decode LED signals, supported symbologies and operating modes.

Aiming System

A 650 nm laser and a DOE generate a laser-aiming pattern which represents the imager's field of view throughout its entire depth of field. The aiming subsystem uses a visible laser diode, a lens, and a diffractive optical element to generate the aiming pattern. The pattern's center cross hairs indicates the center of the field of view.

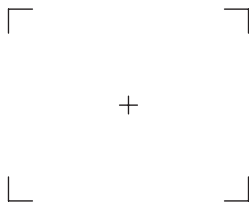


Figure 3-1 *Figure 1-2. Aiming Pattern*

Aiming Error

The aiming pattern is designed to eliminate divergence (parallax) between the aiming axis and the imaging axis. This method provides an aiming axis parallel to the imaging axis, while minimizing the offset between the two. See [Table 4-3 on page 4-6](#) and [Table 4-4 on page 4-8](#) and for aiming element specifications.

Aiming Control

The aiming subsystem is under dynamic software control and is independent of the illumination subsystem. The Symbol MS440X can capture images with both the aiming subsystem turned on (the image of the aiming pattern is captured in the digital image) and the aiming subsystem turned off.

Illumination System

An illumination subsystem, consisting of four red 635 nm LEDs, is provided to meet the image capture and decoding requirements throughout the full range of ambient lighting (total darkness to full sunlight).

Illumination Control

The Symbol MS440X can capture images with the illumination subsystem turned on or off, accommodating images that are close to the wavelength of the illumination. For example, since red LED illumination is used, it may be desirable to shut off the illumination when capturing a printed image in red ink.

Focus Control

The Symbol MS440X has two focus positions controlled by an electromagnetic motor, which is under dynamic software control and is independent of the illumination and aiming systems. The operating modes of the motor are:

- Near Focus
- Far Focus (default).

Imaging Tips

When imaging, ensure the symbol to be captured is within the decode range. See [Location and Positioning on page 2-4](#). Ensure the bar code is within the aiming pattern. The green decode LED lights and the imager beeps to indicate a successful decode.

Capturing Data

Place the symbol in any orientation within the aiming pattern. Ensure the entire symbol is within the rectangular area formed by the brackets in the aiming pattern. The red laser aiming pattern turns on to assist in aiming.

1D bar code symbol

2D bar code symbol

2D dot peen DPM symbol

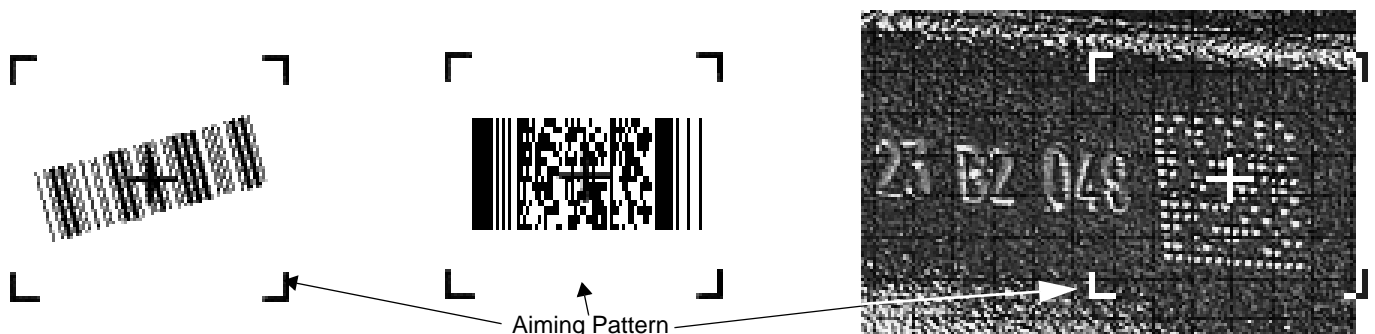


Figure 3-2 Imager Aiming Pattern: Bar Code Centered

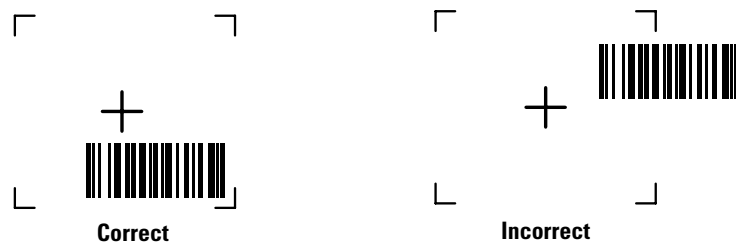


Figure 3-3 Imager Aiming Pattern: Bar Code Not Centered

Beeper Signals

The BPR* output line is provided for user feedback, and provides 50 mA drive capability for an external beeper.

The Symbol MS440X's beeper ranges from 2.352 KHz to 2.963 KHz. The beeper output is a 50% duty cycle square wave at maximum volume, 12.5% at low volume.

Table 3-1 Beeper Indications

Event	Beeper Indication
Decode	Middle Tone
Trigger is pulled	No sound
System bootup	Low Tone, Middle Tone, High Tone
Transmission error	Four Low Tones
Snapshot started	Low Tone
Snapshot completed	Low Tone
Entry error	Low Tone, High Tone
Parameter entered	High Tone, Low Tone, High Tone, Low Tone
Defaults set	High Tone, Low Tone, High Tone, Low Tone
Scanner expects a number	High Tone, Low Tone
No Decode message	No Sound
Video mode is on	No Sound
Video mode is off	No Sound
Scanner wakeup	No Sound

Supported Symbolologies

[Table 3-2](#) lists the bar code types supported by the imaging system. Each can be individually enabled or disabled.

Table 3-2 *Supported Symbolologies*

Bookland EAN	Coupon Code	GS1 DataBar
Codabar	Data Matrix (ECC 200)	UPC/EAN
Code 11	Discrete 2 of 5	UCC/EAN 128
Code 39	Interleaved 2 of 5	US Planet
Code 39 Full ASCII	Maxicode	US Postnet
Trioptic Code 39	MicroPDF417	UK Postal
Code 93	PDF417	Australian Postal
Code 128	MSI Plessey	Japan Postal
Composite Codes	QR Code	Dutch Postal
Aztec (New in 2006)		

Operating Modes

The imaging system supports the following operating modes. See [Operational Modes on page 7-4](#) for the bar codes to change between modes.

- Decode (default mode) - for decoding a bar code
- Snapshot - for capturing an image
- Video - provides a video of the subject
- Snapshot with Viewfinder Mode - provides a video of the subject until a snapshot of the image is captured.

Chapter 4 Symbol MS4404/MS4407 Specifications

Electrical Interface

Symbol MS4404 Electrical Interface

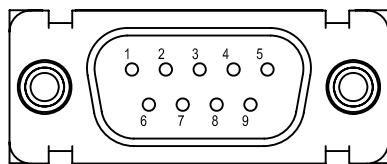


Figure 4-1 *Symbol MS4404 MiniScan Connector*

Table 4-1 lists the pin functions of the Symbol MS4404 interface.

Table 4-1 Symbol MS4404 True RS-232 Electrical Interface

Pin No.	Pin Name	Type*	Function
1	Trigger	I	Signals imager to begin decoding session.
2	TXD	O	Serial data transmit output. Drives the serial data receive input on the device communicating with the imager.
3	RXD	I	Serial data receive input. Driven by the serial data transmit output on the device communicating with the imager.
4	NC		
5	Ground		Power supply ground input and signal ground reference.
6	Power	I	5.0 VDC - 12 VDC \pm 10%
7	CTS	I	Clear-to-send handshaking input line, used only in conjunction with the RTS line. Optionally used by another device to signal the imager to begin transmitting data.
8	RTS	O	Request-to-send handshaking output line, used only in conjunction with the CTS line. Optionally used by the imager to signal another device that data is available to send.
9	Beeper/Download	I/O	During normal operation this signal functions as an external beeper drive line. This signal can sink 50mA of current to drive an external beeper, and is normally pulled up. This signal is also used to begin Flash Download operation when grounded externally during power up.

NC = No Connect (Do not connect this pin)

***I = Input O = Output**

Symbol MS4407 Electrical Interface

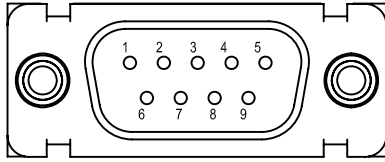


Figure 4-2 Symbol MS4407 MiniScan Connector

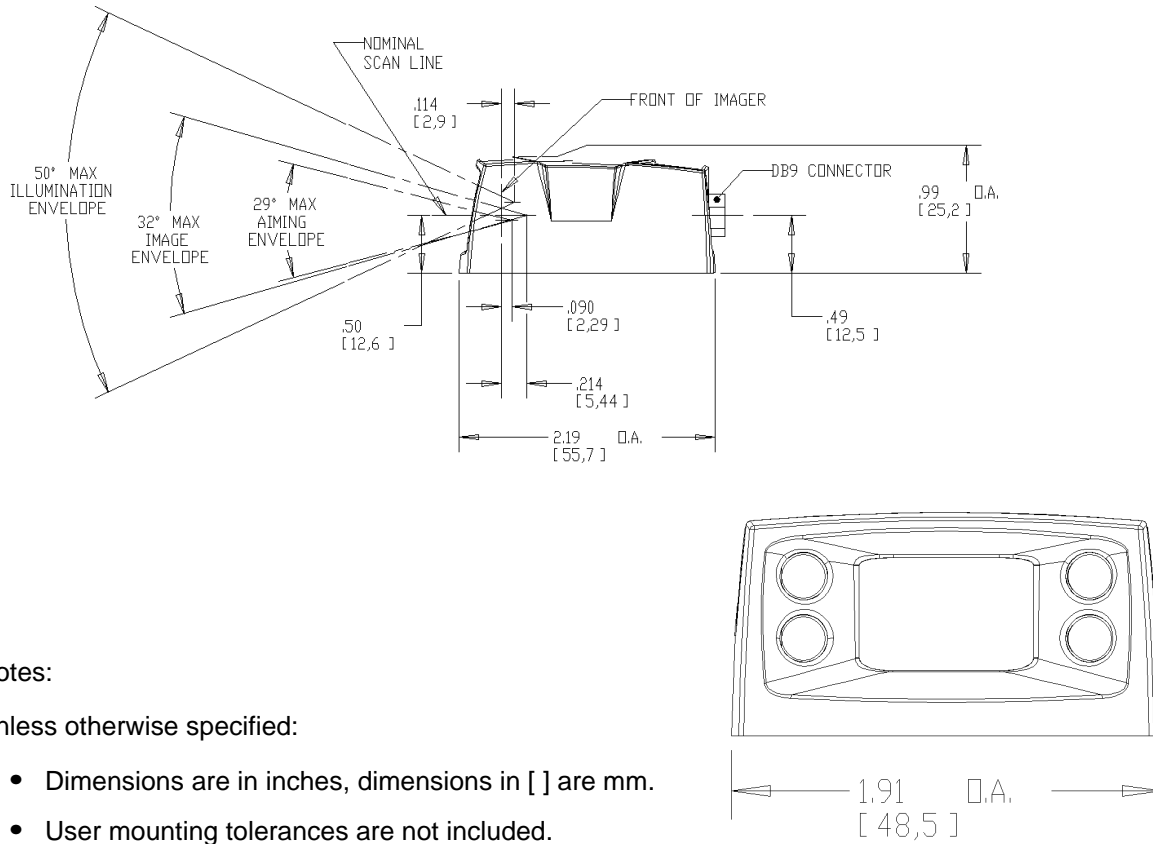
[Table 4-2](#) lists the pin functions of the Symbol MS4407 interface.

Table 4-2 Symbol MS4407 USB and Serial Electrical Interface

USB Interface		Serial Interface	
Pin No.	Pin Name	Pin No.	Pin Name
1	Trigger	1	Trigger
2	NC	2	TXD Output TTL Only
3	USB +	3	RXD Input TTL Only
4	Connect to Pin 8	4	NC
5	Ground	5	Ground
6	+5V Power	6	+5V Power
7	USB -	7	CTS Input TTL Only
8	Connect to Pin 4	8	RTS Output TTL Only
9	Beeper/Download	9	Beeper/Download

NC = No Connect (Do not connect this pin)

Mechanical Drawings

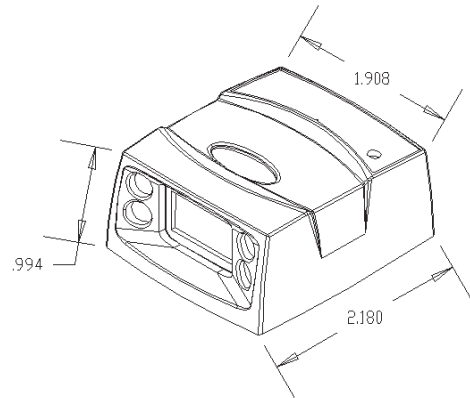
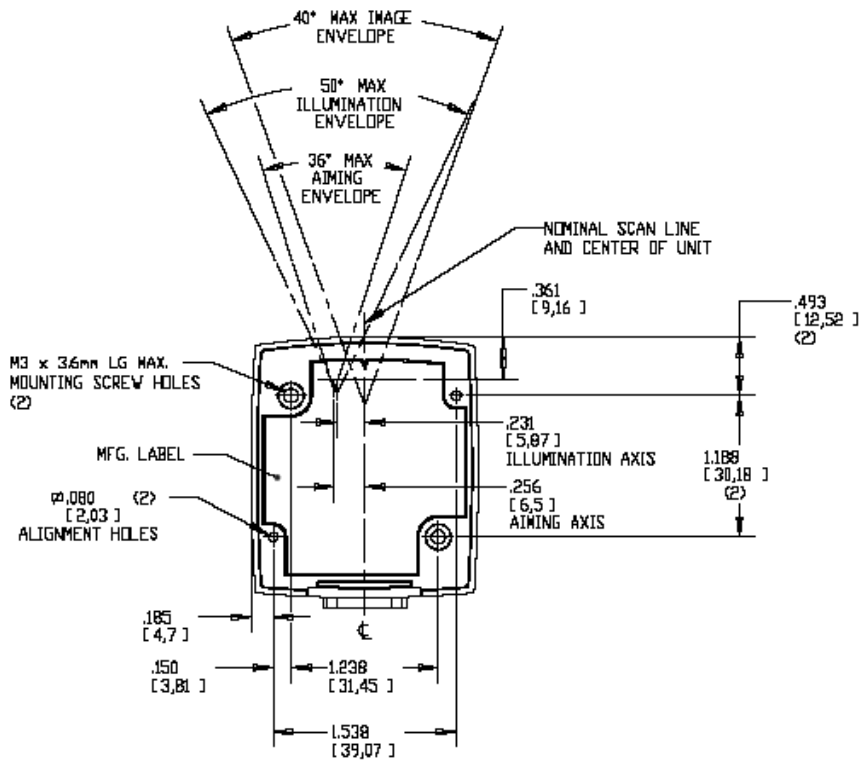


Notes:

Unless otherwise specified:

- Dimensions are in inches, dimensions in [] are mm.
- User mounting tolerances are not included.

Figure 4-3 Symbol MS440X Mechanical Drawings - Part 1



Notes:

Unless otherwise specified:

- Dimensions are in inches, dimensions in [] are mm.
- User mounting tolerances are not included.

Figure 4-4 Symbol MS440X Mechanical Drawings - Part 2

Symbol MS4404 Technical Specifications

Table 4-3 Symbol MS4404 Technical Specifications at 23° C

Item	Description																								
Power Requirements Input Voltage Input Current	4.5 V (min) to 13.2 V (max) 5 V in presentation mode active scan with external illumination; 260 mA (max)																								
Aiming Element Visible Laser Diode (VLD) VLD Power Pattern Angle Aiming Error	650 nm \pm 5 nm 0.7 mW Maximum 30.0° horizontal, 22.5° vertical Total aiming error is 6.0 mm offset (horizontal) Maximum angular aiming error is 1.5°																								
Field of View Horizontal Vertical	33.2 degrees 24.5 degrees																								
Focal Distance from Front of Engine Near Focus Far Focus	5 inches 9 inches																								
Illumination Element Light Emitting Diode (LED)	635 nm \pm 20 nm (Internal/External)																								
Image File Formats	BMP, TIFF, JPEG																								
Interface	True RS-232																								
Optical Resolution (gray scale)	640 (H) x 480 (V) pixels																								
Pitch Angle	\pm 60° from normal (see Figure 4-5 on page 4-10)																								
Roll	360° (see Figure 4-5 on page 4-10)																								
Skew Tolerance	\pm 50° from normal (see Figure 4-5 on page 4-10)																								
Symbologies	<table border="0"> <tr> <td>1-D Symbologies</td> <td>2-D Symbologies</td> </tr> <tr> <td>UPC/EAN</td> <td>Maxicode</td> </tr> <tr> <td>Code 128</td> <td>PDF417</td> </tr> <tr> <td>UCC.EAN128</td> <td>DataMatrix</td> </tr> <tr> <td>GS1 DataBar</td> <td>QRCode</td> </tr> <tr> <td>Code 39</td> <td></td> </tr> <tr> <td>Code 93</td> <td>Postal Codes</td> </tr> <tr> <td>I 2 of 5</td> <td>US Postnet</td> </tr> <tr> <td>Discrete 2 of 5</td> <td>US Planet</td> </tr> <tr> <td>Codabar</td> <td>UK Postal</td> </tr> <tr> <td>MSI</td> <td>Australian Postal</td> </tr> <tr> <td></td> <td>Japan Postal</td> </tr> </table>	1-D Symbologies	2-D Symbologies	UPC/EAN	Maxicode	Code 128	PDF417	UCC.EAN128	DataMatrix	GS1 DataBar	QRCode	Code 39		Code 93	Postal Codes	I 2 of 5	US Postnet	Discrete 2 of 5	US Planet	Codabar	UK Postal	MSI	Australian Postal		Japan Postal
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Note: Environmental and/or tolerance parameters are not cumulative. A thermal analysis is recommended if the application is subject to an extreme temperature environment.

Table 4-3 Symbol MS4404 Technical Specifications at 23° C (Continued)

Item	Description
Ambient Light Immunity Sunlight	Total darkness to 9,000 ft. candles (96,900 lux)
Humidity Operating Storage	95% RH, non-condensing at 50° C 85% RH, non-condensing at 70° C
Shock	2000 ± 5% G
Drop	Multiple 30 in. (76.2 cm) drops to concrete
Temperature Operating Storage	-4° to 122° F (-20° to 50° C) (50% duty cycle) -40° to 158° F (-40° to 70° C)
Electrical Safety (pending)	ETL, VDE
Laser Classification (aiming element)	It is intended for use in CDRH Class 2/IEC Class 1 devices.
Radiated Emissions (pending)	FCC Part 15 Class B, CISPIR22 Class B
Height	0.99 in. (25.2 mm) maximum
Width	1.91 in. (30.2 mm) maximum
Depth	2.18 in. (55.4 mm) maximum
Weight	1.8 oz. (51.0 grams)
Interface	9-pin Male D-sub supports all interfaces



Note: Environmental and/or tolerance parameters are not cumulative. A thermal analysis is recommended if the application is subject to an extreme temperature environment.

Symbol MS4407 Imager Technical Specifications

Table 4-4 Symbol MS4407 Technical Specifications at 23° C

Item	Description
Power Requirements Input Voltage Input Current	4.5 V (min) to 5.5 V (max) 5 V in presentation mode active scan with external illumination; 245 mA (max)
Aiming Element Visible Laser Diode (VLD) VLD Power Pattern Angle Aiming Error	650 nm \pm 5 nm 0.7 mW Maximum 30.0° horizontal, 22.5° vertical Total aiming error is 6.0 mm offset (horizontal) Maximum angular aiming error is 1.5°
Field of View Horizontal Vertical	33.2 degrees 24.5 degrees
Focal Distance from Front of Engine Near Focus Far Focus	5 inches 9 inches
Illumination Element Light Emitting Diode (LED)	635 nm \pm 20 nm (Internal/External)
Image File Formats	BMP, TIFF, JPEG
Interface	0 - 5 V Serial (TTL 232), USB1.1
Optical Resolution (gray scale)	640 (H) x 480 (V) pixels
Pitch Angle	\pm 60° from normal (see Figure 4-5 on page 4-10)
Roll	360° (see Figure 4-5 on page 4-10)
Skew Tolerance	\pm 50° from normal (see Figure 4-5 on page 4-10)



Note: Environmental and/or tolerance parameters are not cumulative. A thermal analysis is recommended if the application is subject to an extreme temperature environment.

Table 4-4 Symbol MS4407 Technical Specifications at 23° C (Continued)

Item	Description																																
Symbologies	<table border="0"> <tr> <td data-bbox="683 369 906 401">1-D Symbologies</td> <td data-bbox="1003 369 1219 401">2-D Symbologies</td> </tr> <tr> <td data-bbox="683 401 906 428">UPC/EAN</td> <td data-bbox="1003 401 1219 428">PDF417</td> </tr> <tr> <td data-bbox="683 428 906 455">Code 128</td> <td data-bbox="1003 428 1219 455">MicroPDF417</td> </tr> <tr> <td data-bbox="683 455 906 483">UCC.EAN128</td> <td data-bbox="1003 455 1219 483">DataMatrix</td> </tr> <tr> <td data-bbox="683 483 906 510">ISBT 128</td> <td data-bbox="1003 483 1219 510">Maxicode</td> </tr> <tr> <td data-bbox="683 510 906 537">Code 39</td> <td data-bbox="1003 510 1219 537">QRCode</td> </tr> <tr> <td data-bbox="683 537 906 564">Trioptic Code 39</td> <td data-bbox="1003 537 1219 564">Aztec</td> </tr> <tr> <td data-bbox="683 564 906 592">Code 93</td> <td data-bbox="1003 600 1219 632">Postal Codes</td> </tr> <tr> <td data-bbox="683 592 906 619">Code 11</td> <td data-bbox="1003 632 1219 659">US Postnet</td> </tr> <tr> <td data-bbox="683 619 906 646">I 2 of 5</td> <td data-bbox="1003 659 1219 686">US Planet</td> </tr> <tr> <td data-bbox="683 646 906 674">Discrete 2 of 5</td> <td data-bbox="1003 686 1219 714">UK Postal</td> </tr> <tr> <td data-bbox="683 674 906 701">Codabar</td> <td data-bbox="1003 714 1219 741">Japan Postal</td> </tr> <tr> <td data-bbox="683 701 906 728">MS</td> <td data-bbox="1003 741 1219 768">Australian Postal</td> </tr> <tr> <td data-bbox="683 728 906 756">GS1 DataBar</td> <td data-bbox="1003 768 1219 795">Dutch Postal</td> </tr> <tr> <td data-bbox="683 756 906 783">Inverse 1DI</td> <td data-bbox="1003 795 1219 823">4State Postal</td> </tr> <tr> <td data-bbox="683 783 906 810">Composite Codes</td> <td></td> </tr> </table> <p data-bbox="683 877 972 909">DPM (DPM version only).</p>	1-D Symbologies	2-D Symbologies	UPC/EAN	PDF417	Code 128	MicroPDF417	UCC.EAN128	DataMatrix	ISBT 128	Maxicode	Code 39	QRCode	Trioptic Code 39	Aztec	Code 93	Postal Codes	Code 11	US Postnet	I 2 of 5	US Planet	Discrete 2 of 5	UK Postal	Codabar	Japan Postal	MS	Australian Postal	GS1 DataBar	Dutch Postal	Inverse 1DI	4State Postal	Composite Codes	
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Electrical Safety (pending)	ETL, VDE																																
Laser Classification (aiming Element)	It is intended for use in CDRH Class 2/IEC Class 1 devices.																																
Radiated Emissions (pending)	FCC Part 15 Class B, CISPIR22 Class B																																
Height	0.99 in. (25.2 mm) maximum																																
Width	1.91 in. (30.2 mm) maximum																																
Depth	2.18 in. (55.4 mm) maximum																																
Weight	1.8 oz. (51.0 grams)																																
Interface	9-pin Male D-sub supports all interfaces																																



Note: Environmental and/or tolerance parameters are not cumulative. A thermal analysis is recommended if the application is subject to an extreme temperature environment.

Skew, Pitch and Roll

Measured on a 20 mil Code 39 symbol at a distance of 10 inches. Tolerance is reduced at extreme ends of the working range.

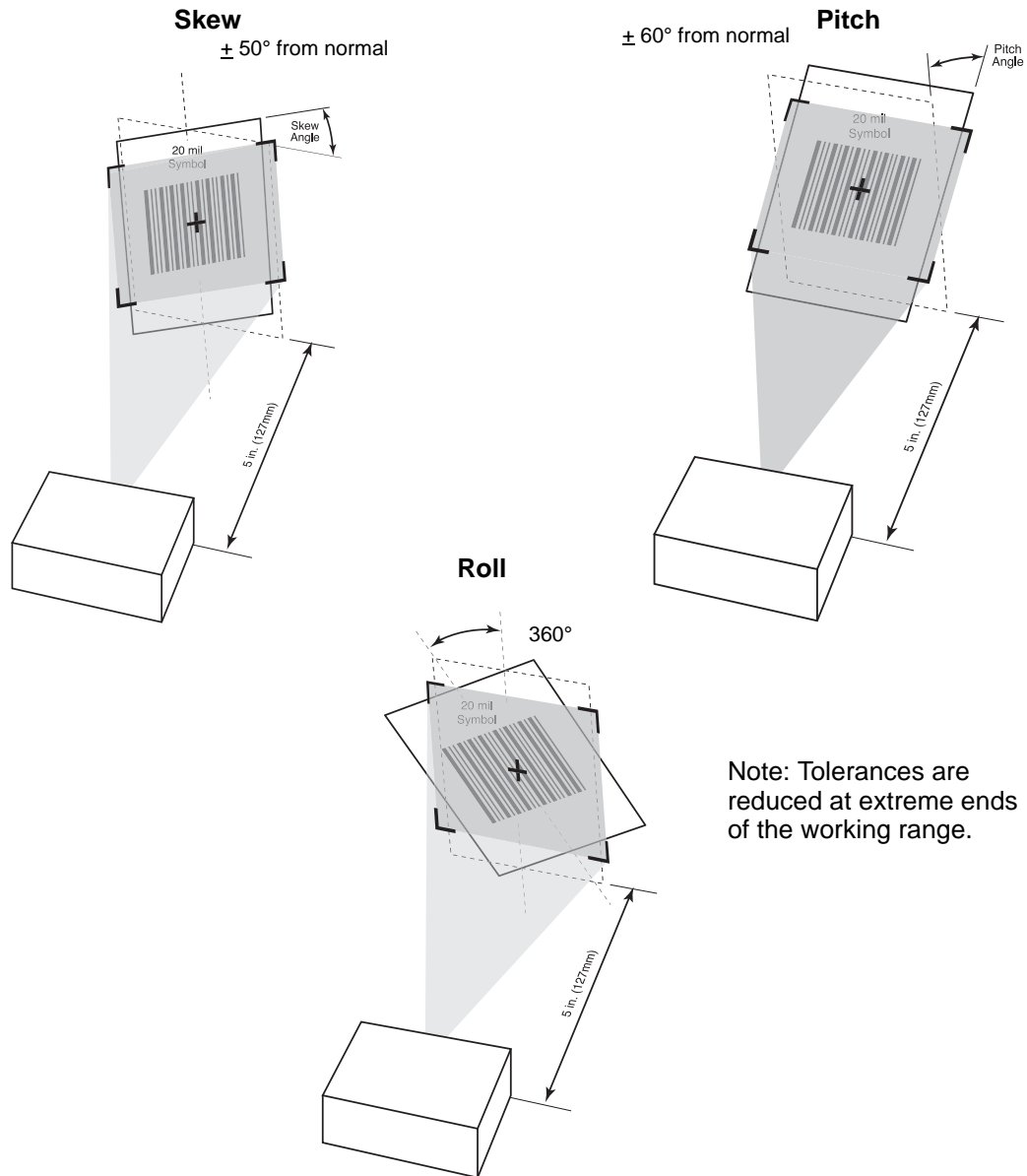


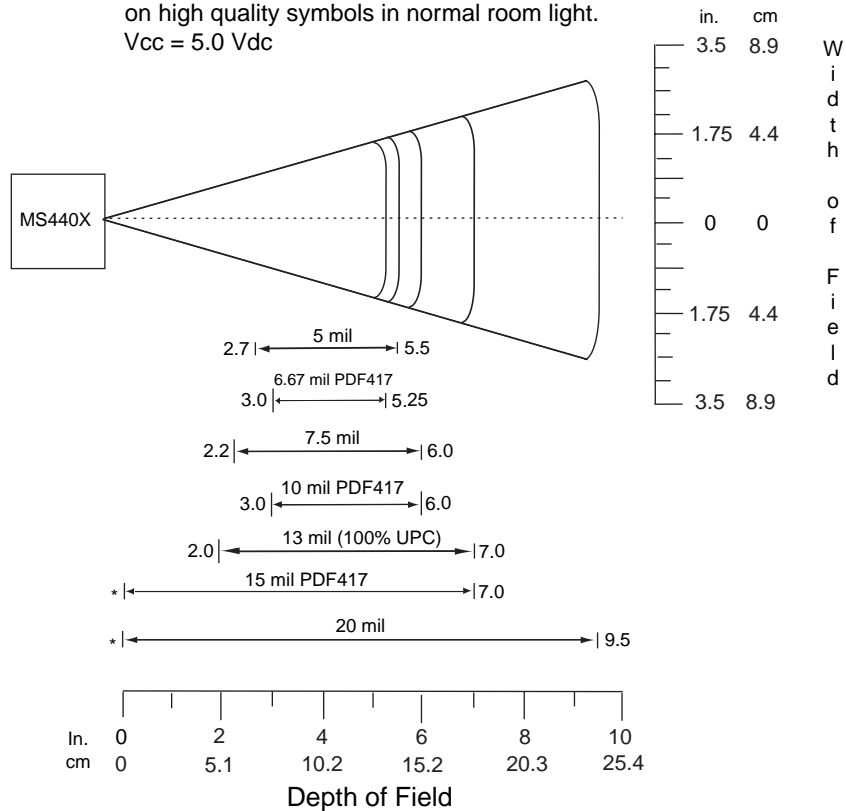
Figure 4-5 Skew, Pitch and Roll

Decode Zones

Standard Near Focus

The decode zone for the Near Focus Symbol MS440X is shown in [Figure 4-6](#). Typical values are shown. [Table 4-5](#) lists the typical and guaranteed distances for selected bar code densities. The minimum element width (or “symbol density”) is the width in mils of the narrowest element (bar or space) in the symbol.

Note: Typical performance at 73°F (23°C)
on high quality symbols in normal room light.
Vcc = 5.0 Vdc



* Minimum distance determined by symbol length and scan angle.

Figure 4-6 Standard Near Focus Decode Zone

Table 4-5 Standard Near Focus Decode Distances

Symbol Density/ Bar Code Type	Bar Code Content/ Contrast ^{Note 2}	Typical Working Ranges		Guaranteed Working Ranges	
		Near	Far	Near	Far
5.0 mil Code 39	ABCDEFGH 80% MRD	2.7 in 6.9 cm	5.5 in 14.0 cm	4.0 in 10.2 cm	5.0 in 12.7 cm
6.67 mil PDF417	4 Col, 20 Rows 80% MRD	3.0 in 7.62 cm	5.25 in 13.3 cm	4.5 in 11.4 cm	5.0 in 12.7 cm
7.5 mil Code 39	ABCDEF 80% MRD	2.2 in 5.6 cm	6.0 in 15.2 cm	3.5 in 8.9 cm	5.5 in 13.9 cm
10 mil PDF417	3 Col, 17 Rows 80% MRD	3.0 in 7.6 cm	6.0 in 15.2 cm	4.0 in 10.2 cm	5.5 in 13.9 cm
13 mil UPC-A	012345678905 80% MRD	2.0 in 5.1 cm	7.0 in 17.8 cm	3.0 in 7.6 cm	6.0 in 15.2 cm
15 mil PDF417	80% MRD	Note 1	7.0 in 17.8 cm	Note 1	6.0 in 15.2 cm
20 mil Code 39	123 80% MRD	Note 1	9.5 in 24.1 cm	Note 1	8.0 in 20.3 cm

Notes:

1. Near distances are field-of-view (FOV) limited.

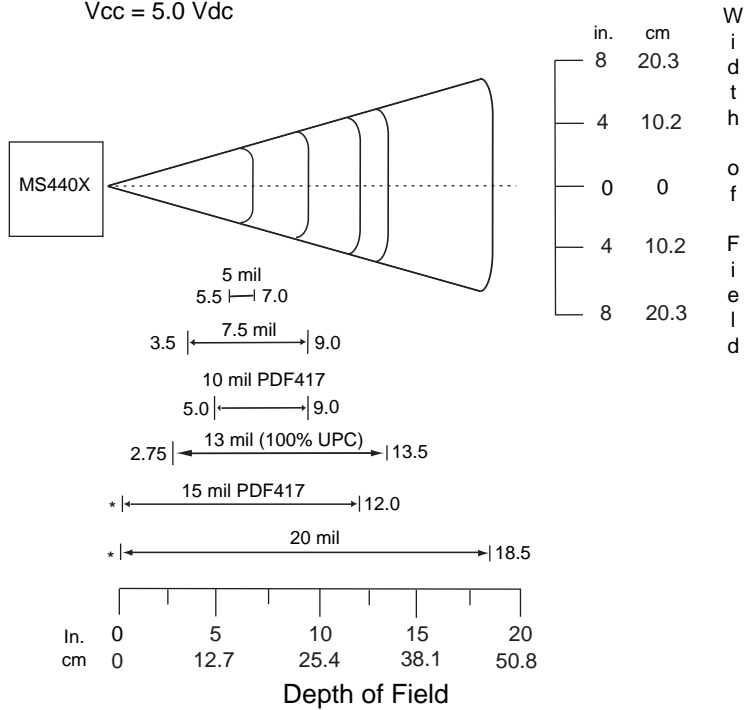
2. Contrast is measured as Mean Reflective Difference (MRD) at 670 nm.

3. Working range specifications at temperature = 23°C, pitch=15°, roll=0°, skew=0°, photographic quality, ambient light ~30 ft-c, humidity 45-70% RH.

Standard Far Focus

The decode zone for the Far Focus Symbol MS440X is shown in *Figure 4-7*. Typical values are shown. *Table 4-6* lists the typical and guaranteed distances for selected bar code densities. The minimum element width (or “symbol density”) is the width in mils of the narrowest element (bar or space) in the symbol.

Note: Typical performance at 73°F (23°C)
 on high quality symbols in normal room light.
 Vcc = 5.0 Vdc



* Minimum distance determined by symbol length and scan angle.

Figure 4-7 Standard Far Focus Decode Zone

Table 4-6 Standard Far Focus Decode Distances

Symbol Density/ Bar Code Type	Bar Code Content/ Contrast ^{Note 2}	Typical Working Ranges		Guaranteed Working Ranges	
		Near	Far	Near	Far
5.0 mil Code 39	ABCDEFGH 80% MRD	5.5 in 13.9 cm	7.0 in 17.8 cm	N/A	N/A
6.67 mil PDF417	4 Col, 20 Rows 80% MRD	N/A	N/A	N/A	N/A
7.5 mil Code 39	ABCDEF 80% MRD	3.5 in 8.9 cm	9.0 in 22.9 cm	5.5 in 14.0 cm	7.0 in 17.8 cm
10 mil PDF417	3 Col, 17 Rows 80% MRD	5.0 in 12.7 cm	9.0 in 22.9 cm	6.5 in 16.5 cm	8.0 in 20.3 cm
13 mil UPC-A	012345678905 80% MRD	2.75 in 6.9 cm	13.5 in 34.3 cm	3.0 in 7.6 cm	11.5 in 29.2 cm
15 mil PDF417	80% MRD	Note 1	12.0 in 30.5 cm	Note 1	11.0 in 27.9 cm
20 mil Code 39	123 80% MRD	Note 1	18.5 in 46.9 cm	Note 1	15.5 in 39.4 cm

Notes:**1. Near distances are FOV limited.****2. Contrast is measured as Mean Reflective Difference (MRD) at 670 nm.****3. Working range specifications at temperature = 23°C, pitch=15°, roll=0°, skew=0°, photographic quality, ambient light ~30 ft-c, humidity 45-70% RH.**

HD/DPM Near Focus

The decode zone for the Near Focus Symbol MS440X HD and DPM versions is shown in *Figure 4-8*. Typical values are shown. *Table 4-7* lists the typical and guaranteed distances for selected bar code densities. The minimum element width (or “symbol density”) is the width in mils of the narrowest element (bar or space) in the symbol.

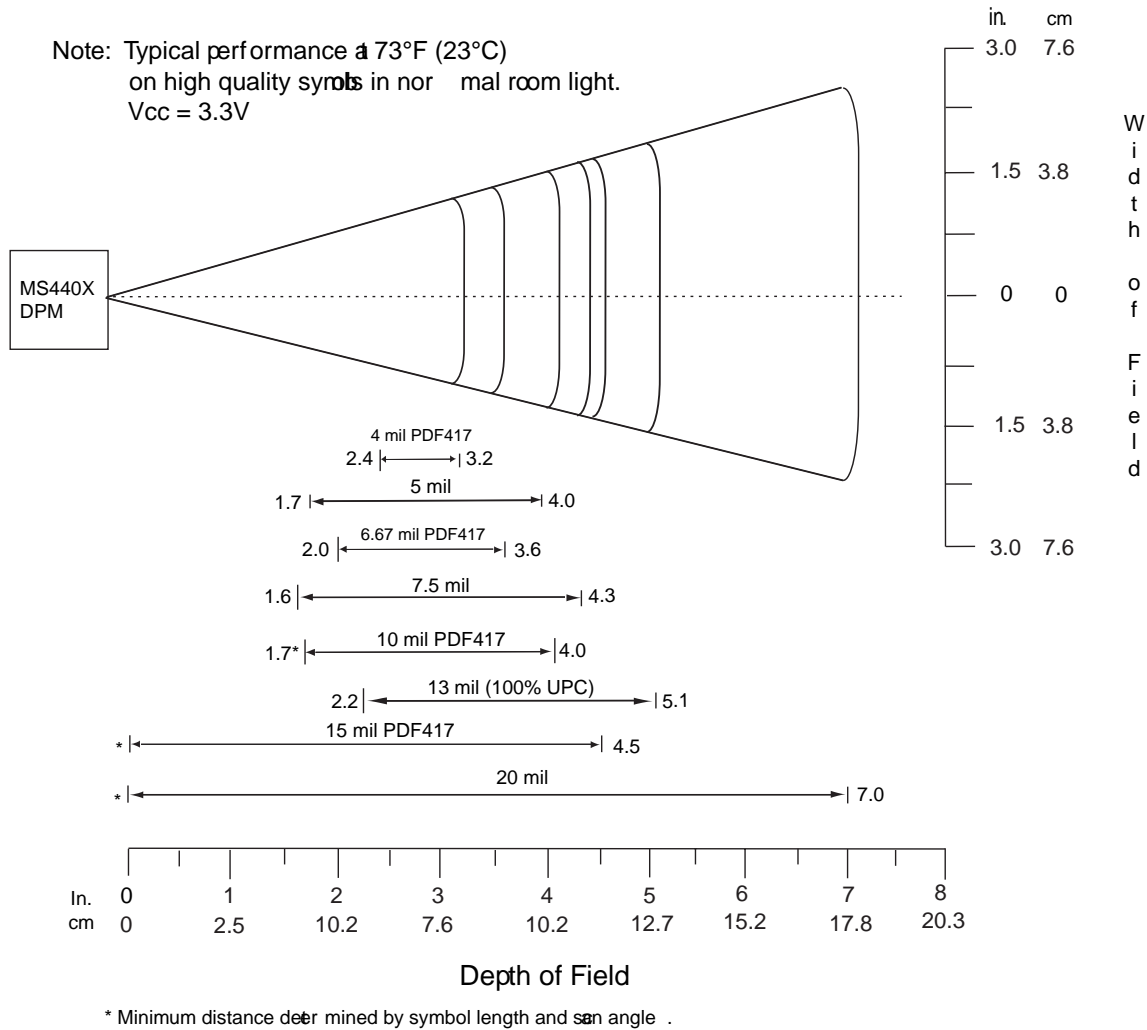


Figure 4-8 HD/DPM Near Focus Decode Zone

NOTE The decode zone performance for DPM shown above is based on controlled conditions and is to be used as a guide only. Decoding is affected by mark quality, type, surface, and grade as well as ambient lighting conditions.

Table 4-7 HD/DPM Near Focus Decode Distances

Symbol Density/ Bar Code Type	Bar Code Content/ Contrast ^{Note 2}	Typical Working Ranges		Guaranteed Working Ranges	
		Near	Far	Near	Far
4.0 mil PDF417	80% MRD	2.4 in 6.10 cm	3.2 in 8.13 cm	Note 1	2.74 in 6.96 cm
5.0 mil Code 39	ABCDEFGH 80% MRD	1.7 in 4.32 cm	4.0 in 10.16 cm	2.29 in 5.82 cm	3.04 in 7.72 cm
6.67 mil PDF417	4 Col, 20 Rows 80% MRD	2.0 in 5.08 cm	3.6 in 9.14 cm	2.74 in 6.96 cm	2.94 in 7.47 cm
7.5 mil Code 39	ABCDEF 80% MRD	1.6 in 4.06 cm	4.3 in 10.92 cm	2.54 in 6.45 cm	3.54 in 8.99 cm
10 mil PDF417	3 Col, 17 Rows 80% MRD	1.7 in ^{Note 1} 4.32 cm	4.0 in 10.16 cm	Note 1	3.04 in 7.72 cm
13 mil UPC-A	012345678905 80% MRD	2.2 in 5.59 cm	5.1 in 12.95 cm	Note 1	4.04 in 10.26 cm
15 mil PDF417	80% MRD	Note 1	4.5 in 11.43 cm	Note 1	3.79 in 9.63 cm
20 mil Code 39	123 80% MRD	Note 1	7.0 in 17.78 cm	Note 1	5.29 in 13.44 cm

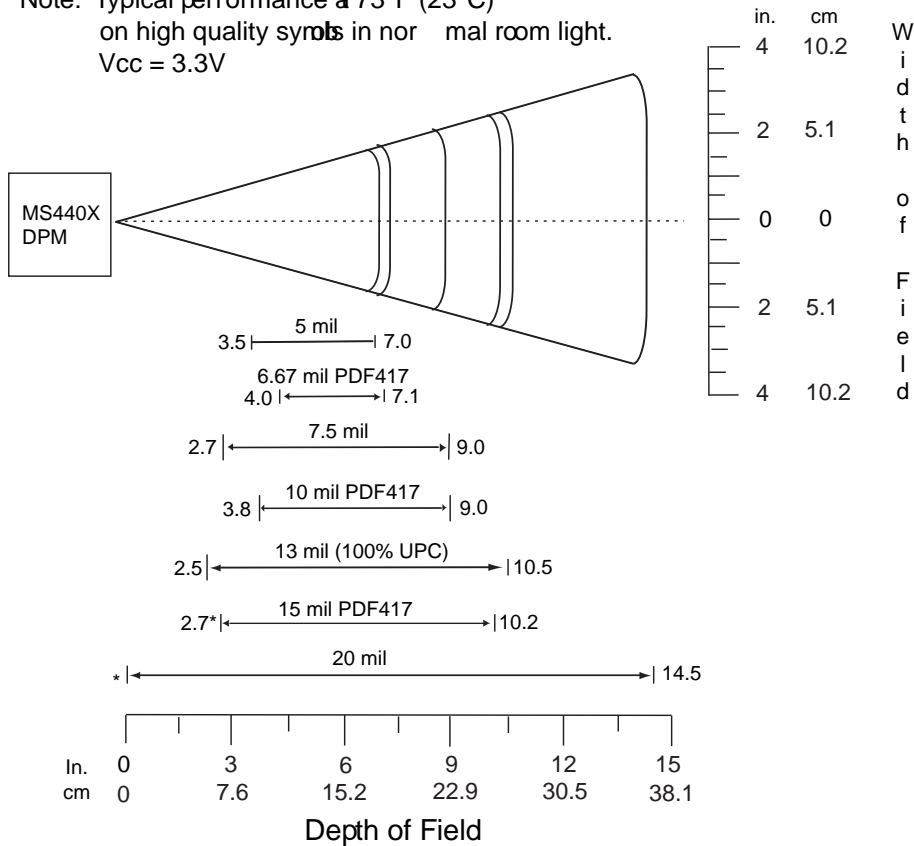
Notes:

1. Near distances are field-of-view (FOV) limited.
2. Contrast is measured as Mean Reflective Difference (MRD) at 670 nm.
3. Working range specifications at temperature = 23°C, pitch=15°, roll=0°, skew=0°, photographic quality, ambient light ~30 ft-c, humidity 45-70% RH.

HD/DPM Far Focus

The decode zone for the Far Focus Symbol MS440X HD and DPM versions is shown in *Figure 4-9*. Typical values are shown. *Table 4-8* lists the typical and guaranteed distances for selected bar code densities. The minimum element width (or “symbol density”) is the width in mils of the narrowest element (bar or space) in the symbol.

Note: Typical performance at 73°F (23°C)
on high quality symbols in normal room light.
Vcc = 3.3V



* Minimum distance determined by symbol length and scan angle.

Figure 4-9 HD/DPM Far Focus Decode Zone



NOTE The decode zone performance for DPM shown above is based on controlled conditions and is to be used as a guide only. Decoding is affected by mark quality, type, surface, and grade as well as ambient lighting conditions.

Table 4-8 HD/DPM Far Focus Decode Distances

Symbol Density/ Bar Code Type	Bar Code Content/ Contrast ^{Note 2}	Typical Working Ranges		Guaranteed Working Ranges	
		Near	Far	Near	Far
4.0 mil PDF417	80% MRD	N/A	N/A	N/A	N/A
5.0 mil Code 39	ABCDEFGH 80% MRD	3.5 in 8.89 cm	7.0 in 17.78 cm	4.79 in 12.17 cm	6.29 in 15.98 cm
6.67 mil PDF417	4 Col, 20 Rows 80% MRD	4.0 in 10.16 cm	7.1 in 18.03 cm	5.29 in 13.44 cm	5.79 in 14.71
7.5 mil Code 39	ABCDEF 80% MRD	2.7 in 6.86 cm	9.0 in 22.86 cm	4.04 in 10.26 cm	7.29 in 18.52 cm
10 mil PDF417	3 Col, 17 Rows 80% MRD	3.8 in 9.65 cm	9.0 in 22.86 cm	5.29 in 13.44 cm	7.04 in 17.88 cm
13 mil UPC-A	012345678905 80% MRD	2.5 in 6.35 cm	10.5 in 26.67 cm	3.54 in 8.99 cm	8.29 in 21.06 cm
15 mil PDF417	80% MRD	2.7 in ^{Note 1} 6.86 cm	10.2 in 25.91 cm	Note 1	7.79 in 19.79 cm
20 mil Code 39	123 80% MRD	Note 1	14.5 in 36.83 cm	Note 1	11.54 in 29.31 cm

Notes:

1. Near distances are FOV limited.
2. Contrast is measured as Mean Reflective Difference (MRD) at 670 nm.
3. Working range specifications at temperature = 23°C, pitch=15°, roll=0°, skew=0°, photographic quality, ambient light ~30 ft-c, humidity 45-70% RH.



Chapter 5 Maintenance & Troubleshooting

Overview

The chapter provides information on maintenance and troubleshooting.

Maintenance

Cleaning the exit window is the only maintenance required. Do not allow any abrasive material to touch the window. Clean the exit window with a damp cloth and, if necessary, a non-ammonia based detergent.

Troubleshooting

Problem	Possible Cause	Possible Solutions
No red LED or nothing happens during a capture attempt.	No power to the imager.	Check the system power. Confirm that the correct host interface cable is used.
		Connect the power supply.
		Re-connect loose cables.
Imager cannot read the bar code.	Interface/power cables are loose.	Re-connect loose cables.
	Imager is not programmed for the correct bar code type.	Ensure the imager is programmed to read the type of bar code to be decoded. Try capturing other bar code(s) and other bar code types.
	Incorrect communication parameters.	Set the correct communication parameters (baud rate, parity, stop bits, etc.)
	Bar code symbol is unreadable.	Check the symbol to ensure it is not defaced. Try capturing similar symbols of the same code type.
	Inappropriately hot environment.	Remove the imager from the hot environment, and allow it to cool down.
Laser activates, followed by a beep sequence.	Beeper is configured.	Refer to <i>Beeper Signals on page 3-3</i> for beeper indication descriptions.



NOTE If after performing these checks the symbol still does not decode, contact the distributor or contact Motorola Enterprise Mobility Support. See [page xv](#) for contact information.

Chapter 6 User Preferences

Overview

This chapter describes each user preference feature and provides the programming bar codes necessary for selecting these features.

Host Selection

Select a host type according to the pinout information in [Table 4-2 on page 4-3](#) (connecting pins 4 and 8). The default serial host for the Symbol MS4404 is SSI and the default USB host for the Symbol MS4407 is SNAPi with Imaging, as these host types provide more flexibility during integration when configuring the unit via host command.

Selecting other host configurations require using bar code menus and are not available via host programming. These hosts do not support host triggering, and require a method to trigger the reader for initial configuration. Use caution when selecting one of these hosts. Be sure to consider how setting up via bar code menu, which includes providing a triggering method, can impact integration. See each host chapter for configuration options for each host type.

Changing Default Values

The imager ships with the settings shown in [User Preferences Default Table on page 6-3](#) (also see [Appendix A, Standard Defaults](#) for all host device and miscellaneous defaults). If the default values suit requirements, programming is not necessary.

There are two ways to change a parameter value:

- Capture the appropriate bar codes in this guide. These new values replace the standard default values in memory.
- For SSI and USB SNAPi hosts, send a “parameter send” command from the host system. Hexadecimal parameter numbers are shown in this chapter below the parameter title, and options are shown in parenthesis beneath the accompanying bar codes. See the *Simple Serial Interface (SSI) Programmer Guide* for detailed instructions for changing parameter values using this method.



NOTE Most computer monitors allow capturing the bar codes directly on the screen. When capturing from the screen, be sure to set the document magnification to a level where the bar code can be seen clearly, and bars and/or spaces are not merging.

To return all features to default values, capture [Set Default Parameter on page 6-3](#). Throughout the programming bar code menus, default values are indicated with asterisks (*).



* Indicates Default — ***High Volume** — Feature/Option
(00h) — Option Hex Value for programming via SSI command

Imaging Sequence Examples

In most cases, capturing one bar code sets the parameter value. For example, to set the beeper tone to high, capture the **High Frequency** (beeper tone) bar code listed under [Beeper Tone on page 6-4](#). The imager issues a fast warble beep signal and a good decode LED signal, signifying a successful parameter entry.

Other parameters, such as **Presentation Mode Session Timeout**, require capturing several bar codes. See these parameter descriptions for this procedure.

Errors While Decoding

Unless otherwise specified, to correct an error during a decoding sequence, just re-capture the correct parameter.

User Preferences Parameter Defaults

[Table 6-1](#) lists defaults for user preferences parameters. To change any parameter value, capture the appropriate bar code(s) provided in [User Preferences on page 6-3](#).



NOTE See [Appendix A, Standard Defaults](#) for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 6-1 *User Preferences Default Table*

Parameter	Parameter Number	Default	Page Number
User Preferences			
Set Default Parameter		All Defaults	6-3
Parameter Scanning	ECh	Enable	6-4
Beeper Tone	91h	Medium	6-4
Beeper Volume	8Ch	High	6-5
Trigger Mode	8Ah	Presentation	6-6
Picklist Mode	F0h 92h	Disabled Always	6-7
Power Mode	80h	Continuous On	6-8
Time Delay to Low Power Mode	92h	1.0 Sec	6-8
Decode Session Timeout	88h	9.9 Sec	6-9
Timeout Between Decodes, Same Symbol	89h	0.6 Sec	6-10
Beep After Good Decode	38h	Enable	6-10
Presentation Mode Session Timeout	F0h, 90h	2 Seconds	6-11

User Preferences

Set Default Parameter

Capture this bar code to return all parameters to the default values listed in [Table A-1 on page A-1](#).



*Set All Defaults

Parameter Scanning

Parameter # ECh

To disable decoding of parameter bar codes, capture the **Disable Parameter Scanning** bar code below. Note that you can still decode the **Set Defaults** parameter bar code. To enable decoding of parameter bar codes, capture either **Enable Parameter Scanning** or **Set All Defaults**.



*Enable Parameter Scanning
(01h)



Disable Parameter Scanning
(00h)

Beeper Tone

Parameter # 91h

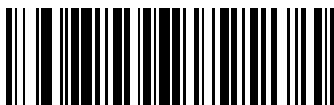
To select a decode beep frequency (tone), capture the **Low Frequency**, **Medium Frequency**, or **High Frequency** bar code.



Low Frequency
(02h)



*Medium Frequency
(Optimum Setting)
(01h)



High Frequency
(00h)

Beeper Volume

Parameter # 8Ch

To select a beeper volume, capture the **Low Volume**, **Medium Volume**, or **High Volume** bar code.



Low Volume
(02h)



Medium Volume
(01h)



***High Volume**
(00h)

Trigger Mode

Parameter # 8Ah

- **Level** - A trigger event activates decode processing, which continues until the trigger event ends, a valid decode, or the decode session time-out is reached.
- **Presentation Mode** - When the Symbol MS440X detects an object in its field of view it triggers and attempt to decode. The range of object detection does not vary under normal lighting conditions. This applies to decode mode only. In this mode the unit does not enter its sleep state.
- **Host** - A host command issues the triggering signal. The Symbol MS440X interprets a trigger pull as a level triggering option.



Level
(00h)



*Presentation Mode
(07h)



Host
(08h)

Picklist Mode

Parameter # F0h 92h

Picklist mode enables the imager to decode only bar codes that are aligned under the laser crosshair. Select one of the following picklist modes for the imager:

- **Disabled Always (default)** - Picklist mode is always disabled.
- **Enabled Out of Scanstand** - Picklist mode is enabled when the imager is out of Scanstand mode and disabled when the imager is in Scanstand mode.
- **Enabled Always**- Picklist mode is always enabled.



*Disabled Always
(00h)



Enabled Out of Scanstand
(01h)



Enabled Always
(02h)

Power Mode

Parameter # 80h

This parameter determines whether or not power remains on after a decode attempt. In low power mode, the imager enters into a low power consumption mode to preserve battery life after each decode attempt. In continuous power mode, power remains on after each decode attempt.



*Continuous On
(00h)



Low Power Mode
(01h)

Time Delay to Low Power Mode

Parameter # 92h

This parameter sets the time the imager remains active after decoding. The imager wakes upon trigger pull or when the host attempts to communicate with the imager.



NOTE This parameter only applies when Power Mode is set to Low Power.

To program a different value for this parameter than those provided below, see the *Simple Serial Interface (SSI) Programmer Guide*.



*1 Second
(11h)



5 Seconds
(15h)

Time Delay to Low Power Mode (continued)



1 Minute
(21h)



5 Minutes
(25h)



15 Minutes
(2Bh)



1 Hour
(31h)

Decode Session Timeout

Parameter # 88h

This parameter sets the maximum time decode processing continues during a decode attempt. It is programmable in 0.1 second increments from 0.5 to 9.9 seconds. The default timeout is 9.9 seconds.

To set a Decode Session Timeout, capture the bar code below. Next, capture two numeric bar codes from [Appendix D, Numeric Bar Codes](#) that correspond to the desired on time. Single digit numbers must have a leading zero. For example, to set a Decode Session Timeout of 0.5 seconds, capture the bar code below, then capture the **0** and **5** bar codes. To correct an error or change the selection, capture *Cancel* on page D-3.



Decode Session Timeout

Timeout Between Decodes, Same Symbol

Parameter # 89h

This option is used in presentation mode to prevent multiple reads of a symbol left in the Symbol MS440X field of view. The timeout begins when the symbol is removed from the field of view. It is programmable in 0.1 second increments from 0.0 to 9.9 seconds. The default interval is 0.6 seconds.

To select the timeout between decodes for the same symbol, capture the bar code below, then capture two numeric bar codes from [Appendix D, Numeric Bar Codes](#) that correspond to the desired interval, in 0.1 second increments.

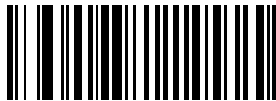


Timeout Between Decodes, Same Symbol

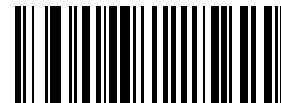
Beep After Good Decode

Parameter # 38h

Capture a bar code below to select whether or not the imager issues a beep signal after a good decode. If selecting **Do Not Beep After Good Decode**, beeper signals are issued during parameter menu imaging and to indicate error conditions.



*Beep After Good Decode
(Enable)
(01h)



Do Not Beep After Good Decode
(Disable)
(00h)

Presentation Mode Session Timeout

Parameter # F0h, 90h

To set the duration of the attempt to decode a bar code detected in presentation mode, capture the bar code below. Next, capture three numeric bar codes from [Appendix D, Numeric Bar Codes](#) to select a value between 1 and 255 that represents tenths of a second. Single digit numbers must have a leading zero. For example, to set 0.5 seconds, capture the bar code below, then capture the **0, 0, 5** bar codes. To correct an error or change the selection, capture *Cancel on page D-3*. The default value is 2 seconds.



Presentation Mode Session Timeout

Chapter 7 Imager Preferences


Overview

This chapter describes imager preference features and provides the programming bar codes for selecting these features.

The imager ships with the settings shown in the [Imager Preferences Default Table on page 7-2](#) (also see [Appendix A, Standard Defaults](#) for all host device and miscellaneous defaults). If the default values suit requirements, programming is not necessary.

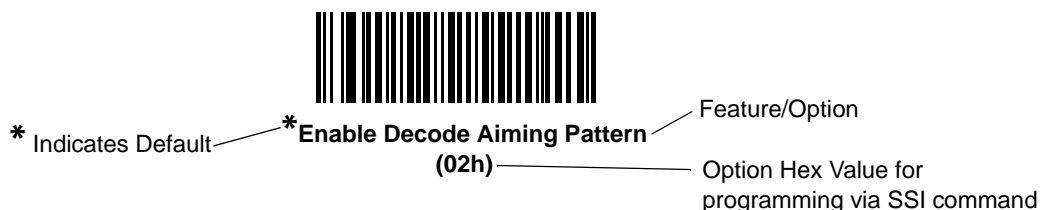
There are two ways to change a parameter value:

- Capture the appropriate bar codes in this guide. These new values replace the standard default values in memory.
- For SSI and USB SNAPi hosts, send a “parameter send” command from the host system. Hexadecimal parameter numbers are shown in this chapter below the parameter title, and options are shown in parenthesis beneath the accompanying bar codes. See the *Simple Serial Interface (SSI) Programmer Guide* for detailed instructions for changing parameter values using this method.

 **NOTE** Most computer monitors allow capturing the bar codes directly on the screen. When capturing from the screen, be sure to set the document magnification to a level where the bar code can be seen clearly, and bars and/or spaces are not merging.

Select a host type (see each host chapter for specific host information) after the power-up beep signal activates. This is only necessary upon the first power-up when connected to a new host.

To return all features to default values, capture [*Set All Defaults on page 6-3](#). Throughout the programming bar code menus, default values are indicated with asterisks (*).



Imaging Sequence Examples

In most cases capturing one bar code sets the parameter value. For example, to disable the decode aiming pattern, capture the **Disable Decode Aiming Pattern** bar code listed under [Decode Aiming Pattern on page 7-7](#). For systems that use a beeper and LED, a fast warble beep sounds and the LED lights, signifying a successful parameter entry.

Other parameters, such as **Crop to Pixel Address**, require capturing several bar codes. See these parameter descriptions for this procedure.

Errors While Imaging

Unless otherwise specified, to correct an error during an imaging sequence, just re-capture the correct parameter.

Imager Preferences Parameter Defaults

[Table 7-1](#) lists defaults for imager preferences parameters. To change any option, capture the appropriate bar code(s) provided in [Imager Preferences on page 7-4](#).



NOTE See [Appendix A, Standard Defaults](#) for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 7-1 *Imager Preferences Default Table*

Parameter	Parameter Number	Default	Page Number
Imaging Options			
Focus Mode	F0h A6h	Far Focus Note: The default value for DPM digital scanners is Near Focus.	7-5
Decoding Autoexposure	F0h 29h	Enable	7-6
Decoding Illumination	F0h 2Ah	Enable	7-6
Decode Aiming Pattern	F0h 32h	Enable	7-7
DPM Scanning	F1h 09h	Enable	7-8
Image Capture Autoexposure	F0h 68h	Enable	7-9
Image Capture Illumination	F0h 69h	Enable	7-9
Gain	F4h F0h A7h	100	7-10
Exposure Time	F4h F0h 38h	10 ms	7-11
LED Illumination	F0h ADh	External LED Illumination	7-12
Snapshot Mode Timeout	F0h 43h	0 (30 seconds)	7-12

Table 7-1 *Imager Preferences Default Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Snapshot Aiming Pattern	F0h 2Ch	Enable	7-13
Image Cropping	F0h 2Dh	Disable	7-13
Crop to Pixel Addresses	F4h F0h 3Bh; F4h F0h 3Ch; F4h F0h 3Dh; F4h F0h 3Eh	0 top, 0 left, 479 bottom, 639 right	7-14
Image Resolution	F0h 2Eh	Full	7-15
JPEG Image Options	F0h 2Bh	Quality	7-16
JPEG Quality Value	F0h 31h	65	7-16
JPEG Size Value	F0h 33h	40 (41K)	7-16
Image File Format Selection	F0h 30h	JPEG	7-17
Bits per Pixel (BPP)	F0h 2Fh	8 BPP	7-17
Signature Capture	5Dh	Disable	7-18
Signature Capture Image File Format Selection	F0h 39h	JPEG	7-19
Signature Capture Bits per Pixel (BPP)	F0h 3Ah	8 BPP	7-20
Signature Capture Width	F4h F0h 6Eh	400	7-20
Signature Capture Height	F4h F0h 6Fh	100	7-21
Signature Capture JPEG Quality	F0h A5h	65	7-21
Video View Finder	F0h 44h	Disable	7-21
Target Video Frame Size	F0h 48h	2200 bytes	7-22
Video View Finder Image Size	F0h 49h	1700 bytes	7-22

Imager Preferences

The parameters in this chapter control image capture characteristics. Image capture occurs in all modes of operation, including decode, video, and snapshot.

Operational Modes

The imager has three modes of operation:

- Decode Mode
- Snapshot Mode
 - Snapshot with Viewfinder Mode
- Video Mode.

Decode Mode

By default, upon a trigger event, the imager attempts to locate and decode enabled bar codes within its field of view. The imager remains in this mode as long as the trigger is active or until a bar code is decoded.

Snapshot Mode

Use Snapshot Mode to capture a high-quality image and transmit it to the host. To temporarily enter this mode capture the **Snapshot Mode** bar code. While in this mode the imager blinks the green LED at 1-second intervals to indicate it is not in standard operating (decode) mode.

In Snapshot Mode, the imager turns on the laser aiming pattern to highlight the area to be captured in the image. The next trigger event instructs the imager to capture a high quality image and transmit it to the host. A short time may pass (less than 2 seconds) between when the trigger is activated and the image is captured as the imager adjusts to the lighting conditions. Hold the imager steady until the image is captured, denoted by a single beep.

If a trigger event is not activated within the Snapshot Mode Timeout period, the imager returns to Decode Mode. Use [Snapshot Mode Timeout on page 7-12](#) to adjust this timeout period. The default timeout period is 30 seconds.

To disable the laser aiming pattern during Snapshot Mode, see [Snapshot Aiming Pattern on page 7-13](#).

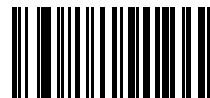
Use [Video View Finder on page 7-21](#) to enable **Snapshot with Viewfinder Mode**. In this mode the imager behaves as a video camera until the trigger is active, at which time a Snapshot is performed as described above.

Video Mode

In this mode the imager behaves as a video camera as long as the trigger is active. When the trigger is released, the imager returns to Decode Mode. Capture this bar code to temporarily enter Video Capture Mode.



Snapshot Mode



Video Mode

Focus Mode

Parameter # F0h, A6h

Select the focus mode to control the working range of the imager. If **Far Focus** is selected, the imager is optimized to read at its far position. With **Near Focus**, the imager is optimized to read at its near position.



*Far Focus
(00h)



Near Focus
(01h)



NOTE The default value for DPM digital scanners is Near Focus.

Decoding Autoexposure

Parameter # F0h,29h

Select **Enable Decoding Autoexposure** to allow the imager to control gain settings and exposure (integration) time to best capture an image for the selected operation mode.

Select **Disable Decoding Autoexposure** to manually adjust the gain and exposure time (see [Gain](#) and [Exposure Time](#) on the following pages). This option is only recommended for advanced users with difficult image capture situations.



*Enable Decoding Autoexposure
(01h)



Disable Decoding Autoexposure
(00h)

Decoding Illumination

Parameter # F0h, 2Ah

Selecting **Enable Illumination** causes the imager to flash illumination on every image capture to aid decoding. Select **Disable Illumination** to prevent the imager from using decoding illumination.

Enabling illumination usually results in superior images. The effectiveness of the illumination decreases as the distance to the target increases.



*Enable Decoding Illumination
(01h)

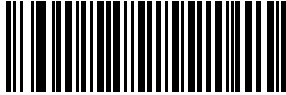


Disable Decoding Illumination
(00h)

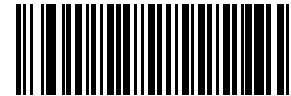
Decode Aiming Pattern

Parameter # F0h, 32h

This parameter only applies when in Decode Mode. Select **Enable Decode Aiming Pattern** to project the aiming pattern during bar code capture, or **Disable Decode Aiming Pattern** to turn the aiming pattern off.



*Enable Decode Aiming Pattern
(02h)



Disable Decode Aiming Pattern
(00h)

DPM Scanning

Parameter # F1h, 09h

Unlike bar codes that are typically printed on labels, a direct part mark (DPM) is a symbol that is marked directly on an item's surface for permanent identification. These symbols are marked using methods such as laser etching and dot peening (see [Figure 3-2 on page 3-2](#) for an example of a dot peen symbol). The DS3407-DP (DPM) digital reader scans these types of symbols.

- ✓ **NOTE** When the DS3407-DP digital scanner is DPM enabled, the digital scanner reads all symbols including DPM, 1D, PDF417, etc. If DPM reading is not required, scan **Disable DPM Scanning** to ensure optimum scanner performance.

If you enable **DPM Scanning**, disable [Picklist Mode on page 6-7](#) when scanning a DPM bar code. Picklist performance is not guaranteed for DPM bar codes.

Also, if you enable DPM Scanning, the scanner behaves as if the **DataMatrix Inverse Autodetect** setting is selected. When you disable DPM Scanning, the previous (user-selected) **DataMatrix Inverse** setting remains in effect. See [Data Matrix Inverse on page 11-68](#).

To ensure the DS3407-DP digital scanner is programmed for DPM reading:

1. The DS3407-DP digital scanner can not read certain bar codes in near field. To ensure the digital scanner can read all bar codes, scan **Far Focus** on [page 7-5](#).
2. If DPM scanning was disabled in the DS3407-DP digital scanner, scan **Enable DPM Scanning** (below).
3. Before scanning a DPM bar code, ensure that [Data Matrix on page 11-68](#) is enabled.



***Enable DPM Scanning
(01h)**



**Disable DPM Scanning
(00h)**

Image Capture Autoexposure

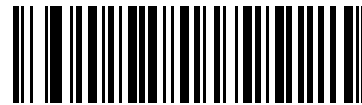
Parameter # F0h, 68h

Select **Enable Autoexposure** to allow the imager to control gain settings and exposure (integration) time to best capture an image for the selected operation mode.

Select **Disable Autoexposure** to manually adjust the gain and exposure time (see [Gain](#) and [Exposure Time](#) on the following pages). This option is only recommended for advanced users with difficult image capture situations.



*Enable Image Capture Autoexposure
(01h)



Disable Image Capture Autoexposure
(00h)

Image Capture Illumination

Parameter # F0h, 69h

Selecting **Enable Image Capture Illumination** causes the imager to flash on every image capture. Select **Disable Illumination** to prevent the imager from using artificial illumination.

Enabling illumination usually results in superior images. The effectiveness of the illumination decreases as the distance to the target increases.



*Enable Image Capture Illumination
(01h)



Disable Image Capture Illumination
(00h)

Gain

Parameter # F4h, F0h, A7h

This parameter only applies when Decoding or Image Capture Autoexposure is disabled. Gain is a means of amplifying the raw image data before it is converted into 256 grayscale values. Increasing the gain increases brightness and contrast, but also increases noise (undesired electrical fluctuations in the image) which makes the image less attractive and/or harder to decode.

To set the manual gain, capture the bar code below followed by 3 bar codes from [Appendix D, Numeric Bar Codes](#), in the range of 79 to 127, representing the value. The default is 100.



Set Gain

Exposure Time

Parameter # F4h, F0h, 38h

This parameter is only available when Image Capture Autoexposure is disabled. Exposure Time controls the amount of time the CCD is allowed to collect light, much like the shutter speed for a camera. Generally, the brighter the environment, the lower the exposure time. Set the manual exposure time to one of the following values: 5 ms, 10 ms, 15 ms, 20 ms, 25 ms, or 30 ms. Increasing the exposure time past 20 ms in a handheld application increases the risk of blurring the image due to hand jitter.



5 ms
(004Fh)



*10 ms
(009Dh)



15 ms
(00ECh)



20 ms
(013Bh)



25 ms
(018Ah)



30 ms
(01D8h)

LED Illumination

Parameter # F0h, ADh

Select whether to use internal LED illumination (provided by the Symbol MS440X), external illumination (provided outside the Symbol MS440X), or both.

This parameter only applies for decoding if [Decoding Illumination on page 7-6](#) is enabled, or for image capture if [Image Capture Illumination on page 7-9](#) is enabled. If Decoding Illumination or Image Capture Illumination is disabled, all illumination is off for that mode, regardless of this LED Illumination setting.



Internal Illumination
(00h)



*External Illumination
(01h)



Internal and External Illumination
(02h)

Snapshot Mode Timeout

Parameter # F0h, 43h

This parameter sets the amount of time the imager remains in Snapshot Mode. The imager exits Snapshot Mode upon a trigger event, or when the Snapshot Mode Timeout elapses. To set this timeout value, capture the bar code below followed by a bar code from [Appendix D, Numeric Bar Codes](#). The default value is 0 which represents 30 seconds; values increment by 30. For example, 1 = 60 seconds, 2 = 90 seconds, etc.



Snapshot Mode Timeout

Snapshot Aiming Pattern

Parameter # F0h, 2Ch

Select **Enable Snapshot Aiming Pattern** to project the aiming pattern when in Snapshot Mode, or **Disable Snapshot Aiming Pattern** to turn the aiming pattern off.



*Enable Snapshot Aiming Pattern
(01h)



Disable Snapshot Aiming Pattern
(00h)

Image Cropping

Parameter # F0h, 2Dh

This parameter crops a captured image. If **Disable Image Cropping** is selected, the full 640 x 480 pixels are presented. If **Enable** is selected, the imager crops the image to the pixel addresses set in [Crop to Pixel Addresses on page 7-14](#).



Enable Image Cropping
(01h)



*Disable Image Cropping
(Use Full 640 x 480 Pixels)
(00h)

Crop to Pixel Addresses

Parameter # F4h, F0h, 3Bh (Top)

Parameter # F4h, F0h, 3Ch (Left)

Parameter # F4h, F0h, 3Dh (Bottom)

Parameter # F4h, F0h, 3Eh (Right)

If Enable Image Cropping is selected, set the pixel addresses from (0,0) to (639,479) to crop to.

Columns are numbered from 0 to 639, rows from 0 to 479. Specify four values for Top, Left, Bottom, and Right, where Top and Bottom correspond to row pixel addresses, and Left and Right correspond to column pixel addresses. For example, for a 4 row x 8 column image in the extreme bottom-right section of the image, set the following values:

Top = 476, Bottom = 479, Left = 632, Right = 639

To set the pixel address to crop to, capture each Pixel Address bar code followed by three bar codes from [Appendix D, Numeric Bar Codes](#) which represent the value. Leading zeros are required, so to enter a value of 3, for example, capture **0, 0, 3**.



Top Pixel Address
(0 - 479 Decimal)



Left Pixel Address
(0 - 639 Decimal)



Bottom Pixel Address
(0 - 479 Decimal)



Right Pixel Address
(0 - 639 Decimal)

Image Resolution

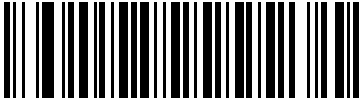
Parameter # F0h, 2Eh

This option alters image resolution before compression. Multiple pixels are combined to one pixel, resulting in a smaller image containing the original content with reduced resolution.

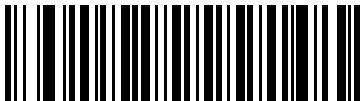
Select one of the following values:

Table 7-2 Resolution Value

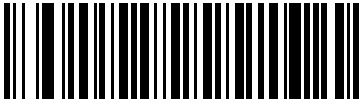
Resolution Value	Uncropped Image Size
Full	640 x 480
1/2	320 x 240
1/3	212 x 160
1/4	160 x 120



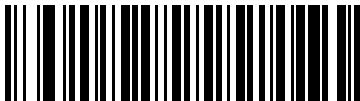
*Full Resolution
(00h)



1/2 Resolution
(01h)



1/3 Resolution
(02h)



1/4 Resolution
(03h)

JPEG Image Options

Parameter # F0h, 2Bh

JPEG images can be optimized for either size or for quality. Capture the **Quality Selector** bar code to enter a quality value; the imager then selects the corresponding image size. Capture the **Size Selector** bar code to enter a size value; the imager then selects the best image quality.



* JPEG Quality Selector
(01h)



JPEG Size Selector
(00h)

JPEG Quality and Size Value

JPEG Quality = Parameter # F0h, 31h

JPEG Size = Parameter # F0h, 33h

If JPEG Quality Selector is selected, capture the **JPEG Quality Value** bar code followed by 3 bar codes from [Appendix D, Numeric Bar Codes](#) corresponding to a value from 5 to 100, where 100 represents the highest quality image.

If JPEG Size Selector is selected, capture **JPEG Size Value** followed by 3 bar codes from [Appendix D, Numeric Bar Codes](#) corresponding to a value from 5 to 150 which represents the file size in multiples of 1024 bytes (1K). For example, setting this value to 8 (008) permits the file size to be as large as 8192 bytes.



JPEG Quality Value
(Default: 065)
(5 - 100 Decimal)



JPEG Size Value
(Default: 040)
(5 - 150 Decimal)

Image File Format Selector

Parameter # F0h, 30h

Select an image format appropriate for the system (BMP, TIFF, or JPEG). The imager stores captured images in the selected format.



BMP File Format
(03h)



*** JPEG File Format**
(01h)



TIFF File Format
(04h)

Bits per Pixel

Parameter # F0h, 2Fh

Select the number of significant bits per pixel (BPP) to use when capturing an image. Select 1BPP for a black and white image, 4BPP to assign 1 of 16 levels of grey to each pixel, or 8BPP to assign 1 of 256 levels of grey to each pixel. The imager ignores these settings for JPEG files, which always use 8BPP.



1 BPP
(00h)

Bits per Pixel (continued)

4 BPP
(01h)



*8 BPP
(02h)

Signature Capture**Parameter # 5Dh**

A signature capture bar code is a special-purpose symbology which delineate a signature capture area in a document with a machine-readable format. The recognition pattern is variable so it can optionally provide an index to various signatures. The region inside the bar code pattern is considered the signature capture area.

Output File Format

Decoding a signature capture bar code de-skews the signature image converts the image to a BMP, JPEG, or TIFF file format. The output data includes the file descriptor followed by the formatted signature image.

Table 7-3 *Output File Format*

File Descriptor			Signature Image
Output Format (1 byte)	Signature Type (1 byte)	Signature Image Size (4 bytes) (BIG Endian)	
JPEG - 1 BMP - 3 TIFF - 4	1-8	0x00000400	0x00010203.....

To enable or disable Signature Capture, capture the appropriate bar code below.



**Enable Signature Capture
(01h)**



***Disable Signature Capture
(00h)**

Signature Capture File Format Selector

Parameter # F0h, 39h

Select a signature file format appropriate for the system (BMP, TIFF, or JPEG). The imager stores captured signatures in the selected format.



**BMP Signature Format
(03h)**



***JPEG Signature Format
(01h)**



**TIFF Signature Format
(04h)**

Signature Capture Bits per Pixel

Parameter # F0h, 3Ah

Select the number of significant bits per pixel (BPP) to use when capturing a signature. Select 1BPP for a black and white image, 4BPP to assign 1 of 16 levels of grey to each pixel, or 8BPP to assign 1 of 256 levels of grey to each pixel. The imager ignores these settings for JPEG files, which always use 8BPP.



1 BPP
(00h)



4 BPP
(01h)



*8 BPP
(02h)

Signature Capture Width

Parameter # F4h, F0h, 6Eh

The aspect ratio of the Signature Capture Width and Signature Capture Height parameters must match that of the signature capture area. For example, a 4 x 1 inch signature capture area would require a 4 to 1 aspect ratio of width to height.

To set the width of the signature capture box, capture the **Signature Capture Width** bar code, followed by 3 bar codes from [Appendix D, Numeric Bar Codes](#) corresponding to a value in the range of 001 to 640 decimal.



Signature Capture Width
(Default: 400)
(001 - 640 Decimal)

Signature Capture Height

Parameter # F4h, F0h, 6Fh

To set the height of the signature capture box, capture the **Signature Capture Height** bar code, followed by 3 bar codes from [Appendix D, Numeric Bar Codes](#) corresponding to a value in the range of 001 to 480 decimal.



Signature Capture Height (Default: 100)
(001 - 480 Decimal)

Signature Capture JPEG Quality

Parameter # F0h, A5h

Capture the **JPEG Quality Value** bar code followed by 3 bar codes from [Appendix D, Numeric Bar Codes](#) corresponding to a value from 005 to 100, where 100 represents the highest quality image.

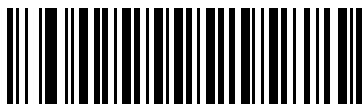


JPEG Quality Value (Default: 065)
(5 - 100 Decimal)

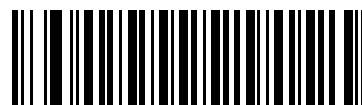
Video View Finder

Parameter # F0h, 44h

Select **Enable Video View Finder** to project the video view finder while in Image Mode, or **Disable Video View Finder** to turn the video view finder off.



*Disable Video View Finder
(00h)



Enable Video View Finder
(01h)

Target Video Frame Size

Parameter # F0h, 48h

Select the number of 100-byte blocks to be transmitted per second. Selecting a smaller value allows more frames to be transmitted per second but reduces video quality; selecting a larger value increases video quality but slows transmission.

To set the Target Video Frame Size, capture the bar code below followed by two bar codes from [Appendix D, Numeric Bar Codes](#) corresponding to the 100-byte value from 800 to 3300 bytes. For example, to select 1500 bytes, enter 1, 5. To select 900 bytes, enter 0, 9.



Target Video Frame Size

Video View Finder Image Size

Parameter # F0h, 49h

Select the number of 100-byte blocks. Values range from 800 to 3000 bytes. Selecting a smaller value allows more frames to be transmitted per second; selecting a larger value increases video quality.

To set the Video View Finder Imager Size, capture the bar code below followed by two bar codes from [Appendix D, Numeric Bar Codes](#) corresponding to the 100-byte value from 800 to 3000 bytes. For example, to select 1500 bytes, enter 1, 5. To select 900 bytes, enter 0, 9.



Video View Finder Image Size

Chapter 8 SSI Interface

Overview

This chapter describes the system requirements of the Simple Serial Interface (SSI), which provides a communications link between Motorola decoders (e.g., scan engines, slot scanners, hand-held scanners, two-dimensional scanners, hands-free scanners, and RF base stations) and a serial host. It provides the means for the host to control the decoder or scanner.

Communications

All communications between the decoder and host are done over the hardware interface lines using the SSI protocol. See the *Simple Serial Interface Programmer's Guide*, p/n 72-40451-xx, for more information on SSI.

The host and the decoder exchange messages in packets. (A packet is a collection of bytes framed by the proper SSI protocol formatting bytes.) The maximum number of bytes per packet allowed by the SSI protocol for any transaction is 257 (255 bytes + 2 byte checksum).

Decode data can be sent as ASCII data (unpacked), or as part of a larger message (packeted), depending on the decoder configuration.

The SSI performs the following major functions for the host device:

- Maintains a bi-directional interface with the decoder
- Allows the host to send commands that control the decoder
- Passes data from the decoder to a host device in the formatted SSI packet format or straight decode message.

The working environment of the SSI consists of a decoder, a serial cable which attaches to the host device, and in some instances, a power supply.

SSI transmits all decode data including special formatting (e.g., AIM ID). The format of the transmitted data can be controlled via parameter settings.

The decoder may also send parameter information, product identification information or event codes to the host.

All commands sent between the decoder and host must use the format described in the SSI Message Formats section. The SSI Transactions section describes the required sequence of messages in specific cases.

Table 8-1 lists all the SSI Opcodes supported by the decoder. It identifies the SSI partner allowed to send a message of each type. The host transmits Opcodes designated type H. The decoder transmits type D Opcodes, and either partner can transmit Host/Decoder (H/D) types.

Table 8-1 SSI Commands

Name	Type	Opcode	Description
AIM_OFF	H	0xC4	Deactivate aim pattern.
AIM_ON	H	0xC5	Activate aim pattern.
BEEP	H	0xE6	Sound the beeper.
CAPABILITIES_REPLY	D	0xD4	Reply to CAPABILITIES_REQUEST; contains a list of the capabilities and commands supported by the decoder.
CAPABILITIES_REQUEST	H	0xD3	Request capabilities report from the decoder.
CMD_ACK	H/D	0xD0	Positive acknowledgment of received packet.
CMD_NAK	H/D	0xD1	Negative acknowledgment of received packet.
DECODE_DATA	D	0xF3	Decode data in SSI packet format.
EVENT	D	0xF6	Event indicated by associated event code.
LED_OFF	H	0xE8	De-activate LED output.
LED_ON	H	0xE7	Activate LED output.
PARAM_DEFAULTS	H	0xC8	Set parameter default values.
PARAM_REQUEST	H	0xC7	Request values of certain parameters.
PARAM_SEND	H/D	0xC6	Send parameter values.
REPLY_ID	D	0xA6	Reply to REQUEST_ID; contains decoder's serial number.
REPLY_REVISION	D	0xA4	Reply to REQ_REV contains decoder's software/hardware configuration.
REQUEST_REVISION	H	0xA3	Request the decoder's configuration.
SCAN_DISABLE	H	0xEA	Prevent the operator from scanning bar codes.
SCAN_ENABLE	H	0xE9	Permit bar code scanning.
SLEEP	H	0xEB	Request to place the decoder into low power.
START_DECODE	H	0xE4	Tell decoder to attempt to decode a bar code.
STOP_DECODE	H	0xE5	Tell decoder to abort a decode attempt.
WAKEUP	H	N/A	Wakeup decoder after it has entered low power mode.

The details of the SSI protocol can be found in the *Simple Serial Interface Programmer's Guide (72-40451-xx)*.

SSI Transactions

General Data Transactions

ACK/NAK Handshaking

ACK/NAK handshaking may be enabled or disabled. If this parameter is set, all packeted messages must have a CMD_ACK or CMD_NAK response, unless the command description states otherwise. This parameter is enabled by default. This handshaking should remain enabled to provide feedback to the host. Raw decode data and WAKEUP do not use ACK/NAK handshaking since they are not packeted data.

Example of a problem which may occur when ACK/NAK handshaking is disabled:

- The host sends a PARAM_SEND message to the decoder to change baud rate from 9600 to 19200.
- The decoder cannot interpret the message.
- The decoder does not implement the changes requested by the host.
- The host assumes that the parameter changes have occurred and acts accordingly.
- Communications are lost because the change did not occur on both sides.

If the ACK/NAK handshaking is enabled, the following occurs:

- The host sends a PARAM_SEND message.
- The decoder cannot interpret the message.
- The decoder CMD_NAKs the message.
- The host resends the message.
- The decoder receives the message successfully, responds with CMD_ACK, and implements parameter changes.

Transfer of Decode Data

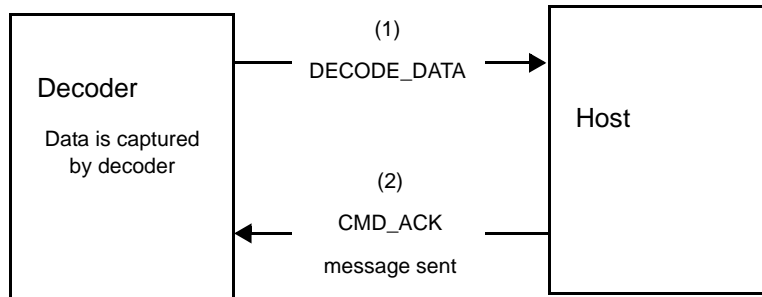
The Decode Data Packet Format parameter controls how decode data is sent to the host. When this parameter is set, the data is sent in a DECODE_DATA packet. When the parameter is cleared, the data is transmitted as raw ASCII data.



NOTE When decode data is transmitted as raw ASCII data, then ACK/NAK handshaking does not apply regardless of the state of the ACK/NAK handshaking parameter.

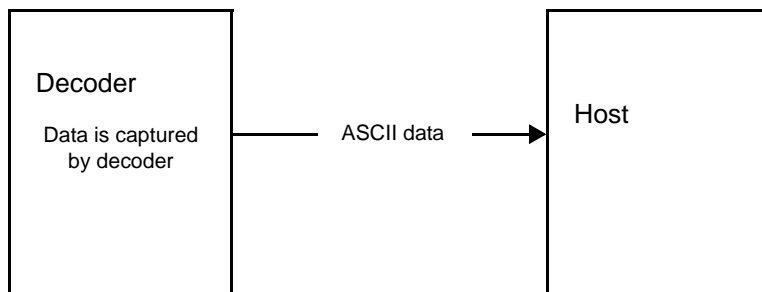
ACK/NAK Enabled and Packeted Data

The decoder sends a `DECODE_DATA` message after a successful decode. The decoder waits for a programmable time-out for a `CMD_ACK` response. If it does not receive the response, the decoder tries to send two more times before issuing a host transmission error. If the decoder receives a `CMD_NAK` from the host, it may attempt a retry depending on the cause field of the `CMD_NAK` message.



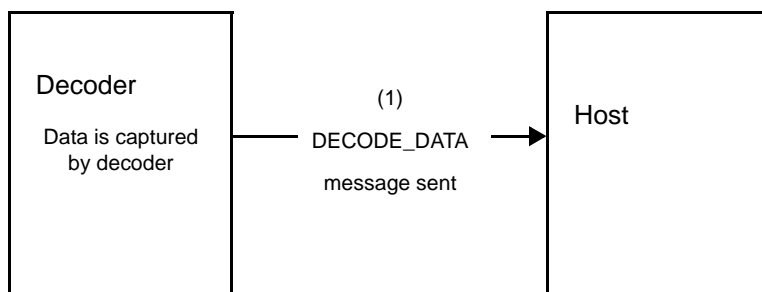
ACK/NAK Enabled and Unpacketed ASCII Data

Even though the ACK/NAK handshaking is enabled, no handshaking occurs because the handshaking applies only to packeted data. In this example the `packeted_decode` parameter is disabled.



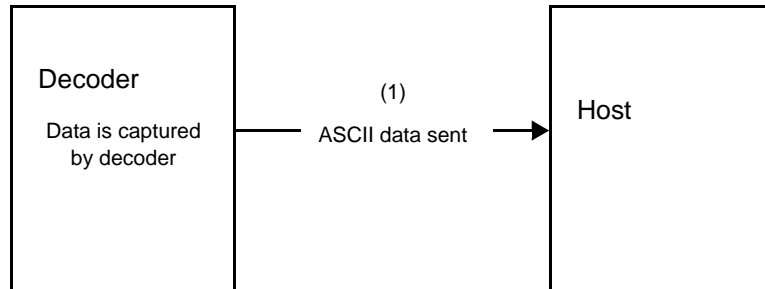
ACK/NAK Disabled and Packeted DECODE_DATA

In this example ACK/NAK does not occur even though `packeted_decode` is enabled because the ACK/NAK handshaking parameter is disabled.



ACK/NAK Disabled and Unpacketed ASCII Data

Data captured by the decoder is sent to the host.



Communication Summary

RTS/CTS Lines

All communication must use RTS/CTS handshaking as described in the *Simple Serial Interface Programmer's Guide*, p/n 72-40451-xx. If hardware handshaking is disabled or bypassed, the WAKEUP command must be sent prior to all other communications, or else the first byte of a communication message may be lost during the decoder wakeup sequence.

ACK/NAK Option

ACK/NAK handshaking can be enabled or disabled. This handshaking is enabled by default and we suggest the option not be disabled. Disabling this handshaking may lead to communication problems, as handshaking is the only acknowledgment that a message was received, and if it was received correctly. ACK/NAK is not used with unpacketed decode data regardless of whether or not this option is enabled.

Number of Data Bits

All communication with the decoder must use 8-bit data.

Serial Response Time-out

The Serial Response Time-out parameter is used to determine how long to wait for a handshaking response before trying again, or aborting any further attempts. Both the host and decoder should use the same value for this parameter.



NOTE A temporary change may be made to the Serial Response Time-out when the host takes longer to process an ACK, or longer data string. Frequent permanent changes are not recommended due to limited write cycles of non-volatile memory.

Retries

When sending data, the host should resend twice after the initial send if the decoder does not respond with an ACK or NAK (if ACK/NAK handshaking is enabled), or response data (e.g., PARAM_SEND, REPLY_REVISION). If the decoder replies with a NAK RESEND, the host resends the data. All resent messages must have the resend bit set in the Status byte.

The decoder resends data two times after the initial send if the host fails to reply with an ACK or NAK (if ACK/NAK handshaking is enabled).

Baud Rate, Stop Bits, Parity, Response Time-out, ACK/NAK Handshake

If the serial parameters above are changed using PARAM_SEND, the ACK response to the PARAM_SEND is sent using the previous values for these parameters. The new values then take effect for the next transaction.

Errors

A communication error is generated by the decoder when:

- The CTS line is asserted when the decoder tries to transmit, and is still asserted on each of 2 successive retries
- Failure to receive an ACK or NAK after initial transmit and two resends.

Things to Remember When Using SSI Communication

If hardware handshaking is not used, space messages sufficiently apart. The host must not communicate with the decoder if the decoder is sending.

If hardware handshaking is used, frame each message properly with the handshaking signals. Do not try to send two commands within the same handshaking frame.

There is a permanent/temporary bit in the PARAM_SEND message. Temporary changes are lost when power is removed from the decoder. Permanent changes are written to non-volatile memory. Frequent changes shorten the life of the non-volatile memory.

Selecting Time Delay to Low Power Mode using SSI

[Time Delay to Low Power Mode on page 6-8](#) provides bar codes to select a general time delay. To program a more specific delay value, use an SSI command according to [Table 8-2](#).

Table 8-2 Values for Selecting Time Delay to Low Power

Value	Timeout	Value	Timeout	Value	Timeout	Value	Timeout
0x00	15 Mins	0x10	1 Sec	0x20	1 Min	0x30	1 Hour
0x01	30 Mins	0x11	1 Sec	0x21	1 Min	0x31	1 Hour
0x02	60 Mins	0x12	2 Secs	0x22	2 Mins	0x32	2 Hours
0x03	90 Mins	0x13	3 Secs	0x23	3 Mins	0x33	3 Hours
N/A	N/A	0x14	4 Secs	0x24	4 Mins	0x34	4 Hours
N/A	N/A	0x15	5 Secs	0x25	5 Mins	0x35	5 Hours
N/A	N/A	0x16	6 Secs	0x26	6 Mins	0x36	6 Hours
N/A	N/A	0x17	7 Secs	0x27	7 Mins	0x37	7 Hours
N/A	N/A	0x18	8 Secs	0x28	8 Mins	0x38	8 Hours
N/A	N/A	0x19	9 Secs	0x29	9 Mins	0x39	9 Hours
N/A	N/A	0x1A	10 Secs	0x2A	10 Mins	0x3A	10 Hours
N/A	N/A	0x1B	15 Secs	0x2B	15 Mins	0x3B	15 Hours
N/A	N/A	0x1C	20 Secs	0x2C	20 Mins	0x3C	20 Hours
N/A	N/A	0x1D	30 Secs	0x2D	30 Mins	0x3D	30 Hours
N/A	N/A	0x1E	45 Secs	0x2E	45 Mins	0x3E	45 Hours
N/A	N/A	0x1F	60 Secs	0x2F	60 Mins	0x3F	60 Hours

Simple Serial Interface Default Parameters

This section describes how to set up the decoder with a SSI host. When SSI is used, the decoder is programmed via bar code menu or SSI hosts commands.

Throughout the programming bar code menus, default values are indicated with asterisks (*).



NOTE Most computer monitors allow scanning the bar codes directly on the screen. When scanning from the screen, be sure to set the document magnification to a level where the bar code can be seen clearly, and bars and/or spaces are not merging.

[Table 8-3](#) lists the defaults for the SSI host. There are two ways to change the default values:

- Scan the appropriate bar codes in this guide. These new values replace the standard default values in memory. To recall the default parameter values, scan the [*Set All Defaults](#) bar code on [page 6-3](#).
- Download data through the device's serial port using SSI. Hexadecimal parameter numbers are shown in this chapter below the parameter title, and options are shown in parenthesis beneath the accompanying bar codes. See the *Simple Serial Interface (SSI) Programmer's Guide* for detailed instructions for changing parameters using this method.



NOTE See [Appendix A, Standard Defaults](#) for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 8-3 SSI Default Table

Parameter	Parameter Number	Default	Page Number
Select SSI Host	N/A	N/A	8-10
Baud Rate	9Ch	9600	8-11
Parity	9Eh	None	8-13
Check Parity	97h	Disable	8-14
Software Handshaking	9Fh	ACK/NAK	8-14
Host RTS Line State	9Ah	Low	8-15
Decode Data Packet Format	EEh	Send Raw Decode Data	8-15
Stop Bits	9Dh	1	8-16

Table 8-3 SSI Default Table (Continued)

Parameter	Parameter Number	Default	Page Number
Host Serial Response Time-out	9Bh	2 sec	8-17
Host Character Time-out	EFh	200 msec	8-18
Multipacket Option	F0h 4Eh	Option 1	8-19
Event Reporting			
Decode Event	F0h 00h	Disable	8-20
Boot Up Event	F0h 02h	Disable	8-21
Parameter Event	F0h 03h	Disable	8-21



NOTE SSI interprets Prefix, Suffix1, and Suffix2 values listed in [Table E-1 on page E-1](#) differently than other interfaces. SSI does not recognize key categories, only the 3-digit decimal value. The default value of 7013 is interpreted as CR only.

SSI Host Parameters

Select SSI Host

To select SSI as the host interface, scan the following bar code.



SSI Host

Baud Rate

Parameter # 9Ch

Baud rate is the number of bits of data transmitted per second. Set the decoder's baud rate to match the data rate setting of the host device. Otherwise, data may not reach the host.

Scan the appropriate baud rate bar code that matches the baud rate setting of the host device.



**Baud Rate 600
(02h)**



**Baud Rate 1200
(03h)**



**Baud Rate 2400
(04h)**



**Baud Rate 4800
(05h)**



***Baud Rate 9600
(06h)**



**Baud Rate 19,200
(07h)**

Baud Rate (continued)



**Baud Rate 38,400
(08h)**



**Baud Rate 57,600
(0Ah)**



**Baud Rate 115,200
(0Bh)**



**Baud Rate 230,400
(0Ch)**



**Baud Rate 460,800
(0Dh)**



**Baud Rate 921,600
(0Eh)**

Parity

Parameter # 9Eh

A parity check bit is the most significant bit of each ASCII coded character. Select the parity type according to host device requirements.

- Select **Odd** parity and the parity bit has a value 0 or 1, based on data, to ensure that an odd number of 1 bits is contained in the coded character.
- Select **Even** parity and the parity bit has a value 0 or 1, based on data, to ensure that an even number of 1 bits is contained in the coded character.
- If no parity is required, select **None**.



Odd
(00h)



Even
(01h)



***None**
(04h)

Check Parity

Parameter # 97h

Select whether or not to check the parity of received characters. Use the Parity parameter to select the type of parity.



*Do Not Check Parity
(00h)



Check Parity
(01h)

Software Handshaking

Parameter # 9Fh

This parameter offers control of the data transmission process in addition to that offered by hardware handshaking. Hardware handshaking is always enabled and cannot be disabled by the user.

- **Disable ACK/NAK Handshaking:** When this option is selected, the decoder neither generates nor expects ACK/NAK handshaking packets.
- **Enable ACK/NAK Handshaking:** When this option is selected, after transmitting data, the decoder expects either an ACK or NAK response from the host. The decoder also ACKs or NAKs messages from the host.

The decoder waits up to the programmable Host Serial Response Time-out to receive an ACK or NAK. If the decoder does not get a response in this time, it resends its data up to two times before discarding the data and declaring a transmit error.



Disable ACK/NAK
(00h)



*Enable ACK/NAK
(01h)

Host RTS Line State

Parameter # 9Ah

This parameter sets the expected idle state of the Serial Host RTS line.

The SSI Interface is used with host applications which also implement the SSI protocol. However, the decoder can be used in a "scan-and-transmit" mode to communicate with any standard serial communication software on a host PC (see [Decode Data Packet Format on page 8-15](#)). If transmission errors occur in this mode, the host PC may be asserting hardware handshaking lines which interfere with the SSI protocol. Scan the **Host: RTS High** bar code to address this problem.



*Host: RTS Low
(00h)



Host: RTS High
(01h)

Decode Data Packet Format

Parameter # EEh

This parameter selects whether to transmit decoded data in raw format (unpacketed), or with the packet format defined by the serial protocol.

Selecting the raw format disables ACK/NAK handshaking for decode data.



*Send Raw Decode Data
(00h)



Send Packeted Decode Data
(01h)

Stop Bit Select

Parameter # 9Dh

The stop bit(s) at the end of each transmitted character marks the end of transmission of one character and prepares the receiving (host) device for the next character in the serial data stream. Set the number of stop bits (one or two) to match host device requirements.



***1 Stop Bit
(01h)**



**2 Stop Bits
(02h)**

Host Serial Response Time-out

Parameter # 9Bh

This parameter specifies how long the decoder waits for an ACK or NAK before resending. Also, if the decoder wants to send, and the host has already been granted permission to send, the decoder waits for the designated time-out before declaring an error.

To set the delay period (options are 2, 5, 7.5, or 9.9 seconds), scan one of the following bar codes.



NOTE Other values are available via SSI command.



***Low - 2 Seconds
(14h)**



**Medium - 5 Seconds
(32h)**



**High - 7.5 Seconds
(4Bh)**



**Maximum - 9.9 Seconds
(63h)**

Host Character Time-out

Parameter # EFh

This parameter determines the maximum time the decoder waits between characters transmitted by the host before discarding the received data and declaring an error.

To set the delay period (options are 200, 500, 750, or 990 ms), scan one of the following bar codes.



NOTE Other values are available via SSI command.



*Low - 200 ms
(14h)



Medium - 500 ms
(32h)



High - 750 ms
(4Bh)



Maximum - 990 ms
(63h)

Multipacket Option

Parameter # F0h, 4Eh

This parameter controls ACK/NAK handshaking for multi-packet transmissions.

- **Multi-Packet Option 1:** The host sends an ACK / NAK for each data packet during a multi-packet transmission.
- **Multi-Packet Option 2:** The decoder sends data packets continuously, with no ACK/NAK handshaking to pace the transmission. The host, if overrun, can use hardware handshaking to temporarily delay decoder transmissions. At the end of transmission, the decoder waits for a CMD_ACK or CMD_NAK.
- **Multi-Packet Option 3:** Option 3 is the same as option 2 with the addition of a programmable interpacket delay.



*Multipacket Option 1
(00h)



Multipacket Option 2
(01h)



Multipacket Option 3
(02h)

Event Reporting

The host can request the decoder to provide certain information (events) relative to the decoder's behavior. Enable or disable the events listed in [Table 8-4](#) and on the following pages by scanning the appropriate bar codes.

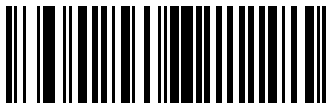
Table 8-4 *Event Codes*

Event Class	Event	Code Reported
Decode Event	Non parameter decode	0x01
Boot Up Event	System power-up	0x03
Parameter Event	Parameter entry error	0x07
	Parameter stored	0x08
	Defaults set (and parameter event is enabled by default)	0x0A
	Number expected	0x0F

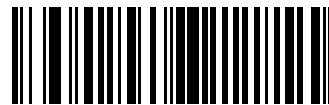
Decode Event

Parameter # F0h, 00h

When enabled, the decoder generates a message to the host whenever a bar code is successfully decoded. When disabled, no notification is sent.



**Enable Decode Event
(01h)**

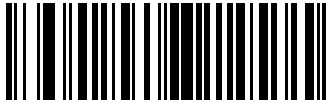


***Disable Decode Event
(00h)**

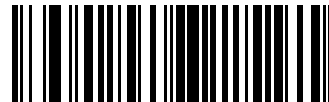
Boot Up Event

Parameter # F0h, 02h

When enabled, the decoder generates a message to the host whenever power is applied. When disabled, no notification is sent.



Enable Boot Up Event
(01h)

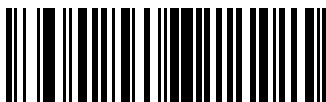


*Disable Boot Up Event
(00h)

Parameter Event

Parameter # F0h, 03h

When enabled, the decoder generates a message to the host when one of the events specified in [Table 8-4 on page 8-20](#) occurs. When disabled, no notification is sent.



Enable Parameter Event
(01h)



*Disable Parameter Event
(00h)

Chapter 9 Symbol MS4404 - RS-232 (Serial) Interface

Overview

This chapter describes how to set up the Symbol MS4404 with a serial host. The serial interface is used to connect the Symbol MS4404 to point-of-sale devices, host computers, or other devices with an available serial port (e.g., com port).

If the host is not listed in [Table 9-2](#), refer to the documentation for the host device to set communication parameters to match the host.

NOTE The Symbol MS4404 uses RS-232C signal levels.

Throughout the programming bar code menus, default values are indicated with asterisks (*).



* Indicates Default — *Baud Rate 57,600 — Feature/Option

NOTE The serial host type requires proper configuration of the sysconfig lines, and typically require using bar code menus as part of initial configuration.

Most computer monitors allow capturing the bar codes directly on the screen. When capturing from the screen, be sure to set the document magnification to a level where the bar code can be seen clearly, and bars and/or spaces are not merging.

Serial Parameter Defaults

[Table 9-1](#) lists the defaults for serial host parameters. To change any option, capture the appropriate bar code(s) provided in the Serial Host Parameters section beginning on page [9-3](#).



NOTE See [Appendix A, Standard Defaults](#) for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 9-1 Serial Host Default Table

Parameter	Default	Page Number
Serial Host Parameters		
Serial Host Types	SSI Host	9-5
Baud Rate	9600	9-6
Parity Type	None	9-8
Stop Bit Select	1 Stop Bit	9-8
Data Bits	8-Bit	9-9
Check Receive Errors	Enable	9-9
Hardware Handshaking	None	9-10
Software Handshaking	None	9-12
Host Serial Response Time-out	2 Sec	9-14
RTS Line State	Low RTS	9-15
Beep on <BEL>	Disable	9-15
Intercharacter Delay	0 msec	9-16
Nixdorf Beep/LED Options	Normal Operation	9-17
Ignore Unknown Characters	Send Bar Code	9-17

Serial Host Parameters

Various serial hosts are set up with their own parameter default settings ([Table 9-2](#)). Selecting standard, ICL, Fujitsu, Wincor-Nixdorf Mode A, Wincor-Nixdorf Mode B, OPOS/JPOS, Olivetti, or Omron sets the defaults listed below.

Table 9-2 Terminal Specific Serial

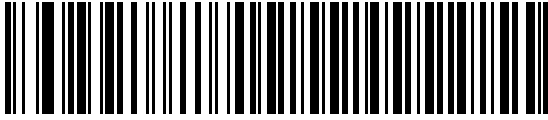
Parameter	ICL	Fujitsu	Wincor-Nixdorf Mode A	Wincor-Nixdorf Mode B/OPOS/JPOS	Olivetti	Omron
Transmit Code ID	Yes	Yes	Yes	Yes	Yes	Yes
Data Transmission Format	Data/Suffix	Data/Suffix	Data/Suffix	Data/Suffix	Prefix/Data/Suffix	Data/Suffix
Suffix	CR (1013)	CR (1013)	CR (1013)	CR (1013)	ETX (1002)	CR (1013)
Baud Rate	9600	9600	9600	9600	9600	9600
Parity	Even	None	Odd	Odd	Even	None
Hardware Handshaking	RTS/CTS Option 3	None	RTS/CTS Option 3	RTS/CTS Option 3	None	None
Software Handshaking	None	None	None	None	Ack/Nak	None
Serial Response Time-out	9.9 Sec.	2 Sec.	9.9 Sec.	9.9 Sec.	9.9 Sec.	9.9 Sec.
Stop Bit Select	One	One	One	One	One	One
ASCII Format	8-Bit	8-Bit	8-Bit	8-Bit	7-Bit	8-Bit
Beep On <BEL>	Disable	Disable	Disable	Disable	Disable	Disable
RTS Line State	High	Low	Low	Low = No data to send	Low	High
Prefix	None	None	None	None	STX (1003)	None

***In the Nixdorf Mode B, if CTS is Low, imaging is disabled. When CTS is High, you can capture bar codes.
If you select Nixdorf Mode B and the imager is not connected to the proper host, it may appear unable to decode. If this happens, select a different serial host type within 5 seconds of cycling power to the imager.

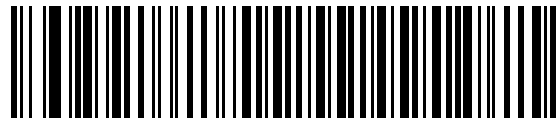
Selecting ICL, Fujitsu, Wincor-Nixdorf Mode A, Wincor-Nixdorf Mode B, OPOS/JPOS, Olivetti, or Omron enables the transmission of code ID characters listed in [Table 9-3](#). These code ID characters are not programmable and are separate from the Transmit Code ID feature. Do not enable the Transmit Code ID feature for these terminals.

Serial Host Types

To select a serial host interface, capture one of the following bar codes.



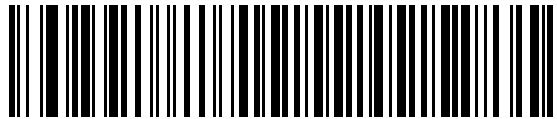
Enable SSI Host (No Variant)*



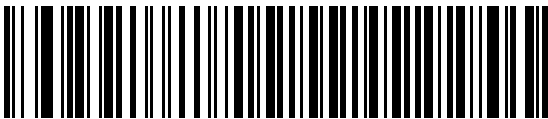
ICL Serial



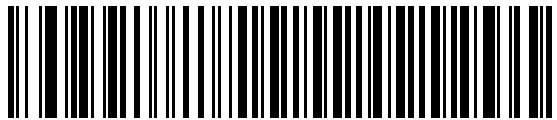
Wincor-Nixdorf Serial Mode A



Wincor-Nixdorf Serial Mode B



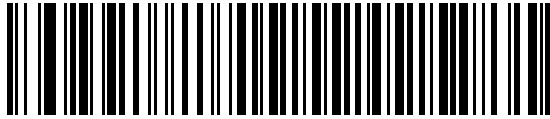
Olivetti ORS4500



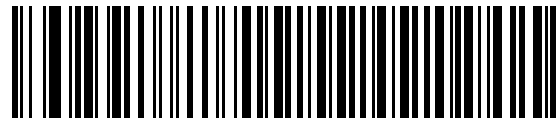
Omron

*Selecting Enable SSI Host (No Variant) activates the serial driver, but does not change port settings (e.g., parity, data bits, handshaking). Selecting another serial host type bar code changes these settings.

Serial Host Types (continued)



OPOS/JPOS



Fujitsu Serial

Baud Rate

Baud rate is the number of bits of data transmitted per second. Set the imager's baud rate to match the baud rate setting of the host device. Otherwise, data may not reach the host device or may reach it in distorted form.



Baud Rate 600



Baud Rate 1200



Baud Rate 2400



Baud Rate 4800

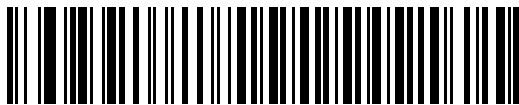
Baud Rate (continued)



Parity

A parity check bit is the most significant bit of each ASCII coded character. Select the parity type according to host device requirements.

- Select **Odd** parity and the parity bit value is set to 0 or 1, based on data, to ensure that an odd number of 1 bits are contained in the coded character.
- Select **Even** parity and the parity bit value is set to 0 or 1, based on data, to ensure that an even number of 1 bits are contained in the coded character.
- Select **None** when no parity bit is required.



Odd



Even



*None

Stop Bit Select

The stop bit(s) at the end of each transmitted character marks the end of transmission of one character and prepares the receiving device for the next character in the serial data stream. The number of stop bits selected (one or two) depends on the number the receiving terminal is programmed to accommodate. Set the number of stop bits to match host device requirements.



*1 Stop Bit



2 Stop Bits

Data Bits

This parameter allows the imager to interface with devices requiring a 7-bit or 8-bit ASCII protocol.



7-Bit



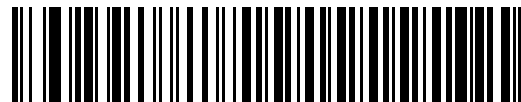
*8-Bit

Check Receive Errors

Select whether or not the parity, framing, and overrun of received characters are checked. The parity value of received characters is verified against the parity parameter selected above.



*Check For Received Errors



Do Not Check For Received Errors

Hardware Handshaking

The data interface consists of a serial port designed to operate either with or without the hardware handshaking lines, *Request to Send (RTS)*, and *Clear to Send (CTS)*.

If Standard RTS/CTS handshaking is not selected, decoded data is transmitted as it becomes available. If Standard RTS/CTS handshaking is selected, decoded data is transmitted according to the following sequence:

- The imager reads the CTS line for activity. If CTS is asserted, the imager waits up to Host Serial Response Time-out for the host to de-assert the CTS line. If, after Host Serial Response Time-out (default), the CTS line is still asserted, the imager sounds a transmit error, and any decoded data is lost.
- When the CTS line is de-asserted, the imager asserts the RTS line and waits up to Host Serial Response Time-out for the host to assert CTS. When the host asserts CTS, data is transmitted. If, after Host Serial Response Time-out (default), the CTS line is not asserted, the imager sounds a transmit error, and discards the data.
- When data transmission is complete, the imager de-asserts RTS 10 msec after sending the last character.
- The host should respond by negating CTS. The imager checks for a de-asserted CTS upon the next transmission of data.

During the transmission of data, the CTS line should be asserted. If CTS is deasserted for more than 50 ms between characters, the transmission is aborted, the imager sounds a transmission error, and the data is discarded.

If the above communication sequence fails, the imager issues an error indication. In this case, the data is lost and must be recaptured.

If Hardware Handshaking and Software Handshaking are both enabled, Hardware Handshaking takes precedence.



NOTE The DTR signal is jumpered to the active state.

- **None:** Capture the bar code below if no Hardware Handshaking is desired.
- **Standard RTS/CTS:** Capture the bar code below to select Standard RTS/CTS Hardware Handshaking.
- **RTS/CTS Option 1:** When RTS/CTS Option 1 is selected, the imager asserts RTS before transmitting and ignores the state of CTS. The imager de-asserts RTS when the transmission is complete.
- **RTS/CTS Option 2:** When Option 2 is selected, RTS is always high or low (user-programmed logic level). However, the imager waits for CTS to be asserted before transmitting data. If CTS is not asserted within Host Serial Response Time-out (default), the imager issues an error indication and discards the data.
- **RTS/CTS Option 3:** When Option 3 is selected, the imager asserts RTS prior to any data transmission, regardless of the state of CTS. The imager waits up to Host Serial Response Time-out (default) for CTS to be asserted. If CTS is not asserted during this time, the imager issues an error indication and discards the data. The imager de-asserts RTS when transmission is complete.

Hardware Handshaking (continued)



Software Handshaking

This parameter offers control of the data transmission process in addition to, or instead of, that offered by hardware handshaking. There are five options.

If Software Handshaking and Hardware Handshaking are both enabled, Hardware Handshaking takes precedence.

- **None:** When this option is selected, data is transmitted immediately. No response is expected from host.
- **ACK/NAK:** When this option is selected, after transmitting data, the imager expects either an ACK or NAK response from the host. When a NAK is received, the imager transmits the same data again and waits for either an ACK or NAK. After three unsuccessful attempts to send data when NAKs are received, the imager issues an error indication and discards the data.

The imager waits up to the programmable Host Serial Response Time-out to receive an ACK or NAK. If the imager does not get a response in this time, it issues an error indication and discards the data. There are no retries when a time-out occurs.

- **ENQ:** When this option is selected, the imager waits for an ENQ character from the host before transmitting data. If an ENQ is not received within the Host Serial Response Time-out, the imager issues an error indication and discards the data. The host must transmit an ENQ character at least every Host Serial Response Time-out to prevent transmission errors.
- **ACK/NAK with ENQ:** This combines the two previous options. For re-transmissions of data, due to a NAK from the host, an additional ENQ is not required.
- **XON/XOFF:** An XOFF character turns the imager transmission off until the imager receives an XON character. There are two situations for XON/XOFF:
 - XOFF is received before the imager has data to send. When the imager has data to send, it waits up to Host Serial Response Time-out for an XON character before transmission. If the XON is not received within this time, the imager issues an error indication and discards the data.
 - XOFF is received during a transmission. Data transmission then stops after sending the current byte. When the imager receives an XON character, it sends the rest of the data message. The imager waits indefinitely for the XON.

Software Handshaking (continued)



Host Serial Response Time-out

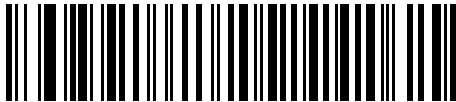
This parameter specifies how long the imager waits for an ACK, NAK, or CTS before determining that a transmission error has occurred. This only applies when in one of the ACK/NAK Software Handshaking modes, or RTS/CTS Hardware Handshaking option.



*Minimum: 2 Sec



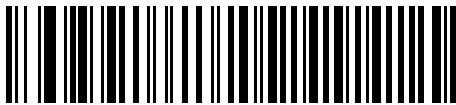
Low: 2.5 Sec



Medium: 5 Sec



High: 7.5 Sec



Maximum: 9.9 Sec

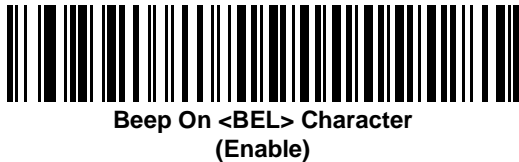
RTS Line State

This parameter sets the idle state of the Serial Host RTS line. Capture a bar code below to select **Low RTS** or **High RTS** line state.



Beep on <BEL>

When this parameter is enabled, the imager issues a beep when a <BEL> character is detected on the serial line. <BEL> is issued to gain a user's attention to an illegal entry or other important event.



NOTE A NULL character must be sent to the imager before BEL to ensure the BEL character is processed correctly.

Intercharacter Delay

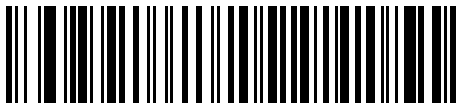
This parameter specifies the intercharacter delay inserted between character transmissions.



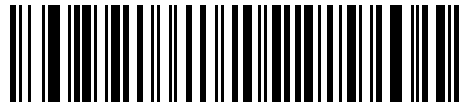
*Minimum: 0 msec



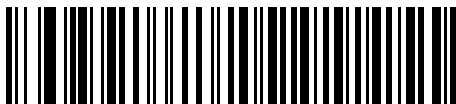
Low: 25 msec



Medium: 50 msec



High: 75 msec



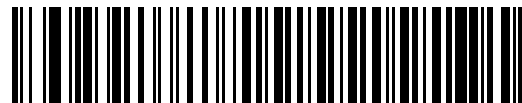
Maximum: 99 msec

Nixdorf Beep/LED Options

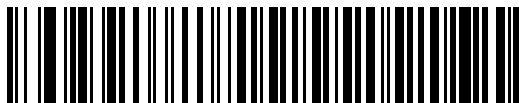
When Nixdorf Mode B is selected, this indicates when the imager should beep and turn on its LED after a decode.



* Normal Operation
(Beep/LED immediately after decode)



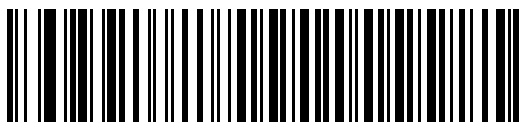
Beep/LED After Transmission



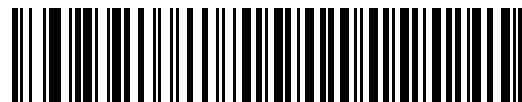
Beep/LED After CTS Pulse

Ignore Unknown Characters

Unknown characters are characters the host does not recognize. When you select **Send Bar Codes with Unknown Characters**, all bar code data is sent except for unknown characters, and the imager emits no error beeps. When you select **Do Not Send Bar Codes With Unknown Characters**, bar code data is sent up to the first unknown character and the imager emits an error beep.



* Send Bar Code
(with unknown characters)



Do Not Send Bar Codes
(with unknown characters)

ASCII Character Set for Serial Hosts

The values in [Table 9-4](#) can be assigned as prefixes or suffixes for ASCII character data transmission.

Table 9-4 *Prefix/Suffix Values*

Prefix/Suffix Value	Full ASCII Code 39 Encode Character	ASCII Character
1000	%U	NUL
1001	\$A	SOH
1002	\$B	STX
1003	\$C	ETX
1004	\$D	EOT
1005	\$E	ENQ
1006	\$F	ACK
1007	\$G	BELL
1008	\$H	BCKSPC
1009	\$I	HORIZ TAB
1010	\$J	LF/NW LN
1011	\$K	VT
1012	\$L	FF
1013	\$M	CR/ENTER
1014	\$N	SO
1015	\$O	SI
1016	\$P	DLE
1017	\$Q	DC1/XON
1018	\$R	DC2
1019	\$S	DC3/XOFF
1020	\$T	DC4
1021	\$U	NAK
1022	\$V	SYN
1023	\$W	ETB
1024	\$X	CAN
1025	\$Y	EM
1026	\$Z	SUB

Table 9-4 *Prefix/Suffix Values (Continued)*

Prefix/Suffix Value	Full ASCII Code 39 Encode Character	ASCII Character
1027	%A	ESC
1028	%B	FS
1029	%C	GS
1030	%D	RS
1031	%E	US
1032	Space	Space
1033	/A	!
1034	/B	"
1035	/C	#
1036	/D	\$
1037	/E	%
1038	/F	&
1039	/G	'
1040	/H	(
1041	/I)
1042	/J	*
1043	/K	+
1044	/L	,
1045	-	-
1046	.	.
1047	/O	/
1048	0	0
1049	1	1
1050	2	2
1051	3	3
1052	4	4
1053	5	5
1054	6	6
1055	7	7
1056	8	8

Table 9-4 Prefix/Suffix Values (Continued)

Prefix/Suffix Value	Full ASCII Code 39 Encode Character	ASCII Character
1057	9	9
1058	/Z	:
1059	%F	;
1060	%G	<
1061	%H	=
1062	%I	>
1063	%J	?
1064	%V	@
1065	A	A
1066	B	B
1067	C	C
1068	D	D
1069	E	E
1070	F	F
1071	G	G
1072	H	H
1073	I	I
1074	J	J
1075	K	K
1076	L	L
1077	M	M
1078	N	N
1079	O	O
1080	P	P
1081	Q	Q
1082	R	R
1083	S	S
1084	T	T
1085	U	U
1086	V	V

Table 9-4 Prefix/Suffix Values (Continued)

Prefix/Suffix Value	Full ASCII Code 39 Encode Character	ASCII Character
1087	W	W
1088	X	X
1089	Y	Y
1090	Z	Z
1091	%K	[
1092	%L	\
1093	%M]
1094	%N	^
1095	%O	_
1096	%W	`
1097	+A	a
1098	+B	b
1099	+C	c
1100	+D	d
1101	+E	e
1102	+F	f
1103	+G	g
1104	+H	h
1105	+I	i
1106	+J	j
1107	+K	k
1108	+L	l
1109	+M	m
1110	+N	n
1111	+O	o
1112	+P	p
1113	+Q	q
1114	+R	r
1115	+S	s
1116	+T	t

Table 9-4 *Prefix/Suffix Values (Continued)*

Prefix/Suffix Value	Full ASCII Code 39 Encode Character	ASCII Character
1117	+U	u
1118	+V	v
1119	+W	w
1120	+X	x
1121	+Y	y
1122	+Z	z
1123	%P	{
1124	%Q	
1125	%R	}
1126	%S	~
1127		Undefined
7013		ENTER

Chapter 10 Symbol MS4407 - USB Interface

Overview

This chapter describes how to set up the Symbol MS4407 with a USB host. The MiniScan connects directly to a USB host, or a powered USB hub, and is powered by it. No additional power supply is required.

Throughout the programming bar code menus, default values are indicated with asterisks (*).



NOTE Most computer monitors allow capturing the bar codes directly on the screen. When capturing from the screen, be sure to set the document magnification to a level where the bar code can be seen clearly, and bars and/or spaces are not merging.

USB Parameter Defaults

[Table 10-1](#) lists the defaults for USB host parameters. To change any option, capture the appropriate bar code(s) provided in the Parameter Descriptions section beginning on page [10-3](#).



NOTE See [Appendix A, Standard Defaults](#) for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 10-1 *USB Host Default Table*

Parameter	Default	Page Number
USB Host Parameters		
USB Device Type	SNAPI with Imaging	10-3
Symbol Native API (SNAPI) Status Handshaking	Enable	10-4
USB Country Keyboard Types (Country Codes)	North American	10-5
USB Keystroke Delay	No Delay	10-7
USB CAPS Lock Override	Disable	10-7
USB Ignore Unknown Characters	Enable	10-8
Emulate Keypad	Disable	10-8
USB FN1 Substitution	Disable	10-9
Function Key Mapping	Disable	10-9
Simulated Caps Lock	Disable	10-10
Convert Case	None	10-10

USB Host Parameters

USB Device Type

Select the desired USB device type.



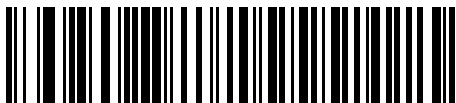
NOTE When changing USB Device Types, the MiniScan automatically resets and issues the standard startup beep sequences.



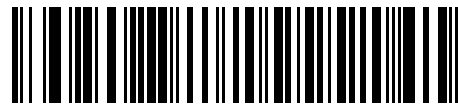
*Symbol Native API (SNAPI) with Imaging Interface



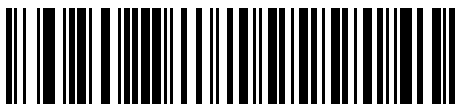
Symbol Native API (SNAPI) without Imaging Interface



HID Keyboard Emulation



IBM Table Top USB



IBM Hand-Held USB

USB Device Type (continued)



USB OPOS Handheld



Simple COM Port Emulation

Symbol Native API (SNAPI) Status Handshaking

After selecting a SNAPI interface as the USB device type, select whether to enable or disable status handshaking.



*Enable SNAPI Status Handshaking



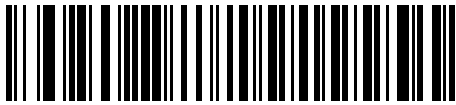
Disable SNAPI Status Handshaking

USB Country Keyboard Types (Country Codes)

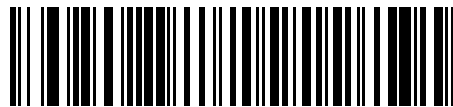
Capture the bar code corresponding to the keyboard type. This setting applies only to the USB HID Keyboard Emulation device.



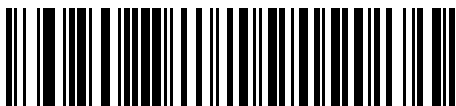
NOTE When changing USB country keyboard types the MiniScan automatically resets and issues the standard startup beep sequences.



*North American Standard USB Keyboard



German Windows



French Windows



French Canadian Windows 95/98



French Canadian Windows 2000/XP

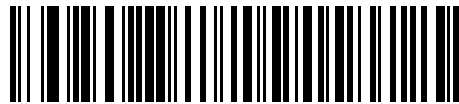
USB Country Keyboard Types (continued)



Spanish Windows



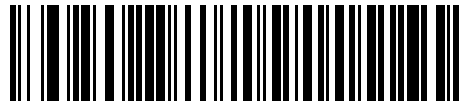
Italian Windows



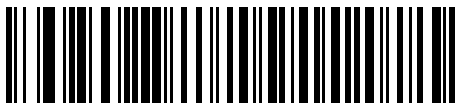
Swedish Windows



UK English Windows



Japanese Windows (ASCII)



Portuguese-Brazilian Windows

USB Keystroke Delay

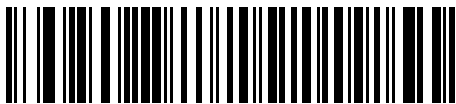
This parameter sets the delay, in milliseconds, between emulated keystrokes. Capture a bar code below to increase the delay when hosts require a slower transmission of data.



***No Delay**



Medium Delay (20 msec)



Long Delay (40 msec)

USB CAPS Lock Override

This option applies only to the HID Keyboard Emulation device. When enabled, the case of the data is preserved regardless of the state of the caps lock key. This setting is always enabled for the Japanese, Windows (ASCII) keyboard type and can not be disabled.



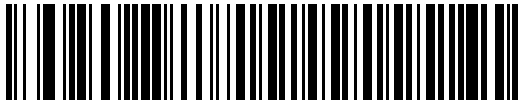
**Override Caps Lock Key
(Enable)**



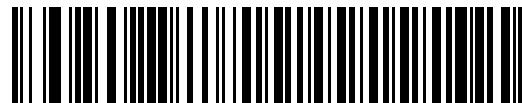
***Do Not Override Caps Lock Key
(Disable)**

USB Ignore Unknown Characters

This option applies only to the HID Keyboard Emulation device and IBM device. Unknown characters are characters the host does not recognize. When **Send Bar Codes With Unknown Characters** is selected, all bar code data is sent except for unknown characters, and no error beeps sound. When **Do Not Send Bar Codes With Unknown Characters** is selected, for IBM devices, bar codes containing at least one unknown character are not sent to the host, and an error beep sounds. For HID Keyboard Emulation devices, the bar code characters up to the unknown character are sent, and an error beep sounds.



***Send Bar Codes with Unknown Characters
(Transmit)**



**Do Not Send Bar Codes with Unknown Characters
(Disable)**

Emulate Keypad

When enabled, all characters are sent as ASCII sequences over the numeric keypad. For example ASCII A would be sent as “ALT make” 0 6 5 “ALT Break”. This allows support for other country variants.



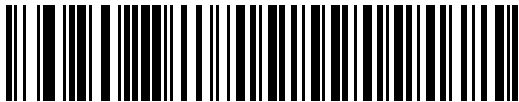
***Disable Keypad Emulation**



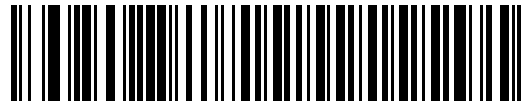
Enable Keypad Emulation

USB Keyboard FN 1 Substitution

This option applies only to the USB HID Keyboard Emulation device. When enabled, this allows replacement of any FN 1 characters in an EAN 128 bar code with a Key Category and value chosen by the user (see [FN1 Substitution Values on page 12-6](#) to set the Key Category and Key Value).



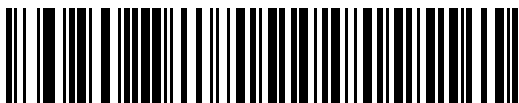
Enable



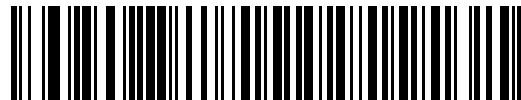
*Disable

Function Key Mapping

ASCII values under 32 are normally sent as a control-key sequences (see [Table 10-2 on page 10-11](#)). When this parameter is enabled, the keys in bold are sent in place of the standard key mapping. Table entries that do not have a bold entry remain the same whether or not this parameter is enabled.



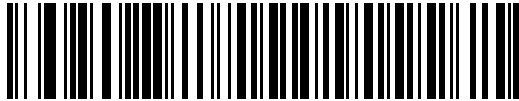
*Disable Function Key Mapping



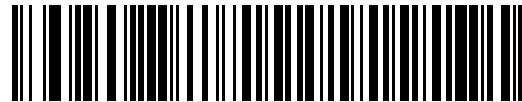
Enable Function Key Mapping

Simulated Caps Lock

When enabled, the MiniScan inverts upper and lower case characters on the bar code as if the Caps Lock state is enabled on the keyboard. This inversion is done regardless of the current state of the keyboard's Caps Lock state.



***Disable Simulated Caps Lock**



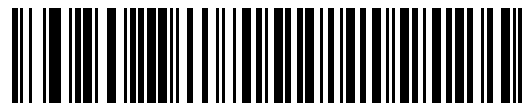
Enable Simulated Caps Lock

Convert Case

When enabled, the MiniScan converts all bar code data to the selected case.



***No Case Conversion**



Convert All to Upper Case



Convert All to Lower Case

ASCII Character Set for USB

Table 10-2 USB Prefix/Suffix Values

Prefix / Suffix Value	Full ASCII Code 39 Encode Character	Keystroke
1000	%U	CTRL 2
1001	\$A	CTRL A
1002	\$B	CTRL B
1003	\$C	CTRL C
1004	\$D	CTRL D
1005	\$E	CTRL E
1006	\$F	CTRL F
1007	\$G	CTRL G
1008	\$H	CTRL H/ BACKSPACE ¹
1009	\$I	CTRL I/ HORIZONTAL TAB ¹
1010	\$J	CTRL J
1011	\$K	CTRL K
1012	\$L	CTRL L
1013	\$M	CTRL M/ ENTER ¹
1014	\$N	CTRL N
1015	\$O	CTRL O
1016	\$P	CTRL P
1017	\$Q	CTRL Q
1018	\$R	CTRL R
1019	\$S	CTRL S
1020	\$T	CTRL T
1021	\$U	CTRL U
1022	\$V	CTRL V
1023	\$W	CTRL W
1024	\$X	CTRL X
1025	\$Y	CTRL Y

¹The keystroke in bold is sent only if the "Function Key Mapping" is enabled. Otherwise, the unbolded keystroke is sent.

Table 10-2 USB Prefix/Suffix Values (Continued)

Prefix / Suffix Value	Full ASCII Code 39 Encode Character	Keystroke
1026	\$Z	CTRL Z
1027	%A	CTRL [/ESC ¹
1028	%B	CTRL \
1029	%C	CTRL]
1030	%D	CTRL 6
1031	%E	CTRL -
1032	Space	Space
1033	/A	!
1034	/B	“
1035	/C	#
1036	/D	\$
1037	/E	%
1038	/F	&
1039	/G	‘
1040	/H	(
1041	/I)
1042	/J	*
1043	/K	+
1044	/L	,
1045	-	-
1046	.	.
1047	/O	/
1048	0	0
1049	1	1
1050	2	2
1051	3	3
1052	4	4
1053	5	5

¹The keystroke in bold is sent only if the “Function Key Mapping” is enabled. Otherwise, the unbolded keystroke is sent.

Table 10-2 USB Prefix/Suffix Values (Continued)

Prefix / Suffix Value	Full ASCII Code 39 Encode Character	Keystroke
1054	6	6
1055	7	7
1056	8	8
1057	9	9
1058	/Z	:
1059	%F	;
1060	%G	<
1061	%H	=
1062	%I	>
1063	%J	?
1064	%V	@
1065	A	A
1066	B	B
1067	C	C
1068	D	D
1069	E	E
1070	F	F
1071	G	G
1072	H	H
1073	I	I
1074	J	J
1075	K	K
1076	L	L
1077	M	M
1078	N	N
1079	O	O
1080	P	P
1081	Q	Q

¹The keystroke in bold is sent only if the “Function Key Mapping” is enabled. Otherwise, the unbolded keystroke is sent.

Table 10-2 USB Prefix/Suffix Values (Continued)

Prefix / Suffix Value	Full ASCII Code 39 Encode Character	Keystroke
1082	R	R
1083	S	S
1084	T	T
1085	U	U
1086	V	V
1087	W	W
1088	X	X
1089	Y	Y
1090	Z	Z
1091	%K	[
1092	%L	\
1093	%M]
1094	%N	^
1095	%O	_
1096	%W	`
1097	+A	a
1098	+B	b
1099	+C	c
1100	+D	d
1101	+E	e
1102	+F	f
1103	+G	g
1104	+H	h
1105	+I	i
1106	+J	j
1107	+K	k
1108	+L	l
1109	+M	m

¹The keystroke in bold is sent only if the "Function Key Mapping" is enabled. Otherwise, the unbolded keystroke is sent.

Table 10-2 USB Prefix/Suffix Values (Continued)

Prefix / Suffix Value	Full ASCII Code 39 Encode Character	Keystroke
1110	+N	n
1111	+O	o
1112	+P	p
1113	+Q	q
1114	+R	r
1115	+S	s
1116	+T	t
1117	+U	u
1118	+V	v
1119	+W	w
1120	+X	x
1121	+Y	y
1122	+Z	z
1123	%P	{
1124	%Q	
1125	%R	}
1126	%S	~

¹The keystroke in bold is sent only if the "Function Key Mapping" is enabled. Otherwise, the unbolded keystroke is sent.

Table 10-3 *USB ALT Key Character Set*

ALT Keys	Keystroke
2064	ALT 2
2065	ALT A
2066	ALT B
2067	ALT C
2068	ALT D
2069	ALT E
2070	ALT F
2071	ALT G
2072	ALT H
2073	ALT I
2074	ALT J
2075	ALT K
2076	ALT L
2077	ALT M
2078	ALT N
2079	ALT O
2080	ALT P
2081	ALT Q
2082	ALT R
2083	ALT S
2084	ALT T
2085	ALT U
2086	ALT V
2087	ALT W
2088	ALT X
2089	ALT Y
2090	ALT Z

Table 10-4 *USB GUI Key Character Set*

GUI Key	Keystroke
3000	Right Control Key
3048	GUI 0
3049	GUI 1
3050	GUI 2
3051	GUI 3
3052	GUI 4
3053	GUI 5
3054	GUI 6
3055	GUI 7
3056	GUI 8
3057	GUI 9
3065	GUI A
3066	GUI B
3067	GUI C
3068	GUI D
3069	GUI E
3070	GUI F
3071	GUI G
3072	GUI H
3073	GUI I
3074	GUI J
3075	GUI K
3076	GUI L
3077	GUI M
3078	GUI N
3079	GUI O
3080	GUI P
3081	GUI Q



Note: GUI Shift Keys - The Apple™ iMac keyboard has an apple key on either side of the space bar. Windows-based systems have a GUI key to the left of the left ALT key, and to the right of the right ALT key.

Table 10-4 USB GUI Key Character Set (Continued)

GUI Key	Keystroke
3082	GUI R
3083	GUI S
3084	GUI T
3085	GUI U
3086	GUI V
3087	GUI W
3088	GUI X
3089	GUI Y
3090	GUI Z



Note: GUI Shift Keys - The Apple™ iMac keyboard has an apple key on either side of the space bar. Windows-based systems have a GUI key to the left of the left ALT key, and to the right of the right ALT key.

Table 10-5 *USB F Key Character Set*

F Keys	Keystroke
5001	F1
5002	F2
5003	F3
5004	F4
5005	F5
5006	F6
5007	F7
5008	F8
5009	F9
5010	F10
5011	F11
5012	F12
5013	F13
5014	F14
5015	F15
5016	F16
5017	F17
5018	F18
5019	F19
5020	F20
5021	F21
5022	F22
5023	F23
5024	F24

Table 10-6 *USB Numeric Keypad Character Set*

Numeric Keypad	Keystroke
6042	*
6043	+
6044	undefined
6045	-
6046	.
6047	/
6048	0
6049	1
6050	2
6051	3
6052	4
6053	5
6054	6
6055	7
6056	8
6057	9
6058	Enter
6059	Num Lock

Table 10-7 *USB Extended Keypad Character Set*

Extended Keypad	Keystroke
7001	Break
7002	Delete
7003	PgUp
7004	End
7005	Pg Dn
7006	Pause
7007	Scroll Lock
7008	Backspace
7009	Tab
7010	Print Screen
7011	Insert
7012	Home
7013	Enter
7014	Escape
7015	Up Arrow
7016	Down Arrow
7017	Left Arrow
7018	Right Arrow

Chapter 11 Symbolologies

Overview

This chapter describes symbology features and provides the programming bar codes for selecting these features. Before programming, follow the instructions in [Chapter 1, Getting Started](#).

The imager is shipped with the settings shown in the [Symbology Default Table on page 11-2](#) (also see [Appendix A, Standard Defaults](#) for all host device and miscellaneous defaults). If the default values suit requirements, programming is not necessary.

There are two ways to change a parameter value:

- Capture the appropriate bar codes in this guide. These new values replace the standard default values in memory.
- For SSI and USB SNAPi hosts, send a “parameter send” command from the host system. Hexadecimal parameter numbers are shown in this chapter below the parameter title, and options are shown in parenthesis beneath the accompanying bar codes. See the *Simple Serial Interface (SSI) Programmer Guide* for detailed instructions for changing parameter values using this method.



NOTE Most computer monitors allow capturing the bar codes directly on the screen. When capturing from the screen, be sure to set the document magnification to a level where the bar code can be seen clearly, and bars and/or spaces are not merging.

To return all features to default values, capture [*Set All Defaults on page 6-3](#). Throughout the programming bar code menus, default values are indicated with asterisks (*).



* Indicates Default — *Enable UPC-A — Feature/Option
(00h)

Imaging Sequence Examples

In most cases, capturing one bar code sets the parameter value. For example, to transmit bar code data without the UPC-A check digit, simply capture the **Do Not Transmit UPC-A Check Digit** bar code under [Transmit UPC-A Check Digit on page 11-14](#). The imager issues a fast warble beep and the LED turns green, signifying a successful parameter entry.

Other parameters, such as **Set Length(s) for D 2 of 5** require capturing several bar codes. See the individual parameter, such as **Set Length(s) for D 2 of 5**, for this procedure.

Errors While Imaging

Unless otherwise specified, to correct an error during an imaging sequence, just re-capture the correct parameter.

Symbology Parameter Defaults

[Table 11-1](#) lists the defaults for all symbologies parameters. To change any option, capture the appropriate bar code(s) provided in the Symbologies Parameters section beginning on [page 11-7](#).



NOTE See [Appendix A, Standard Defaults](#) for all user preferences, hosts, and miscellaneous default parameters.

Table 11-1 Symbology Default Table

Parameter	Parameter Number	Default	Page Number
UPC/EAN			
UPC-A	01h	Enable	11-7
UPC-E	02h	Enable	11-7
UPC-E1	0Ch	Disable	11-8
EAN-8/JAN 8	04h	Enable	11-8
EAN-13/JAN 13	03h	Enable	11-9
Bookland EAN	53h	Disable	11-9
Decode UPC/EAN/JAN Supplementals (2 and 5 digits)	10h	Ignore	11-10
User-Programmable Supplementals			11-13
Supplemental 1:	F1h 43h		
Supplemental 2:	F1h 44h		
UPC/EAN/JAN Supplemental Redundancy	50h	10	11-14
Transmit UPC-A Check Digit	28h	Enable	11-14
Transmit UPC-E Check Digit	29h	Enable	11-15

Table 11-1 Symbology Default Table (Continued)

Parameter	Parameter Number	Default	Page Number
Transmit UPC-E1 Check Digit	2Ah	Enable	11-15
UPC-A Preamble	22h	System Character	11-16
UPC-E Preamble	23h	System Character	11-17
UPC-E1 Preamble	24h	System Character	11-18
Convert UPC-E to A	25h	Disable	11-19
Convert UPC-E1 to A	26h	Disable	11-19
EAN-8/JAN-8 Extend	27h	Disable	11-20
Bookland ISBN Format	F1h 40h	ISBN-10	11-21
UCC Coupon Extended Code	55h	Disable	11-22
Code 128			
Code 128	08h	Enable	11-22
UCC/EAN-128	0Eh	Enable	11-23
ISBT 128	54h	Enable	11-24
Code 39			
Code 39	00h	Enable	11-25
Trioptic Code 39	0Dh	Disable	11-25
Convert Code 39 to Code 32 (Italian Pharmacy Code)	56h	Disable	11-26
Code 32 Prefix	E7h	Disable	11-26
Set Length(s) for Code 39	12h 13h	2 to 55	11-27
Code 39 Check Digit Verification	30h	Disable	11-29
Transmit Code 39 Check Digit	2Bh	Disable	11-29
Code 39 Full ASCII Conversion	11h	Disable	11-30
Buffer Code 39	71h	Disable	11-31
Code 93			
Code 93	09h	Disable	11-34
Set Length(s) for Code 93	1Ah 1Bh	4 to 55	11-34
Code 11			
Code 11	0Ah	Disable	11-36
Set Lengths for Code 11	1Ch 1Dh	4 to 55	11-36

Table 11-1 Symbology Default Table (Continued)

Parameter	Parameter Number	Default	Page Number
Code 11 Check Digit Verification	34h	Disable	11-38
Transmit Code 11 Check Digit(s)	2Fh	Disable	11-39
Interleaved 2 of 5 (ITF)			
Interleaved 2 of 5 (ITF)	06h	Enable	11-39
Set Lengths for I 2 of 5	16h 17h	14	11-40
I 2 of 5 Check Digit Verification	31h	Disable	11-42
Transmit I 2 of 5 Check Digit	2Ch	Disable	11-42
Convert I 2 of 5 to EAN 13	52h	Disable	11-43
Discrete 2 of 5 (DTF)			
Discrete 2 of 5	05h	Disable	11-43
Set Length(s) for D 2 of 5	14h 15h	12	11-44
Codabar (NW - 7)			
Codabar	07h	Disable	11-46
Set Lengths for Codabar	18h 19h	5 to 55	11-46
CLSI Editing	36h	Disable	11-48
NOTIS Editing	37h	Disable	11-48
MSI			
MSI	0Bh	Disable	11-49
Set Length(s) for MSI	1Eh 1Fh	4 to 55	11-50
MSI Check Digits	32h	One	11-52
Transmit MSI Check Digit	2Eh	Disable	11-52
MSI Check Digit Algorithm	33h	Mod 10/Mod 10	11-53
Inverse 1D	F1h 4Ah	Regular	11-54
Postal Codes			
US Postnet	59h	Enable	11-55
US Planet	5Ah	Enable	11-55
UK Postal	5Bh	Enable	11-56
Transmit UK Postal Check Digit	60h	Enable	11-56
Japan Postal	F0h 22h	Enable	11-57
Australian Postal	F0h 23h	Enable	11-57

Table 11-1 Symbology Default Table (Continued)

Parameter	Parameter Number	Default	Page Number
Dutch Postal	F0h 46h	Enable	11-58
4State Postal	F1h 50h	Disable	11-58
Transmit US Postal Check Digit	5Fh	Enable	11-59
GS1 DataBar (Formerly RSS, Reduced Space Symbology)			
GS1 DataBar-14	F0h 52h	Enable	11-60
GS1 DataBar Limited	F0h 53h	Enable	11-60
GS1 DataBar Expanded	F0h 54h	Enable	11-61
Convert GS1 DataBar to UPC/EAN	F0h 8Dh	Disable	11-61
Composite			
Composite CC-C	F0h 55h	Disable	11-62
Composite CC-A/B	F0h 56h	Disable	11-62
Composite TLC-39	F0h 73h	Disable	11-63
UPC Composite Mode	F0h 58h	Always Linked	11-63
Composite Beep Mode	F0h 8Eh	Beep As Each Code Type is Decoded	11-64
UCC/EAN Code 128 Emulation Mode for UCC/EAN Composite Codes	F0h ABh	Disable	11-65
2-D Symbologies			
PDF417	0Fh	Enable	11-66
MicroPDF417	E3h	Disable	11-66
Code 128 Emulation	7Bh	Disable	11-67
Data Matrix	F0h 24h	Enable	11-68
Data Matrix Inverse	F1h 4Ch	Regular	11-68
Maxicode	F0h 26h	Enable	11-69
QR Code	F0h 25h	Enable	11-70
MicroQR	F1h 3Dh	Enable	11-70
QR Inverse	F1h 4Bh	Regular	11-71
Aztec	F1h 3Eh	Enable	11-71
Aztec Inverse	F1h 4Dh	Regular	11-72

Table 11-1 Symbology Default Table (Continued)

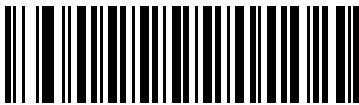
Parameter	Parameter Number	Default	Page Number
Symbology-Specific Security Levels			
Redundancy Level	4Eh	1	11-73
Security Level	4Dh	1	11-75
Intercharacter Gap Size	F0h 7Dh	Normal	11-76
Report Version			11-76
Macro PDF			
Macro PDF Transmit/Decode Mode Symbols	BCh	Passthrough Mode	11-78
Transmit Macro PDF Control Header	B8h	Disable	11-79
Escape Characters	E9h	None	11-79
Flush Macro PDF Buffer			11-80
Abort Macro PDF Entry			11-80

UPC/EAN

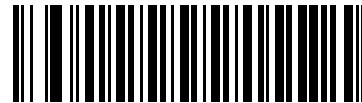
Enable/Disable UPC-A

Parameter # 01h

To enable or disable UPC-A, capture the appropriate bar code below.



*Enable UPC-A
(01h)



Disable UPC-A
(00h)

Enable/Disable UPC-E

Parameter # 02h

To enable or disable UPC-E, capture the appropriate bar code below.



*Enable UPC-E
(01h)



Disable UPC-E
(00h)

Enable/Disable UPC-E1

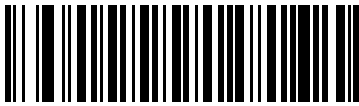
Parameter # 0Ch

UPC-E1 is disabled by default.

To enable or disable UPC-E1, capture the appropriate bar code below.



NOTE UPC-E1 is not a UCC (Uniform Code Council) approved symbology.



Enable UPC-E1
(01h)

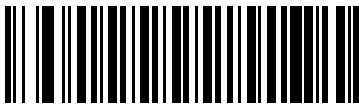


*Disable UPC-E1
(00h)

Enable/Disable EAN-8/JAN-8

Parameter # 04h

To enable or disable EAN-8/JAN-8, capture the appropriate bar code below.



*Enable EAN-8/JAN-8
(01h)

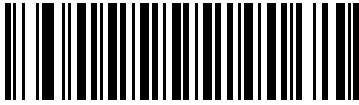


Disable EAN-8/JAN-8
(00h)

Enable/Disable EAN-13/JAN-13

Parameter # 03h

To enable or disable EAN-13/JAN-13, capture the appropriate bar code below.



*Enable EAN-13/JAN-13
(01h)

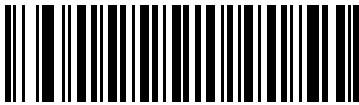


Disable EAN-13/JAN-13
(00h)

Enable/Disable Bookland EAN

Parameter # 53h

To enable or disable Bookland EAN, capture the appropriate bar code below.



Enable Bookland EAN
(01h)



*Disable Bookland EAN
(00h)



NOTE If you enable Bookland EAN, select a [Bookland ISBN Format on page 11-21](#). Also select either Decode UPC/EAN Supplementals, Autodiscriminate UPC/EAN Supplementals, or Enable 978/979 Supplemental Mode in [Decode UPC/EAN/JAN Supplementals on page 11-10](#).

Decode UPC/EAN/JAN Supplementals

Parameter # 10h

Supplementals are bar codes appended according to specific format conventions (e.g., UPC A+2, UPC E+2, EAN 13+2). The following options are available:

- If you select **Ignore UPC/EAN with Supplementals**, and the scanner is presented with a UPC/EAN plus supplemental symbol, the scanner decodes UPC/EAN and ignores the supplemental characters.
- If you select **Decode UPC/EAN with Supplementals**, the scanner only decodes UPC/EAN symbols with supplemental characters, and ignores symbols without supplementals.
- If you select **Autodiscriminate UPC/EAN Supplementals**, the scanner decodes UPC/EAN symbols with supplemental characters immediately. If the symbol does not have a supplemental, the scanner must decode the bar code the number of times set via [UPC/EAN/JAN Supplemental Redundancy on page 11-14](#) before transmitting its data to confirm that there is no supplemental.
- If you select one of the following **Supplemental Mode** options, the scanner immediately transmits EAN-13 bar codes starting with that prefix that have supplemental characters. If the symbol does not have a supplemental, the scanner must decode the bar code the number of times set via [UPC/EAN/JAN Supplemental Redundancy on page 11-14](#) before transmitting its data to confirm that there is no supplemental. The scanner transmits UPC/EAN bar codes that do not have that prefix immediately.
 - **Enable 378/379 Supplemental Mode**
 - **Enable 978/979 Supplemental Mode**

✓ **NOTE** If you select 978/979 Supplemental Mode and are scanning Bookland EAN bar codes, see [Enable/Disable Bookland EAN on page 11-9](#) to enable Bookland EAN, and select a format using [Bookland ISBN Format on page 11-21](#).

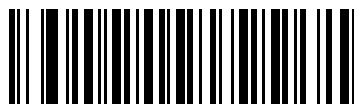
- **Enable 977 Supplemental Mode**
- **Enable 414/419/434/439 Supplemental Mode**
- **Enable 491 Supplemental Mode**
- **Enable Smart Supplemental Mode** - applies to EAN-13 bar codes starting with any prefix listed previously.
- **Supplemental User-Programmable Type 1** - applies to EAN-13 bar codes starting with a 3-digit user-defined prefix. Set this 3-digit prefix using [User-Programmable Supplementals on page 11-13](#).
- **Supplemental User-Programmable Type 1 and 2** - applies to EAN-13 bar codes starting with either of two 3-digit user-defined prefixes. Set the 3-digit prefixes using [User-Programmable Supplementals on page 11-13](#).
- **Smart Supplemental Plus User-Programmable 1** - applies to EAN-13 bar codes starting with any prefix listed previously or the user-defined prefix set using [User-Programmable Supplementals on page 11-13](#).
- **Smart Supplemental Plus User-Programmable 1 and 2** - applies to EAN-13 bar codes starting with any prefix listed previously or one of the two user-defined prefixes set using [User-Programmable Supplementals on page 11-13](#).

✓ **NOTE** To minimize the risk of invalid data transmission, select either to decode or ignore supplemental characters.

Decode UPC/EAN/JAN Supplementals (continued)



Decode UPC/EAN/JAN Only With Supplementals
(01h)



*Ignore Supplementals
(00h)



Autodiscriminate UPC/EAN/JAN Supplementals
(02h)



Enable 378/379 Supplemental Mode
(04h)



Enable 978/979 Supplemental Mode
(05h)



Enable 977 Supplemental Mode
(07h)

Decode UPC/EAN/JAN Supplementals (continued)



Enable 414/419/434/439 Supplemental Mode
(06h)



Enable 491 Supplemental Mode
(08h)



Enable Smart Supplemental Mode
(03h)



Supplemental User-Programmable Type 1
(09h)



Supplemental User-Programmable Type 1 and 2
(0Ah)



Smart Supplemental Plus User-Programmable 1
(0Bh)



Smart Supplemental Plus User-Programmable 1 and 2
(0Ch)

User-Programmable Supplementals

Supplemental 1: Parameter # F1h 43h

Supplemental 2: Parameter # F1h 44h

If you selected a Supplemental User-Programmable option from [Decode UPC/EAN/JAN Supplementals on page 11-10](#), select **User-Programmable Supplemental 1** to set the 3-digit prefix. Then select the 3 digits using the numeric bar codes beginning on [page D-1](#). Select **User-Programmable Supplemental 2** to set a second 3-digit prefix. Then select the 3 digits using the numeric bar codes beginning on [page D-1](#).



User-Programmable Supplemental 1



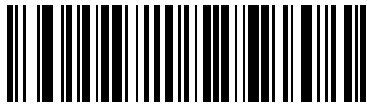
User-Programmable Supplemental 2

UPC/EAN/JAN Supplemental Redundancy

Parameter # 50h

With **Autodiscriminate UPC/EAN/JAN Supplementals** selected, this option adjusts the number of times a symbol without supplementals is decoded before transmission. The range is from two to thirty times. Five or above is recommended when decoding a mix of UPC/EAN/JAN symbols with and without supplementals, and the autodiscriminate option is selected. The default is set at 10.

Capture the bar code below to set a decode redundancy value. Next, capture two numeric bar codes in [Appendix D, Numeric Bar Codes](#). Single digit numbers must have a leading zero. To correct an error or change a selection, capture **Cancel** on [page D-3](#).

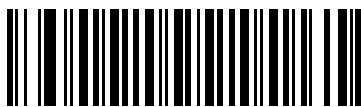


UPC/EAN/JAN Supplemental Redundancy

Transmit UPC-A Check Digit

Parameter # 28h

The check digit is the last character of the symbol used to verify the integrity of the data. Capture the appropriate bar code below to transmit the bar code data with or without the UPC-A check digit. It is always verified to guarantee the integrity of the data.



*Transmit UPC-A Check Digit
(01h)

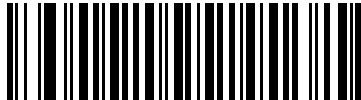


Do Not Transmit UPC-A Check Digit
(00h)

Transmit UPC-E Check Digit

Parameter # 29h

The check digit is the last character of the symbol used to verify the integrity of the data. Capture the appropriate bar code below to transmit the bar code data with or without the UPC-E check digit. It is always verified to guarantee the integrity of the data.



*Transmit UPC-E Check Digit
(01h)

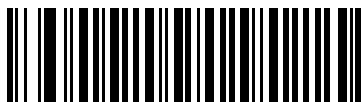


Do Not Transmit UPC-E Check Digit
(00h)

Transmit UPC-E1 Check Digit

Parameter # 2Ah

The check digit is the last character of the symbol used to verify the integrity of the data. Capture the appropriate bar code below to transmit the bar code data with or without the UPC-E1 check digit. It is always verified to guarantee the integrity of the data.



*Transmit UPC-E1 Check Digit
(01h)

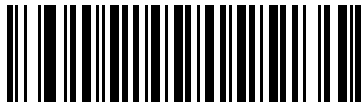


Do Not Transmit UPC-E1 Check Digit
(00h)

UPC-A Preamble

Parameter # 22h

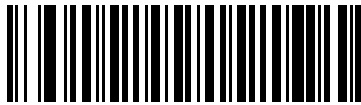
Preamble characters are part of the UPC symbol, and include Country Code and System Character. There are three options for transmitting a UPC-A preamble to the host device: transmit System Character only, transmit System Character and Country Code ("0" for USA), and transmit no preamble. Select the appropriate option to match the host system.



No Preamble (<DATA>)
(00h)



*System Character (<SYSTEM CHARACTER> <DATA>)
(01h)



System Character & Country Code
(< COUNTRY CODE> <SYSTEM CHARACTER> <DATA>)
(02h)

UPC-E Preamble

Parameter # 23h

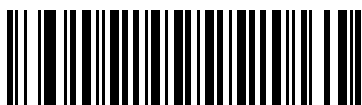
Preamble characters are part of the UPC symbol, and include Country Code and System Character. There are three options for transmitting a UPC-E preamble to the host device: transmit System Character only, transmit System Character and Country Code ("0" for USA), and transmit no preamble. Select the appropriate option to match the host system.



No Preamble (<DATA>)
(00h)



*System Character (<SYSTEM CHARACTER> <DATA>)
(01h)

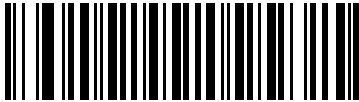


System Character & Country Code
(< COUNTRY CODE> <SYSTEM CHARACTER> <DATA>)
(02h)

UPC-E1 Preamble

Parameter # 24h

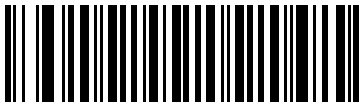
Preamble characters are part of the UPC symbol, and include Country Code and System Character. There are three options for transmitting a UPC-E1 preamble to the host device: transmit System Character only, transmit System Character and Country Code ("0" for USA), and transmit no preamble. Select the appropriate option to match the host system.



No Preamble (<DATA>)
(00h)



*System Character (<SYSTEM CHARACTER> <DATA>)
(01h)



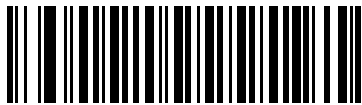
System Character & Country Code
(< COUNTRY CODE> <SYSTEM CHARACTER> <DATA>)
(02h)

Convert UPC-E to UPC-A

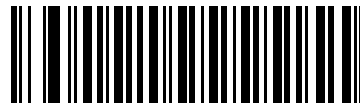
Parameter # 25h

Enable this to convert UPC-E (zero suppressed) decoded data to UPC-A format before transmission. After conversion, the data follows UPC-A format and is affected by UPC-A programming selections (e.g., Preamble, Check Digit).

When disabled, UPC-E decoded data is transmitted as UPC-E data, without conversion.



Convert UPC-E to UPC-A (Enable)
(01h)



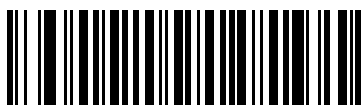
*Do Not Convert UPC-E to UPC-A (Disable)
(00h)

Convert UPC-E1 to UPC-A

Parameter # 26h

Enable this to convert UPC-E1 decoded data to UPC-A format before transmission. After conversion, the data follows UPC-A format and is affected by UPC-A programming selections (e.g., Preamble, Check Digit).

When disabled, UPC-E1 decoded data is transmitted as UPC-E1 data, without conversion.



Convert UPC-E1 to UPC-A (Enable)
(01h)



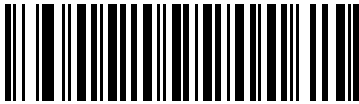
*Do Not Convert UPC-E1 to UPC-A (Disable)
(00h)

EAN-8/JAN-8 Extend

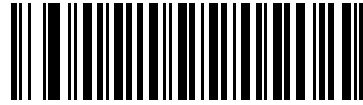
Parameter # 27h

When enabled, this parameter adds five leading zeros to decoded EAN-8 symbols to make them compatible in format to EAN-13 symbols.

When disabled, EAN-8 symbols are transmitted as is.



**Enable EAN/JAN Zero Extend
(01h)**



***Disable EAN/JAN Zero Extend
(00h)**

Bookland ISBN Format

Parameter # F1h 40h

If you enabled Bookland EAN using [Enable/Disable Bookland EAN on page 11-9](#), select one of the following formats for Bookland data:

- **Bookland ISBN-10** - The scanner reports Bookland data starting with 978 in traditional 10-digit format with the special Bookland check digit for backward-compatibility. Data starting with 979 is not considered Bookland in this mode.
- **Bookland ISBN-13** - The scanner reports Bookland data (starting with either 978 or 979) as EAN-13 in 13-digit format to meet the 2007 ISBN-13 protocol.



***Bookland ISBN-10**
(00h)



Bookland ISBN-13
(01h)

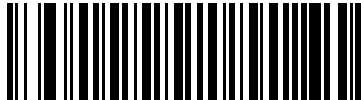


NOTE For Bookland EAN to function properly, first enable Bookland EAN using [Enable/Disable Bookland EAN on page 11-9](#), then select either Decode UPC/EAN Supplementals, Autodiscriminate UPC/EAN Supplementals, or Enable 978/979 Supplemental Mode in [Decode UPC/EAN/JAN Supplementals on page 11-10](#).

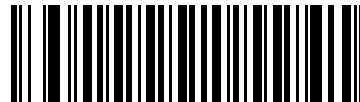
UCC Coupon Extended Code

Parameter # 55h

When enabled, this parameter decodes UPC-A bar codes starting with digit '5', EAN-13 bar codes starting with digit '99', and UPC-A/EAN-128 Coupon Codes. UPCA, EAN-13, and EAN-128 must be enabled to decode all types of Coupon Codes.



Enable UCC Coupon Extended Code
(01h)



*Disable UCC Coupon Extended Code
(00h)



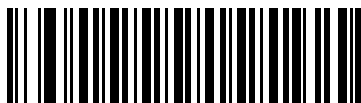
NOTE Use the Decode UPC/EAN Supplemental Redundancy parameter to control autodiscrimination of the EAN128 (right half) of a coupon code.

Code 128

Enable/Disable Code 128

Parameter # 08h

To enable or disable Code 128, capture the appropriate bar code below.



*Enable Code 128
(01h)

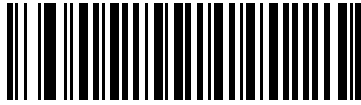


Disable Code 128
(00h)

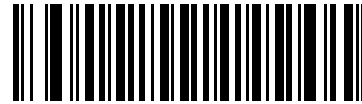
Enable/Disable UCC/EAN-128

Parameter # 0Eh

To enable or disable UCC/EAN-128, capture the appropriate bar code below.



*Enable UCC/EAN-128
(01h)



Disable UCC/EAN-128
(00h)

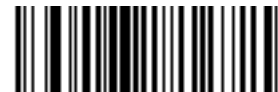
Enable/Disable ISBT 128

Parameter # 54h

ISBT 128 is a variant of Code 128 used in the blood bank industry. Capture a bar code below to enable or disable ISBT 128. If necessary, the host must perform concatenation of the ISBT data.



*Enable ISBT 128
(01h)



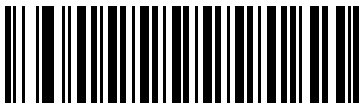
Disable ISBT 128
(00h)

Code 39

Enable/Disable Code 39

Parameter # 00h

To enable or disable Code 39, capture the appropriate bar code below.



*Enable Code 39
(01h)

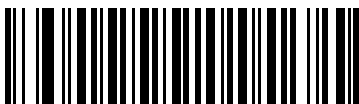


Disable Code 39
(00h)

Enable/Disable Trioptic Code 39

Parameter # 0Dh

Trioptic Code 39 is a variant of Code 39 used in the marking of computer tape cartridges. Trioptic Code 39 symbols always contain six characters. To enable or disable Trioptic Code 39, capture the appropriate bar code below.



Enable Trioptic Code 39
(01h)



*Disable Trioptic Code 39
(00h)



NOTE Trioptic Code 39 and Code 39 Full ASCII cannot be enabled simultaneously.

Convert Code 39 to Code 32

Parameter # 56h

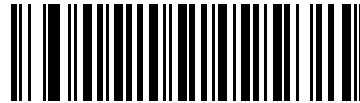
Code 32 is a variant of Code 39 used by the Italian pharmaceutical industry. Capture the appropriate bar code below to enable or disable converting Code 39 to Code 32.



NOTE Code 39 must be enabled for this parameter to function.



Enable Convert Code 39 to Code 32
(01h)



*Disable Convert Code 39 to Code 32
(00h)

Code 32 Prefix

Parameter # E7h

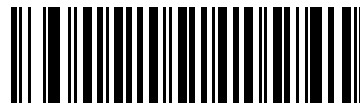
Capture the appropriate bar code below to enable or disable adding the prefix character “A” to all Code 32 bar codes.



NOTE Convert Code 39 to Code 32 must be enabled for this parameter to function.



Enable Code 32 Prefix
(01h)



*Disable Code 32 Prefix
(00h)

Set Lengths for Code 39

Parameter # L1 = 12h, L2 = 13h

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for Code 39 to any length, one or two discrete lengths, or lengths within a specific range. If Code 39 Full ASCII is enabled, **Length Within a Range** or **Any Length** are the preferred options.



NOTE When setting lengths for different bar code types by decoding single digit numbers, single digit numbers must always be preceded by a leading zero.

- **One Discrete Length** - Select this option to decode only Code 39 symbols containing a selected length. Select the length using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only Code 39 symbols with 14 characters, capture **Code 39 - One Discrete Length**, then capture **1** followed by **4**. To correct an error or change the selection, capture **Cancel** on [page D-3](#).
- **Two Discrete Lengths** - Select this option to decode only Code 39 symbols containing either of two selected lengths. Select lengths using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only those Code 39 symbols containing either 2 or 14 characters, select **Code 39 - Two Discrete Lengths**, then capture **0, 2, 1**, and then **4**. To correct an error or change the selection, capture **Cancel** on [page D-3](#).
- **Length Within Range** - Select this option to decode a Code 39 symbol with a specific length range. Select lengths using numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode Code 39 symbols containing between 4 and 12 characters, first capture **Code 39 - Length Within Range**. Then capture **0, 4, 1**, and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, capture **Cancel** on [page D-3](#).
- **Any Length** - Select this option to decode Code 39 symbols containing any number of characters within the imager capability.

Set Lengths for Code 39 (continued)



Code 39 - One Discrete Length



Code 39 - Two Discrete Lengths



Code 39 - Length Within Range

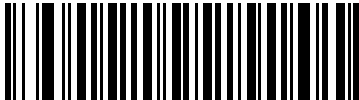


Code 39 - Any Length

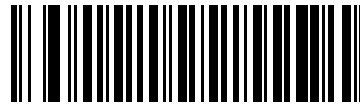
Code 39 Check Digit Verification

Parameter # 30h

When this feature is enabled, the imager checks the integrity of all Code 39 symbols to verify that the data complies with specified check digit algorithm. Only Code 39 symbols which include a modulo 43 check digit are decoded. Enable this feature if the Code 39 symbols contain a Modulo 43 check digit.



Enable Code 39 Check Digit
(01h)

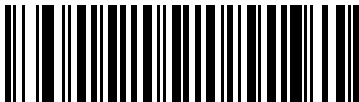


*Disable Code 39 Check Digit
(00h)

Transmit Code 39 Check Digit

Parameter # 2Bh

Capture a bar code below to transmit Code 39 data with or without the check digit.



Transmit Code 39 Check Digit (Enable)
(01h)



*Do Not Transmit Code 39 Check Digit (Disable)
(00h)

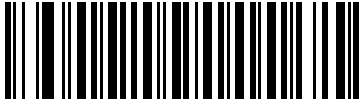


NOTE Code 39 Check Digit Verification must be enabled for this parameter to function.

Code 39 Full ASCII Conversion

Parameter # 11h

Code 39 Full ASCII is a variant of Code 39 which pairs characters to encode the full ASCII character set. To enable or disable Code 39 Full ASCII, capture the appropriate bar code below.



Enable Code 39 Full ASCII
(01h)



*Disable Code 39 Full ASCII
(00h)



NOTE Trioptic Code 39 and Code 39 Full ASCII cannot be enabled simultaneously.

Code 39 Full ASCII to Full ASCII Correlation is host-dependent, and is therefore described in the ASCII Character Set Table for the appropriate interface. See [Appendix E, ASCII Character Sets](#).

Code 39 Buffering (Scan & Store)

Parameter # 71h

This feature allows the imager to accumulate data from multiple Code 39 symbols.

Selecting the Scan and Store option (Buffer Code 39) temporarily buffers all Code 39 symbols having a leading space as a first character for later transmission. The leading space is not buffered.

Decode of a valid Code 39 symbol with no leading space causes transmission in sequence of all buffered data in a first-in first-out format, plus transmission of the “triggering” symbol. See the following pages for further details.

When the **Do Not Buffer Code 39** option is selected, all decoded Code 39 symbols are transmitted immediately without being stored in the buffer.

This feature affects Code 39 only. If selecting **Buffer Code 39**, we recommend configuring the imager to decode Code 39 symbology only.



Buffer Code 39 (Enable)
(01h)



***Do Not Buffer Code 39 (Disable)**
(00h)

While there is data in the transmission buffer, selecting **Do Not Buffer Code 39** is not allowed. The buffer holds 200 bytes of information.

To disable Code 39 buffering when there is data in the transmission buffer, first force the buffer transmission (see [Transmit Buffer on page 11-32](#)) or clear the buffer.

Buffer Data

To buffer data, Code 39 buffering must be enabled and a Code 39 symbol must be read with a space immediately following the start pattern.

- Unless the data overflows the transmission buffer, the imager issues a lo/hi beep to indicate successful decode and buffering. (For overflow conditions, see [Overfilling Transmission Buffer on page 11-33](#).)
- The imager adds the decoded data excluding the leading space to the transmission buffer.
- No transmission occurs.

Clear Transmission Buffer

To clear the transmission buffer, capture the **Clear Buffer** bar code below, which contains only a start character, a dash (minus), and a stop character.

- The imager issues a short hi/lo/hi beep.
- The imager erases the transmission buffer.
- No transmission occurs.



Clear Buffer



NOTE The Clear Buffer contains only the dash (minus) character. In order to decode this command, be sure Code 39 length is set to include length 1.

Transmit Buffer

There are two methods to transmit the Code 39 buffer.

1. Capture the **Transmit Buffer** bar code below. Only a start character, a plus (+), and a stop character.
 - The imager transmits and clears the buffer.
 - The imager issues a Lo/Hi beep.



Transmit Buffer

2. Capture a Code 39 bar code with a leading character other than a space.
 - The imager appends new decode data to buffered data.
 - The imager transmits and clears the buffer.
 - The imager signals that the buffer was transmitted with a lo/hi beep.
 - The imager transmits and clears the buffer.



NOTE The Transmit Buffer contains only a plus (+) character. In order to decode this command, be sure Code 39 length is set to include length 1.

Overfilling Transmission Buffer

The Code 39 buffer holds 200 characters. If the symbol just read results in an overflow of the transmission buffer:

- The imager indicates that the symbol was rejected by issuing three long, high beeps.
- No transmission occurs. The data in the buffer is not affected.

Attempt to Transmit an Empty Buffer

If the symbol just read was the **Transmit Buffer** symbol and the Code 39 buffer is empty:

- A short lo/hi/lo beep signals that the buffer is empty.
- No transmission occurs.
- The buffer remains empty.

Code 93

Enable/Disable Code 93

Parameter # 09h

To enable or disable Code 93, capture the appropriate bar code below.



Enable Code 93
(01h)



*Disable Code 93
(00h)

Set Lengths for Code 93

Parameter # L1 = 1Ah, L2 = 1Bh

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for Code 93 to any length, one or two discrete lengths, or lengths within a specific range.

- One Discrete Length** - Select this option to decode only Code 93 symbols containing a selected length. Select the length using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only Code 93 symbols with 14 characters, capture **Code 93 - One Discrete Length**, then capture **1** followed by **4**. To correct an error or to change the selection, capture **Cancel** on [page D-3](#).
- Two Discrete Lengths** - Select this option to decode only Code 93 symbols containing either of two selected lengths. Select lengths using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only those Code 93 symbols containing either 2 or 14 characters, select **Code 93 - Two Discrete Lengths**, then capture **0, 2, 1**, and then **4**. To correct an error or to change the selection, capture **Cancel** on [page D-3](#).
- Length Within Range** - Select this option to decode a Code 93 symbol with a specific length range. Select lengths using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode Code 93 symbols containing between 4 and 12 characters, first capture **Code 93 - Length Within Range**. Then capture **0, 4, 1**, and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, capture **Cancel** on [page D-3](#).
- Any Length** - Capture this option to decode Code 93 symbols containing any number of characters within the imager's capability.

Set Lengths for Code 93 (continued)



Code 93 - One Discrete Length



Code 93 - Two Discrete Lengths



Code 93 - Length Within Range



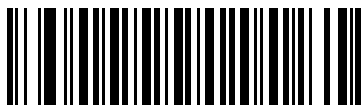
Code 93 - Any Length

Code 11

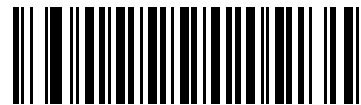
Code 11

Parameter # 0Ah

To enable or disable Code 11, capture the appropriate bar code below.



Enable Code 11
(01h)



*Disable Code 11
(00h)

Set Lengths for Code 11

Parameter # L1 = 1Ch, L2 = 1Dh

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for Code 11 to any length, one or two discrete lengths, or lengths within a specific range.

- One Discrete Length** - Select this option to decode only Code 11 symbols containing a selected length. Select the length using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only Code 11 symbols with 14 characters, capture **Code 11 - One Discrete Length**, then capture **1** followed by **4**. To correct an error or to change the selection, capture **Cancel** on [page D-3](#).
- Two Discrete Lengths** - Select this option to decode only Code 11 symbols containing either of two selected lengths. Select lengths using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only those Code 11 symbols containing either 2 or 14 characters, select **Code 11 - Two Discrete Lengths**, then capture **0, 2, 1**, and then **4**. To correct an error or to change the selection, capture **Cancel** on [page D-3](#).
- Length Within Range** - Select this option to decode a Code 11 symbol with a specific length range. Select lengths using numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode Code 11 symbols containing between 4 and 12 characters, first capture **Code 11 - Length Within Range**. Then capture **0, 4, 1**, and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, capture **Cancel** on [page D-3](#).
- Any Length** - Capture this option to decode Code 11 symbols containing any number of characters within the imager capability.

Set Lengths for Code 11 (continued)



Code 11 - One Discrete Length



Code 11 - Two Discrete Lengths



Code 11 - Length Within Range



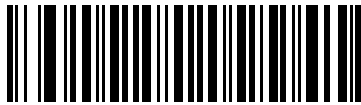
Code 11 - Any Length

Code 11 Check Digit Verification

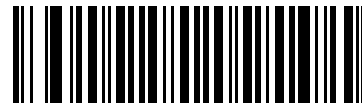
Parameter # 34h

This feature allows the imager to check the integrity of all Code 11 symbols to verify that the data complies with the specified check digit algorithm. This selects the check digit mechanism for the decoded Code 11 bar code. The options are to check for one check digit, check for two check digits, or disable the feature.

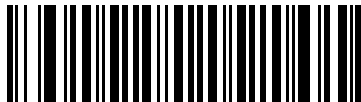
To enable this feature, capture the bar code below corresponding to the number of check digits encoded in the Code 11 symbols.



***Disable
(00h)**



**One Check Digit
(01h)**

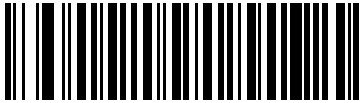


**Two Check Digits
(02h)**

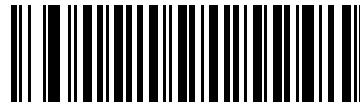
Transmit Code 11 Check Digits

Parameter # 2Fh

This feature selects whether or not to transmit the Code 11 check digit(s).



Transmit Code 11 Check Digit(s) (Enable)
(01h)



*Do Not Transmit Code 11 Check Digit(s) (Disable)
(00h)



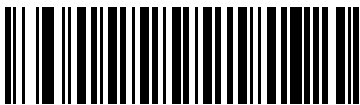
NOTE Code 11 Check Digit Verification must be enabled for this parameter to function.

Interleaved 2 of 5 (ITF)

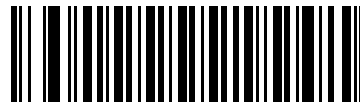
Enable/Disable Interleaved 2 of 5

Parameter # 06h

To enable or disable Interleaved 2 of 5, capture the appropriate bar code below, and select an Interleaved 2 of 5 length from the following pages.



*Enable Interleaved 2 of 5
(01h)



Disable Interleaved 2 of 5
(00h)

Set Lengths for Interleaved 2 of 5

Parameter # L1 = 16h, L2 = 17h

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for I 2 of 5 to any length, one or two discrete lengths, or lengths within a specific range.

- **One Discrete Length** - Select this option to decode only I 2 of 5 symbols containing a selected length. Select the length using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only I 2 of 5 symbols with 14 characters, capture **I 2 of 5 - One Discrete Length**, then capture **1** followed by **4**. To correct an error or to change the selection, capture **Cancel** on [page D-3](#).
- **Two Discrete Lengths** - Select this option to decode only I 2 of 5 symbols containing either of two selected lengths. Select lengths using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only those I 2 of 5 symbols containing either 2 or 14 characters, select **I 2 of 5 - Two Discrete Lengths**, then capture **0, 2, 1**, and then **4**. To correct an error or to change the selection, capture **Cancel** on [page D-3](#).
- **Length Within Range** - Select this option to decode an I 2 of 5 symbol with a specific length range. Select lengths using numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode I 2 of 5 symbols containing between 4 and 12 characters, first capture **I 2 of 5 - Length Within Range**. Then capture **0, 4, 1**, and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, capture **Cancel** on [page D-3](#).
- **Any Length** - Capture this option to decode I 2 of 5 symbols containing any number of characters within the imager capability.



NOTE Due to the construction of the I 2 of 5 symbology, it is possible for a scan line covering only a portion of the code to be interpreted as a complete scan, yielding less data than is encoded in the bar code. To prevent this, select specific lengths (I 2 of 5 - One Discrete Length - Two Discrete Lengths) for I 2 of 5 applications.

Set Lengths for Interleaved 2 of 5 (continued)



I 2 of 5 - One Discrete Length



I 2 of 5 - Two Discrete Lengths



I 2 of 5 - Length Within Range



I 2 of 5 - Any Length

I 2 of 5 Check Digit Verification

Parameter # 31h

When this feature is enabled, the imager checks the integrity of all I 2 of 5 symbols to verify the data complies with either the specified Uniform Symbology Specification (USS), or the Optical Product Code Council (OPCC) check digit algorithm.



***Disable
(00h)**



**USS Check Digit
(01h)**



**OPCC Check Digit
(02h)**

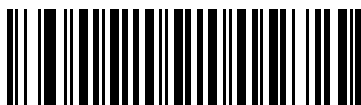
Transmit I 2 of 5 Check Digit

Parameter # 2Ch

Capture the appropriate bar code below to transmit I 2 of 5 data with or without the check digit.



**Transmit I 2 of 5 Check Digit (Enable)
(01h)**

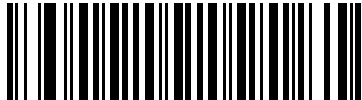


***Do Not Transmit I 2 of 5 Check Digit (Disable)
(00h)**

Convert I 2 of 5 to EAN-13

Parameter # 52h

Enable this parameter to convert 14-character I 2 of 5 codes to EAN-13, and transmit to the host as EAN-13. To accomplish this, the I 2 of 5 code must be enabled, and the code must have a leading zero and a valid EAN-13 check digit.



Convert I 2 of 5 to EAN-13 (Enable)
(01h)



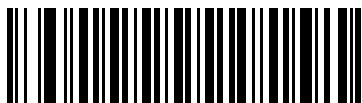
*Do Not Convert I 2 of 5 to EAN-13 (Disable)
(00h)

Discrete 2 of 5 (DTF)

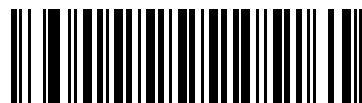
Enable/Disable Discrete 2 of 5

Parameter # 05h

To enable or disable Discrete 2 of 5, capture the appropriate bar code below.



Enable Discrete 2 of 5
(01h)



*Disable Discrete 2 of 5
(00h)

Set Lengths for Discrete 2 of 5

Parameter # L1 = 14h, L2 = 15h

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for D 2 of 5 to any length, one or two discrete lengths, or lengths within a specific range.

- **One Discrete Length** - Select this option to decode only D 2 of 5 symbols containing a selected length. Select the length using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only D 2 of 5 symbols with 14 characters, capture **D 2 of 5 - One Discrete Length**, then capture **1** followed by **4**. To correct an error or to change the selection, capture **Cancel** on [page D-3](#).
- **Two Discrete Lengths** - Select this option to decode only D 2 of 5 symbols containing either of two selected lengths. Select lengths using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only those D 2 of 5 symbols containing either 2 or 14 characters, select **D 2 of 5 - Two Discrete Lengths**, then capture **0, 2, 1**, and then **4**. To correct an error or to change the selection, capture **Cancel** on [page D-3](#).
- **Length Within Range** - Select this option to decode a D 2 of 5 symbol with a specific length range. Select lengths using numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode D 2 of 5 symbols containing between 4 and 12 characters, first capture **D 2 of 5 - Length Within Range**. Then capture **0, 4, 1**, and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, capture **Cancel** on [page D-3](#).
- **Any Length** - Capture this option to decode D 2 of 5 symbols containing any number of characters within the imager capability.



NOTE Due to the construction of the D 2 of 5 symbology, it is possible for a scan line covering only a portion of the code to be interpreted as a complete scan, yielding less data than is encoded in the bar code. To prevent this, select specific lengths (D 2 of 5 - One Discrete Length - Two Discrete Lengths) for D 2 of 5 applications.

Set Lengths for Discrete 2 of 5 (continued)



D 2 of 5 - One Discrete Length



D 2 of 5 - Two Discrete Lengths



D 2 of 5 - Length Within Range



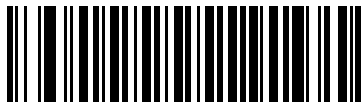
D 2 of 5 - Any Length

Codabar (NW - 7)

Enable/Disable Codabar

Parameter # 07h

To enable or disable Codabar, capture the appropriate bar code below.



Enable Codabar
(01h)



*Disable Codabar
(00h)

Set Lengths for Codabar

Parameter # L1 = 18h, L2 = 19h

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for Codabar to any length, one or two discrete lengths, or lengths within a specific range.

- One Discrete Length** - Select this option to decode only Codabar symbols containing a selected length. Select the length using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only Codabar symbols with 14 characters, capture **Codabar - One Discrete Length**, then capture **1** followed by **4**. To correct an error or to change the selection, capture **Cancel** on [page D-3](#).
- Two Discrete Lengths** - Select this option to decode only Codabar symbols containing either of two selected lengths. Select lengths using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only Codabar symbols containing either 2 or 14 characters, select **Codabar - Two Discrete Lengths**, then capture **0, 2, 1**, and then **4**. To correct an error or to change the selection, capture **Cancel** on [page D-3](#).
- Length Within Range** - Select this option to decode a Codabar symbol with a specific length range. Select lengths using numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode Codabar symbols containing between 4 and 12 characters, first capture **Codabar - Length Within Range**. Then capture **0, 4, 1**, and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, capture **Cancel** on [page D-3](#).
- Any Length** - Capture this option to decode Codabar symbols containing any number of characters within the imager capability.

Set Lengths for Codabar (continued)



Codabar - One Discrete Length



Codabar - Two Discrete Lengths



Codabar - Length Within Range



Codabar - Any Length

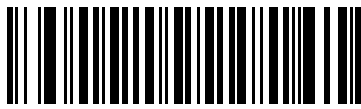
CLSI Editing

Parameter # 36h

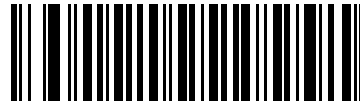
When enabled, this parameter strips the start and stop characters and inserts a space after the first, fifth, and tenth characters of a 14-character Codabar symbol. Enable this feature if the host system requires this data format.



NOTE Symbol length does not include start and stop characters.



Enable CLSI Editing
(01h)



*Disable CLSI Editing
(00h)

NOTIS Editing

Parameter # 37h

When enabled, this parameter strips the start and stop characters from a decoded Codabar symbol. Enable this feature if the host system requires this data format.



Enable NOTIS Editing
(01h)



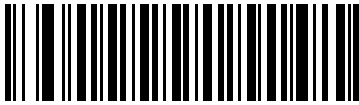
*Disable NOTIS Editing
(00h)

MSI

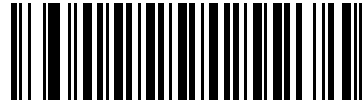
Enable/Disable MSI

Parameter # 0Bh

To enable or disable MSI, capture the appropriate bar code below.



Enable MSI
(01h)



*Disable MSI
(00h)

Set Lengths for MSI

Parameter # L1 = 1Eh, L2 = 1Fh

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for MSI to any length, one or two discrete lengths, or lengths within a specific range.

- **One Discrete Length** - Select this option to decode only MSI symbols containing a selected length. Select the length using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only MSI symbols with 14 characters, capture **MSI - One Discrete Length**, then capture **1** followed by **4**. To correct an error or to change the selection, capture **Cancel** on [page D-3](#).
- **Two Discrete Lengths** - Select this option to decode only MSI symbols containing either of two selected lengths. Select lengths using the numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode only MSI symbols containing either 2 or 14 characters, select **MSI - Two Discrete Lengths**, then capture **0, 2, 1**, and then **4**. To correct an error or to change the selection, capture **Cancel** on [page D-3](#).
- **Length Within Range** - Select this option to decode a MSI symbol with a specific length range. Select lengths using numeric bar codes in [Appendix D, Numeric Bar Codes](#). For example, to decode MSI symbols containing between 4 and 12 characters, first capture **MSI - Length Within Range**. Then capture **0, 4, 1**, and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, capture **Cancel** on [page D-3](#).
- **Any Length** - Capture this option to decode MSI symbols containing any number of characters within the imager capability.



NOTE Due to the construction of the MSI symbology, it is possible for a scan line covering only a portion of the code to be interpreted as a complete scan, yielding less data than is encoded in the bar code. To prevent this, select specific lengths (MSI - One Discrete Length - Two Discrete Lengths) for MSI applications.

Set Lengths for MSI (continued)



MSI - One Discrete Length



MSI - Two Discrete Lengths



MSI - Length Within Range



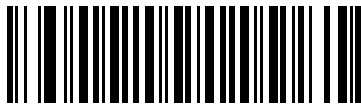
MSI - Any Length

MSI Check Digits

Parameter # 32h

With MSI symbols, one check digit is mandatory and always verified by the reader. The second check digit is optional. If the MSI codes include two check digits, capture the **Two MSI Check Digits** bar code to enable verification of the second check digit.

See [MSI Check Digit Algorithm on page 11-53](#) for the selection of second digit algorithms.



***One MSI Check Digit
(00h)**

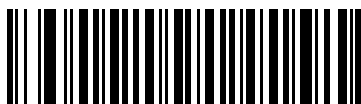


**Two MSI Check Digits
(01h)**

Transmit MSI Check Digit(s)

Parameter # 2Eh

Capture a bar code below to transmit MSI data with or without the check digit.



**Transmit MSI Check Digit(s) (Enable)
(01h)**

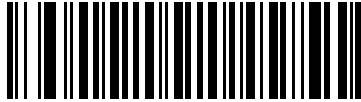


***Do Not Transmit MSI Check Digit(s) (Disable)
(00h)**

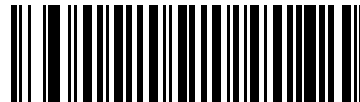
MSI Check Digit Algorithm

Parameter # 33h

Two algorithms are possible for the verification of the second MSI check digit. Select the bar code below corresponding to the algorithm used to encode the check digit.



MOD 10/MOD 11
(00h)



*MOD 10/MOD 10
(01h)

Inverse 1D

Parameter # F1h 4Ah

This parameter sets the 1D inverse decoder setting. Options are:

- **Regular Only** - the scanner decodes regular 1D bar codes only.
- **Inverse Only** - the scanner decodes inverse 1D bar codes only.
- **Inverse Autodetect** - the scanner decodes both regular and inverse 1D bar codes.



*Regular
(00h)



Inverse Only
(01h)



Inverse Autodetect
(02h)

Postal Codes

US Postnet

Parameter # 59h

To enable or disable US Postnet, capture the appropriate bar code below.



*Enable US Postnet
(01h)



Disable US Postnet
(00h)

US Planet

Parameter # 5Ah

To enable or disable US Planet, capture the appropriate bar code below.



*Enable US Planet
(01h)



Disable US Planet
(00h)

UK Postal

Parameter # 5Bh

To enable or disable UK Postal, capture the appropriate bar code below.



***Enable UK Postal
(01h)**



**Disable UK Postal
(00h)**

Transmit UK Postal Check Digit

Parameter # 60h

Select whether to transmit UK Postal data with or without the check digit.



***Transmit UK Postal
Check Digit
(01h)**



**Do Not Transmit UK Postal Check Digit
(00h)**

Japan Postal

Parameter # F0h, 22h

To enable or disable Japan Postal, capture the appropriate bar code below.



*Enable Japan Postal
(01h)



Disable Japan Postal
(00h)

Australian Postal

Parameter # F0h, 23h

To enable or disable Australian Postal, capture the appropriate bar code below.



*Enable Australian Postal
(01h)



Disable Australian Postal
(00h)

Dutch Postal

Parameter # F0h, 46h

To enable or disable Dutch Postal, capture the appropriate bar code below.



***Enable Dutch Postal
(01h)**



**Disable Dutch Postal
(00h)**

4State Postal

Parameter # F1h 50h

To enable or disable 4State Postal, scan the appropriate bar code below.



**Enable 4State Postal
(01h)**

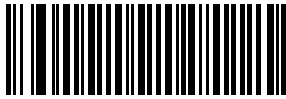


***Disable 4State Postal
(00h)**

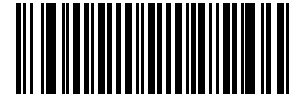
Transmit US Postal Check Digit

Parameter # 5Fh

Select whether to transmit US Postal data with or without the check digit.



***Transmit US Postal Check Digit
(01h)**



**Do Not Transmit US Postal Check Digit
(00h)**

GS1 DataBar (Formerly RSS, Reduced Space Symbology)

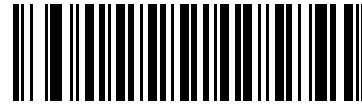
The variants of GS1 DataBar are DataBar-14, DataBar Expanded, and DataBar Limited. The limited and expanded versions have stacked variants. Capture the appropriate bar code below to enable or disable each variant of GS1 DataBar.

GS1 DataBar-14

Parameter # F0h 52h.



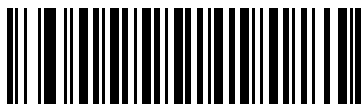
*Enable GS1 DataBar-14
(01h)



Disable GS1 DataBar-14
(00h)

GS1 DataBar Limited

Parameter # F0h 53h.



*Enable GS1 DataBar Limited
(01h)



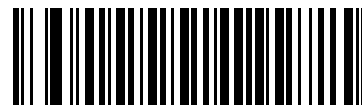
Disable GS1 DataBar Limited
(00h)

GS1 DataBar Expanded

Parameter # F0h 54h.



*Enable GS1 DataBar Expanded
(01h)



Disable GS1 DataBar Expanded
(00h)

Convert GS1 DataBar to UPC/EAN

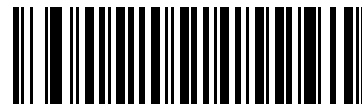
Parameter # F0h, 8Dh

This parameter only applies to GS1 DataBar-14 and GS1 DataBar Limited symbols not decoded as part of a Composite symbol. Enable this to strip the leading '010' from GS1 DataBar-14 and GS1 DataBar Limited symbols encoding a single zero as the first digit, and report the bar code as EAN-13.

For bar codes beginning with two or more zeros but not six zeros, this parameter strips the leading '0100' and reports the bar code as UPC-A. The UPC-A Preamble parameter that transmits the system character and country code applies to converted bar codes. Note that neither the system character nor the check digit can be stripped.



Enable Convert GS1 DataBar to UPC/EAN
(01h)



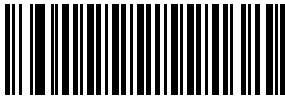
*Disable Convert GS1 DataBar to UPC/EAN
(00h)

Composite

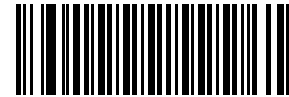
Composite CC-C

Parameter # F0h 55h

Capture a bar code below to enable or disable Composite bar codes of type CC-C.



Enable CC-C
(01h)



*Disable CC-C
(00h)

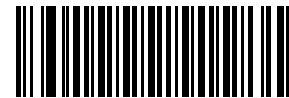
Composite CC-A/B

Parameter # F0h 56h

Capture a bar code below to enable or disable Composite bar codes of type CC-A/B.



Enable CC-A/B
(01h)

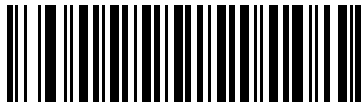


*Disable CC-A/B
(00h)

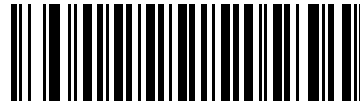
Composite TLC-39

Parameter # F0h 73h

Capture a bar code below to enable or disable Composite bar codes of type TLC-39.



Enable TLC39
(01h)



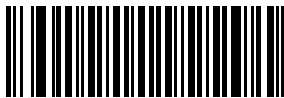
*Disable TLC39
(00h)

UPC Composite Mode

Parameter # F0h 58h

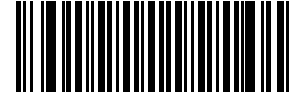
UPC symbols can be “linked” with a 2-D symbol during transmission as if they were one symbol. There are three options for these symbols:

- Select **UPC Never Linked** to transmit UPC bar codes regardless of whether a 2-D symbol is detected.
- Select **UPC Always Linked** to transmit UPC bar codes and the 2-D portion.
If 2-D is not present, the UPC bar code does not transmit.
- If Autodiscriminate UPC Composites is selected, the SE4400 determines if there is a 2-D portion, then transmits the UPC, as well as the 2-D portion if present.

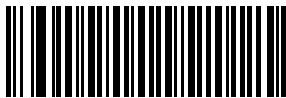


UPC Never Linked
(00h)

UPC Composite Mode (continued)



*UPC Always Linked
(01h)

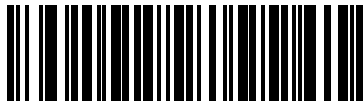


Autodiscriminate UPC Composites
(02h)

Composite Beep Mode

Parameter # F0h, 8Eh

To select the number of decode beeps when a composite bar code is decoded, capture the appropriate bar code.



Single Beep after both are decoded
(00h)



*Beep as each code type is decoded
(01h)



Double Beep after both are decoded
(02h)

UCC/EAN Code 128 Emulation Mode for UCC/EAN Composite Codes

Parameter # F0h, ABh

Select whether to enable or disable this mode.



Enable UCC/EAN Code 128 Emulation Mode for
UCC/EAN Composite Codes
(01h)



*Disable UCC/EAN Code 128 Emulation Mode for
UCC/EAN Composite Codes
(00h)

2-D Symbologies

Enable/Disable PDF417

Parameter # 0Fh

To enable or disable PDF417, capture the appropriate bar code below.



***Enable PDF417
(01h)**



**Disable PDF417
(00h)**

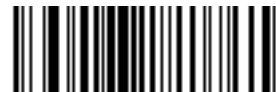
Enable/Disable MicroPDF417

Parameter # E3h

To enable or disable MicroPDF417, capture the appropriate bar code below.



**Enable MicroPDF417
(01h)**



***Disable MicroPDF417
(00h)**

Code 128 Emulation

Parameter # 7Bh

When this parameter is enabled, the SE4400 transmits data from certain MicroPDF417 symbols as if it was encoded in Code 128 symbols. Transmit AIM Symbology Identifiers must be enabled for this parameter to work.

If Code 128 Emulation is enabled, these MicroPDF417 symbols are transmitted with one of the following prefixes:

-]C1 if the first codeword is 903-907, 912, 914, 915
-]C2 if the first codeword is 908 or 909
-]C0 if the first codeword is 910 or 911

If disabled, they are transmitted with one of the following prefixes:

-]L3 if the first codeword is 903-907, 912, 914, 915
-]L4 if the first codeword is 908 or 909
-]L5 if the first codeword is 910 or 911

Capture a bar code below to enable or disable Code 128 Emulation.



**Enable Code 128 Emulation
(01h)**



***Disable Code 128 Emulation
(00h)**

Data Matrix

Parameter # F0h, 24h

To enable or disable Data Matrix, capture the appropriate bar code below.



***Enable Data Matrix
(01h)**



**Disable Data Matrix
(00h)**

Data Matrix Inverse

Parameter # F1h 4Ch

This parameter sets the Data Matrix inverse decoder setting. Options are:

- **Regular Only** - the scanner decodes regular Data Matrix bar codes only.
- **Inverse Only** - the scanner decodes inverse Data Matrix bar codes only.
- **Inverse Autodetect** - the scanner decodes both regular and inverse Data Matrix bar codes.



***Regular
(00h)**



**Inverse Only
(01h)**



**Inverse Autodetect
(02h)**

Maxicode

Parameter # F0h, 26h

To enable or disable Maxicode, capture the appropriate bar code below.



***Enable Maxicode
(01h)**



**Disable Maxicode
(00h)**

QR Code

Parameter # F0h,25h

To enable or disable QR Code, capture the appropriate bar code below.



*Enable QR Code
(01h)



Disable QR Code
(00h)

MicroQR

Parameter # F1h 3Dh

To enable or disable MicroQR, scan the appropriate bar code below.



*Enable MicroQR
(01h)



Disable MicroQR
(00h)

QR Inverse

Parameter # F1h 4Bh

This parameter sets the QR inverse decoder setting. Options are:

- **Regular Only** - the scanner decodes regular QR bar codes only.
- **Inverse Only** - the scanner decodes inverse QR bar codes only.
- **Inverse Autodetect** - the scanner decodes both regular and inverse QR bar codes.



*Regular
(00h)



Inverse Only
(01h)



Inverse Autodetect
(02h)

Aztec

Parameter # F1h 3Eh

To enable or disable Aztec, scan the appropriate bar code below.



*Enable Aztec
(01h)



Disable Aztec
(00h)

Aztec Inverse

Parameter # F1h 4Dh

This parameter sets the Aztec inverse decoder setting. Options are:

- **Regular Only** - the scanner decodes regular Aztec bar codes only.
- **Inverse Only** - the scanner decodes inverse Aztec bar codes only.
- **Inverse Autodetect** - the scanner decodes both regular and inverse Aztec bar codes.



*Regular
(00h)



Inverse Only
(01h)



Inverse Autodetect
(02h)

Redundancy Level

Parameter # 4Eh

The imager offers four levels of decode redundancy. Select higher redundancy levels for decreasing levels of bar code quality. As redundancy levels increase, the imager's aggressiveness decreases.

Select the redundancy level appropriate for the bar code quality.

Redundancy Level 1

The code types in [Table 11-2](#) must be successfully read twice before being decoded:

Table 11-2 *Redundancy Level 1*

Code Type	Code Length
Codabar	8 characters or less
MSI	4 characters or less
D 2 of 5	8 characters or less
I 2 of 5	8 characters or less

Redundancy Level 2

The code types in [Table 11-3](#) must be successfully read twice before being decoded:

Table 11-3 *Redundancy Level 2*

Code Type	Code Length
All	All

Redundancy Level 3

Code types other than the code types in [Table 11-4](#) must be successfully read twice before being decoded. The following codes must be read three times:

Table 11-4 *Redundancy Level 3*

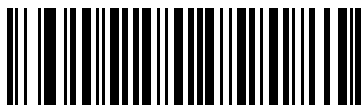
Code Type	Code Length
MSI Plessey	4 characters or less
D 2 of 5	8 characters or less
I 2 of 5	8 characters or less
Codabar	8 characters or less

Redundancy Level 4

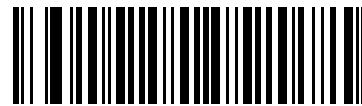
The code types in [Table 11-5](#) must be successfully read three times before being decoded:

Table 11-5 *Redundancy Level 4*

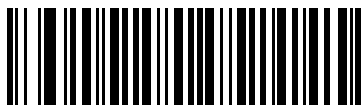
Code Type	Code Length
All	All



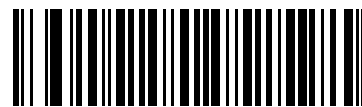
*Redundancy Level 1
(01h)



Redundancy Level 2
(02h)



Redundancy Level 3
(03h)



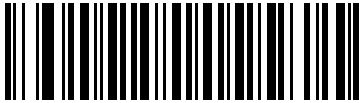
Redundancy Level 4
(04h)

Security Level

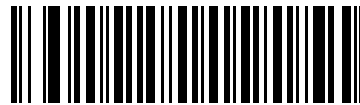
Parameter # 4Dh

The imager offers four levels of decode security for delta bar codes, which include the Code 128 family, UPC/EAN, and Code 93. Select increasing levels of security for decreasing levels of bar code quality. There is an inverse relationship between security and imager aggressiveness, so choose only that level of security necessary for any given application.

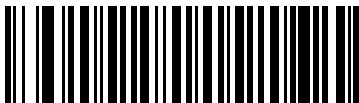
- **Security Level 0:** This setting allows the imager to operate in its most aggressive state, while providing sufficient security in decoding most “in-spec” bar codes.
- **Security Level 1:** Select this option if misdecodes occur. This default setting should eliminate most misdecodes.
- **Security Level 2:** Select this option if Security level 1 fails to eliminate misdecodes.
- **Security Level 3:** If Security Level 2 was selected and misdecodes still occur, select this security level. Be advised, selecting this option is an extreme measure against mis-decoding severely out of spec bar codes. Selecting this level of security significantly impairs the decoding ability of the imager. If this level of security is necessary, try to improve the quality of the bar codes.



Security Level 0
(00h)



*Security Level 1
(01h)



Security Level 2
(02h)



Security Level 3
(03h)

Intercharacter Gap Size

Parameter # F0h, 7Dh

The Code 39 and Codabar symbologies have an intercharacter gap that is typically quite small. Due to various bar code-printing technologies, this gap can grow larger than the maximum size allowed, preventing the imager from decoding the symbol. If this problem occurs, capture the **Large Intercharacter Gaps** parameter to tolerate these out-of-specification bar codes.



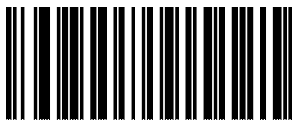
*Normal Intercharacter Gaps
(06h)



Large Intercharacter Gaps
(0Ah)

Report Version

Capture the bar code below to report the version of software currently installed in the imager.



Report Software Version

Macro PDF Features

Macro PDF is a special feature for concatenating multiple PDF symbols into one file. The imager can decode symbols that are encoded with this feature, and can store more than 64 kb of decoded data stored in up to 50 Macro PDF symbols.



CAUTION When printing, keep each Macro PDF sequence separate, as each sequence has unique identifiers. Do not mix bar codes from several Macro PDF sequences, even if they encode the same data. When capturing Macro PDF sequences, capture the entire Macro PDF sequence without interruption.

Macro PDF User Indications

In this mode the imager provides the following feedback.

Table 11-6 *Macro PDF User Indications*

User Captures	Passthrough All Symbols		Transmit Any Symbol in Set		Buffer All Symbols	
	Beep	T	Beep	T	Beep	T
Last Macro PDF in set	Decode Beep	Y	Decode Beep	Y	Decode Beep	Y
Any Macro PDF in set except last	Decode Beep	Y	Decode Beep	Y	2 Short Low	N
Macro PDF is not in current Set	Decode Beep	Y	2 Long Low	N	2 Long Low	N
Invalid formatted Macro PDF	Decode Beep	Y	2 Long Low	N	2 Long Low	N
Macro PDF from a set has already been captured	Decode Beep	Y	4 Long Low	N	4 Long Low	N
Out of Macro PDF memory	N/A	-	3 Long Low	N	3 Long Low	N
Any non-Macro PDF captured during a set	N/A	-	4 Long Low	N	4 Long Low	N
Flush Macro PDF	Low Hi	N	5 Long Low	N	5 Long Low	Y
Abort Macro PDF	High Low High Low	N	High Low High Low	N	High Low High Low	N

Notes:

1. The beep only sounds if the *BEEPER_ON signal is connected.
 2. The column marked T indicates whether the symbol is transmitted to the host.
- N = No transmission.**

Macro PDF Transmit / Decode Mode Symbols

Parameter # BCh

Select one of the options below for handling Macro PDF decoding. In *Buffer All Symbols* the imager can handle sets of up to 50 maximum-sized Macro PDF symbols. In all other modes there is no limit to the size of the Macro PDF set.

- **Buffer All Symbols / Transmit Macro PDF When Complete:** This transmits all decode data from an entire Macro PDF sequence only when the entire sequence is captured and decoded. Use the beeper and LED signals provided with the Symbol MS440X when using this mode to ensure proper user feedback. If the decode data exceeds the limit of 50 symbols, there is no transmission because the entire sequence was not decoded. Use the parameter *Flush Macro Buffer on page 11-80* to purge the buffer.
- **Transmit Any Symbol in Set / No Particular Order:** This transmits data from each Macro PDF symbol as decoded, regardless of the sequence (although some error handling is performed; see *Table 11-6*). When selecting this mode, enable *Transmit Macro PDF Control Header on page 11-79*. Also use the beeper and LED signals provided with the Symbol MS440X to ensure proper user feedback.
- **Passthrough All Symbols:** This transmits and decodes all Macro PDF symbols and performs no processing. In this mode the host is responsible for detecting and parsing the Macro PDF sequences.

Use this mode when the imager's BEEPER_ON signal is not used to drive a beeper. In the other modes, some Macro PDF imaging sequences provide audible feedback only, so if BEEPER_ON is not used no user feedback is provided. In *Table 11-6*, all actions marked **No Transmission** provide no feedback unless the BEEPER_ON signal is used. By using **Passthrough All Symbols** mode every user decode is transmitted to the host where the host software can provide the appropriate feedback.



Buffer All Symbols / Transmit Macro PDF When Complete
(00h)



Transmit Any Symbol in Set / No Particular Order
(01h)



*Passthrough All Symbols
(04h)

Transmit Macro PDF Control Header

Parameter # B8h

When enabled, this activates transmission of the control header, which contains the segment index and the file ID, in Macro PDF symbols. For example, the field may be: \92800000\725\120\343. The five digits after the \928 are the segment index (or block index), and \725\120\343 is the file ID.

Enable this when selecting *Transmit Any Symbol in Set / No Particular Order* for the [Macro PDF Transmit / Decode Mode Symbols on page 11-78](#), and disable this when selecting *Buffer All Symbols / Transmit Macro PDF When Complete*. This parameter has no effect when *Passthrough All Symbols* is selected.



Enable Macro PDF Control Header Transmit
(01h)



*Disable Macro PDF Control Header Transmit
(00h)

Escape Characters

Parameter # E9h

This enables the backslash (\) character as an Escape character for systems that can process transmissions containing special data sequences. Capture a bar code below to either format special data according to the GLI (Global Label Identifier) protocol, or to disable this parameter. This parameter only affects the data portion of a Macro PDF symbol transmission; the Macro PDF Control Header (if enabled) is always sent with GLI formatting.



GLI Protocol
(02h)



*None
(00h)

Flush Macro Buffer

This flushes the buffer of all decoded Macro PDF data stored to that point, transmits it to the host device, and aborts from Macro PDF mode.



Flush Macro PDF Buffer

Abort Macro PDF Entry

This clears all currently-stored Macro PDF data in the buffer without transmission and aborts from Macro PDF mode.



Abort Macro PDF Entry

Chapter 12 Miscellaneous Imager Options


Introduction

This chapter includes commonly used bar codes to customize how data is transmitted to the host device.

The imager ships with the settings shown in the [Miscellaneous Imager Options Default Table on page 12-2](#) (also see [Appendix A, Standard Defaults](#) for all host device and miscellaneous imager defaults). If the default values suit requirements, programming is not necessary.

There are two ways to change a parameter value:

- Capture the appropriate bar codes in this guide. These new values replace the standard default values in memory.
- For SSI and USB SNAPi hosts, send a “parameter send” command from the host system. Hexadecimal parameter numbers are shown in this chapter below the parameter title, and options are shown in parenthesis beneath the accompanying bar codes. See the *Simple Serial Interface (SSI) Programmer Guide* for detailed instructions for changing parameter values using this method.

 **NOTE** Most computer monitors allow capturing the bar codes directly on the screen. When capturing from the screen, be sure to set the document magnification to a level where the bar code can be seen clearly, and bars and/or spaces are not merging.

To return all features to default values, capture [*Set All Defaults on page 6-3](#). Throughout the programming bar code menus, default values are indicated with asterisks (*).



Imaging Sequence Examples

In most cases, capture one bar code to set a specific parameter value. Other parameters, such as **Prefix Value**, require capturing several bar codes. See each parameter for descriptions of this procedure.

Errors While Imaging

Unless otherwise specified, to correct an error during an imaging sequence, just re-capture the correct parameter.

Miscellaneous Imager Parameter Defaults

[Table 12-1](#) lists the defaults for miscellaneous imager options. To change any option, capture the appropriate bar code(s) provided in the [Miscellaneous Imager Parameters on page 12-3](#).



NOTE See [Appendix A, Standard Defaults](#) for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 12-1 *Miscellaneous Imager Options Default Table*

Parameter	Parameter Number	Default	Page Number
Transmit Code ID Character	2Dh	None	12-3
SSI Prefix Value	69h	<CR>	12-4
SSI Suffix 1 Value SSI Suffix 2 Value	68h 6Ah	<CR> <CR>	12-4
Non-SSI Prefix Value	63h, 69h	<CR><LF>	12-4
Non-SSI Suffix 1 Value Non-SSI Suffix 2 Value	62h, 68h 64h, 6Ah	<CR><LF> <CR><LF>	12-4
Scan Data Transmission Format	EBh	Data as is	12-5
FN1 Substitution Values	67h, 6Dh	Set	12-6
Transmit "No Read" Message	5Eh	Disable	12-7

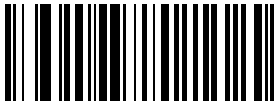
Miscellaneous Imager Parameters

Transmit Code ID Character

Parameter # 2Dh

A Code ID character identifies the code type of a decoded bar code. This is useful when the imager is decoding more than one code type. In addition to any single character prefix already selected, the Code ID character is inserted between the prefix and the decoded symbol.

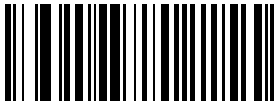
Select no Code ID character, a Symbol Code ID character, or an AIM Code ID character. For Code ID Characters, see [Symbol Code Identifiers on page B-1](#) and [AIM Code Identifiers on page B-3](#).



Symbol Code ID Character
(02h)



AIM Code ID Character
(01h)



*None
(00h)

Prefix/Suffix Values

For SSI Hosts:

Parameter # P = 69h, S1 = 68h, S2 = 6Ah

For Non-SSI Hosts:

Key Category Parameter # P = 63h, S1 = 62h, S2 = 64h

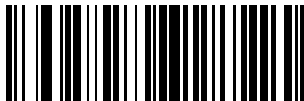
Decimal Value Parameter # P = 69h, S1 = 68h, S2 = 6Ah

A prefix and/or one or two suffixes can be appended to decoded data for use in data editing. To set a value for a prefix or suffix, capture a prefix or suffix bar code below, then capture a four-digit number (i.e., four bar codes from [Appendix D, Numeric Bar Codes](#)) that corresponds to that value. See [Table E-1 on page E-1](#) for the four-digit codes. To correct an error or change a selection, capture [Cancel on page D-3](#).



NOTE To use Prefix/Suffix values, first set the [Scan Data Transmission Format on page 12-5](#).

For non-SSI hosts, when using host commands to set the prefix or suffix, set the key category parameter to 1, then set the 3-digit decimal value. See [Table E-1 on page E-1](#) for the four-digit codes.



Scan Prefix
(07h)



Scan Suffix 1
(06h)



Scan Suffix 2
(08h)

Scan Data Transmission Format

Parameter # EBh

To change the scan data format, capture one of the following eight bar codes corresponding to the desired format.



NOTE If using this parameter do not use ADF rules to set the prefix/suffix.

To set values for the prefix and/or suffix, see [Prefix/Suffix Values on page 12-4](#).



*Data As Is
(00h)



<DATA> <SUFFIX 1>
(01h)



<DATA> <SUFFIX 2>
(02h)



<DATA> <SUFFIX 1> <SUFFIX 2>
(03h)



<PREFIX> <DATA >
(04h)

Scan Data Transmission Format (continued)



<PREFIX> <DATA> <SUFFIX 1>
(05h)



<PREFIX> <DATA> <SUFFIX 2>
(06h)



<PREFIX> <DATA> <SUFFIX 1> <SUFFIX 2>
(07h)

FN1 Substitution Values

Key Category Parameter # 67h

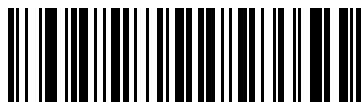
Decimal Value Parameter # 6Dh

The Wedge and USB HID Keyboard hosts support a FN1 Substitution feature. When enabled any FN1 character (0x1b) in an EAN128 bar code is substituted with a value. This value defaults to 7013 (Enter Key).

When using host commands to set the FN1 substitution value, set the key category parameter to 1, then set the 3-digit keystroke value. See the [Appendix E, ASCII Character Sets](#) for the currently installed host interface for the desired value.

To select a FN1 substitution value via bar code menus:

1. Capture the bar code below.



Set FN1 Substitution Value

2. Look up the keystroke desired for FN1 Substitution in the ASCII Character Set table for the currently installed host interface. Enter the 4-digit ASCII Value by capturing each digit in [Appendix D, Numeric Bar Codes](#).

To correct an error or change the selection, capture **Cancel** on *Cancel on page D-3*.

To enable FN1 substitution for USB HID keyboard, capture the **Enable FN1 Substitution** bar code on [page 12-6](#).

Transmit "No Read" Message

Parameter # 5Eh

Capture a bar code below to select whether or not to transmit a No Read message. When enabled, the characters NR are transmitted when a bar code is not decoded. When disabled, if a symbol does not decode, nothing is sent to the host.



**Enable No Read
(01h)**



***Disable No Read
(00h)**

Chapter 13 Mounting Template

Overview

This chapter provides the mounting template for the Symbol MS440X MiniScan. Copy the page to aid in mounting.

Symbol MS440X Mounting Template

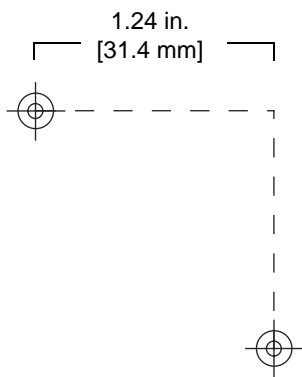


Figure 13-1 *Symbol MS440X Mounting Template*

Appendix A Standard Defaults

Default Parameters

Table A-1 Standard Default Parameters Table

Parameter	Parameter Number	Default	Page Number
User Preferences			
Set Default Parameter		All Defaults	6-3
Parameter Scanning	ECh	Enable	6-4
Beeper Tone	91h	Medium	6-4
Beeper Volume	8Ch	High	6-5
Trigger Mode	8Ah	Presentation	6-6
Picklist Mode	F0h 92h	Disabled Always	6-7
Power Mode	80h	Continuous On	6-8
Time Delay to Low Power Mode	92h	1.0 Sec	6-8
Decode Session Timeout	88h	9.9 Sec	6-9
Timeout Between Decodes, Same Symbol	89h	0.6 Sec	6-10
Beep After Good Decode	38h	Enable	6-10
Presentation Mode Session Timeout	F0h, 90h	2 Seconds	6-11

¹User selection is required to configure this interface and this is the most common selection.

Table A-1 Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
Imager Preferences			
Focus Mode	F0h A6h	Far Focus	7-5
Decoding Autoexposure	F0h 29h	Enable	7-6
Decoding Illumination	F0h 2Ah	Enable	7-6
Decode Aiming Pattern	F0h 32h	Enable	7-7
Image Capture Autoexposure	F0h 68h	Enable	7-9
Image Capture Illumination	F0h 69h	Enable	7-9
Gain	F4h F0h A7h	100	7-10
Exposure Time	F4h F0h 38h	10 ms	7-11
LED Illumination	F0h ADh	External LED Illumination	7-12
Snapshot Mode Timeout	F0h 43h	0 (30 seconds)	7-12
Snapshot Aiming Pattern	F0h 2Ch	Enable	7-13
Image Cropping	F0h 2Dh	Disable	7-13
Crop to Pixel Addresses	F4h F0h 3Bh; F4h F0h 3Ch; F4h F0h 3Dh; F4h F0h 3Eh	0 top, 0 left, 479 bottom, 639 right	7-14
Image Resolution	F0h 2Eh	Full	7-15
JPEG Image Options	F0h 2Bh	Quality	7-16
JPEG Quality Value	F0h 31h	65	7-16
JPEG Size Value	F0h 33h	40 (41K)	7-16
Image File Format Selection	F0h 30h	JPEG	7-17
Bits per Pixel (BPP)	F0h 2Fh	8 BPP	7-17
Signature Capture	5Dh	Disable	7-18
Signature Capture Image File Format Selection	F0h 39h	JPEG	7-19
Signature Capture Bits per Pixel (BPP)	F0h 3Ah	8 BPP	7-20
Signature Capture Width	F4h F0h 6Eh	400	7-20

¹User selection is required to configure this interface and this is the most common selection.

Table A-1 Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
Signature Capture Height	F4h F0h 6Fh	100	7-21
Signature Capture JPEG Quality	F0h A5h	65	7-21
Video View Finder	F0h 44h	Disable	7-21
Target Video Frame Size	F0h 48h	2200 bytes	7-22
Video View Finder Image Size	F0h 49h	1700 bytes	7-22
SSI Interface Parameters			
Select SSI Host	N/A	N/A	8-10
Baud Rate	9Ch	9600	8-11
Parity	9Eh	None	8-13
Check Parity	97h	Disable	8-14
Software Handshaking	9Fh	ACK/NAK	8-14
Host RTS Line State	9Ah	Low	8-15
Decode Data Packet Format	EEh	Send Raw Decode Data	8-15
Stop Bits	9Dh	1	8-16
Host Serial Response Time-out	9Bh	2 sec	8-17
Host Character Time-out	EFh	200 msec	8-18
Multipacket Option	F0h 4Eh	Option 1	8-19
Event Reporting			
Decode Event	F0h 00h	Disable	8-20
Boot Up Event	F0h 02h	Disable	8-21
Parameter Event	F0h 03h	Disable	8-21
Serial Host Parameters			
Serial Host Types	N/A	SSI Host	9-5
Baud Rate	N/A	9600	9-6
Parity Type	N/A	None	9-8
Stop Bit Select	N/A	1 Stop Bit	9-8
Data Bits	N/A	8-Bit	9-9

¹User selection is required to configure this interface and this is the most common selection.

Table A-1 Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
Check Receive Errors	N/A	Enable	9-9
Hardware Handshaking	N/A	None	9-10
Software Handshaking	N/A	None	9-12
Host Serial Response Time-out	N/A	2 Sec	9-14
RTS Line State	N/A	Low RTS	9-15
Beep on <BEL>	N/A	Disable	9-15
Intercharacter Delay	N/A	0 msec	9-16
Nixdorf Beep/LED Options	N/A	Normal Operation	9-17
Ignore Unknown Characters	N/A	Send Bar Code	9-17
USB Host Parameters			
USB Device Type	N/A	SNAPI with Imaging	10-3
Symbol Native API (SNAPI) Status Handshaking	N/A	Enable	10-4
USB Country Keyboard Types (Country Codes)	N/A	North American	10-5
USB Keystroke Delay	N/A	No Delay	10-7
USB CAPS Lock Override	N/A	Disable	10-7
USB Ignore Unknown Characters	N/A	Enable	10-8
Emulate Keypad	N/A	Disable	10-8
USB FN1 Substitution	N/A	Disable	10-9
Function Key Mapping	N/A	Disable	10-9
Simulated Caps Lock	N/A	Disable	10-10
Convert Case	N/A	None	10-10
UPC/EAN			
UPC-A	01h	Enable	11-7
UPC-E	02h	Enable	11-7
UPC-E1	0Ch	Disable	11-8
EAN-8/JAN 8	04h	Enable	11-8

¹User selection is required to configure this interface and this is the most common selection.

Table A-1 Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
EAN-13/JAN 13	03h	Enable	11-9
Bookland EAN	53h	Disable	11-9
Decode UPC/EAN/JAN Supplementals (2 and 5 digits)	10h	Ignore	11-10
User-Programmable Supplementals Supplemental 1: Supplemental 2:	F1h 43h F1h 44h		11-13
UPC/EAN/JAN Supplemental Redundancy	50h	10	11-14
Transmit UPC-A Check Digit	28h	Enable	11-14
Transmit UPC-E Check Digit	29h	Enable	11-15
Transmit UPC-E1 Check Digit	2Ah	Enable	11-15
UPC-A Preamble	22h	System Character	11-16
UPC-E Preamble	23h	System Character	11-17
UPC-E1 Preamble	24h	System Character	11-18
Convert UPC-E to A	25h	Disable	11-19
Convert UPC-E1 to A	26h	Disable	11-19
EAN-8/JAN-8 Extend	27h	Disable	11-20
Bookland ISBN Format	F1h 40h	ISBN-10	11-21
UCC Coupon Extended Code	55h	Disable	11-22
Code 128			
Code 128	08h	Enable	11-22
UCC/EAN-128	0Eh	Enable	11-23
ISBT 128	54h	Enable	11-24
Code 39			
Code 39	00h	Enable	11-25
Trioptic Code 39	0Dh	Disable	11-25
Convert Code 39 to Code 32 (Italian Pharmacy Code)	56h	Disable	11-26
Code 32 Prefix	E7h	Disable	11-26

¹User selection is required to configure this interface and this is the most common selection.

Table A-1 Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
Set Length(s) for Code 39	12h 13h	2 to 55	11-27
Code 39 Check Digit Verification	30h	Disable	11-29
Transmit Code 39 Check Digit	2Bh	Disable	11-29
Code 39 Full ASCII Conversion	11h	Disable	11-30
Buffer Code 39	71h	Disable	11-31
Code 93			
Code 93	09h	Disable	11-34
Set Length(s) for Code 93	1Ah 1Bh	4 to 55	11-34
Code 11			
Code 11	0Ah	Disable	11-36
Set Lengths for Code 11	1Ch 1Dh	4 to 55	11-36
Code 11 Check Digit Verification	34h	Disable	11-38
Transmit Code 11 Check Digit(s)	2Fh	Disable	11-39
Interleaved 2 of 5 (ITF)			
Interleaved 2 of 5 (ITF)	06h	Enable	11-39
Set Lengths for I 2 of 5	16h 17h	14	11-40
I 2 of 5 Check Digit Verification	31h	Disable	11-42
Transmit I 2 of 5 Check Digit	2Ch	Disable	11-42
Convert I 2 of 5 to EAN 13	52h	Disable	11-43
Discrete 2 of 5 (DTF)			
Discrete 2 of 5	05h	Disable	11-43
Set Length(s) for D 2 of 5	14h 15h	12	11-44
Codabar (NW - 7)			
Codabar	07h	Disable	11-46
Set Lengths for Codabar	18h 19h	5 to 55	11-46
CLSI Editing	36h	Disable	11-48
NOTIS Editing	37h	Disable	11-48

¹User selection is required to configure this interface and this is the most common selection.

Table A-1 Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
MSI			
MSI	0Bh	Disable	11-49
Set Length(s) for MSI	1Eh 1Fh	4 to 55	11-50
MSI Check Digits	32h	One	11-52
Transmit MSI Check Digit	2Eh	Disable	11-52
MSI Check Digit Algorithm	33h	Mod 10/Mod 10	11-53
Inverse 1D	F1h 4Ah	Regular	11-54
Postal Codes			
US Postnet	59h	Enable	11-55
US Planet	5Ah	Enable	11-55
UK Postal	5Bh	Enable	11-56
Transmit UK Postal Check Digit	60h	Enable	11-56
Japan Postal	F0h 22h	Enable	11-57
Australian Postal	F0h 23h	Enable	11-57
Dutch Postal	F0h 46h	Enable	11-58
4State Postal	F1h 50h	Disable	11-58
Transmit US Postal Check Digit	5Fh	Enable	11-59
GS1 DataBar			
GS1 DataBar-14	F0h 52h	Enable	11-60
GS1 DataBar Limited	F0h 53h	Enable	11-60
GS1 DataBar Expanded	F0h 54h	Enable	11-61
Convert GS1 DataBar to UPC/EAN	F0h 8Dh	Disable	11-61
Composite			
Composite CC-C	F0h 55h	Disable	11-62
Composite CC-A/B	F0h 56h	Disable	11-62
Composite TLC-39	F0h 73h	Disable	11-63
UPC Composite Mode	F0h 58h	Always Linked	11-63

¹User selection is required to configure this interface and this is the most common selection.

Table A-1 Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
Composite Beep Mode	F0h 8Eh	Beep As Each Code Type is Decoded	11-64
UCC/EAN Code 128 Emulation Mode for UCC/EAN Composite Codes	F0h ABh	Disable	11-65
2-D Symbologies			
PDF417	0Fh	Enable	11-66
MicroPDF417	E3h	Disable	11-66
Code 128 Emulation	7Bh	Disable	11-67
Data Matrix	F0h 24h	Enable	11-68
Data Matrix Inverse	F1h 4Ch	Regular	11-68
Maxicode	F0h 26h	Enable	11-69
QR Code	F0h 25h	Enable	11-70
MicroQR	F1h 3Dh	Enable	11-70
QR Inverse	F1h 4Bh	Regular	11-71
Aztec	F1h 3Eh	Enable	11-71
Aztec Inverse	F1h 4Dh	Regular	11-72
Symbology-Specific Security Levels			
Redundancy Level	4Eh	1	11-73
Security Level	4Dh	1	11-75
Intercharacter Gap Size	F0h 7Dh	Normal	11-76
Report Version			11-76
Macro PDF			
Macro PDF Transmit/Decode Mode Symbols	BCh	Passthrough Mode	11-78
Transmit Macro PDF Control Header	B8h	Disable	11-79
Escape Characters	E9h	None	11-79
Flush Macro PDF Buffer			11-80
Abort Macro PDF Entry			11-80

¹User selection is required to configure this interface and this is the most common selection.

Table A-1 Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
Miscellaneous Imager Options			
Transmit Code ID Character	2Dh	None	12-3
SSI Prefix Value	69h	<CR>	12-4
SSI Suffix 1 Value SSI Suffix 2 Value	68h 6Ah	<CR> <CR>	12-4
Non-SSI Prefix Value	63h, 69h	<CR><LF>	12-4
Non-SSI Suffix 1 Value Non-SSI Suffix 2 Value	62h, 68h 64h, 6Ah	<CR><LF> <CR><LF>	12-4
Scan Data Transmission Format	EBh	Data as is	12-5
FN1 Substitution Values	67h, 6Dh	Set	12-6
Transmit "No Read" Message	5Eh	Disable	12-7

¹User selection is required to configure this interface and this is the most common selection.

Reserved Parameters

The Symbol MS440X reports the following parameters, however these parameters are reserved for future use.

- 0x20
- 0x21
- 0x3A
- 0x3B
- 0x3C
- 0x3D
- 0x3E
- 0x3F
- 0x40
- 0x41
- 0x42
- 0x45
- 0x71
- 0xCF
- 0xD0
- 0xD1
- 0xD2
- 0xD5
- 0xEA
- 0xF0, 0x01
- 0xF0, 0x04
- 0xF0, 0x05
- 0xF0, 0x28
- 0xF0, 0x94
- 0xF0, 0x96
- 0xF0, 0x97
- 0xF0, 0x98
- 0xF0, 0x99
- 0xF0, 0xA8
- 0xF0, 0xA9

Appendix B Programming Reference

Symbol Code Identifiers

Table B-1 *Symbol Code Characters*

Code Character	Code Type
A	UPC-A, UPC-E, UPC-E1, EAN-8, EAN-13
B	Code 39, Code 32
C	Codabar
D	Code 128
E	Code 93
F	Interleaved 2 of 5
G	Discrete 2 of 5, or Discrete 2 of 5 IATA
H	Code 11
J	MSI
K	UCC/EAN-128
L	Bookland EAN
M	Trioptic Code 39
N	Coupon Code
R	GS1 DataBar Family
T	UCC Composite, TLC 39
X	PDF417, Macro PDF417, Micro PDF417
P00	Data Matrix
P01	QR Code

Table B-1 *Symbol Code Characters (Continued)*

Code Character	Code Type
P02	Maxicode
P03	US Postnet
P04	US Planet
P05	Japan Postal
P06	UK Postal
P08	Dutch Postal
P09	Australian Postal
P09	UK Postal

AIM Code Identifiers

Each AIM Code Identifier contains the three-character string **Jcm** where:

- J = Flag Character (ASCII 93)
- c = Code Character (see [Table B-2](#))
- m = Modifier Character (see [Table B-3](#))

Table B-2 *Aim Code Characters*

Code Character	Code Type
A	Code 39, Code 39 Full ASCII, Code 32
C	Code 128, Coupon (Code 128 portion)
d	Data Matrix
E	UPC/EAN, Coupon (UPC portion)
e	UCC Composite Codes (GS1 DataBar, UCC/EAN-128, 2-D portion of UPC composite)
F	Codabar
G	Code 93
H	Code 11
I	Interleaved 2 of 5
L	PDF417, Macro PDF417, Micro PDF417
M	MSI
Q	QR Code
S	Discrete 2 of 5, IATA 2 of 5
U	Maxicode
X	Bookland EAN, Trioptic Code 39, US Postnet, US Planet, UK Postal, Japan Postal, Australian Postal, Dutch Postal

The modifier character is the sum of the applicable option values based on [Table B-3](#).

Table B-3 *Modifier Characters*

Code Type	Option Value	Option
Code 39	0	No check character or Full ASCII processing.
	1	Reader has checked one check character.
	3	Reader has checked and stripped check character.
	4	Reader has performed Full ASCII character conversion.
	5	Reader has performed Full ASCII character conversion and checked one check character.
	7	Reader has performed Full ASCII character conversion and checked and stripped check character.
	Example: A Full ASCII bar code with check character W, A+I+MI+DW , is transmitted as JA7AIMID where 7 = (3+4).	
Trioptic Code 39	0	No option specified at this time. Always transmit 0.
	Example: A Trioptic bar code 412356 is transmitted as JX0412356	
Code 128	0	Standard data packet, no Function code 1 in first symbol position.
	1	Function code 1 in first symbol character position.
	2	Function code 1 in second symbol character position.
	Example: A Code (EAN) 128 bar code with Function 1 character ^{FNC1} in the first position, AIMID is transmitted as JC1AIMID	
I 2 of 5	0	No check digit processing.
	1	Reader has validated check digit.
	3	Reader has validated and stripped check digit.
	Example: An I 2 of 5 bar code without check digit, 4123, is transmitted as JIO4123	
Codabar	0	No check digit processing.
	1	Reader has checked check digit.
	3	Reader has stripped check digit before transmission.
	Example: A Codabar bar code without check digit, 4123, is transmitted as JF04123	
Code 93	0	No options specified at this time. Always transmit 0.
	Example: A Code 93 bar code 012345678905 is transmitted as JG0012345678905	

Table B-3 *Modifier Characters (Continued)*

Code Type	Option Value	Option
MSI	0	Check digits are sent.
	1	No check digit is sent.
	Example: An MSI bar code 4123, with a single check digit checked, is transmitted as JM1 4123	
D 2 of 5	0	No options specified at this time. Always transmit 0.
	Example: A D 2 of 5 bar code 4123, is transmitted as JS0 4123	
UPC/EAN	0	Standard packet in full EAN country code format, which is 13 digits for UPC-A, UPC-E, and EAN-13 (not including supplemental data).
	1	Two-digit supplement data only.
	2	Five-digit supplement data only.
	3	Combined data packet comprising 13 digits from a UPC-A, UPC-E, or EAN-13 symbol and 2 or 5 digits from a supplemental symbol.
	4	EAN-8 data packet.
	Example: A UPC-A bar code 012345678905 is transmitted as JE0 0012345678905	
Bookland EAN	0	No options specified at this time. Always transmit 0.
	Example: A Bookland EAN bar code 123456789X is transmitted as JX0 123456789X	
Code 11	0	Single check digit
	1	Two check digits
	3	Check characters validated but not transmitted.
GS1 DataBar Family		No option specified at this time. Always transmit 0. DataBar-14 and DataBar Limited transmit with an Application Identifier "01". Note: In UCC/EAN-128 emulation mode, GS1 DataBar is transmitted using Code 128 rules (i.e.,]C1).
	Example: A DataBar-14 bar code 100123456788902 is transmitted as Je 001100123456788902.	

Table B-3 *Modifier Characters (Continued)*

Code Type	Option Value	Option
EAN.UCC Composites (GS1 DataBar, UCC/EAN-128, 2-D portion of UPC composite)		Native mode transmission. Note: UPC portion of composite is transmitted using UPC rules.
	0	Standard data packet.
	1	Data packet containing the data following an encoded symbol separator character.
	2	Data packet containing the data following an escape mechanism character. The data packet does not support the ECI protocol.
	3	Data packet containing the data following an escape mechanism character. The data packet supports the ECI protocol.
		UCC/EAN-128 emulation Note: UPC portion of composite is transmitted using UPC rules.
	1	Data packet is a UCC/EAN-128 symbol (i.e., data is preceded with JJC1).
PDF417, Micro PDF417	0	Reader set to conform to protocol defined in 1994 PDF417 symbology specifications. Note: When this option is transmitted, the receiver cannot reliably determine whether ECIs have been invoked or whether data byte 92 _{DEC} has been doubled in transmission.
	1	Reader set to follow the ECI protocol (Extended Channel Interpretation). All data characters 92 _{DEC} are doubled.
	2	Reader set for Basic Channel operation (no escape character transmission protocol). Data characters 92 _{DEC} are not doubled. Note: When imagers are set to this mode, unbuffered Macro symbols and symbols requiring the imager to convey ECI escape sequences cannot be transmitted.
	3	The bar code contains a UCC/EAN-128 symbol, and the first codeword is 903-907, 912, 914, 915.
	4	The bar code contains a UCC/EAN-128 symbol, and the first codeword is in the range 908-909.
	5	The bar code contains a UCC/EAN-128 symbol, and the first codeword is in the range 910-911.
		Example: A PDF417 bar code ABCD, with no transmission protocol enabled, is transmitted as JL2ABCD.

Table B-3 *Modifier Characters (Continued)*

Code Type	Option Value	Option
Data Matrix	0	ECC 000-140, not supported.
	1	ECC 200.
	2	ECC 200, FNC1 in first or fifth position.
	3	ECC 200, FNC1 in second or sixth position.
	4	ECC 200, ECI protocol implemented.
	5	ECC 200, FNC1 in first or fifth position, ECI protocol implemented.
	6	ECC 200, FNC1 in second or sixth position, ECI protocol implemented.
Maxicode	0	Symbol in Mode 4 or 5.
	1	Symbol in Mode 2 or 3.
	2	Symbol in Mode 4 or 5, ECI protocol implemented.
	3	Symbol in Mode 2 or 3, ECI protocol implemented in secondary message.
QR Code	0	Model 1 symbol.
	1	Model 2 symbol, ECI protocol not implemented.
	2	Model 2 symbol, ECI protocol implemented.
	3	Model 2 symbol, ECI protocol not implemented, FNC1 implied in first position.
	4	Model 2 symbol, ECI protocol implemented, FNC1 implied in first position.
	5	Model 2 symbol, ECI protocol not implemented, FNC1 implied in second position.
	6	Model 2 symbol, ECI protocol implemented, FNC1 implied in second position.

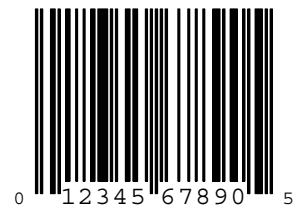
Appendix C Sample Bar Codes

Code 39



UPC/EAN

UPC-A, 100%



EAN-13, 100%



Code 128



Interleaved 2 of 5



GS1 DataBar

- ✓ **NOTE** GS1 DataBar variants must be enabled to read the bar codes below. See [GS1 DataBar \(Formerly RSS, Reduced Space Symbology\) on page 11-60](#).

GS1 DataBar



10293847560192837465019283746029478450366523
(GS1 DataBar Expanded Stacked)



1234890hjo990mnb
(GS1 DataBar Expanded)



08672345650916
(GS1 DataBar Limited)

GS1 DataBar-14



55432198673467
(GS1 DataBar-14 Truncated)

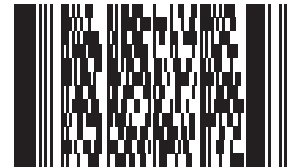


90876523412674
(GS1 DataBar-14 Stacked)



78123465709811
(GS1 DataBar-14 Stacked Omni-Directional)

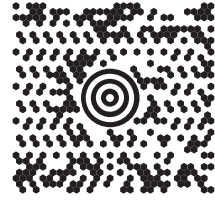
PDF417



Data Matrix



Maxicode



Appendix D Numeric Bar Codes

Numeric Bar Codes

For parameters requiring specific numeric values, capture the appropriately numbered bar code(s).



Numeric Bar Codes (continued)



4



5



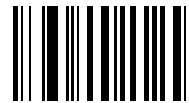
6



7



8



9

Cancel

To correct an error or change a selection, capture the bar code below.



Cancel

Appendix E ASCII Character Sets

Table E-1 *ASCII Value - Code 39 Encode - Keystroke*

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
1000	%U	CTRL 2
1001	\$A	CTRL A
1002	\$B	CTRL B
1003	\$C	CTRL C
1004	\$D	CTRL D
1005	\$E	CTRL E
1006	\$F	CTRL F
1007	\$G	CTRL G
1008	\$H	CTRL H/ BACKSPACE ¹
1009	\$I	CTRL I/ HORIZONTAL TAB ¹
1010	\$J	CTRL J
1011	\$K	CTRL K
1012	\$L	CTRL L
1013	\$M	CTRL M/ ENTER ¹
1014	\$N	CTRL N
1015	\$O	CTRL O

The keystroke in bold is sent only if the "Function Key Mapping" is enabled. Otherwise, the unbolded keystroke is sent.

Table E-1 ASCII Value - Code 39 Encode - Keystroke (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
1016	\$P	CTRL P
1017	\$Q	CTRL Q
1018	\$R	CTRL R
1019	\$S	CTRL S
1020	\$T	CTRL T
1021	\$U	CTRL U
1022	\$V	CTRL V
1023	\$W	CTRL W
1024	\$X	CTRL X
1025	\$Y	CTRL Y
1026	\$Z	CTRL Z
1027	%A	CTRL [
1028	%B	CTRL \
1029	%C	CTRL]
1030	%D	CTRL 6
1031	%E	CTRL -
1032	Space	Space
1033	/A	!
1034	/B	"
1035	/C	#
1036	/D	?
1037	/E	%
1038	/F	&
1039	/G	'
1040	/H	(
1041	/I)
1042	/J	*

The keystroke in bold is sent only if the "Function Key Mapping" is enabled. Otherwise, the unbolded keystroke is sent.

Table E-1 ASCII Value - Code 39 Encode - Keystroke (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
1043	/K	+
1044	/L	,
1045	-	-
1046	.	.
1047	/o	/
1048	0	0
1049	1	1
1050	2	2
1051	3	3
1052	4	4
1053	5	5
1054	6	6
1055	7	7
1056	8	8
1057	9	9
1058	/Z	:
1059	%F	;
1060	%G	<
1061	%H	=
1062	%I	>
1063	%J	?
1064	%V	@
1065	A	A
1066	B	B
1067	C	C
1068	D	D
1069	E	E

The keystroke in bold is sent only if the "Function Key Mapping" is enabled. Otherwise, the unbolded keystroke is sent.

Table E-1 ASCII Value - Code 39 Encode - Keystroke (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
1070	F	F
1071	G	G
1072	H	H
1073	I	I
1074	J	J
1075	K	K
1076	L	L
1077	M	M
1078	N	N
1079	O	O
1080	P	P
1081	Q	Q
1082	R	R
1083	S	S
1084	T	T
1085	U	U
1086	V	V
1087	W	W
1088	X	X
1089	Y	Y
1090	Z	Z
1091	%K	[
1092	%L	\
1093	%M]
1094	%N	^
1095	%O	_
1096	%W	'

The keystroke in bold is sent only if the "Function Key Mapping" is enabled. Otherwise, the unbolded keystroke is sent.

Table E-1 ASCII Value - Code 39 Encode - Keystroke (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
1097	+A	a
1098	+B	b
1099	+C	c
1100	+D	d
1101	+E	e
1102	+F	f
1103	+G	g
1104	+H	h
1105	+I	i
1106	+J	j
1107	+K	k
1108	+L	l
1109	+M	m
1110	+N	n
1111	+O	o
1112	+P	p
1113	+Q	q
1114	+R	r
1115	+S	s
1116	+T	t
1117	+U	u
1118	+V	v
1119	+W	w
1120	+X	x
1121	+Y	y
1122	+Z	z
1123	%P	{

The keystroke in bold is sent only if the "Function Key Mapping" is enabled. Otherwise, the unbolded keystroke is sent.

Table E-1 ASCII Value - Code 39 Encode - Keystroke (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
1124	%Q	
1125	%R	}
1126	%S	~

The keystroke in bold is sent only if the "Function Key Mapping" is enabled. Otherwise, the unbolded keystroke is sent.

Table E-2 ALT Key Standard Defaults

ALT Keys	Keystroke
2064	ALT 2
2065	ALT A
2066	ALT B
2067	ALT C
2068	ALT D
2069	ALT E
2070	ALT F
2071	ALT G
2072	ALT H
2073	ALT I
2074	ALT J
2075	ALT K
2076	ALT L
2077	ALT M
2078	ALT N
2079	ALT O
2080	ALT P
2081	ALT Q
2082	ALT R
2083	ALT S
2084	ALT T

Table E-2 ALT Key Standard Defaults (Continued)

ALT Keys	Keystroke
2085	ALT U
2086	ALT V
2087	ALT W
2088	ALT X
2089	ALT Y
2090	ALT Z

Table E-3 PF Key Standard Default Table

PF Keys	Keystroke
4001	PF 1
4002	PF 2
4003	PF 3
4004	PF 4
4005	PF 5
4006	PF 6
4007	PF 7
4008	PF 8
4009	PF 9
4010	PF 10
4011	PF 11
4012	PF 12
4013	PF 13
4014	PF 14
4015	PF 15
4016	PF 16

Table E-4 *F key Standard Default Table*

F Keys	Keystroke
5001	F 1
5002	F 2
5003	F 3
5004	F 4
5005	F 5
5006	F 6
5007	F 7
5008	F 8
5009	F 9
5010	F 10
5011	F 11
5012	F 12
5013	F 13
5014	F 14
5015	F 15
5016	F 16
5017	F 17
5018	F 18
5019	F 19
5020	F 20
5021	F 21
5022	F 22
5023	F 23
5024	F 24

Table E-5 *Numeric Key Standard Default Table*

Numeric Keypad	Keystroke
6042	*
6043	+
6044	Undefined
6045	-
6046	.
6047	/
6048	0
6049	1
6050	2
6051	3
6052	4
6053	5
6054	6
6055	7
6056	8
6057	9
6058	Enter
6059	Num Lock

Table E-6 *Extended Keypad Standard Default Table*

Extended Keypad	Keystroke
7001	Break
7002	Delete
7003	Pg Up
7004	End
7005	Pg Dn
7006	Pause
7007	Scroll Lock
7008	Backspace
7009	Tab
7010	Print Screen
7011	Insert
7012	Home
7013	Enter
7014	Escape
7015	Up Arrow
7016	Dn Arrow
7017	Left Arrow
7018	Right Arrow

Table E-7 *GUI Shift Keys*

Other Value	Keystroke
3048	GUI 0
3049	GUI 1
3050	GUI 2
3051	GUI 3
3052	GUI 4
3053	GUI 5

The Apple™ iMac keyboard has an apple key on either side of the space bar. Windows-based systems have a GUI key to the left of the left ALT key, and to the right of the right ALT key.

Table E-7 GUI Shift Keys (Continued)

Other Value	Keystroke
3054	GUI 6
3055	GUI 7
3056	GUI 8
3057	GUI 9
3065	GUI A
3066	GUI B
3067	GUI C
3068	GUI D
3069	GUI E
3070	GUI F
3071	GUI G
3072	GUI H
3073	GUI I
3074	GUI J
3075	GUI K
3076	GUI L
3077	GUI M
3078	GUI N
3079	GUI O
3080	GUI P
3081	GUI Q
3082	GUI R
3083	GUI S
3084	GUI T
3085	GUI U
3086	GUI V
3087	GUI W

The Apple™ iMac keyboard has an apple key on either side of the space bar. Windows-based systems have a GUI key to the left of the left ALT key, and to the right of the right ALT key.

Table E-7 GUI Shift Keys (Continued)

Other Value	Keystroke
3088	GUI X
3089	GUI Y
3090	GUI Z

The Apple™ iMac keyboard has an apple key on either side of the space bar. Windows-based systems have a GUI key to the left of the left ALT key, and to the right of the right ALT key.

Table E-8 Misc. Key Standard Defaults

Misc. Key	Keystroke
3001	PA 1
3002	PA 2
3003	CMD 1
3004	CMD 2
3005	CMD 3
3006	CMD 4
3007	CMD 5
3008	CMD 6
3009	CMD 7
3010	CMD 8
3011	CMD 9
3012	CMD 10
3013	CMD 11
3014	CMD 12
3015	CMD 13
3016	CMD 14

Glossary

A

AIM. Automatic Identification Manufacturers, Inc. is the trade association for manufacturers of automatic identification systems.

Alphanumeric. A character set that contains letters, numbers and other characters such as special symbols.

Aperture. The opening in an optical system defined by a lens or baffle that establishes the field of view.

ASCII. American Standard Code for Information Interchange. A 7 bit-plus-parity code representing 128 letters, numerals, punctuation marks and control characters. It is a standard data transmission code in the U.S.

Aspect Ratio. The ratio of symbol height to symbol length in a 2-dimensional symbol.

Autodiscrimination. The ability of an interface controller to determine the code type of a scanned bar code. After this determination is made, the information content is decoded.

Automatic Identification System. The application of various technologies, such as bar code recognition, image recognition, voice recognition and RF/MW transponders, for the purpose of data entry into a data processing system and bypassing the key-entry component of traditional data entry.

B

Background. The area surrounding a printed symbol including the spaces and quiet zones.

Bar. The dark element in a printed bar code symbol.

Bar Code. A pattern of variable-width bars and spaces which represents numeric or alphanumeric data in machine-readable form. The general format of a bar code symbol consists of a leading margin, start character, data or message character, check character (if any), stop character, and trailing margin. Within this framework, each recognizable symbology uses its own unique format. See **Symbology**.

Bar Code Character. A single group of bars and spaces which represent an individual number, letter, punctuation mark or other symbol.

Bar Code Density. The number of characters represented per unit of measurement (e.g., characters per inch).

Bar Code Reader. A device used to read or decode a bar code symbol.

Bar Code Symbol. The combination of symbol characters and features required by a particular symbology, including quiet zones, start and stop characters, data characters, check characters and other auxiliary patterns, that together form a complete scannable entity. See **Symbol**.

Bar Height. The dimension of a bar measured perpendicular to the bar width.

Bar Width. Thickness of a bar measured from the edge closest to the symbol start character to the trailing edge of the same bar.

Baud Rate. A measure of the data flow or number of signaling events occurring per second. When one bit is the standard "event," this is a measure of bits per second (bps). For example, a baud rate of 50 means transmission of 50 bits of data per second.

Bi-directional. Denotes that a machine-readable symbol can be read successfully in two directions – either backwards or forwards. Also identifies a scanner that can operate on a bar code that can be read independent of scanning direction.

Binary. Denotes a numbering system to base 2 in which numbers are expressed as combinations of the digits 0 and 1 with positional weighting based on powers of 2. In computing, these can be represented electrically by 'off' and 'on' respectively or in machine-readable symbols by narrow and wide elements or by the absence or presence of a bar module.

Bit. Binary digit. One bit is the basic unit of binary information. Generally, eight consecutive bits compose one byte of data. The pattern of 0 and 1 values within the byte determines its meaning.

Bits per Second (bps). Bits transmitted or received.

bps. See **Bits Per Second**.

Byte. On an addressable boundary, eight adjacent binary digits (0 and 1) combined in a pattern to represent a specific character or numeric value. Bits are numbered from the right, 0 through 7, with bit 0 the low-order bit. One byte in memory is used to store one ASCII character.

or

A sequential series of bits comprising one character and handled as one unit. Usually encoded in the ASCII format, a byte usually consists of eight bits and represents one alphabetic or special character, two decimal digits or eight binary bits.

C

CDRH. Center for Devices and Radiological Health. A federal agency responsible for regulating laser product safety. This agency specifies various laser operation classes based on power output during operation.

CDRH Class 1. This is the lowest power CDRH laser classification. CDRH Class 1 devices are safe under reasonably foreseeable conditions of operation. Software and other controls to limit exposure to laser light may be required to achieve CDRH Class 1 operation. The CDRH time base for Class 1 devices is 10,000 seconds.

CDRH Class 2. CDRH Class II devices may not emit more than 1 milliwatt average radiant power. Eye protection for CDRH Class II devices is normally afforded by aversion responses, including the blink reflex.

Character. A pattern of bars and spaces which either directly represents data or indicates a control function, such as a number, letter, punctuation mark, or communications control contained in a message.

Character Set. Those characters available for encoding in a particular bar code symbology.

Check Digit. A digit used to verify a correct symbol decode. The scanner inserts the decoded data into an arithmetic formula and checks that the resulting number matches the encoded check digit. Check digits are required for UPC but are optional for other symbologies. Using check digits decreases the chance of substitution errors when a symbol is decoded.

Codabar. A discrete self-checking code with a character set consisting of digits 0 to 9 and six additional characters: (- \$: / , +).

Code. A set of unambiguous rules specifying the way in which data may be represented as numbers and letters used to represent information. See **Number System**.

Code 128. A high density symbology which allows the controller to encode all 128 ASCII characters without adding extra symbol elements.

Code 3 of 9 (Code 39). A versatile and widely used alphanumeric bar code symbology with a set of 43 character types, including all uppercase letters, numerals from 0 to 9 and 7 special characters (- . / + % \$ and space). The code name is derived from the fact that 3 of 9 elements representing a character are wide, while the remaining 6 are narrow.

Code 93. An industrial symbology compatible with Code 39 but offering a full character ASCII set and a higher coding density than Code 39.

Code Length. Number of data characters in a bar code between the start and stop characters, not including those characters.

Codeword. As a symbol character value, this is an intermediate level of coding between source data and the graphical encodation in the symbol.

COM port. Communication port; ports are identified by number, e.g., COM1, COM2.

Concatination. The construction of a string of data from two or more strings by appending each string in succession. The linking or chaining together of separate items of data in a bar code symbol or of the data contained in two or more separate bar code symbols (also referred to as message append and structured append).

Continuous Code. A bar code or symbol in which all spaces within the symbol are parts of characters. There are no intercharacter gaps in a continuous code. The absence of gaps allows for greater information density.

Contrast. The difference in reflectance between the black and white (or bar and space) areas of a symbol.

D

Data Identifier. A specified character or string of characters that defines the intended use of the data element that follows. For the purposes of automatic data capture technologies, data identifier refers to the alphanumeric identifiers as defined in ANSI MH10.8.2, formerly known as ANSI/FACT data identifiers.

Data Matrix. This error correcting, 2-dimensional matrix symbology was originally developed in 1989, and a finalized design was completed in 1995 by International Data Matrix. It's capable of encoding various character sets including strictly numeric data, alphanumeric data and all ISO 646 (ASCII) characters, as well as special character sets. The symbology has both error detection and error correction features. Each Data Matrix symbol consists of data regions, which contain nominally square modules set out in a regular array. A dark module is a binary 1 and a light module is a binary 0. There is no specified minimum or maximum for the X or Y dimension. The data region is surrounded by a finder pattern, a perimeter to the data region that is 1 module wide, which is surrounded by a quiet zone on all four sides of the symbol. Two adjacent sides are solid dark lines used primarily to define physical size, orientation and symbol distortion. The two opposite sides consist of alternating dark and light modules. These are used primarily to define the cell structure but also assist in determining physical size and distortion. There are 2 types of Data Matrix symbologies: ECC 000 - 140 with several available levels of convolutional error correction, and ECC 200, which uses Reed-Solomon error correction. For ISO/IEC JTC 1/SC 31 purposes, only ECC 200 is recommended. The intellectual property rights associated with Data Matrix have been committed to the public domain.

Data Structure. The stipulation of the type of information that is included in a bar code, such as its order and format.

Dead Zone. An area within a scanner's field of view, in which specular reflection may prevent a successful decode.

Decode. To recognize a bar code symbology (e.g., UPC/EAN) and then analyze the content of the specific bar code scanned.

Decode Algorithm. A decoding scheme that converts pulse widths into data representation of the letters or numbers encoded within a bar code symbol.

Decoder. An electronic package that receives the signals from the scanning function, performs the algorithm to interpret the signals into meaningful data and provides the interface to other devices.

Decryption. Decryption is the decoding and unscrambling of received encrypted data. Also see, **Encryption** and **Key**.

Depth of Field. The range between minimum and maximum distances at which a scanner can read a symbol with a certain minimum element width.

Diffuse Reflection. The component of reflected light that emanates in all directions from the reflecting surface.

Discrete 2 of 5. A binary bar code symbology representing each character by a group of five bars, two of which are wide. The location of wide bars in the group determines which character is encoded; spaces are insignificant. Only numeric characters (0 to 9) and START/STOP characters may be encoded.

Discrete Code. A bar code or symbol in which the spaces between characters (intercharacter gaps) are not part of the code.

DRAM. Dynamic random access memory.

E

EAN. European Article Number. This European/International version of the UPC provides its own coding format and symbology standards. Element dimensions are specified metrically. EAN is used primarily in retail.

EAN/UPC. A fixed-length, numeric 13-digit bar code symbol consisting of 30 dark elements and 29 intervening light elements. Each character is represented by 2 bars and 2 spaces over 7 modules. A bar may be comprised of 1, 2, 3 or 4 modules. Each EAN/U.P.C. symbol consists of a leading quiet zone, a start pattern, 7 left-hand data characters, a center bar pattern, 5 right-hand data characters, a Modulo 10 check character, a stop pattern and a trailing quiet zone.

U.P.C. is often considered a 12-digit code. The 13th digit of EAN/U.P.C. symbol is a derived character in the left-most position. In the case of U.P.C., this derived left-most character is a 0.

Element. Generic term for a bar or space.

Encoded Area. Total linear dimension occupied by all characters of a code pattern, including start/stop characters and data.

ENQ (RS-232). ENQ software handshaking is also supported for the data sent to the host.

Error Correction. A reader or decoder's use of mathematical schemes to reconstruct or replace damaged or missing symbol characters to enable the reading of the symbol data.

Error-Correction Characters. Symbol characters used for error correction and detection, calculated automatically from the other symbol characters.

Error-Correction Level. An indicator of the number of characters used in a symbology for error correction. A higher level of error correction allows for correcting greater potential symbol damage.

Error Detection. This occurs when error-correction characters detect that the presence of errors in the symbol exceeds the error correction capacity, and keeps the symbol from being decoded as erroneous data.

Error-Detection Characters. Symbol characters reserved for error detection that are calculated automatically from the other symbol characters.

ESD. Electro-Static Discharge

F

Fixed Beam Bar Code Reader. A scanning device where scanning motion is achieved by moving the object relative to the reader; as opposed to a moving beam reader.

G

GS1 DataBar. Formerly Reduced Space Symbology (RSS): A family of space efficient symbologies developed by UCC.EAN.

Guard Bars. Bars located at both ends and the center of a UPC and EAN symbol to provide reference points for scanning.

H

Horizontal Bar Code. A bar code or symbol with an overall length dimension that is parallel to the horizon, which resembles a picket fence.

Host Computer. A computer that serves other terminals in a network, providing such services as computation, database access, supervisory programs and network control.

Hz. Hertz; A unit of frequency equal to one cycle per second.

I

IEC. International Electrotechnical Commission. This international agency regulates laser safety by specifying various laser operation classes based on power output during operation.

IEC (825) Class 1. This is the lowest power IEC laser classification. IEC Class 1 devices are safe under reasonably foreseeable conditions of operation. Software and other controls to limit exposure to laser light may be required to achieve IEC Class 1 operation. The IEC time base for Class 1 devices is 100 seconds if intentional viewing of laser light is not required in the design or function of the device. The IEC time base for Class 1 devices is 30,000 seconds where intentional viewing of laser light is inherent in the design or function of the device.

Input/Output Ports. I/O ports are primarily dedicated to passing information into or out of the terminal memory. Series 9000 mobile computers include Serial and USB ports.

Intercharacter Gap. The space between two adjacent bar code characters in a discrete code.

Interleaved 2 of 5. A binary bar code symbology representing character pairs in groups of five bars and five interleaved spaces. Interleaving provides for greater information density. The location of wide elements (bar/spaces) within each group determines which characters are encoded. This continuous code type uses no intercharacter spaces. Only numeric (0 to 9) and START/STOP characters may be encoded.

Interleaved Bar Code. A bar code in which characters are paired together, using bars to represent the first character and the intervening spaces to represent the second.

I/O Ports. interface The connection between two devices, defined by common physical characteristics, signal characteristics, and signal meanings. Types of interfaces include RS-232 and PCMCIA.

K

Key. A key is the specific code used by the algorithm to encrypt or decrypt the data. Also see, **Encryption** and **Decrypting**.

L

LASER. Light Amplification by Stimulated Emission of Radiation. The laser is an intense light source. Light from a laser is all the same frequency, unlike the output of an incandescent bulb. Laser light is typically coherent and has a high energy density.

Laser Diode. A gallium-arsenide semiconductor type of laser connected to a power source to generate a laser beam. This laser type is a compact source of coherent light.

Laser Scanner. An optical bar code reading device using a coherent laser light beam as its source of illumination.

LCD. See **Liquid Crystal Display**.

LED Indicator. A semiconductor diode (LED - Light Emitting Diode) used as an indicator, often in digital displays. The semiconductor uses applied voltage to produce light of a certain frequency determined by the semiconductor's particular chemical composition.

Light Emitting Diode. See **LED**.

Liquid Crystal Display (LCD). A display that uses liquid crystal sealed between two glass plates. The crystals are excited by precise electrical charges, causing them to reflect light outside according to their bias. They use little electricity and react relatively quickly. They require external light to reflect their information to the user.

M

Matrix Symbols. A 2-dimensional array of regular polygon shaped cells where the center-to-center distance of adjacent elements is uniform. The arrangement of the cells represents data and/or symbology functions. Matrix symbols may include recognition patterns that do not follow the same rule as the other elements within the symbol (i.e., Data Matrix and Maxicode).

MIL. 1 mil = 1 thousandth of an inch; a unit of measure often used to quantify bar code printing and scanning dimensions.

Misread (Misdecode). A condition which occurs when the data output of a reader or interface controller does not agree with the data encoded within a bar code symbol.

Module. (1) The narrowest nominal width unit of measure in a symbol. In certain symbologies, element widths are specified as multiples of 1 module. Equivalent to X dimension; or (2) a single cell in a matrix symbology used to encode 1 bit of data. In Maxicode, the module shape is a regular hexagon. In Data Matrix, the module shape is nominally square. In PDF417, the module shape is a regular rectangle. In bar code symbologies, the module shape is a regular rectangle.

Module Check Digit or Character. A character within the symbol data field calculated using modular arithmetic that is used for error detection. The calculated character is determined by applying a code algorithm to the data field contents. See **Check Character**.

Moving Beam Bar Code Reader. A device where scanning motion is achieved by mechanically moving the optical geometry.

MRD. Minimum reflectance difference: a formula that is used to determine if there is an adequate difference between absorbed and reflected light.

N

Nanometer. Unit of measure used to define the wavelength of light that is equal to 10^{-9} meter.

Nominal. The exact (or ideal) intended value for a specified parameter. Tolerances are specified as positive and negative deviations from this value.

Nominal Size. Standard size for a bar code symbol. Most UPC/EAN codes are used over a range of magnifications (e.g., from 0.80 to 2.00 of nominal).

Non-Contact Reader/Scanner. Bar code readers requiring no physical contact with the printed symbol.

Non-read. The absence of data at the scanner output after an attempted scan, which is due to no code, defective code, scanner failure or operator error.

O

Omnidirectional. Bar codes read in any orientation relative to the scanner.

Optical Throw. The distance from the scanner face to the closest point at which symbol can be read; also, optical throw is the difference between range and depth of field.

Orientation. The alignment of the symbol's scan path. Two possible orientations are horizontal with vertical bars and spaces (picket fence) and vertical with horizontal bars and spaces (ladder).

Overhead. The fixed number of characters required for start, stop and checking in a given symbol. For example, a symbol requiring a start, stop and 2 check characters contains 4 characters of overhead.

P

Parameter. A variable that can have different values assigned to it.

PDF417. An error correcting 2-dimensional multi-row symbol developed in 1992 by Symbol Technologies, PDF417 symbols are constructed from 4 bars and 4 spaces over 17 modules. The symbol size is from 3 to 90 rows. There is no specified minimum or maximum for X or Y dimension. With at least the recommended minimum level of error correction, the recommended Y dimension is 3X. With less than the minimum recommended level of error correction, the recommended Y dimension is 4X. A quiet zone of 2X is specified on each side of a symbol. Because of delta decode techniques, the symbology is immune from uniform bar width growth. PDF417 supports cross-row scanning. The intellectual property rights associated with PDF417 have been committed to the public domain.

Percent Decode. The average probability that a single scan of a bar code would result in a successful decode. In a well-designed bar code scanning system, that probability should approach near 100%.

Pitch. Rotation of a bar code symbol in an axis parallel to the direction of the bars.

Plessey Code. A pulse-width, modulated bar code commonly used for shelf marking in grocery stores.

Postnet Code. Code developed by the U.S. Postal Service to assist in the automatic sorting of mail.

Print Contrast Signal (PCS). Measurement of the contrast (brightness difference) between the bars and spaces of a symbol. A minimum PCS value is needed for a bar code symbol to be scannable. $PCS = (RL - RD) / RL$, where RL is the reflectance factor of the background and RD the reflectance factor of the dark bars.

Programming Mode. The state in which a scanner is configured for parameter values. See **Scanning Mode**.

Q

Quiet Zone. A clear space, containing no dark marks, which precedes the start character of a bar code symbol and follows the stop character.

QWERTY. A standard keyboard commonly used on North American and some European PC keyboards. "QWERTY" refers to the arrangement of keys on the left side of the third row of keys.

R

Reflectance. Amount of light returned from an illuminated surface.

Resolution. The narrowest element dimension which is distinguished by a particular reading device or printed with a particular device or method.

RS-232. An Electronic Industries Association (EIA) standard that defines the connector, connector pins, and signals used to transfer data serially from one device to another.

S

Scan Area. Area intended to contain a symbol.

Scanner. An electronic device used to scan bar code symbols and produce a digitized pattern that corresponds to the bars and spaces of the symbol. Its three main components are: 1) Light source (laser or photoelectric cell) - illuminates a bar code; 2) Photodetector - registers the difference in reflected light (more light reflected from spaces); 3) Signal conditioning circuit - transforms optical detector output into a digitized bar pattern.

Scanning Mode. The scanner is energized, programmed and ready to read a bar code.

Scanning Sequence. A method of programming or configuring parameters for a bar code reading system by scanning bar code menus.

Self-Checking Code. A symbology that uses a checking algorithm to detect encoding errors within the characters of a bar code symbol.

Skew. Rotation of a bar code symbol on an axis parallel to the symbol's length.

Space. The lighter element of a bar code formed by the background between bars.

Space Width. The thickness of a space measured from the edge closest to the symbol start character to the trailing edge of the same space.

Specular Reflection. The mirror-like direct reflection of light from a surface, which can cause difficulty decoding a bar code.

Stacked Symbol (2-D Symbols). A 2-dimensional (2-D) symbol with sequences of linear (width-coded) data that are stacked one upon another (i.e., PDF417).

Start/Stop Character. A pattern of bars and spaces that provides the scanner with start and stop reading instructions and scanning direction. The start and stop characters are normally to the left and right margins of a horizontal code.

Substrate. A foundation material on which a substance or image is placed.

Symbol. A scannable unit that encodes data within the conventions of a certain symbology, usually including start/stop characters, quiet zones, data characters and check characters.

Symbol Aspect Ratio. The ratio of symbol height to symbol width.

Symbol Density. The number of data characters per unit length; usually expressed as characters per inch (CPI).

Symbol Height. The distance between the outside edges of the quiet zones of the first row and the last row.

Symbol Length. Length of symbol measured from the beginning of the quiet zone (margin) adjacent to the start character to the end of the quiet zone (margin) adjacent to a stop character.

Symbology. The structural rules and conventions for representing data within a particular bar code type (e.g. UPC/EAN, Code 39, PDF417, etc.).

T

Tilt. Rotation of a bar code symbol on an axis perpendicular to the substrate.

Tolerance. Allowable deviation from the nominal bar or space width.

Two-dimensional symbology. A machine-readable symbol which must be examined both vertically and horizontally to read the entire message.

A 2-dimensional (2-D) symbol may be one of two types of machine-readable symbols: a Matrix Symbol or a stacked symbol. 2-D symbols differ from linear bar codes with the ability for high data content, small size, data efficiency and error correction capability.

U

UCC. Uniform Code Council: the organization that administers the U.P.C and other retail standards.

UCC.EAN-128. Code 128 with a Function 1 character in the first position that is the symbology used with the UCC.EAN format for a universal product number (UPN).

UPC. Universal Product Code. A relatively complex numeric symbology. Each character consists of two bars and two spaces, each of which is any of four widths. The standard symbology for retail food packages in the United States.

V

Variable Length Code. A code with a number of encoded characters within a range, as opposed to a code with a fixed number of encoded characters.

Vertical Bar Code. A bar code pattern presented in such orientation that the symbol from start to stop is perpendicular to the horizon. The individual bars are in an array appearing as rungs of a ladder.

Visible Laser Diode (VLD). A solid state device which produces visible laser light.

W

Wand Scanner. A handheld scanning device used as a contact bar code or OCR reader.

Wedge. A device that plugs in between a keyboard and a terminal and allows data to be entered by a keyboard or by various types of scanners.

X

X Dimension. The dimension of the narrowest bar and narrowest space in a bar code.

Y

Y Dimension. The height of the modules in a row of a 2-dimensional (2-D) symbols.

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