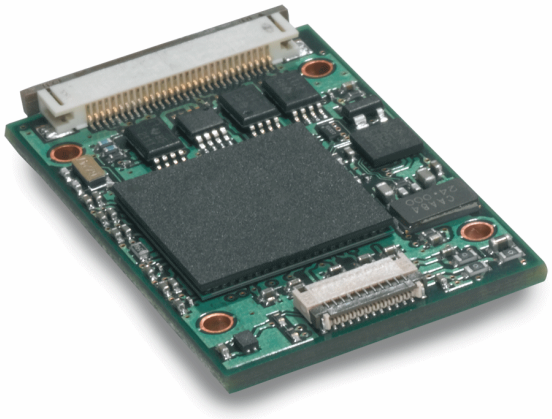
Symbol PL4507 Decoder

Integration Guide



Symbol PL4507 Decoder Integration Guide

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Motorola, Inc.
One Motorola Plaza
Holtsville, New York 11742-1300
http://www.motorola.com/enterprisemobility

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For the complete Motorola hardware product warranty statement, go to:
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Revision History

Changes to the original manual are listed below:

Change	Date	Description
-01 Rev A	1/2009	Initial release.
-02 Rev A	4/2009	Add Presentation Mode and Multicode Mode features.

Table of Contents

About This Guide

Introduction

The *Symbol PL4507 Decoder Integration Guide* provides general instructions for mounting and setting up the Symbol PL4507 decoder.

Chapter Descriptions

Topics covered in this guide are as follows:

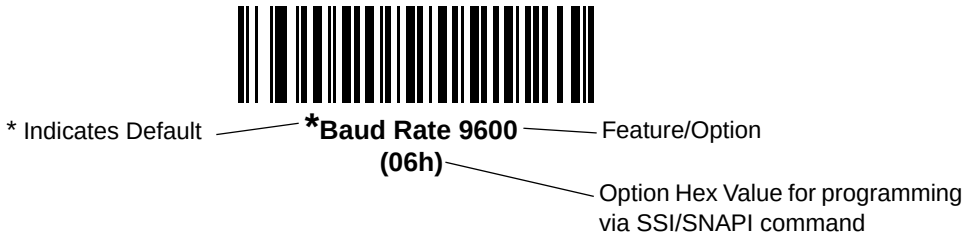
- *Chapter 1, Getting Started* provides an overview of the Symbol PL4507 decoder module, including a theory of operation.
- *Chapter 2, Installation* provides installation and electrical information for the Symbol PL4507.
- *Chapter 3, Accessories* provides information on accessories for the Symbol PL4507, including flexes and connectors.
- *Chapter 4, User Preferences* provides programming bar codes for selecting user preference features.
- *Chapter 5, Imager Preferences* provides programming bar codes for selecting imager preference features.
- *Chapter 6, SSI Interface* describes how to set up the decoder with a Simple Serial Interface (SSI) host. Use SSI to program the decoder via bar code menu or SSI hosts commands.
- *Chapter 7, Serial Interface* describes how to set up the decoder with a serial host. Use the serial interface to connect the decoder to point-of-sale devices, host computers, or other devices with an available serial port (e.g., com port).
- *Chapter 8, USB Interface* describes how to set how to set up the decoder with a USB host. The decoder connects directly to a USB host, or a powered USB hub, and is powered by it.
- *Chapter 9, Symbologies* describes all symbology features and provides the programming bar codes necessary for selecting these features for the decoder.
- *Chapter 10, Miscellaneous Options* includes commonly used bar codes that customize how data transmits to the host device.
- *Chapter 11, Advanced Data Formatting* provides instructions for using ADF, a means of customizing data before transmission to the host device.

- *Appendix A, Standard Default Parameters* provides a table of all host 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 of various code types.
- Appendix D, Numeric Bar Codes includes the numeric bar codes to scan for parameters requiring specific numeric values.
- Appendix E, ASCII Character Set provides ASCII character value tables.

Notational Conventions

The following conventions are used in this document:

- "Decoder" refers to the Symbol PL4507 decoder.
- "Engine" or "imager" refers to the Symbol SE4500 imager engine.
- *Italics* highlight 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.



NOTE This symbol indicates something of special interest or importance to the reader. Failure to read the note will not result in physical harm to the reader, equipment or data.

CAUTION This symbol indicates that if this information is ignored, the possibility of data or material damage may occur.

WARNING! **This symbol indicates that if this information is ignored the possibility that serious personal injury may occur.**

Related Documents

The *Symbol SE4500 Integration Guide*, p/n 72-112996-xx, provides information for the Symbol SE4500, and includes installation and integration information.

For the latest version of this guide and all guides, go to: http://www.motorola.com/enterprisemobility/manuals.

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.motorola.com/enterprisemobility/contactsupport.

When contacting Enterprise Mobility Support, please have the following information available:

- Serial number of the unit
- Model number or product name
- Software type and version number.

Motorola responds to calls by E-mail, telephone or fax within the time limits set forth in support agreements.

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.

If you purchased your Enterprise Mobility business product from a Motorola business partner, contact that business partner for support.

Chapter 1 Getting Started

Introduction

The Symbol PL4507 is a companion decoder module for the Symbol SE4500 imager engine, and controls the imager, acquires images, and decodes 1D and 2D symbologies. For information on the SE4500 imager engine, refer to the *Symbol SE4500 Integration Guide*, p/n 72-112996-xx.

The Symbol PL4507 is a hybrid, multi-chip processing system, composed of an XScale core and related subsystems. The PL4507 includes asynchronous serial (the standard Symbol Simple Serial Interface/SSI command set) and SNAPI (Symbol Native API) interfaces, as well as USB keyboard emulation, and a variety of RS-232 host interfaces.

Symbol PL4507 architecture includes:

- Marvell PXA320 microprocessor core, 624 MHz
- 64 MB Double Data Rate (DDR) Synchronous DRAM
- 128 MB asynchronous flash
- Camera Sensor Interface (CSI) port
- Host communication port.

System peripherals include:

- One UART (RS-232) channel: SSI support for compatibility with existing devices and applications
- I^2C bus used for camera control
- USB 2.0 Full Speed port for image and bar code data transfers.

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

Theory of Operation

During image capture:

1. The image sensor array in the Symbol SE4500 captures an image of the bar code through the engine's optical lens. If necessary, the engine automatically adjusts illumination, exposure, and other parameters to obtain the best quality image.
2. The SE4500 sends the image to Symbol PL4507 decoder board.
3. The PL4507 processes the image to identify the target bar code(s), decodes them, and transmits the decoded data to the host.

Set various parameters provided in this guide to adjust the performance of the Symbol SE4500 and PL4507 to match the application or desired usage profile.

Symbol PL4507 Decoder

Figure 1-1 shows a block diagram for the decoder.

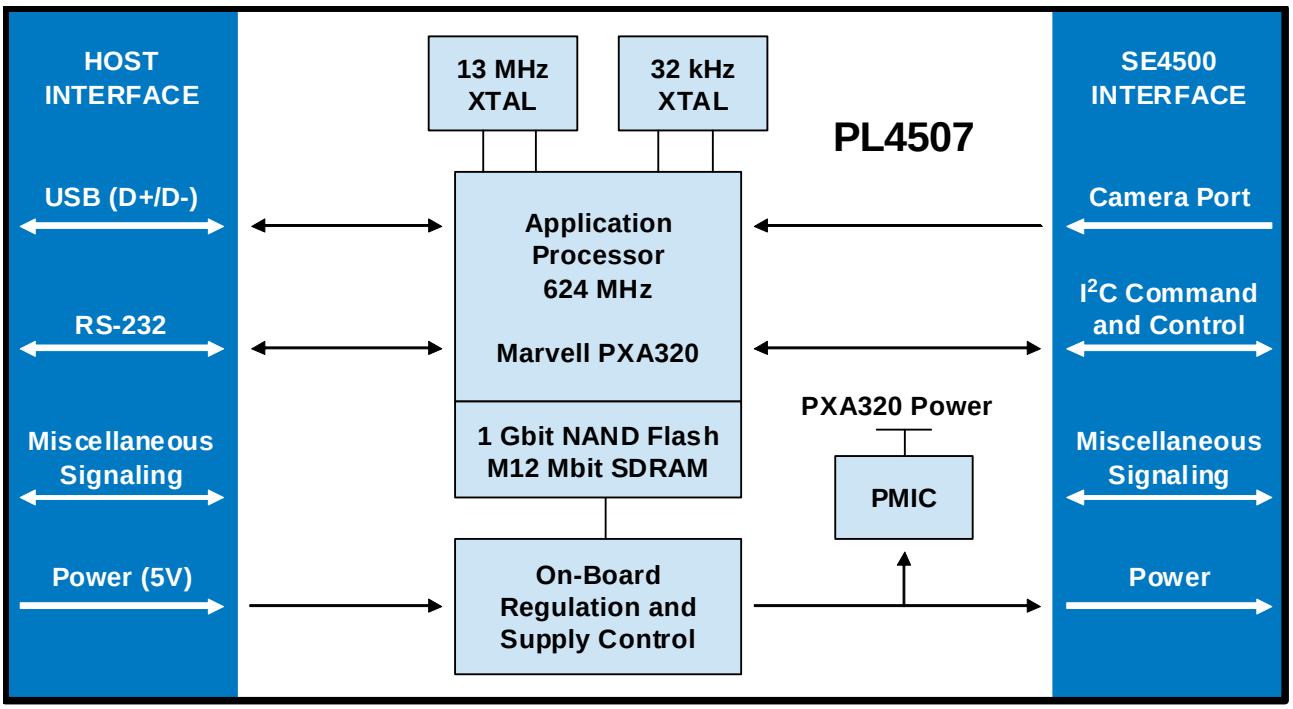


Figure 1-1 *Symbol PL4507 Decoder Block Diagram*

Marvell PXA320 Processor

The digital system is built on a Marvell PXA320 (Intel XScale®) super-pipelined RISC microarchitecture core. The major features of the core are:

- CPU clock speed up to 624 MHz with external DDR SDRAM bus speed of 133 MHz.
- 32 KB instruction/32 KB data L1 cache, 256 KB unified L2 cache, 728 KB internal SRAM.

Power Management

The Symbol PL4507 has various power management options depending on the host interface.

USB (SNAPI, USB HID Keyboard, etc.)

The PL4507 automatically manages its power usage, including USB suspend mode. Additionally, when drawing power from the USB bus, the PL4507 and SE4500 do not exceed the USB limit of 500 mA (see *Interfaces on page 1-4*).

NOTE The PL4507 does not use Low Power mode when connected to a USB-based host.

SSI or RS-232

When using SSI or any RS-232 host interface, set the PL4507 to use one of the following power modes:

- **Continuous Power**: The PL4507 is fully awake and running, even when not in a decode session.
- **Low Power** (default): The PL4507 draws less current at idle than when in Continuous Power mode, and is more suitable for battery-powered applications. See *Technical Specifications on page 1-7*.

Table 1-1 *Methods of Placing the Symbol PL4507 into Low Power Mode*

Action	Behavior
Set the Power Mode parameter to Low Power (see *Power Mode (RS-232 Hosts Only) on page 4-12*)	The PL4507 enters Low Power mode automatically whenever possible.
Send the SLEEP command (see *Table 6-1 on page 6-2*)	The PL4507 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.	

In Low Power mode the PL4507 reduces its current draw whenever possible, and must be awakened before performing any functions. Any of the following conditions wake the device.

Table 1-2 *Waking Up the Symbol PL4507*

Signal	State to Wake Up	Comment
HOST_AIM_WAKE*	Low	
HOST_TRIGGER*	Low	
HOST_CTS	Low	Applies to SSI host only.

When the PL4507 is awakened, it remains awake for 1 second (or for another value set via the *Time Delay to Low Power Mode on page 4-12*) before re-entering Low Power mode.

Interfaces

The PL4507's host interface is configured via two pins on the host interface connector. Logic low (0) is set by grounding the respective pin. Logic high (1) requires no connection. See *Table 2-3 on page 2-9* and *Typical Input Circuit on page 2-11*.

Table 1-3 *Configuring the PL4507 Host Interface*

SYS_CONFIG1	SYS_CONFIG0	Interface Description
0	0	RS-232. The decoder defaults to the SSI interface. To select another RS-232 interface type, scan a bar code in *Serial Host Types on page 7-5*.
0	1	USB Bus Powered. The decoder defaults to SNAPI with Imaging Interface mode. To select another USB interface type, scan a bar code in *USB Device Type on page 8-3*.
1	0	Reserved for future use.
1	1	USB Self Powered. The decoder defaults to SNAPI with Imaging Interface mode. To select another USB interface type, scan a bar code in *USB Device Type on page 8-3*.

Beeper and Decode LED Signals from the Symbol PL4507

The BEEPER_OUT and HOST_DEC_LED* output lines provide user feedback but do not provide enough current drive for the actual beeper and LED device. Additional buffering is required.

The Symbol PL4507's beeper output 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.

If using a non-inverting driver to buffer the HOST_DEC_LED* line, connect the output of the driver to the cathode (-) end of the LED.

Table 1-4 *User Interface Indications*

Description	Indication		SSI Event
	Beeper	Decode LED	
Trigger pull	No sound	No light	TRIGGER_PULLED
No decode			NODECODE_MSG
Wakeup			WAKEUP
Video is off			VIDEO_OFF
Video is on	No Sound	Light	VIDEO_ON
Decode	Middle Tone	Flash of light	DECODE
Snapshot started	Low Tone	Blinking	SNAPSHOT_START
Snapshot is complete	Low Tone	No light	SNAPSHOT_COMPLETE
Bootup	Low Tone, Middle Tone, High Tone	No light	BOOTUP
Transmission error	Four Low Tones	No light	TRANSMIT_ERROR
Entry error	Low Tone, High Tone	Flash of light	ENTRY_ERROR
Defaults set	High Tone, Low Tone, High Tone, Low Tone	Flash of light	DEFAULTS_SET
Parameter entered			PARAM_ENTERED
Number entry expected	High Tone, Low Tone	Flash of light	NUMBER_EXPECTED

Supported Symbologies

The following bar code types are supported and can be individually enabled or disabled:

1-D Symbologies

UPC/EAN
Bookland EAN
UCC Coupon Code
ISSN EAN
Code 128
GS1-128
ISBT 128
Code 39
Trioptic Code 39
Code 32
Code 93
Code 11
Interleaved 2 of 5
Discrete 2 of 5
Codabar
MSI
Chinese 2 of 5
Matrix 2 of 5
Inverse 1D
GS1 DataBar
Composite Codes

2-D Symbologies

PDF417
MicroPDF417
Data Matrix
Data Matrix Inverse
Maxicode
QR Code
MicroQR
QR Inverse
Aztec
Aztec Inverse

Postal Codes

US Postnet
US Planet
UK Postal
Japan Postal
Australian Postal
Netherlands KIX Code
USPS 4CB/One Code/Intelligent Mail
UPU FICS Postal

Operating Modes

The PL4507 supports the following operating modes. See *Operational Modes on page 5-4* for the bar codes to change between modes.

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

Technical Specifications

Table 1-5 provides the technical specifications for the Symbol PL4507 decoder. Note that current draw figures are valid for a PL4507 with an attached SE4500 imager engine.

Table 1-5 *Symbol PL4507 Decoder Technical Specifications at 23°C*

Item	Description
Power Requirements:	
Host Supply 3.3 V (HOST_3P3 only):	
Supply Voltage	3.30 V +/- 0.3 V
Low Power Current	2.5 mA (typical)
Idle Current	160 mA (typical)
Operating Current	450 mA (average, scan and decode session)
Peak Current	700 mA (see *Figure 2-3 on page 2-6*)
Host Supply 5.0 V (HOST_5V only):	
Supply Voltage	5.00 V +/- 0.5 V
Low Power / Suspend Current Draw	2.5 mA (typical)
Idle Current	115 mA (typical, USB bus powered) 135 mA (typical, USB self powered, SSI, RS-232)
Operating Current	280 mA (average, scan/decode session, USB bus powered) 400 mA (average, scan/decode session, USB self powered, SSI, RS-232)
Peak Current	450 mA (USB bus powered) 580 mA (USB self powered, SSI, RS-232, see *Figure 2-4 on page 2-7*)
Maximum Power Supply Noise	100 mVp-p - bar code and image capture applications, host supply = 5 VDC (HOST_5V only) 100 mVp-p - bar code applications, host supply = 3.3 VDC (HOST_3P3 only) 30 mVp-p - image capture applications, host supply VCC = 3.3 VDC (HOST_3P3 only)
Start Up Time	
From Power On	2700 ms typical (RS-232) 3700 ms typical (USB)
From Low Power Mode	8 ms
Typical Bar Code Decode Speed (typical office lighting, bar code at focal distance from engine)	
Linear	75 ms
Two Dimensional (PDF417)	100 ms
Baud Rate	9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, 230400 bps, 460800 bps, 921600 bps

Table 1-5 *Symbol PL4507 Decoder Technical Specifications at 23°C (Continued)*

Item	Description
Temperature	
Operating	-30° C to 55° C (-22° F to 131° F)
Storage	-40° C to 70° C (-40° F to 158° F)
Humidity	
Operating	95% RH, non-condensing at 55°C
Storage	85% RH, non-condensing at 70°C
Shock	2000 G ± 5% applied via any mounting surface at -30º C and 55º C for a period of 0.85 ± 0.05% msec 2500 G ± 5% applied via any mounting surface at 23º C for a period of 0.85 ± 0.05% msec
Vibration	Unpowered decoder board withstands a random vibration along each of the X, Y, and Z axes for a period of one hour per axis, defined as follows: 20 to 80 Hz Ramp up at 0.04 G^2/Hz at 3 dB/octave 80 to 350 Hz 0.04 G^2/Hz 350 Hz to 2 kHz Ramp down at 0.04 G^2/Hz at 3 dB/octave
Dimensions	25.27 mm x 37.97 mm x 6.55 mm (0.995 in. x 1.495 in. x 0.258 in.)
Weight	5.6 g (0.2 oz)

Chapter 2 Installation

Introduction

This chapter provides information for connecting and mounting the Symbol PL4507 decoder.

General Information

Grounding

The mounting holes for the Symbol PL4507 include exposed copper that may, if necessary, be used to electrically ground the decoder to the host using metal screws. If installing the PL4507 in a host where there is a potential to inject ground noise, use nylon or other non-conductive hardware. In this case the PL4507 ground is provided through the host connector.

Electrical Isolation

Both sides of the Symbol PL4507 decoder board include components and electrical conductors that must be isolated from contact with components on the host device. See *Symbol PL4507 Decoder Board on page 2-3*.

Electrostatic Discharge (ESD)

The Symbol PL4507 decoder is protected from ESD events that can occur in an uncontrolled environment, however, use care when handling the module and apply standard ESD precautions such as using grounding wrist straps and handling only in a properly grounded work area.

Environment

Enclose the PL4507 decoder sufficiently to prevent dust from gathering on the printed circuit board and components. Dust and other contaminants can eventually degrade performance. Motorola does not guarantee performance of the decoder when used in an exposed application.

Power Supply Noise

For reliable operation a low-noise power supply is required. Pay close attention to power supply quality and testing to ensure the best performance from the PL4507 and SE4500 components.

5V Host: For a host that supplies 5 VDC (HOST_5V) to the decoder, the decoder maintains proper regulation and supply quality.

3.3V Host: For a host that provides power via the HOST_3P3 connection, the power supply passes directly through the decoder module to the SE4500 imager engine. In bar code applications, up to 100 mV peak-to-peak noise is acceptable on the 3.3V supply (10 Hz to 100 kHz). For image capture applications, limit power supply noise to 30 mV peak-to-peak across the same frequency range. To achieve improvements in both image quality and decode performance, provide additional filtering of the HOST_3P3 supply. To achieve optimal performance use a low noise linear regulator; however consider that in certain applications the PL4507/SE4500 can draw as much as 700 mA. Carefully review both the efficiency and current delivering capacity of the regulator.

Thermal Considerations

The PL4507 decoder module includes several high-power components that dissipate heat during operation. These components can exhibit case temperatures as high as 25^{o}C above ambient when the PL4507/SE4500 pair is running at 60 frames per second with full illumination. Use care when integrating the PL4507/SE4500 pair into the target application.

Protective measures that reduce power consumption and/or facilitate heat removal within a target system include but are not limited to:

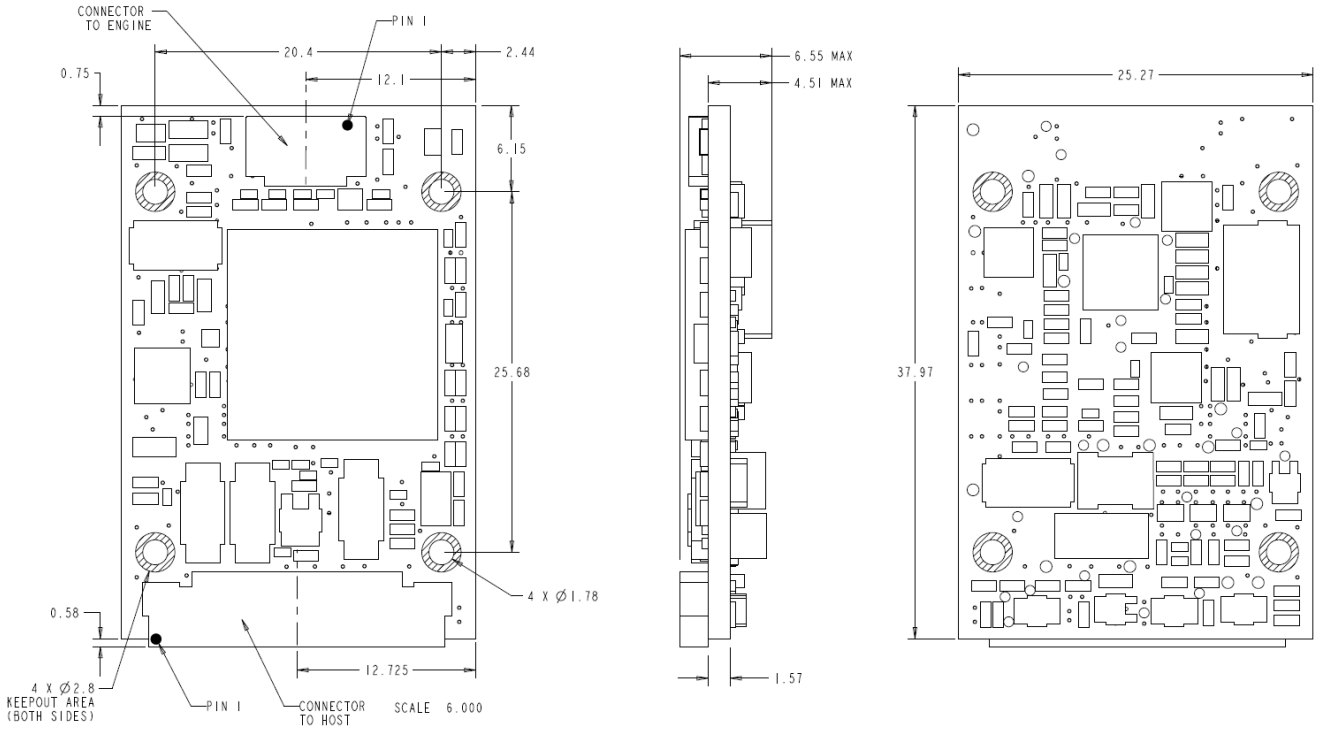
- Using reduced video frame rates (e.g., 15 fps)
- Reducing illumination intensity on the SE4500
- Mounting the SE4500 to a solid metallic surface and mounting the PL4507 to a similar surface using metal screws
- Selecting a housing design that allows for natural or forced convection.

Note that running the PL4507/SE4500 pair in continuous 60 fps video mode with both aiming and illumination enabled full time is highly uncommon. Typical decoding and image capture applications are low duty cycle operations and internal temperature rise due to the PL4507/SE4500 pair should be minimal.

Symbol PL4507 Decoder Board

There are four mounting holes (1.78 mm / 0.07 in.) on the decoder board. *Figure 2-1* provides an outline drawing of the PL4507 decoder board. Position the board in the host equipment so that the connecting interface cable reaches the engine.

The Symbol PL4507 board contains components and circuitry on two sides.



Notes: Unless otherwise specified:

- This is a reference drawing and is not intended to specify or guarantee all possible integration requirements for this decoder.
- Dimensions are in mm.
- Tolerance for dimensions are ± 0.25 mm / ± 0.01 in.

Figure 2-1 *Symbol PL4507 Decoder Board Drawing*

Symbol PL4507 Electrical Information

Power Supply Requirements

The Symbol PL4507 decoder board can be powered from one of two possible supply voltages: Host 5 VDC or 3.3 VDC. The PL4507 uses an intelligent hardware multiplexer to configure the most efficient power supply arrangement for the combined PL4507/SE4500 system. *Figure 2-2* shows a block diagram of the supply multiplexer.

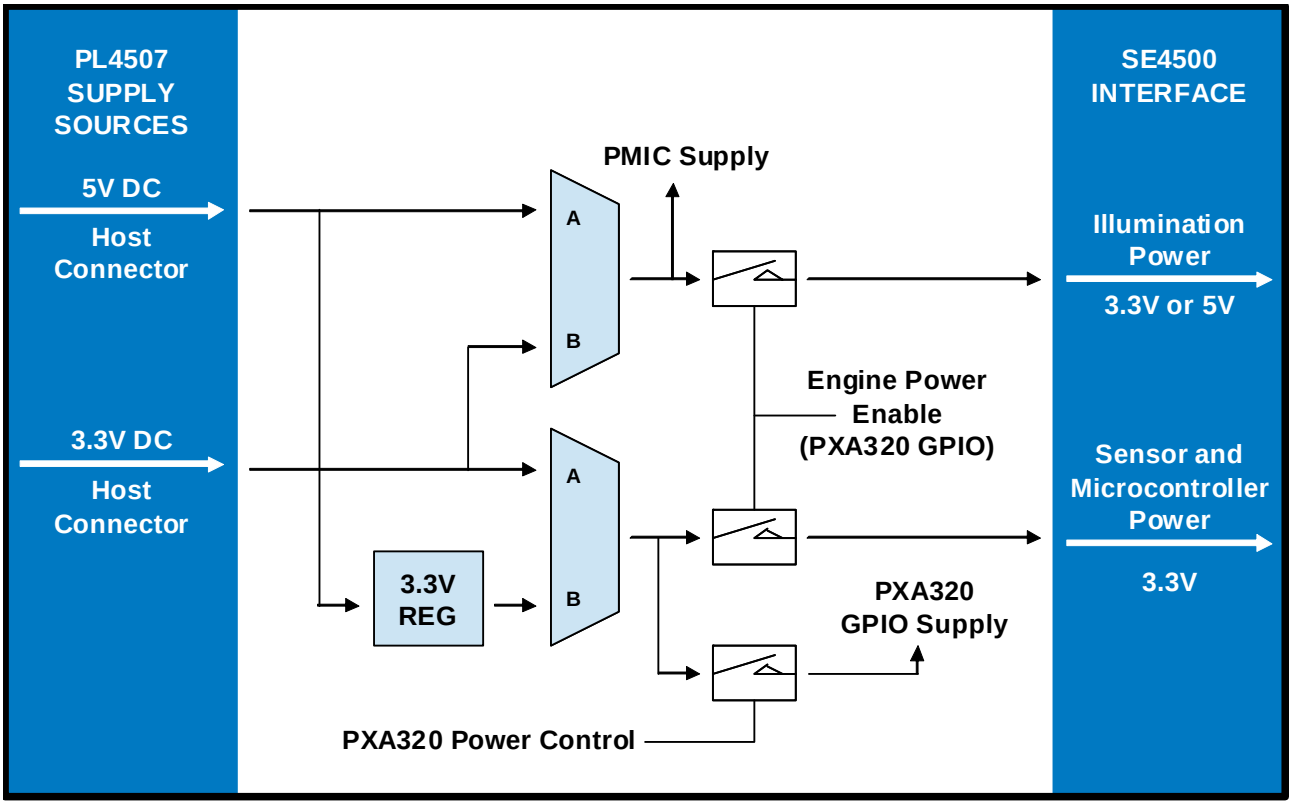


Figure 2-2 *Symbol PL4507 Power Supply Multiplexer*

The multiplexers are low resistance switches that automatically select between their A and B inputs. If both inputs are present (e.g., Host 5 VDC and Host 3.3 VDC) the A input takes precedence.

This arrangement allows powering the PL4507 using 3.3 V, 5 V, or combined supply voltages that offer improved efficiency for the overall system due to the different supplies that the PL4507 decoder and SE4500 imager engine require internally.

Table 2-1 *Symbol PL4507 Electrical Characteristics*

Symbol	Parameter	Condition	Minimum	Typical	Maximum	Units
HOST_3P3	Supply Voltage		3.0	3.3	3.6	V
HOST_5V	Supply Voltage		4.5	5.0	5.5	V
NOTE: Logic Levels are referred to PXA320 GPIO supply (HOST_3P3=3.3V)						
VIH	Input High voltage		0.8 x HOST_3P3		HOST_3P3 +0.3	V
VIL	Input Low voltage		-0.3		0.2 x HOST_3P3	V
I_{CC}					See *Table 1-5 on page 1-7*	mA
I_{iL}	Input Low Leakage current	V_{in} = GND, no pull up or pull down			± 1	uA
I_{iH}	Input High Leakage current	V_{in} = V_{CC}, no pull up or pull down			± 1	uA
I_{oL}	Output Low Current	V_{oL} = 0.4 V	-5			mA
I_{oH}	Output High Current	V_{oh} = 0.8 V_{CC}			+5	mA
C_i	Input capacitance				5	pF
C_o	Output capacitance				5	pF
C_{i_usb}	Input capacitance, USB_OUT+/-				20	pF
Note: Supply current varies depending on factors such as what function the software is performing and which Symbol PL4507 functions are being used. See *Appendix F, Reference Schematic and Application Notes* for more details.						

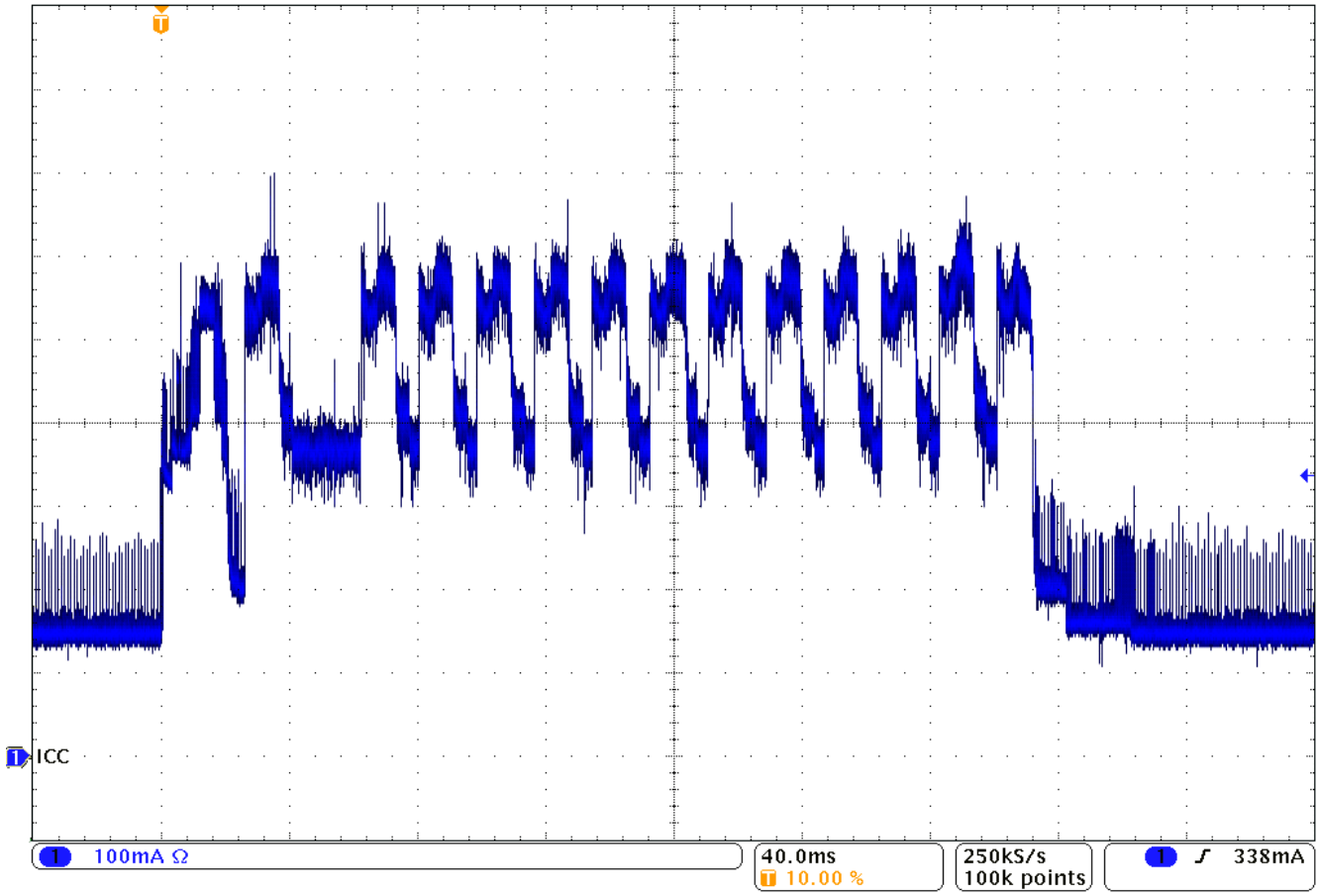


Figure 2-3 *Symbol PL4507 Supply Current - 3.3 V Operation (SSI, Scan/Decode Session)*

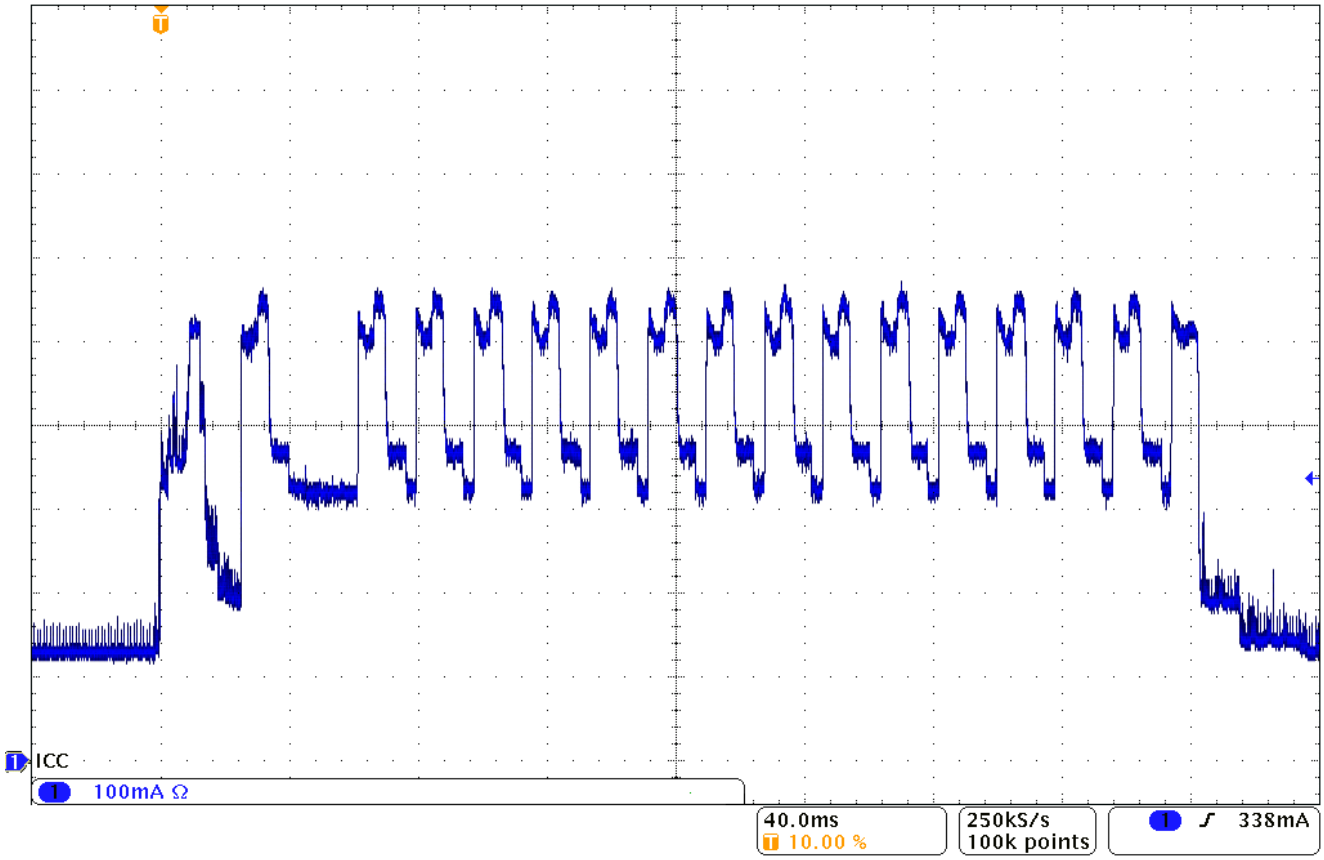


Figure 2-4 *Symbol PL4507 Supply Current - 5 V Operation (USB Self Powered, Scan/Decode Session)*

Electrical Interface

Table 2-2 and *Table 2-3* list the pin functions of the Symbol SE4500 and PL4507 interfaces, and illustrate typical input and output circuitry.

NOTE Signal directions are listed relative to PL4507 decoder module.

Table 2-2 *Symbol SE4500 Signal Descriptions*

Signal Name	Description	Dir	Engine Interface	Comments
GND	Power supply	-	1	SE4500 power supply return
GND	Power supply	-	2	SE4500 power supply return
I2C_CLK	Communication interface	Out	3	SE4500 I^2C Clock
I2C_DATA	Communication interface	In/ Out	4	SE4500 I^2C Data
VSYNC	Vertical sync synchronized to a WVGA frame	In	5	Vertical sync clock from the SE4500
PIX_DATA_7	Pixel data	In	6	Pixel data from the SE4500 (MSB)
PIX_DATA_6	Pixel data	In	7	Pixel data from the SE4500
PIX_DATA_5	Pixel data	In	8	Pixel data from the SE4500
PIX_DATA_4	Pixel data	In	9	Pixel data from the SE4500
PIX_DATA_3	Pixel data	In	10	Pixel data from the SE4500
PIX_DATA_2	Pixel data	In	11	Pixel data from the SE4500
PIX_DATA_1	Pixel data	In	12	Pixel data from the SE4500
PIX_DATA_0	Pixel data	In	13	Pixel data from the SE4500 (LSB)
EXT_ILLUM_EN	Illumination enable	In	14	Enable external illumination
VCC_SENSOR	Power supply	-	15	Decoder provided 3.3V for SE4500 image sensor and oscillator
VCC	Power supply	-	16	Decoder provided 3.3V for SE4500 logic and laser control system
VCC_ILLUM	Power supply	-	17	Decoder provided 3.3 to 5V for SE4500 illumination system
HSYNC	Horizontal sync synchronized to the rows of the image data	In	18	Horizontal sync clock from the SE4500

Note: Signal directions are listed relative to the PL4507 decoder module.

Table 2-2 *Symbol SE4500 Signal Descriptions (Continued)*

Signal Name	Description	Dir	Engine Interface	Comments
GND	Power supply	-	19	SE4500 power supply return
PIXCLK	Pixel clock used to synchronize the decoder to the pixel data	In	20	Pixel clock returned from the SE4500
GND	Power supply	-	21	SE4500 power supply return

Note: Signal directions are listed relative to the PL4507 decoder module.

Table 2-3 *Symbol PL4507 Signal Descriptions*

Signal Name	Description	Dir	Host Connector Pin	Control State	Comments
HOST_DOWNLOAD	PL4507 download signal	In	1	L = PL4507 in software download mode H = No action	Signal is sampled immediately following a reset state. It indicates to the PL4507 the system is ready to accept a new software image.
HOST_3P3	+3.3 V power supply	In	2		PL4507 supply voltage
GND	System ground		3		PL4507 power supply return
HOST_RXD	RS-232 receive	In	4		See *Typical Input Circuit*
HOST_TXD	RS-232 transmit	Out	5		
HOST_CTS	RS-232 Clear To Send control signal	In	6		See *Typical Input Circuit*
HOST_RTS	RS-232 Request To Send control signal	Out	7		
POWER_DOWN	Status signal from the PL4507 indicating power down state	Out	8	L = Normal state H = Engine is in a power down state	
BEEPER_OUT	Pulse width modulated output used to control an external beeper	Out	9		The beeper output 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. Normally used as a control signal for beeper drive circuit. Control line can source/sink 5 mA.
HOST_DEC_LED*	Active low output used to indicate a valid bar code decode	Out	10	L = Led On H = Led off	Normally used as a control signal for an LED drive circuit. Control line can source/sink 5 mA.

Note: Signal directions are listed relative to the PL4507 decoder module.

Table 2-3 *Symbol PL4507 Signal Descriptions (Continued)*

Signal Name	Description	Dir	Host Connector Pin	Control State	Comments
HOST_AIM_WAKE*	Signal functions as aiming pattern control when the PL4507 is not in a low power state	In	11	L = Aiming pattern on H= Aiming pattern off	See *Typical Input Circuit*. Set the appropriate parameters for this signal to function properly.
	Signal functions as a wakeup only when the PL4507 is in a low power state			L = Wake up PL4507 from a power down state H = No action	
HOST_TRIGGER*	Used to start a decode session	In	12	L = Start session H = Inactive	See *Typical Input Circuit*.
HOST_3P3	+3.3 V power supply	In	13		PL4507 supply voltage
GND	System ground		14		PL4507 power supply return
Reserved			15		
GND	System ground		16		PL4507 power supply return
Reserved			17		
HOST_3P3	+3.3 V power supply	In	18		PL4507 supply voltage
Reserved			19		
Reserved			20		
Reserved			21		
GND	System ground		22		PL4507 power supply return
HOST_USB_P	Positive differential data signal for the USB bus	In/ Out	23		USB 2.0 full speed bus
HOST_USB_N	Negative differential data signal for the USB bus	In/ Out	24		USB 2.0 full speed bus
GND	System ground		25		PL4507 power supply return
HOST_5V	+5.0V power supply	In	26		PL4507 supply voltage
HOST_5V	+5.0V power supply	In	27		PL4507 supply voltage
ILLUM_EN_OUT	External illumination control signal	Out	28	L = Illumination on H = Illumination off	Reserved for external illumination control. Control line can only source/sink 5 mA.
HOST_SYS_CFG0	System configuration bits	In	29		Used to determine which host interface is used after reset state. See *Table 1-3 on page 1-4*.
HOST_SYS_CFG1		In	30		

Note: Signal directions are listed relative to the PL4507 decoder module.

Typical Input Circuit

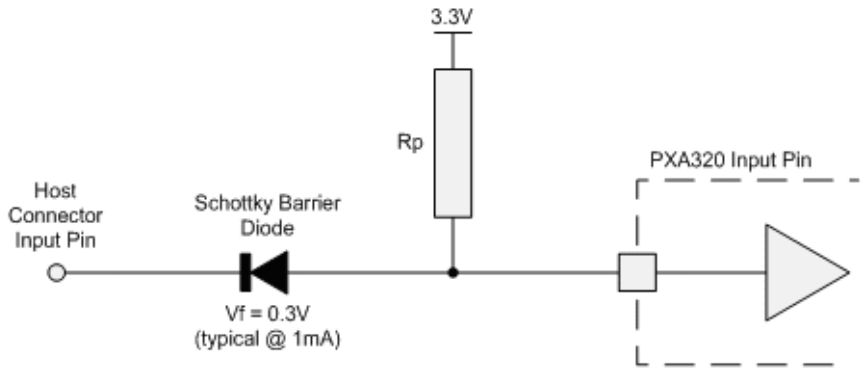


Figure 2-5 *Input Circuit*

Pull-up resistor, R_p, is 4.7K ohms, except on SYS_CONFIG0 and SYS_CONFIG1 inputs where Rp is 10K ohms. The input circuit allows a host with 5V logic to communicate directly with the PL4507 and eliminates the possibility of back powering the decoder.

Chapter 3 Accessories

Table 3-1 lists the accessories for the Symbol PL4507 system.

Table 3-1 *Symbol PL4507 Accessories*

Accessory	Motorola Part Number	Kit Ordering Number
One of each of the accessories listed in this table	N/A	KT-SE4500-01R
Flex for connecting the SE4500 to the PL4507 (21 pin, 0.3 mm pitch, 55 mm length)	15-113896-01	KT-SE4500-02R
Flex for connecting the PL4507 to a host (30 pin, 0.5 mm pitch, 37 mm length)	50-16000-623	KT-SE4500-03R
Flex reducer for connecting the PL4507 to a legacy SSI interface (30 pins to 12 pins, 152 mm length)	15-84084-01	KT-SE4500-04R
30 pin vertical ZIF connector for connecting the PL4507 to a host	50-12167-030	

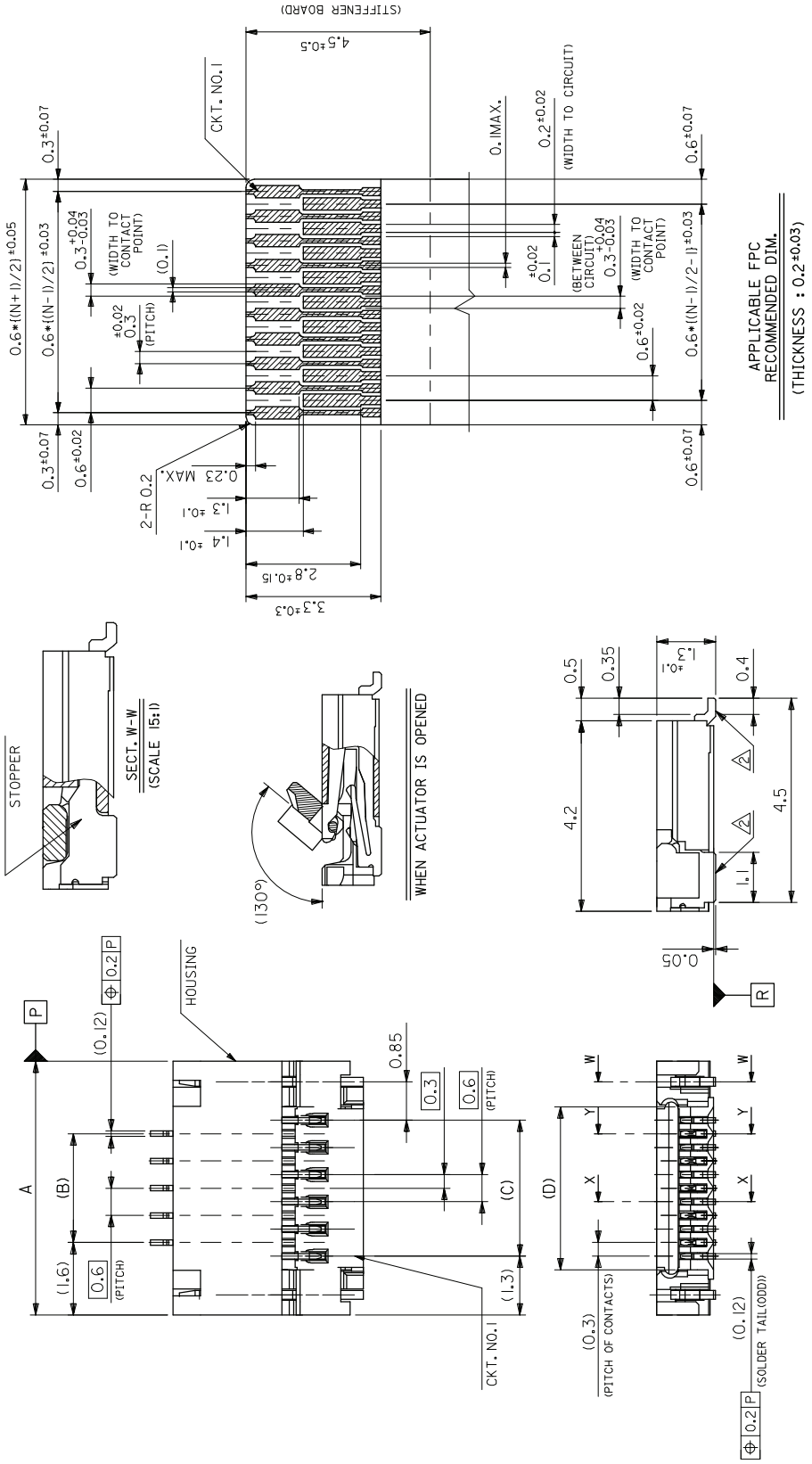
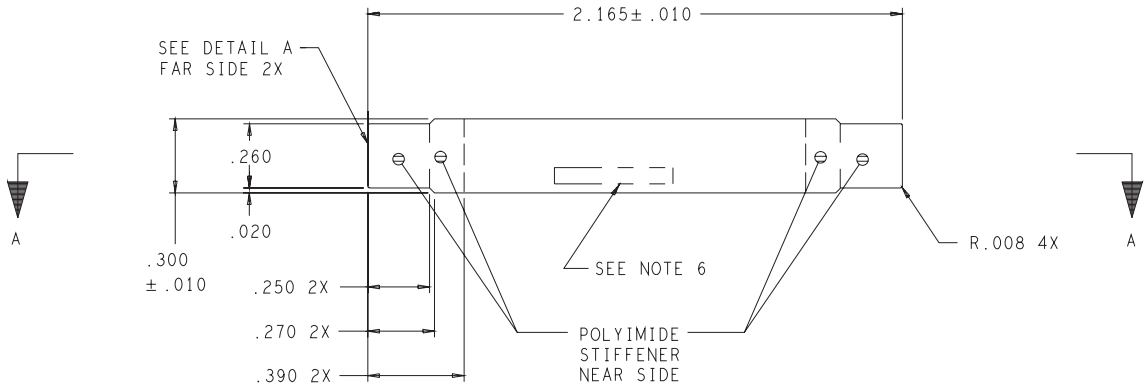
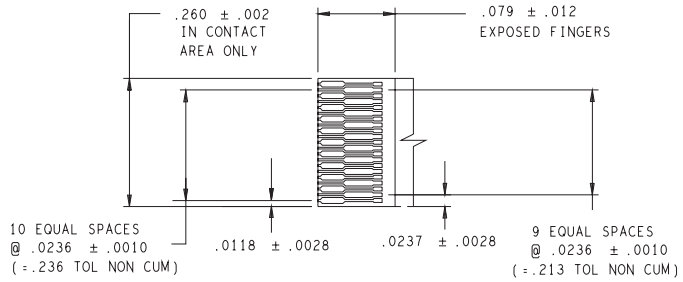


Figure 3-1 *21-Pin ZIF Connector (PL4507 Decoder to Flex), p/n 50-12100-2154 (Molex 54809 Series)*

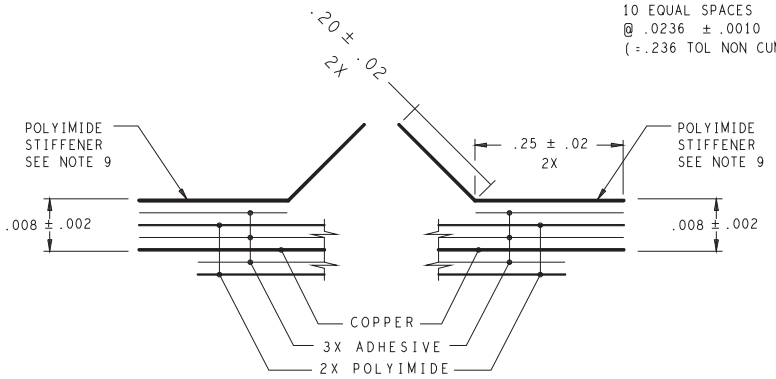


PRIMARY SIDE



DETAIL "A"

SCALE:NONE
2X



VIEW A-A

SCALE: NONE
EXPANDED FOR CLARITY

NOTES:

1. REFERENCE ASSOCIATED P/L 15-113896-01 AND SUBSEQUENT P/L'S.
2. FABRICATE IN ACCORDANCE WITH ITEM 30.
3. MATERIAL:
   BASE DIELECTRIC ITEM 10
   COPPER PANEL PLATE USING ITEM 20.
   COVERLAYER / BOND FILM(S) ITEM 11.
   FINISH:ITEM 21 OVER ITEM 22.
   POLYIMIDE STIFFENER(S) PER ITEM 12.
4. SUPPLIED GERBER DATA: MINIMUM CONDUCTOR WIDTH .005" AND MINIMUM SPACING TO BE .004" (EXCEPT IN CONNECTOR AREA).
5. LABEL AND SHIPPING REQUIREMENTS PER ITEM 31.
6. VENDOR IDENTIFICATION PER ITEM 32 USING ITEM 28.
7. DIMENSIONS ARE TO CENTER OF THE CONTACT.
8. APPLY SILKSCREEN TO THE PRIMARY SIDE WITH ARTWORK MASTER USING ITEM 28.
9. POLYIMIDE STIFFENER TO BE FREE OF BONDING FROM FLEX CIRCUIT IN AREA SPECIFIED.
10. ALL MATERIALS: LAMINATES, RESINS AND METALLIZATIONS TO BE COMPLIANT TO EU RoHS DIRECTIVE 2002/95/EC IAW SP-12509-01.

Figure 3-2 *Symbol SE4500 to PL4507 21-Pin Flex, p/n 15-113896-01*

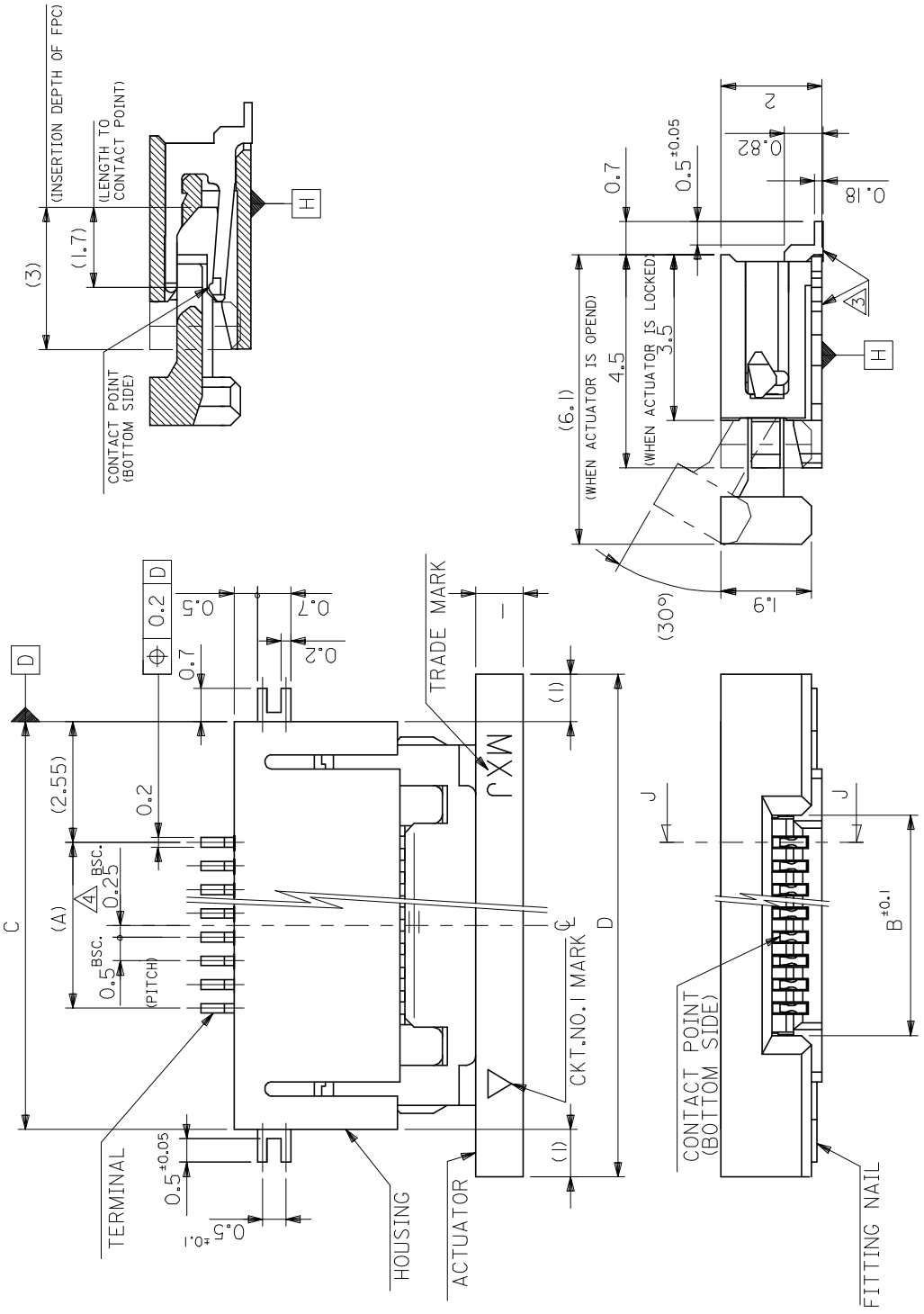


Figure 3-3 *Symbol PL4507 30-Pin Host Connector, p/n 50-12171-030*

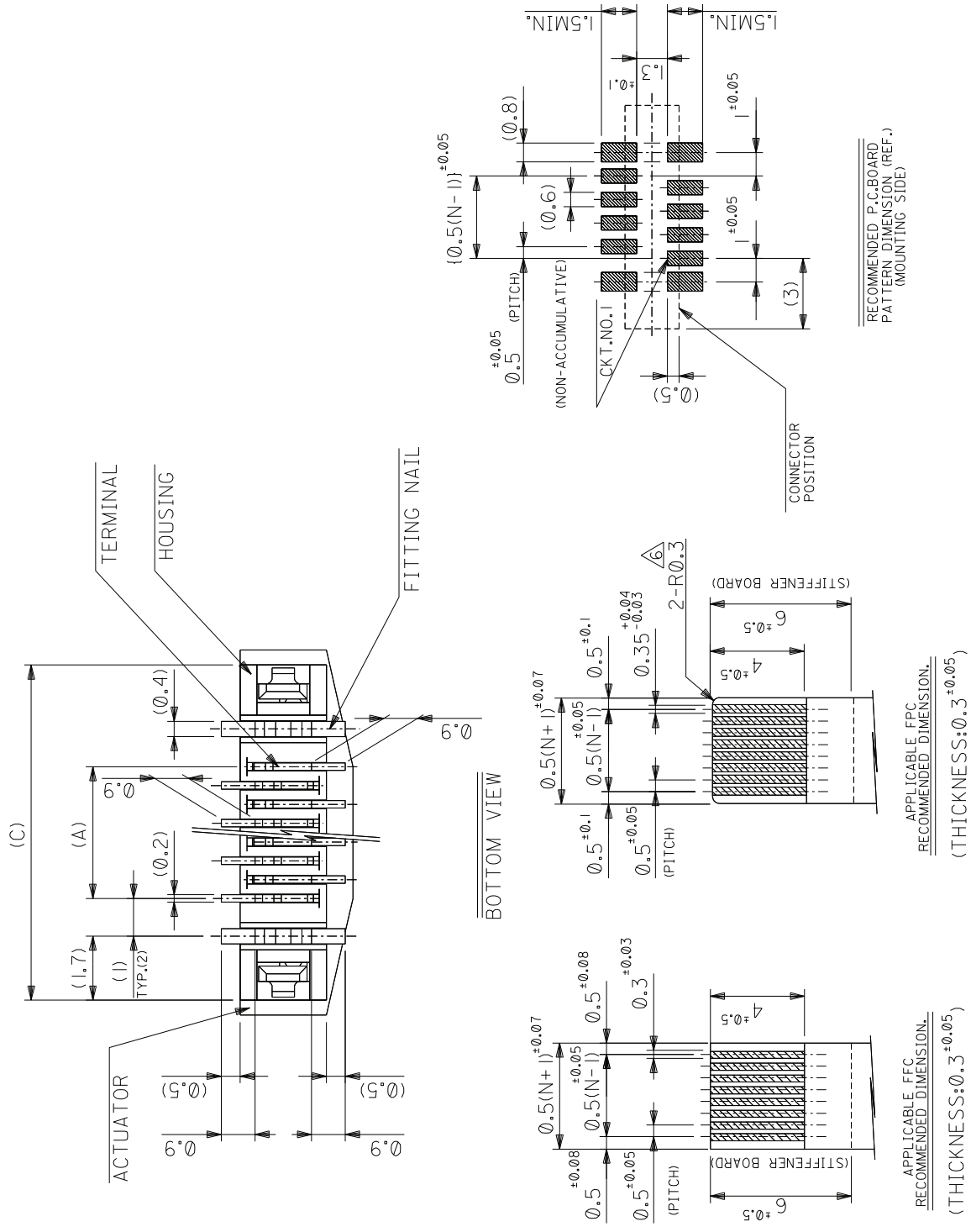


Figure 3-4 *Symbol PL4507 30-Pin Mating Host Connector, p/n 50-12167-030*

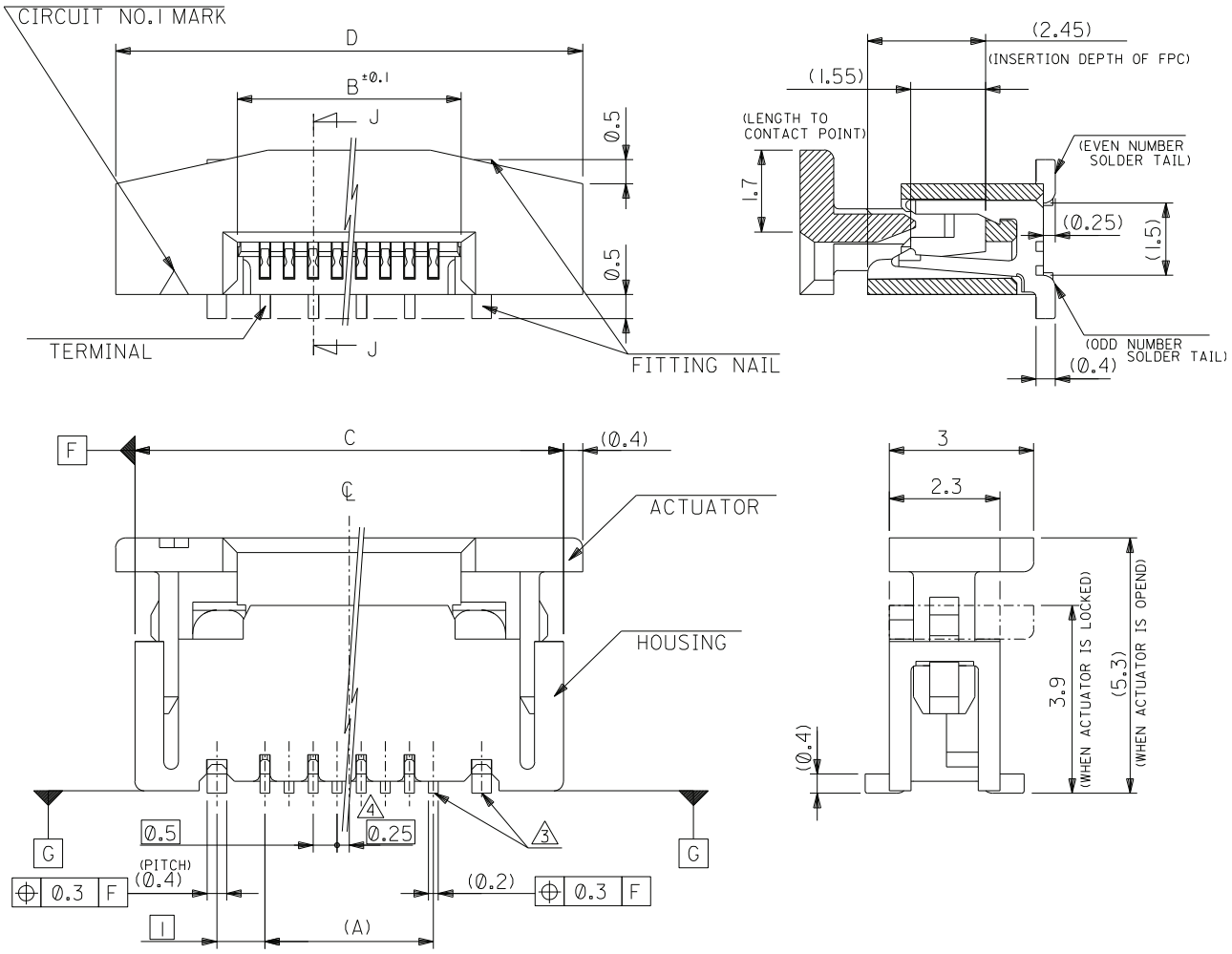


Figure 3-5 *Symbol PL4507 30-Pin Mating Host Connector, p/n 50-12167-030 (continued)*

Chapter 4 User Preferences

Introduction

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

Host Selection

The primary method of selecting a host type (serial or USB) for the Symbol PL4507 is using the sysconfig hardware lines described in *Table 2-3 on page 2-9*. The default serial host is SSI and the default USB host 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 scanning 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.

Phantom Scan Session

The Phantom Scan Session feature places the system into a known state for two seconds immediately after the power-up beep sequence in order to decode a parameter bar code without intervention and regardless of existing settings and mode. This allows you to scan a **Set Defaults** or other parameter bar code without triggering the scanner or initiating a host scan session in order to return an unresponsive system to its factory default settings. Aim and illumination are turned off and Phantom Scan exits upon a trigger pull, host command, or successful decode.

Changing Default Values

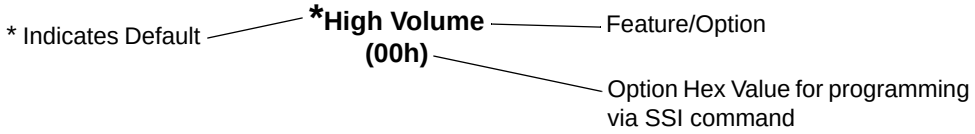
The decoder ships with the settings shown in the *Table 4-1 on page 4-3* (also see *Appendix A, Standard Default Parameters* for all host and miscellaneous defaults). If the default values suit requirements, programming is not necessary.

There are two ways to change a parameter value:

- Scan 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 appear in this chapter below the parameter title, and options appear in parenthesis beneath the accompanying bar codes. See the *Simple Serial Interface (SSI) Programmer’s Guide* for detailed instructions for changing parameter values using this method.

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 you can see the bar code clearly, and bars and/or spaces are not merging.

To return all features to default values, scan **Restore Defaults on page 4-4*. Throughout the programming bar code menus, asterisks (*) indicate default values.



Scanning Sequence Examples

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

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

Errors While Scanning

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

User Preferences Parameter Defaults

Table 4-1 lists defaults for user preferences parameters. To change any parameter value, scan the appropriate bar code(s) provided in the User Preferences section beginning on *page 4-4*.

NOTE See *Appendix A, Standard Default Parameters* for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 4-1 *User Preferences Default Table*

Parameter	Parameter Number	Default	Page Number
User Preferences			
Set Default Parameter		Restore Defaults	*4-4*
Parameter Scanning	ECh	Enable	*4-5*
Beeper Tone	91h	Medium	*4-6*
Beeper Volume	8Ch	High	*4-7*
Trigger Modes	8Ah	Level	*4-8*
Motion Enhancement for Presentation Mode	F1 A6h	Disable	*4-9*
Motion Enhancement Performance Setting	F1 8Ah	Standard	*4-9*
Time Delay to Motion Enhancement Sleep Mode	F1 96h	1 Minute	*4-10*
Power Mode	80h	Low Power	*4-12*
Time Delay to Low Power Mode	92h	1.0 Sec	*4-12*
Picklist Mode	F0h 92h	Disabled Always	*4-14*
Decode Session Timeout	88h	9.9 Sec	*4-14*
Timeout Between Decodes, Same Symbol	89h	0.6 Sec	*4-15*
Beep After Good Decode	38h	Enable	*4-15*
Continuous Bar Code Read	F1h 89h	Disable	*4-16*
Multicode Mode	F1h A5h	Disable	*4-16*
Multicode Expression	F1h 95h	1	*4-17*

User Preferences

Set Default Parameter

You can reset the Symbol PL4507 to two types of defaults: factory defaults or custom defaults. Scan the appropriate bar code below to reset the decoder to its default settings and/or set its current settings as custom defaults.

- **Restore Defaults** - Scan this bar code to reset all default parameters as follows.
  - If you previously set custom defaults by scanning **Write to Custom Defaults**, scan **Restore Defaults** to retrieve and restore the decoder's custom default settings.
  - If you did not set custom defaults, scan **Restore Defaults** to restore the factory default values listed in *Table A-1*.
- **Set Factory Defaults** - Scan this bar code to restore the factory default values listed in *Table A-1.* This deletes any custom defaults set.
- **Write to Custom Defaults** - Scan this bar code to set the current decoder settings as custom defaults. Once set, you can recover custom default settings by scanning **Restore Defaults**.

***Restore Defaults**

Set Factory Defaults

Write to Custom Defaults

Parameter Scanning

Parameter # ECh

To disable the decoding of parameter bar codes, including the **Set Defaults** parameter bar codes, scan the **Disable Parameter Scanning** bar code below. To enable decoding of parameter bar codes, scan **Enable Parameter Scanning**.

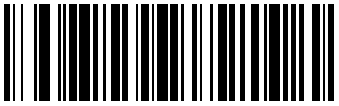
***Enable Parameter Scanning (01h)**

Disable Parameter Scanning (00h)

Beeper Tone

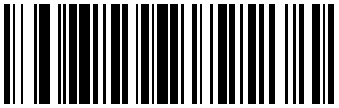
Parameter # 91h

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

Low Volume
(02h)

Medium Volume
(01h)

***High Volume**
(00h)

Trigger Modes

Parameter # 8Ah

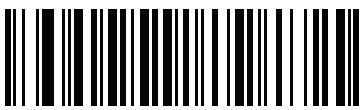
- **Level** - A trigger event activates decode processing, which continues until the trigger event ends, a valid decode, or the decode session time-out occurs.
- **Presentation Mode** - When the Symbol SE4500 detects an object in its field of view, it triggers and attempt to decode. The range of object detection does not vary under normal lighting conditions. This applies to decode mode only. In this mode the unit does not enter Low Power mode.
- **Auto Aim** - This trigger mode turns on the red laser aiming pattern when the Symbol SE4500 senses motion. A trigger pull activates decode processing. After 2 seconds of inactivity the red laser aiming pattern automatically shuts off.
- **Auto Aim with Illumination** - This trigger mode turns on the red laser aiming pattern and internal illumination LEDs when the Symbol SE4500 senses motion. A trigger pull activates decode processing. After 2 seconds of inactivity the red laser aiming pattern and internal illumination LEDs automatically shut off.
- **Host** - A host command issues the triggering signal. The SE4500 interprets a trigger pull as a level triggering option.

***Level**
(00h)

Presentation Mode
(07h)

Host
(08h)

Auto Aim
(09h)



Auto Aim with Illumination
(0Ah)

Motion Enhancement for Presentation Mode

Parameter # F1 A6h

Select **Enable Motion Enhancement** to fine-tune engine and decoder behavior for bar codes moving quickly through the SE4500's field of view. **Disable Motion Enhancement** reverts to standard Presentation Mode behavior.

NOTE Motion Enhancement and its associated parameters require setting *Trigger Modes on page 4-8* to **Presentation Mode**.

Enable Motion Enhancement (01h)

***Disable Motion Enhancement (00h)**

Motion Enhancement Performance Setting

Parameter # F1 8Ah

Standard Motion Performance is optimized for both motion insensitivity and depth of field. To further increase the SE4500 system's motion tolerance, select **Extended Motion Performance.** This option slightly reduces decode range. This parameter is only valid when **Enable Motion Enhancement** is selected.

***Standard Motion Performance (02h)**

Extended Motion Performance (00h)

Time Delay to Motion Enhancement Sleep Mode

Parameter # F1 96h

When **Enable Motion Enhancement** is selected, this parameter sets the time the engine and decoder remain active before entering sleep mode with no illumination. The PL4507 system wakes when it detects an object in its field of view, or after a trigger event.

NOTE *Low Light Enhancement on page 5-8* does not apply when **Motion Enhancement** is enabled. Performance is not guaranteed in dim conditions.

Disable
(00h)

1 Second
(01h)

10 Seconds
(0Ah)

***1 Minute**
(11h)

5 Minutes
(15h)

Time Delay to Presentation Sleep Mode (continued)

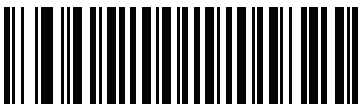
15 Minutes
(1Bh)

30 Minutes
(1Dh)

45 Minutes
(1Eh)

1 Hour
(21h)

3 Hours
(23h)



6 Hours
(26h)

9 Hours
(29h)

Power Mode (RS-232 Hosts Only)

Parameter # 80h

Select whether or not the decoder enters Low Power consumption mode after a decode attempt. In Continuous On mode, the decoder does not enter this low power state.

Continuous On
(00h)

***Low Power Mode**
(01h)

Time Delay to Low Power Mode

Parameter # 92h

This parameter sets the time the decoder remains active after decoding. After a scan session, the decoder waits this amount of time before entering Low Power mode.

NOTE This parameter only applies when *Power Mode* is set to **Low Power**.
To program a different value for this parameter than those provided here, see *Using Time Delay to Low Power Mode with SSI on page 6-7*.

***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)

Picklist Mode

Parameter # F0h 92h

Picklist mode enables the decoder to decode only bar codes aligned under the center of the laser aiming pattern. Select one of the following picklist modes:

- **Disabled Always** - Picklist mode is always disabled.
- **Enabled Always** - Picklist mode is always enabled.

NOTE With Picklist Mode enabled, the decode aiming pattern turns on even when the *Decode Aiming Pattern on page 5-6* is disabled.

***Disabled Always**
(00h)

Enabled Always
(02h)

Decode Session Timeout

Parameter # 88h

This parameter sets the maximum time decode processing continues during a scan 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, scan the bar code below. Next, scan two numeric bar codes from *Appendix D, Numeric Bar Codes* that correspond to the desired on time. Provide a leading zero for single digit numbers. For example, to set a Decode Session Timeout of 0.5 seconds, scan the bar code below, then scan the **0** and **5** bar codes. To correct an error or change the selection, scan *Cancel on page D-3*.

Decode Session Timeout

Timeout Between Decodes, Same Symbol

Parameter # 89h

Use this option in presentation mode to prevent multiple reads of a symbol left in the Symbol SE4500's field of view. The timeout begins when you remove the symbol from the field of view.

To select the timeout between decodes for the same symbol, available in 0.1 second increments from 0.0 to 9.9 seconds, scan the bar code below, then scan two numeric bar codes from Appendix D, Numeric Bar Codes that correspond to the desired interval. The default interval is 0.6 seconds.

Timeout Between Decodes, Same Symbol

Beep After Good Decode

Parameter # 38h

Scan a bar code below to select whether or not the decoder issues a beep signal after a good decode. If selecting **Do Not Beep After Good Decode**, beeper signals still occur during parameter menu scanning and to indicate error conditions.

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

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

Continuous Bar Code Read

Parameter # F1 89h

Select **Enable** to allow decode processing to continue until the trigger event ends or the decode session time-out occurs. User indications occur upon decoding each bar code. Select **Disable** to end decode processing upon a valid decode as well. This mode does not apply to presentation mode.

✓ ***NOTE*** Motorola strongly recommends enabling *Picklist Mode on page 4-14* with this feature. Disabling Picklist Mode can cause accidental decodes when more than one bar code is in the imager engine's field of view.

***Disable Continuous Bar Code Read**
(00h)

Enable Continuous Bar Code Read
(01h)

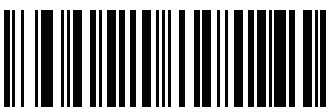
Multicode Mode

Parameter # F1h, A5h

Enable this parameter to allow multiple bar codes to decode upon one trigger event based on the programmed multicode expression. The decoder reports a successful decode and provides user indication only if it decodes all bar codes indicated by the multicode expression, otherwise the decode fails. Bar codes are transmitted in the order defined in the multicode expression. Disable this to operate in normal decode mode.

This mode operates in Level trigger mode only. Also disable *Continuous Bar Code Read*. If you enable this mode, always orient scanner at the same distance and angle (perpendicular).

***Disable Multicode Mode**
(00h)



Enable Multicode Mode
(01h)

Multicode Expression

Parameter # F1h, 95h

Use this feature to program a multicode expression for *Multicode Mode* (grid method). The default is 1, which indicates any bar code.

To set the multicode expression:

1. Scan the bar code below.
2. Scan bar codes from the *Alphanumeric Keyboard on page 11-91* to define the expression.
3. Scan *End of Message on page 11-100*.

Multicode Expression

Multicode Expression Syntax: [n] [Element 1]; [Element 2]; ... [Element n];

Where *n* is the number of elements in the overall expression.

The multicode expression describes the bar code(s) that the decoder can expect to find in an image. Each element represents one bar code in the SE4500's field of view. The order of elements in the expression is the order in which bar code data from each element transmits to the host. Elements are defined using one or more of the following methods:

By Region. This type of element limits decoding to a specific area within the SE4500's field of view. Region coordinates are defined as the top left and bottom right corners of the region, expressed in percentages of the field of view. These can range from 0% to 100%, or 0x00 to 0x64 in hex, for both horizontal and vertical axes. A region element is constructed as:

[R] [4] [Top, Left] [Bottom, Right]

Where:

- [R] is the character R
- [4] is 0x04, indicating there are four bytes thereafter to describe the region
- [Top, Left] are two values representing the top left corner of the region
- [Bottom, Right] are two values representing the bottom right corner of the region

Note that the top of the field of view used for multicode expressions is the topmost part of the field of view when the SE4500's chassis rests on a horizontal surface.

By Code Type. An element can specify a specific bar code symbology to find and decode somewhere in the field of view. A code type element is constructed as:

[C] [2] [Code Type]

Where:

- [C] is the character C
- [2] is 0x02, indicating there are two bytes thereafter to describe the code type

- [Code Type] is the desired symbology's parameter number (see *Chapter 9, Symbologies*). For single-byte parameter numbers, extend the value to two bytes by adding 00 before the parameter number.

Notes

When defining multicode expressions consider the following:

- Use the Code Type specifier if there are bar codes of more than one code type in view.
- Always use the Region specifier when there are multiple bar codes of the same code type.
- When transmission order is important (the first element in the expression transmits first), use either type to define the order.
- When there are unwanted bar codes in view, filter them out in one of two ways:
  - Use Code Type to specify only the target bar codes.
  - Use Region to identify only the target bar codes.
- If the expression does not contain a Region specifier, scanning angle and distance do not matter. If you specify a region you must scan in a fixed orientation and at a fixed distance. Because of this, it is preferable to use the Code Type specifier rather than the Region specifier.
- When defining regions:
  - Defining a region much larger than the bar code improves tolerance to scan distance and angle, but can cause a decode of a nearby bar code instead of the target bar code. Therefore, for best performance define larger regions when only a few bar codes are in view and those in view are widely separated.
  - Defining a region close to (or smaller than) the target bar code improves the probability of decoding this bar code rather than one nearby, but scan distance and angle must be more accurate. Therefore, for best performance define small regions when many bar codes are in view or those in view are close together.
- Use Region elements to improve decode speeds by reducing the image area to search for the target bar code.
- Specifying Code Type may also improve decode speeds for some code types.
- Although you can scan parameter bar codes when multicode mode is enabled, be aware of the following: If the multicode expression defined a region(s), to scan a parameter bar code you must position the bar code within the first region defined in the expression. In some cases, this first region is not the center of the image and aiming at the parameter bar code does not result in a successful decode.

The following examples show the multicode expressions in both hex and decimal formats, however in the sample figures the values are decimal. Be sure to use the correct base numbering system when creating an expression. A region specified as 0x00 0x00 0x64 0x32 represents a region with coordinates of Top-Left (0,0) and Bottom Right (100,50).

Example 1

To decode one Code 128 bar code anywhere in the image (even when bar codes of other types are in view), as in *Figure 4-1*, program the expression as follows:

The expression in decimal is (formatted for readability):

1 C 2 0 8 ;

To program the expression via scanning parameters the sequence is (spaces are for readability):

[MultiCode-Expression] 01 C 02 00 08 ; [End Of Message]

To program the expression via host command (SSI/SNAPI) the sequence is:

0x01 0x43 0x02 0x00 0x08 0x3b

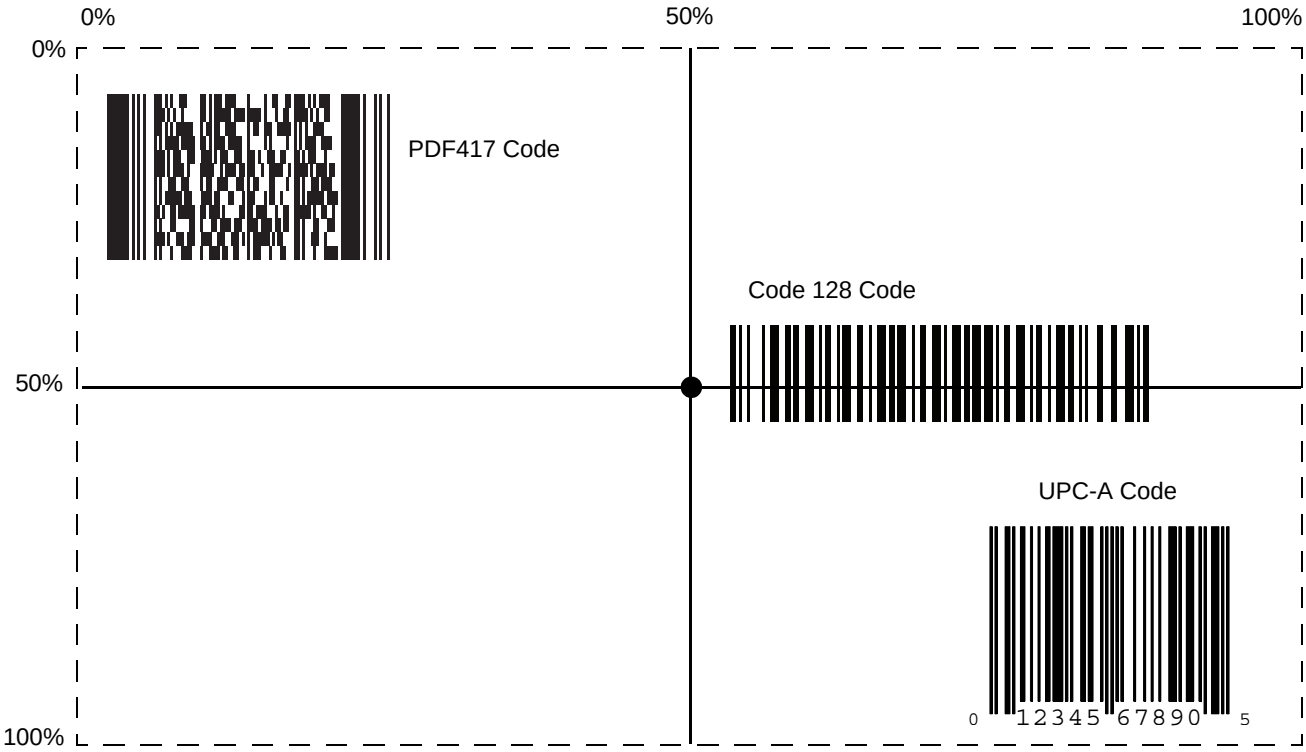


Figure 4-1 *Multicode Expression Example 1*

Example 2a

To decode a Code128 (Code Type=8) on the top half of the image and a PDF417 (Code Type=15) on the bottom half of the image, as in *Figure 4-2*, program the expression as follows:

The expression in decimal is (formatted for readability):

2 C 2 0 8 R 4 0 0 100 50 ; C 2 0 15 R 4 0 50 100 100 ;

To program the expression via scanning parameters the sequence is:

[MultiCode-Expression] 02 C 02 00 08 R 04 00 00 64 32 ; C 02 00 0F R 04 00 32 64 64 ; [End Of Message]

To program the expression via host command (SSI/SNAPI) the sequence is:

0x02 0x43 0x02 0x00 0x08 0x52 0x04 0x00 0x00 0x64 0x32 0x3B 0x43 0x02 0x00 0x0F 0x52 0x04 0x00 0x32 0x64 0x64 0x3B

Example 2b

In *Figure 4-2*, if the bottom PDF417 bar code must transmit first, reverse the sequence of the two bar codes:

The expression in decimal is (formatted for readability):

2 C 2 0 15 R 4 0 50 100 100 ; C 2 0 8 R 4 0 0 100 50 ;

To program the expression via scanning parameters the sequence is:

[MultiCode-Expression] 02 C 02 00 0F R 04 00 32 64 64 ; C 02 00 08 R 04 00 00 64 32 ; [End Of Message]

To program the expression via host command (SSI/SNAPI) the sequence is:

0x02 0x43 0x02 0x00 0x0F 0x52 0x04 0x00 0x32 0x64 0x64 0x3B 0x43 0x02 0x00 0x08 0x52 0x04 0x00 0x00 0x64 0x32 0x3B

Figure 4-2 *Multicode Expression Example 2*

Example 3

To decode the set of three bar codes while excluding the center Code 128 bar code, as in *Figure 4-3*, the expression is:

The expression in decimal is (formatted for readability):

3 C 2 0 15 R 4 0 0 50 50 ; C 2 [F0 24] R 4 70 0 100 40 ; C 2 0 8 R 4 65 60 100 100 ;

To program the expression via scanning parameters the sequence is:

[MultiCode-Expression] 03 C 02 00 0F R 04 00 00 32 32 ; C 02 F0 24 R 04 46 00 64 28 ;
C 02 00 08 R 04 41 3C 64 64 ; [End Of Message]

To program the expression via host command (SSI/SNAPI) the sequence is:

0x03 0x43 0x02 0x00 0x0F 0x52 0x04 0x00 0x00 0x32 0x32 0x3B 0x43 0x02 0xF0 0x24 0x52 0x04 0x46 0x00 0x64 0x28 0x3B 0x43 0x02 0x00 0x08 0x52 0x04 0x41 0x3C 0x64 0x64 0x3B

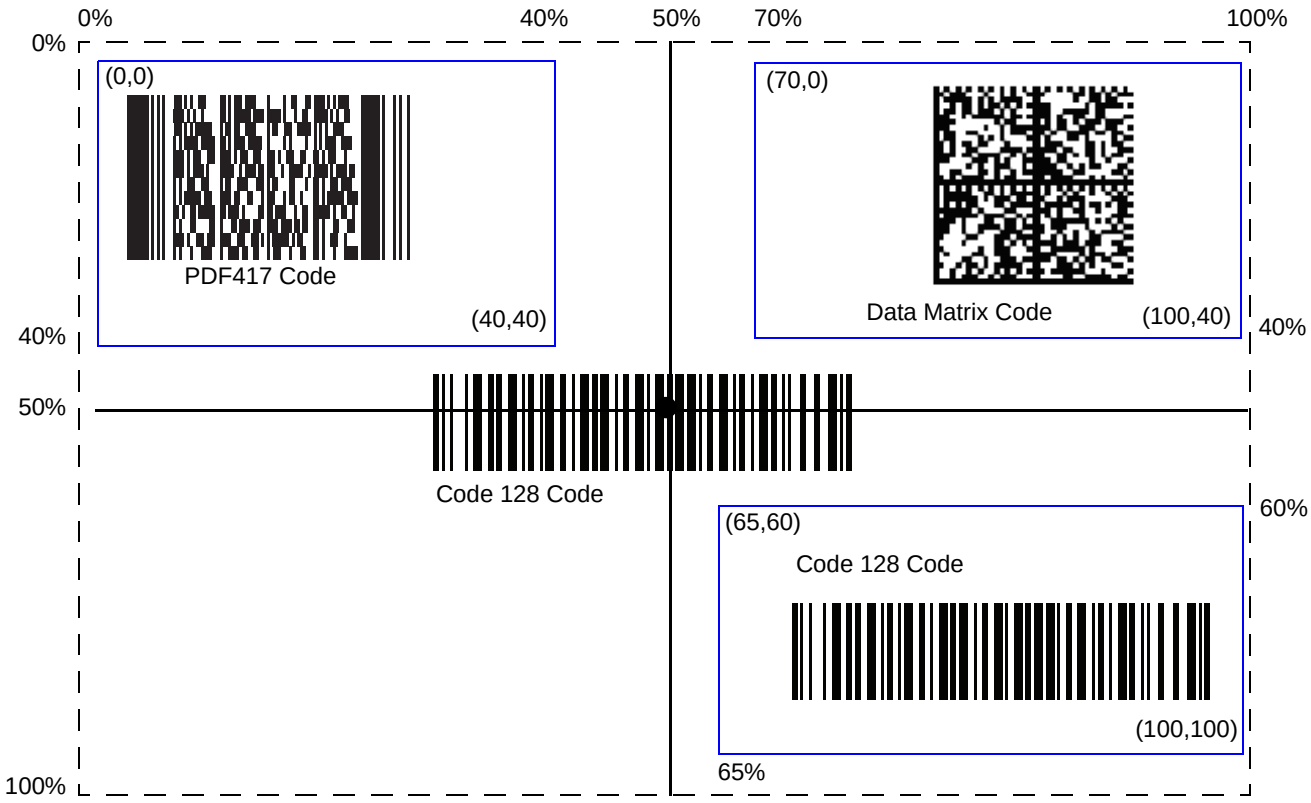


Figure 4-3 *Multicode Expression Example 3*

Multicode Troubleshooting

Troubleshooting Multicode Expression Programming

Use the following suggestions if encountering problems programming a multicode expression:

- Ensure the expression is valid. Invalid expressions are rejected during programming. When an expression is rejected the previous expression remains intact. If after programming the expression the decoder can still decode any bar code, the expression was possibly rejected.
- When programming the multicode expression via parameter bar code, the PL4507 generates beeps. If any of the following beeps do not sound during programming, an error occurred (see *Table 1-4 on page 1-5* for error indicators):
  - Scanning the **Multicode Expression** bar code produces a two-tone (same pitch) beep.
  - Scanning each value of the expression produces a two-tone (same pitch) beep.
  - Scanning the **End Of Message** bar code produces a four-tone (high-low-high-low) beep.
- Check the expression for syntax errors.
- Try programming a simple expression to ensure the syntax is correct. See *Examples of Simple Multicode Expressions*.
- Review *Notes on page 4-18* for additional hints.

Troubleshooting Multicode Mode Scanning and Decoding

Use the following suggestions if encountering problems using multicode mode:

- If the PL4507 appears to decode any single bar code instead of the intended multiple bar codes, ensure you enabled *Multicode Mode on page 4-16*. Programming the multicode expression does not enable multicode mode.
- When specifying **Region**, ensure:
  - Coordinates are within range the 0-100 decimal (or 0x00 - 0x64 hexadecimal).
  - Top, Left is above Bottom, Right. Top, Left is 0,0 (0x00, 0x00 hexadecimal), and Bottom, Right is 100,100 (0x64, 0x64 hexadecimal).
  - Regions for two or more bar codes do not overlap.
- When specifying **Code Type** ensure the PL4507 supports the code type. Try decoding a single bar code without using multicode. If it does not decode try enabling the bar code type. See *Chapter 9, Symbologies*.
- Experiment with simpler expressions, then add to it until you discover the source of the error. For example try the simplest expression (see *Examples of Simple Multicode Expressions*) and make sure you can scan a single bar code. If so, extend the expression by adding a second bar code, specifying a region, or specifying the code type. Verify that the PL4507 can decode this new expression. Continue adding to the expression until it fails to decode as expected, indicating the source of the error.
- Review *Notes on page 4-18* for additional hints.

Examples of Simple Multicode Expressions

The simplest multicode expression is:

- One bar code of any type, anywhere in the image.
- To program this use: **[MultiCode-Expression] 01 ; [End Of Message]**

Another simple multicode expression is:

- One Code 128 bar code, anywhere in the image.
- To program this use: **[MultiCode-Expression] 01 C 02 00 08 ; [End Of Message]**

Chapter 5 Imager Preferences

Introduction

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

The decoder ships with the settings shown in the *Imager Preferences Default Table on page 5-2* (also see *Appendix A, Standard Default Parameters* for all host and miscellaneous defaults). If the default values suit requirements, programming is not necessary.

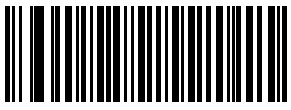
There are two ways to change a parameter value:

- Scan 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 appear in this chapter below the parameter title, and options appear in parenthesis beneath the accompanying bar codes. See the *Simple Serial Interface (SSI) Programmer’s Guide* for detailed instructions for changing parameter values using this method.

✓ ***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 you can see the bar code 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, scan the *Set Default Parameter on page 4-4*. Throughout the programming bar code menus, asterisks (*) indicate default values.



* Indicates Default — ***Enable Decode Aiming Pattern** — Feature/Option

(02h) — Option Hex Value for programming via SSI command

Scanning Sequence Examples

In most cases scanning one bar code sets the parameter value. For example, to disable the decode aiming pattern, scan the **Disable Decode Aiming Pattern** bar code listed under *Decode Aiming Pattern on page 5-6*. 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 scanning several bar codes. See these parameter descriptions for this procedure.

Errors While Scanning

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

Imager Preferences Parameter Defaults

Table 5-1 lists defaults for imager preferences parameters. To change any option, scan the appropriate bar code(s) provided in *Imager Preferences on page 5-4*.

NOTE See *Appendix A, Standard Default Parameters* for all user preferences, hosts, symbologies, and miscellaneous default parameters

Table 5-1 *Imager Preferences Default Table*

Parameter	Parameter Number	Default	Page Number
Imaging Options			
Decoding Autoexposure	F0h 29h	Enable	*5-5*
Decoding Illumination	F0h 2Ah	Enable	*5-6*
Decode Aiming Pattern	F0h 32h	Enable	*5-6*
Aim Brightness	F0h 9Ch	0	*5-7*
Illumination Brightness	F0h 9Dh	10	*5-7*
Low Light Enhancement	F1h 64h	Disable	*5-8*
Presentation Mode Field of View	F1h 61h	Default (Reduced)	*5-8*
Frame Rate	F1h A2h	Auto	*5-9*
Image Capture Autoexposure	F0h 68h	Enable	*5-10*
Image Capture Illumination	F0h 69h	Enable	*5-10*
Gain	F4h F0h A7h	100	*5-11*
Exposure Time	F4h F1h 37h	10 (1 ms)	*5-11*
LED Illumination	F0h ADh	Internal LED Illumination	*5-12*

Table 5-1 *Imager Preferences Default Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Snapshot Mode Timeout	F0h 43h	0 (30 seconds)	5-14
Snapshot Aiming Pattern	F0h 2Ch	Enable	5-14
Presentation Snapshot by Motion	F1h 87h	Disable	5-15
Continuous Snapshot	F1h 88h	Disable	5-15
Image Cropping	F0h 2Dh	Disable	5-16
Crop to Pixel Addresses	F4h F0h 3Bh; F4h F0h 3Ch; F4h F0h 3Dh; F4h F0h 3Eh	0 top, 0 left, 479 bottom, 751 right	5-17
Image Resolution	F0h 2Eh	Full	5-18
Image Brightness (Target White)	F0h 86h	180	5-19
Image File Format Selection	F0h 30h	JPEG	5-20
JPEG Image Options	F0h 2Bh	Quality	5-20
JPEG Quality Value	F0h 31h	65	5-21
JPEG Size Value	F1h 31h	40 (41K)	5-21
Image Enhancement	F1h 34h	Off	5-22
Image Edge Sharpening	F1h 98h	Off	5-23
Image Contrast Enhancement	F1h 9Ah	Off	5-24
Image Rotation	F1h 99h	0	5-25
Bits per Pixel (BPP)	F0h 2Fh	8 BPP	5-26
Signature Capture	5Dh	Disable	5-27
Signature Capture Image File Format Selection	F0h 39h	JPEG	5-28
Signature Capture Bits per Pixel (BPP)	F0h 3Ah	8 BPP	5-29
Signature Capture Width	F4h F0h 6Eh	400	5-29
Signature Capture Height	F4h F0h 6Fh	100	5-30
Signature Capture JPEG Quality	F0h A5h	65	5-30
Video View Finder	F0h 44h	Disable	5-30
Target Video Frame Size	F0h 48h	2200 bytes	5-31
Video View Finder Image Size	F0h 49h	1700 bytes	5-31
Video Resolution	F0h 9Bh	1/4 resolution	5-32

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 decoder has three modes of operation:

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

Decode Mode

By default, upon a trigger event, the decoder attempts to locate and decode bar codes within its field of view. The decoder remains in this mode as long as the trigger is active, until it decodes a bar code, or it reaches the *Decode Session Timeout on page 4-14*.

Snapshot Mode

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

In Snapshot Mode, the decoder turns on the Symbol SE4500's laser aiming pattern to highlight the area to capture in the image. The next trigger event instructs the decoder to capture a high quality image and transmit it to the host. A short time may pass (less than 2 seconds) between trigger activation and image capture as the decoder adjusts to the lighting conditions. Hold the decoder steady until image capture, denoted by a single beep.

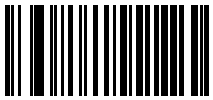
If a trigger event does not occur within the Snapshot Mode Timeout period, the decoder returns to Decode Mode. Use *Snapshot Mode Timeout on page 5-14* to adjust this timeout period. The default timeout period is 30 seconds.

To disable the laser aiming pattern during Snapshot Mode, see *Snapshot Aiming Pattern on page 5-14*.

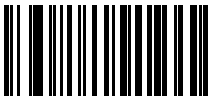
Use *Video View Finder on page 5-30* to enable **Snapshot with Viewfinder Mode**. In this mode the decoder behaves as a video camera until the trigger activates, at which time a Snapshot occurs as described above.

Video Mode

In this mode the decoder behaves as a video camera as long as the trigger is active. Upon trigger release, the decoder returns to Decode Mode. Scan the **Video Mode** bar code to temporarily enter Video Capture Mode.



Snapshot Mode



Video Mode

Decoding Autoexposure

Parameter # F0h 29h

Select **Enable Decoding Autoexposure** to allow the SE4500 to control gain settings and exposure (integration) time to best capture an image for decode mode.

Select **Disable Decoding Autoexposure** to manually adjust the gain and exposure time (see *Gain* and *Exposure Time*). Motorola recommends this option only for advanced users with difficult decoding situations.

***Enable Decoding Autoexposure (01h)**

Disable Decoding Autoexposure (00h)

Decoding Illumination

Parameter # F0h 2Ah

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

Enabling illumination usually results in superior images. The effectiveness of 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 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.

NOTE If *Picklist Mode on page 4-14* is enabled, the decode aiming pattern turns on even when disabled.

***Enable Decode Aiming Pattern**
(02h)

Disable Decode Aiming Pattern
(00h)

Aim Brightness

Parameter # F1h 9Ch

This feature sets the brightness of the aim pattern. The default is 0, which indicates that the aim pattern is always on in between camera exposures. For values above 0, each increment of the brightness value increments the aim duration 0.5 ms.

To program Aim Brightness, scan this bar code followed by three numeric bar codes in Appendix D, Numeric Bar Codes that correspond to the value representing brightness. Settings range from 0 to 255. The maximum aim duration is limited by the frame time, so the recommended range is 0 to 30 when the frame rate is set to 60 fps.

Aim Brightness

Illumination Brightness

Parameter # F1h 9Dh

This feature sets the brightness of the illumination by altering LED power. The default is 10, which is maximum LED brightness. For values from 1 to 10, LED brightness varies from lowest to highest level of brightness.

To program Illumination Brightness, scan this bar code followed by two numeric bar codes in Appendix D, Numeric Bar Codes that correspond to the value of desired illumination brightness. For example, to set Illumination Brightness to 6, scan the bar code below followed by the 0 and 6 bar codes.

Illumination Brightness

Low Light Enhancement

Parameter # F1h 64h

In presentation mode, selecting **Enable Low Light Enhancement** causes illumination to remain on at a low power in low lighting conditions. When the SE4500 detects an object in its field of view, it turns on illumination full power. Select **Disable Low Light Enhancement** to prevent illumination from remaining on under low lighting conditions

Enable Low Light Enhancement (01h)

***Disable Low Light Enhancement (00h)**

Presentation Mode Field of View

Parameter # F1h 61h

In presentation mode, by default the decoder searches for a bar code in a smaller region around the aiming pattern's center cross to speed search time.

To use a full field of view, scan **Presentation Mode Full Field of View**. This allows the decoder to search the larger area of the aiming pattern.

***Presentation Mode Default Field of View (01h)**

Presentation Mode Full Field of View (02h)

Frame Rate

Select an option to control the rate at which frames are captured and transmitted. When capturing images, using lower frame rates can improve image brightness.

NOTE The aiming pattern appears to blink when the frame rate is 30 frames per second (fps) or lower.

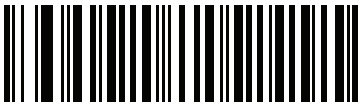
Settings for frame rate are:

- Auto - The PL4500 controls the frame rate and changes dynamically based on the mode of operation to provide optimal performance.
- 60 fps - The frame rate is fixed at 60 frames per second
- 30 fps - The frame rate is fixed at 30 frames per second
- 15 fps - The frame rate is fixed at 15 frames per second
- 10 fps - The frame rate is fixed at 10 frames per second

***Auto**
(00h)

60 fps
(01h)

30 fps
(02h)



15 fps
(03h)

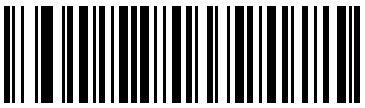
10 fps
(04h)

Image Capture Autoexposure

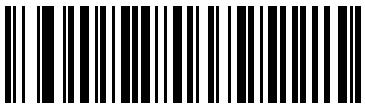
Parameter # F0h 68h

Select **Enable Image Capture Autoexposure** to allow the decoder to control gain settings and exposure (integration) time to best capture an image for snapshot mode.

Select **Disable Image Capture Autoexposure** to manually adjust the gain and exposure time (see *Gain* and *Exposure Time*). Motorola recommends this option only for advanced users with difficult image capture situations.



***Enable Image Capture Autoexposure (01h)**



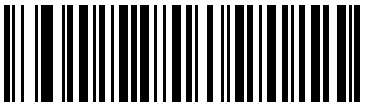
Disable Image Capture Autoexposure (00h)

Image Capture Illumination

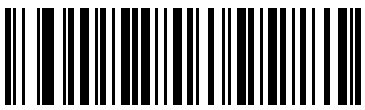
Parameter # F0h 69h

Selecting **Enable Image Capture Illumination** causes illumination to turn on during every image capture. Disable illumination to prevent the decoder from using illumination.

Enabling illumination usually results in superior images. The effectiveness of 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 8-bit 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, scan the bar code below followed by 3 bar codes from Appendix D, Numeric Bar Codes, in the range of 1 to 100, representing the value. The default is 100.

Set Gain

Exposure Time

Parameter # F4h F1h 37h

This parameter only applies when Decoding or Image Capture Autoexposure is disabled. It configures the exposure for both Decode and Snapshot modes.

Each integer value represents 100 µs worth of exposure. The default value is 10 which results in an exposure setting of 1 ms.

To set the Exposure Time parameter, scan **Fixed Exposure** followed by four numeric bar codes representing the value in the range of 1 - 1000. Insert leading zeros if necessary. For example, to set a Fixed Exposure value of 9.9 ms, scan 0, 0, 9, 9. See Appendix D, Numeric Bar Codes for numeric bar codes.

Exposure Time
(4 digits)

LED Illumination

Parameter # F0h ADh

Select the type of LED illumination to use:

- **Internal Illumination** - use the SE4500's illumination.
- **External Illumination** - assert the ILLUM_EN_OUT signal continuously during a decode session, and do not use the SE4500's illumination.
- **Internal and External Illumination** - use the SE4500's illumination and assert the ILLUM_EN_OUT signal continuously during a decode session.
- **Internal Illumination Matches Engine** - use the SE4500's illumination and pulse the ILLUM_EN_OUT signal to match the engine's illumination duration for each frame.
- **Alternating Internal and External Illumination** - use the SE4500's illumination and ILLUM_EN_OUT signal on alternating frames.

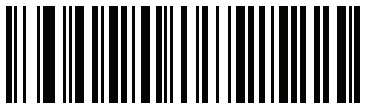
This parameter only applies for decoding if *Decoding Illumination on page 5-6* is enabled, or for image capture if *Image Capture Illumination on page 5-10* is enabled. Disabling Decoding Illumination or Image Capture Illumination turns off all illumination for that mode, regardless of this LED Illumination setting.

LED Illumination (continued)

***Internal Illumination**
(00h)

External Illumination
(01h)

Internal and External Illumination
(02h)



Internal Illumination Matches Engine
(04h)

Alternating Internal and External Illumination
(05h)

Snapshot Mode Timeout

Parameter # F0h 43h

This parameter sets the amount of time the decoder remains in Snapshot Mode. The decoder exits Snapshot Mode upon a trigger event, or when the Snapshot Mode Timeout elapses. To set this timeout value, scan 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.

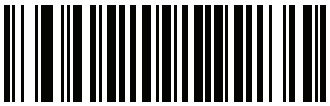
***Enable Snapshot Aiming Pattern (01h)**

Disable Snapshot Aiming Pattern (00h)

Presentation Snapshot by Motion

Parameter # F1h 87h

When the Symbol SE4500 detects an object in its field of view, and the object stops moving, it attempts to capture a high quality image and transmit it to the host. This applies to snapshot mode only. Select a bar code below to enable or disable this feature.



***Disable Presentation Snapshot by Motion (00h)**

Enable Presentation Snapshot by Motion (01h)

Continuous Snapshot

Parameter # F1h 88h

Select **Enable** to stay in Snapshot Mode, and **Disable** to return to normal decode mode after image capture. This only applies in Presentation Snapshot by Motion mode.

If you enable this, you can not scan parameter bar codes to exit this mode. To restore normal decode mode, power cycle the Symbol PL4507, then scan the **Disable Continuous Snapshot** bar code.

***Disable Continuous Snapshot (00h)**

Enable Continuous Snapshot (01h)

Image Cropping

Parameter # F0h 2Dh

This parameter crops a captured image. Select **Disable Image Cropping** to present the full 742 x 480 pixels. Select **Enable** to crop the image to the pixel addresses set in *Crop to Pixel Addresses on page 5-17*.

NOTE The decoder has a cropping resolution of 4 pixels. Setting the cropping area to less than 3 pixels transfers the entire image.

Enable Image Cropping
(01h)

***Disable Image Cropping**
(Use Full 742 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 (751,479) to crop to.

Columns are numbered from 0 to 751, 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 = 744, Right = 751

To set the pixel address to crop to, scan each Pixel Address bar code followed by three bar codes from Appendix D, Numeric Bar Codes which represent the value. Include leading zeros, so to enter a value of 3, for example, scan **0**, **0**, **3**.

NOTE The decoder has a minimum cropping resolution of four pixels; increment and decrement cropping addresses in multiples of four. Other values are rounded up. For example, choosing to crop from the top at addresses 0, 1, or 2 (removing 1, 2, or 3 pixels) has the same result as cropping at address 3; this removes four rows from the top.

Top Pixel Address
(0 - 479 Decimal)

Left Pixel Address
(0 - 751 Decimal)

Bottom Pixel Address
(0 - 479 Decimal)

Right Pixel Address
(0 - 751 Decimal)

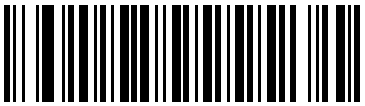
Image Resolution

Parameter # F0h 2Eh

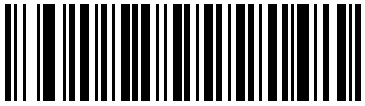
This option alters image resolution before compression. Rows and columns are removed from the image, resulting in a smaller image containing the original content with reduced resolution.

Select one of the following values:

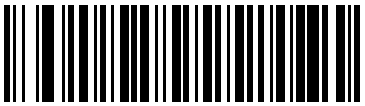
Resolution Value	Uncropped Image Size
Full	752 x 480
1/2	376 x 240
1/4	188 x 120



***Full Resolution (00h)**



1/2 Resolution (01h)



1/4 Resolution (03h)

Image Brightness (Target White)

Parameter # F0h 86h

This parameter sets the Target White value used in Snapshot and Video modes when using autoexposure. White and black are defined as 255 decimal and 0, respectively. Setting the value to the default of 180 results in a white level of ~180 for the image.

To set the Image Brightness parameter, scan **Image Brightness** below followed by three numeric bar codes representing the value. Include leading zeros. For example, to set an Image Brightness value of 99, scan 0, 9, 9. See Appendix D, Numeric Bar Codes for numeric bar codes.

***180**

Image Brightness (3 digits)

Image File Format Selector

Parameter # F0h 30h

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

BMP File Format (03h)

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

TIFF File Format (04h)

JPEG Image Options

Parameter # F0h 2Bh

JPEG images can be optimized for either size or for quality. Scan the **Quality Selector** bar code to enter a quality value; the decoder then selects the corresponding image size. Scan the **Size Selector** bar code to enter a size value; the decoder 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 # F1h 31h

If you select JPEG Quality Selector, scan 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 you select JPEG Size Selector, scan **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 Enhancement

Parameter # F1h 34h

This feature uses a combination of edge sharpening and contrast enhancement to produce an image that is visually pleasing. If you select **User**, also set the *Image Edge Sharpening on page 5-23* and *Image Contrast Enhancement on page 5-24* to enhance the image.

The levels of image enhancement are:

- Off (0) - Default
- Low (1)
- Med (2)
- High (3)
- User (4).

***Off**
(0)

Low
(1)

Medium
(2)

High
(3)

User
(4)

Image Edge Sharpening

Parameter # F1h 98h

This feature uses an edge sharpening technique, and only applies if you set the *Image Enhancement* parameter to **User**. To set this parameter, scan the **Image Edge Sharpening** bar code, followed by three numeric bar codes in Appendix D, Numeric Bar Codes that represent the image edge sharpening value. Alternatively, to set a recommended value, scan one of the value bar codes below.

Recommended settings are:

- Off (0) - Default
- Low (30)
- Med (75)
- High (100).

Image Edge Sharpening

***Off**
(0)

Low
(30)

Medium
(75)

High
(100)

Image Contrast Enhancement

Parameter # F1h 9Ah

Enable this feature to enhance the contrast of an image. This parameter only applies if you set the *Image Enhancement* parameter to **User**.

***Disable**
(00h)

Enable
(01h)

Image Rotation

Parameter # F1h 99h

This parameter controls the rotation of the image by 0, 90,180, or 270 degrees.

***Rotate 0°**
(00h)

Rotate 90°
(01h)

Rotate 180°
(02h)

Rotate 270°
(03h)

Bits per Pixel

Parameter # F0h 2Fh

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

1 BPP
(00h)

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 and converts the image to a BMP, JPEG, or TIFF file format. The output data includes the file descriptor followed by the formatted signature image.

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, scan 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 decoder 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 1 BPP for a black and white image, 4 BPP to assign 1 of 16 levels of grey to each pixel, or 8 BPP to assign 1 of 256 levels of grey to each pixel. The decoder ignores these settings for JPEG files, which always use 8 BPP.

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 requires a 4 to 1 aspect ratio of width to height.

To set the width of the signature capture box, scan 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 752 decimal.

Signature Capture Width
(Default: 400)
(001 - 752 Decimal)

Signature Capture Height

Parameter # F4h F0h 6Fh

To set the height of the signature capture box, scan 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

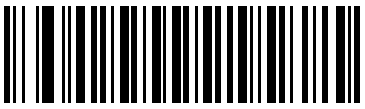
Scan the **JPEG Quality Value** bar code followed by 3 bar codes from Appendix D, Numeric Bar Codes corresponding to a value from 005 to 100, where 100 represents the highest quality image.

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 transmit per second. Selecting a smaller value transmits more frames per second but reduces video quality; selecting a larger value increases video quality but slows transmission.

To set the Target Video Frame Size, scan the bar code below followed by two bar codes from Appendix D, Numeric Bar Codes corresponding to the 100-byte value from 800 to 20,000 bytes. For example, to select 1500 bytes, enter 1, 5. To select 900 bytes, enter 0, 9. The default is 2200 bytes.

Target Video Frame Size

Video View Finder Image Size

Parameter # F0h 49h

Select the number of 100-byte blocks. Values range from 800 to 12,000 bytes. Selecting a smaller value transmits more frames per second; selecting a larger value increases video quality.

To set the Video View Finder Imager Size, scan the bar code below followed by two bar codes from *Appendix D, Numeric Bar Codes* corresponding to the 100-byte value from 800 to 12,000 bytes. For example, to select 1500 bytes, enter 1, 5. To select 900 bytes, enter 0, 9. The default is 1700 bytes.

Video View Finder Image Size

Video Resolution

Parameter # F1h 9Bh

This parameter alters the video resolution before transmission. Rows and columns are removed from the image, resulting in a smaller video image containing the original content with reduced resolution.

Select one of the following values:

Resolution Value	Video Image Size
Full	752 x 480
1/2	376 x 240
1/4	188 x 120

Full Resolution
(00h)

1/2 Resolution
(01h)

***1/4 Resolution**
(03h)

Chapter 6 SSI Interface

Introduction

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 communication between the decoder and host occurs over the hardware interface lines using the SSI protocol. Refer to 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 that the SSI protocol allows for any transaction is 257 (255 bytes + 2 byte checksum).

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

SSI performs the following 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 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). Parameter settings can control the format of the transmitted data.

The decoder can 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. *SSI Transactions on page 6-3* describes the required sequence of messages in specific cases.

Table 6-1 lists all the SSI opcodes the decoder supports. 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 6-1 *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 the decoder supports.
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 REQUEST_REVISION contains decoder's software/hardware configuration.
REQUEST_ID	H	0xA3	Request the decoder's serial number.
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.

For details of the SSI protocol, refer to the *Simple Serial Interface Programmer's Guide* (72-40451-xx).

SSI Transactions

General Data Transactions

ACK/NAK Handshaking

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

Following is an example of a problem which can occur if you disable ACK/NAK handshaking:

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

If you enable ACK/NAK handshaking, 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.

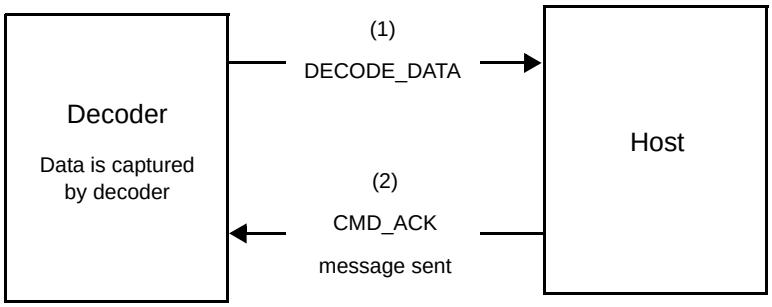
Transfer of Decode Data

The Decode Data Packet Format parameter controls how decode data is sent to the host. Set this parameter to send the data in a DECODE_DATA packet. Clear this parameter to transmit the data as raw ASCII data.

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

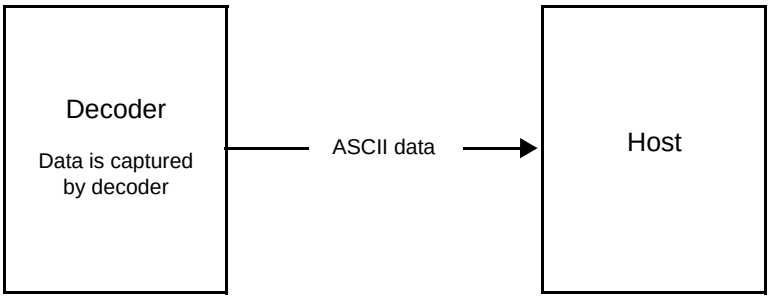
ACK/NAK Enabled and Packeted Data

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.



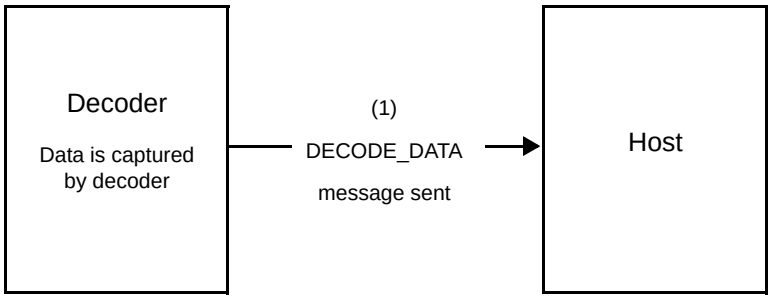
ACK/NAK Enabled and Unpacketed ASCII Data

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.



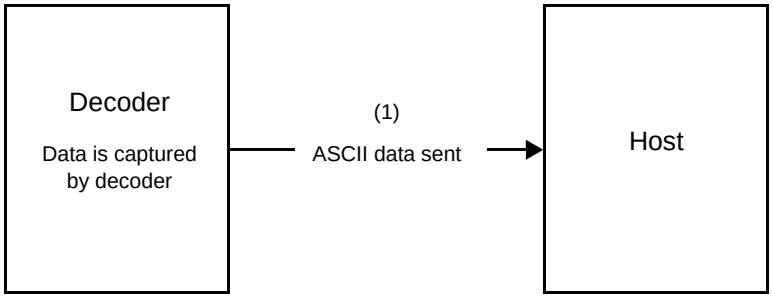
ACK/NAK Disabled and Packeted DECODE_DATA

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 the first byte of a communication message may be lost during the decoder wakeup sequence.

ACK/NAK Option

Enable or disable ACK/NAK handshaking. This handshaking is enabled by default and Motorola recommends leaving it enabled. Disabling this handshaking can cause 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 it 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 determines how long to wait for a handshaking response before trying again, or aborting any further attempts. Set the same value for both the host and decoder.

NOTE You can temporarily change the Serial Response Time-out when the host takes longer to process an ACK or longer data string. Motorola does not recommend frequent permanent changes 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 you use PARAM_SEND to change these serial parameters, the ACK response to the PARAM_SEND uses the previous values for these parameters. The new values then take effect for the next transaction.

Errors

The decoder issues a communication error 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

When not using hardware handshaking, space messages sufficiently apart. The host must not communicate with the decoder if the decoder is transmitting.

When using hardware handshaking, 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. Removing power from the decoder discards temporary changes. Permanent changes are written to non-volatile memory. Frequent changes shorten the life of the non-volatile memory.

Using Time Delay to Low Power Mode with SSI

Time Delay to Low Power Mode on page 4-12 provides bar codes to select a general time delay. To program a more specific delay value, use an SSI command according to *Table 6-2*.

Table 6-2 *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

CAUTION With hardware handshaking disabled, the PL4507 wakes from low power mode upon receiving a character. However, the PL4507 does not process this character or any others it receives during the 7 ms period following wakeup. Wait at least 7 ms after wakeup to send valid characters.

Simple Serial Interface Default Parameters

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

Throughout the programming bar code menus, asterisks (*) indicate default values.

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 you can see the bar code clearly, and bars and/or spaces are not merging.

Table 6-3 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 **Restore Defaults* bar code on *page 4-4*.
- Download data through the device's serial port using SSI. Hexadecimal parameter numbers appear in this chapter below the parameter title, and options appear in parenthesis beneath the accompanying bar codes. Refer to the *Simple Serial Interface (SSI) Programmer's Guide* for detailed instructions for changing parameters using this method.

NOTE See *Appendix A, Standard Default Parameters* for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 6-3 *SSI Default Table*

Parameter	Parameter Number	Default	Page Number
Select SSI Host	N/A	N/A	*6-9*
Baud Rate	9Ch	9600	*6-10*
Parity	9Eh	None	*6-11*
Check Parity	97h	Disable	*6-12*
Software Handshaking	9Fh	ACK/NAK	*6-12*
Host RTS Line State	9Ah	Low	*6-13*
Decode Data Packet Format	EEh	Send Raw Decode Data	*6-13*
Host Serial Response Time-out	9Bh	2 sec	*6-14*

Table 6-3 *SSI Default Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Host Character Time-out	EFh	200 msec	*6-15*
Multipacket Option	F0h 4Eh	Option 1	*6-16*
Interpacket Delay	F0h 4Fh	0 ms	*6-17*
Event Reporting			
Decode Event	F0h 00h	Disable	*6-18*
Boot Up Event	F0h 02h	Disable	*6-19*
Parameter Event	F0h 03h	Disable	*6-19*

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 baud rate setting of the host device. Otherwise, data may not reach the host device or may reach it in distorted form.

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

Baud Rate 19,200
(07h)

Baud Rate 38,400
(08h)

Baud Rate 57,600
(0Ah)

Baud Rate 115,200
(0Bh)

Baud Rate 230,400
(0Ch)

Baud Rate (continued)

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 data transmission in addition to the control hardware handshaking offers. Hardware handshaking is always enabled; you cannot disable it.

- **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, you can use the decoder 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 6-13*). 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)

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)

Interpacket Delay

Parameter # F0h, 4Fh

This parameter specifies the interpacket delay if you selected **Multipacket Option 3**.

To set the delay period (options are 0, 25, 50, 75, or 99 ms), scan one of the following bar codes.

NOTE Other values are available via SSI command.

***Minimum - 0 ms**
(00h)

Low - 25 ms
(19h)

Medium - 50 ms
(32h)

High - 75 ms
(4Bh)

Maximum - 99 ms
(63h)

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 6-4* and on the following pages by scanning the appropriate bar codes.

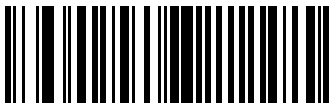
Table 6-4 *Event Codes*

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

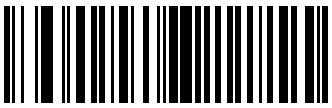
Decode Event

Parameter # F0h, 00h

When enabled, the decoder generates a message to the host upon a successful bar code decode. When disabled, no notification is sent.



Enable Decode Event (01h)

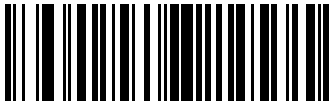


***Disable Decode Event (00h)**

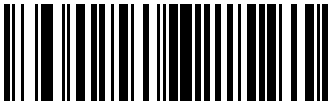
Boot Up Event

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)

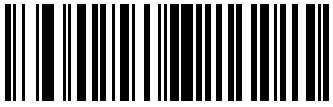


***Disable Boot Up Event**
(00h)

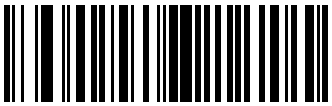
Parameter Event

Parameter # F0h, 03h

When enabled, the decoder generates a message to the host when one of the events specified in *Table 6-4 on page 6-18* occurs. When disabled, no notification is sent.



Enable Parameter Event
(01h)



***Disable Parameter Event**
(00h)

Chapter 7 Serial Interface

Introduction

This chapter describes how to set up the decoder with a serial host. The serial interface connects the decoder 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 7-2*, refer to the documentation for the host device to set communication parameters to match the host.

NOTE The decoder uses TTL signal levels, which interface with most system architectures. System architectures that use RS-232C signal levels require a conversion circuitry.

Throughout the programming bar code menus, asterisks (*) indicate default values.

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

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

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 you can see the bar code clearly, and bars and/or spaces are not merging.

CAUTION The PL4507 wakes from low power mode upon receiving a character. However, the PL4507 does not process this character or any others it receives during the 7 ms period following wakeup. Wait at least 7 ms after wakeup to send valid characters.

Serial Parameter Defaults

Table 7-1 lists the defaults for serial host parameters. To change any option, scan the appropriate bar code(s) provided in the Serial Host Parameters section beginning on *page 7-3*.

NOTE See *Appendix A, Standard Default Parameters* for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 7-1 *Serial Host Default Table*

Parameter	Default	Page Number
Serial Host Parameters		
Serial Host Types	Standard RS-232	*7-5*
Baud Rate	9600	*7-7*
Parity Type	None	*7-9*
Data Bits	8-Bit	*7-9*
Check Receive Errors	Enable	*7-10*
Hardware Handshaking	None	*7-11*
Software Handshaking	None	*7-13*
Host Serial Response Time-out	2 Sec	*7-15*
RTS Line State	Low RTS	*7-16*
Beep on <BEL>	Disable	*7-16*
Intercharacter Delay	0 msec	*7-17*
Nixdorf Beep/LED Options	Normal Operation	*7-18*
Ignore Unknown Characters	Send Bar Code	*7-18*

Serial Host Parameters

Various serial hosts use their own parameter default settings (*Table 7-2*). Selecting standard, ICL, Fujitsu, Wincor-Nixdorf Mode A, Wincor-Nixdorf Mode B, OPOS/JPOS, Olivetti, or Omron sets the defaults listed below.

Table 7-2 *Terminal-Specific Serial Defaults*

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 Nixdorf Mode B, if CTS is low, scanning is disabled. When CTS is high, scanning is enabled.**
****If Nixdorf Mode B is scanned without the decoder connected to the proper host, it may appear unable to scan. If this happens, scan a different serial host type within 5 seconds of cycling power to the decoder.**

Serial Host Parameters (continued)

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 7-3*. 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.

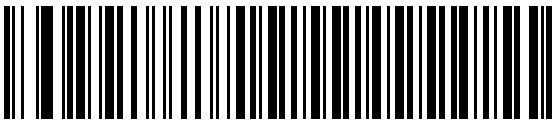
Table 7-3 *Terminal-Specific Code ID Characters*

Code Type	ICL	Fujitsu	Wincor-Nixdorf Mode A	Wincor-Nixdorf Mode B/ OPOS/JPOS	Olivetti	Omron
UPC-A	A	A	A	A	A	A
UPC-E	E	E	C	C	C	E
EAN-8/JAN-8	FF	FF	B	B	B	FF
EAN-13/JAN-13	F	F	A	A	A	F
Code 39	C <len>	None	M	M	M <len>	C <len>
Codabar	N <len>	None	N	N	N <len>	N <len>
Code 128	L <len>	None	K	K	K <len>	L <len>
I 2 of 5	I <len>	None	I	I	I <len>	I <len>
Code 93	None	None	L	L	L <len>	None
D 2 of 5	H <len>	None	H	H	H <len>	H <len>
UCC/EAN 128	L <len>	None	P	P	P <len>	L <len>
MSI	None	None	O	O	O <len>	None
Bookland EAN	F	F	A	A	A	F
Trioptic	None	None	None	None	None	None
Code 11	None	None	None	None	None	None
IATA	H<len>	None	H	H	None	None
Code 32	None	None	None	None	None	None

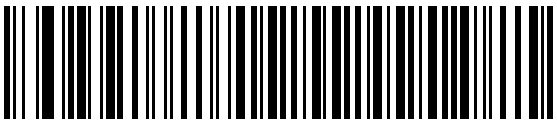
Serial Host Types

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

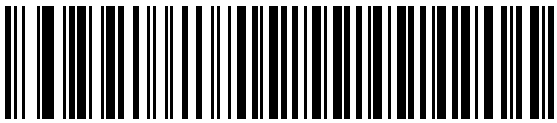
NOTE Scanning **Standard RS-232** activates the serial driver, but does not change port settings (e.g., parity, data bits, handshaking). Selecting another serial host type bar code changes these settings.



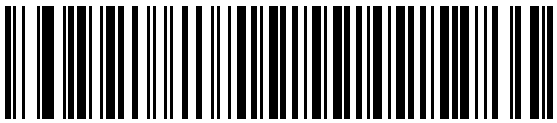
Standard RS-232



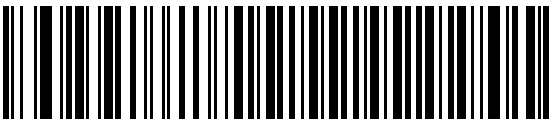
ICL Serial



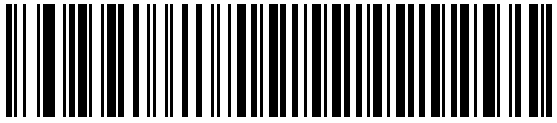
Wincor-Nixdorf Serial Mode A



Wincor-Nixdorf Serial Mode B

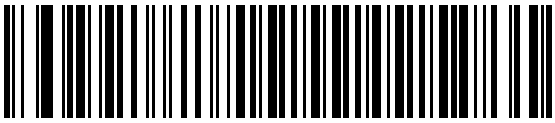


Olivetti ORS4500

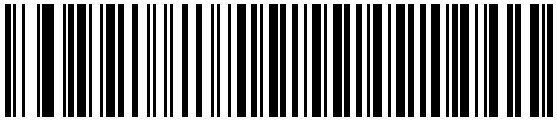


Omron

Serial Host Types (continued)



OPOS/JPOS



Fujitsu Serial

Baud Rate

Baud rate is the number of bits of data transmitted per second. Set the decoder'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 9600**

Baud Rate 19,200

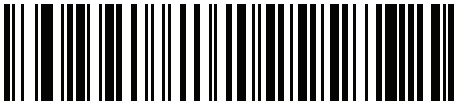
Baud Rate 38,400

Baud Rate 57,600

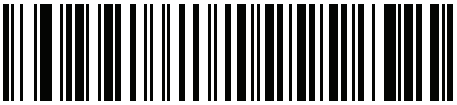
Baud Rate 115,200

Baud Rate 230,400

Baud Rate (continued)



Baud Rate 460,800

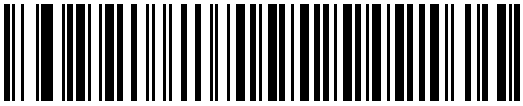


Baud Rate 921,600

Parity

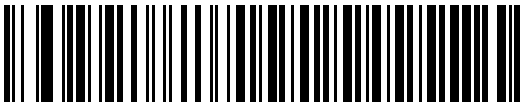
A parity check bit is the most significant bit of each ASCII coded character. Select the parity type according to host device requirements.

- Select **Odd** parity to set the parity bit value 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 to set the parity bit value 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**

Data Bits

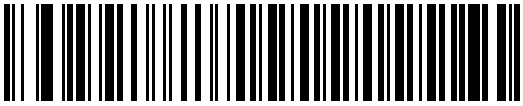
This parameter allows the decoder to interface with devices requiring a 7-bit or 8-bit ASCII protocol.

7-Bit

***8-Bit**

Check Receive Errors

Select whether or not to check the parity, framing, and overrun of received characters. The parity value of received characters is verified against the setting of *Parity on page 7-9*.



***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, scan data transmits as it becomes available. Select Standard RTS/CTS handshaking to transmit scan data according to the following sequence:

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

During data transmission, the CTS line should be asserted. If CTS is deasserted for more than 50 ms between characters, the decoder aborts transmission, sounds a transmission error, and discards the data.

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

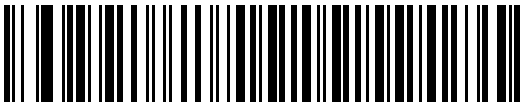
If hardware handshaking and software handshaking are both enabled, hardware handshaking takes precedence.

NOTE The DTR signal is jumpered to the active state.

- **None**: Scan this bar code to disable hardware handshaking.
- **Standard RTS/CTS**: Scan this bar code to select Standard RTS/CTS Hardware Handshaking.
- **RTS/CTS Option 1**: The decoder asserts RTS before transmitting and ignores the state of CTS. The decoder de-asserts RTS when transmission completes.
- **RTS/CTS Option 2**: RTS is always high or low (user-programmed logic level). However, the decoder waits for CTS to be asserted before transmitting data. If CTS is not asserted within Host Serial Response Time-out (default), the decoder issues an error indication and discards the data.
- **RTS/CTS Option 3**: The decoder asserts RTS prior to any data transmission, regardless of the state of CTS. The decoder waits up to Host Serial Response Time-out (default) for CTS to be asserted. If CTS is not asserted during this time, the decoder issues an error indication and discards the data. The decoder de-asserts RTS when transmission completes.

Hardware Handshaking (continued)

*None



Standard RTS/CTS

RTS/CTS Option 1

RTS/CTS Option 2

RTS/CTS Option 3

Software Handshaking

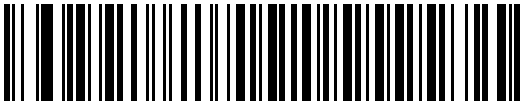
This parameter offers control of data transmission in addition to, or instead of, the control hardware handshaking offers. There are five options.

If software handshaking and hardware handshaking are both enabled, Hardware Handshaking takes precedence.

- **None**: Data transmits immediately. No response is expected from host.
- **ACK/NAK**: After transmitting data, the decoder expects either an ACK or NAK response from the host. When the decoder receives a NAK, it 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 decoder issues an error indication and discards the data.

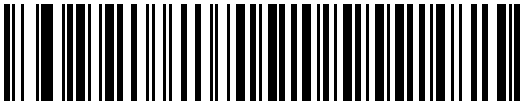
  The decoder waits up to the programmable Host Serial Response Time-out to receive an ACK or NAK. If the decoder does not receive a response in this time, it issues an error indication and discards the data. There are no retries when a time-out occurs.
- **ENQ**: The decoder waits for an ENQ character from the host before transmitting data. If the decoder does not receive an ENQ within the Host Serial Response Time-out, it 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 decoder transmission off until the decoder receives an XON character. There are two situations for XON/XOFF:
  - The decoder receives an XOFF before it has data to send. When the decoder has data to send, it waits up to the Host Serial Response Time-out for an XON character before transmission. If it does not receive an XON within this time, the decoder issues an error indication and discards the data.
  - The decoder receives an XOFF during a transmission. Data transmission then stops after sending the current byte. When the decoder receives an XON character, it sends the rest of the data message. The decoder waits indefinitely for the XON.

Software Handshaking (continued)

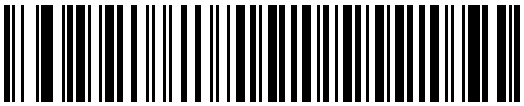


*None

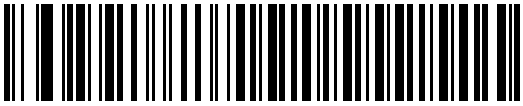
ACK/NAK



ENQ



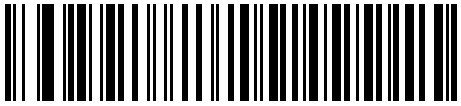
ACK/NAK with ENQ



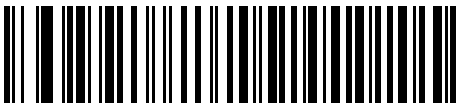
XON/XOFF

Host Serial Response Time-out

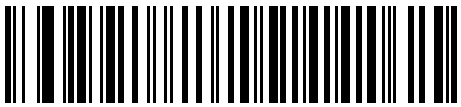
This parameter specifies how long the decoder waits for an ACK, NAK, or CTS before determining that a transmission error occurred. This only applies when in one of the ACK/NAK software handshaking modes, or RTS/CTS hardware handshaking mode.



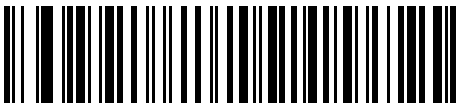
***Minimum: 2 Sec**



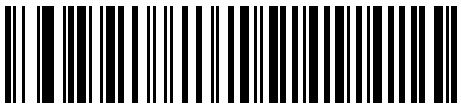
Low: 2.5 Sec



Medium: 5 Sec



High: 7.5 Sec

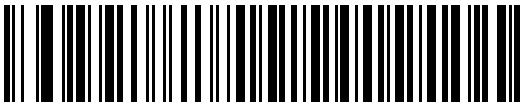


Maximum: 9.9 Sec

RTS Line State

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

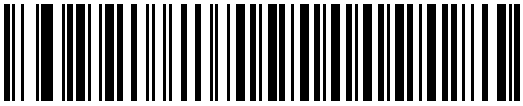
***Host: Low RTS**



Host: High RTS

Beep on <BEL>

When this parameter is enabled, the decoder issues a beep when it detects a <BEL> character on the serial line. <BEL> gains a user's attention to an illegal entry or other important event.



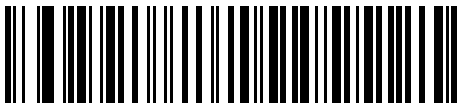
Beep On <BEL> Character (Enable)

***Do Not Beep On <BEL> Character (Disable)**

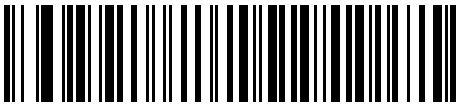
NOTE A NULL character must be sent to the decoder before BEL to ensure the BEL character is processed correctly.

Intercharacter Delay

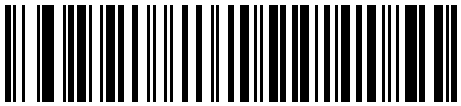
This parameter specifies the intercharacter delay inserted between character transmissions.



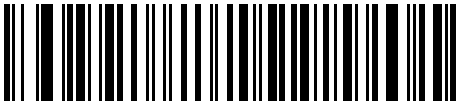
***Minimum: 0 msec**



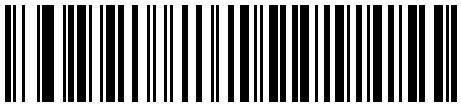
Low: 25 msec



Medium: 50 msec



High: 75 msec

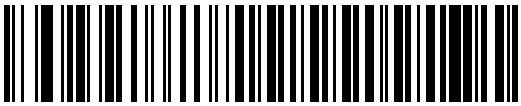


Maximum: 99 msec

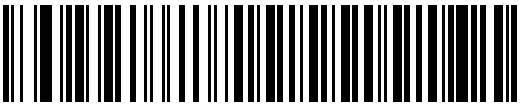
Nixdorf Beep/LED Options

Select Nixdorf Mode B to indicate when the decoder beeps and turns on its LED after a decode.

***Normal Operation**
(Beep/LED immediately after decode)



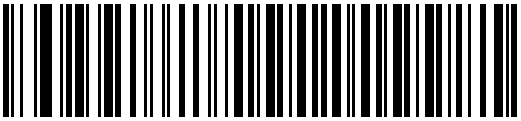
Beep/LED After Transmission



Beep/LED After CTS Pulse

Ignore Unknown Characters

Unknown characters are characters the host does not recognize. Select **Send Bar Codes with Unknown Characters** to send all bar code data except for unknown characters. The decoder issues no error beeps. Select **Do Not Send Bar Codes With Unknown Characters** to send bar code data up to the first unknown character. The decoder issues an error beep.



***Send Bar Code**
(with unknown characters)

Do Not Send Bar Codes
(with unknown characters)

ASCII Character Set for Serial Hosts

You can assign the values in *Table 7-4* as prefixes or suffixes for ASCII character data transmission.

Table 7-4 *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 7-4 *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 7-4 *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 7-4 *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 7-4 *Prefix/Suffix Values (Continued)*

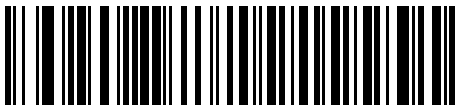
Prefix/Suffix Value	Full ASCII Code 39 Encode Character	ASCII Character
1117	+U	u
1118	+V	v
1119	+W	w
1120	+X	x
1121	+Y	y
1122	+Z	z
1123	%P	{
1124	%Q	|
1125	%R	}
1126	%S	~
1127		Undefined
7013		ENTER

Chapter 8 USB Interface

Introduction

This chapter describes how to set up the decoder with a USB host. The decoder connects directly to a USB host, or a powered USB hub, which powers it. No additional power supply is required.

Throughout the programming bar code menus, asterisks (*) indicate default values.



* Indicates Default — ***North American Standard USB Keyboard** — Feature/Option

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 you can see the bar code clearly, and bars and/or spaces are not merging.

USB Parameter Defaults

Table 8-1 lists the defaults for USB host parameters. To change any option, scan the appropriate bar code(s) provided in the Parameter Descriptions section beginning on *page 8-3*.

NOTE See *Appendix A, Standard Default Parameters* for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 8-1 *USB Host Default Table*

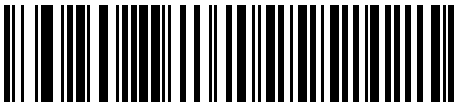
Parameter	Default	Page Number
USB Host Parameters		
USB Device Type	SNAPI with Imaging	*8-3*
Symbol Native API (SNAPI) Status Handshaking	Enable	*8-4*
USB Country Keyboard Types (Country Codes)	North American	*8-5*
USB Keystroke Delay	No Delay	*8-7*
USB CAPS Lock Override	Disable	*8-7*
USB Ignore Unknown Characters	Enable	*8-8*
Emulate Keypad	Disable	*8-8*
Emulate Keypad with Leading Zero	Disable	*8-9*
USB FN1 Substitution	Disable	*8-9*
Function Key Mapping	Disable	*8-10*
Simulated Caps Lock	Disable	*8-10*
Convert Case	None	*8-11*

USB Host Parameters

USB Device Type

Select the desired USB device type.

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



HID Keyboard Emulation

Simple COM Port Emulation

***Symbol Native API (SNAPI) with Imaging Interface**

Symbol Native API (SNAPI) without Imaging Interface

USB Device Type (continued)

Symbol Native API (SNAPI) Status Handshaking

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

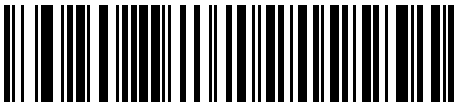
***Enable SNAPI Status Handshaking**

Disable SNAPI Status Handshaking

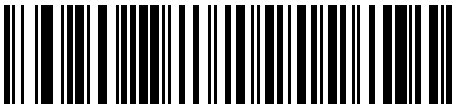
USB Country Keyboard Types (Country Codes)

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

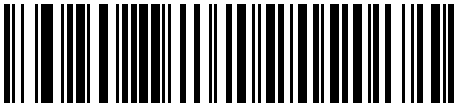
✓ ***NOTE*** When changing USB country keyboard types the decoder automatically resets. The decoder issues the standard startup beep sequences.



***North American Standard USB Keyboard**



German Windows

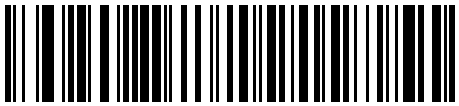


French Windows

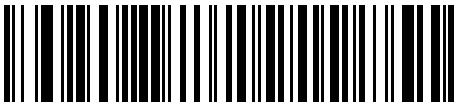
French Canadian Windows 95/98

French Canadian Windows 2000/XP

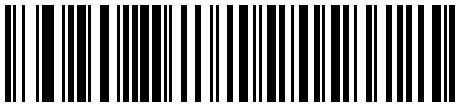
USB Country Keyboard Types (continued)



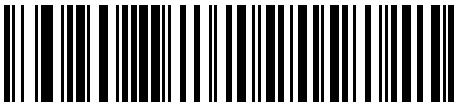
Spanish Windows



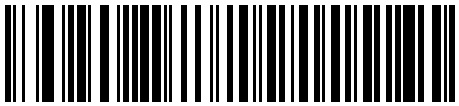
Italian Windows



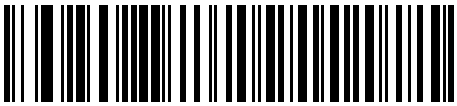
Swedish Windows



UK English Windows



Japanese Windows (ASCII)



Portuguese-Brazilian Windows

USB Keystroke Delay

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

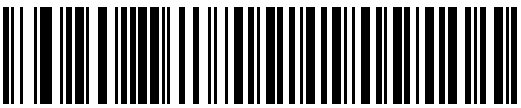
***No Delay**

Medium Delay (20 msec)

Long Delay (40 msec)

USB CAPS Lock Override

This option applies only to the HID Keyboard Emulation device. Enable this to preserve the case of the data 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. Select **Send Bar Codes With Unknown Characters** to send all bar code data except for unknown characters. 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

Enable this to send all characters as ASCII sequences over the numeric keypad. For example ASCII A is sent as “ALT make” 0 6 5 “ALT Break”. This allows support for other country variants.

***Disable Keypad Emulation**

Enable Keypad Emulation

Emulate Keypad with Leading Zero

Enable this to send character sequences sent over the numeric keypad as ISO characters which have a leading zero. For example ASCII A is sent as “ALT MAKE” 0 0 6 5 “ALT BREAK”.

***Disable Keypad Emulation with Leading Zero**

Enable Keypad Emulation with Leading Zero

USB Keyboard FN 1 Substitution

This option applies only to the USB HID Keyboard Emulation device. Enable this to replace any FN 1 characters in an EAN 128 bar code with a Key Category and value (see *FN1 Substitution Values on page 10-6* to set the Key Category and Key Value).

Enable

***Disable**

Function Key Mapping

ASCII values under 32 are normally sent as control-key sequences (see *Table 8-2 on page 8-12*). Enable this to send the keys in bold 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.

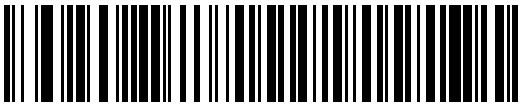
***Disable Function Key Mapping**

Enable Function Key Mapping

Simulated Caps Lock

Enable this to invert upper and lower case characters on the bar code as if the Caps Lock state is enabled on the keyboard. This inversion occurs regardless of the keyboard's current Caps Lock state.

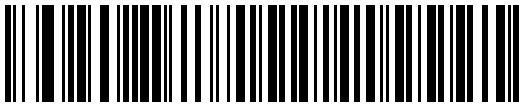
***Disable Simulated Caps Lock**



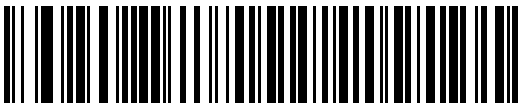
Enable Simulated Caps Lock

Convert Case

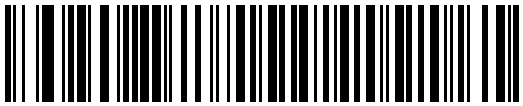
Enable this to convert all bar code data to the selected case.



***No Case Conversion**



Convert All to Upper Case



Convert All to Lower Case

ASCII Character Set for USB

Table 8-2 *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

[1]The keystroke in bold is sent only if *Function Key Mapping on page 8-10* is enabled. Otherwise, the unbolded keystroke is sent.

Table 8-2 *USB Prefix/Suffix Values (Continued)*

Prefix/ Suffix Value	Full ASCII Code 39 Encode Character	Keystroke
1025	$Y	CTRL Y
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

[1]The keystroke in bold is sent only if *Function Key Mapping on page 8-10* is enabled. Otherwise, the unbolded keystroke is sent.

Table 8-2 *USB Prefix/Suffix Values (Continued)*

Prefix/ Suffix Value	Full ASCII Code 39 Encode Character	Keystroke
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
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

[1]The keystroke in bold is sent only if *Function Key Mapping on page 8-10* is enabled. Otherwise, the unbolded keystroke is sent.

Table 8-2 *USB Prefix/Suffix Values (Continued)*

Prefix/ Suffix Value	Full ASCII Code 39 Encode Character	Keystroke
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	`
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

[1]The keystroke in bold is sent only if *Function Key Mapping on page 8-10* is enabled. Otherwise, the unbolded keystroke is sent.

Table 8-2 *USB Prefix/Suffix Values (Continued)*

Prefix/ Suffix Value	Full ASCII Code 39 Encode Character	Keystroke
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	{
1124	%Q	|
1125	%R	}
1126	%S	~

[1]The keystroke in bold is sent only if *Function Key Mapping on page 8-10* is enabled. Otherwise, the unbolded keystroke is sent.

Table 8-3 *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

Table 8-3 *USB ALT Key Character Set (Continued)*

ALT Keys	Keystroke
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 8-4 *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

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 8-4 *USB GUI Key Character Set (Continued)*

GUI Key	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

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 8-4 *USB GUI Key Character Set (Continued)*

GUI Key	Keystroke
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 8-5 *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

Table 8-5 *USB F Key Character Set (Continued)*

F Keys	Keystroke
5022	F22
5023	F23
5024	F24

Table 8-6 *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 8-7 *USB Extended Keypad Character Set*

Extended Keypad	Keystroke
7001	Break
7002	Delete
7003	PgUp
7004	End
7005	Pg Dn

Table 8-7 *USB Extended Keypad Character Set (Continued)*

Extended Keypad	Keystroke
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 9 Symbologies

Introduction

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*.

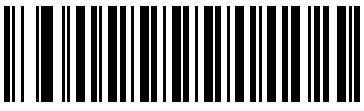
The decoder is shipped with the settings shown in the *Symbology Default Table on page 9-2* (also see *Appendix A, Standard Default Parameters* for all host device and miscellaneous defaults). If the default values suit requirements, programming is not necessary.

There are two ways to change a parameter value:

- Scan 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’s Guide* for detailed instructions for changing parameter values using this method.

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.

To return all features to default values, scan *Set Default Parameter on page 4-4*. Throughout the programming bar code menus, default values are indicated with asterisks (*).



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

Scanning Sequence Examples

In most cases, scanning one bar code sets the parameter value. For example, to transmit bar code data without the UPC-A check digit, simply scan the **Do Not Transmit UPC-A Check Digit** bar code under *Transmit UPC-A Check Digit on page 9-15*. The decoder 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 scanning several bar codes. See the individual parameter, such as **Set Length(s) for D 2 of 5**, for this procedure.

Errors While Scanning

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

Symbology Parameter Defaults

Table 9-1 lists the defaults for all symbologies parameters. To change any option, scan the appropriate bar code(s) provided in the Symbologies Parameters section beginning on *page 9-8*.

NOTE See *Appendix A, Standard Default Parameters* for all user preferences, hosts, and miscellaneous default parameters.

Table 9-1 *Symbology Default Table*

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

Table 9-1 *Symbology Default Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Transmit UPC-E Check Digit	29h	Enable	9-15
Transmit UPC-E1 Check Digit	2Ah	Enable	9-16
UPC-A Preamble	22h	System Character	9-17
UPC-E Preamble	23h	System Character	9-18
UPC-E1 Preamble	24h	System Character	9-19
Convert UPC-E to A	25h	Disable	9-20
Convert UPC-E1 to A	26h	Disable	9-20
EAN-8/JAN-8 Extend	27h	Disable	9-21
Bookland ISBN Format	F1h 40h	ISBN-10	9-22
UCC Coupon Extended Code	55h	Disable	9-23
ISSN EAN	F1h 69h	Disable	9-23
Code 128			
Code 128	08h	Enable	9-24
Set Length(s) for Code 128	D1h D2h	Any Length	9-24
GS1-128 (formerly UCC/EAN-128)	0Eh	Enable	9-26
ISBT 128	54h	Enable	9-26
ISBT Concatenation	F1h 41h	Disable	9-27
Check ISBT Table	F1h 42h	Enable	9-28
ISBT Concatenation Redundancy	DFh	10	9-28
Code 39			
Code 39	00h	Enable	9-29
Trioptic Code 39	0Dh	Disable	9-29
Convert Code 39 to Code 32 (Italian Pharmacy Code)	56h	Disable	9-30
Code 32 Prefix	E7h	Disable	9-30
Set Length(s) for Code 39	12h 13h	2 to 55	9-31
Code 39 Check Digit Verification	30h	Disable	9-32
Transmit Code 39 Check Digit	2Bh	Disable	9-42
Code 39 Full ASCII Conversion	11h	Disable	9-33
Buffer Code 39	71h	Disable	9-34

Table 9-1 *Symbology Default Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Code 93			
Code 93	09h	Disable	*9-37*
Set Length(s) for Code 93	1Ah 1Bh	4 to 55	*9-37*
Code 11			
Code 11	0Ah	Disable	*9-39*
Set Lengths for Code 11	1Ch 1Dh	4 to 55	*9-39*
Code 11 Check Digit Verification	34h	Disable	*9-41*
Transmit Code 11 Check Digit(s)	2Fh	Disable	*9-42*
Interleaved 2 of 5 (ITF)			
Interleaved 2 of 5 (ITF)	06h	Enable	*9-42*
Set Lengths for I 2 of 5	16h 17h	14	*9-43*
I 2 of 5 Check Digit Verification	31h	Disable	*9-44*
Transmit I 2 of 5 Check Digit	2Ch	Disable	*9-45*
Convert I 2 of 5 to EAN 13	52h	Disable	*9-45*
Discrete 2 of 5 (DTF)			
Discrete 2 of 5	05h	Disable	*9-46*
Set Length(s) for D 2 of 5	14h 15h	12	*9-46*
Codabar (NW - 7)			
Codabar	07h	Disable	*9-48*
Set Lengths for Codabar	18h 19h	5 to 55	*9-48*
CLSI Editing	36h	Disable	*9-50*
NOTIS Editing	37h	Disable	*9-50*
MSI			
MSI	0Bh	Disable	*9-51*
Set Length(s) for MSI	1Eh 1Fh	4 to 55	*9-51*
MSI Check Digits	32h	One	*9-53*
Transmit MSI Check Digit	2Eh	Disable	*9-54*
MSI Check Digit Algorithm	33h	Mod 10/Mod 10	*9-54*
Chinese 2 of 5			
Chinese 2 of 5	F0h 98h	Disable	*9-55*

Table 9-1 *Symbology Default Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Matrix 2 of 5			
Matrix 2 of 5	F1h 6Ah	Disable	*9-55*
Matrix 2 of 5 Lengths	F1h 6Bh F1h 6Ch	1 Length - 14	*9-56*
Matrix 2 of 5 Redundancy	F1h 6Dh	Disable	*9-57*
Matrix 2 of 5 Check Digit	F1h 6Eh	Disable	*9-57*
Transmit Matrix 2 of 5 Check Digit	F1h 6Fh	Disable	*9-58*
Inverse 1D	F1h 4Ah	Regular	*9-59*
Postal Codes			
US Postnet	59h	Enable	*9-60*
US Planet	5Ah	Enable	*9-60*
Transmit US Postal Check Digit	5Fh	Enable	*9-61*
UK Postal	5Bh	Enable	*9-61*
Transmit UK Postal Check Digit	60h	Enable	*9-62*
Japan Postal	F0h 22h	Enable	*9-62*
Australian Postal	F0h 23h	Enable	*9-63*
Netherlands KIX Code	F0h 46h	Enable	*9-63*
USPS 4CB/One Code/Intelligent Mail	F1h 50h	Disable	*9-64*
UPU FICS Postal	F1h 63h	Disable	*9-64*
GS1 DataBar (formerly RSS, Reduced Space Symbology)			
GS1 DataBar-14	F0h 52h	Enable	*9-65*
GS1 DataBar Limited	F0h 53h	Enable	*9-65*
GS1 DataBar Expanded	F0h 54h	Enable	*9-66*
Convert GS1 DataBar to UPC/EAN	F0h 8Dh	Disable	*9-66*
Composite			
Composite CC-C	F0h 55h	Disable	*9-67*
Composite CC-A/B	F0h 56h	Disable	*9-67*
Composite TLC-39	F0h 73h	Disable	*9-68*
UPC Composite Mode	F0h 58h	Always Linked	*9-69*
Composite Beep Mode	F0h 8Eh	Beep As Each Code Type is Decoded	*9-70*

Table 9-1 *Symbology Default Table (Continued)*

Parameter	Parameter Number	Default	Page Number
GS1-128 Emulation Mode for UCC/EAN Composite Codes	F0h ABh	Disable	*9-70*
2D Symbologies			
PDF417	0Fh	Enable	*9-71*
MicroPDF417	E3h	Disable	*9-71*
Code 128 Emulation	7Bh	Disable	*9-72*
Data Matrix	F0h 24h	Enable	*9-73*
Data Matrix Inverse	F1h 4Ch	Regular	*9-74*
Decode Mirror Images (Data Matrix Only)	F1h 19h	Never	*9-75*
Maxicode	F0h 26h	Enable	*9-76*
QR Code	F0h 25h	Enable	*9-76*
QR Inverse	F1h 4Bh	Regular	*9-77*
MicroQR	F1h 3Dh	Enable	*9-78*
Aztec	F1h 3Eh	Enable	*9-78*
Aztec Inverse	F1h 4Dh	Regular	*9-79*
Symbology-Specific Security Levels			
Redundancy Level	4Eh	1	*9-80*
Security Level	4Dh	1	*9-82*
Intercharacter Gap Size	F0h 7Dh	Normal	*9-83*
Macro PDF			
Macro PDF Transmit/Decode Mode Symbols	BCh	Passthrough Mode	*9-85*
Transmit Macro PDF Control Header	B8h	Disable	*9-86*
Escape Characters	E9h	None	*9-86*
Flush Macro PDF Buffer			*9-87*
Abort Macro PDF Entry			*9-87*

Disable All Symbologies

Scan the bar code below to disable the decoding of all symbologies. Use this to simplify selecting a single symbology to decode by scanning this, then scanning the desired enable code type bar code. Note that the decoder can still decode parameter bar codes.

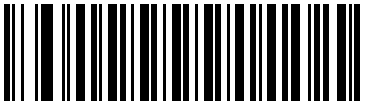
Disable All Symbologies

UPC/EAN

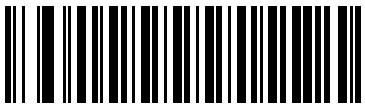
Enable/Disable UPC-A

Parameter # 01h

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



***Enable UPC-A**
(01h)

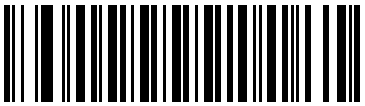


Disable UPC-A
(00h)

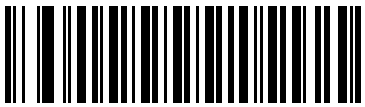
Enable/Disable UPC-E

Parameter # 02h

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



***Enable UPC-E**
(01h)



Disable UPC-E
(00h)

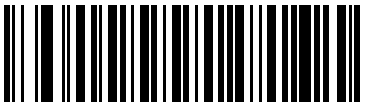
Enable/Disable UPC-E1

Parameter # 0Ch

UPC-E1 is disabled by default.

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

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



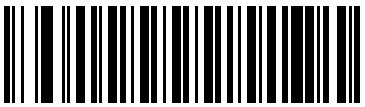
Enable UPC-E1
(01h)

***Disable UPC-E1**
(00h)

Enable/Disable EAN-8/JAN-8

Parameter # 04h

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



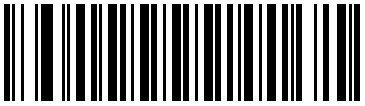
***Enable EAN-8/JAN-8**
(01h)

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

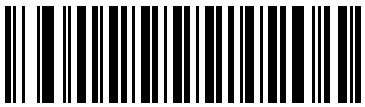
Enable/Disable EAN-13/JAN-13

Parameter # 03h

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



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

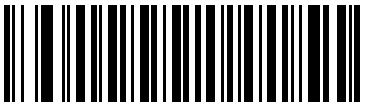


Disable EAN-13/JAN-13 (00h)

Enable/Disable Bookland EAN

Parameter # 53h

To enable or disable Bookland EAN, scan 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 9-22*. 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 9-11*.

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:

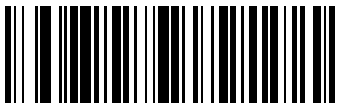
- If you select **Ignore UPC/EAN with Supplementals**, and the scanner is presented with a UPC/EAN plus supplemental symbol, the scanner decodes UPC/EAN and ignores the supplemental characters.
- If you select **Decode UPC/EAN with Supplementals**, the scanner only decodes UPC/EAN symbols with supplemental 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 9-14* 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 9-14* 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 Supplemental Mode and are scanning Bookland EAN bar codes, see *Enable/Disable Bookland EAN on page 9-10* to enable Bookland EAN, and select a format using *Bookland ISBN Format on page 9-22*.

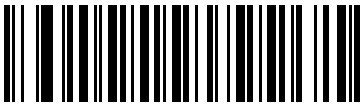
  - Enable 977 Supplemental Mode
  - Enable 414/419/434/439 Supplemental Mode
  - Enable 491 Supplemental Mode
  - **Enable Smart Supplemental Mode** - applies to EAN-13 bar codes starting with any prefix listed previously.
  - **Supplemental User-Programmable Type 1** - applies to EAN-13 bar codes starting with a 3-digit user-defined prefix. Set this 3-digit prefix using *User-Programmable Supplementals on page 9-14*.
  - **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 9-14***.**
  - **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 9-14*.
  - **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 9-14*.

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

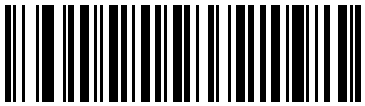
Decode UPC/EAN/JAN Supplementals (continued)



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 9-11*, 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.

Scan the bar code below to set a decode redundancy value. Next, scan 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, scan **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. Scan 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. Scan 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. Scan 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)

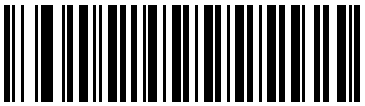
***System Character (<SYSTEM CHARACTER> <DATA>)**
(01h)

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

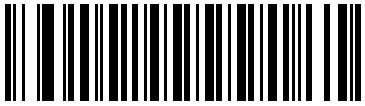
UPC-E Preamble

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)



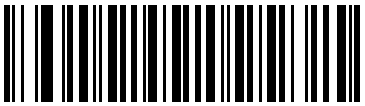
***System Character (<SYSTEM CHARACTER> <DATA>)**
(01h)

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)

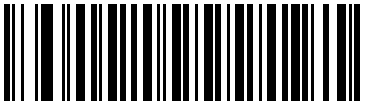
System Character & Country Code
(< COUNTRY CODE> <SYSTEM CHARACTER> <DATA>)
(02h)

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)

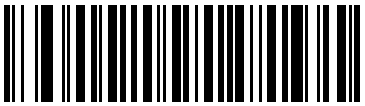
***Do Not Convert UPC-E to UPC-A (Disable)**
(00h)

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)

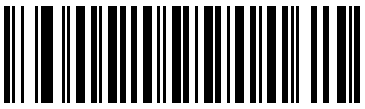
***Do Not Convert UPC-E1 to UPC-A (Disable)**
(00h)

EAN-8/JAN-8 Extend

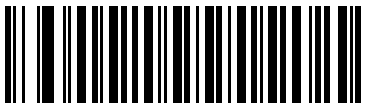
Parameter # 27h

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 9-10*, 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)

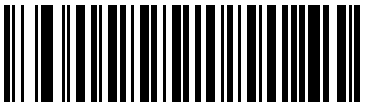
Bookland ISBN-13
(01h)

NOTE For Bookland EAN to function properly, first enable Bookland EAN using *Enable/Disable Bookland EAN on page 9-10*, 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 9-11*.

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 scan 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.

ISSN EAN

Parameter # F1h 69h

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

Enable ISSN EAN (01h)

***Disable ISSN EAN (00h)**

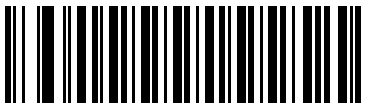
Code 128

Enable/Disable Code 128

Parameter # 08h

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

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



Disable Code 128
(00h)

Set Lengths for Code 128

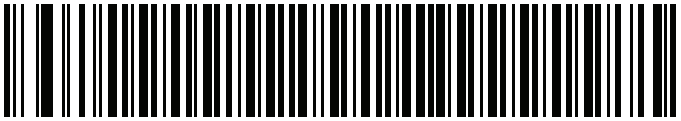
Parameter # L1 = D1h, L2 = D2h

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 128 to any length, one or two discrete lengths, or lengths within a specific range.

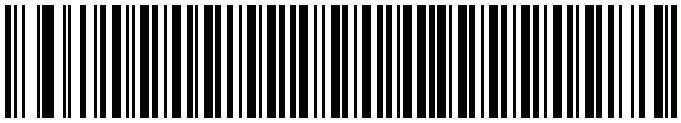
NOTE When setting lengths for different bar code types by scanning single digit numbers, single digit numbers must always be preceded by a leading zero.

- **One Discrete Length** - Select this option to decode only Code 128 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 128 symbols with 14 characters, scan **Code 128 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or change the selection, scan *Cancel on page D-3*.
- **Two Discrete Lengths** - Select this option to decode only Code 128 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 128 symbols containing either 2 or 14 characters, select **Code 128 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or change the selection, scan *Cancel on page D-3*.
- **Length Within Range** - Select this option to decode a Code 128 symbol with a specific length range. Select lengths using numeric bar codes in Appendix D, Numeric Bar Codes. For example, to decode Code 128 symbols containing between 4 and 12 characters, first scan **Code 128 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, scan *Cancel on page D-3*.
- **Any Length** - Select this option to decode Code 128 symbols containing any number of characters within the digital scanner capability.

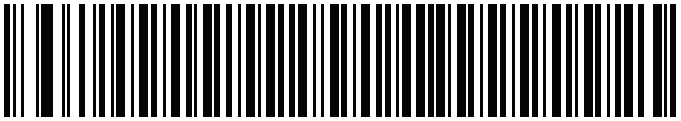
Set Lengths for Code 128 (continued)



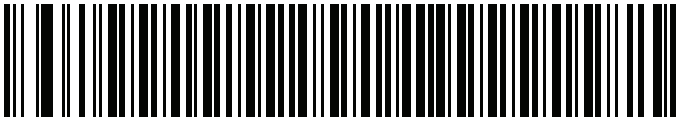
Code 128 - One Discrete Length



Code 128 - Two Discrete Lengths



Code 128 - Length Within Range

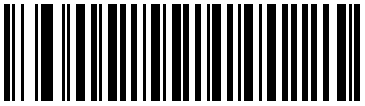


***Code 128 - Any Length**

Enable/Disable GS1-128 (formerly UCC/EAN-128)

Parameter # 0Eh

To enable or disable GS1-128, scan the appropriate bar code below.



***Enable GS1-128**
(01h)

Disable GS1-128
(00h)

Enable/Disable ISBT 128

Parameter # 54h

ISBT 128 is a variant of Code 128 used in the blood bank industry. Scan 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)

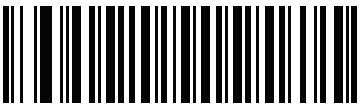
ISBT Concatenation

Parameter # F1h 41h

Select an option for concatenating pairs of ISBT code types:

- If you select **Disable ISBT Concatenation**, the decoder does not concatenate pairs of ISBT codes it encounters.
- If you select **Enable ISBT Concatenation**, there must be two ISBT codes in order for the decoder to decode and perform concatenation. The decoder does not decode single ISBT symbols.
- If you select **Autodiscriminate ISBT Concatenation**, the decoder decodes and concatenates pairs of ISBT codes immediately. If only a single ISBT symbol is present, the decoder must decode the symbol the number of times set via *ISBT Concatenation Redundancy on page 9-28* before transmitting its data to confirm that there is no additional ISBT symbol.

***Disable ISBT Concatenation**
(00h)



Enable ISBT Concatenation
(01h)

Autodiscriminate ISBT Concatenation
(00h)

Check ISBT Table

Parameter # F1h 42h

The ISBT specification includes a table that lists several types of ISBT bar codes that are commonly used in pairs. If you set **ISBT Concatenation** to **Enable**, enable **Check ISBT Table** to concatenate only those pairs found in this table. Other types of ISBT codes are not concatenated.

***Enable Check ISBT Table (01h)**

Disable Check ISBT Table (00h)

ISBT Concatenation Redundancy

Parameter # DFh

If you set **ISBT Concatenation** to **Autodiscriminate,** use this parameter to set the number of times the digital scanner must decode an ISBT symbol before determining that there is no additional symbol.

Scan the bar code below, then scan two numeric bar codes in Appendix D, Numeric Bar Codes to set a value between 2 and 20. Enter a leading zero for single digit numbers. To correct an error or change a selection, scan *Cancel on page D-2*. The default is 10.

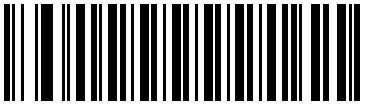
ISBT Concatenation Redundancy

Code 39

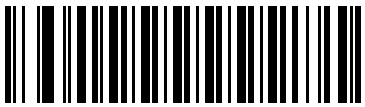
Enable/Disable Code 39

Parameter # 00h

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



***Enable Code 39**
(01h)

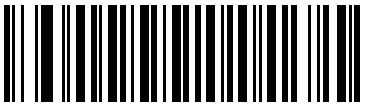


Disable Code 39
(00h)

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, scan the appropriate bar code below.



Enable Trioptic Code 39
(01h)

***Disable Trioptic Code 39**
(00h)

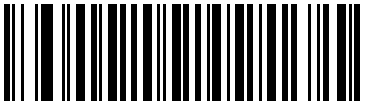
✓ ***NOTE*** Trioptic Code 39 and Code 39 Full ASCII cannot be enabled simultaneously.

Convert Code 39 to Code 32

Parameter # 56h

Code 32 is a variant of Code 39 used by the Italian pharmaceutical industry. Scan 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

Scan 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 scanning 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, scan **Code 39 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or change the selection, scan **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 scan **0**, **2**, **1**, and then **4**. To correct an error or change the selection, scan **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 scan **Code 39 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, scan **Cancel** on *page D-3*.
- **Any Length** - Select this option to decode Code 39 symbols containing any number of characters within the decoder capability.

Code 39 - One Discrete Length

Code 39 - Two Discrete Lengths

Set Lengths for Code 39 (continued)

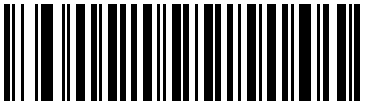
Code 39 - Length Within Range

Code 39 - Any Length

Code 39 Check Digit Verification

Parameter # 30h

When this feature is enabled, the decoder 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

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

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

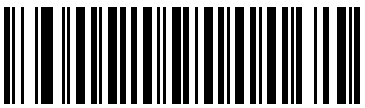
***Do Not Transmit Code 39 Check Digit (Disable)**
(00h)

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, scan 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 Set.

Code 39 Buffering (Scan & Store)

Parameter # 71h

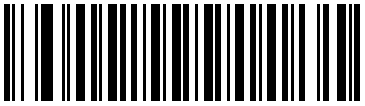
This feature allows the decoder to accumulate data from multiple Code 39 symbols.

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 decoder 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 9-35*) 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 decoder issues a lo/hi beep to indicate successful decode and buffering. (For overflow conditions, see *Overfilling Transmission Buffer*.)
- The decoder adds the decoded data excluding the leading space to the transmission buffer.
- No transmission occurs.

Clear Transmission Buffer

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

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

Clear Buffer

NOTE The Clear Buffer contains only the dash (minus) character. In order to scan 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. Scan the **Transmit Buffer** bar code below. Only a start character, a plus (+), and a stop character.
   - The decoder transmits and clears the buffer.
   - The decoder issues a Lo/Hi beep.

Transmit Buffer

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

NOTE The Transmit Buffer contains only a plus (+) character. In order to scan 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 decoder 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.

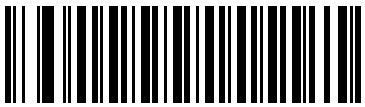
Code 93

Enable/Disable Code 93

Parameter # 09h

To enable or disable Code 93, scan 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, scan **Code 93 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan **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 scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan **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 scan **Code 93 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, scan **Cancel** on *page D-3*.
- **Any Length** - Scan this option to decode Code 93 symbols containing any number of characters within the decoder'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

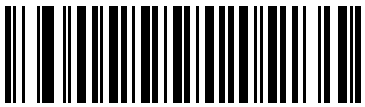
Code 11

Code 11

Parameter # 0Ah

To enable or disable Code 11, scan 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, scan **Code 11 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan **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 scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan **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 scan **Code 11 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, scan **Cancel** on *page D-3*.
- **Any Length** - Scan this option to decode Code 11 symbols containing any number of characters within the decoder capability.

Set Lengths for Code 11 (continued)

Code 11 - One Discrete Length

Code 11 - Two Discrete Lengths

Code 11 - Length Within Range

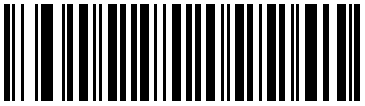
Code 11 - Any Length

Code 11 Check Digit Verification

Parameter # 34h

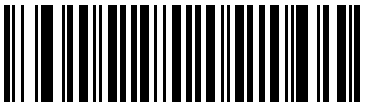
This feature allows the decoder to check the integrity of all Code 11 symbols to verify that the data complies with the specified check digit algorithm. This selects the check digit mechanism for the decoded Code 11 bar code. The options are to check for one check digit, check for two check digits, or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

To enable this feature, scan 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)

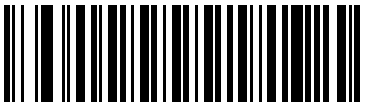
NOTE Code 11 Check Digit Verification must be enabled for this parameter to function.

Interleaved 2 of 5 (ITF)

Enable/Disable Interleaved 2 of 5

Parameter # 06h

To enable or disable Interleaved 2 of 5, scan 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, scan **I 2 of 5 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan **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 scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan **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 scan **I 2 of 5 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, scan **Cancel** on *page D-3*.
- **Any Length** - Scan this option to decode I 2 of 5 symbols containing any number of characters within the decoder 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.

I 2 of 5 - One Discrete Length

I 2 of 5 - Two Discrete Lengths

Set Lengths for Interleaved 2 of 5 (continued)

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 decoder 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)

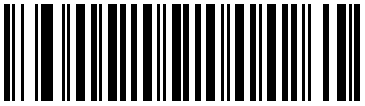
USS Check Digit
(01h)

OPCC Check Digit
(02h)

Transmit I 2 of 5 Check Digit

Parameter # 2Ch

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



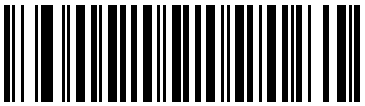
Transmit I 2 of 5 Check Digit (Enable)
(01h)

***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, scan 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, scan **D 2 of 5 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan **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 scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan **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 scan **D 2 of 5 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, scan **Cancel** on *page D-3*.
- **Any Length** - Scan this option to decode D 2 of 5 symbols containing any number of characters within the decoder capability.

Set Lengths for Discrete 2 of 5 (continued)

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.

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, scan 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, scan **Codabar - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan **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 scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan **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 scan **Codabar - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, scan **Cancel** on *page D-3*.
- **Any Length** - Scan this option to decode Codabar symbols containing any number of characters within the decoder capability.

Set Lengths for Codabar (continued)

Codabar - One Discrete Length

Codabar - Two Discrete Lengths

Codabar - Length Within Range

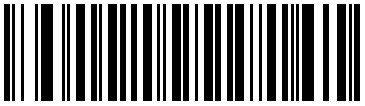
Codabar - Any Length

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)

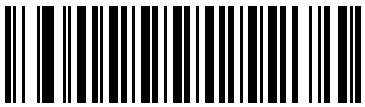
MSI

Enable/Disable MSI

Parameter # 0Bh

To enable or disable MSI, scan 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, scan **MSI - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan **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 scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan **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 scan **MSI - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, scan **Cancel** on *page D-3*.
- **Any Length** - Scan this option to decode MSI symbols containing any number of characters within the decoder capability.

Set Lengths for MSI (continued)

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.

MSI - One Discrete Length

MSI - Two Discrete Lengths

MSI - Length Within Range

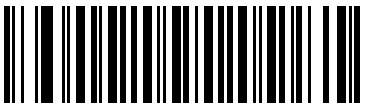
MSI - Any Length

MSI Check Digits

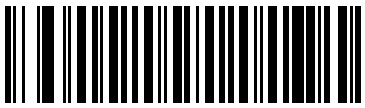
Parameter # 32h

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, scan the **Two MSI Check Digits** bar code to enable verification of the second check digit.

See *MSI Check Digit Algorithm on page 9-54* for the selection of second digit algorithms.



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



Two MSI Check Digits
(01h)

Transmit MSI Check Digit(s)

Parameter # 2Eh

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

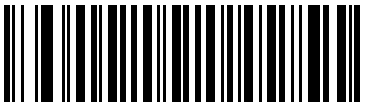
Transmit MSI Check Digit(s) (Enable)
(01h

***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)

Chinese 2 of 5

Enable/Disable Chinese 2 of 5

Parameter # F0h 98h

To enable or disable Chinese 2 of 5, scan the appropriate bar code below.

Enable Chinese 2 of 5 (01h)

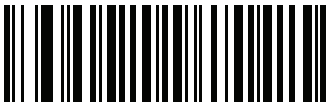
***Disable Chinese 2 of 5 (00h)**

Matrix 2 of 5

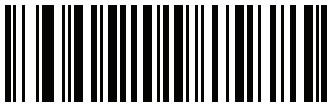
Enable/Disable Matrix 2 of 5

Parameter # F1h 6Ah

To enable or disable Matrix 2 of 5, scan the appropriate bar code below.



Enable Matrix 2 of 5 (01h)



***Disable Matrix 2 of 5 (00h)**

Set Lengths for Matrix 2 of 5

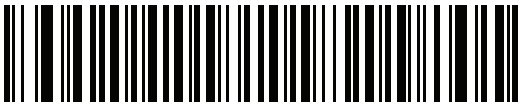
Parameter # L1 = F1h 6Bh, L2 = F1h 6Ch

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 Matrix 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 Matrix 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 Matrix 2 of 5 symbols with 14 characters, scan **Matrix 2 of 5 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page D-3*.
- **Two Discrete Lengths** - Select this option to decode only Matrix 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 Matrix 2 of 5 symbols containing either 2 or 14 characters, select **Matrix 2 of 5 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page D-3*.
- **Length Within Range** - Select this option to decode a Matrix 2 of 5 symbol with a specific length range. Select lengths using the numeric bar codes in Appendix D, Numeric Bar Codes. For example, to decode Matrix 2 of 5 symbols containing between 4 and 12 characters, first scan **Matrix 2 of 5 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (enter a leading zero for single digit numbers). To correct an error or change the selection, scan *Cancel on page D-3*.
- **Any Length** - Scan this option to decode Matrix 2 of 5 symbols containing any number of characters within the digital scanner's capability.

***Matrix 2 of 5 - One Discrete Length**

Matrix 2 of 5 - Two Discrete Lengths



Matrix 2 of 5 - Length Within Range

Matrix 2 of 5 - Any Length

Matrix 2 of 5 Redundancy

Parameter # F1h 6Dh

To enable or disable Matrix 2 of 5 redundancy, scan the appropriate bar code below.

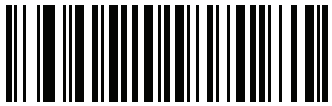
Enable Matrix 2 of 5 Redundancy (01h)

***Disable Matrix 2 of 5 Redundancy (00h)**

Matrix 2 of 5 Check Digit

Parameter # F1h 6Eh

The check digit is the last character of the symbol used to verify the integrity of the data. Scan the appropriate bar code below to transmit the bar code data with or without the Matrix 2 of 5 check digit.



Enable Matrix 2 of 5 Check Digit (01h)

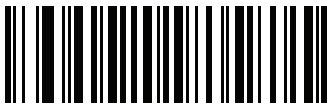
***Disable Matrix 2 of 5 Check Digit (00h)**

Transmit Matrix 2 of 5 Check Digit

Parameter # F1h 6Fh

Scan a bar code below to transmit Matrix 2 of 5 data with or without the check digit.

Transmit Matrix 2 of 5 Check Digit (01h)



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

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, scan the appropriate bar code below.

***Enable US Postnet**
(01h)

Disable US Postnet
(00h)

US Planet

Parameter # 5Ah

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

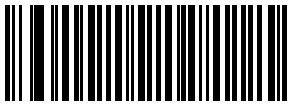
***Enable US Planet**
(01h)

Disable US Planet
(00h)

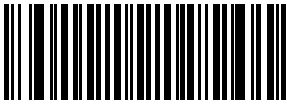
Transmit US Postal Check Digit

Parameter # 5Fh

Select whether to transmit US Postal data, which includes both US Postnet and US Planet, with or without the check digit.



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



Do Not Transmit US Postal Check Digit (00h)

UK Postal

Parameter # 5Bh

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

***Enable Japan Postal (01h)**

Disable Japan Postal (00h)

Australian Postal

Parameter # F0h, 23h

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

***Enable Australian Postal**
(01h)

Disable Australian Postal
(00h)

Netherlands KIX Code

Parameter # F0h, 46h

To enable or disable Netherlands KIX Code, scan the appropriate bar code below.

***Enable Netherlands KIX Code**
(01h)

Disable Netherlands KIX Code
(00h)

USPS 4CB/One Code/Intelligent Mail

Parameter # F1h 50h

To enable or disable USPS 4CB/One Code/Intelligent Mail, scan the appropriate bar code below.

Enable USPS 4CB/One Code/Intelligent Mail (01h)

***Disable USPS 4CB/One Code/Intelligent Mail (00h)**

UPU FICS Postal

Parameter # F1h 63h

To enable or disable UPU FICS Postal, scan the appropriate bar code below.

Enable UPU FICS Postal (01h)

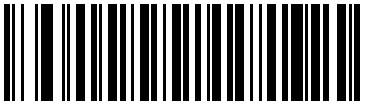
***Disable UPU FICS Postal (00h)**

GS1 DataBar (formerly RSS, Reduced Space Symbology)

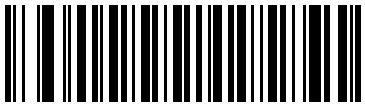
The variants of GS1 DataBar are DataBar-14, DataBar Expanded, and DataBar Limited. The limited and expanded versions have stacked variants. Scan the appropriate bar code below to enable or disable each variant of GS1 DataBar.

GS1 DataBar-14

Parameter # F0h 52h.



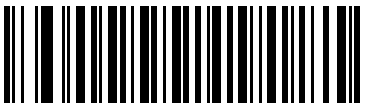
***Enable GS1 DataBar-14 (01h)**



Disable GS1 DataBar-14 (00h)

GS1 DataBar Limited

Parameter # F0h 53h.

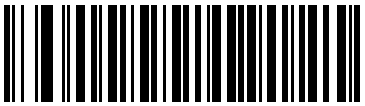


***Enable GS1 DataBar Limited (01h)**

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

Scan 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

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

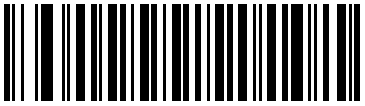
Enable CC-A/B
(01h)

***Disable CC-A/B**
(00h)

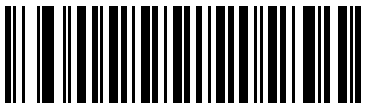
Composite TLC-39

Parameter # F0h 73h

Scan 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 2D 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 2D symbol is detected.
- Select **UPC Always Linked** to transmit UPC bar codes and the 2D portion.
  If 2D is not present, the UPC bar code does not transmit.
- If Autodiscriminate UPC Composites is selected, the SE4500 determines if there is a 2D portion, then transmits the UPC, as well as the 2D portion if present.

UPC Never Linked
(00h)

***UPC Always Linked**
(01h)

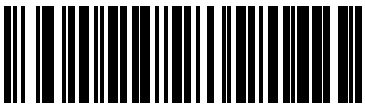
Autodiscriminate UPC Composites
(02h)

Composite Beep Mode

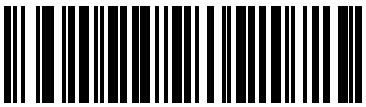
Parameter # F0h, 8Eh

To select the number of decode beeps when a composite bar code is decoded, scan 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)

GS1-128 Emulation Mode for UCC/EAN Composite Codes

Parameter # F0h, ABh

Select whether to enable or disable this mode.

Enable GS1-128 Emulation Mode for UCC/EAN Composite Codes (01h)

***Disable GS1-128 Emulation Mode for UCC/EAN Composite Codes (00h)**

2D Symbologies

Enable/Disable PDF417

Parameter # 0Fh

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

***Enable PDF417**
(01h)

Disable PDF417
(00h)

Enable/Disable MicroPDF417

Parameter # E3h

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

Enable MicroPDF417
(01h)

***Disable MicroPDF417**
(00h)

Code 128 Emulation

Parameter # 7Bh

When this parameter is enabled, the scanner 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 903-905
]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 903-905
]L4	if the first codeword is 908 or 909
]L5	if the first codeword is 910 or 911

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

NOTE Linked MicroPDF codewords 906, 907, 912, 914, and 915 are not supported. Use GS1 Composites instead.

Enable Code 128 Emulation (01h)

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

Data Matrix

Parameter # F0h, 24h

To enable or disable Data Matrix, scan 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)

Decode Mirror Images (Data Matrix Only)

Parameter # F1h 19h

Select an option for decoding mirror image Data Matrix bar codes:

- Always - decode only Data Matrix bar codes that are mirror images
- Never - do not decode Data Matrix bar codes that are mirror images
- Auto - decode both mirrored and unmirrored Data Matrix bar codes.

***Never**
(00h)

Always
(01h)

Auto
(02h)

Maxicode

Parameter # F0h, 26h

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

***Enable Maxicode**
(01h)

Disable Maxicode
(00h)

QR Code

Parameter # F0h,25h

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

***Enable QR Code**
(01h)

Disable QR Code
(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)

MicroQR

Parameter # F1h 3Dh

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

***Enable MicroQR**
(01h)

Disable MicroQR
(00h)

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

Select the redundancy level appropriate for the bar code quality.

Redundancy Level 1

The following code types must be successfully read twice before being decoded:

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 following code types must be successfully read twice before being decoded:

Code Type	Code Length
All	All

Redundancy Level 3

Code types other than the following must be successfully read twice before being decoded. The following codes must be read three times:

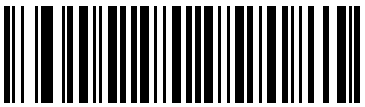
Code Type	Code Length
MSI Plessey	4 characters or less
D 2 of 5	8 characters or less
I 2 of 5	8 characters or less
Codabar	8 characters or less

Redundancy Level 4

The following code types must be successfully read three times before being decoded:

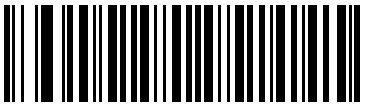
Code Type	Code Length
All	All

Redundancy Level (continued)

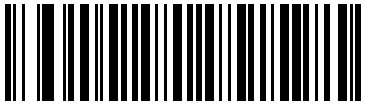


***Redundancy Level 1**
(01h)

Redundancy Level 2
(02h)



Redundancy Level 3
(03h)



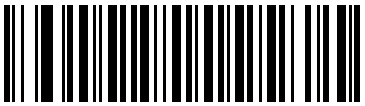
Redundancy Level 4
(04h)

Security Level

Parameter # 4Dh

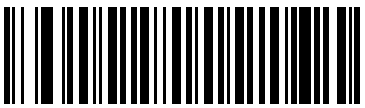
The decoder offers four levels of decode security for delta bar codes, which include the Code 128 family, UPC/EAN, and Code 93. Select increasing levels of security for decreasing levels of bar code quality. There is an inverse relationship between security and decoder aggressiveness, so choose only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

- **Security Level 0:** This setting allows the decoder 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 decoder. 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 decoder from decoding the symbol. If this problem occurs, scan the **Large Intercharacter Gaps** parameter to tolerate these out-of-specification bar codes.

***Normal Intercharacter Gaps (06h)**

Large Intercharacter Gaps (0Ah)

Macro PDF Features

Macro PDF is a special feature for concatenating multiple PDF symbols into one file. The decoder 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 scanning Macro PDF sequences, scan the entire Macro PDF sequence without interruption.

Macro PDF User Indications

In this mode the decoder provides the following feedback.

Table 9-2 *Macro PDF User Indications*

User Scans	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 scanned	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 scanned 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 decoder 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 scanned and decoded. Use the beeper and LED signals provided with the Symbol PL4507 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 scanned. Use the parameter *Flush Macro Buffer on page 9-87* 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 9-2*).
  When selecting this mode, enable *Transmit Macro PDF Control Header on page 9-86*. Also use the beeper and LED signals provided with the Symbol PL4507 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 decoder's BEEPER_ON signal is not used to drive a beeper (see *Table 2-3 on page 2-9*). In the other modes, some Macro PDF scanning sequences provide audible feedback only, so if BEEPER_ON is not used no user feedback is provided. In *Table 9-2*, all actions marked **No Tranmission** 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 9-85*, 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. Scan 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 10 Miscellaneous Options

Introduction

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

The decoder ships with the settings shown in the *Miscellaneous Options Default Table on page 10-2* (also see *Appendix A, Standard Default Parameters* for all host device and miscellaneous scanner defaults). If the default values suit requirements, programming is not necessary.

There are two ways to change a parameter value:

- Scan 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’s Guide* for detailed instructions for changing parameter values using this method.

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.

To return all features to default values, scan the *Set Default Parameter on page 4-4*. Throughout the programming bar code menus, default values are indicated with asterisks (*).

Scanning Sequence Examples

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

Errors While Scanning

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

Miscellaneous Parameter Defaults

Table 10-1 lists the defaults for miscellaneous options parameters. To change any option, scan the appropriate bar code(s) provided in the *Miscellaneous Parameters on page 10-3*.

NOTE See *Appendix A, Standard Default Parameters* for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 10-1 *Miscellaneous Options Default Table*

Parameter	Parameter Number	Default	Page Number
Transmit Code ID Character	2Dh	None	*10-3*
SSI Prefix Value	69h	<CR>	*10-4*
SSI Suffix 1 Value SSI Suffix 2 Value	68h 6Ah	<CR> <CR>	*10-4*
Non-SSI Prefix Value	63h, 69h	<CR><LF>	*10-4*
Non-SSI Suffix 1 Value Non-SSI Suffix 2 Value	62h, 68h 64h, 6Ah	<CR><LF> <CR><LF>	*10-4*
Scan Data Transmission Format	EBh	Data as is	*10-5*
FN1 Substitution Values	67h, 6Dh	Set	*10-6*
Transmit “No Read” Message	5Eh	Disable	*10-7*
Report Version			*10-7*

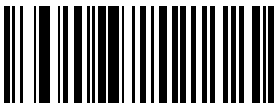
Miscellaneous Parameters

Transmit Code ID Character

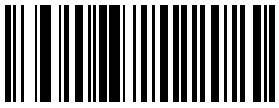
Parameter # 2Dh

A Code ID character identifies the code type of a scanned bar code. This is useful when the decoder 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.

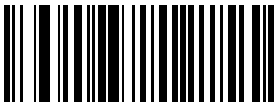
Select no Code ID character, a Symbol Code ID character, or an AIM Code ID character. For Code ID Characters, see *Code Identifiers on page B-1*.



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 scan data for use in data editing. To set a value for a prefix or suffix, scan a prefix or suffix bar code below, then scan 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, scan *Cancel on page D-3*.

NOTE To use Prefix/Suffix values, first set the *Scan Data Transmission Format on page 10-5*.

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, scan 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 10-4*.

***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

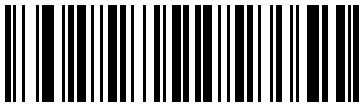
Decimal Value Parameter # 6Dh

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 ASCII Character Set table for the currently installed host interface for the desired value.

To select a FN1 substitution value via bar code menus:

1. Scan 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 scanning each digit in Appendix D, Numeric Bar Codes.

To correct an error or change the selection, scan **Cancel**.

To enable FN1 substitution for USB HID keyboard, scan the **Enable FN1 Substitution** bar code on *page 8-9*.

Transmit “No Read” Message

Parameter # 5Eh

Scan 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)**

Report Version

Scan the bar code below to report the version of software currently installed in the scanner.

Report Software Version

Chapter 11 Advanced Data Formatting

Introduction

Advanced Data Formatting (ADF) is a means of customizing data before transmission to the host device. This enables editing scan data to suit the particular requirements.

To implement ADF, scan a related series of bar codes which begin on *page 11-8* that allows programming the decoder with ADF rules.

Avoid using ADF formatting with bar codes containing more than 60 characters. To add a prefix or suffix value for such bar codes, use *Prefix/Suffix Values on page 10-4*. Using ADF with longer bar codes transmits the bar code in segments of length 252 or less (depending on the host), and applies the rule to each segment.

Rules: Criteria Linked to Actions

ADF uses **rules** to customize data. These rules perform detailed actions when the data meets certain criteria. One rule may consist of single or multiple criteria applied to single or multiple actions.

For instance, a data formatting rule could be:

Criteria*:* *When scan data is Code 39, length 12, and data at the start position is the string "129"*,

Actions*:* *pad all sends with zeros to length 8,*
send all data up to X,
send a space.

Scanning a Code 39 bar code of 1299X1559828 transmits: 00001299<space>. If you scan a Code 39 bar code of 1299X15598, this rule is ignored because the bar code didn't meet the length criteria.

The rule specifies the editing conditions and requirements before data transmission occurs.

Using ADF Bar Codes

When programming a rule, make sure the rule is logically correct. Plan ahead before scanning.

To program each data formatting rule:

- **Start the Rule**. Scan the *Begin New Rule bar code on page 11-8*.
- **Specify Criteria**. Scan the bar codes for all pertinent criteria. Criteria can include code type (e.g., Code 128), code length, or data that contains a specific character string (e.g., the digits “129”). See *Criteria on page 11-11*.
- **Select Actions**. Scan all actions related to, or affecting, these criteria. The actions of a rule specify how to format the data for transmission. See *Actions on page 11-27*.
- **Save the Rule**. Scan the *Save Rule bar code on page 11-8*. This places the rule in the “top” position in the rule buffer.
- Use special-purpose bar codes to correct errors during this process. Erase criteria, actions, and entire rules by scanning the appropriate bar code on *page 11-9*.

ADF Bar Code Menu Example

This section provides an example of how to enter ADF rules for scan data.

An auto parts distribution center wants to encode manufacturer ID, part number, and destination code into their own Code 128 bar codes. The distribution center also has products that carry UPC bar codes, placed there by the manufacturer. The Code 128 bar codes have the following format:

MMMMMPPPPPDD

Where: M = Manufacturer ID
P = Part Number
D = Destination Code

The distribution center uses a PC with dedicated control characters for manufacturer ID <CTRL M>, part number <CTRL P>, and destination code <CTRL D>. The center treats the UPC data as a manufacturer ID code.

The following rules must be entered:

When scanning data of code type Code 128, send the next 5 characters, send the manufacturer ID key <CTRL M>, send the next 5 characters, send the part number key <CTRL P>, send the next 2 characters, send the destination code key <CTRL D>.

When scanning data of code type UPC/EAN, send all data, send the manufacturer ID key <CTRL M>.

To enter these rules, use the following steps:

Rule 1: The Code 128 Scanning Rule

Step	Bar Code	On Page	Beep Indication
1	Begin New Rule	*11-8*	High High
2	Code 128	*11-11*	High High
3	Send next 5 characters	*11-28*	High High
4	Send <CTRL M>	*11-49*	High High
5	Send next 5 characters	*11-28*	High High
6	Send <CTRL P>	*11-49*	High High
7	Send next 2 characters	*11-27*	High High
8	Send <CTRL D>	*11-48*	High High
9	Save Rule	*11-8*	High Low High Low

Rule 2: The UPC Scanning Rule

Step	Bar Code	On Page	Beep Indication
1	Begin New Rule	*11-8*	High High
2	UPC/EAN	*11-13*	High High
3	Send all remaining data	*11-27*	High High
4	Send <CTRL M>	*11-49*	High High
5	Save Rule	*11-8*	High Low High Low

If you make errors entering this rule, scan the *Quit Entering Rules bar code on page 11-9*. If you already saved the rule, scan the *Erase Previously Saved Rule bar code on page 11-9*.

Alternate Rule Sets

Group ADF rules into one of four alternate sets which you can turn on and off when needed. This is useful to format the same message in different ways. For example, a Code 128 bar code contains the following information:

Class (2 digits), Stock Number (8) digits, Price (5 digits)

The bar code might look like this:

245671243701500

where:

Class = 24
Stock Number = 56712437
Price = 01500

Ordinarily, data transmits as follows:

24 (class key)
56712437 (stock key)
01500 (enter key)

But, when there is a sale, send only the following:

24 (class key)
56712437 (stock key)

and the cashier keys the price manually.

To implement this, first enter an ADF rule that applies to the normal situation, such as:

> Scan Rule Belongs to Set 1. When scanning a bar code of length 15, send the next 2 characters, send the class key, send the next 8 characters, send the stock key, send the data that remains, send the Enter key.

The “sale” rule may look like this:

> Scan Rule Belongs to Set 2. When scanning a bar code of length 15, send the next 2 characters, send the class key, send the next 8 characters, send the stock key.

To switch between the two sets of rules, program a “switching rule” to specify the type of bar code to scan to switch between the rule sets. For example, in the case of the “sale” rule above, the rule programmer wants the cashier to scan the bar code “M” before a sale. To do this, enter the following rule:

> When scanning a bar code of length 1 that begins with “M”, select rule set number 1.

Program another rule to switch back:

> When scanning a bar code of length 1 that begins with “N”, turn off rule set number 1.

Or include the switching back rules in the “sale” rule:

> When scanning a bar code of length 15, send the next 2 characters, send the class key, send the next 8 characters, send the stock key, turn off rule set 1.

Motorola recommends scanning the *Disable All Rule Sets bar code on page 11-10* after programming a rule belonging to an alternate rule set.

In addition to enabling and disabling rule sets within the rules, enable or disable them by scanning the appropriate bar codes on *page 11-10*.

Rules Hierarchy (in Bar Codes)

The order of programming individual rules is important. Program the most general rule first.

All programmed rules are stored in a buffer. As they are programmed, they are stored at the “top” of a rules list. If you created three rules, the list is configured as follows:

> Third Rule
> Second Rule
> First Rule

When you scan data, the rules list is checked from top to bottom to determine if the criteria matches (and therefore, if the actions occur). Input is modified into the data format specified by the first matching set of criteria it finds. Be sure to program the most general rule first.

For example, if the THIRD rule states:

> When scanning a bar code of any length, send all data, then send the ENTER key.

And the SECOND rule states:

> When scanning a Code 128 bar code of length 12, send the first four characters, then send the ENTER key, then send all remaining data.

and you scan a Code 128 bar code of length 12, the THIRD rule applies, and the SECOND rule does not function.

Note also that using standard data editing functions also creates ADF rules. Scan options are entered as ADF rules, and the previous hierarchy also applies to them. For the decoder, this applies to prefix/suffix programming in the parameter *Scan Data Transmission Format on page 10-5*.

These rules reside in the same “rule list” as ADF rules, so the order of their creation is also important.

Default Rules

Every unit has a default rule to send all scan data. Units with custom software may have one or more default rules burned in. The rules hierarchy checks user programmable rules first, then the default rules. To disable default rules enter the following general rule in the user programmable buffer:

When receiving scan data, send all data.

Since this rule always applies, ADF never enters the default rules.

ADF Bar Codes

Table 11-1 lists the bar codes available through ADF.

Table 11-1 *ADF Bar Codes*

Table 11-1 *ADF Bar Codes (Continued)*

Table 11-1 *ADF Bar Codes (Continued)*

Parameter	Page Number
End of Message	*11-100*
a - z	*11-100*
{ - ~	*11-104*

Special Commands

Pause Duration

This parameter, along with the Send Pause parameter on *page 11-32*, inserts a pause in the data transmission. Set the pause by scanning a two-digit number (i.e., two bar codes) representing a 0.1 second interval in the range of 0.1 to 9.9. For example, scanning bar codes **0** and **1** inserts a 0.1 second pause; **0** and **5** gives a 0.5 second delay. The default is 1 second. See *Appendix D, Numeric Bar Codes*. To correct an error or change a selection, scan *Cancel on page D-3*.

Pause Duration

Begin New Rule

Scan the bar code below to start entering a new rule

.

Begin New Rule

Save Rule

Scan the bar code below to save the rule.

Save Rule

Erase

Use these bar codes to erase criteria, actions, or rules.

Erase Criteria And Start Again

Erase Actions And Start Again

Erase Previously Saved Rule

Erase All Rules

Quit Entering Rules

Scan the bar code below to quit entering rules.

Quit Entering Rules

Disable Rule Set

Use these bar codes to disable rule sets.

Disable Rule Set 1

Disable Rule Set 2

Disable Rule Set 3

Disable Rule Set 4

Disable All Rule Sets

Criteria

Code Types

Select all code types to be affected by the rule. Scan all desired codes in succession, before selecting other criteria. *Do not select a code type to apply the rule to all code types*.

Code 39

Codabar

GS1 DataBar-14

GS1 DataBar Limited

GS1 DataBar Expanded

Code 128

D 2 OF 5

Code Types (continued)

IATA 2 OF 5

I 2 OF 5

Code 93

UPC-A

UPC-E

EAN-8

EAN-13

ISSN

Code Types (continued)

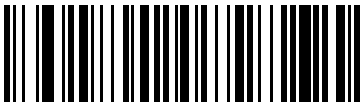
MSI

GS1-128

UPC-E1

Bookland EAN

Trioptic Code 39



Code 11

Code 32

Code Types (continued)

ISBT 128

Coupon Code

Chinese 2 of 5

Matrix 2 of 5

US Postnet

US Planet

UK Postal

Code Types (continued)

Japan Postal

Australian Postal

Netherlands KIX Code

USPS 4CB/One Code/Intelligent Mail

UPU FICS Postal

PDF417

MicroPDF

Code Types (continued)

Macro PDF

Macro MicroPDF

MaxiCode

Datamatrix

QR Code

MicroQR

TLC 39

Code Types (continued)

UPC/EAN Composites

GS1 DataBar and EAN128 Composites

Aztec

Aztec Rune

✓ ***NOTE*** When selecting composite bar codes, enable AIM IDs if parsing UPC or EAN composite data, or data from an application that uses symbol separators.

Code Lengths

Define the number of characters the selected code type must contain. *Do not select any code length to select code types of any length*.

Scan these bar codes to define the number of characters the selected code types must contain. Select one length per rule only.

1 Character

2 Characters

3 Characters

4 Characters

5 Characters

6 Characters

Code Lengths (continued)

7 Characters

8 Characters

9 Characters

10 Characters

11 Characters

12 Characters

13 Characters

Code Lengths (continued)

14 Characters

15 Characters

16 Characters

17 Characters

18 Characters

19 Characters

20 Characters

Code Lengths (continued)

21 Characters

22 Characters

23 Characters

24 Characters

25 Characters

26 Characters

27 Characters

Code Lengths (continued)

28 Characters

29 Characters

30 Characters

Message Containing A Specific Data String

Use this feature to select whether the formatting affects data that begins with a specific character or data string, or contains a specific character or data string.

There are 5 features:

- Specific String at Start
- Specific String, Any Location
- Specific String Search
- Any Message OK
- Rule Belongs to Set

Specific String at Start

1. Scan the following bar code.
2. Scan the bar codes representing the desired character or characters (up to a total of 8) using the *Alphanumeric Keyboard on page 11-91*.
3. Scan *End of Message bar code on page 11-100*.

Specific String At Start

Specific String, Any Location

1. Scan the following bar code.
2. Enter a location by scanning a two-digit number representing the ***position*** (use a leading “zero” if necessary) using the *Numeric Keypad on page 11-24*.
3. Scan the bar codes representing the desired character or characters (up to a total of 8) using the *Alphanumeric Keyboard on page 11-91*.
4. Scan *End of Message bar code on page 11-100*.

Specific String Any Location

Specific String Search

1. Scan the following bar code.
2. Scan the bar codes representing the desired character or characters (up to a total of 10) using the *Alphanumeric Keyboard on page 11-91*.
3. Scan *End of Message bar code on page 11-100*.

Specific String Search

Any Message OK

By not scanning any bar code, all selected code types are formatted, regardless of information contained.

Numeric Keypad

Bar codes on this page should not be confused with those on the alphanumeric keyboard.

0

1

2

3

4

5

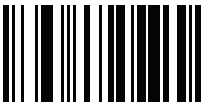
6

Numeric Keypad (continued)

7

8

9



Cancel

Rule Belongs To Set

Select the set a rule belongs to. (There are four possible rule sets.) See *Alternate Rule Sets on page 11-3* for more information about rule sets.

Scan a bar code below to select which set a rule belongs to.

Rule Belongs To Set 1

Rule Belongs To Set 2

Rule Belongs To Set 3

Rule Belongs To Set 4

Actions

Select how to format the data for transmission.

Send Data

Send all data that follows, send all data up to a specific character selected from the *Alphanumeric Keyboard on page 11-91*, or send the next *X* characters. Note that only bar codes for **Send Next 1** to **20** appear here, and can be scanned multiple times to send values greater then 20. For instance, to send the next 28 characters, scan **Send Next 20 Characters**, then **Send Next 8 Characters**.

Send Data Up To Character

Send All Data That Remains

Send Next Character

Send Next 2 Characters

Send Next 3 Characters

Send Next 4 Characters

Send Data (continued)

Send Next 5 Characters

Send Next 6 Characters

Send Next 7 Characters

Send Next 8 Characters

Send Next 9 Characters

Send Next 10 Characters

Send Next 11 Characters

Send Data (continued)

Send Next 12 Characters

Send Next 13 Characters

Send Next 14 Characters

Send Next 15 Characters

Send Next 16 Characters

Send Next 17 Characters

Send Next 18 Characters

Send Data (continued)

Send Next 19 Characters

Send Next 20 Characters

Setup Field(s)

Table 11-2 *Setup Field(s) Definitions*

Parameter	Description	Page
Move Cursor		
Move Cursor To a Character	Scan the *Move Cursor To Character*, then any printable ASCII character from the *Alphanumeric Keyboard on page 11-91*. This moves the cursor to the position after the matching character. If the character is not there, the rule fails and ADF tries the next rule.	*11-31*
Move Cursor to Start of Data	Scan this bar code to move cursor to the beginning of the data.	*11-31*
Move Cursor Past a Character	This action moves the cursor past all sequential occurrences of a selected character. For example, if the selected character is ‘A’, the cursor moves past ‘A’, ‘AA’, ‘AAA’, etc. Scan the *Move Cursor Past Character*, then select a character from the *Alphanumeric Keyboard*. If the character is not there, the cursor does not move (i.e., has no effect).	*11-32*
Move Cursor Past a Specific String	This action moves the cursor past the first occurrence of a selected string. Scan *Move Cursor Past Specific String*, then select the character(s) (up to 10) using the *Alphanumeric Keyboard*. Scan the *End of Message bar code on page 11-100*.	*11-32*
Move Cursor to Specific String and Replace	This action moves the cursor to the first occurrence of a selected string and replaces the string with another user-defined string. Scan *Move Cursor to Specific String and Replace*, then enter an alphanumeric string representing the character(s) (up to 10) to match and delete using the *Alphanumeric Keyboard*. Scan the *End of Message bar code on page 11-100*. Enter another alphanumeric string representing the character(s) (up to 10) to insert using the *Alphanumeric Keyboard*. Scan *End of Message*.	*11-32*

Table 11-2 *Setup Field(s) Definitions (Continued)*

Parameter	Description	Page
Move Cursor to Last Occurrence of String and Replace All	This action replaces all occurrences of a selected string with another user-defined string, and moves the cursor to the beginning of the last occurrence. Scan *Move Cursor to Last Occurrence of String and Replace All*, then enter an alphanumeric string representing the character(s) (up to 10) to match and delete using the *Alphanumeric Keyboard*. Scan the *End of Message*. Enter another alphanumeric string representing the character(s) (up to 10) to insert using the *Alphanumeric Keyboard*. Scan *End of Message*.	*11-32*
Skip to End	Scan *Skip to End* to move the cursor to the end of the data.	*11-32*
Skip Ahead “N” Characters	Scan one of these bar codes to select the number of positions ahead to move the cursor.	*11-33*
Skip Back “N” Characters	Scan one of these bar codes to select the number of positions back to move the cursor.	*11-34*
Send Preset Value	Send Values 1 through 6 by scanning the appropriate bar code. These values must be set using the prefix/suffix values in *Table 7-4 on page 7-19*. Value 1 = Scan Suffix Value 2 = Scan Prefix Values 3-6 are not applicable	*11-34*

Move Cursor

Scan a bar code below to move the cursor in relation to a specified character. Then enter a character by scanning a bar code from the *Alphanumeric Keyboard on page 11-91*.

NOTE If there is no match when the rule is interpreted and the rule fails, the next rule is checked.

Move Cursor To Character

Move Cursor To Start

Move Cursor (continued)

Move Cursor Past Character

Move Cursor Past Specific String

Move Cursor to Specific String and Replace

Move Cursor to Last Occurrence of String and Replace All

Skip to End

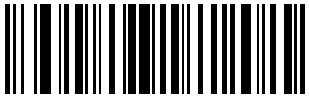
Send Pause

Scan the bar code below to insert a pause in the transmission of data. The length of this pause is controlled by the value of the Pause Duration parameter.

Send Pause

Skip Ahead

Use the following bar codes to skip ahead characters.



Skip Ahead 1 Character

Skip Ahead 2 Characters

Skip Ahead 3 Characters

Skip Ahead 4 Characters

Skip Ahead 5 Characters

Skip Ahead 6 Characters

Skip Ahead 7 Characters

Skip Ahead (continued)

Skip Ahead 8 Characters

Skip Ahead 9 Characters

Skip Ahead 10 Characters

Skip Back

Use the following bar codes to skip back characters.

Skip Back 1 Character

Skip Back 2 Characters

Skip Back 3 Characters

Skip Back (continued)

Skip Back 4 Characters

Skip Back 5 Characters

Skip Back 6 Characters

Skip Back 7 Characters

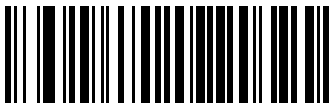
Skip Back 8 Characters

Skip Back 9 Characters

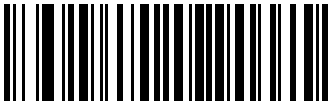
Skip Back 10 Characters

Send Preset Value

Use these bar codes to send preset values. These values must be set using the Scan Prefix and Scan Suffix bar codes on *page 10-4*.



Send Prefix



Send Suffix

Modify Data

Modify data in the ways listed. The following actions work for all send commands that follow it within a rule. Programming *pad zeros to length 6, send next 3 characters, stop padding, send next 5 characters,* adds three zeros to the first send, and the next send is unaffected by the padding. These options do not apply to the **Send Keystroke** or **Send Preset Value** options.

Remove All Spaces

To remove all spaces in the send commands that follow, scan the bar code below.

Remove All Spaces

Crunch All Spaces

To leave one space between words, scan the bar code below. This also removes all leading and trailing spaces.

Crunch All Spaces

Stop Space Removal

Scan the bar code below to disable space removal.

Stop Space Removal

Remove Leading Zeros

Scan the bar code below to remove all leading zeros.

Remove Leading Zeros

Stop Zero Removal

Scan the bar code below to disable the removal of zeros.

Stop Zero Removal

Pad Data with Spaces

To pad data to the left, scan the bar code containing the desired number of spaces. This parameter is activated by Send commands.

Pad Spaces To Length 1

Pad Spaces To Length 2

Pad Spaces To Length 3

Pad Spaces To Length 4

Pad Spaces To Length 5

Pad Spaces To Length 6

Pad Spaces To Length 7

Pad Data with Spaces (continued)

Pad Spaces To Length 8

Pad Spaces To Length 9

Pad Spaces To Length 10

Pad Spaces To Length 11

Pad Spaces To Length 12

Pad Spaces To Length 13

Pad Spaces To Length 14

Pad Data with Spaces (continued)

Pad Spaces To Length 15

Pad Spaces To Length 16

Pad Spaces To Length 17

Pad Spaces To Length 18

Pad Spaces To Length 19

Pad Spaces To Length 20

Pad Spaces To Length 21

Pad Data with Spaces (continued)

Pad Spaces To Length 22

Pad Spaces To Length 23

Pad Spaces To Length 24

Pad Spaces To Length 25

Pad Spaces To Length 26

Pad Spaces To Length 27

Pad Spaces To Length 28

Pad Data with Spaces (continued)

Pad Spaces To Length 29

Pad Spaces To Length 30

Stop Pad Spaces

Pad Data with Zeros

To pad data to the left, scan the bar code containing the desired number of zeros. This parameter is activated by Send commands.

Pad Zeros To Length 1

Pad Zeros To Length 2

Pad Zeros To Length 3

Pad Data with Zeros (continued)

Pad Zeros To Length 4

Pad Zeros To Length 5

Pad Zeros To Length 6

Pad Zeros To Length 7

Pad Zeros To Length 8

Pad Zeros To Length 9

Pad Zeros To Length 10

Pad Data with Zeros (continued)

Pad Zeros To Length 11

Pad Zeros To Length 12

Pad Zeros To Length 13

Pad Zeros To Length 14

Pad Zeros To Length 15

Pad Zeros To Length 16

Pad Zeros To Length 17

Pad Data with Zeros (continued)

Pad Zeros To Length 18

Pad Zeros To Length 19

Pad Zeros To Length 20

Pad Zeros To Length 21

Pad Zeros To Length 22

Pad Zeros To Length 23

Pad Zeros To Length 24

Pad Data with Zeros (continued)

Pad Zeros To Length 25

Pad Zeros To Length 26

Pad Zeros To Length 27

Pad Zeros To Length 28

Pad Zeros To Length 29

Pad Zeros To Length 30

Stop Pad Zeros

Beeps

Select a beep sequence for each ADF rule.

Beep Once

Beep Twice

Beep Three Times

Send Keystroke (Control Characters and Keyboard Characters)

Control Characters

Scan the “Send __” bar code for the keystroke to send

Send Control 2

Send Control A

Send Control B

Control Characters (continued)

Send Control C

Send Control D

Send Control E

Send Control F

Send Control G

Send Control H

Send Control I

Control Characters (continued)

Send Control J

Send Control K

Send Control L

Send Control M

Send Control N

Send Control O

Send Control P

Control Characters (continued)

Send Control Q

Send Control R

Send Control S

Send Control T

Send Control U

Send Control V

Send Control W

Control Characters (continued)

Send Control X

Send Control Y

Send Control Z

Send Control [

**Send Control **

Send Control]

Control Characters (continued)

Send Control 6

Send Control -

Keyboard Characters

Scan the “Send __” bar code for the keyboard characters to send.

Send Space

Send !

Send “

Send #

Keyboard Characters (continued)

Send $

Send %

Send &

Send ‘

Send (

Send)

Send *

Keyboard Characters (continued)

Send +

Send ,

Send -

Send .

Send /

Send 0

Send 1

Keyboard Characters (continued)

Send 2

Send 3

Send 4

Send 5

Send 6

Send 7

Send 8

Keyboard Characters (continued)

Send 9

Send :

Send ;

Send <

Send =

Send >

Send ?

Keyboard Characters (continued)

Send @

Send A

Send B

Send C

Send D

Send E

Send F

Keyboard Characters (continued)

Send G

Send H

Send I

Send J

Send K

Send L

Send M

Keyboard Characters (continued)

Send N

Send O

Send P

Send Q

Send R

Send S

Send T

Keyboard Characters (continued)

Send U

Send V

Send W

Send X

Send Y

Send Z

Send [

Keyboard Characters (continued)

**Send **

Send]

Send ^

Send _

Send `

Send a

Send b

Keyboard Characters (continued)

Send c

Send d

Send e

Send f

Send g

Send h

Send i

Keyboard Characters (continued)

Send j

Send k

Send l

Send m

Send n

Send o

Send p

Keyboard Characters (continued)

Send q

Send r

Send s

Send t

Send u

Send v

Send w

Keyboard Characters (continued)

Send x

Send y

Send z

Send {

Send |

Send }

Send ~

Send ALT Characters

Send Alt 2

Send Alt A

Send Alt B

Send Alt C

Send Alt D

Send Alt E

Send Alt F

Send ALT Characters (continued)

Send Alt G

Send Alt H

Send Alt I

Send Alt J

Send Alt K

Send Alt L

Send Alt M

Send ALT Characters (continued)

Send Alt N

Send Alt O

Send Alt P

Send Alt Q

Send Alt R

Send Alt S

Send Alt T

Send ALT Characters (continued)

Send Alt U

Send Alt V

Send Alt W

Send Alt X

Send Alt Y

Send Alt Z

Send Alt [

Send ALT Characters (continued)

**Send Alt **

Send Alt]

Send Keypad Characters

Send Keypad *

Send Keypad +

Send Keypad -

Send Keypad .

Send Keypad /

Send Keypad 0

Send Keypad 1

Send Keypad Characters (continued)

Send Keypad 2

Send Keypad 3

Send Keypad 4

Send Keypad 5

Send Keypad 6

Send Keypad 7

Send Keypad 8

Send Keypad Characters (continued)

Send Keypad 9

Send Keypad Enter

Send Keypad Numlock

Send Break Key

Send Delete Key

Send Page Up Key

Send End Key

Send Keypad Characters (continued)

Send Page Down Key

Send Pause Key

Send Scroll Lock Key

Send Backspace Key

Send Tab Key

Send Print Screen Key

Send Insert Key

Send Keypad Characters (continued)

Send Home Key

Send Enter Key

Send Escape Key

Send Up Arrow Key

Send Down Arrow Key

Send Left Arrow Key

Send Right Arrow Key

Send Function Key

Send F1 Key

Send F2 Key

Send F3 Key

Send F4 Key

Send F5 Key

Send F6 Key

Send F7 Key

Send Function Key (continued)

Send F8 Key

Send F9 Key

Send F10 Key

Send F11 Key

Send F12 Key

Send F13 Key

Send F14 Key

Send Function Key (continued)

Send F15 Key

Send F16 Key

Send F17 Key

Send F18 Key

Send F19 Key

Send F20 Key

Send F21 Key

Send Function Key (continued)

Send F22 Key

Send F23 Key

Send F24 Key

Send PF1 Key

Send PF2 Key

Send PF3 Key

Send PF4 Key

Send Function Key (continued)

Send PF5 Key

Send PF6 Key

Send PF7 Key

Send PF8 Key

Send PF9 Key

Send PF10 Key

Send PF11 Key

Send Function Key (continued)

Send PF12 Key

Send PF13 Key

Send PF14 Key

Send PF15 Key

Send PF16 Key

Send PF17 Key

Send PF18 Key

Send Function Key (continued)

Send PF19 Key

Send PF20 Key

Send PF21 Key

Send PF22 Key

Send PF23 Key

Send PF24 Key

Send PF25 Key

Send Function Key (continued)

Send PF26 Key

Send PF27 Key

Send PF28 Key

Send PF29 Key

Send PF30 Key

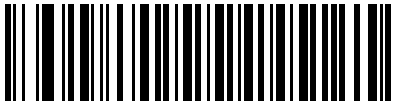
Send Right Control Key

The “Send Right Control Key” action will send a tap (press and release) of the Right Control Key.

Send Right Control Key

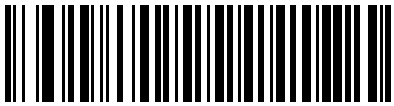
Send Graphic User Interface (GUI) Characters

The “Send Graphic User Interface Character” actions will tap the specified key while holding the System Dependent Graphic User Interface (GUI) Key. The definition of the Graphic User Interface key is dependant upon the attached system:

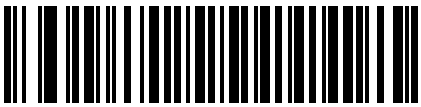


Send GUI 0

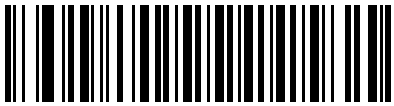
Send GUI 1



Send GUI 2



Send GUI 3



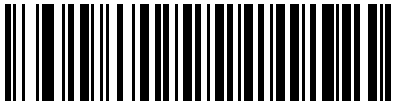
Send GUI 4

Send GUI 5

Send Graphic User Interface (GUI) Characters (continued)

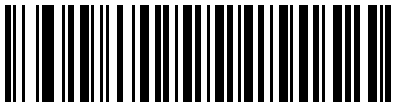
Send GUI 6

Send GUI 7



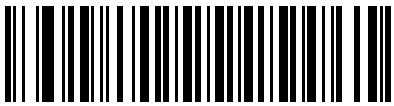
Send GUI 8

Send GUI 9



Send GUI A

Send GUI B



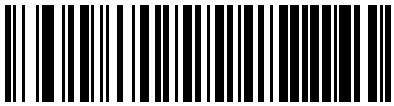
Send GUI C

Send Graphic User Interface (GUI) Characters (continued)

Send GUI D

Send GUI E

Send GUI F



Send GUI G

Send GUI H

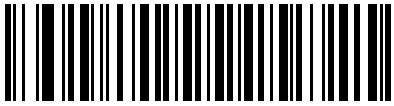
Send GUI I

Send GUI J

Send Graphic User Interface (GUI) Characters (continued)

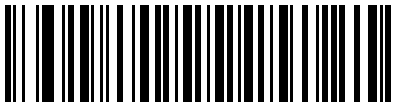
Send GUI K

Send GUI L



Send GUI M

Send GUI N



Send GUI O

Send GUI P

Send GUI Q

Send Graphic User Interface (GUI) Characters (continued)

Send GUI R

Send GUI S

Send GUI T

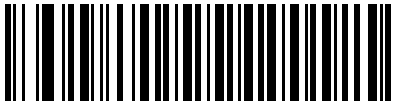
Send GUI U

Send GUI V

Send GUI W

Send GUI X

Send Graphic User Interface (GUI) Characters (continued)



Send GUI Y

Send GUI Z

Turn On/Off Rule Sets

Use these bar codes to turn rule sets on and off.

Turn On Rule Set 1

Turn On Rule Set 2

Turn On Rule Set 3

Turn On Rule Set 4

Turn On/Off Rule Sets (continued)

Use these bar codes to turn rule sets on and off.

Turn Off Rule Set 1

Turn Off Rule Set 2

Turn Off Rule Set 3

Turn Off Rule Set 4

Alphanumeric Keyboard

Space

#

$

%

*****
(Single Close Quote)

+

-
(Dash)

Alphanumeric Keyboard (continued)

.

,
(Comma)

/

!

“

&

‘
(Single Open Quote)

(

Alphanumeric Keyboard (continued)

)

:

;

<

=

>

?

Alphanumeric Keyboard (continued)

@

[

\

]

^

_
(Underscore)

`

Alphanumeric Keyboard (continued)

NOTE Numeric bar codes below should not be confused with those on the numeric keypad

0

1

2

3

4

5

Alphanumeric Keyboard (continued)

6

7

8

9

A

B

C

Alphanumeric Keyboard (continued)

D

E

F

G

H

I

J

Alphanumeric Keyboard (continued)

K

L

M

N

O

P

Q

Alphanumeric Keyboard (continued)

R

S

T

U

V

W

X

Alphanumeric Keyboard (continued)

Y

Z

Cancel

End of Message

a

b

c

Alphanumeric Keyboard (continued)

d

e

f

g

h

i

j

Alphanumeric Keyboard (continued)

k

l

m

n

o

p

q

Alphanumeric Keyboard (continued)

r

s

t

u

v

w

x

Alphanumeric Keyboard (continued)

y

z

{

|

}

~

Appendix A Standard Default Parameters

Default Parameters

Table A-1 *Standard Default Parameters Table*

Parameter	Parameter Number	Default	Page Number
User Preferences			
Set Default Parameter		Restore Defaults	*4-4*
Parameter Scanning	ECh	Enable	*4-5*
Beeper Tone	91h	Medium	*4-6*
Beeper Volume	8Ch	High	*4-7*
Trigger Modes	8Ah	Level	*4-8*
Motion Enhancement for Presentation Mode	F1 A6h	Disable	*4-9*
Motion Enhancement Performance Setting	F1 8Ah	Standard	*4-9*
Time Delay to Motion Enhancement Sleep Mode	F1 96h	1 Minute	*4-10*
Power Mode	80h	Low Power	*4-12*
Time Delay to Low Power Mode	92h	1.0 Sec	*4-12*
Picklist Mode	F0h 92h	Disabled Always	*4-14*
Decode Session Timeout	88h	9.9 Sec	*4-14*
Timeout Between Decodes, Same Symbol	89h	0.6 Sec	*4-15*
Beep After Good Decode	38h	Enable	*4-15*
Continuous Bar Code Read	F1 89h	Disable	*4-16*

[1]User 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
Multicode Mode	F1h A5h	Disable	4-16
Multicode Expression	F1h 95h	1	4-17
Imager Preferences			
Decoding Autoexposure	F0h 29h	Enable	5-5
Decoding Illumination	F0h 2Ah	Enable	5-6
Decode Aiming Pattern	F0h 32h	Enable	5-6
Aim Brightness	F0h 9Ch	0	5-7
Illumination Brightness	F0h 9Dh	10	5-7
Low Light Enhancement	F1h 64h	Disable	5-8
Presentation Mode Field of View	F1h 61h	Default (Reduced)	5-8
Frame Rate	F1h A2h	Auto	5-9
Image Capture Autoexposure	F0h 68h	Enable	5-10
Image Capture Illumination	F0h 69h	Enable	5-10
Gain	F4h F0h A7h	100	5-11
Exposure Time	F4h F1h 37h	10 (1 ms)	5-11
LED Illumination	F0h ADh	Internal LED Illumination	5-12
Snapshot Mode Timeout	F0h 43h	0 (30 seconds)	5-14
Snapshot Aiming Pattern	F0h 2Ch	Enable	5-14
Presentation Snapshot by Motion	F1h 87h	Disable	5-15
Continuous Snapshot	F1h 88h	Disable	5-15
Image Cropping	F0h 2Dh	Disable	5-16
Crop to Pixel Addresses	F4h F0h 3Bh; F4h F0h 3Ch; F4h F0h 3Dh; F4h F0h 3Eh	0 top, 0 left, 479 bottom, 751 right	5-17
Image Resolution	F0h 2Eh	Full	5-18
Image Brightness (Target White)	F0h 86h	180	5-19
Image File Format Selection	F0h 30h	JPEG	5-20
JPEG Image Options	F0h 2Bh	Quality	5-20

[1]User 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
JPEG Quality Value	F0h 31h	65	*5-21*
JPEG Size Value	F1h 31h	40 (41K)	*5-21*
Image Enhancement	F1h 34h	Off	*5-22*
Image Edge Sharpening	F1h 98h	Off	*5-23*
Image Contrast Enhancement	F1h 9Ah	Off	*5-24*
Image Rotation	F1h 99h	0	*5-25*
Bits per Pixel (BPP)	F0h 2Fh	8 BPP	*5-26*
Signature Capture	5Dh	Disable	*5-27*
Signature Capture Image File Format Selection	F0h 39h	JPEG	*5-28*
Signature Capture Bits per Pixel (BPP)	F0h 3Ah	8 BPP	*5-29*
Signature Capture Width	F4h F0h 6Eh	400	*5-29*
Signature Capture Height	F4h F0h 6Fh	100	*5-30*
Signature Capture JPEG Quality	F0h A5h	65	*5-30*
Video View Finder	F0h 44h	Disable	*5-30*
Target Video Frame Size	F0h 48h	2200 bytes	*5-31*
Video View Finder Image Size	F0h 49h	1700 bytes	*5-31*
Video Resolution	F0h 9Bh	1/4 resolution	*5-32*
SSI Host Parameters			
Select SSI Host	N/A	N/A	*6-9*
Baud Rate	9Ch	9600	*6-10*
Parity	9Eh	None	*6-11*
Check Parity	97h	Disable	*6-12*
Software Handshaking	9Fh	ACK/NAK	*6-12*
Host RTS Line State	9Ah	Low	*6-13*
Decode Data Packet Format	EEh	Send Raw Decode Data	*6-13*
Host Serial Response Time-out	9Bh	2 sec	*6-14*
Host Character Time-out	EFh	200 msec	*6-15*
Multipacket Option	F0h 4Eh	Option 1	*6-16*

[1]User 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
Interpacket Delay	F0h 4Fh	0 ms	6-17
Event Reporting			
Decode Event	F0h 00h	Disable	6-18
Boot Up Event	F0h 02h	Disable	6-19
Parameter Event	F0h 03h	Disable	6-19
Serial Host Parameters			
Serial Host Types	N/A	Standard RS-232	7-5
Baud Rate	N/A	9600	7-7
Parity Type	N/A	None	7-9
Data Bits	N/A	8-Bit	7-9
Check Receive Errors	N/A	Enable	7-10
Hardware Handshaking	N/A	None	7-11
Software Handshaking	N/A	None	7-13
Host Serial Response Time-out	N/A	2 Sec	7-15
RTS Line State	N/A	Low RTS	7-16
Beep on <BEL>	N/A	Disable	7-16
Intercharacter Delay	N/A	0 msec	7-17
Nixdorf Beep/LED Options	N/A	Normal Operation	7-18
Ignore Unknown Characters	N/A	Send Bar Code	7-18
USB Host Parameters			
USB Device Type	N/A	SNAPI with Imaging	8-3
Symbol Native API (SNAPI) Status Handshaking	N/A	Enable	8-4
USB Country Keyboard Types (Country Codes)	N/A	North American	8-5
USB Keystroke Delay	N/A	No Delay	8-7
USB CAPS Lock Override	N/A	Disable	8-7
USB Ignore Unknown Characters	N/A	Enable	8-8
Emulate Keypad	N/A	Disable	8-8
Emulate Keypad with Leading Zero	N/A	Disable	8-9

[1]User 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
USB FN1 Substitution	N/A	Disable	*8-9*
Function Key Mapping	N/A	Disable	*8-10*
Simulated Caps Lock	N/A	Disable	*8-10*
Convert Case	N/A	None	*8-11*
Disable All Symbologies	N/A	N/A	*9-7*
UPC/EAN			
UPC-A	01h	Enable	*9-8*
UPC-E	02h	Enable	*9-8*
UPC-E1	0Ch	Disable	*9-9*
EAN-8/JAN 8	04h	Enable	*9-9*
EAN-13/JAN 13	03h	Enable	*9-10*
Bookland EAN	53h	Disable	*9-10*
Decode UPC/EAN/JAN Supplementals (2 and 5 digits)	10h	Ignore	*9-11*
User-Programmable Supplementals Supplemental 1: Supplemental 2:	 F1h 43h F1h 44h		*9-14*
UPC/EAN/JAN Supplemental Redundancy	50h	10	*9-14*
Transmit UPC-A Check Digit	28h	Enable	*9-15*
Transmit UPC-E Check Digit	29h	Enable	*9-15*
Transmit UPC-E1 Check Digit	2Ah	Enable	*9-16*
UPC-A Preamble	22h	System Character	*9-17*
UPC-E Preamble	23h	System Character	*9-18*
UPC-E1 Preamble	24h	System Character	*9-19*
Convert UPC-E to A	25h	Disable	*9-20*
Convert UPC-E1 to A	26h	Disable	*9-20*
EAN-8/JAN-8 Extend	27h	Disable	*9-21*
Bookland ISBN Format	F1h 40h	ISBN-10	*9-22*
UCC Coupon Extended Code	55h	Disable	*9-23*

[1]User 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
ISSN EAN	F1h 69h	Disable	*9-23*
Code 128			
Code 128	08h	Enable	*9-24*
Set Length(s) for Code 128	D1h D2h	Any Length	*9-24*
GS1-128 (UCC/EAN-128)	0Eh	Enable	*9-26*
ISBT 128	54h	Enable	*9-26*
ISBT Concatenation	F1h 41h	Disable	*9-27*
Check ISBT Table	F1h 42h	Enable	*9-28*
ISBT Concatenation Redundancy	DFh	10	*9-28*
Code 39			
Code 39	00h	Enable	*9-29*
Trioptic Code 39	0Dh	Disable	*9-29*
Convert Code 39 to Code 32 (Italian Pharmacy Code)	56h	Disable	*9-30*
Code 32 Prefix	E7h	Disable	*9-30*
Set Length(s) for Code 39	12h 13h	2 to 55	*9-31*
Code 39 Check Digit Verification	30h	Disable	*9-32*
Transmit Code 39 Check Digit	2Bh	Disable	*9-33*
Code 39 Full ASCII Conversion	11h	Disable	*9-33*
Buffer Code 39	71h	Disable	*9-34*
Code 93			
Code 93	09h	Disable	*9-37*
Set Length(s) for Code 93	1Ah 1Bh	4 to 55	*9-37*
Code 11			
Code 11	0Ah	Disable	*9-39*
Set Lengths for Code 11	1Ch 1Dh	4 to 55	*9-39*
Code 11 Check Digit Verification	34h	Disable	*9-41*
Transmit Code 11 Check Digit(s)	2Fh	Disable	*9-42*

[1]User 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
Interleaved 2 of 5 (ITF)			
Interleaved 2 of 5 (ITF)	06h	Enable	*9-42*
Set Lengths for I 2 of 5	16h 17h	14	*9-43*
I 2 of 5 Check Digit Verification	31h	Disable	*9-44*
Transmit I 2 of 5 Check Digit	2Ch	Disable	*9-45*
Convert I 2 of 5 to EAN 13	52h	Disable	*9-45*
Discrete 2 of 5 (DTF)			
Discrete 2 of 5	05h	Disable	*9-46*
Set Length(s) for D 2 of 5	14h 15h	12	*9-46*
Codabar (NW - 7)			
Codabar	07h	Disable	*9-48*
Set Lengths for Codabar	18h 19h	5 to 55	*9-48*
CLSI Editing	36h	Disable	*9-50*
NOTIS Editing	37h	Disable	*9-50*
MSI			
MSI	0Bh	Disable	*9-51*
Set Length(s) for MSI	1Eh 1Fh	4 to 55	*9-51*
MSI Check Digits	32h	One	*9-53*
Transmit MSI Check Digit	2Eh	Disable	*9-54*
MSI Check Digit Algorithm	33h	Mod 10/Mod 10	*9-54*
Chinese 2 of 5			
Chinese 2 of 5	F0h 98h	Disable	*9-55*
Matrix 2 of 5			
Matrix 2 of 5	F1h 6Ah	Disable	*9-55*
Matrix 2 of 5 Lengths	F1h 6Bh F1h 6Ch	1 Length - 14	*9-56*
Matrix 2 of 5 Redundancy	F1h 6Dh	Disable	*9-57*
Matrix 2 of 5 Check Digit	F1h 6Eh	Disable	*9-57*

[1]User 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
Transmit Matrix 2 of 5 Check Digit	F1h 6Fh	Disable	9-58
Inverse 1D	F1h 4Ah	Regular	9-59
Postal Codes			
US Postnet	59h	Enable	9-60
US Planet	5Ah	Enable	9-60
Transmit US Postal Check Digit	5Fh	Enable	9-61
UK Postal	5Bh	Enable	9-61
Transmit UK Postal Check Digit	60h	Enable	9-62
Japan Postal	F0h 22h	Enable	9-62
Australian Postal	F0h 23h	Enable	9-63
Netherlands KIX Code	F0h 46h	Enable	9-63
USPS 4CB/One Code/Intelligent Mail	F1h 50h	Disable	9-64
UPU FICS Postal	F1h 63h	Disable	9-64
GS1 DataBar (formerly RSS, Reduced Space Symbology)			
GS1 DataBar-14	F0h 52h	Enable	9-65
GS1 DataBar Limited	F0h 53h	Enable	9-65
GS1 DataBar Expanded	F0h 54h	Enable	9-66
Convert GS1 DataBar to UPC/EAN	F0h 8Dh	Disable	9-66
Composite			
Composite CC-C	F0h 55h	Disable	9-67
Composite CC-A/B	F0h 56h	Disable	9-67
Composite TLC-39	F0h 73h	Disable	9-68
UPC Composite Mode	F0h 58h	Always Linked	9-69
Composite Beep Mode	F0h 8Eh	Beep As Each Code Type is Decoded	9-70
GS1-128 Emulation Mode for UCC/EAN Composite Codes	F0h ABh	Disable	9-70

[1]User 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
2D Symbologies			
PDF417	0Fh	Enable	*9-71*
MicroPDF417	E3h	Disable	*9-71*
Code 128 Emulation	7Bh	Disable	*9-72*
Data Matrix	F0h 24h	Enable	*9-73*
Data Matrix Inverse	F1h 4Ch	Regular	*9-74*
Decode Mirror Images (Data Matrix Only)	F1h, 19h	Never	*9-75*
Maxicode	F0h 26h	Enable	*9-76*
QR Code	F0h 25h	Enable	*9-76*
QR Inverse	F1h 4Bh	Regular	*9-77*
MicroQR	F1h 3Dh	Enable	*9-78*
Aztec	F1h 3Eh	Enable	*9-78*
Aztec Inverse	F1h 4Dh	Regular	*9-79*
Symbology-Specific Security Levels			
Redundancy Level	4Eh	1	*9-80*
Security Level	4Dh	1	*9-82*
Intercharacter Gap Size	F0h 7Dh	Normal	*9-83*
Macro PDF			
Macro PDF Transmit/Decode Mode Symbols	BCh	Passthrough Mode	*9-85*
Transmit Macro PDF Control Header	B8h	Disable	*9-86*
Escape Characters	E9h	None	*9-86*
Flush Macro PDF Buffer			*9-87*
Abort Macro PDF Entry			*9-87*
Miscellaneous Scanner Options			
Transmit Code ID Character	2Dh	None	*10-3*
SSI Prefix Value	69h	<CR>	*10-4*
SSI Suffix 1 Value SSI Suffix 2 Value	68h 6Ah	<CR> <CR>	*10-4*

[1]User 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
Non-SSI Prefix Value	63h, 69h	<CR><LF>	*10-4*
Non-SSI Suffix 1 Value Non-SSI Suffix 2 Value	62h, 68h 64h, 6Ah	<CR><LF> <CR><LF>	*10-4*
Scan Data Transmission Format	EBh	Data as is	*10-5*
FN1 Substitution Values	67h, 6Dh	Set	*10-6*
Transmit “No Read” Message	5Eh	Disable	*10-7*
Report Version			*10-7*

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

Reserved Parameters

The Symbol PL4507 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

Code Identifiers

AIM Code Identifiers

Each AIM Code Identifier contains the three-character string]cm where:

] = Flag Character (ASCII 93)
c = Code Character (see *Table B-1*)
m = Modifier Character (see *Table B-2*)

The modifier character is the sum of the applicable option values based on *Table B-2*.

Table B-1 *Code Characters*

Code Type	Symbol Code Character	AIM Code Character
UPC-A, UPC-E, UPC-E1, EAN-8, EAN-13	A	E
Code 39, Code 32	B	A
Codabar	C	F
Code 128, ISBT 128	D	C
Code 93	E	G
Interleaved 2 of 5	F	I
Discrete 2 of 5, or Discrete 2 of 5 IATA	G	S
Code 11	H	H
MSI	J	M
GS1-128	K	
Bookland EAN	L	X
Trioptic Code 39	M	X

Table B-1 *Code Characters (Continued)*

Code Type	Symbol Code Character	AIM Code Character
Coupon Code	N	E (UPC portion) C (Code 128 portion)
GS1 DataBar Family	R	e
Matrix 2 of 5	S	X
UCC Composite, TLC 39	T	
Chinese 2 of 5	U	X
ISSN	X	X
PDF417, Macro PDF417, Micro PDF417	X	L
Aztec, Aztec Rune	z	z
Data Matrix	P00	d
QR Code, MicroQR	P01	Q
Maxicode	P02	U
US Postnet	P03	X
US Planet	P04	X
Japan Postal	P05	X
UK Postal	P06	X
Netherlands KIX Code	P08	X
Australian Postal	P09	X
USPS 4CB/One Code/Intelligent Mail	P0A	X
UPU FICS Postal	P0B	X

Table B-2 *AIM Code 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 **]A7**AIMID 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 **]X0**412356	
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 **]C1**AIMID	
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 **]I0**4123	
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 **]F0**4123	
Code 93	0	No options specified at this time. Always transmit 0.
	Example: A Code 93 bar code 012345678905 is transmitted as **]G0**012345678905	
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 **]M1**4123	

Table B-2 *AIM Code Modifier Characters (Continued)*

Code Type	Option Value	Option
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 **]S0**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 **]E0**0012345678905	
Bookland EAN	0	No options specified at this time. Always transmit 0.
	Example: A Bookland EAN bar code 123456789X is transmitted as **]X0**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. GS1 DataBar-14 and GS1 DataBar Limited transmit with an Application Identifier “01”. Note: In GS1-128 emulation mode, GS1 DataBar is transmitted using Code 128 rules (i.e.,]C1).
	Example: An GS1 DataBar-14 bar code 100123456788902 is transmitted as **]e**0001100123456788902.	
EAN.UCC Composites (GS1 DataBar, GS1-128, 2D 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.
		GS1-128 emulation Note: UPC portion of composite is transmitted using UPC rules.
	1	Data packet is a GS1-128 symbol (i.e., data is preceded with]C1).

Table B-2 *AIM Code Modifier Characters (Continued)*

Code Type	Option Value	Option
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 decoders are set to this mode, unbuffered Macro symbols and symbols requiring the decoder to convey ECI escape sequences cannot be transmitted.
	3	The bar code contains a GS1-128 symbol, and the first codeword is 903-907, 912, 914, 915.
	4	The bar code contains a GS1-128 symbol, and the first codeword is in the range 908-909.
	5	The bar code contains a GS1-128 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]L2ABCD.	
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.

Table B-2 *AIM Code Modifier Characters (Continued)*

Code Type	Option Value	Option
QR Code	0	Model 1 symbol.
	1	Model 2 / MicroQR 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.
Aztec	0	Aztec symbol.
	C	Aztec Rune symbol.

Appendix C Sample Bar Codes

Code 39

UPC/EAN

UPC-A, 100 %

EAN-13, 100 %

Code 128

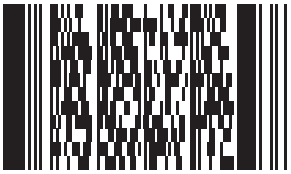
Interleaved 2 of 5

GS1 DataBar-14

NOTE GS1 DataBar-14 must be enabled to read the bar code below (see *GS1 DataBar-14 on page 9-65*).

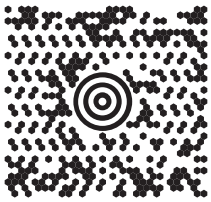
7612341562341

PDF417



Data Matrix

Maxicode



Appendix D Numeric Bar Codes

Numeric Bar Codes

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

0

1

2

3

Numeric Bar Codes (continued)

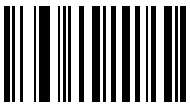
For parameters requiring specific numeric values, scan the appropriately numbered bar code(s).

4

5

6

7

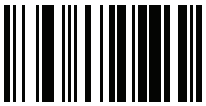


8

9

Cancel

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



Cancel

Appendix E ASCII Character Set

Table E-1 *ASCII Value Table*

ASCII Value	Full ASCII Code 39 Encode Char	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 unbold keystroke is sent.

Table E-1 *ASCII Value Table (Continued)*

ASCII Value	Full ASCII Code 39 Encode Char	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	*
1043	/K	+

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

Table E-1 *ASCII Value Table (Continued)*

ASCII Value	Full ASCII Code 39 Encode Char	Keystroke
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
1070	F	F
1071	G	G

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

Table E-1 *ASCII Value Table (Continued)*

ASCII Value	Full ASCII Code 39 Encode Char	Keystroke
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	‘
1097	+A	a
1098	+B	b
1099	+C	c

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

Table E-1 *ASCII Value Table (Continued)*

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

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

Table E-2 *ALT Key Standard Default Tables*

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 E-3 *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

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 E-3 *USB GUI Key Character Set (Continued)*

GUI Key	Keystroke
3081	GUI Q
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 E-4 *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-5 *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-6 *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-7 *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

Glossary

A

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

API. An interface by means of which one software component communicates with or controls another. Usually used to refer to services provided by one software component to another, usually via software interrupts or function calls

Application Programming Interface. See **API**.

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.

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.

B

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

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.

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.

Boot or Boot-up. The process a computer goes through when it starts. During boot-up, the computer can run self-diagnostic tests and configure hardware and software.

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.

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. This class is considered intrinsically safe, even if all laser output were directed into the eye's pupil. There are no special operating procedures for this class.

CDRH Class 2. No additional software mechanisms are needed to conform to this limit. Laser operation in this class poses no danger for unintentional direct human exposure.

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 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.

COM Port. Communication port; ports are identified by number, e.g., COM1, COM2.

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.

D

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.

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.

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.

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.

ESD. Electro-Static Discharge

F

Flash Memory. Flash memory is responsible for storing the system firmware and is non-volatile. If the system power is interrupted the data is not lost.

H

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.

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.

LED Indicator. A semiconductor diode (LED - Light Emitting Diode). 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**.

M

MIL. 1 mil = 1 thousandth of an inch.

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.

N

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).

NVM. Non-Volatile Memory.

O

Open System Authentication. Open System authentication is a null authentication algorithm.

P

Parameter. A variable that can have different values assigned to it.

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%.

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.

R

RAM. Random Access Memory. Data in RAM can be accessed in random order, and quickly written and read.

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.

ROM. Read-Only Memory. Data stored in ROM cannot be changed or removed.

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.

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.

SDK. Software Development Kit

Self-Checking Code. A symbology that uses a checking algorithm to detect encoding errors within the characters of a bar code symbol.

Shared Key. Shared Key authentication is an algorithm where both the AP and the MU share an authentication key.

Space. The lighter element of a bar code formed by the background between bars.

Specular Reflection. The mirror-like direct reflection of light from a surface, which can cause difficulty decoding a bar code.

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 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

Terminal Emulation. A “terminal emulation” emulates a character-based mainframe session on a remote non-mainframe terminal, including all display features, commands and function keys.

Tolerance. Allowable deviation from the nominal bar or space width.

U

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

Visible Laser Diode (VLD). A solid state device which produces visible laser light.

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