

# LI4278

## PRODUCT REFERENCE GUIDE





**LI4278**  
**PRODUCT REFERENCE GUIDE**

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Revision A

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## Revision History

Changes to the original guide are listed below:

Change	Date	Description
-01 Rev. A	1/2012	Initial Release
-02 Rev. A	4/2013	Added: <ul style="list-style-type: none"> <li>- HID features for Apple iOS</li> <li>- Unsolicited Heartbeat Interval</li> <li>- Dump Scanner Parameters</li> <li>- Changed Parameter #s to Attribute #s</li> <li>- Added attribute #s.</li> </ul>
-03 Rev. A	7/2013	Updated: <ul style="list-style-type: none"> <li>- Cosmetic updates throughout the guide</li> <li>- Page 8-5, Note #2.</li> <li>- Matrix 2 of 5 Lengths default verbiage</li> <li>- ISBT Concatenation: changed bar code value of Autodiscriminate to 02h</li> </ul>
-04 Rev. A	10/2014	Zebra Rebranding
-05 Rev. A	1/2015	Updated formula for the number of storable bar codes with correct memory size (9,000 instead of 30,720 bytes of memory).
-05 Rev. B	3/2015	Zebra Rebranding
-06 Rev. A	7/2015	Updated Zebra logo & copyright; deleted Glossary; added Communication Protocol Table
-07 Rev. A	7/2016	Updated Advanced Data Formatting chapter.
-08 Rev. A	5/2019	Updated: <ul style="list-style-type: none"> <li>- Note for USB Device Type on pg. 8-5</li> <li>- <b>USB OPOS Hand-held to OPOS (IBM Hand-held with Full Disable)</b> on pgs. 8-5, G-1 and G-3</li> <li>- <b>HID Keyboard Emulation to USB HID Keyboard</b> on pgs.4-12, 4-35, 8-4, 8-5, 8-7, 8-9, 8-10, 8-12, A-4, G-1, and G-3</li> <li>- <b>MOD 10/MOD 11 to MOD 11/MOD 10</b> on pg. 11-54</li> <li>- Zebra copyright statement on the last page.</li> </ul>
-09 Rev. A	3/2020	Updates: <ul style="list-style-type: none"> <li>- Scanner to cradle range update.</li> <li>- 123Scan<sup>2</sup> to 123Scan.</li> <li>- Copyright.</li> <li>- URLs.</li> </ul>
-10 Rev. A	12/2020	Replaced all references of master/slave with central/peripheral.
-11 Rev. A	02/2023	Added SSI Over USB CDC host parameter.
-12 Rev. A	04/2023	Updated: <ul style="list-style-type: none"> <li>- Added note for Out of Range Mode</li> <li>- Added 3 parameters (Fast HID Keyboard, WiFi Friendly Mode, and WiFi Channel Exclusion)</li> </ul>



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# ABOUT THIS GUIDE

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## Introduction

The *LI4278 Product Reference Guide* provides general instructions for setting up, operating, maintaining, and troubleshooting the LI4278 linear imager scanner and cradles.

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## Scanner Configurations

[Table 2-1](#) lists the linear imager scanner configurations.

✓ **NOTE** Check Solution Builder for the latest available model configurations.

**Table 2-1** *Linear Imager Scanner Configurations*

Region	Part #:	Description
North America	LI4278-SR20007WR	LI4278 Linear Imager - Twilight Black
	LI4278-SR20001WR	LI4278 Linear Imager - Cash Register White
	LI4278-PRBU2100AWR	Kit: LI4278 Linear Imager, Presentation Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - Black, PS (Country LC Required)
	LI4278-PRWU2100AWR	Kit: LI4278 Linear Imager, Presentation Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - White, PS (Country LC Required)
	LI4278-TRBU0100ZWR	Kit: LI4278 Linear Imager, Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - Black, P/S is NOT Required
	LI4278-TRWU0100ZWR	Kit: LI4278 Linear Imager, Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - White, P/S is NOT Required

**Table 2-1** *Linear Imager Scanner Configurations (Continued)*

<b>Region</b>	<b>Part #:</b>	<b>Description</b>
<b>EMEA</b>	LI4278-SR20007WR	LI4278 Linear Imager - Twilight Black
	LI4278-SR20001WR	LI4278 Linear Imager - Cash Register White
	LI4278-PRBU2100AWR	Kit: LI4278 Linear Imager, Presentation Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - Black, PS (Country LC Required)
	LI4278-PRWU2100AWR	Kit: LI4278 Linear Imager, Presentation Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - White, PS (Country LC Required)
	LI4278-TRBU0100ZER	Kit: LI4278 Linear Imager, Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - Black, P/S is NOT Required
	LI4278-TRWU0100ZER	Kit: LI4278 Linear Imager, Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - White, P/S is NOT Required
<b>Latin America</b>	LI4278-SR20007WR	LI4278 Linear Imager - Twilight Black
	LI4278-SR20001WR	LI4278 Linear Imager - Cash Register White
	LI4278-PRBU2100ALR	Kit: LI4278 Linear Imager, Presentation Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - Black, PS (Country LC Required)
	LI4278-PRWU2100ALR	Kit: LI4278 Linear Imager, Presentation Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - White, PS (Country LC Required)
	LI4278-TRBU0100ZLR	Kit: LI4278 Linear Imager, Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - Black, P/S is NOT Required
	LI4278-TRWU0100ZLR	Kit: LI4278 Linear Imager, Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - White, P/S is NOT Required
<b>APAC</b>	LI4278-SR20007WR	LI4278 Linear Imager - Twilight Black
	LI4278-SR20001WR	LI4278 Linear Imager - Cash Register White
	LI4278-PRBU2100AAR	Kit: LI4278 Linear Imager, Presentation Cradle, USB Series A 7 ft. Straight Cable - Black, PS (Country LC Required)
	LI4278-PRWU2100AAR	Kit: LI4278 Linear Imager, Presentation Cradle, USB Series A 7 ft. Straight Cable - White, PS (Country LC Required)
	LI4278-TRBU0100ZAR	Kit: LI4278 Linear Imager, Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - Black, P/S is NOT Required
	LI4278-TRWU0100ZAR	Kit: LI4278 Linear Imager, Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - White, P/S is NOT Required

**Table 2-1** *Linear Imager Scanner Configurations (Continued)*

Region	Part #:	Description
<b>Government (Fed/S&amp;L)</b>	LI4278-SR20007WR	LI4278 Linear Imager - Twilight Black
	LI4278-SR20001WR	LI4278 Linear Imager - Cash Register White
	LI4278-PRBU2100AWR	Kit: LI4278 Linear Imager, Presentation Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - Black, PS (Country LC Required)
	LI4278-PRWU2100AWR	Kit: LI4278 Linear Imager, Presentation Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - White, PS (Country LC Required)
	LI4278-TRBU0100ZWR	Kit: LI4278 Linear Imager, Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - Black, P/S is NOT Required
	LI4278-TRWU0100ZWR	Kit: LI4278 Linear Imager, Cradle (Radio/Charger), USB Series A, 7 ft. Straight Cable - White, P/S is NOT Required

## Related Product Line Configurations

[Table 2-2](#) lists the configurations of product lines related to the LI4278 linear imager scanner.

- ✓ **NOTE** Check Solution Builder for:
- additional information regarding all available accessories
  - the complete selection of optional accessories
  - the latest available configurations.

**Table 2-2** *Cradle, Power Supply, Battery, Miscellaneous Configurations*

Product Line	Part #	Description
<b>Cradles</b>	STB4208-C0001R	Cradle: Charger Only - White
	STB4208-C0007R	Cradle: Charger Only - Twilight Black
	STB4278-C0001WR	Cradle: Radio & Charger, Multi-Interface - White
	STB4278-C0007WR	Cradle: Radio & Charger, Multi-Interface - Twilight Black
	CR0078-SC10001WR	Cradle Standard (Radio, Interfaces, Charging, White)
	CR0078-SC10007WR	Cradle Standard (Radio, Interfaces, Charging, Black)
	CR0008-SC10007R	Cradle Standard (Charging Only, Black)
	CR0008-SC10001R	Cradle Standard (Charging Only, White)
	CR0078-PC1F007WR	Cradle Presentation (Radio, Interfaces, Charging, Black)
	STB4208-C0001R	Cradle: Charger Only - White
<b>Holders/Intell</b>	11-66553-06R	Wall Mount Holder
<b>Miscellaneous</b>	50-12500-066	Wrist Lanyard
<b>Power/Battery</b>	BTRY-LS42RAA0E-01	LS4278 Spare Battery (works with LI4278)

Table 2-2 Cradle, Power Supply, Battery, Miscellaneous Configurations (Continued)

Product Line	Part #	Description
<b>Universal Cables</b>	CBA-D02-C09ZAR	Cable - Scanner Emulation: 9 ft. (2.8m) Coiled, Undecoded
	CBA-K01-S07PAR	Cable - Keyboard Wedge: 7 ft. (2m) Straight, PS/2 Power Port
	CBA-K02-C09PAR	Cable - Keyboard Wedge: 9 ft. (2.8m) Coiled, PS/2 Power Port
	CBA-K08-C20PAR	Cable - Keyboard Wedge: 20 ft. (6m) Coiled, PS/2 Power Port
	CBA-M01-S07ZAR	Cable - IBM: 468x/9x, 7 ft. (2m) Straight, Port 9B
	CBA-M02-C09ZAR	Cable - IBM: 468x/9x, 9 ft. (2.8m) Coiled, Port 9B
	CBA-M03-S09EAR	Cable - IBM: 468x/9x, 9 ft. (2.8m) Straight, Port 9B with EAS
	CBA-M04-S07ZAR	Cable - IBM: 468x/9x, 7 ft. (2m) Straight, Port 5B
	CBA-M10-C12ZAR	Cable - IBM: 468x/9x, 12 ft. (3.7m) Coiled, Port 9B
	CBA-R01-S07PAR	Cable - RS232: DB9 Female Connector, 7 ft. (2m) Straight, TxD on 2
	CBA-R02-C09PAR	Cable - RS232: DB9 Female Connector, 9 ft. (2.8m) Coiled, TxD on 2
	CBA-R03-C12PAR	Cable - RS232: DB9 Female Connector, 12 ft. (3.6m) Coiled, TxD on 2
	CBA-R06-C20PAR	Cable - RS232: DB9 Female Connector, 20 ft. (6m) Coiled, TxD on 2
	CBA-R08-S07ZAR	Cable - RS232: 7 ft. (2m) Straight, Nixdorf Beetle - 5V Direct Power
	CBA-R09-C09ZAR	Cable - RS232: 9 ft. (2.8m) Coiled, Nixdorf Beetle - 5V Direct Power
	CBA-R10-S07ZAR	Cable - RS232: 7 ft. (2m) Straight, Nixdorf Beetle - Direct Power
	CBA-R11-C09ZAR	Cable - RS232: 9 ft. (2.8m) Coiled, Nixdorf Beetle - Direct Power
	CBA-R13-S09EAR	Cable - RS232: 9 ft. (2.8m) Straight., Nixdorf Beetle - Direct Power with EAS.
	CBA-R22-C09ZAR	Cable - RS232: 9 ft. (2.8m) Coiled, Fujitsu T POS 500 ICL
	CBA-R23-S07ZAR	Cable - RS232: 7 ft. (2m) Straight, Fujitsu T POS 500 ICL
	CBA-R24-C20ZAR	Cable - RS232: 20 ft. (6m) Coiled, Fujitsu T POS 500 ICL
	CBA-R28-C09ZAR	Cable - RS232: 9 ft. (2.8m) Coiled, Verifone Ruby
	CBA-R32-S07PAR	Cable - RS232: DB9 Female Connector, 7 ft. (2m) Straight, TxD on 2, True Converter
	CBA-R36-C09ZAR	Cable - RS232: DB9 Female Connector, 9 ft. (2.8m) Coiled, Power Pin 9
	CBA-R46-C09ZAR	Cable - RS232: DB9 Female Connector, 9 ft. (2.8m) Coiled, Power Pin 9, TxD on 2, True Converter
CBA-S01-S07ZAR	Synapse Adapter Cable: 7 ft. Straight. Cable Code S01	

Table 2-2 Cradle, Power Supply, Battery, Miscellaneous Configurations (Continued)

Product Line	Part #	Description
<b>Universal Cables (continued)</b>	CBA-S03-C09ZAR	Synapse Adapter Cable: 9 ft. Coiled. Cable Code S03
	CBA-S04-C16ZAR	Synapse Adapter Cable: 16 ft. Coiled
	CBA-S05-S09EAR	Synapse Adapter Cable with EAS 9 ft. Straight. Cable Code S05
	CBA-U01-S07ZAR	Cable - USB: Series A Connector, 7 ft. (2m) Straight
	CBA-U03-S07ZAR	Cable - USB: Power Plus Connector, 7 ft. (2m) Straight
	CBA-U06-S09EAR	Cable - USB: Series A Connector, 9 ft. (2.8m) Straight, with EAS
	CBA-U08-C15ZAR	Cable - USB: Power Plus Connector, 15 ft. (4.6m) Coiled
	CBA-U09-C15ZAR	Cable - USB: Series A Connector, 15 ft. (4.6m) Coiled
	CBA-U10-S15ZAR	Cable - USB: Series A Connector, 15 ft. (4.6m) Straight
	CBA-U12-C09ZAR	Cable - USB: Series A Connector, 9 ft. (2.8m) Coiled
	CBA-U14-C09ZAR	Cable - USB: Power Plus Connector, 9 ft. (2.8m) Coiled
	CBA-U15-S15ZAR	Cable - USB: Power Plus Connector, 15 ft. (4.6m) Straight
	CBA-D01-S07ZAR	Cable - Scanner Emulation: 7 ft. (2m) Straight, Undecoded
	CBA-K05-S15PAR	Cable - Keyboard Wedge: 15 ft. (4.6m) Straight, PS/2 Power Port
	CBA-K06-C12PAR	Cable - Keyboard Wedge: 12 ft. (3.7m) Coiled, PS/2 Power Port
	CBA-R04-S09FAR	Cable - RS232: DB9 Female Connector, 9 ft. (2.8m) Straight, TxD on 2, with EAS.
	CBA-R12-C12ZAR	Cable - RS232: 12 ft. (3.7m) Coiled, Nixdorf Beetle- Direct Power
	CBA-R18-C09ZAR	Cable - RS232: DB9 Female Connector, 9 ft. (2.8m) Coiled, Power on Pin 1
	CBA-R40-C09SAR	Cable - RS232: Split DB9 Female Connector & Power Line, 9 ft. (2.8m) Coiled
	CBA-R41-S12ZAR	Cable - RS232: 12 ft. (3.7m) Straight, Nixdorf Beetle- Direct Power
CBA-W01-S07ZAR	Cable - Wand: 7 ft. (2m) Straight	
CBA-W02-C09ZAR	Cable - Wand: 9 ft. (2.8m) Coiled	

Table 2-2 Cradle, Power Supply, Battery, Miscellaneous Configurations (Continued)

Product Line	Part #	Description
<b>Power Supplies and Line Cords</b>	PWRS-14000-253R	Power Supply: 5VDC,850MA, US-CA-MX-JP-TW
	PWRS-14000-256R	Power Supply: 5VDC,850MA, EU-UK-EMEA-RU-ZA
	50-14000-259R	Power Supply: 5VDC,850MA, ARGENTINA-UY
	PWRS-14000-255R	Power Supply: 5VDC, 850MA, Brazil/Korea, Must order line cord separately
	PWRS-14000-257R	Power Supply: 5VDC,850MA, CHINA
	PWRS-14000-258R	Power Supply:5VDC,850MA, AU-HK-NZ
	PWRS-14000-148R	Power Supply (Presentation Cradle) - requires additional country-specific line cord
	PWRS-14000-253R	Power Supply: 5VDC,850MA, US-CA-MX-JP-TW

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## Chapter Descriptions

Topics covered in this guide are as follows:

- [Chapter 1, GETTING STARTED](#) provides a product overview, unpacking instructions, and cable connection information.
- [Chapter 2, SCANNING](#) describes parts of the linear imager scanner, beeper and LED definitions, and how to use the linear imager scanner.
- [Chapter 3, MAINTENANCE, TROUBLESHOOTING & TECHNICAL SPECIFICATIONS](#) provides information on how to care for the linear imager scanner and cradle, troubleshooting, and technical specifications.
- [Chapter 4, RADIO COMMUNICATIONS](#) provides information about the modes of operation and features available for wireless communication. This chapter also includes programming bar codes to configure the linear imager scanner.
- [Chapter 5, USER PREFERENCES & MISCELLANEOUS SCANNER OPTIONS](#) provides programming bar codes for selecting user preference features for the linear imager scanner and commonly used bar codes to customize how the data is transmitted to the host device.
- [Chapter 6, KEYBOARD WEDGE INTERFACE](#) provides information for setting up the linear imager scanner and cradle for Keyboard Wedge operation.
- [Chapter 7, RS-232 INTERFACE](#) provides information for setting up the linear imager scanner and cradle for RS-232 operation.
- [Chapter 8, USB INTERFACE](#) provides information for setting up the linear imager scanner and cradle for USB operation.
- [Chapter 9, IBM INTERFACE](#) provides all information for setting up the linear imager scanner and cradle with IBM 468X/469X POS systems.
- [Chapter 10, 123SCAN2](#) (PC based scanner configuration tool) enables rapid and easy customized setup of scanners.
- [Chapter 11, SYMBOLOGIES](#) describes all symbology features and provides the programming bar codes necessary for selecting these features for the linear imager scanner.
- [Chapter 12, ADVANCED DATA FORMATTING \(ADF\)](#) provides a reference to customize scanned data before transmitting to the host.
- [Appendix A, STANDARD DEFAULT PARAMETERS](#) provides a table of all host devices and miscellaneous linear imager scanner defaults.
- [Appendix B, PROGRAMMING REFERENCE](#) provides a table of AIM code identifiers, ASCII character conversions, and keyboard maps.
- [Appendix C, SAMPLE BAR CODES](#) includes sample bar codes.
- [Appendix D, NUMERIC BAR CODES](#) includes the numeric bar codes to scan for parameters requiring specific numeric values.
- [Appendix E, ALPHANUMERIC BAR CODES](#) includes the bar codes representing the alphanumeric keyboard, used when setting ADF rules.
- [Appendix F, ASCII CHARACTER SETS](#) provides ASCII character value tables.
- [Appendix G, COMMUNICATION PROTOCOL FUNCTIONALITY](#) provides supported scanner functionality by communication protocol.

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## Notational Conventions

The following conventions are used in this document:

- *Italics* are used to highlight chapters and sections in this and related documents.
- **Bold** text is used to highlight parameter names and options.
- bullets (•) indicate:
  - Action items
  - Lists of alternatives
  - Lists of required steps that are not necessarily sequential
- Sequential lists (e.g., those that describe step-by-step procedures) appear as numbered lists.
- Throughout the programming bar code menus, asterisks (\*) are used to denote default parameter settings.



\*Indicates Default — **Baud Rate 9600** — Feature/Option



**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.



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## Related Documents

- The *LI4278 Quick Start Guide* (p/n 72-154896-xx) provides general information to help the user get started with the linear imager scanner. It includes basic operation instructions and start up bar codes.
- The *CR0078-S/CR0008-S Cradle Quick Reference Guide* (p/n 72-135874-xx) provides information to help the user set up and use the charge only and host interface cradles. It includes set up and mounting instructions.
- The *CR0078-P Cradle Quick Reference Guide* (p/n 72-138860-xx) provides general information regarding the cradle. It includes set up and usage instructions.

The latest version of this guide and all guides, are available at: [zebra.com/support](http://zebra.com/support).

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## Service Information

If you have a problem using the equipment, contact your facility's technical or systems support. If there is a problem with the equipment, they will contact the Zebra Global Customer Support Center at: [zebra.com/support](http://zebra.com/support).

When contacting Zebra support, please have the following information available:

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

Zebra responds to calls by e-mail, telephone or fax within the time limits set forth in service agreements.

If your problem cannot be solved by Zebra support, you may need to return your equipment for servicing and will be given specific directions. Zebra 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 business product from a Zebra business partner, please contact that business partner for support.



# CHAPTER 1 GETTING STARTED

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## Introduction

The world class LI4278 linear imager scanner, first in a family of high performance linear imagers from Zebra, offers customers a cost effective, cordless 1D bar code scanner which out performs all existing linear imagers and established Zebra as a leader in imager bar code readers.

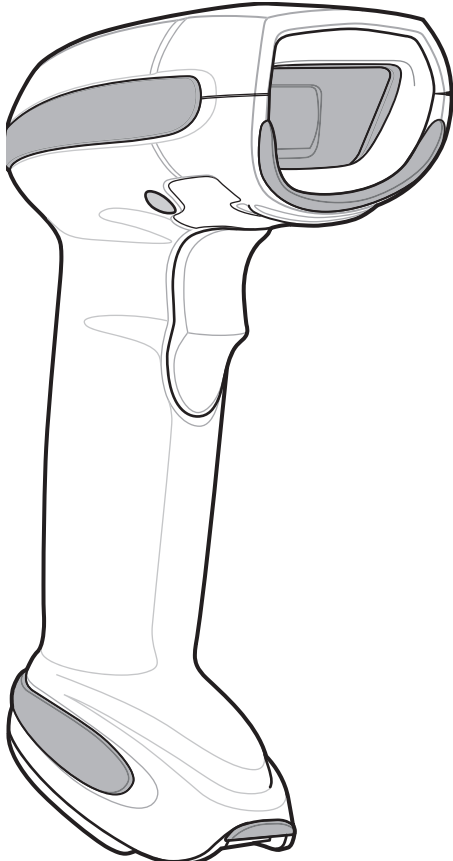


Figure 1-1 *LI4278 Linear Imager*

## Interfaces

The CR0078-S cradle supports all of the following interfaces. The CR0078-P cradle supports all of the below listed interfaces with the exception of Wand Emulation, Scanner Emulation and Synapse.

**Table 1-1** Interface Support - CR0078-S / CR0078-P Cradles

Interface	Description	Cradle Support	
		CR0078-S	CR0078-P
USB Connection to a Host	The cradle auto detects a USB host and defaults to the HID keyboard interface type. Select other USB interface types by scanning programming bar code menus. This interface supports the following international keyboards (for Windows® environment): North America, German, French, French Canadian, Spanish, Italian, Swedish, UK English, Portuguese-Brazilian, and Japanese.	X	X
Standard RS-232 Connection to a Host	Scan bar code menus to set up proper communication of the cradle with the host.	X	X
Keyboard Wedge Connection to a Host	The host interprets scanned data as keystrokes. This interface supports the following international keyboards (for Windows® environment): North America, German, French, French Canadian, Spanish, Italian, Swedish, UK English, Portuguese-Brazilian, and Japanese.	X	X
Connection to IBM® 468X/469X Hosts	Scan bar code menus to set up communication of the cradle with the IBM terminal.	X	X
Wand Emulation Connection to a Host	The cradle is connected to a portable data terminal, a controller, or host which collects the data as wand data and decodes it.	X	
Scanner Emulation connection to a Host	The cradle is connected to a portable data terminal, a controller which collects the data and interprets it for the host.	X	
Synapse Capability	Allows connection to a wide variety of host systems using a Synapse and Synapse adapter cable. The cradle auto detects the host.	X	
Configuration via 123Scan	PC-based software tool that enables rapid and easy customized setup of Zebra scanners.	X	X

## Unpacking the Linear Imager Scanner and Cradle

Remove the scanner and cradle from their respective packing and inspect for damage. If the scanner or cradle was damaged in transit, contact Zebra Support. See [page xxiii](#) for contact information. **KEEP THE PACKING.** It is the approved shipping container and should be used if the equipment ever needs to be returned for servicing.

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## Parts

### Scanner

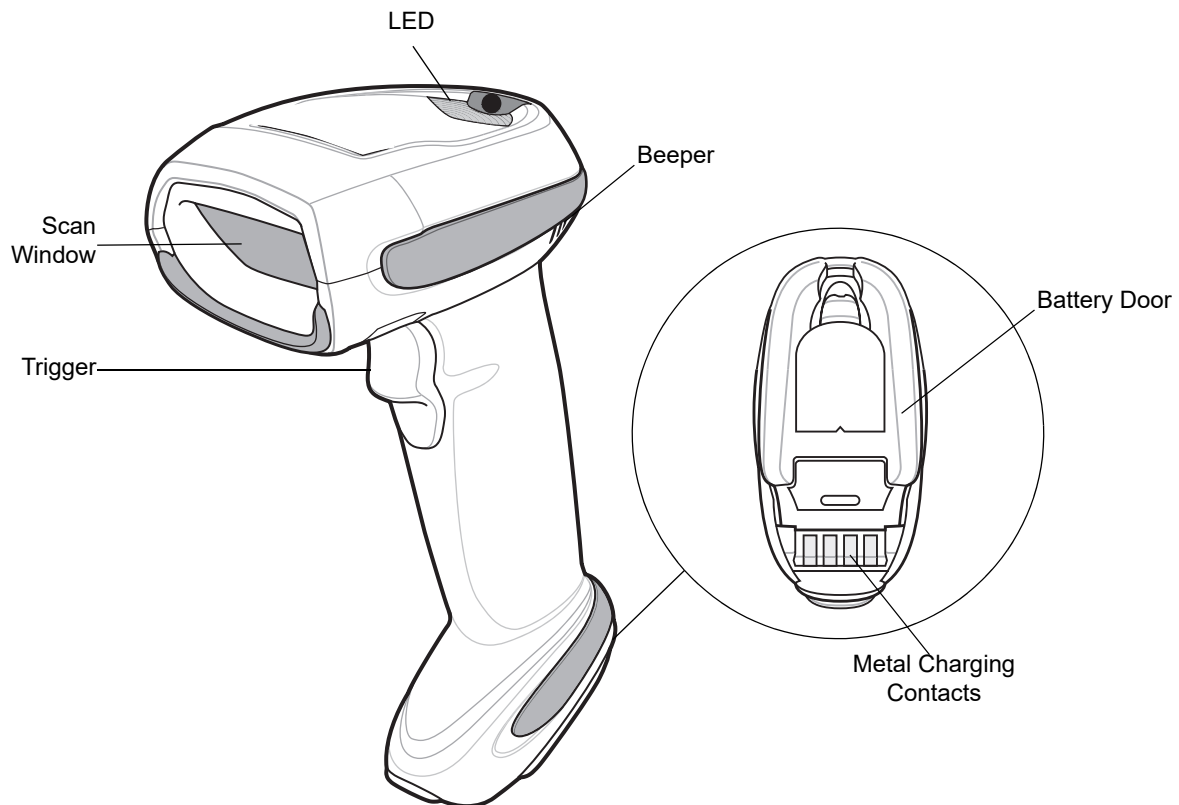


Figure 1-2 *Parts of the Linear Imager Scanner*

## CR0078-S/CR0008-S Series Cradle

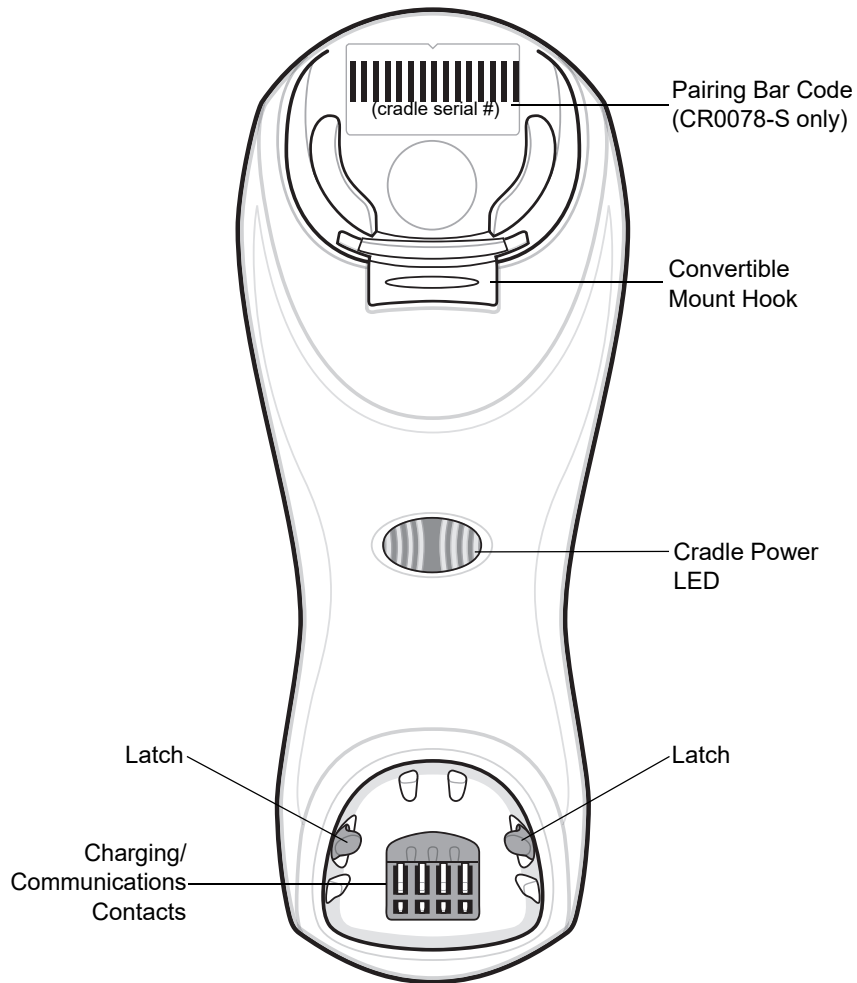
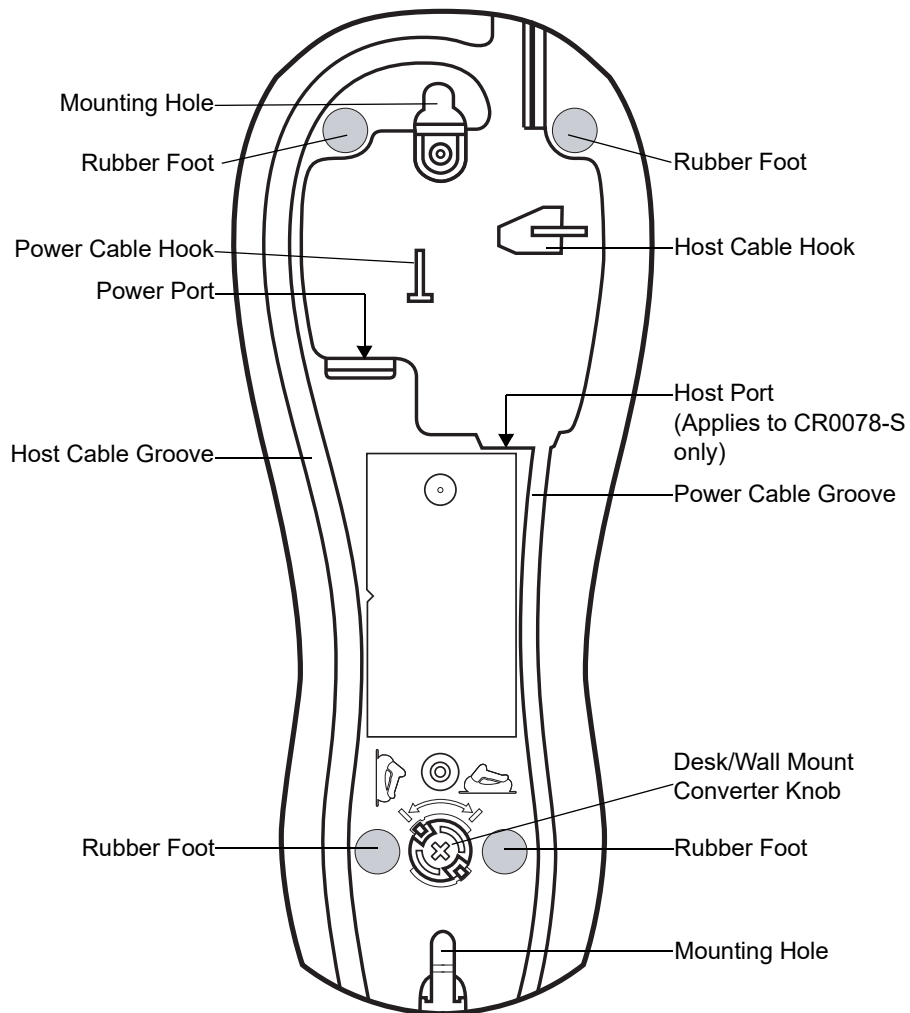


Figure 1-3 CR0078-S/CR0008-S Series Cradle Front View



**Figure 1-4** CR0078-S/CR0008-S Series Cradle Back View

## CR0078-P Series Cradle

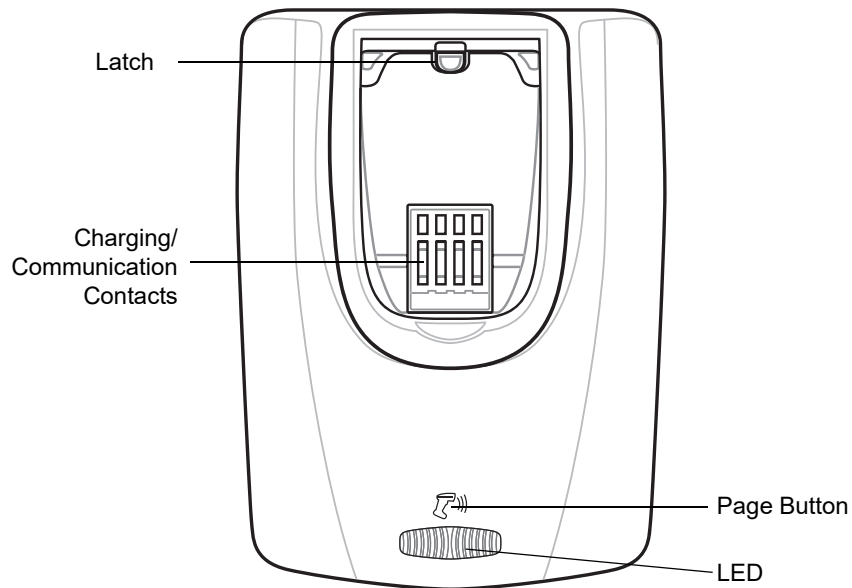


Figure 1-5 CR0078-P Cradle Top View

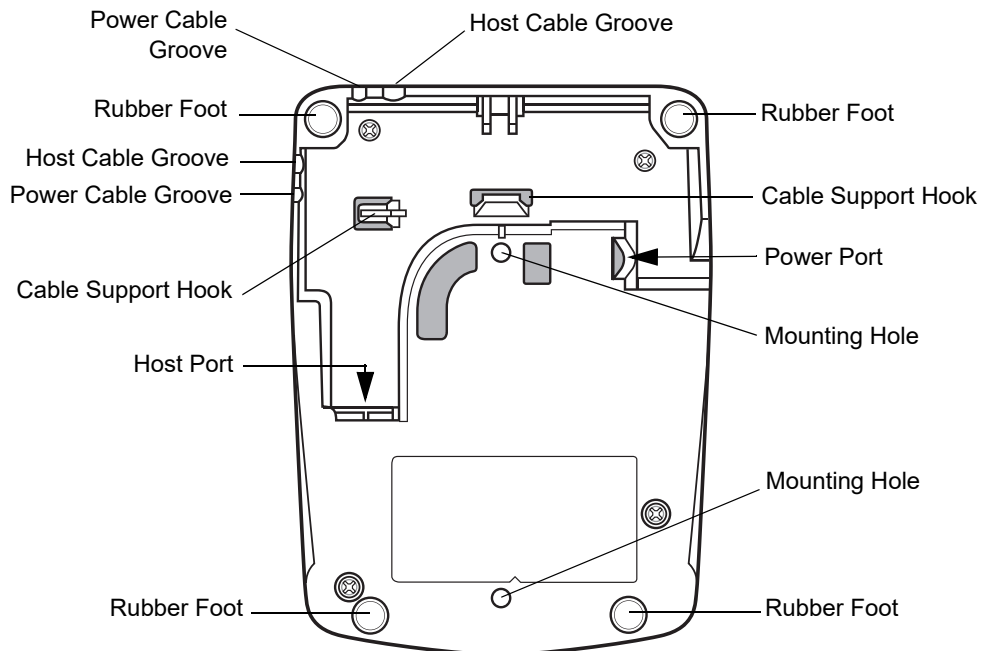


Figure 1-6 CR0078-P Cradle Bottom View



## Linear Imager Scanner Cradle

The scanner cradles (CR0078-S and CR0078-P) serve as a stand, charger, and host interface for the linear imager scanner. The cradle sits on a desktop. The CR0078-S cradle can also be mounted on a vertical surface (such as a wall). For more information about mounting options and procedures, refer to the documentation included with the cradle.

The CR0078-S cradle is available as a charging cradle with a radio and as a charge-only cradle. The CR0078-P cradle is only available as a charging cradle with a radio. The differences between the two versions are as follows:

- **Charging cradle with radio:** When the cordless linear imager scanner is paired to the cradle, all communication between the linear imager scanner and the host computer is accomplished through the cradle. Each bar code contains programming instructions or other data unique to the bar code pattern. The linear imager scanner is paired to the cradle and transmits bar code data to the cradle via Bluetooth Technology Profile Support. The cradle then sends that information via an interface cable to the host computer for interpretation.
- **Charge-only cradle:** This cradle serves as a stand and battery charger. It does not contain a radio and has no communication capability.

✓ **NOTE** For more information about communication between the linear imager scanner, cradle and host, see [Chapter 4, RADIO COMMUNICATIONS](#).

[Table 1-2](#) outlines several main differences between the CR0078-S and CR0078-P cradles.

**Table 1-2** Cradle Features

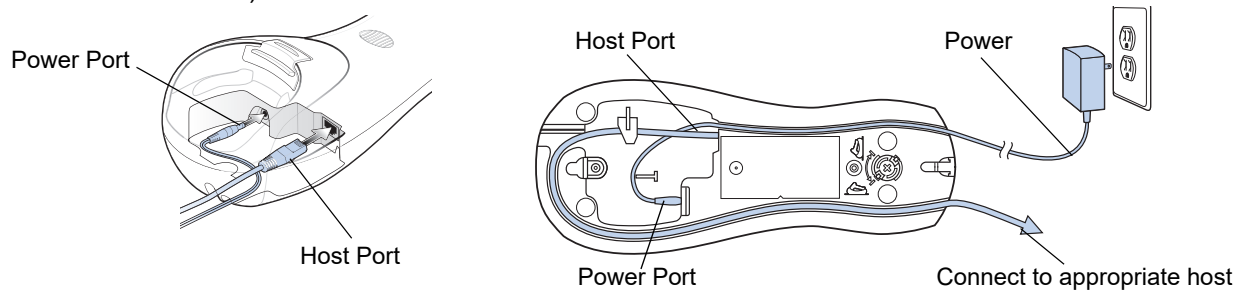
Feature	CR0078-S	CR0078-P
Scanning	Hand-Held scanning	Hands-Free or Hand-Held scanning
Bluetooth	Bluetooth or Charge Only (CR0008-S)	Bluetooth
Pairing	Pair up to 3 scanners per cradle	Pair up to seven scanners per cradle
Paging	Not available	Ability to page misplaced scanner(s)
Charging	Can charge via host power, if available, or with optional 5V power supply.	Requires 12V power supply
Interfaces	Supports most commonly used interfaces (see Technical Specifications on page 3-9 for detailed list)	Supports most commonly used interfaces with the exception of Wand Emulation, Scanner Emulation and Synapse
USB Cable	Standard universal USB cable	Requires universal cables with shielded modular plugs

## Connecting the CR0078-S/CR0008-S Series Cradle



**IMPORTANT** Connect the interface cable and power supply (if necessary) in the following order to ensure proper operation of the linear imager scanner and cradle.

1. If a power supply is connected to the cradle, disconnect it. See [Figure 1-7](#).
2. If using an interface cable (CR0078-S only), insert the cable into the cradle's host port.
3. If using a power supply that connects to the interface cable (CR0078-S only), insert this power supply into the power connector on the interface cable, and the other end to an AC supply.
4. Insert the other end of the interface cable into the appropriate port on the host computer (see the specific host chapter for information on host connections).
5. If using an external power supply (if required by the interface, or to allow fast charging of the linear imager scanner), insert the power cable into the power port on the back of the cradle, and connect the power supply to an approved AC supply (refer to the *CR0078-S/CR0008-S Cradle Quick Reference Guide* for more information).



**Figure 1-7** Connecting the Cables to the CR0078-S/CR0008-S Cradle

6. If applicable, thread the interface cable over the cable support hook and run the host and power cables into their respective cable grooves.
7. Mount the cradle, as necessary. (For information on mounting the cradle, refer to the documentation included with the cradle.)



**NOTE** Disconnect the power supply before changing host cables, or the cradle may not recognize the new host. Different cables are required for different hosts. The connectors illustrated in each host chapter are examples only. The connectors may be different from those illustrated, but the steps to connect the cradle remain the same.

## Supplying Power to the CR0078-S/CR0008-S Cradle

The CR0078-S/CR0008-S cradle receives power from one of two sources:

- An external power supply.
- When connected to the host through a host cable that supplies power (CR0078-S only).

The cradle detects whether the host or the external supply is supplying power. It always draws power from the external supply when available, regardless of the presence of power from a host.

When the CR0078-S cradle is connected to the host via the USB interface, it can be powered by the USB port instead of an external power supply. Powering from a USB host limits charging. The linear imager scanner charges at a slower rate than when charging from an external power supply.

## Connecting the CR0078-P Series Cradle



**IMPORTANT** Connect the interface cable and power supply in the following order to ensure proper operation of the linear imager scanner and cradle.

1. Insert the interface cable into the cradle's host port.
2. Connect the other end of the interface cable to the host.
3. Connect the power supply to the cradle's power port.
4. Connect the appropriate cable to the power supply and AC power source.
5. Thread the interface cable over the cable support hook (see [Chapter 1-6, CR0078-P Cradle Bottom View](#)) and run the host and power cables into their respective cable grooves.
6. If necessary, (for non-autodetected interfaces) scan the appropriate host bar code (refer to the [CR0078-S/CR0008-S Cradle Quick Reference Guide](#) for more information).

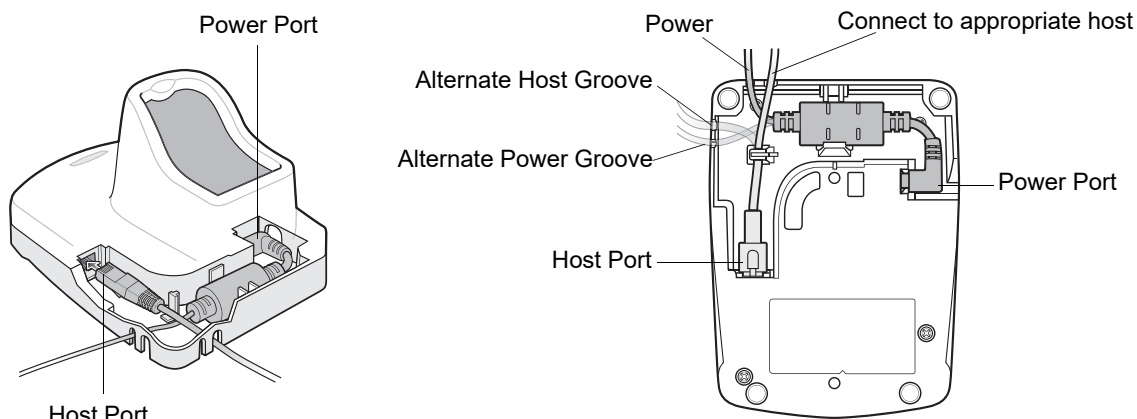


Figure 1-8 Connecting the Cables to the CR0078-P Cradle

## Supplying Power to the CR0078-P Cradle

The CR0078-P cradle receives power from an external power supply.

- ✓ **NOTE** The CR0078-S cradle has the ability to be powered by the host instead of an external power supply. The CR0078-P can only receive power via an external power supply.

It is always recommended that an external power supply be used to provide fastest recharge times.

## Lost Connection to Host

If scanned data does not transmit to the cradle's host, ensure that all cables are firmly inserted and the power supply is connected to an appropriate AC outlet. If scanned data still does not transmit to the host, reestablish a connection with the host:

1. Disconnect the power supply from the cradle.
2. Disconnect the host interface cable from the cradle.
3. Wait three seconds.
4. Reconnect the host interface cable to the cradle.
5. Reconnect the power supply to the cradle, if required.
6. Reestablish pairing with the cradle by scanning the pairing bar code.



**NOTE** The CR0078-S does not always require a power supply whereas the CR0078-P always requires a power supply.

## Mounting the Cradle

For information on mounting the CR0078-S cradle, refer to the documentation included with the cradle.

## Replacing the Linear Imager Scanner Battery

The battery is installed in the cordless linear imager scanner by the factory and resides in a chamber in the linear imager scanner handle. To replace the battery:

1. Insert a Phillips screwdriver in the screw at the base of the linear imager scanner, then turn the screw counterclockwise to release the latch.
2. Remove the latch.
3. If a battery is already installed, turn the linear imager scanner upright to slide the battery out. Disconnect the battery connector clip.

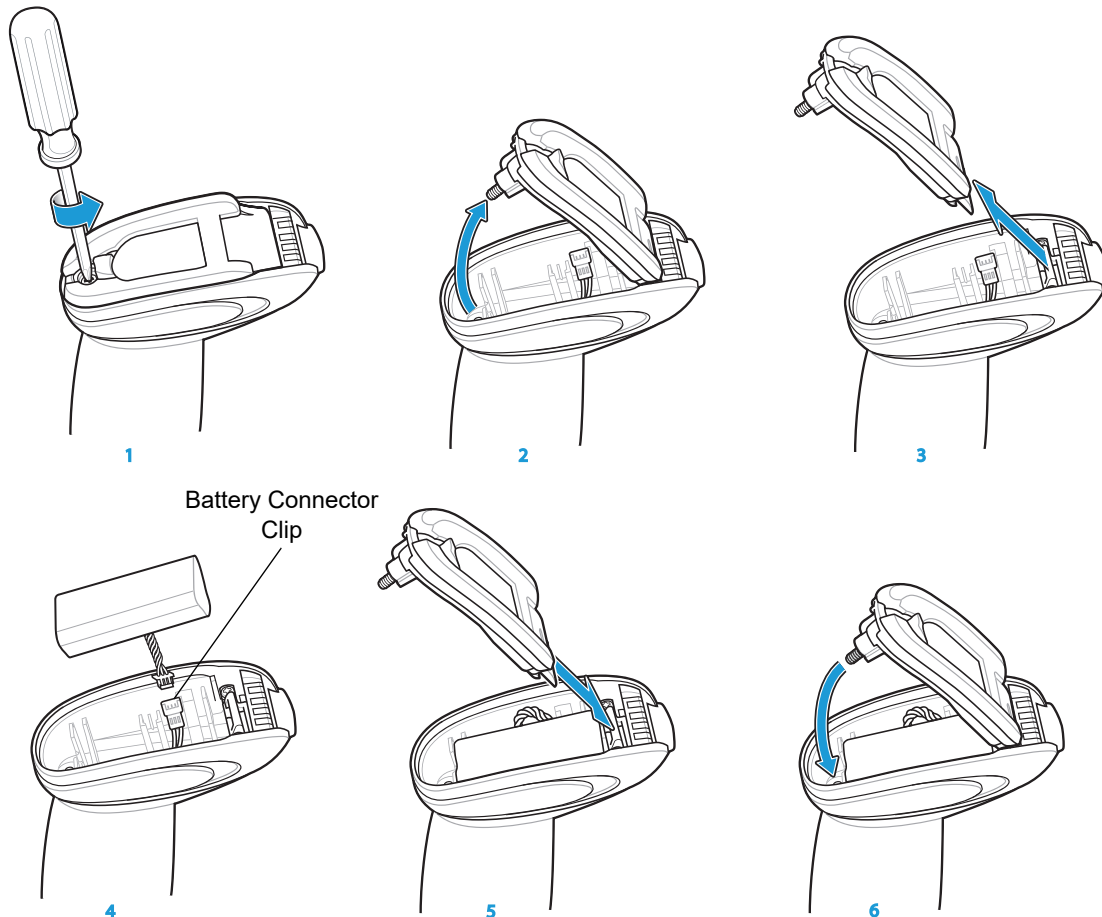


Figure 1-9 *Inserting the Battery*

4. With the contacts on the connector clips facing in the same direction, attach the new battery's connector clip to the connector clip in the base of the linear imager scanner.

✓ **NOTE** Do not pull the wires in the harness to disconnect the plastic connectors. Damage to the harness and the battery pack can occur if the harness is forcefully disconnected from the plastic connectors.

5. Slide the new battery into the battery well and ensure the battery leads are visible. The battery should sit securely in the well.
6. Attach and close the latch.
7. Insert a Phillips screwdriver in the screw at the base of the linear imager scanner, press down gently, and turn the screw clockwise to lock the latch in place.

## Charging the Linear Imager Scanner Battery

Fully charge the linear imager scanner battery before using the linear imager scanner for the first time. To charge the linear imager scanner battery, place the linear imager scanner in the cradle, ensuring that the metal contacts on the bottom of the linear imager scanner touch the contacts on the cradle. A complete charge of a fully discharged battery can take typically three hours using external power and typically five hours when powered from a host.

For battery charging LED indicators see [Table 1-3](#) and [Table 2-2 on page 2-5](#). See [Table 1-4 on page 1-13](#) for battery reconditioning LED indicators.



**CAUTION** To avoid a battery temperature fault, always charge the battery in the linear imager scanner within the recommended temperature of 32° to 104° F (0° to 40° C) nominal, 41° to 95° F (5° to 35° C) ideal.

**Table 1-3** Charging LED Definitions

LED Indication	Indication
Green - Slow Continuous Flash	Non-critical battery temperature fault. Battery is above or below normal operating temperature. If this occurs, do not use the linear imager scanner and move the linear imager scanner to a location within normal operating temperature. The linear imager scanner can remain in the cradle while the battery warms or cools to normal operating temperature. Note: For appropriate charging temperatures, see <a href="#">Table 3-3 on page 3-10</a> .
Red & Green - Continuous Flash	Critical battery temperature fault. Battery is above or below normal operating temperature. If this occurs, do not use the linear imager scanner and move the linear imager scanner to a location within normal operating temperature. The linear imager scanner can remain in the cradle while the battery warms or cools to normal operating temperature. Note: For appropriate charging temperatures, see <a href="#">Table 3-3 on page 3-10</a> .
Green - Fast Continuous Flash	Linear imager scanner is charging.
Green - Solid	Linear imager scanner is fully charged.
Red	Battery may require pre-charge.

## Turning Off the Linear Imager Scanner Battery

To turn off the NiMH battery for long term storage or shipping:

1. Scan **Battery Off** bar code below.



**Battery Off**

2. To turn the battery back on, place the linear imager scanner in the cradle.

## Reconditioning the Linear Imager Scanner Battery

To maintain optimal performance of the linear imager scanner NiMH battery, perform a battery recondition approximately once a year.

To begin the battery recondition cycle:

1. Scan **Battery Recondition** below.



### Battery Recondition

2. Place the linear imager scanner into the cradle.

✓ **NOTE** If the scanner is removed from the cradle during the battery reconditioning cycle, the scanner exits the battery reconditioning mode of operation and returns to the normal mode of battery charging (see [Charging the Linear Imager Scanner Battery on page 1-12](#)). To restart the battery reconditioning cycle, re-scan the Battery Recondition parameter and place the scanner in the cradle.

3. The linear imager scanner must perform two charge cycles to complete the battery reconditioning process (discharge/charge/discharge/charge). See [Table 1-4](#).

## Battery Reconditioning LED Definitions

Table 1-4 Battery Reconditioning LED Definitions

Battery Reconditioning Mode	LED	Comments
Discharging	Red Flash	Time to discharge is approximately 2.5 hours.
Charging	Green Flash	Time to charge is typically 3 hours with an external power supply.
Reconditioning Complete	Green - Solid (always on)	The linear imager scanner enters a trickle charge until the linear imager scanner is removed from the cradle.

**Note:** When the scanner is inserted into the CR0078-S (standard) cradle, the scanner's LED is used as the charging indicator.

When the scanner is inserted into the CR0078-P (presentation) cradle, the cradle's LED is used as the charging indicator.

## Inserting the Linear Imager Scanner in the Cradle

Insert the linear imager scanner in the cradle so that the metal contacts on the bottom of the linear imager scanner handle touch the contacts on the cradle. Push the handle lightly to ensure a proper connection, engaging the contacts in the cradle and linear imager scanner. Ensure the desk/wall mount converter knob on the back of the cradle is in the correct position for the horizontal or vertical mounting.

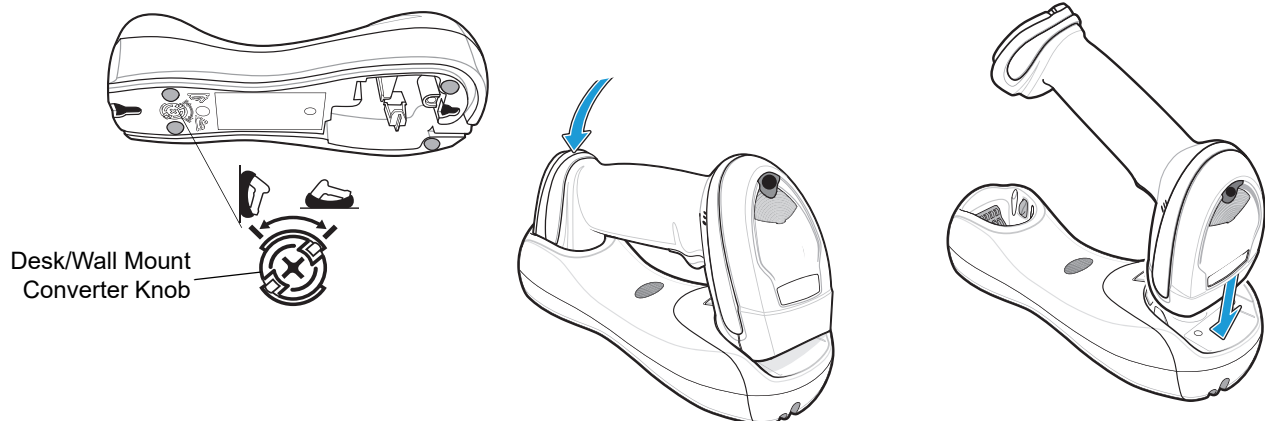
- ✓ **NOTE** References to mounting the cradle only apply to the CR0078-S/CR0008-S cradle (not the CR0078-P cradle).

### Inserting Linear Imager Scanner in the CR0078-S/CR0008-S Cradle

#### Horizontal Cradle Mount

When mounting the cradle horizontally, where no fastening is necessary:

1. Ensure the rubber feet are attached to the cradle. These feet provide traction and prevent surface damage.
2. Ensure the desk/wall mount converter knob is in the position shown in [Figure 1-10](#).



**Figure 1-10** Horizontal Mount - Inserting the Linear Imager Scanner in the Cradle

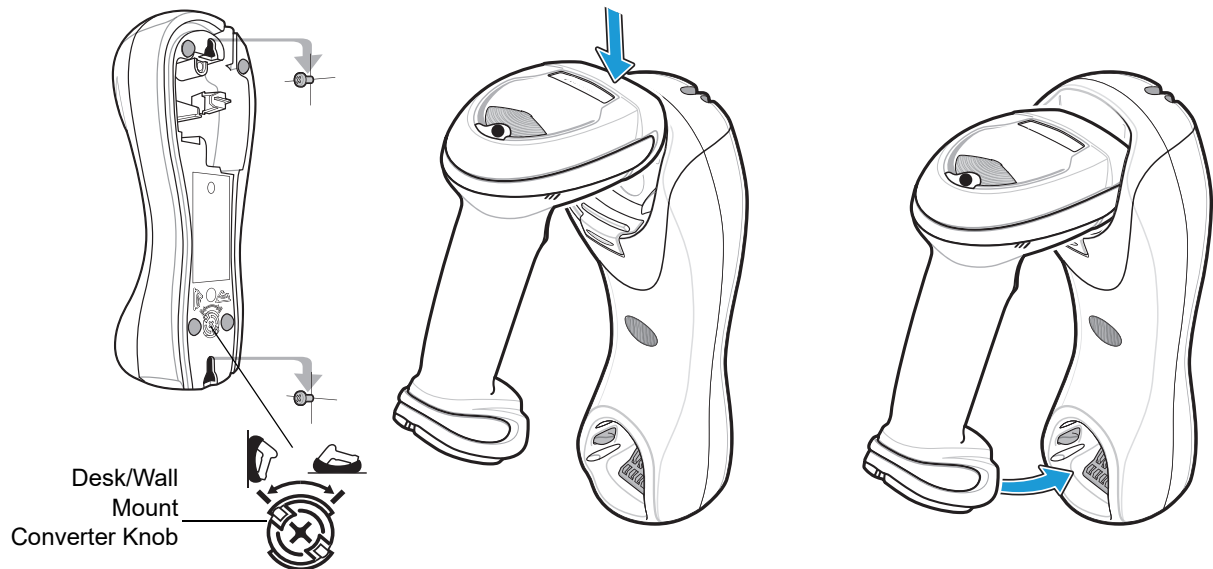
#### Vertical Cradle Mount

When mounting the cradle vertically:

1. Ensure the rubber feet are attached to the cradle. These feet provide traction and prevent surface damage.
2. Ensure the convertible mount hook on the front of the cradle is inserted with the hook facing up. If not, remove and reverse the hook so that it is in position to secure the linear imager scanner in place. (See [Figure 1-3 on page 1-4](#) for the location of the convertible mount hook.)



3. Ensure the desk/wall mount converter knob is in the position shown in *Figure 1-11*.

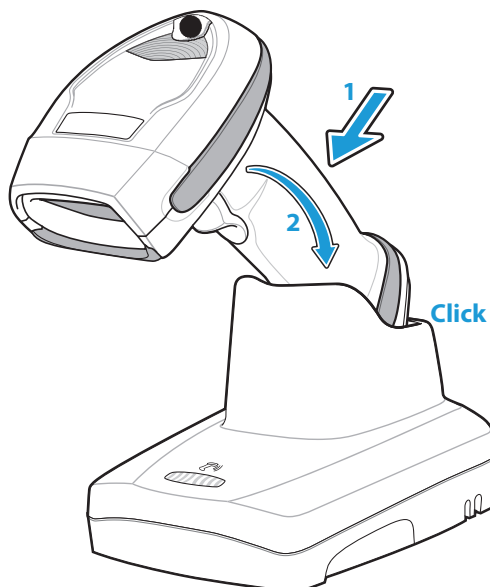


**Figure 1-11** Vertical Mount - Inserting the Linear Imager Scanner in the Cradle

## Inserting/Removing Linear Imager Scanner in the CR0078-P Cradle

To insert the scanner in the Presentation Cradle:

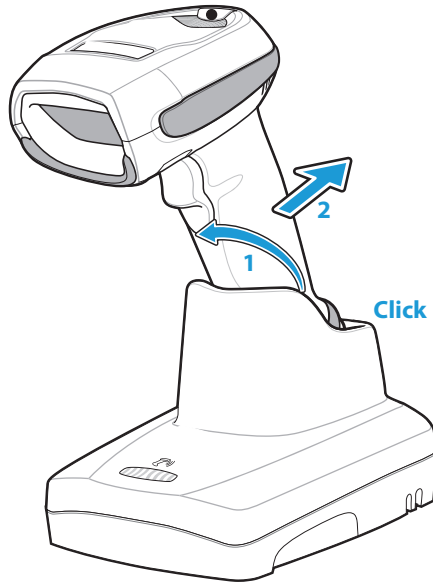
1. Insert the scanner by placing the bottom of the scanner, at a slight forward angle, into the CR0078-P cradle.
2. Push the handle back and down until it clicks, engaging the contacts of the scanner and cradle.



**Figure 1-12** Inserting the Linear Imager Scanner in the Presentation Cradle

To remove the scanner from the Presentation Cradle:

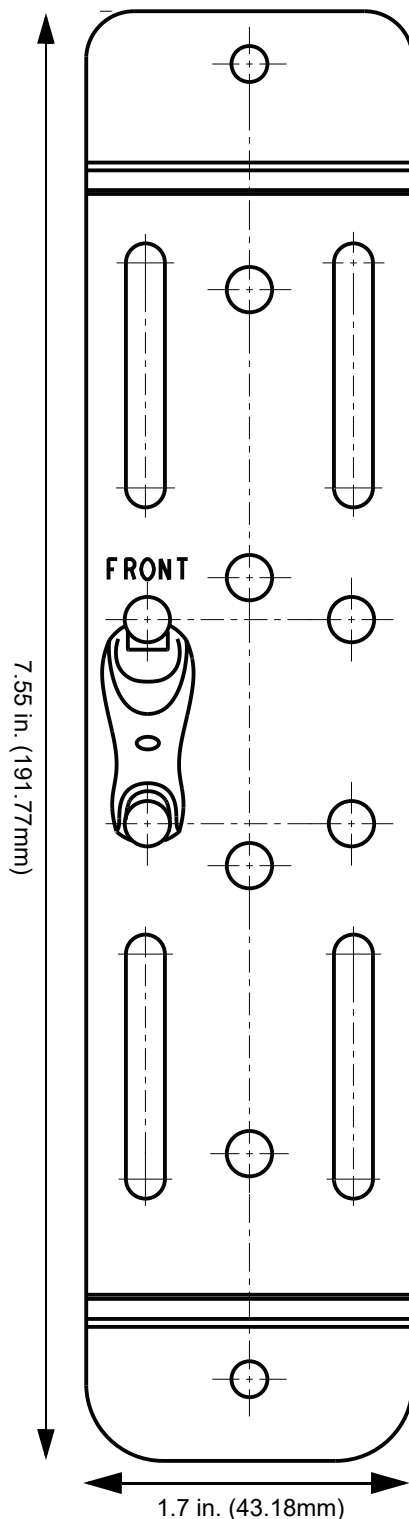
1. Remove the scanner by pushing the scanner slightly forward and up out of the CR0078-P cradle.



**Figure 1-13** *Removing the Linear Imager Scanner in the Presentation Cradle*

## Wall Mount Bracket Template

For your convenience, a wall mount bracket can be purchased from Zebra. Use the mounting holes on the Wall Mount Bracket or use the template in [Figure 1-14](#) to determine the location of the screw holes.



**NOTE** Cradle mounting only applies to the CR0078-S/CR0008-S cradle (not the CR0078-P cradle). For detailed instructions on mounting the cradle, refer to the *CR0078-S/CR0008-S Quick Reference Guide* (p/n 72-135874-xx).

Figure 1-14 Wall Mount Bracket Template

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## Radio Communications

The linear imager scanner can communicate with remote devices via Bluetooth Technology Profile Support, or by pairing with a cradle. For radio communication parameters, detailed information about operational modes, Bluetooth Technology Profile Support and pairing, see [Chapter 4, RADIO COMMUNICATIONS](#).

---

## Configuring the Linear Imager Scanner

Use the bar codes in this manual or the 123Scan configuration program to configure the linear imager scanner. See [Chapter 5, USER PREFERENCES & MISCELLANEOUS SCANNER OPTIONS](#) for information about programming the linear imager scanner using bar code menus. Also see each host-specific chapter to set up connection to a specific host type. See [Chapter 10, 123SCAN2](#) to configure the linear imager scanner using this configuration program.

---

## Accessories

The linear imager scanner and cradle accessories that are available separately include:

- Power supplies for applications that do not supply power over the host cable. See each host interface chapter for set up information.
- Wall-mount bracket for mounting the cradle vertically. Refer to the *CR0078-S/CR0008-S Cradle Quick Reference Guide* (p/n 72-135874-xx) for a wall mounting template and installation instructions.
- Lanyard for wearing the linear imager scanner on a wrist.

### Lanyard

The lanyard attaches to the inside of the linear imager scanner battery door latch.

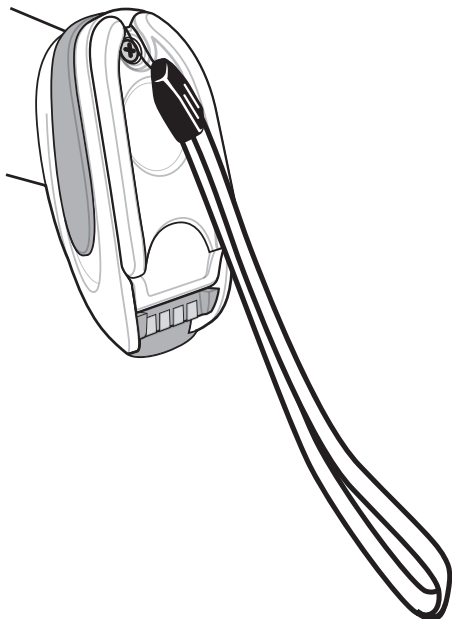
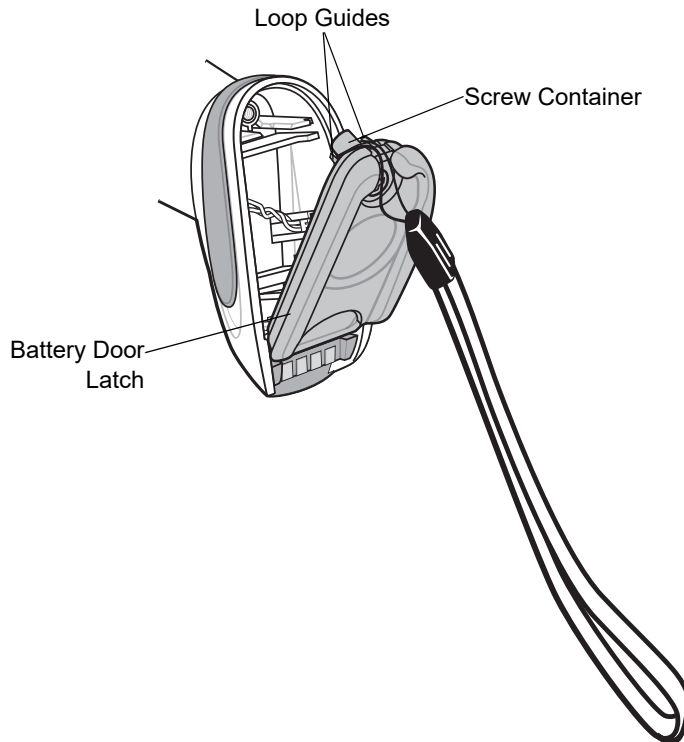


Figure 1-15 Attached Lanyard

To attach the lanyard:

1. Open the battery door latch as described in [Replacing the Linear Imager Scanner Battery on page 1-11](#). Do not remove the battery.
2. Hook the loop of the lanyard around the screw container inside the battery door latch, between the loop guides.



**Figure 1-16** *Attaching Lanyard*

3. Close the battery door latch.
4. Tighten the screw.



# CHAPTER 2 SCANNING

---

## Introduction

This chapter provides beeper and LED definitions, scanning techniques, general instructions and tips about scanning, and decode ranges.

---

## Beeper and LED Definitions

The linear imager scanner issues different beeper sequences/patterns and an LED display to indicate status. [Table 2-1](#) defines beeper sequences/patterns and LED displays which occur during both normal scanning and while programming the linear imager scanner. (Also see [Table 1-3 on page 1-12](#) and [Table 1-4 on page 1-13](#) for charging and battery reconditioning LED indicators.)

**Table 2-1** *Scanner Beeper and LED Definitions*

Beeper Sequence	LED Indication	Indication
<b>Standard Use</b>		
Low/medium/high beeps	None	Power up.
<b>Scanning</b>		
None	Green Solid	Presentation Mode on.
None	No LED; green LED is turned off	Presentation Mode off.
Medium beep (or as configured)	Green Flash	A bar code was successfully decoded. (See <a href="#">Chapter 5-1, User Preferences Parameter Defaults</a> for programming beeper sounds.)
Low/low/low/extra low beeps	Red	Parity error.

**Table 2-1 Scanner Beeper and LED Definitions (Continued)**

Beeper Sequence	LED Indication	Indication
Four long low beeps	Red	<ol style="list-style-type: none"> <li>1. A transmission error was detected in a scanned symbol. The data is ignored. This occurs if a unit is not properly configured. Check option setting.</li> <li>2. When communicating with a cradle, the cradle acknowledges receipt of data. If the acknowledgment is not received, this transmission error beep sequence sounds. Data may still have been received by the host. Check the host system for receipt of transmitted data. If data was not received by the host, re-scan the bar code.</li> </ol>
Four short high beeps	None	Low battery warning.
Five long low beeps	Red	Conversion or format error.
Long low/long high/long low/long high beeps	Red	Out of memory - unable to store a new bar code.
<b>Wireless Operation</b>		
Low beep	None	Linear imager scanner detects power when inserted into a cradle. Note: This feature is enabled by default and can be disabled (see <a href="#">Beep on Insertion on page 4-23</a> ).
Long low/long high/long low/long high beeps	Red	Cradle is out of batch storage memory, unable to store new bar code.
High/low/high/low beeps	None	Pairing bar code scanned.
Low/high beeps	None	Bluetooth connection established.
High/low beeps	None	Bluetooth disconnection event. Note: When connected to a remote device using SPP or HID, if a disconnect beep sequence sounds immediately after a bar code is scanned, check the host device for receipt of transmitted data. It is possible that an attempt was made to transmit the last bar code scanned after the connection was lost.
Long low/long high beeps	Red	Page timeout; remote device is out of range/not powered. (See <a href="#">Auto-reconnect Feature on page 4-18</a> .)
Five high beeps (only when configured)	Green Blinking	<ol style="list-style-type: none"> <li>1. Bluetooth attempting reconnection.</li> <li>2. Emitted every 5 seconds while a reconnection attempt is in progress. (See <a href="#">Auto-reconnect Feature on page 4-18</a>.)</li> </ol>



Table 2-1 Scanner Beeper and LED Definitions (Continued)

Beeper Sequence	LED Indication	Indication
Long low/long high/long low/long high beeps	None	Connection attempt was rejected by remote device. Note: In the case of <i>Pairing Methods on page 4-27</i> , the cradle may already be connected to another linear imager scanner in single Point-to-Point locked mode, or the piconet may be full in Multipoint-to-Point mode. If Pair On Contacts is enabled and the linear imager scanner that is inserted is already connected to the cradle, no beeping occurs.
<b>Parameter Programming</b>		
Long low/long high beeps	Red	Input error, incorrect bar code or <b>Cancel</b> scanned, wrong entry, incorrect bar code programming sequence; remain in program mode.
High/low beeps	Green	Keyboard parameter selected. Enter value using bar code keypad.
High/low/high/low beeps	Green	Successful program exit with change in the parameter setting.
<b>ADF Programming</b>		
Low/high/low beeps	None	ADF transmit error.
High/low beeps	Green	Number expected. Enter another digit. Add leading zeros to the front if necessary.
Low/low beeps	Green	Alpha expected. Enter another alphabetic character or scan the <b>End of Message</b> bar code.
High/high beeps	Green Blinking	ADF criteria or action is expected. Enter another criteria or action or scan the <b>Save Rule</b> bar code.
High/low/low beeps	Green	All criteria or actions cleared for current rule, continue entering rule.
High/low/high/low beeps	Green (turns off blinking)	Rule saved. Rule entry mode exited.
Long low/long high beeps	Red	Rule error. Entry error, wrong bar code scanned, or criteria/action list is too long for a rule. Re-enter criteria or action.
Low beep	Green	Deleted last saved rule. The current rule is left intact.
Low/high/high beeps	Green	All rules deleted.
Long low/long high/long low/long high beeps	Red	Out of rule memory. Erase some existing rules, then try to save rule again.
Long low/long high/long low beeps	Green (turns off blinking)	Cancel rule entry. Rule entry mode exited because of an error or the user asked to exit rule entry.
<b>Code 39 Buffering</b>		
High/low beeps	None	New Code 39 data was entered into the buffer.

**Table 2-1** Scanner Beeper and LED Definitions (Continued)

<b>Beeper Sequence</b>	<b>LED Indication</b>	<b>Indication</b>
Three long high beeps	None	Code 39 buffer is full.
High/low/high beeps	None	The Code 39 buffer was erased/cleared.
Low/high/low beeps	None	The Code 39 buffer was erased or there was an attempt to clear or transmit an empty buffer.
Low/high beeps	None	A successful transmission of buffered data.
<b>Host Specific</b>		
<b>USB only</b>		
Four high beeps	None	Linear imager scanner has not completed initialization. Wait several seconds and scan again.
<b>RS-232 only</b>		
High/high/high/low beeps	Red	RS-232 receive error.
High beep	None	A <BEL> character is received when Beep on <BEL> is enabled (Point-to-Point mode only).

## Cradle LED Definitions



**IMPORTANT** When the scanner is inserted into the CR0078-S (standard) cradle, the scanner's LED is used as the charging indicator.

When the scanner is inserted into the CR0078-P (presentation) cradle, the cradle's LED is used as the charging indicator.



**NOTE** The CR0078-S/CR0008-S cradles' LED indicate power only.

**Table 2-2** CR0078-P Cradle LED Definitions

LED	Indication
Green Blinking	Cradle is externally powered and connected to a USB host interface which has suspended the cradle. The cradle is no longer connected to the linear imager scanner but it will charge the linear imager scanner. Scan the pairing bar code to pair the scanner and cradle (see <i>Pairing on page 4-25</i> ).
Red Blinking	Transmission error.
Green	Cradle is powered.
Red Blinking	Transmission error.
Green Slow Blinking	Non-critical battery temperature fault.
Green Slow Blinking	Charging in cradle with USB (bus powered).
Green Fast Blinking	The scanner is charging.
Amber Blinking	Critical battery temperature fault.
Green Solid	The scanner is fully charged.
Red Solid	Battery requires precharge.
Red Slow Blinking	Battery is reconditioning.

---

## Scanning

To program the linear imager scanner, see the appropriate host chapter, [Chapter 4, RADIO COMMUNICATIONS](#) and [Chapter 11, SYMBOLOGIES](#). (In addition to the parameters included in the chapters mentioned, user preference and miscellaneous linear imager scanner option parameters are also available in this guide.)

### Aiming

When scanning, the linear imager scanner projects a red illumination which allows positioning the bar code within its field of view. See [Decode Ranges on page 2-8](#) for the proper distance to achieve between the linear imager scanner and a bar code.

### Hand-Held Scanning

To scan:

1. Ensure all connections are secure (see appropriate host chapter).
2. Aim the linear imager scanner at the bar code.
3. Press the trigger.

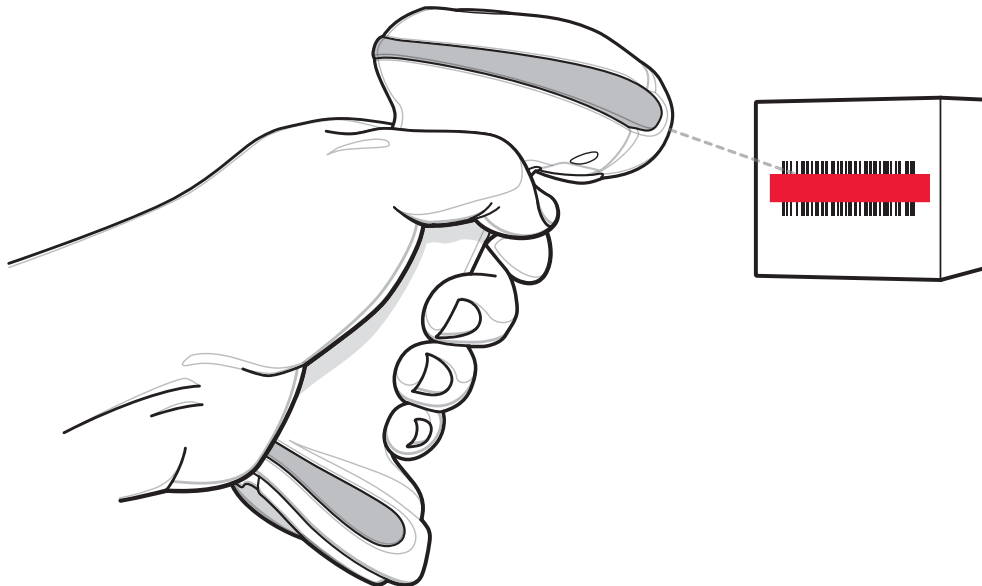


Figure 2-1 Scanning

4. Upon successful decode, the linear imager scanner beeps and the LED displays a single green flash. (For more information about beeper and LED definitions, see [Table 2-1](#) and [Table 2-2](#).)

## Hands-Free Scanning

The linear imager scanner is in hands-free (presentation) mode when it sits in the CR0078-P cradle. In this mode the linear imager scanner operates in continuous (constant-on) mode, where it automatically decodes a bar code presented in the field of view. The scanner LED is on, solid green

To scan:

1. Ensure all connections are secure (see appropriate host chapter).
2. Present the bar code in the linear imager scanner field of view.

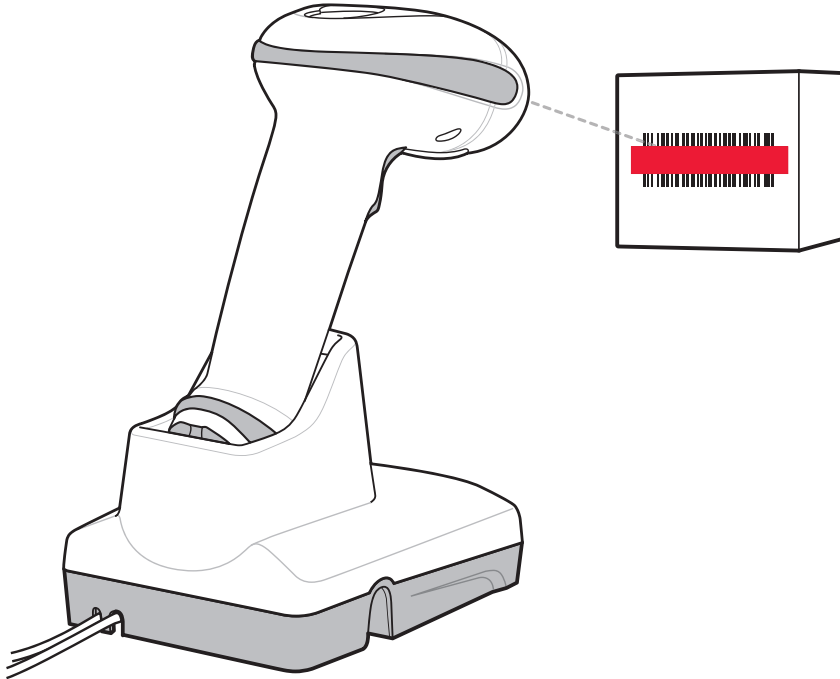


Figure 2-2 *Presentation Scanning*

3. Upon successful decode, the linear imager scanner beeps and the green LED momentarily turns off. (For more information about beeper and LED definitions, see [Table 2-1](#) and [Table 2-2](#).)

## Decode Ranges

Ranges are calculated on Code 39 except where noted.

**Table 2-3** LI4278 Decode Ranges

Symbol Density	Bar Code Type	Typical Working Ranges	
		Near	Far
4 mil	Code 39	4 in. (10.2 cm)	10.0 in. (25.4 cm)
5 mil	Code 39	3.0 in. (7.6 cm)	13.0 in. (33.0 cm)
7.5 mil	Code 39	1.5 in. (3.8 cm)	19.0 in. (48.3 cm)
13 mil	100% UPC-A	1.0 in. (2.5 cm)	31.0 in. (78.7 cm)
20 mil	Code 39	1.0 in. (2.5 cm)	42.0 in. (106.7 cm)
26 mil	200% UPC-A	3.0 in. (7.6 cm)	55.0 in. (140.0 cm)
100 mil (paper)			> 20 ft. (> 6 m)



**NOTE** When reading high density bar codes, users should attempt to read them slightly farther away from the scanner. Typically a 3 mil Code39 bar code begins reading at 5 in. (12.8cm).

# CHAPTER 3 MAINTENANCE, TROUBLESHOOTING & TECHNICAL

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## Introduction

This chapter provides suggested linear imager scanner and cradle maintenance, troubleshooting, technical specifications, and signal descriptions (pinouts).

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## Maintenance

### Known Harmful Ingredients

The following chemicals are known to damage the plastics on Zebra scanners/cradles and should not come in contact with the device:

- Acetone
- Ammonia solutions
- Aqueous or alcoholic alkaline solutions
- Aromatic and chlorinated hydrocarbons
- Benzene
- Bleach
- Carboic acid
- Compounds of amines or ammonia
- Ethanolamine
- Ethers
- Ketones
- TB-lysoform
- Toluene
- Trichloroethylene.

## Approved Cleaning Agents

The following cleaning agents are approved for cleaning the plastics on Zebra scanners/cradles:

- Pre-moistened wipes
- Isopropyl alcohol 70%

## Cleaning the Linear Imager Scanner



**CAUTION** Avoid using cleansers directly on the linear imager scanner battery door and contacts. Use a cotton swab moistened with alcohol to gently clean contacts.

Routinely cleaning the exit window is required. A dirty window may affect scanning accuracy. Do not allow any abrasive material to touch the window.

To clean the scanner:

1. Dampen a soft cloth with one of the approved cleaning agents listed above or use pre-moistened wipes.
2. Gently wipe all surfaces, including the front, back, sides, top and bottom. Never apply liquid directly to the scanner. Be careful not to let liquid pool around the scanner window, trigger, cable connector or any other area on the device.
3. Be sure to clean the trigger and in between the trigger and the housing (use a cotton-tipped applicator to reach tight or inaccessible areas).
4. Do not spray water or other cleaning liquids directly into the exit window.
5. Wipe the scanner exit window with a lens tissue or other material suitable for cleaning optical material such as eyeglasses.
6. Immediately dry the scanner window after cleaning with a soft non-abrasive cloth to prevent streaking.
7. Allow the unit to air dry before use.
8. Scanner connectors:
  - a. Dip the cotton portion of a cotton-tipped applicator in isopropyl alcohol.
  - b. Rub the cotton portion of the cotton-tipped applicator back-and-forth across the connector on the Zebra scanner at least 3 times. Do not leave any cotton residue on the connector.
  - c. Use the cotton-tipped applicator dipped in alcohol to remove any grease and dirt near the connector area.
  - d. Use a dry cotton tipped applicator and rub the cotton portion of the cotton-tipped applicator back-and-forth across the connectors at least 3 times. Do not leave any cotton residue on the connectors.

## Cleaning the Linear Imager Scanner Cradles



**CAUTION** Avoid using cleansers directly on the linear imager scanner cradle contacts. Use a cotton swab moistened with alcohol to gently clean contacts.

Do not pour, spray or spill any liquid on the cradle. See [Cleaning the Linear Imager Scanner](#) for instructions about cleaning the cradles.

To clean the cradle connectors:

1. Remove the DC power cable from the cradle.



2. Dip the cotton portion of a cotton-tipped applicator in isopropyl alcohol.
3. Rub the cotton portion of the cotton-tipped applicator along the pins of the connector. Slowly move the applicator back-and-forth from one side of the connector to the other. Do not let any cotton residue remain on the connector.
4. Rub all sides of the connector with the cotton-tipped applicator.
5. Spray compressed air in the connector area by pointing the tube/nozzle approximately 1/2 inch (1 cm) away from the surface.



**CAUTION** When using compressed air, always wear eye protection; do not point nozzle at yourself or others; make sure the nozzle or tube is pointing away from your face; read warning label on compressed air product.

- a. Ensure that there is no lint left by the cotton tipped applicator. Remove lint if found.
- b. If grease and other dirt are found on other areas of the cradle, use a lint free cloth and isopropyl alcohol to remove.
- c. Allow at least 10 to 30 minutes (depending on ambient temperature and humidity) for the isopropyl alcohol to air dry before applying power to cradle.



**NOTE** If the temperature is low and humidity is high, longer drying time is required. Warm temperature and low humidity requires less drying time.

---

## Battery Information

Rechargeable battery packs are designed and constructed to the highest standards within the industry. However, there are limitations to how long a battery can operate or be stored before needing replacement. Many factors affect the life of a battery pack such as heat, cold, customer usage profiles, age and severe drops.

When batteries are stored over a year, battery cell manufacturers advise that some irreversible deterioration in overall battery quality may occur. To minimize this loss, they recommend storing batteries half charged in a dry, cool place between 41° F and 77° F (5° C and 25° C), the cooler the better, and removed from the equipment to prevent the loss of capacity. Batteries should be charged to half capacity at least once a year. If an electrolyte leakage is observed, avoid any contact with the affected area and properly dispose of the battery.

Replace the battery when a significant loss of run time is detected. Batteries must be charged within the 32° F to 104° F (0° C to 40°C) temperature range.

The standard warranty period for all Zebra batteries is 30 days, regardless if the battery was purchased separately or included as part of the linear imager scanner. For more information on batteries, please visit: [zebra.com/support](http://zebra.com/support).

## Troubleshooting

- ✓ **NOTE** See *Dump Scanner Parameters* on page 5-24 to debug scanner problems by creating a text file with all the scanner's asset tracking information, and parameter settings.

If after performing the possible solutions in [Table 3-1](#) the symbol still does not scan, contact the distributor or contact the Zebra Global Customer Support Center. See [page xxiii](#) for contact information.

**Table 3-1** *Troubleshooting*

Problem	Possible Causes	Possible Solutions
<b>Battery</b>		
Linear imager scanner battery requires frequent charging.	Battery may need reconditioning.	Restore the battery by performing a battery reconditioning cycle. See <a href="#">Reconditioning the Linear Imager Scanner Battery</a> on page 1-13 for more information.
Linear imager scanner displays solid red LED longer than 3 seconds when placed in cradle.	Battery may require pre-charge due to excessive discharge.	Wait for the red LED to turn green indicating that the scanner has begun normal charging. Recommend allowing battery to fully recharge.
<b>Beeper Indications</b>		
Linear imager scanner emits low/high/low beeps.	ADF transmit error.	See <a href="#">Chapter 12, ADVANCED DATA FORMATTING</a> for information about ADF programming.
	Invalid ADF rule is detected.	See <a href="#">Chapter 12, ADVANCED DATA FORMATTING</a> for information about ADF programming.
	The Code 39 buffer was erased or there was an attempt to clear or transmit an empty buffer.	Normal when scanning the Code 39 Buffering <b>Clear Buffer</b> bar code or upon attempt to transmit an empty Code 39 buffer.
Linear imager scanner emits a low/high/low/high beep sequence while it is being programmed.	Out of ADF parameter storage space.	Erase all rules and re-program with shorter rules.
Linear imager scanner emits long low/long high beeps.	Input error, incorrect bar code or <b>Cancel</b> bar code was scanned.	Scan the correct numeric bar codes within range for the parameter programmed.
	Page timeout; remote device is out of range/not powered.	Move the linear imager scanner back into range of the remote device; try to re-connect; check remote device configuration.

**Table 3-1 Troubleshooting (Continued)**

Problem	Possible Causes	Possible Solutions
Linear imager scanner emits long low/long high/long low/long high beeps.	Out of host parameter storage space.	Scan <i>Default Parameters</i> on page 5-4.
	Out of memory for ADF rules.	Reduce the number of ADF rules or the number of steps in the ADF rules.
	Connection attempt was rejected by remote device.	Free up remote device resources.
Linear imager scanner emits high/high/high/low beeps.	RS-232 receive error.	Normal during host reset. Otherwise, set the linear imager scanner's RS-232 parity to match the host setting.
Linear imager scanner emits high/low beeps.	The linear imager scanner is buffering Code 39 data. Or Keyboard parameter selected.	Normal. Or Enter value using bar code keypad.
	Bluetooth disconnection event.	Move the linear imager scanner back into range of the remote device. In Central (SPP) mode, re-pair the linear imager scanner and cradle by scanning the <b>PAIR</b> bar code on the cradle; check cradle power. In Peripheral (SPP/HID) mode, reestablish connection between the linear imager scanner and remote device from the remote device side.
Linear imager scanner emits three long high beeps.	Code 39 buffer is full.	Scan the Code 39 bar code without a leading space or scan <b>Do Not Buffer Code 39</b> on <i>Code 39 Buffering - Scan &amp; Store</i> on page 11-32 to transmit stored Code 29 data.
Linear imager scanner emits four high beeps on trigger release.	Low battery.	Place linear imager scanner in cradle to charge the battery.
Linear imager scanner emits four long low beeps.	A transmission error was detected in a scanned symbol. The data is ignored.	This occurs if a unit is not properly configured. Check option setting.
	The linear imager scanner is either: - Out of range - Not paired to the cradle - Not connected to a remote Bluetooth device.	Move the linear imager scanner back into range of the remote device. Or Scan the <b>PAIR</b> bar code on the cradle.
	Acknowledgment that transmitted data was not received by the cradle.	Data may have been received by the host. Check the host system for receipt of transmitted data. If data was not received by the host, re-scan the bar code.

Table 3-1 Troubleshooting (Continued)

Problem	Possible Causes	Possible Solutions
Linear imager scanner emits five low long beeps.	Conversion or format error.	Check ADF rules for the host.
Linear imager scanner emits a power-up beep after scanning a USB device type.	Communication with the bus was not established.	Communication with the bus must be established before the linear imager scanner can operate at the highest power level.
Power-up beep occurs more than once.	The host PC performed a cold boot.	The USB bus may put the linear imager scanner in a state where power to the linear imager scanner is cycled on and off more than once. This is normal and usually happens when the host PC cold boots.
<b>Decoding Bar Codes</b>		
Linear imager scanner projects red illumination, but does not decode the bar code.	Linear imager scanner is not programmed for the correct bar code type.	Program the linear imager scanner to read that type of bar code. See <a href="#">Chapter 11, SYMBOLOGIES</a> .
	Bar code symbol is unreadable.	Scan test symbols of the same bar code type to determine if the bar code is defaced.
	Distance between linear imager scanner and bar code is incorrect.	Move the linear imager scanner closer to or further from the bar code. See <a href="#">Decode Ranges on page 2-8</a> .
	The scan line is not crossing every bar and space of the symbol.	Move the symbol until the scan line is within the acceptable aiming pattern. See <a href="#">Figure 2-1 on page 2-6</a> .
Linear imager scanner decodes bar code, but does not transmit the data to the host.	Linear imager scanner is not programmed for the correct host type.	Scan the appropriate host type programming bar code. See the chapter corresponding to the host type.
	Interface cable is loose.	Ensure all cable connections are secure.
	Cradle is not programmed for the correct host interface.	Check linear imager scanner host parameters or edit options.
	Linear imager scanner not paired to host-connected interface.	Pair the linear imager scanner to the cradle by scanning the <b>PAIR</b> bar code on the cradle.
	Cradle has lost connection to host.	<i>In this exact order:</i> disconnect power supply; disconnect host cable; wait three seconds; reconnect host cable; reconnect power supply; reestablish pairing.

**Table 3-1** *Troubleshooting (Continued)*

Problem	Possible Causes	Possible Solutions
Linear imager scanner emits five long low beep after a bar code is decoded.	Conversion or format error was detected. The linear imager scanner's conversion parameters are not properly configured.	Ensure the linear imager scanner's conversion parameters are properly configured.
	Conversion or format error was detected. An ADF rule was set up with characters that can't be sent for the host selected.	Change the ADF rule, or change to a host that can support the ADF rule.
	Conversion or format error was detected. A bar code was scanned with characters that can't be sent for that host.	Change the bar code, or change to a host that can support the bar code.
<b>Host Displays</b>		
Host displays scanned data incorrectly.	Linear imager scanner is not programmed to work with the host.	Ensure the proper host is selected. Scan the appropriate host type programming bar code.
		For RS-232, ensure the linear imager scanner's communication parameters match the host's settings.
		For a USB HID keyboard or Keyboard Wedge configuration, ensure the system is programmed for the correct keyboard type and language, and turn off the CAPS LOCK key.
		Ensure editing options (e.g., ADF, UPC-E to UPC-A Conversion) are properly programmed.
		Check the linear imager scanner's host type parameters or editing options.
<b>Trigger</b>		
Nothing happens when the trigger is pulled.	No power to the linear imager scanner.	Check the system power. If the configuration requires a power supply, re-connect the power supply. Check the battery. Ensure that end cap to battery chamber is secured.
	Interface/power cables are loose.	Check for loose cable connections and re-connect cables.

**Table 3-1** *Troubleshooting (Continued)*

Problem	Possible Causes	Possible Solutions
	Linear imager scanner is disabled.	For Synapse or IBM-468x mode, enable the linear imager scanner via the host interface.
The red illumination does not appear when the trigger is pulled.	No power to the linear imager scanner.	Check battery and charging contacts; ensure that end cap to battery chamber is secured; ensure all power and cable connections to cradle are secure.
	Interface/power cables are loose.	Check battery and charging contacts; ensure power and cable connections to cradle are secure.

## Technical Specifications

Table 3-2 Technical Specifications - LI4278 Linear Imager Scanner

Item	Description
<b>Physical Characteristics</b>	
Dimensions	3.84 in. H x 2.75 in. W x 7.34 in. L 9.8 cm H x 7 cm W x 18.6 cm L
Weight (with battery)	Approximately 7.9 oz. (224 g)
Color	Cash Register White or Twilight Black
Cradle Interface	RS-232, RS-485 (IBM), USB, Keyboard Wedge (also see <a href="#">Table 3-3</a> )
Battery	Rechargeable replaceable battery with 'green sustainability'
<b>Performance Characteristics</b>	
Aiming/Illumination	LED Class 1 device 617nm (amber)
Scan Speed	547 scans per second
Scan Pattern	Single bright aiming line
Scan Angle	Horizontal 35°
Scans Per Charge	Up to 57,000
Hours of operation (per full charge)	72 hours
Battery Specifications	750mAH NiMH Number of scans per full charge: up to 57,000 @ 1 scan/second Hours of operation out of cradle per full charge: 72 hrs @ 1 scan/6 seconds Charge Time: A complete charge of a fully discharged battery can take typically three hours using external power and typically five hours when powered from a host.
Roll Tolerance	± 45°
Pitch Tolerance	± 65°
Skew Tolerance	± 65°
Nominal Working Distance	(See <a href="#">Decode Ranges on page 2-8</a> )
Decode Capability	UPC/EAN: UPC-A, UPC-E, UPC-E1, EAN-8/JAN 8, EAN-13/JAN 13, Bookland EAN, Bookland ISBN Format, UCC Coupon Extended Code, ISSN EAN Code 128 including GS1-128, ISBT 128, ISBT Concatenation, Code 39 including Trioptic Code 39, Convert Code 39 to Code 32 (Italian Pharmacy Code), Code 39 Full ASCII Conversion Code 93, Code 11, Matrix 2 of 5, Interleaved 2 of 5 (ITF), Discrete 2 of 5 (DTF), Codabar (NW - 7), MSI, Chinese 2 of 5, IATA, Inverse 1 D (except all GS1 DataBars), GS1 DataBar including GS1 DataBar-14, GS1 DataBar Limited, GS1 DataBar Expanded
Motion tolerance	25 in./ 63.5 cm per second
Min. Print Contrast	15% MrD
<b>User Environment</b>	
Operating Temperature	32° to 122° F (0° to 50° C)

**Table 3-2** Technical Specifications - LI4278 Linear Imager Scanner (Continued)

Item	Description
Storage Temperature	-40° to 158° F (-40° to 70° C)
Charging Temperature	32° to 104° F (0° to 40° C) nominal, 41° to 95° F (5° to 35° C) ideal
Humidity	5 % to 85 % RH, non-condensing
Drop Specifications	Over 100 drops at 5 ft./1.5 m at room temperature; survives 6ft./1.8 m drops to concrete
# of Cradle Insertions	250,000+ insertions
Ambient Light Immunity	Incandescent - 557 ft. candles (6,000 Lux) Sunlight - 10,000 ft. candles (108,000 Lux) Fluorescent - 557 ft. candles (6,000 Lux) Mercury Vapor - 557 ft. candles (6,000 Lux) Sodium Vapor - 557 ft. candles (6,000 Lux) Immune to normal, artificial indoor and natural outdoor (direct sunlight) lighting conditions
Environmental Sealing	Gasket sealed housing withstands dust and can be sprayed clean
<b>Wireless Connectivity</b>	
Radio Range	330ft/100m line of sight
Radio	Bluetooth v2.1 Class 2 Radio
Data Rate	3.0 Mbit/s (2.1 Mbit/s) Bluetooth v2.1
<b>Note:</b> There is a difference in the scanner to cradle bluetooth range depending on the cradle used: <ul style="list-style-type: none"> <li>• When the LI4278 is connected to the Standard Cradle (Class 2), the range is 33 ft/10m.</li> <li>• When the LI4278 is connected to the Presentation Cradle (Class 1), the range is 330 ft/100m.</li> </ul>	
<b>Utilities</b>	123Scan, Remote Scanner Management (RSM), Scanner Management Services (SMS), Zebra Scanner SDK
<b>Accessories</b>	
Lanyard	Optional lanyard attaches to battery door

**Table 3-3** Technical Specifications - CR0078-S/CR0008-S Cradle

Item	Description
<b>Physical Characteristics</b>	
Dimensions:	2.0 in. H x 8.35 in. L x 3.4 in. W (5 cm H x 21.1 cm L x 8.6 cm W)
Weight	Approximately 6.4 oz. (183 gm)
Voltage & Current	Charging Cradle: Voltage                      Current 5 +/- 10% VDC       575mA (External power) 5 +/- 10% VDC       395 mA (Host power through cable) Cradle only: 5V @ 70mA



**Table 3-3** *Technical Specifications - CR0078-S/CR0008-S Cradle (Continued)*

Item	Description
Color	Cash Register White or Twilight Black
Power Requirements	4.75 - 14.0 VDC
<b>Performance Characteristics</b>	
Interfaces Supported (CR0078-S only)	Features on-board Multiple Interface with: RS-232C (Standard, Nixdorf, ICL, & Fujitsu); IBM 468x/469x; Keyboard Wedge; USB (Standard, IBM SurePOS, Macintosh); SSI; 123Scan; Remote Scanner Management. In addition, Synapse allows for connectivity to all of the above plus many non-standard interfaces.
<b>User Environment</b>	
Operating Temperature	32° to 122° F (0° to 50° C)
Storage Temperature	-40° to 158° F (-40° to 70° C)
Charging Temperature	32° to 104° F (0° to 40° C) nominal, 41° to 95° F (5° to 35° C) ideal
Humidity	5% to 95% (non-condensing)
<b>Accessories</b>	
Mounting Options	Desktop, mount on a wall, computer work station or medical cart.
Power Supplies	Power supplies are available for applications that do not supply power over host cable.

**Table 3-4** *Technical Specifications - CR0078-P Cradle*

Item	Description								
<b>Physical Characteristics</b>									
Dimensions:	5.4 in. L x 4 in. W x 3.6 in. H								
Weight	Approximately 7.9 oz.								
Voltage & Current	Charging Cradle: <table border="0"> <tr> <td>Voltage</td> <td>Current</td> </tr> <tr> <td>12 +/- VDC</td> <td>60mA (no scanner)</td> </tr> <tr> <td>12 +/- VDC</td> <td>160mA (idle scanner)</td> </tr> <tr> <td>12 +/- VDC</td> <td>335 mA (charging scanner)</td> </tr> </table>	Voltage	Current	12 +/- VDC	60mA (no scanner)	12 +/- VDC	160mA (idle scanner)	12 +/- VDC	335 mA (charging scanner)
Voltage	Current								
12 +/- VDC	60mA (no scanner)								
12 +/- VDC	160mA (idle scanner)								
12 +/- VDC	335 mA (charging scanner)								
Color	Twilight Black								
Power Requirements	12 +/-10% VDC								
<b>Performance Characteristics</b>									
Interfaces Supported (CR0078-P only)	Features on-board Multiple Interface with: RS-232C (Standard, Nixdorf, ICL, & Fujitsu); IBM 468x/469x; Keyboard Wedge; USB (Standard, IBM SurePOS, Macintosh); SNAPi; 123Scan; Remote Scanner Management.								
<b>User Environment</b>									

**Table 3-4** *Technical Specifications - CR0078-P Cradle (Continued)*

<b>Item</b>	<b>Description</b>
Operating Temperature	32° to 122° F (0° to 50° C)
Storage Temperature	-40° to 158° F (-40° to 70° C)
Charging Temperature	32° to 104° F (0° to 40° C) nominal, 41° to 95° F (5° to 35° C) ideal
Humidity	5% to 95% (non-condensing)
<b>Accessories</b>	
Power Supplies	Power supply is required.

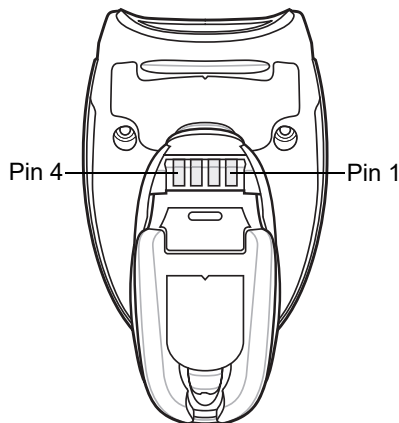
## Cradle Signal Descriptions

The signal descriptions in [Table 3-5](#) apply to the connector on the linear imager scanner and are for reference only.

**Table 3-5** Cradle Signal Pin-outs

Pin	IBM	Synapse	RS-232	Keyboard Wedge	USB
1	Reserved	SynClock	Reserved	Reserved	Jump to Pin 6
2	Power	Power	Power	Power	Power
3	Ground	Ground	Ground	Ground	Ground
4	IBM_A(+)	Reserved	TxD	KeyClock	Reserved
5	Reserved	Reserved	RxD	TermData	D +
6	IBM_B(-)	SynData	RTS	KeyData	Jump to Pin 1
7	Reserved	Reserved	CTS	TermClock	D -
8	Reserved	Reserved	Reserved	Reserved	Reserved
9	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A

[Figure 3-1](#) illustrates the positions of the cradle pins.



**Figure 3-1** Cradle Pin Assignments

The signal descriptions in [Table 3-6](#) apply to the connector from the linear imager scanner to the linear imager scanner cradle and are for reference only.

**Table 3-6** *Cradle Pin-outs*

Pin	Description
1	CRADLE_TXD
2	VCC
3	GND
4	CRADLE_RXD

# CHAPTER 4 RADIO COMMUNICATIONS

## Introduction

This chapter provides information about the modes of operation and features available for wireless communication between linear imager scanners, cradles and hosts. The chapter also includes the parameters necessary to configure the linear imager scanner.

The linear imager scanner ships with the settings shown in the [Radio Communication Default Table on page 4-2](#) (also see [Appendix A, STANDARD DEFAULT PARAMETERS](#) for all host device and miscellaneous linear imager scanner defaults). If the default values suit requirements, programming is not necessary.

To set feature values, scan a single bar code or a short bar code sequence. The settings are stored in non-volatile memory and are preserved even when the linear imager scanner is powered down.

If not using a Synapse or USB cable with the cradle, select a host type (see each host chapter for specific host information) after the power-up beeps sound. This is only necessary upon the first power-up when connected to a new host.

To return all features to default values, scan a default bar code in [Default Parameters on page 5-4](#). Throughout the programming bar code menus, default values are indicated with asterisks (\*).



\* Indicates Default — **\*Enable Pair on Contacts** — Feature/Option

## Scanning Sequence Examples

In most cases, scan one bar code to set a specific parameter value.

## Errors While Scanning

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

## Radio Communications Parameter Defaults

*Table 4-1* lists the defaults for radio communication parameters. If you wish to change any option, scan the appropriate bar code(s) provided in the Radio Communications Parameters section beginning on [page 4-3](#).

✓ **NOTE** See [Appendix A, STANDARD DEFAULT PARAMETERS](#) for all user preferences, hosts, symbologies, and miscellaneous default parameters.

In this guide, the parameter numbers listed are the same as the attribute numbers for these parameters.

**Table 4-1** *Radio Communication Default Table*

Parameter	Parameter Number	Default	Page Number
Radio Communications Host Types		Cradle Host	<a href="#">4-5</a>
BT Friendly Name	607	n/a	<a href="#">4-7</a>
Discoverable Mode	610	General	<a href="#">4-7</a>
Wi-Fi Friendly Mode	1299	Disable	<a href="#">4-8</a>
Wi-Fi Friendly Channel Exclusion		Use All Channel	<a href="#">4-9</a>
HID Features for Apple iOS	1114	Disable	<a href="#">4-11</a>
Country Keyboard Types (Country Code)		North American	<a href="#">4-12</a>
HID Keyboard Keystroke Delay		No Delay (0 msec)	<a href="#">4-14</a>
CAPS Lock Override		Disable	<a href="#">4-14</a>
Ignore Unknown Characters		Enable	<a href="#">4-15</a>
Emulate Keypad		Disable	<a href="#">4-15</a>
Keyboard FN1 Substitution		Disable	<a href="#">4-16</a>
Function Key Mapping		Disable	<a href="#">4-16</a>
Simulated Caps Lock		Disable	<a href="#">4-17</a>
Convert Case		No Case Conversion	<a href="#">4-17</a>
Beep on Reconnect Attempt	559	Disable	<a href="#">4-19</a>
Reconnect Attempt Interval	558	30 sec	<a href="#">4-20</a>
Auto-reconnect in Bluetooth Keyboard Emulation (HID Peripheral) Mode	604	On Bar Code Data	<a href="#">4-22</a>
Beep on Insertion	288	Enable	<a href="#">4-23</a>
Modes of Operation (Point-to-Point/Multipoint-to-Point)	538	Point-to-Point	<a href="#">4-24</a>
Parameter Broadcast (Cradle Host Only)	148	Enable	<a href="#">4-25</a>
Pairing Modes	542	Unlocked	<a href="#">4-26</a>
Pairing on Contacts	545	Enable	<a href="#">4-27</a>

**Table 4-1** Radio Communication Default Table (Continued)

Parameter	Parameter Number	Default	Page Number
Connection Maintenance Interval	5002	15 min	<a href="#">4-29</a>
Batch Mode	544	Normal (Do Not Batch Data)	<a href="#">4-32</a>
Page Button	746	Disable	<a href="#">4-33</a>
Authentication	549	Disable	<a href="#">4-34</a>
PIN Code (Set and Store)	552	12345	<a href="#">4-35</a>
Variable Pin Code	608	Static (Default PIN code is 12345)	<a href="#">4-35</a>
Encryption	550	Disable	<a href="#">4-36</a>
Secure Simple Pairing IO Capability (SPP Server and SPP Central Host Mode Only)	911	No Input/No Output	<a href="#">4-37</a>

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## Wireless Beeper Definitions

When the linear imager scanner scans the pairing bar code it issues various beep sequences indicating successful or unsuccessful operations. See [Beeper and LED Definitions on page 2-1](#) for all beep sequences and LED displays including those which occur during pairing operations.

---

## Radio Communications Host Types

To set up the linear imager scanner for communication with a cradle, or to use standard Bluetooth profiles, scan the appropriate host type bar code below.

- Cradle Host (default) - Select this host type for linear imager scanner(s) to cradle operation. The linear imager scanner must then be paired to the cradle and the cradle communicates directly to the host via the host interface cable connection.
- Serial Port Profile (Central) - Select this host type for Bluetooth Technology Profile Support (see [page 4-6](#)). The linear imager scanner connects to the PC/host via Bluetooth and performs like there's a serial connection. The linear imager scanner initiates the connection to the remote device and is the Central. Scan **Serial Port Profile (Central)**, then scan the **PAIR** bar code for the remote device. See [Pairing Bar Code Format on page 4-28](#) for information about creating a pairing bar code for a remote device.
- Serial Port Profile (Peripheral) - Select this host type for Bluetooth Technology Profile Support (see [page 4-6](#)). The linear imager scanner connects to the PC/host via Bluetooth and performs like there's a serial connection. The linear imager scanner accepts incoming connection requested from a remote device and is the Peripheral. Scan **Serial Port Profile (Peripheral)** and wait for the incoming connection.
- Bluetooth Keyboard Emulation (HID Peripheral) - Select this host type for Bluetooth Technology Profile Support. (See [page 4-6](#) for Bluetooth Technology Profile Support and Central/Peripheral definitions.) The linear imager scanner connects to the PC/host via Bluetooth and performs like a keyboard. The linear imager scanner accepts incoming connection requested from a remote device and is the peripheral. Scan **Bluetooth Keyboard Emulation (HID Peripheral)** and wait for the incoming connection.



1. The linear imager scanner supports keyboard emulation over the Bluetooth HID profile. For detailed information, and HID host parameters, see [HID Host Parameters on page 4-11](#).
2. When the linear imager scanner is paired to the cradle in SPP Central or Cradle Host mode, the linear imager scanner automatically tries to reconnect to a remote device when a disconnection occurs that is due to the radio losing communication. For more information see [Auto-reconnect Feature on page 4-18](#).



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## Radio Communications Host Types (continued)



**\*Cradle Host**



**Serial Port Profile (Central)**



**Serial Port Profile (Peripheral)**



**Bluetooth Keyboard Emulation (HID Peripheral)**

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## Bluetooth Technology Profile Support

With Bluetooth Technology Profile Support, the cradle is not required for wireless communication. The linear imager scanner communicates directly to the host using Bluetooth technology. The linear imager scanner supports the standard Bluetooth Serial Port Profile (SPP) and HID Profiles which enable the linear imager scanner to communicate with other Bluetooth devices that support these profiles.

- SPP - the linear imager scanner connects to the PC/host via Bluetooth and performs like there's a serial connection.
- HID - the linear imager scanner connects to the PC/host via Bluetooth and performs like a keyboard.

## Central/Peripheral Set Up

The linear imager scanner can be set up as a Central or Peripheral.

When the linear imager scanner is set up as a Peripheral, it is discoverable and connectable to other devices. When the linear imager scanner is set up as a Central, the Bluetooth address of the remote device to which a connection is requested is required. A pairing bar code with the remote device address must be created and scanned to attempt a connection to the remote device. See the [Pairing Bar Code Format on page 4-28](#) for information about creating a pairing bar code.

### Central

When the linear imager scanner is set up as a Central (SPP), it initiates the radio connection to a Peripheral device. Initiating the connection is done by scanning a pairing bar code for the remote device (see [Pairing Bar Code Format on page 4-28](#)).

### Peripheral

When the linear imager scanner is set up as a Peripheral device (SPP), the linear imager scanner accepts an incoming connection request from a remote device.

✓ **NOTE** The number of linear imager scanners is dependent on the host's capability.

## Bluetooth Friendly Name

Parameter # 607

You can set a meaningful name for the linear imager scanner that appears in the application during device discovery. The default name is the linear imager scanner name followed by its serial number, e.g., **LI4278 123456789ABCDEF**. Scanning **Set Defaults** reverts the linear imager scanner to this name; use custom defaults to maintain the user-programmed name through a **Set Defaults** operation.

To set a new Bluetooth Friendly Name, scan the following bar code, then scan up to 23 characters from [Appendix E, ALPHANUMERIC BAR CODES](#). If the name contains less than 23 characters, scan *End of Message on page E-7* after entering the name.

✓ **NOTE** If your application allows you to set a device name, this takes precedence over the Bluetooth Friendly Name.



**Bluetooth Friendly Name**

## Discoverable Mode

Parameter # 610

Select a discoverable mode based on the device initiating discovery:

- Select **General Discoverable Mode** when initiating connection from a PC.
- Select **Limited Discoverable Mode** when initiating connection from a mobile device (e.g., Q), and the device does not appear in General Discoverable Mode. Note that it can take longer to discover the device in this mode.

The device remains in Limited Discoverable Mode for 30 seconds, and green LEDs flash while in this mode. It is then non-discoverable. To re-active Limited Discoverable Mode, press the trigger.



**\*General Discoverable Mode  
(0)**



**Limited Discoverable Mode  
(1)**

---

## Wi-Fi Friendly Mode

Parameter # 1299

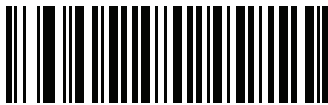
Scanners configured for Wi-Fi friendly mode behave as follows:

- The scanner remains in sniff mode, and exits sniff mode only during firmware update.
- If any Wi-Fi channel is excluded from the hopping sequence, AFH turns off.
- Scanner (and cradle) avoid the selected Wi-Fi channels after establishing connection.

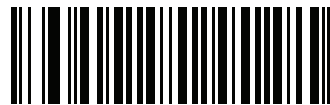
### Notes

- If using this feature, configure all scanners in the area for Wi-Fi friendly mode.
- By default, no Wi-Fi channels are excluded.
- Since Bluetooth requires a minimum of 20 channels when Wi-Fi channels 1, 6, and 11 are excluded, a smaller number of channels are cut from the hopping sequence.
- Updating Wi-Fi friendly settings before Bluetooth connection is recommended.

Scan a bar code below to enable or disable **Wi-Fi Friendly Mode**, then see [Wi-Fi Friendly Channel Exclusion](#) to select any channels to exclude.



**\*Disable Wi-Fi Friendly Mode**



**Enable Wi-Fi Friendly Mode**

## Wi-Fi Friendly Channel Exclusion

### Wi-Fi Channel Exclusion

Select the channels to exclude:

- **Exclude Wi-Fi channel 1:** Bluetooth channels 0-21 are excluded from hopping sequence (2402-2423 MHz).
- **Exclude Wi-Fi channel 6:** Bluetooth channels 25-46 are excluded from hopping sequence (2427 - 2448 MHz).
- **Exclude Wi-Fi channel 11:** Bluetooth channels 50-71 are excluded from hopping sequence (2452 - 2473 MHz).
- **Exclude Wi-Fi channel 1, 6 and 11:** Bluetooth channels 2-19 (2404-2421 MHz), 26-45 (2428 - 2447 MHz) and 51-69 (2453 - 2471 MHz) are excluded from hopping sequence.
- **Exclude Wi-Fi channels 1 and 6:** Bluetooth channels 0-21 (2402-2423 MHz) and 25-46 (2427 - 2448 MHz) are excluded from hopping sequence.
- **Exclude Wi-Fi channels 1 and 11:** Bluetooth channels 0-21 (2402-2423 MHz) and 50-71 (2452 - 2473 MHz) are excluded from hopping sequence.
- **Exclude Wi-Fi channel 6 and 11:** Bluetooth channels 25-46 (2427 - 2448 MHz) and 50-71 (2452 - 2473 MHz) are excluded from hopping sequence.

### Wi-Fi Friendly Channel Exclusion (continued)



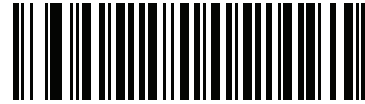
**\*Use All Channels (Standard AFH)**



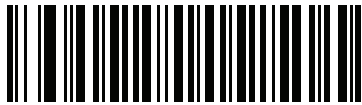
**Exclude Wi-Fi Channel 1**



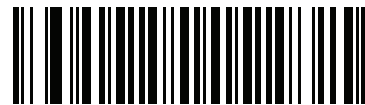
**Exclude Wi-Fi Channel 6**



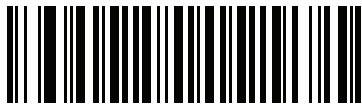
**Exclude Wi-Fi Channel 11**



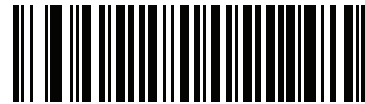
**Exclude Wi-Fi Channels 1, 6, and 11**



**Exclude Wi-Fi Channels 1 and 6**



**Exclude Wi-Fi Channels 1 and 11**



**Exclude Wi-Fi Channels 6 and 11**

---

## HID Host Parameters

The linear imager scanner supports virtual keyboard emulation for the Apple iOS, and keyboard emulation over the Bluetooth HID profile. In this mode the linear imager scanner can interact with Bluetooth enabled hosts supporting the HID profile as a Bluetooth keyboard. Scanned data is transmitted to the host as keystrokes.

### HID Features for Apple iOS

#### Parameter # 1114

This option works with Apple iOS devices to enable the opening and closing of the iOS virtual keyboard by double-pressing the trigger.

✓ *NOTE* When this feature is enabled, the linear imager scanner may be incompatible with non-Apple iOS devices.



**\*Disable**  
**(0)**



**Enable**  
**(1)**

## HID Country Keyboard Types (Country Codes)

Following are the keyboard parameters supported by the HID host.

Scan the bar code corresponding to the keyboard type.



**\*North American Standard Keyboards**



**French Windows**



**French Canadian Windows 98**



**French International**



**German Windows**



**Spanish Windows**



**Italian Windows**



**HID Country Keyboard Types  
(continued)**



**Swedish Windows**



**UK English Windows**



**Japanese Windows**



**French Canadian Windows 2000/XP**



**Portuguese/Brazilian Windows**

## HID Keyboard Keystroke Delay

This parameter sets the delay, in milliseconds, between emulated keystrokes. Scan a bar code below to increase the delay when the HID host requires a slower transmission of data.



**\*No Delay (0 msec)**



**Medium Delay (20 msec)**



**Long Delay (40 msec)**

## HID CAPS Lock Override

When enabled, the case of the data is preserved regardless of the state of the caps lock key. This setting is always enabled for the “Japanese, Windows (ASCII)” keyboard type and can not be disabled.



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



**Override Caps Lock Key  
(Enable)**

## HID Ignore Unknown Characters

This option applies only to the USB HID Keyboard device and IBM device. Unknown characters are characters the host does not recognize. When **Send Bar Codes With Unknown Characters** is selected, all bar code data is sent except for unknown characters, and no error beeps sound. When **Do Not Send Bar Codes With Unknown Characters** is selected, bar code data is sent up to the first unknown character, then the linear imager scanner issues an error beep.



**\*Send Bar Codes With Unknown Characters  
(Enable)**



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

## Emulate Keypad

When enabled, all characters are sent as ASCII sequences over the numeric keypad. For example, ASCII A is sent as "ALT make" 0 6 5 "ALT Break."



**\*Disable Keypad Emulation**



**Enable Keypad Emulation**

## HID Keyboard FN1 Substitution

When enabled, this parameter allows replacement of any FN1 character in an EAN128 bar code with a Key Category and value chosen by the user. See *FN1 Substitution Values on page 5-21* to set the Key Category and Key Value.



**\*Disable Keyboard FN1 Substitution**



**Enable Keyboard FN1 Substitution**

## HID Function Key Mapping

ASCII values under 32 are normally sent as control-key sequences. When this parameter is enabled, the keys in bold are sent in place of the standard key mapping (see *Table 7-4 on page 7-19*).

Table entries that do not have a bold entry remain the same whether or not this parameter is enabled.



**\*Disable Function Key Mapping**



**Enable Function Key Mapping**

## Simulated Caps Lock

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



**\*Disable Simulated Caps Lock**



**Enable Simulated Caps Lock**

## Convert Case

When enabled, the linear imager scanner converts all bar code data to the selected case.



**\*No Case Conversion**



**Convert All to Upper Case**



**Convert All to LowerCase**

---

## Auto-reconnect Feature

When in SPP Central or Cradle Host mode, the linear imager scanner automatically tries to reconnect to a remote device when a disconnection occurs that is due to the radio losing communication. This can happen if the linear imager scanner goes out of range with the remote device, or if the remote device powers down. The linear imager scanner tries to reconnect for the period of time specified by the Reconnect Attempt Interval setting. During that time the green LED continues to blink.

If the auto-reconnect process fails due to page time-outs, the linear imager scanner sounds a page timeout beep (long low/long high) and enters low power mode. The auto-reconnect process can be re-started by pulling the linear imager scanner trigger.

If the auto-reconnect process fails because the remote device rejects the connection attempt, the linear imager scanner sounds a connection reject beep sequence (see [Wireless Beeper Definitions on page 4-3](#)) and deletes the remote pairing address. If this happens, a pairing bar code must be scanned to attempt a new connection to the remote device.

- ✓ **NOTE** If a bar code is scanned while the auto-reconnect sequence is in process, a transmission error beep sequence sounds and the data is not transmitted to the host. After a connection is reestablished, normal scanning operation returns. For error beep sequence definitions, see [Beeper and LED Definitions on page 2-1](#).

The linear imager scanner has memory available for storing a remote Bluetooth address for each Central mode (SPP, Cradle). When switching between these modes, the linear imager scanner automatically tries to reconnect to the last device it was connected to in that mode.

- ✓ **NOTE** Switching between Bluetooth host types by scanning a host type bar code ([page 4-3](#)) causes the radio to be reset. Scanning is disabled during this time. It takes several seconds for the linear imager scanner to re-initialize the radio at which time scanning is enabled.

## Reconnect Attempt Beep Feedback

Parameter # 559

When a linear imager scanner disconnects as it goes out of range, it immediately attempts to reconnect. While the linear imager scanner attempts to reconnect, the green LED continues to blink. If the auto-reconnect process fails, the linear imager scanner emits a page timeout beep (long low/long high) and stops blinking the LED. The process can be restarted by pulling the trigger.

The Beep on Reconnect Attempt feature is disabled by default. When enabled, the linear imager scanner emits 5 short high beeps every 5 seconds while the re-connection attempt is in progress. Scan a bar code below to enable or disable Beep on Reconnect Attempt.



**\*Disable Beep on Reconnect Attempt  
(0)**



**Enable Beep on Reconnect Attempt  
(1)**

## Reconnect Attempt Interval

### Parameter # 558

When a linear imager scanner disconnects as it goes out of range, it immediately attempts to reconnect for the default time interval of 30 seconds. This time interval can be changed to one of the options below.

To set the Reconnect Attempt Interval, scan one of the bar codes below.



**\*Attempt to Reconnect for 30 Seconds  
(6)**



**Attempt to Reconnect for 1 Minute  
(12)**





**Attempt to Reconnect for 5 Minutes  
(60)**



**Attempt to Reconnect for 30 Minutes  
(360)**



**Attempt to Reconnect for 1 Hour  
(720)**



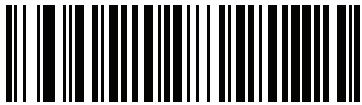
**Attempt to Reconnect Indefinitely  
(0)**

## Auto-reconnect in Bluetooth Keyboard Emulation (HID Peripheral) Mode

### Parameter # 604

In Bluetooth Keyboard Emulation (HID Peripheral) mode, select a re-connect option for when the linear imager scanner loses its connection with a remote device:

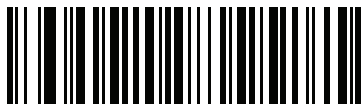
- **Auto-reconnect on Bar Code Data:** The linear imager scanner auto-reconnects when you scan a bar code. With this option, a delay can occur when transmitting the first characters. The linear imager scanner sounds a decode beep upon bar code scan, followed by a connection, a page timeout, a rejection beep, or a transmission error beep. Select this option to optimize battery life on the linear imager scanner and mobile device. Note that auto-reconnect does not occur on rejection and cable unplug commands.
- **Auto-reconnect Immediately:** When the linear imager scanner loses connection, it attempts to reconnect. If a page timeout occurs, the linear imager scanner attempts reconnect on a trigger pull. Select this option if the linear imager scanner's battery life is not an issue and you do not want a delay to occur when the first bar code is transmitted. Note that auto-reconnect does not occur on rejection and cable unplug commands.
- **Disable Auto-reconnect:** When the linear imager scanner loses connection, you must re-establish it manually.



\*Auto-reconnect on Bar Code Data  
(1)



Auto-reconnect Immediately  
(2)



Disable Auto-reconnect  
(0)

---

## Out of Range Indicator

An out of range indicator can be set by scanning [Enable Beep on Reconnect Attempt \(1\) on page 4-19](#) and extending the time using the [Reconnect Attempt Interval on page 4-20](#).

For example, with Beep on Reconnect Attempt disabled while the linear imager scanner loses radio connection when it is taken out of range, the linear imager scanner attempts to reconnect silently during the time interval set by scanning a Reconnect Attempt Interval.

When Beep on Reconnect Attempt is enabled, the linear imager scanner emits 5 high beeps every 5 seconds while the re-connection attempt is in progress. If the Reconnect Attempt Interval is adjusted to a longer period of time, such as 30 minutes, the linear imager scanner emits 5 high beeps every 5 seconds for 30 minutes providing an out of range indicator.

---

## Beep on Insertion

Parameter # 288

When a linear imager scanner is inserted into a cradle and detects power, it emits a short low beep. This feature is enabled by default.

To enable or disable beeping on insertion, scan the appropriate bar code below.



**\*Enable Beep on Insertion  
(00h)**



**Disable Beep on Insertion  
(01h)**

---

## Linear Imager Scanner(s) To Cradle Support

### Modes of Operation

#### Parameter # 538

The charging cradle with radio supports two radio communication modes of operation, allowing the linear imager scanner to communicate wirelessly:

- Point-to-Point
- Multipoint-to-Point.

#### Point-to-Point Communication

In Point-to-Point communication mode, the cradle allows one linear imager scanner to connect to it at a time. In this mode, the linear imager scanner is paired to the cradle either by insertion into the cradle (if pairing on contacts is enabled, [page 4-27](#)), or by scanning the **PAIR** bar code. Communication can be locked, unlocked (default), or in a lock override state (see [Pairing Modes on page 4-26](#)). In locked mode, locking intervals must be set by scanning a connection maintenance interval bar code beginning on [page 4-28](#).

To activate this mode of operation, scan **Point-to-Point**.

#### Multipoint-to-Point Communication

Multipoint-to-Point communication mode allows up to three linear imager scanners to pair to one cradle for the CR0078-S and up to seven linear imager scanners for the CR0078-P.

To activate this mode, the first linear imager scanner connected to the cradle must scan the **Multipoint-to-Point** bar code. This mode allows a parameter broadcast ([page 4-25](#)) feature that forwards parameter bar code settings to all connected linear imager scanners. In this mode, programming one linear imager scanner applies the settings to all connected linear imager scanners.

To select Point-to-Point or Multipoint-to-Point mode, scan the appropriate bar code.



**Multipoint-to-Point Mode  
(1)**



**\*Point-to-Point Mode  
(0)**

## Parameter Broadcast (Cradle Host Only)

Parameter # 148

- ✓ **NOTE** When Parameter Broadcast is disabled on one scanner in the piconet, **Parameter Broadcast** is disabled on all scanners in the piconet.

When in multipoint-to-point mode, enable Parameter Broadcast to broadcast all parameter bar codes scanned to all other linear imager scanners in the piconet. If disabled, parameter bar codes are processed by the individual linear imager scanner only, and the linear imager scanner ignores parameters broadcast from other linear imager scanners or from the cradle.



**\*Enable Parameter Broadcast  
(1)**



**Disable Parameter Broadcast  
(0)**

## Pairing

Pairing is the process by which a linear imager scanner initiates communication with a cradle. Scanning **Multipoint-to-Point** activates multi linear imager scanner-to-cradle operation and allows up to three linear imager scanners to pair to one cradle for the CR0078-S and up to seven linear imager scanners for the CR0078-P.

To pair the linear imager scanner with the cradle, scan the pairing bar code. A high/low/high/low beep sequence indicates that the pairing bar code was decoded. When a connection between the cradle and linear imager scanner is established, a low/high beep sounds.

- ✓ **NOTE**
1. The pairing bar code that connects the linear imager scanner to a cradle is unique to each cradle.
  2. Do not scan data or parameters until pairing completes.
  3. When the linear imager scanner is paired to the cradle in SPP Central or Cradle Host mode, the linear imager scanner automatically tries to reconnect to a remote device when a disconnection occurs that is due to the radio losing communication. For more information see [Auto-reconnect Feature on page 4-18](#).

## Pairing Modes

### Parameter # 542

When operating with the cradle, two modes of pairing are supported:

- **Locked Pairing Mode** - When a cradle is paired (connected) to the linear imager scanner (or up to three linear imager scanners for the CR0078-S and up to seven linear imager scanners for the CR0078-P in Multipoint-to-Point mode), any attempt to connect a different linear imager scanner, by either scanning the **PAIR** bar code on the cradle or by inserting it into the cradle with the pairing on contacts feature enabled ([page 4-27](#)), is rejected. The currently connected linear imager scanner(s) maintain connection. In this mode, you must set a [Connection Maintenance Interval on page 4-28](#).
- **Unlocked Pairing Mode**
  - With the CR0078-S cradle, unlocking works in Point-to-Point mode only. Pair (connect) a new linear imager scanner to a cradle at any time by either scanning the **PAIR** bar code on the cradle or by inserting it into the cradle with the pairing on contacts feature enabled. This unpairs the previous linear imager scanner from the cradle.
  - With the CR0078-P cradle, unlocking works in both Point-to-Point and Multipoint-to-Point modes. Pair (connect) a new linear imager scanner to a cradle at any time by either scanning the **PAIR** bar code on the cradle or by inserting it into the cradle with the pairing on contacts feature enabled.
    - In Point-to-Point mode the previous linear imager scanner unpairs from the cradle.
    - In Multipoint-to-Point mode, when the eighth scanner tries to connect one of the scanners already connected disconnects to make room.

To set the cradle pairing mode, scan the appropriate bar code below.



**\*Unlocked Pairing Mode  
(0)**



**Locked Pairing Mode  
(1)**

## Lock Override

**Lock Override** overrides a locked linear imager scanner base pairing and connects a new linear imager scanner. In Multipoint-to-Point mode, this unpairs any disconnected (out of range) linear imager scanner first, in order to connect the new linear imager scanner.

To use **Lock Override**, scan the bar code below, followed by the pairing bar code on the cradle.



**Lock Override**

### Pairing Methods

Parameter # 545

There are two pairing methods. The default method allows the linear imager scanner and cradle to pair (connect) when the pairing bar code on the cradle is scanned. A second method pairs the linear imager scanner and cradle when the linear imager scanner is inserted in the cradle. To enable this feature, scan **Enable Pair On Contacts** below. With this feature enabled it is not necessary to scan the pairing bar code on the cradle. If the pairing is successful, a low/high connection beep sequence sounds a few seconds after the linear imager scanner is placed in the cradle. See [Wireless Beeper Definitions on page 4-3](#) for other beep sequences.

To enable or disable pairing on contacts, scan the appropriate bar code below.



**\*Enable Pair On Contacts  
(1)**



**Disable Pair on Contacts  
(0)**

### Unpairing

Unpair the linear imager scanner from the cradle or PC/host to make the cradle available for pairing with another linear imager scanner. Scan the bar code below to disconnect the linear imager scanner from its cradle/PC host.

An unpairing bar code is also included in the *LI4278 Quick Reference Guide*.



**Unpairing**

## Pairing Bar Code Format

When the linear imager scanner is configured as an SPP Central, you must create a pairing bar code for the remote Bluetooth device to which the linear imager scanner can connect. The Bluetooth address of the remote device must be known. Pairing bar codes are Code 128 bar codes and are formatted as follows:

<Fnc 3>Bxxxxxxxxxxxx

where:

- **B** (or **LNKB**) is the prefix
- xxxxxxxxxxxx represents the 12-character Bluetooth address.

### Pairing Bar Code Example

If the remote device to which the linear imager scanner can connect has a Bluetooth address of 11:22:33:44:55:66, then the pairing bar code is:



## Connection Maintenance Interval

### Parameter # 5002

- ✓ **NOTE** The Connection Maintenance Interval only applies in locked pairing mode (see [page 4-26](#)).

When a linear imager scanner disconnects from a cradle due to a Link Supervision Timeout, the linear imager scanner immediately attempts to reconnect to the cradle for 30 seconds. If the auto-reconnect process fails, it can be restarted by pulling the linear imager scanner trigger.

To guarantee that a disconnected linear imager scanner can reconnect when it comes back in range, the cradle reserves the connection for that linear imager scanner for a period of time defined by the Connection Maintenance Interval. If the cradle is supporting the maximum three linear imager scanners and one linear imager scanner disconnects, a fourth linear imager scanner cannot pair to the cradle during this interval. To connect another linear imager scanner: either wait until the connection maintenance interval expires then scan the **PAIR** bar code on the cradle with the new linear imager scanner; or, scan **Lock Override** ([page 4-27](#)) with the new linear imager scanner then scan the **PAIR** bar code on the cradle.

- ✓ **NOTE** When the CR0078-S cradle supports the maximum three linear imager scanners and the CR0078-P supports the maximum seven linear imager scanners, it stores the remote pairing address of each linear imager scanner in memory regardless of the linear imager scanner condition (e.g., discharged battery). When you want to change the linear imager scanners paired to the cradle, unpair each linear imager scanner currently connected to the cradle by scanning the [Unpairing](#) bar code prior and reconnect each appropriate linear imager scanner by scanning the PAIR bar code on the cradle.

### Considerations

The system administrator determines the Connection Maintenance Interval. A shorter interval allows new users to gain access to abandoned connections more quickly, but causes problems if users leave the work area for extended periods. A longer interval allows existing users to leave the work area for longer periods of time, but ties up the system for new users.

To avoid this conflict, users who are going off-shift can scan the unpair bar code on [page 4-27](#) to ignore the Connection Maintenance Interval and make the connection immediately available.



**Connection Maintenance Interval (continued)**

To set the Connection Maintenance Interval, scan one of the bar codes below



**\*Set Interval to 15 Minutes  
(0)**



**Set Interval to 30 Minutes  
(1)**



**Set Interval to 60 Minutes  
(2)**



**Set Interval to 2 Hours  
(3)**

### Connection Maintenance Interval (continued)



**Set Interval to 4 Hours**  
**(4)**



**Set Interval to 8 Hours**  
**(5)**



**Set Interval to 24 Hours**  
**(6)**



**Set Interval to Forever**  
**(7)**

## Batch Mode

Parameter # 544



**IMPORTANT** Batch mode does not apply to SPP Peripheral Mode.

The linear imager scanner supports three versions of batch mode. When the linear imager scanner is configured for any of the batch modes, it attempts to store bar code data (not parameter bar codes) until transmission is initialized, or the maximum number of bar codes are stored. When a bar code is saved successfully, a good decode beep sounds and the LED flashes green. If the linear imager scanner is unable to store a new bar code, a low/high/low/high out of memory beep sounds. (See pages [2-1](#) and [2-5](#) for all beeper and LED definitions.)

In all modes, calculate the amount of data (number of bar codes) the linear imager scanner can store as follows:

Number of storable bar codes = 9,000 bytes of memory / (number of characters in the bar code + 3).

- ✓ **NOTE** If the batch mode selection is changed while there is batched data, the new batch mode will take effect only after all the previously batched data is sent.

### Modes of Operation

- **Normal (default)** - Do not batch data. The linear imager scanner attempts to transmit every scanned bar code.
- **Out of Range Batch Mode** - The linear imager scanner starts storing bar code data when it loses its connection to a remote device (for example, when a user holding the linear imager scanner walks out of range). Data transmission is triggered by reestablishing the connection with the remote device (for example, when a user holding the linear imager scanner walks back into range).
  - ✓ **NOTE** Do not use Out of Range Batch Mode together with the Auto-reconnect feature on page [4-22](#). Decode data scanned will be batched and will not cause the scanner to reconnect.
- **Standard Batch Mode** - The linear imager scanner starts storing bar code data after **Enter Batch Mode** is scanned. Data transmission is triggered by scanning **Send Batch Data**.
  - ✓ **NOTE** Transmission is halted if the connection to the remote device is lost.
- **Cradle Contact Batch Mode** - The linear imager scanner starts storing bar code data when **Enter Batch Mode** is scanned. Data transmission is triggered by insertion of the linear imager scanner into the cradle.
  - ✓ **NOTE** If the linear imager scanner is removed from the cradle during batch data transfer, transmission halts until the linear imager scanner is re-inserted in the cradle.

In all modes, transmissions are halted if the linear imager scanner is moved out of range. The linear imager scanner resumes when it is back in range. If a bar code is scanned while batch data is transmitted it is appended to the end of the batched data; parameter bar codes are not stored.

---

## Batch Mode (continued)



**\*Normal  
(00h)**



**Out of Range Batch Mode  
(01h)**



**Standard Batch Mode  
(02h)**



**Cradle Contact Batch Mode  
(03h)**



**Enter Batch Mode**




**Send Batch Data**

---

## Page Button

### Parameter # 746

The CR0078-P cradle offers a page button (see [CR0078-P Series Cradle on page 1-6](#)). The page button is a sensor that when touched, causes paired scanners to emit a beeping sequence. The default is **Disable Page Button**.

1. Place your finger over the button sensor .
2. Press down for approximately 1 second.
3. The cradle LED will turn blue when the scanner is out of the cradle. The paired scanner will beep five times. If multiple scanners are paired to the cradle, all the scanners will beep five times.
4. Repeat as necessary.

✓ **NOTE** Scanners out of radio range will not beep when paged. Refer to [Technical Specifications on page 3-9](#) for detailed radio range information.

Scan one of the following bar codes to enable or disable this feature.



**\*Disable Page Button  
(0)**



**Enable Page Button  
(1)**

---

## Bluetooth Security

The linear imager scanner supports Bluetooth Authentication and Encryption. Authentication can be requested by either the remote device or the linear imager scanner. Once Authentication is complete, either device may then negotiate to enable Encryption.

✓ *NOTE* A remote device can still request Authentication.

### Authentication

#### Parameter # 549

To force Authentication with a remote device (including the cradle), scan the **Enable Authentication** bar code below. To prevent the linear imager scanner from forcing Authentication, scan the **Disable Authentication** bar code below.



**Enable Authentication**  
**(1)**



**\*Disable Authentication**  
**(0)**

## PIN Code

### Parameter # 552

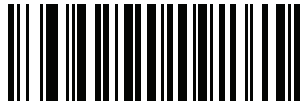
To set and store a PIN code (e.g., password) on the linear imager scanner to connect to the host:

1. Scan the **Set & Store PIN Code** bar code below.
2. Scan five alphanumeric programming bar codes using the alphanumeric bar codes beginning on [page E-1](#).
3. Scan *End of Message on page E-7*.

The default PIN code is **12345**.

If the linear imager scanner communicates with a host with security enabled, synchronize the PIN codes on the linear imager scanner and host. To achieve this, connect the linear imager scanner to the host when setting the PIN codes. If the linear imager scanner is not connected to a host, the PIN code change only takes affect on the linear imager scanner. If security is required between the linear imager scanner and host, and the PIN codes do not match, pairing fails.

✓ **NOTE** An extended 16 character PIN code is available for additional security with Open Bluetooth (SPP and HID).



**Set and Store PIN Code**

## Variable PIN Code

### Parameter # 608

When switching to Cradle Host mode with authentication enabled, scan **Static PIN Code** below to avoid entering the PIN code manually. The PIN stored in memory is used. Scan the **Variable PIN Code** below to manually enter a PIN code with each connection.

The default PIN code is the user-programmed PIN set and stored above. Typically, however, HID connections require entering a Variable PIN Code. If, when attempting connection, the application presents a text box that includes a PIN, scan the **Variable PIN Code** bar code, then re-attempt connection. When you hear a beep indicating the linear imager scanner is waiting for an alphanumeric entry, enter the provided variable PIN using the *Alphanumeric Keyboard on page E-1*, then scan *End of Message on page E-7* if the code is less than 16 characters. The linear imager scanner discards the variable PIN code after connection.



**\*Static PIN Code  
(0)**



**Variable PIN Code  
(1)**

## Encryption

Parameter # 550

✓ *NOTE* Authentication must be performed before Encryption can take effect.

To set up the linear imager scanner for enabling Encryption, scan **Enable Encryption**. To prevent the linear imager scanner from enabling Encryption, scan **Disable Encryption**. When enabled, the radio encrypts data.



**Enable Encryption**  
**(1)**



**\*Disable Encryption**  
**(0)**



## Secure Simple Pairing IO Capability (SPP Server and SPP Central Host Mode Only)

### Parameter # 911

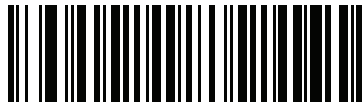
Bluetooth 2.1 uses The *Secure Simple Pairing* method to authenticate devices and create an encryption key. As a part of that algorithm, the device must state its IO capabilities. When in Serial Profile Host (central or peripheral), the default is **No Input/No Output** and no user interaction is required; however, a device may prompt the user to confirm the pairing process.

**Keyboard Only** (passkey entry) is used between a device with a display and a device with numeric keypad entry (such as a keyboard), or two devices with numeric keypad entry. In the first case, the display is used to show a 6-digit numeric code to the user, who then enters the code on the keypad. In the second case, the user of each device enters the same 6-digit number.

✓ *NOTE* This option should be used to connect to an Android tablet.

- **No Input/No Output**: Least amount of security (may not be acceptable for some devices).

**Keyboard Only**: Higher level of security.



\* **No Input/No Output**  
(03h)



**Keyboard Only**  
(02h)

---

## Bluetooth Radio, Linking, and Batch Operation

The LI4278 linear imager scanner has a Bluetooth Class 2 radio which achieves a range of at least 135m / 440ft (open air, line of sight). The actual range you achieve is influenced by the presence of other radios, shelving and wall materials as well as which cradle is tested. The environments vary widely and often influence radio ranges.

When the linear imager scanner goes out of communications range to the base, it can be configured for Batch Mode (see [Batch Mode on page 4-31](#)). The linear imager scanner has sufficient onboard memory to store 500 bar codes of typical size (UPC/EAN).

### Setting Up an iOS or Android Product To Work With The Linear Imager Scanner

Perform the following steps on each device to establish a link.

#### *USB HID Keyboard*

1. On the LI4278, scan [Bluetooth Keyboard Emulation \(HID Peripheral\) on page 4-5](#).
2. On an iOS/iPad/iPhone, select *Settings > General > Bluetooth* and turn Bluetooth On. Choose the LI4278 linear imager scanner from the list of discovered devices. A link should be established allowing scanning into any application with keyboard entry.
3. On an Android/ET1/Droid, select *Settings > Wireless & networks > Bluetooth* (to turn Bluetooth on, if not already on). Select *Bluetooth Settings* and choose the LI4278 linear imager scanner from the list of discovered devices. (The LI4278 linear imager scanner normally displays as LI4278 - xxxxxx, where xxxxxx is the serial number.)



**IMPORTANT** Android devices, specifically the ET1, may require you to scan a PIN to connect. If so, a PIN displays on the device. To enter the required PIN, scan the bar code, [Variable PIN Code \(1\) on page 4-35](#) then re-attempt connection. When a beep sounds, indicating the scanner is waiting for PIN entry, scan the PIN using the *Alphanumeric Keyboard on page E-1*. Incorrect scanned entries can be deleted by scanning *Cancel on page E-7*.

For more information, read the section [Variable PIN Code on page 4-35](#).

# CHAPTER 5 USER PREFERENCES & MISCELLANEOUS SCANNER OPTIONS

## Introduction

If desired, program the linear imager scanner to perform various functions, or activate different features. This chapter describes imaging preference features and provides programming bar codes for selecting these features.

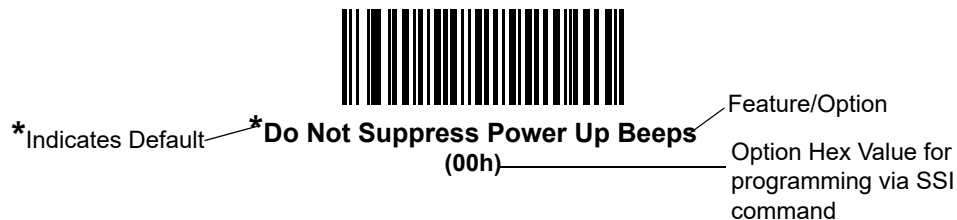
The linear imager scanner ships with the settings in [User Preferences Parameter Defaults on page 5-2](#) (also see [Appendix A, STANDARD DEFAULT PARAMETERS](#) for all host device and miscellaneous defaults). If the default values suit requirements, programming is not necessary.

To set feature values, scan a single bar code or a short bar code sequence. The settings are stored in non-volatile memory and are preserved even when you power down the linear imager scanner.

✓ **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.

If not using a USB cable, select a host type (see each host chapter for specific host information) after the power-up beeps sound. This is only necessary upon the first power-up when connecting to a new host.

To return all features to default values, scan the [Default Parameters on page 5-4](#). 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 5-7](#). The linear imager scanner issues a fast warble beep and the LED turns green, signifying a successful parameter entry.

Other parameters 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/Miscellaneous Option Parameter Defaults

[Table 5-1](#) lists the defaults for preferences parameters. 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 [Default Parameters on page 5-4](#).
- Configure the linear imager scanner using the 123Scan configuration program (see [123SCAN2 on page 10-1](#)).

✓ **NOTE** See [Appendix A, STANDARD DEFAULT PARAMETERS](#) for all user preferences, hosts, symbologies, and miscellaneous default parameters.

In this guide, the parameter numbers listed are the same as the attribute numbers for these parameters.

**Table 5-1** *User Preferences Parameter Defaults*

Parameter	Parameter Number	Default	Page Number
<b>User Preferences</b>			
Set Default Parameter		Restore Defaults	<a href="#">5-4</a>
Report Version		N/A	<a href="#">5-5</a>
Parameter Bar Code Scanning	236	Enable	<a href="#">5-5</a>
Beep After Good Decode	56	Enable	<a href="#">5-6</a>
Decode Illumination Indicator	859	Disable	<a href="#">5-6</a>
Beeper Tone	145	Medium	<a href="#">5-7</a>
Suppress Power Up Beeps	721	Do Not Suppress (Disable)	<a href="#">5-8</a>
Beeper Volume	140	High	<a href="#">5-8</a>
Beeper Duration	628	Medium	<a href="#">5-9</a>
Hand-Held Trigger Mode	138	Level	<a href="#">5-9</a>
Hands-Free Mode	630	Enable	<a href="#">5-10</a>
Low Power Mode	128	Enable	<a href="#">5-10</a>

Parameter	Parameter Number	Default	Page Number
Time Delay to Low Power Mode	146	100 msec	<a href="#">5-11</a>
Time Delay to Presentation Sleep Mode	662	5 Min	<a href="#">5-12</a>
Timeout to Low Power Mode from Auto Aim	729	15 sec	<a href="#">5-14</a>
Continuous Bar Code Read	649	Disable	<a href="#">5-15</a>
Unique Bar Code Reporting	723	Disable	<a href="#">5-15</a>
Decode Session Timeout	136	9.9 sec	<a href="#">5-16</a>
Timeout Between Decodes, Same Symbol	137	0.5 sec	<a href="#">5-16</a>
Timeout Between Decodes, Different Symbols	144	0.2 sec	<a href="#">5-16</a>
Decoding Illumination	298	Enable	<a href="#">5-17</a>
<b>Miscellaneous Options</b>			
Transmit Code ID Character	45	None	<a href="#">5-18</a>
Prefix Value	99, 105	7013 <CR><LF>	<a href="#">5-19</a>
Suffix 1 Value Suffix 2 Value	98, 104 100, 106	7013 <CR><LF>	<a href="#">5-19</a>
Scan Data Transmission Format	235	Data as is	<a href="#">5-20</a>
FN1 Substitution Values	103, 109	Set	<a href="#">5-21</a>
Transmit "No Read" Message	94	Disable	<a href="#">5-22</a>
Unsolicited Heartbeat Interval	1118	Disable	<a href="#">5-23</a>
Dump Scanner Parameters			<a href="#">5-24</a>

---

## User Preferences

### Default Parameters

The scanner can be reset to two types of defaults: factory defaults or custom defaults. Scan the appropriate bar code below to reset the scanner to its default settings and/or set the scanner's current settings as the custom default.

- **Restore Defaults** - Resets all default parameters as follows:
  - If custom default values were configured (see **Write to Custom Defaults**), the custom default values are set for all parameters each time the **Restore Defaults** bar code below is scanned.
  - If no custom default values were configured, the factory default values are set for all parameters each time the **Restore Defaults** bar code below is scanned. (For factory default values, see [Appendix A, STANDARD DEFAULT PARAMETERS](#) beginning on [page A-1.](#))
- **Set Factory Defaults** - Scan the **Set Factory Defaults** bar code below to eliminate all custom default values and set the scanner to factory default values. (For factory default values, see [Appendix A, STANDARD DEFAULT PARAMETERS](#) beginning on [page A-1.](#))
- **Write to Custom Defaults** - Custom default parameters can be configured to set unique default values for all parameters. After changing all parameters to the desired default values, scan the **Write to Custom Defaults** bar code below to configure custom defaults.



**\*Restore Defaults**



**Set Factory Defaults**



**Write to Custom Defaults**

## Report Version

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



**Report Software Version**

## Parameter Bar Code Scanning

Parameter # 236

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 Bar Code Scanning  
(01h)**



**Disable Parameter Bar Code Scanning  
(00h)**

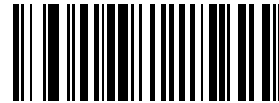
## Beep After Good Decode

Parameter # 56

Scan a bar code below to select whether or not the linear imager scanner beeps after a good decode. If selecting **Do Not Beep After Good Decode**, the beeper still operates during parameter menu scanning and to indicate error conditions.



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



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

## Decode Illumination Indicator

Parameter # 859

Scan a bar code below to select optional blinking of the illumination on a successful decode.



**\*Disable Decode Illumination Indicator  
(00h)**



**1 Blink  
(01h)**



**2 Blinks  
(02h)**



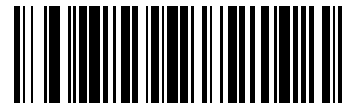
## Beeper Tone

Parameter # 145

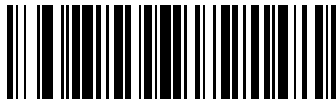
To select a decode beep frequency (tone), scan one of the following bar codes.



**Off  
(03h)**



**Low Tone  
(02h)**



**\*Medium Tone  
(01h)**



**High Tone  
(00h)**



**Medium to High Tone (2-tone)  
(04h)**

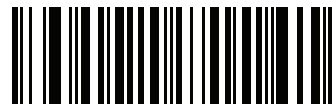
## Suppress Power Up Beeps

Parameter # 721

Scan a bar code below to select whether or not to suppress linear imager scanner beeps upon power up.



**\*Do Not Suppress Power Up Beeps  
(00h)**



**Suppress Power Up Beeps  
(01h)**

## Beeper Volume

Parameter # 140

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)**

## Beeper Duration

Parameter # 628

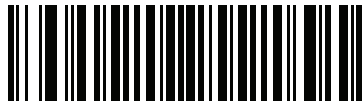
To select the duration for the beeper, scan one of the following bar codes.



**Short**  
**(00h)**



**\*Medium**  
**(01h)**



**Long**  
**(02h)**

## Hand-Held Trigger Mode

Parameter # 138

Select one of the following trigger modes for the linear imager scanner:

- **Standard (Level)** - A trigger pull activates decode processing. Decode processing continues until the bar code decodes, you release the trigger, or the Decode Session Timeout occurs.
- **Auto Aim** - This trigger mode projects the red illumination when you lift the linear imager scanner. A trigger pull activates decode processing. After 2 seconds of inactivity the aiming pattern shuts off.



**\*Standard (Level)**  
**(00h)**



**Auto Aim**  
**(09h)**

## Hands-Free Trigger Mode

### Parameter # 630

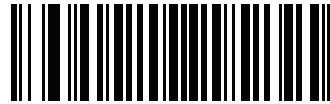
In hands-free mode, the linear imager scanner automatically triggers when presented with a bar code. Lifting the linear imager scanner causes it to behave according to the setting of the [Hand-Held Trigger Mode on page 5-9](#).

✓ **NOTE** The CR0078-P cradle is required for Hands-Free mode.

If you select **Disable Hands-Free Mode**, the linear imager scanner behaves according to the setting of the [Hand-Held Trigger Mode](#) regardless of whether it is hand-held or on a counter top.



\*Enable Hands-Free Mode  
(01h)



Disable Hands-Free Mode  
(00h)

## Low Power Mode

### Parameter # 128

If enabled, the linear imager scanner enters a low power consumption mode after Time Delay to Low Power Mode has expired, in which the LEDs turn off in order to conserve energy and prolong the life of the scanner. The linear imager scanner wakes when it senses a trigger pull or when the host attempts to communicate.

If disabled, power remains on after each decode attempt.

✓ **NOTE** The linear imager scanner does not go into low power mode when it is seated in the cradle.



Disable Low Power Mode  
(00h)



\*Enable Low Power Mode  
(01h)

## Time Delay to Low Power Mode

### Parameter # 146

This parameter sets the time it takes the linear imager scanner to enter low power mode after any scanning activity. Scan the appropriate bar code below to set the time.



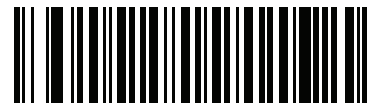
**\*100msec  
(65)**



**500 msec  
(69)**



**1 sec  
(17)**



**2 sec  
(18)**



**3 sec  
(19)**



**4 sec  
(20)**



**5 sec  
(21)**

## Time Delay to Presentation Sleep Mode

### Parameter # 662

In Presentation Mode, this parameter sets the time the linear imager scanner remains active before entering sleep mode with no illumination. The linear imager scanner wakes when it senses motion, upon presentation of a bar code, or a trigger pull.

✓ **NOTE** Linear imager scanner 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)**

## Timeout to Low Power Mode from Auto Aim

### Parameter # 729

This parameter sets the time the linear imager scanner remains in auto aim before entering low power mode.



**Disabled**  
**(0)**



**5 sec**  
**(5)**



**\*15 sec**  
**(11)**



**30 sec**  
**(13)**



**1 minute**  
**(17)**



## Continuous Bar Code Read

Parameter # 649

Enable this to report every bar code while the trigger is pressed.



**\*Disable Continuous Bar Code Read  
(0h)**



**Enable Continuous Bar Code Read  
(1h)**

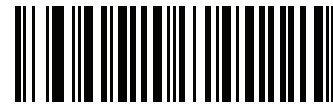
## Unique Bar Code Reporting

Parameter # 723

Enable this to report only unique bar codes while the trigger is pressed. This option only applies when **Continuous Bar Code Read** is enabled.



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



**Enable Continuous Bar Code Read Uniqueness  
(01h)**

## Decode Session Timeout

### Parameter # 136

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. Enter 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 # 137

Use this option in presentation mode and Continuous Bar Code Read mode to prevent the beeper from continuously beeping when a symbol is left in the linear imager scanner's field of view. The bar code must be out of the field of view for the timeout period before the scanner reads the same consecutive symbol. It is programmable in 0.1 second increments from 0.0 to 9.9 seconds. The default interval is 0.5 seconds.

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



**Timeout Between Decodes, Same Symbol**

## Timeout Between Decodes, Different Symbols

### Parameter # 144

Use this option in presentation mode or Continuous Bar Code Read to control the time the scanner is inactive between decoding different symbols. It is programmable in 0.1 second increments from 0.1 to 9.9 seconds. The default is 0.2 seconds.

To select the timeout between decodes for different symbols, scan the bar code below, then scan two numeric bar codes from [Appendix D, NUMERIC BAR CODES](#) that correspond to the desired interval, in 0.1 second increments.



**NOTE** Timeout Between Decodes, Different Symbols cannot be greater than or equal to the Decode Session Timeout.



**Timeout Between Decodes, Different Symbols**

## Decoding Illumination

Parameter # 298

Scanning **Enable Decoding Illumination** enables LED Illumination and usually results in superior images and reading ranges. Scanning **Disable Decoding Illumination** disables LED illumination.



**\*Enable Decoding Illumination  
(01h)**



**Disable Decoding Illumination  
(00h)**

---

## Miscellaneous Scanner Parameters

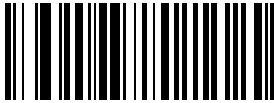
### Transmit Code ID Character

#### Parameter # 45

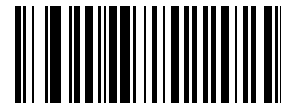
A Code ID character identifies the code type of a scanned bar code. This is useful when decoding more than one code type. In addition to any single character prefix already selected, the Code ID character is inserted between the prefix and the decoded symbol.

Select no Code ID character, a Symbol Code ID character, or an AIM Code ID character. For Code ID Characters, see *Symbol Code Characters on page B-1* and *Aim Code Characters on page B-3*.

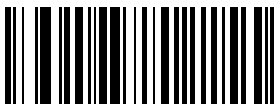
- ✓ **NOTE** If you enable Symbol Code ID Character or AIM Code ID Character, and enable *Transmit "No Read" Message on page 5-22*, the linear imager scanner appends the code ID for Code 39 to the NR message.



**Symbol Code ID Character  
(02h)**



**AIM Code ID Character  
(01h)**



**\*None  
(00h)**

## Prefix/Suffix Values

Key Category Parameter # P = 99, S1 = 98, S2 = 100

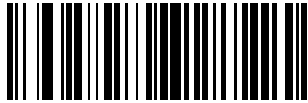
Decimal Value Parameter # P = 105, S1 = 104, S2 = 106

You can append a prefix and/or one or two suffixes to scan data for use in data editing. To set a value for a prefix or suffix, scan a four-digit number (i.e., four bar codes from [Appendix D, NUMERIC BAR CODES](#)) that corresponds to that value. See [Table F-1 on page F-1](#) for the four-digit codes.

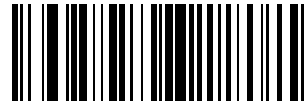
When using host commands to set the prefix or suffix, set the key category parameter to 1, then set the 3-digit decimal value. See [Table F-1 on page F-1](#) for the four-digit codes.

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 5-20](#).



**Scan Prefix  
(07h)**



**Scan Suffix 1  
(06h)**



**Scan Suffix 2  
(08h)**



**Data Format Cancel**

## Scan Data Transmission Format

### Parameter # 235

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 5-19](#).



**\*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 # 103

Decimal Value Parameter # 109

The Wedge and USB HID Keyboard hosts support a FN1 Substitution feature. Enabling this substitutes any FN1 character (0x1b) in an EAN128 bar code 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 current 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. Locate the keystroke desired for FN1 Substitution in the ASCII Character Set table for the current 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 [5-21](#).

## Transmit “No Read” Message

### Parameter # 94

Scan a bar code below to select whether or not to transmit a No Read message. Enable this to transmit the characters NR when a successful decode does not occur before trigger release or the **Decode Session Timeout** expires. See [Decode Session Timeout on page 5-16](#). Disable this to send nothing to the host if a symbol does not decode.



**NOTE** If you enable **Transmit No Read**, and also enable Symbol Code ID Character or AIM Code ID Character for [Transmit Code ID Character on page 5-18](#), the linear imager scanner appends the code ID for Code 39 to the NR message.



**Enable No Read  
(01h)**



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



## Unsolicited Heartbeat Interval

Parameter # 1118

The linear imager scanner supports sending *Unsolicited Heartbeat Messages* to assist in diagnostics. To enable this feature and set the desired unsolicited heartbeat interval, scan one of the time interval bar codes below, or scan **Set Another Interval** followed by four numeric bar codes from [Appendix D, NUMERIC BAR CODES](#) (scan sequential numbers that correspond to the desired number of seconds).

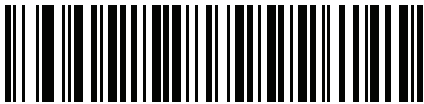
Scan **Disable Unsolicited Heartbeat Interval** to turn off the feature.

The heartbeat event is sent as decode data (with no decode beep) in the form of:

MOTEVTHB:nnn

where nnn is a three digit sequence number starting at 001 and wrapping after 100.

✓ **NOTE** For correct operation, you must disable Low Power Mode (see [Low Power Mode on page 5-10](#)).



**10 seconds**  
(10)



**1 minute**  
(60)



**Set Another Interval**



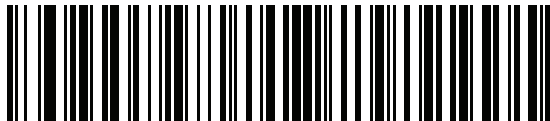
**Disable Unsolicited Heartbeat Interval**  
(0)

## Dump Scanner Parameters

For debugging a scanner problem, scan the programming bar code below to output all the scanner's asset tracking information, and parameter settings. The information is output to a text document in a human readable format.

Scan **STISCANPARAMS** with the scanner connected in USB HID keyboard mode to Microsoft® Windows Notepad or Wordpad, or with the scanner connected via RS232 to a Windows Hyperterminal. The parameter/attribute numbers in this output can be interpreted using parameter numbers in this guide, or the Attribute Data Dictionary (index of parameters). The Attribute Data Dictionary (72E-149786-xx) can be found using the Zebra Support site at: [zebra.com/support](http://zebra.com/support).

✓ **NOTE** It may be necessary to first scan "<DATA><SUFFIX1>" for proper formatting. (See [Scan Data Transmission Format on page 5-20](#).)



**STISCANPARAMS**

# CHAPTER 6 KEYBOARD WEDGE INTERFACE

---

## Introduction

This chapter provides instructions for programming the cradle for keyboard wedge host interface, used to connect the cradle between the keyboard and host computer. The linear imager scanner translates the bar code data into keystrokes, and transmits the information to the host computer via the cradle interface. The host computer accepts the keystrokes as if they originated from the keyboard.

This interface adds bar code reading functionality to a system designed for manual keyboard input. In this mode the keyboard keystrokes are simply passed through.

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

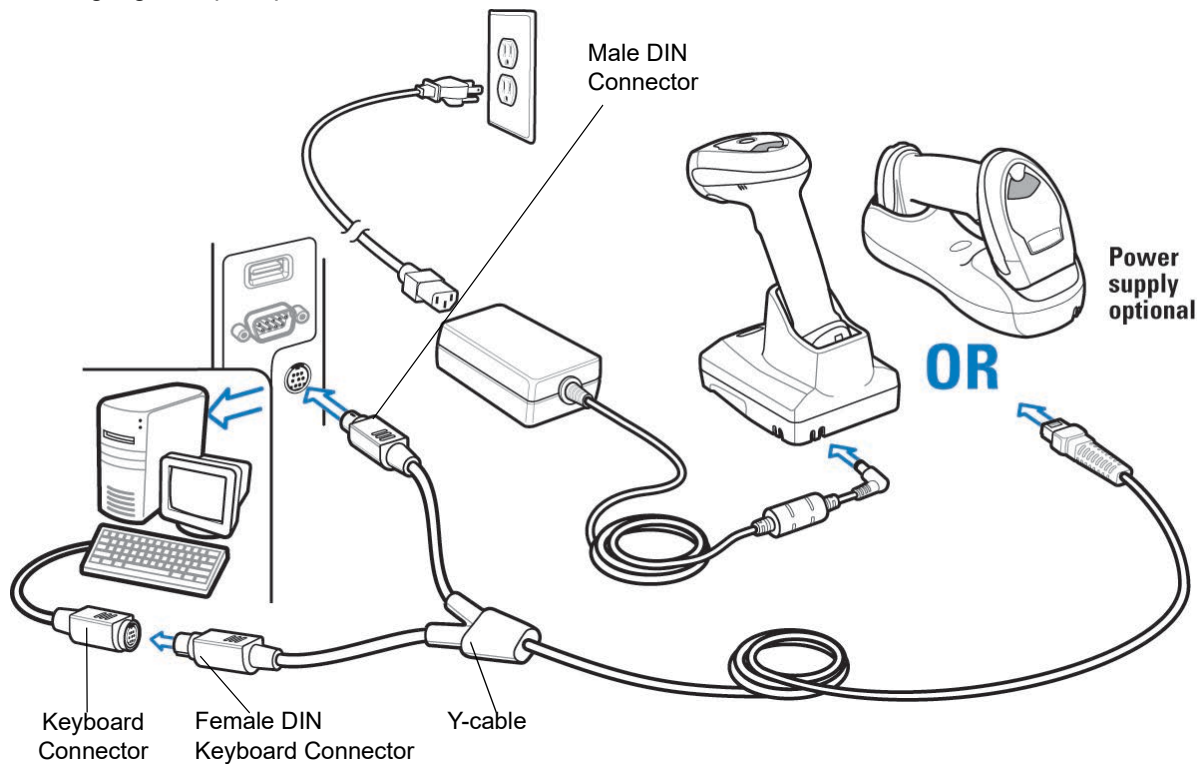


\*Indicates Default    \*North American    Feature/Option

## Connecting a Keyboard Wedge Interface

- ✓ **NOTE** See [Chapter 4, RADIO COMMUNICATIONS](#) for information about linear imager scanner/cradle pairing and wireless communication.

The linear imager scanner must be connected to the cradle for the host parameter setting to take effect. When the linear imager scanner is not connected to a cradle, and a host parameter bar code is scanned, a long low/long high beep sequence sounds.



**Figure 6-1** Keyboard Wedge Connection with Y-cable

To connect the Keyboard Wedge interface Y-cable:

1. Turn off the host and unplug the keyboard connector.
2. Attach the modular connector of the Y-cable to the host port on the bottom of the linear imager scanner cradle (see [Connecting the CR0078-S/CR0008-S Series Cradle on page 1-8](#) or [Connecting the CR0078-P Series Cradle on page 1-9](#)).
3. Connect the round male DIN host connector of the Y-cable to the keyboard port on the host device.
4. Connect the round female DIN keyboard connector of the Y-cable to the keyboard connector.
5. If needed, attach the optional power supply to the connector in the middle of the Y-cable.
6. Ensure that all connections are secure.
7. Turn on the host system.
8. Select the Keyboard Wedge host type by scanning the appropriate bar code from [Keyboard Wedge Host Parameters on page 6-4](#).
9. To modify any other parameter options, scan the appropriate bar codes in this chapter.

- ✓ **NOTE** Interface cables vary depending on configuration. The connectors illustrated in [Figure](#) are examples only. The connectors may be different than those illustrated, but the steps to connect the cradle remain the same.

If a power supply is used, disconnect the power supply before changing host cables or the cradle may not recognize the new host.

## Keyboard Wedge Parameter Defaults

[Table 6-1](#) lists the defaults for Keyboard Wedge host parameters. To change any option, scan the appropriate bar code(s) in the Keyboard Wedge Host Parameters section beginning on [page 6-4](#).



**NOTE** See [Appendix A, STANDARD DEFAULT PARAMETERS](#) for all user preferences, hosts, symbologies, and miscellaneous default parameters.

**Table 6-1** Keyboard Wedge Host Default Table

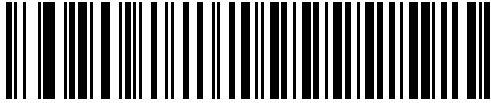
Parameter	Default	Page Number
<b>Keyboard Wedge Host Parameters</b>		
Keyboard Wedge Host Type	IBM PC/AT& IBM PC Compatibles	<a href="#">6-4</a>
Country Types (Country Codes)	North American	<a href="#">6-5</a>
Ignore Unknown Characters	Send	<a href="#">6-7</a>
Keystroke Delay	No Delay	<a href="#">6-7</a>
Intra-Keystroke Delay	Disable	<a href="#">6-8</a>
Alternate Numeric Keypad Emulation	Disable	<a href="#">6-8</a>
Caps Lock On	Disable	<a href="#">6-9</a>
Caps Lock Override	Disable	<a href="#">6-9</a>
Convert Wedge Data	No Convert	<a href="#">6-10</a>
Function Key Mapping	Disable	<a href="#">6-10</a>
FN1 Substitution	Disable	<a href="#">6-11</a>
Send and Make Break	Send	<a href="#">6-11</a>

---

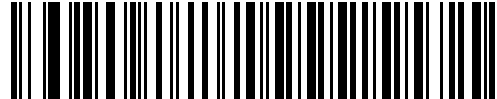
## Keyboard Wedge Host Parameters

### Keyboard Wedge Host Types

Select the Keyboard Wedge host by scanning one of the bar codes below.



**\*IBM PC/AT & IBM PC Compatibles**



**IBM AT Notebook**

## Keyboard Wedge Country Types (Country Codes)

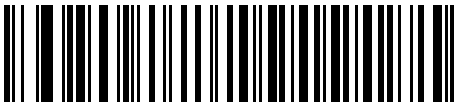
Scan the bar code corresponding to the keyboard type. If the keyboard type is not listed, see [Alternate Numeric Keypad Emulation on page 6-8](#).



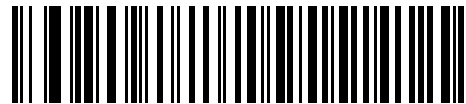
**\*North American**



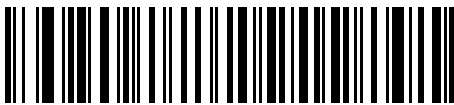
**German Windows**



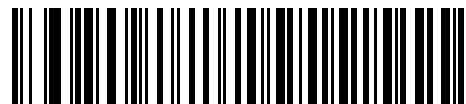
**French Windows**



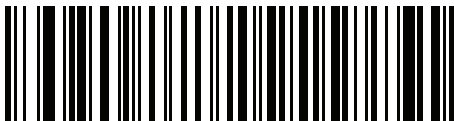
**French Canadian Windows 95/98**



**French Canadian Windows XP/2000**



**Spanish Windows**



**French International**

## Keyboard Wedge Country Types (Country Codes) (continued)



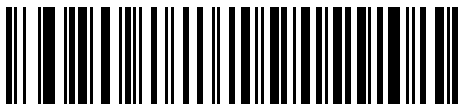
**Italian Windows**



**Swedish Windows**



**UK English Windows**



**Japanese Windows**

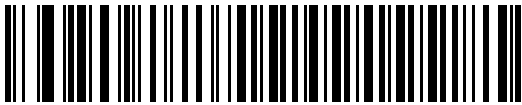


**Portuguese-Brazilian Windows**

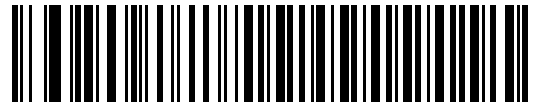


## Ignore Unknown Characters

Unknown characters are characters the host does not recognize. When **Send Bar Codes With Unknown Characters** is selected, all bar code data is sent except for unknown characters, and no error beeps sound on the linear imager scanner. When **Do Not Send Bar Codes With Unknown Characters** is selected, bar code data is sent up to the first unknown character, then the linear imager scanner issues an error beep.



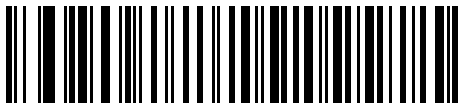
**\*Send Bar Codes with Unknown Characters**



**Do Not Send Bar Codes with Unknown Characters**

## Keystroke Delay

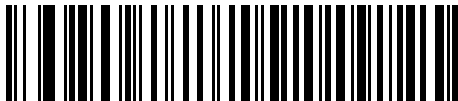
This is the delay in milliseconds between emulated keystrokes. Scan a bar code below to increase the delay when hosts require a slower transmission of data.



**\*No Delay**



**Medium Delay (20 msec)**



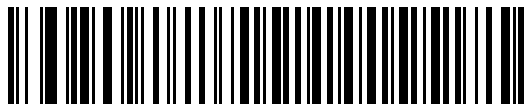
**Long Delay (40 msec)**

## Intra-Keystroke Delay

When enabled, an additional delay is inserted between each emulated key depression and release. This sets the Keystroke Delay parameter to a minimum of 5 msec as well.



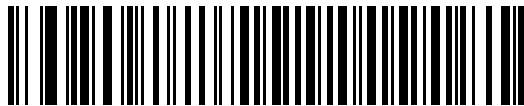
**Enable Intra-Keystroke Delay**



**\*Disable Intra-Keystroke Delay**

## Alternate Numeric Keypad Emulation

This allows emulation of most other country keyboard types not listed in [Keyboard Wedge Country Types \(Country Codes\)](#) on page 6-5 in a Microsoft® operating system environment.



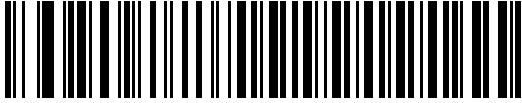
**Enable Alternate Numeric Keypad**



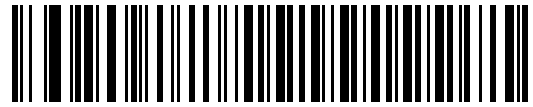
**\*Disable Alternate Numeric Keypad**

## Caps Lock On

When enabled, the linear imager scanner emulates keystrokes as if the Caps Lock key is always pressed. Note that if both **Caps Lock On** and **Caps Lock Override** are enabled, **Caps Lock Override** takes precedence



**Enable Caps Lock On**

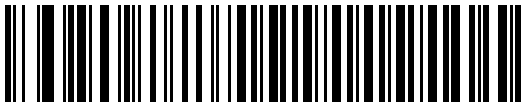


**\*Disable Caps Lock On**

## Caps Lock Override

When enabled, on AT or AT Notebook hosts, the keyboard ignores the state of the Caps Lock key. Therefore, an 'A' in the bar code is sent as an 'A' no matter what the state of the keyboard's Caps Lock key.

Note that if both **Caps Lock On** and **Caps Lock Override** are enabled, **Caps Lock Override** takes precedence.



**Enable Caps Lock Override**



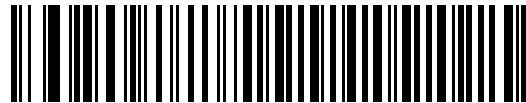
**\*Disable Caps Lock Override**

## Convert Wedge Data

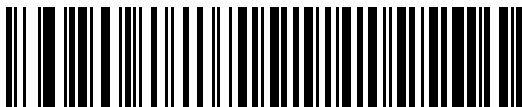
When enabled, the linear imager scanner converts all bar code data to the selected case.



**Convert to Upper Case**



**Convert to Lower Case**



**\*No Convert**

## Function Key Mapping

ASCII values under 32 are normally sent as control key sequences (see [Table 6-2 on page 6-13](#)). When this parameter is enabled, the keys in bold are sent in place of the standard key mapping. Table entries that do not have a bold entry remain the same whether or not this parameter is enabled.



**Enable Function Key Mapping**



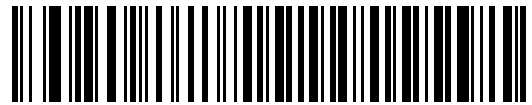
**\*Disable Function Key Mapping**

## FN1 Substitution

When enabled, the linear imager scanner replaces FN1 characters in an EAN128 bar code with a keystroke chosen by the user (see [FN1 Substitution Values on page 5-21](#)).



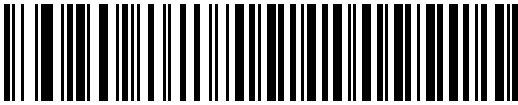
**Enable FN1 Substitution**



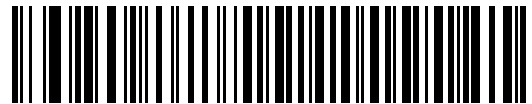
**\*Disable FN1 Substitution**

## Send Make and Break

When enabled, the scan codes for releasing a key are not sent.



**\*Send Make and Break Scan Codes**



**Send Make Scan Code Only**

## Keyboard Map

Refer to the following keyboard map for prefix/suffix keystroke parameters. To program the prefix/suffix values, see the bar codes on [page 5-19](#).

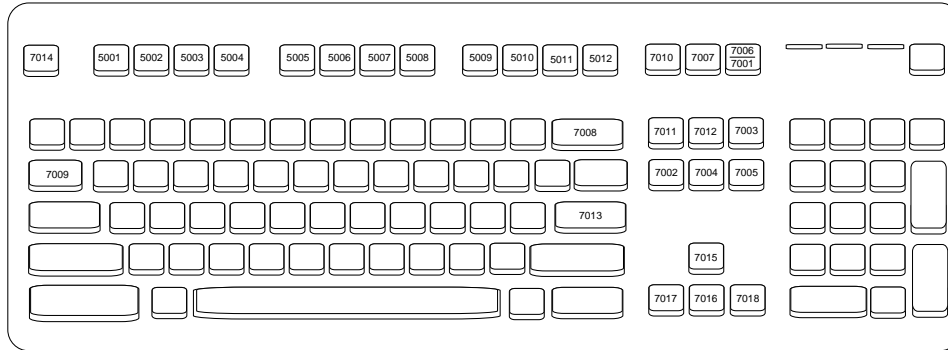


Figure 6-2 IBM PS2 Type Keyboard

## ASCII Character Set for Keyboard Wedge

- ✓ **NOTE** Code 39 Full ASCII interprets the bar code special character (\$ + % /) preceding a Code 39 character and assigns an ASCII character value to the pair. For example, when Code 39 Full ASCII is enabled and a +**B** is scanned, it is interpreted as **b**, %**J** as **?**, and %**V** as **@**. Scanning **ABC%I** outputs the keystroke equivalent of **ABC >**.

Table 6-2 Keyboard Wedge ASCII Character Set

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
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/ <b>BACKSPACE</b> <sup>1</sup>
1009	\$I	CTRL I/ <b>HORIZONTAL TAB</b> <sup>1</sup>
1010	\$J	CTRL J
1011	\$K	CTRL K
1012	\$L	CTRL L
1013	\$M	CTRL M/ <b>ENTER</b> <sup>1</sup>
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

<sup>1</sup>The keystroke in bold is sent only if the “Function Key Mapping” is enabled. Otherwise, the non-bold keystroke is sent.

Table 6-2 Keyboard Wedge ASCII Character Set (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
1022	\$V	CTRL V
1023	\$W	CTRL W
1024	\$X	CTRL X
1025	\$Y	CTRL Y
1026	\$Z	CTRL Z
1027	%A	CTRL [ / <b>ESC</b> <sup>1</sup>
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

<sup>1</sup>The keystroke in bold is sent only if the "Function Key Mapping" is enabled. Otherwise, the non-bold keystroke is sent.



Table 6-2 Keyboard Wedge ASCII Character Set (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
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
1072	H	H
1073	I	I
1074	J	J
1075	K	K
1076	L	L
1077	M	M
1078	N	N

<sup>1</sup>The keystroke in bold is sent only if the “Function Key Mapping” is enabled. Otherwise, the non-bold keystroke is sent.

Table 6-2 Keyboard Wedge ASCII Character Set (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
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	<b>a</b>
1098	+B	<b>b</b>
1099	+C	<b>c</b>
1100	+D	<b>d</b>
1101	+E	<b>e</b>
1102	+F	<b>f</b>
1103	+G	<b>g</b>
1104	+H	<b>h</b>
1105	+I	<b>i</b>
1106	+J	<b>j</b>
1107	+K	<b>k</b>

<sup>1</sup>The keystroke in bold is sent only if the “Function Key Mapping” is enabled. Otherwise, the non-bold keystroke is sent.

**Table 6-2** Keyboard Wedge ASCII Character Set (Continued)

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

<sup>1</sup>The keystroke in bold is sent only if the “Function Key Mapping” is enabled. Otherwise, the non-bold keystroke is sent.

**Table 6-3** Keyboard Wedge ALT Key Character Set

ALT Keys	Keystroke
2065	ALT A
2066	ALT B
2067	ALT C
2068	ALT D
2069	ALT E
2070	ALT F
2071	ALT G

**Table 6-3** Keyboard Wedge 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 6-4** Keyboard Wedge GIU Key Character Set

GUI Keys	Keystrokes
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

**Table 6-4** Keyboard Wedge GIU Key Character Set (Continued)

GUI Keys	Keystrokes
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
3088	GUI X
3089	GUI Y
3090	GUI Z

**Table 6-5** Keyboard Wedge F Key Character Set

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

**Table 6-6** Keyboard Wedge Numeric Keypad Character Set

Numeric Keypad	Keystroke
6042	*
6043	+
6044	undefined

**Table 6-6** *Keyboard Wedge Numeric Keypad Character Set (Continued)*

<b>Numeric Keypad</b>	<b>Keystroke</b>
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 6-7** *Keyboard Wedge Extended Keypad Character Set*

<b>Extended Keypad</b>	<b>Keystroke</b>
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



# CHAPTER 7 RS-232 INTERFACE

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## Introduction

This chapter provides instructions for programming the cradle to interface with an RS-232 host interface. The RS-232 interface is used to attach the scanner cradle to point-of-sale devices, host computers, or other devices with an available RS-232 port (i.e., COM port).

If the particular host is not listed in [Table 7-2](#), set the communication parameters to match the host device. Refer to the documentation for the host device.

✓ **NOTE** This linear imager scanner uses TTL RS-232 signal levels, which interface with most system architectures. For system architectures requiring RS-232C signal levels, Zebra offers different cables providing the TTL to RS-232C conversion. Contact Zebra Support for more information.

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



\*Indicates Default      \*Baud Rate 9600      Feature/Option

## Connecting an RS-232 Interface

- ✓ **NOTE** See [Chapter 4, RADIO COMMUNICATIONS](#) for information about linear imager scanner/cradle pairing and wireless communication.

The linear imager scanner must be connected to the cradle for the host parameter setting to take effect. When the linear imager scanner is not connected to a cradle, and a host parameter bar code is scanned, a long low/long high beep sequence sounds.

This connection is made directly from the cradle to the host computer.

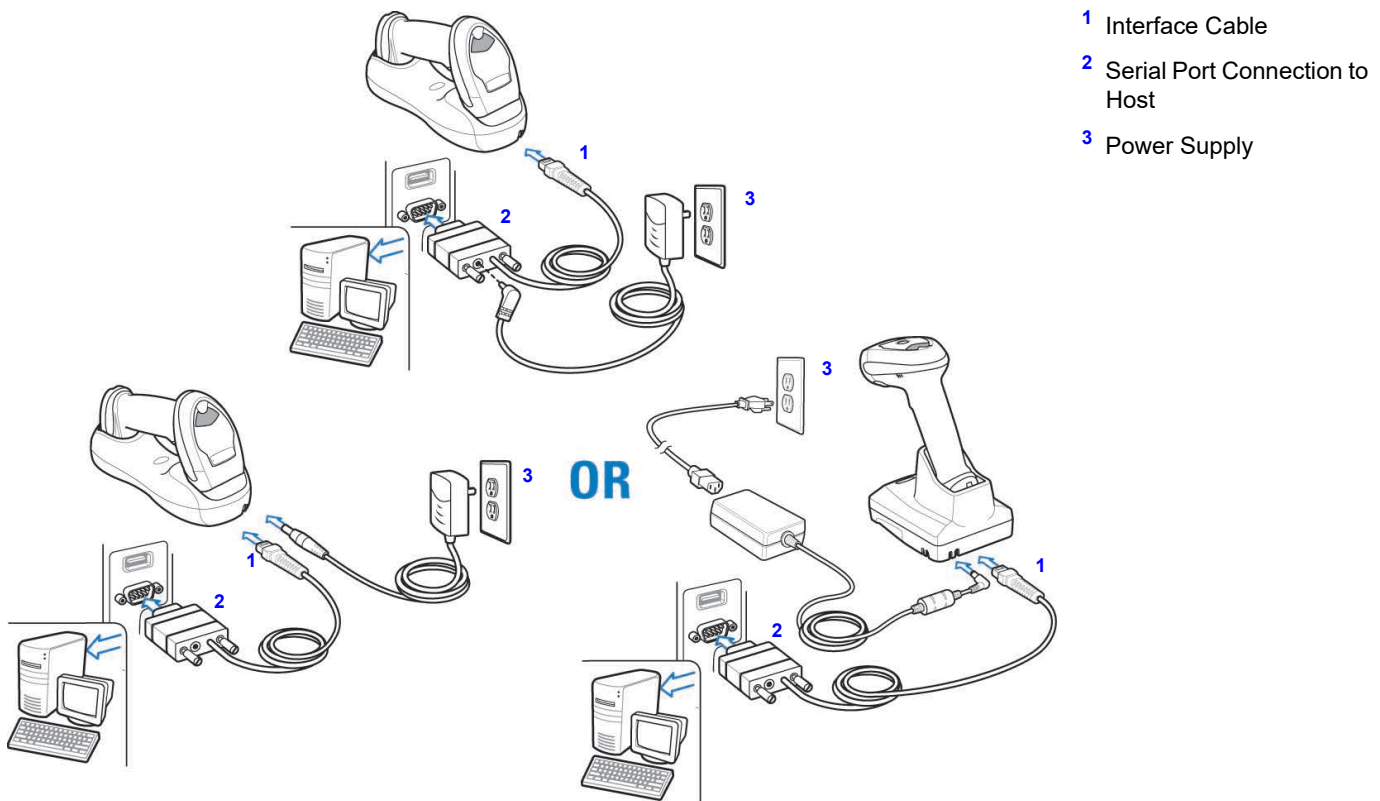


Figure 7-1 RS-232 Direct Connection

- ✓ **NOTE** For faster charging time, connect the power supply to the cradle.

To connect the RS-232 interface:

1. Attach the modular connector of the RS-232 interface cable to the host port on the bottom of the scanner cradle (see [Connecting the CR0078-S/CR0008-S Series Cradle on page 1-8](#) or [Connecting the CR0078-P Series Cradle on page 1-9](#)).
2. Connect the other end of the RS-232 interface cable to the serial port on the host.
3. Connect the power supply to the serial connector end of the RS-232 interface cable. Plug the power supply into an appropriate outlet.
4. Select the RS-232 host type by scanning the appropriate bar code from [RS-232 Host Types on page 7-6](#).
5. To modify any other parameter options, scan the appropriate bar codes in this chapter.

- ✓ **NOTE** Interface cables vary depending on configuration. The connectors illustrated in [Figure 7-1](#) are examples only. The connectors may be different than those illustrated, but the steps to connect the cradle remain the same.

If a power supply is used, disconnect the power supply before changing host cables or the cradle may not recognize the new host.

## RS-232 Parameter Defaults

[Table 7-1](#) lists the defaults for RS-232 host parameters. If any option needs to be changed, scan the appropriate bar code(s) provided in the Parameter Descriptions section beginning on [page 7-4](#).

✓ **NOTE** See [Appendix A, STANDARD DEFAULT PARAMETERS](#) for all user preferences, hosts, symbologies, and miscellaneous default parameters.

**Table 7-1** RS-232 Host Default Table

Parameter	Default	Page Number
<b>RS-232 Host Parameters</b>		
RS-232 Host Types	Standard	<a href="#">7-6</a>
Baud Rate	9600	<a href="#">7-8</a>
Parity Type	None	<a href="#">7-9</a>
Stop Bit Select	1 Stop Bit	<a href="#">7-9</a>
Data Bits (ASCII Format)	8-Bit	<a href="#">7-10</a>
Check Receive Errors	Enable	<a href="#">7-10</a>
Hardware Handshaking	None	<a href="#">7-12</a>
Software Handshaking	None	<a href="#">7-14</a>
Host Serial Response Time-out	2 sec	<a href="#">7-15</a>
RTS Line State	Low RTS	<a href="#">7-16</a>
Beep on <BEL>	Disable	<a href="#">7-16</a>
Intercharacter Delay	0 msec	<a href="#">7-17</a>
Nixdorf Beep/LED Options	Normal Operation	<a href="#">7-18</a>
Ignore Unknown Characters	Send Bar Code	<a href="#">7-18</a>

## RS-232 Host Parameters

Various RS-232 hosts are set up with their own parameter default settings ([Table 7-2](#)). Selecting the ICL, Fujitsu, Wincor-Nixdorf Mode A, Wincor-Nixdorf Mode B, Olivetti, Omron, or terminal sets the defaults listed below.

Table 7-2 Terminal Specific RS-232

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

**In the Nixdorf Mode B, if CTS is low, scanning is disabled. When CTS is high, scanning is enabled. If you scan Nixdorf Mode B without connecting the linear imager scanner to the proper host, it may appear unable to scan. If this happens, scan a different RS-232 host type within 5 seconds of cycling power to the linear imager scanner.**

**The CUTE host disables all parameter scanning, including Set Defaults. If you inadvertently select CUTE, scan *\*Enable Parameter Bar Code Scanning (01h)* on page 5-5, then change the host selection.**

## RS-232 Host Parameters (continued)

Selecting the ICL, Fujitsu, Wincor-Nixdorf Mode A, Wincor-Nixdorf Mode B, OPOS terminal enables the transmission of code ID characters listed in [Table 7-3](#) below. These code ID characters are not programmable and are separate from the Transmit Code ID feature. The Transmit Code ID feature should not be enabled 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	CUTE
UPC-A	A	A	A	A	A	A	A
UPC-E	E	E	C	C	C	E	None
EAN-8/JAN-8	FF	FF	B	B	B	FF	None
EAN-13/JAN-13	F	F	A	A	A	F	A
Code 39	C <len>	None	M	M	M <len>	C <len>	3
Code 39 Full ASCII	None	None	M	M	None	None	3
Codabar	N <len>	None	N	N	N <len>	N <len>	None
Code 128	L <len>	None	K	K	K <len>	L <len>	5
I 2 of 5	I <len>	None	I	I	I <len>	I <len>	1
Code 93	None	None	L	L	L <len>	None	None
D 2 of 5	H <len>	None	H	H	H <len>	H <len>	2
GS1-128	L <len>	None	P	P	P <len>	L <len>	5
MSI	None	None	O	O	O <len>	None	None
Bookland EAN	F	F	A	A	A	F	None
Trioptic	None	None	None	None	None	None	None
Code 11	None	None	None	None	None	None	None
IATA	H <len>	None	H	H	H <len>	H <len>	2
Code 32	None	None	None	None	None	None	None
GS1 Databar Variants	None	None	E	E	None	None	None

## RS-232 Host Types

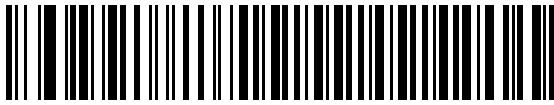
To select an RS-232 host interface, scan one of the following bar codes.



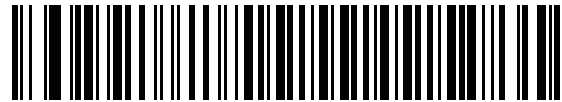
**\*Standard RS-232**



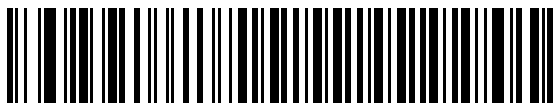
**ICL RS-232**



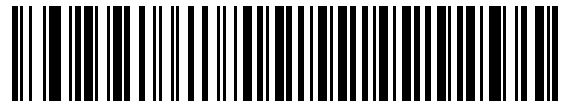
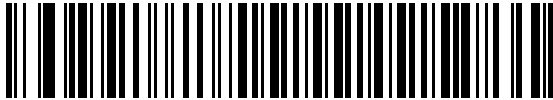
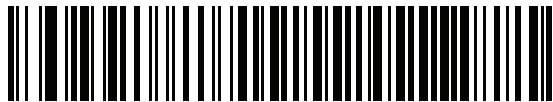
**Wincor-Nixdorf RS-232 Mode A**



**Wincor-Nixdorf RS-232 Mode B**



**Olivetti ORS4500**

**RS-232 Host Types (continued)****Omron****OPOS/JPOS****Fujitsu RS-232****CUTE**

**NOTE** The CUTE host disables all parameter scanning, including set defaults. If the CUTE parameter is inadvertently selected, scan *\*Enable Parameter Bar Code Scanning (01h) on page 5-5*, then change the host selection.

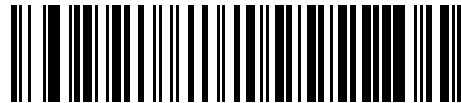
## Baud Rate

Baud rate is the number of bits of data transmitted per second. Set the linear imager scanner'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.

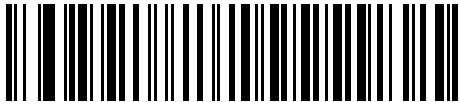
✓ **NOTE** Baud rates above 38,400 are not supported on the CR0078-S cradle. Scanning these bar codes result in Baud 9600.



**\*Baud Rate 9600**



**Baud Rate 19,200**



**Baud Rate 38,400**



**Baud Rate 57,600**



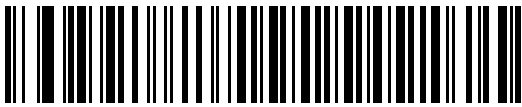
**Baud Rate 115,200**



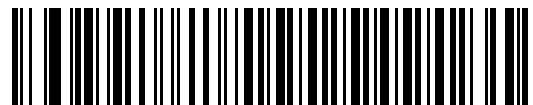
## Parity

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

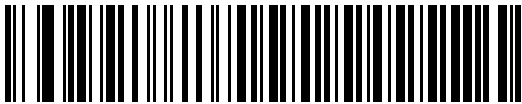
- Select **Odd** parity and the parity bit value is set to 0 or 1, based on data, to ensure that an odd number of 1 bits are contained in the coded character.
- Select **Even** parity and the parity bit value is set to 0 or 1, based on data, to ensure that an even number of 1 bits are contained in the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



Odd



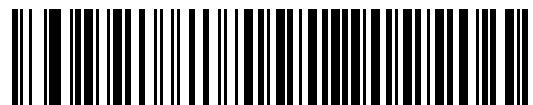
Even



\*None

## Stop Bit Select

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



\*1 Stop Bit



2 Stop Bits

### Data Bits (ASCII Format)

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



**7-Bit**



**\*8-Bit**

### Check Receive Errors

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



**\*Check For Received Errors  
(Enable)**



**Do Not Check For Received Errors  
(Disable)**

## Hardware Handshaking

The data interface consists of an RS-232 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 is transmitted as it becomes available. If Standard RTS/CTS handshaking is selected, scan data is transmitted according to the following sequence:

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

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

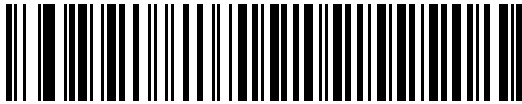
If the above communication sequence fails, the linear imager scanner issues an error indication. In this case, the data is lost and must be rescanned.

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

✓ **NOTE** The DTR signal is jumpered to the active state.

## Hardware Handshaking (continued)

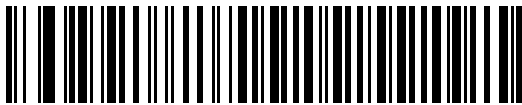
- **None:** Scan the bar code below if no Hardware Handshaking is desired.
- **Standard RTS/CTS:** Scan the bar code below to select Standard RTS/CTS Hardware Handshaking.
- **RTS/CTS Option 1:** When RTS/CTS Option 1 is selected, the linear imager scanner asserts RTS before transmitting and ignores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



**\*None**



**Standard RTS/CTS**



**RTS/CTS Option 1**



**RTS/CTS Option 2**



**RTS/CTS Option 3**

## Software Handshaking

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

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

- **None:** When this option is selected, data is transmitted immediately. No response is expected from host.
- **ACK/NAK:** When this option is selected, after transmitting data, the linear imager scanner expects either an ACK or NAK response from the host. When a NAK is received, the linear imager scanner 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 linear imager scanner issues an error indication and discards the data.

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

- **ENQ:** When this option is selected, the linear imager scanner waits for an ENQ character from the host before transmitting data. If an ENQ is not received within the Host Serial Response Time-out, the linear imager scanner 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 linear imager scanner transmission off until the linear imager scanner receives an XON character. There are two situations for XON/XOFF:
  - XOFF is received before the linear imager scanner has data to send. When the linear imager scanner has data to send, it waits up to Host Serial Response Time-out for an XON character before transmission. If the XON is not received within this time, the linear imager scanner issues an error indication and discards the data.
  - XOFF is received during a transmission. Data transmission then stops after sending the current byte. When the linear imager scanner receives an XON character, it sends the rest of the data message. The linear imager scanner waits up to 30 seconds for the XON.

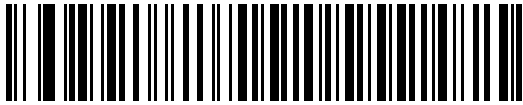
### Software Handshaking (continued)



**\*None**



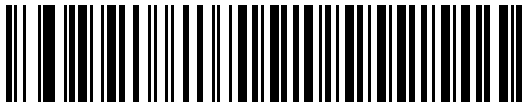
**ACK/NAK**



**ENQ**



**ACK/NAK with ENQ**



**XON/XOFF**

## Host Serial Response Time-out

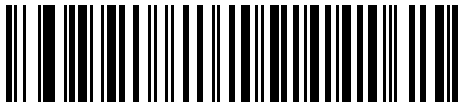
This parameter specifies how long the linear imager scanner waits for an ACK, NAK, ENQ, XON, or CTS before determining that a transmission error occurred.



**\*Minimum: 2 sec**



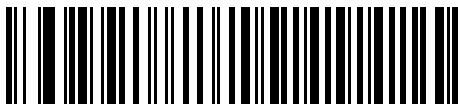
**Low: 2.5 sec**



**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**



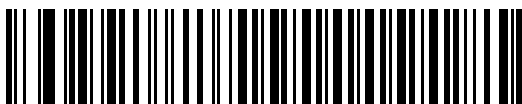
**Host: High RTS**

## Beep on <BEL>

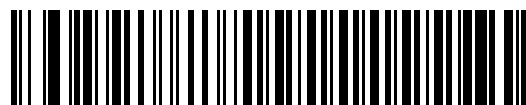
### Point-to-Point Mode Only

When this parameter is enabled, the linear imager scanner issues a beep when a <BEL> character is detected on the RS-232 serial line. <BEL> is issued to gain a user's attention to an illegal entry or other important event.

✓ *NOTE* This parameter is not supported in Multipoint-to-Point mode.



**Beep On <BEL> Character  
(Enable)**



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



## Intercharacter Delay

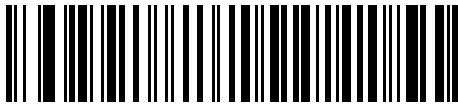
This parameter specifies the intercharacter delay inserted between character transmissions.



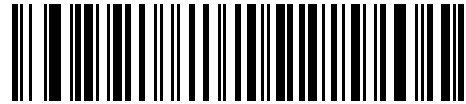
**\*Minimum: 0 msec**



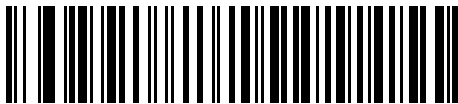
**Low: 25 msec**



**Medium: 50 msec**



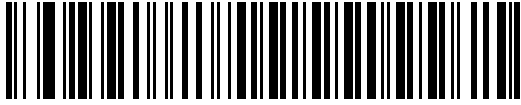
**High: 75 msec**



**Maximum: 99 msec**

## Nixdorf Beep/LED Options

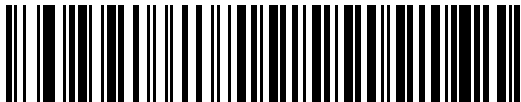
When Nixdorf Mode B is selected, this indicates when the linear imager scanner should beep and turn on its LED after a decode.



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



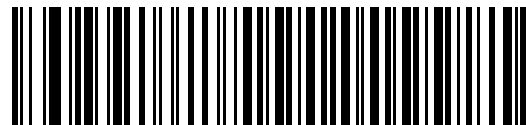
**Beep/LED After Transmission**



**Beep/LED After CTS Pulse**

## Ignore Unknown Characters

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



**\*Send Bar Code with Unknown Characters**



**Do Not Send Bar Codes with Unknown Characters**

## ASCII Character Set for RS-232

The values in [Table 7-4](#) can be assigned as prefixes or suffixes for ASCII character data transmission.

**Table 7-4** ASCII Character Set for RS-232

ASCII 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
1027	%A	ESC

**Table 7-4** ASCII Character Set for RS-232 (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	ASCII Character
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
1057	7	7
1056	8	8
1057	9	9
1058	/Z	:

Table 7-4 ASCII Character Set for RS-232 (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	ASCII Character
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
1087	W	W
1088	X	X
1089	Y	Y

**Table 7-4** ASCII Character Set for RS-232 (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	ASCII Character
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
1117	+U	u
1118	+V	v
1119	+W	w
1120	+X	x

**Table 7-4** ASCII Character Set for RS-232 (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	ASCII Character
1121	+Y	y
1122	+Z	z
1123	%P	{
1124	%Q	
1125	%R	}
1126	%S	~
1127		Undefined
7013		ENTER





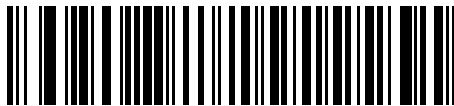
# CHAPTER 8 USB INTERFACE

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## Introduction

This chapter provides instructions for programming the cradle to interface with a USB host. The linear imager scanner cradle connects directly to a USB host, or a powered USB hub. The USB host can power the cradle and recharge the linear imager scanner battery, but this charging method has limitations. See [Supplying Power to the CR0078-S/CR0008-S Cradle on page 1-8](#).

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



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

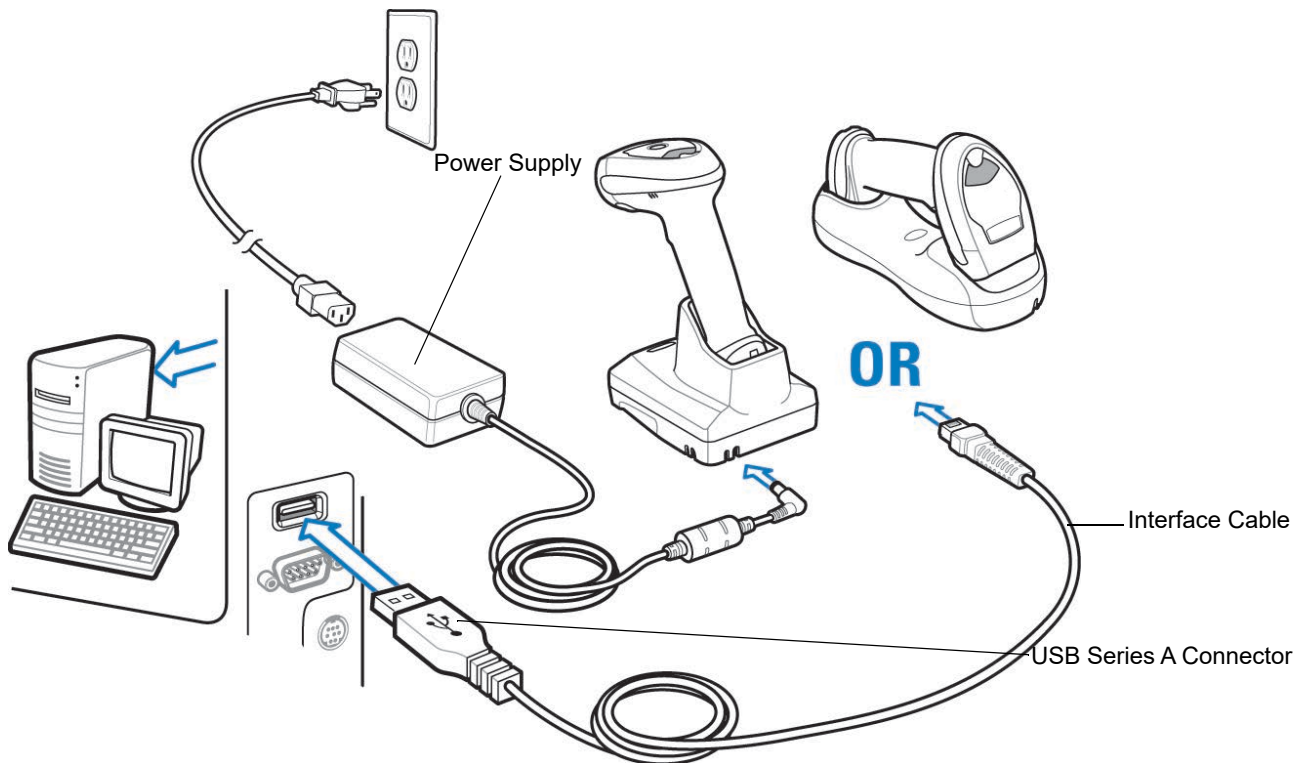


**NOTE** The CR0078-S cradle has the ability to be powered by the USB port instead of an external power supply. The CR0078-P can only receive power via an external power supply.

## Connecting a USB Interface

- ✓ **NOTE** See [Chapter 4, RADIO COMMUNICATIONS](#) for information about linear imager scanner/cradle pairing and wireless communication

The linear imager scanner must be connected to the cradle for the host parameter setting to take effect. When the linear imager scanner is not connected to a cradle, and a host parameter bar code is scanned, a long low/long high beep sequence sounds.



**Figure 8-1** USB Connection

The linear imager scanner cradle connects with USB capable hosts including:

- Desktop PCs and Notebooks
- Apple™ iMac, G4, iBooks (North America only)
- IBM SurePOS terminals
- Sun, IBM, and other network computers that support more than one keyboard.

The following operating systems support the linear imager scanner cradle through USB:

- Windows 98, 2000, ME, XP
- MacOS 8.5 and above
- IBM 4690 OS.

The linear imager scanner cradle also interfaces with other USB hosts which support USB Human Interface Devices (HID).

To connect the USB interface:

1. Attach the modular connector of the USB interface cable to the host port on the bottom of the linear imager scanner cradle (see [Connecting the CR0078-S/CR0008-S Series Cradle on page 1-8](#) or [Connecting the CR0078-P Series Cradle on page 1-9](#)).
2. Plug the series A connector in the USB host or hub, or plug the Plus Power connector in an available port of the IBM SurePOS terminal.
3. Select the USB device type by scanning the appropriate bar code from [USB Device Type on page 8-5](#).
4. On first installation when using Windows, the software prompts to select or install the Human Interface Device driver. To install this driver, provided by Windows, click *Next* through all the choices and click *Finished* on the last choice. The cradle powers up during this installation.
5. To modify any other parameter options, scan the appropriate bar codes in this chapter.

✓ **NOTE** Interface cables vary depending on configuration. The connectors illustrated in [Figure 8-1](#) are examples only. The connectors may be different than those illustrated, but the steps to connect the linear imager scanner cradle remain the same. Ensure you use the matching cable for the appropriate cradle.

If problems occur with the system, see [Troubleshooting on page 3-4](#).

## USB Parameter Defaults

*Table 8-1* lists the defaults for USB host parameters. If any option needs to be changed, scan the appropriate bar code(s) provided in the Parameter Descriptions section beginning on [page 8-5](#).

✓ **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
<b>USB Host Parameters</b>		
USB Device Type	USB HID Keyboard	<a href="#">8-5</a>
Symbol Native API (SNAPI) Status Handshaking	Enable	<a href="#">8-6</a>
USB Country Keyboard Types (Country Codes)	North American Standard USB Keyboard	<a href="#">8-7</a>
USB Keystroke Delay	No Delay	<a href="#">8-9</a>
USB CAPS Lock Override	Disable	<a href="#">8-9</a>
USB Ignore Unknown Characters	Send	<a href="#">8-10</a>
USB Convert Unknown to Code 39	Disable	<a href="#">8-10</a>
Emulate Keypad	Disable	<a href="#">8-11</a>
Emulate Keypad with Leading Zero	Disable	<a href="#">8-11</a>
Quick Keypad Emulation	Disable	<a href="#">8-12</a>
USB FN1 Substitution	Disable	<a href="#">8-12</a>
Function Key Mapping	Disable	<a href="#">8-13</a>
Simulated Caps Lock	Disable	<a href="#">8-13</a>
Convert Case	No Case Conversion	<a href="#">8-14</a>
USB Static CDC	Enable	<a href="#">8-14</a>
Ignore Beep	Disable	<a href="#">8-15</a>
Ignore Bar Code Configuration	Disable	<a href="#">8-15</a>
USB Polling Interval	8 msec	<a href="#">8-17</a>
USB Fast HID	Enable	<a href="#">8-18</a>

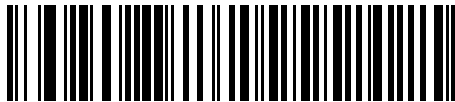
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## USB Host Parameters

### USB Device Type

Select the desired USB device type.

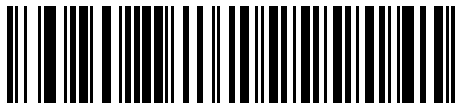
- ✓ **NOTES**
1. When changing USB Device Types, the cradle automatically restarts. The linear imager scanner issues a disconnect-reconnect beep sequence.
  2. The USB CDC host selection is only supported when the scanner is paired with the CR0078-P (presentation), and CR0078-S (standard) cradles.
  3. Select **IBM Hand-Held USB** to disable data transmission when an IBM register issues a Scan Disable command. Aim, illumination, and decoding is still permitted. Select **OPOS (IBM Hand-held with Full Disable)** to completely shut off the scanner when an IBM register issues a Scan Disable command, including aim, illumination, decoding, and data transmission.



**\*USB HID Keyboard**



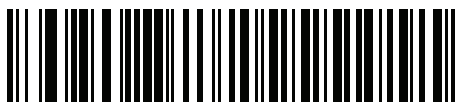
**IBM Table Top USB**



**IBM Hand-Held USB**



**OPOS  
(IBM Hand-held with Full Disable)**



**Simple COM Port Emulation**

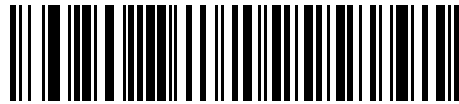
## USB Device Type (continued)



USB CDC Host



Symbol Native API (SNAPI) without Imaging Interface



SSI over USB CDC

## Symbol Native API (SNAPI) Status Handshaking

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

✓ *NOTE* The CR0078-P cradle is required for SNAPI.



\*Enable SNAPI Status Handshaking



Disable SNAPI Status Handshaking

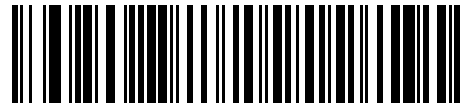
## USB Country Keyboard Types (Country Codes)

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

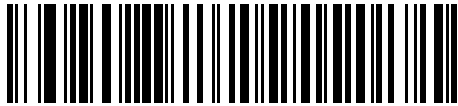
✓ **NOTE** When changing USB country keyboard types the linear imager scanner automatically resets. The linear imager scanner issues the standard startup beep sequences.



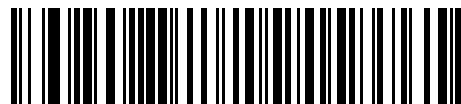
**\*North American Standard USB Keyboard**



**German Windows**



**French Windows**



**French Canadian Windows 95/98**



**French Canadian Windows 2000/XP**

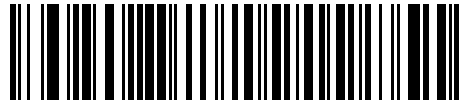


**French International**

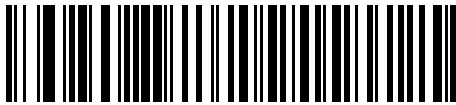
## USB Country Keyboard Types (Country Codes) (continued)



**Spanish Windows**



**Italian Windows**



**Swedish Windows**



**UK English Windows**



**Japanese Windows (ASCII)**



**Portuguese-Brazilian Windows**

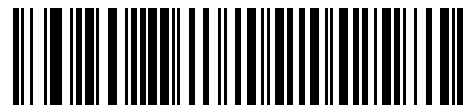


## USB Keystroke Delay

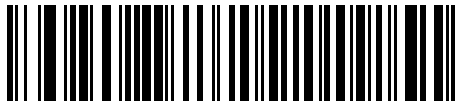
This parameter sets the delay, in milliseconds, between emulated keystrokes. Scan a bar code below to increase the delay when hosts require a slower transmission of data.



**\*No Delay**



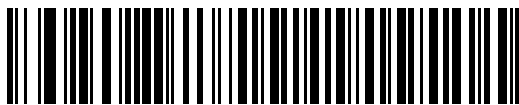
**Medium Delay (20 msec)**



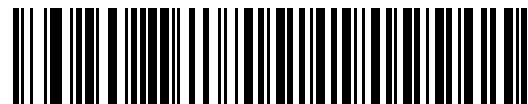
**Long Delay (40 msec)**

## USB CAPS Lock Override

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



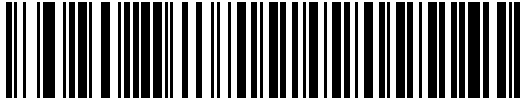
**Override Caps Lock Key  
(Enable)**



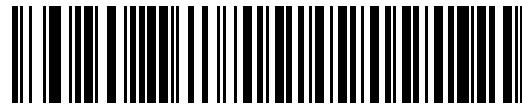
**\*Do Not Override Caps Lock Key  
(Disable)**

## USB Ignore Unknown Characters

This option applies only to the USB HID Keyboard device and IBM device. Unknown characters are characters the host does not recognize. When **Send Bar Codes With Unknown Characters** is selected, all bar code data is sent except for unknown characters, and no error beeps sound. When **Do Not Send Bar Codes With Unknown Characters** is selected, bar code data is sent up to the first unknown character, then the linear imager scanner issues an error beep.



**\*Send Bar Codes with Unknown Characters**



**Do Not Send Bar Codes with Unknown Characters**

## USB Convert Unknown to Code 39

This option applies only to the IBM Handheld, IBM Tabletop, and OPOS devices. Scan a bar code below to enable or disable converting unknown bar code type data to Code 39.



**\*Disable Convert Unknown to Code 39**



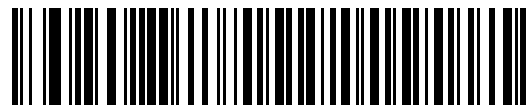
**Enable Convert Unknown to Code 39**

## Emulate Keypad

When enabled, all characters are sent as ASCII sequences over the numeric keypad. For example ASCII A would be sent as "ALT make" 0 6 5 "ALT Break."



**\*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 transmits as "ALT MAKE" 0 0 6 5 "ALT BREAK".



**\*Disable Keypad Emulation with Leading Zero**



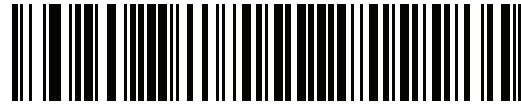
**Enable Keypad Emulation with Leading Zero**

## Quick Keypad Emulation

This option applies only to the USB HID Keyboard Device and if Emulate Keypad is enabled. This parameter enables a quicker method of keypad emulation where ASCII sequences are only sent for ASCII characters not found on the keyboard. The default value is **Disable**.



**Enable**



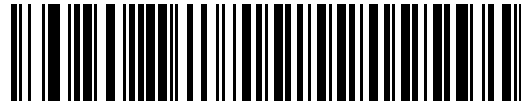
**\*Disable**

## USB Keyboard FN 1 Substitution

This option applies only to the USB HID Keyboard device. When enabled, this allows replacement of any FN 1 characters in an EAN 128 bar code with a Key Category and value chosen by the user (see [FN1 Substitution Values on page 5-21](#) to set the Key Category and Key Value).



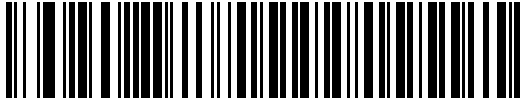
**Enable FN1 Substitution**



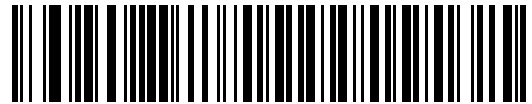
**\*Disable FN1 Substitution**

## Function Key Mapping

ASCII values under 32 are normally sent as a control-key sequences (see [Table 8-2 on page 8-19](#)). When this parameter is enabled, the keys in bold are sent in place of the standard key mapping. Table entries that do not have a bold entry remain the same whether or not this parameter is enabled.



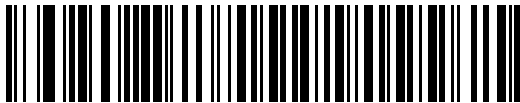
**\*Disable Function Key Mapping**



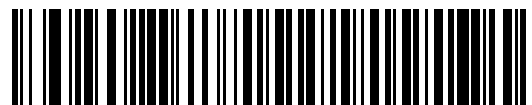
**Enable Function Key Mapping**

## Simulated Caps Lock

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



**\*Disable Simulated Caps Lock**



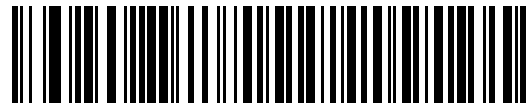
**Enable Simulated Caps Lock**

## Convert Case

When enabled, the linear imager scanner converts all bar code data to the selected case.



**\*No Case Conversion**



**Convert All to Upper Case**



**Convert All to Lower Case**

## USB Static CDC

### Parameter # 670

When disabled, each device connected consumes another COM port (first device = COM1, second device = COM2, third device = COM3, etc.)

When enabled, each device connects to the same COM port.



**\*Enable USB Static CDC  
(1)**



**Disable USB Static CDC  
(0)**

---

## Optional USB Parameters

If you configure the linear imager scanner and find the settings were not saved, or changed, when the system is restarted scan the bar codes that follow to override USB interface defaults.

Scan a bar code below after setting defaults and before configuring the linear imager scanner.

### Ignore Beep

The host can send a beep request to the linear imager scanner. When this parameter is enabled, the request is not sent to the attached linear imager scanner. All directives are still acknowledged to the USB host as if it were processed.



**\*Disable**



**Enable**

### Ignore Bar Code Configuration

The host has the ability to enable/disable code types. When this parameter is enabled, the request is not sent to the attached linear imager scanner. All directives are still acknowledged to the USB host as if it were processed.



**\*Disable**



**Enable**

## USB Polling Interval

Scan a bar code below to set the polling interval. The polling interval determines the rate at which data can be sent between the scanner and host computer. A lower number indicates a faster data rate.



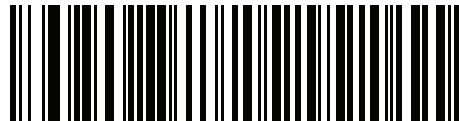
**NOTE** When changing USB Device Types, the cradle automatically restarts. The linear imager scanner issues a disconnect-reconnect beep sequence.



**IMPORTANT** Ensure your host machine can handle the selected data rate.



1 msec



2 msec



3 msec



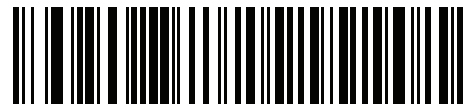
4 msec



### USB Polling Interval (continued)



5 msec



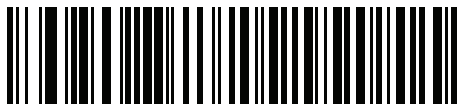
6 msec



7 msec



\*8 msec

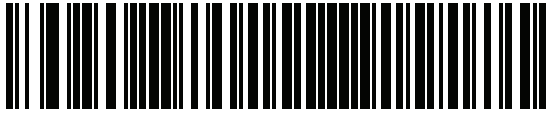


9 msec

## USB Fast HID

This option transmits USB HID keyboard data at a faster rate.

✓ *NOTE* Quick Keypad Emulation (on page [8-12](#)) overrides **USB Fast HID**.



**\*Enable**



**Disable**

## ASCII Character Set for USB

Table 8-2 ASCII Character Set for USB

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

<sup>1</sup>The keystroke in bold is sent only if the “Function Key Mapping” is enabled. Otherwise, the non-bold keystroke is sent.

Table 8-2 ASCII Character Set for USB (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
1025	\$Y	CTRL Y
1026	\$Z	CTRL Z
1027	%A	CTRL <b>[</b> /ESC <sup>1</sup>
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

<sup>1</sup>The keystroke in bold is sent only if the “Function Key Mapping” is enabled. Otherwise, the non-bold keystroke is sent.

Table 8-2 ASCII Character Set for USB (Continued)

ASCII 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
1081	Q	Q

<sup>1</sup>The keystroke in bold is sent only if the “Function Key Mapping” is enabled. Otherwise, the non-bold keystroke is sent.

Table 8-2 ASCII Character Set for USB (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
1082	R	R
1083	S	S
1084	T	T
1085	U	U
1086	V	V
1087	W	W
1088	X	X
1089	Y	Y
1090	Z	Z
1091	%K	[
1092	%L	\
1093	%M	]
1094	%N	^
1095	%O	_
1096	%W	`
1097	+A	<b>a</b>
1098	+B	<b>b</b>
1099	+C	<b>c</b>
1100	+D	<b>d</b>
1101	+E	<b>e</b>
1102	+F	<b>f</b>
1103	+G	<b>g</b>
1104	+H	<b>h</b>
1105	+I	<b>i</b>
1106	+J	<b>j</b>
1107	+K	<b>k</b>
1108	+L	<b>l</b>
1109	+M	<b>m</b>
1110	+N	<b>n</b>

<sup>1</sup>The keystroke in bold is sent only if the “Function Key Mapping” is enabled. Otherwise, the non-bold keystroke is sent.

Table 8-2 ASCII Character Set for USB (Continued)

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

<sup>1</sup>The keystroke in bold is sent only if the “Function Key Mapping” is enabled. Otherwise, the non-bold keystroke is sent.

**Table 8-3** *USB ALT Key Character Set*

<b>ALT Keys</b>	<b>Keystroke</b>
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 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
3054	GUI 6
3055	GUI 7
3056	GUI 8
3057	GUI 9
3065	GUI A
3066	GUI B
3067	GUI C
3068	GUI D
3069	GUI E
3070	GUI F
3071	GUI G
3072	GUI H
3073	GUI I
3074	GUI J
3075	GUI K
3076	GUI L
3077	GUI M
3078	GUI N
3079	GUI O
3080	GUI P
3081	GUI Q

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

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

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

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

**Table 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

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

F Keys	Keystroke
5018	F18
5019	F19
5020	F20
5021	F21
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*

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

# CHAPTER 9 IBM INTERFACE

---

## Introduction

This chapter provides instructions for programming the cradle to interface with an IBM 468X/469X host computer.

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



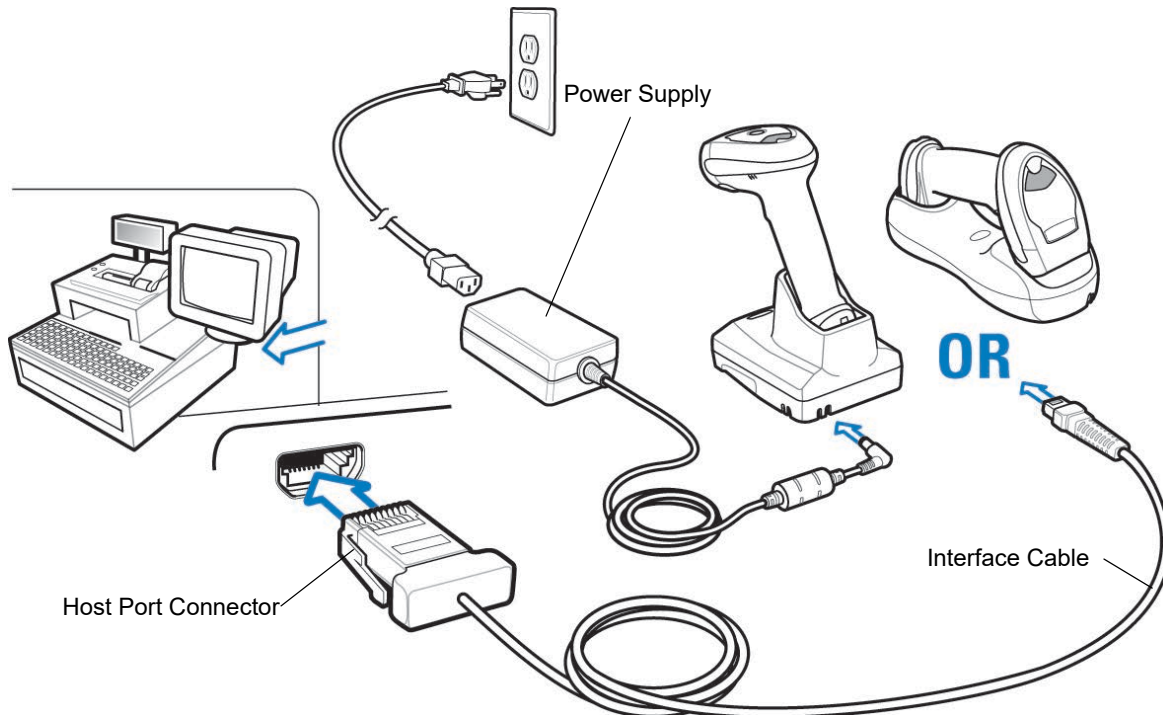
\*Indicates Default — \***Disable Convert Unknown to Code 39** — Feature/Option

## Connecting to an IBM 468X/469X Host

- ✓ **NOTE** See [Chapter 4, RADIO COMMUNICATIONS](#) for information about linear imager scanner/cradle pairing and wireless communication

The linear imager scanner must be connected to the cradle for the host parameter setting to take effect. When the linear imager scanner is not connected to a cradle, and a host parameter bar code is scanned, a long low/long high beep sequence sounds.

This connection is made directly from the cradle to the host interface.



**Figure 9-1** IBM Direct Connection

To connect the IBM 46XX interface:

1. Attach the modular connector of the IBM 46XX interface cable to the host port on the bottom of the linear imager scanner cradle (see [Connecting the Cables to the CR0078-S/CR0008-S Cradle on page 1-8](#) or [Connecting the Cables to the CR0078-P Cradle on page 1-9](#)).
2. Connect the other end of the IBM 46XX interface cable to the appropriate port on the host (typically Port 9).
3. Select the port address by scanning the appropriate bar code from [Port Address on page 9-4](#).
4. To modify any other parameter options, scan the appropriate bar codes in this chapter.

- ✓ **NOTE** Interface cables vary depending on configuration. The connectors illustrated in [Figure 9-1](#) are examples only. The connectors may be different than those illustrated, but the steps to connect the cradle remain the same.

If a power supply is used, disconnect the power supply before changing host cables or the cradle may not recognize the new host.

The only required configuration is the port number. Other linear imager scanner parameters are typically controlled by the IBM system.

## IBM Parameter Defaults

[Table 9-1](#) lists the defaults for IBM host parameters. To change any option, scan the appropriate bar code(s) provided in the Parameter Descriptions section beginning on [page 9-4](#).



**NOTE** See [Appendix A, STANDARD DEFAULT PARAMETERS](#) for all user preferences, hosts, symbologies, and miscellaneous default parameters.

**Table 9-1** *IBM Host Default Table*

Parameter	Default	Page Number
<b>IBM 468X/469X Host Parameters</b>		
Port Address	None Selected	<a href="#">9-4</a>
Convert Unknown to Code 39	Disable	<a href="#">9-5</a>
Ignore Beep	Disable	<a href="#">9-5</a>
Ignore Bar Code Configuration	Disable	<a href="#">9-6</a>

---

## IBM 468X/469X Host Parameters

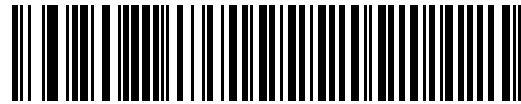
### Port Address

This parameter sets the IBM 468X/469X port used.

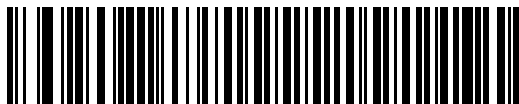
✓ **NOTE** Scanning one of these bar codes enables the RS-485 interface on the linear imager scanner.



**\*None Selected**



**Hand-held Scanner Emulation (Port 9B)<sup>1</sup>**



**Non-IBM Scanner Emulation (Port 5B)**



**Table-top Scanner Emulation (Port 17)**

✓ **NOTE** <sup>1</sup>User selection is required to configure this interface and this is the most common selection.

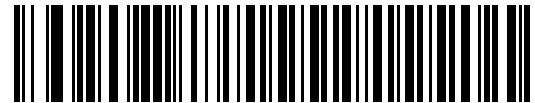


## Convert Unknown to Code 39

Scan a bar code below to enable or disable the conversion of unknown bar code type data to Code 39.



**Enable Convert Unknown to Code 39**



**\*Disable Convert Unknown to Code 39**

---

## Optional IBM Parameters

If you configure the linear imager scanner and find the settings were not saved, or changed, when the system is restarted scan the bar codes that follow to override IBM interface defaults.

Scan a bar code below after setting defaults and before configuring the linear imager scanner.

### Ignore Beep

The host can send a beep request to the linear imager scanner. When this parameter is enabled, the request is not sent to the attached linear imager scanner. All directives are still acknowledged to the IBM RS485 host as if it were processed.



**\*Disable**



**Enable**

## Ignore Bar Code Configuration

The host has the ability to enable/disable code types. When this parameter is enabled, the request is not sent to the attached linear imager scanner. All directives are still acknowledged to the IBM RS485 host as if it were processed.



**\*Disable**



**Enable**

# CHAPTER 10 123SCAN2

---

## Introduction

123Scan is an easy-to-use, PC-based software tool that enables rapid and easy customized setup of Zebra scanners.

123Scan uses a wizard tool to guide users through a streamlined set up process. Settings are saved in a configuration file that can be distributed via e-mail, electronically downloaded via a USB cable, or used to generate a sheet of scannable programming bar codes.

Additionally 123Scan can upgrade scanner firmware, check online to enable support for newly released products, generate a collection of multi-setting bar codes if the number of settings is very large, stage large number of scanners simultaneously, generate reports with asset tracking information and create custom products.

---

## Communication with 123Scan

To communicate with the 123Scan program which runs on a host computer running a Windows XP SP2 and Windows 7 operating system, use a USB cable to connect the scanner cradle to the host computer (see [USB Connection on page 8-2](#)).

---

## 123Scan Requirements

- Host computer with Windows XP SP2 or Windows 7
- Scanner
- Cradle (cordless scanning only)
- USB cable.

For more information about 123Scan, go to:  
[zebra.com/123scan](http://zebra.com/123scan)

---

## Scanner SDK, Other Software Tools, and Videos

Tackle all your scanner programming needs with our diversified set of software tools. Whether you need to simply stage a device, or develop a fully featured application with image and data capture as well as asset management, these tools help you every step of the way. To download any of the free tools listed below, go to: [zebra.com/software](http://zebra.com/software).

- 123Scan Configuration Utility (described in this chapter)
- Scanner SDK for Windows
- How-to-Videos
- Virtual Com Port Driver
- OPOS Driver
- JPOS Driver
- Scanner User Documentation
- Archive of Older Drivers.

# CHAPTER 11 SYMBOLOGIES

---

## Introduction

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

To set feature values, scan a single bar code or a short bar code sequence. The settings are stored in non-volatile memory and are preserved even when the linear imager scanner powers down.

✓ **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 do not merge.

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

To return all features to default values, scan the [Default Parameters on page 5-4](#). Throughout the programming bar code menus, asterisks (\*) indicate default values.



\*Indicates Default — \*Enable UPC-A — Feature/Option  
(01h) — Option Hex Value

---

## 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 11-14](#). The linear imager scanner 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 11-1](#) lists the defaults for all symbologies parameters. 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 [Default Parameters on page 5-4](#).

✓ **NOTE** See [Appendix A, STANDARD DEFAULT PARAMETERS](#) for all user preferences, hosts, and miscellaneous default parameters.

In this guide, the parameter numbers listed are the same as the attribute numbers for these parameters.

**Table 11-1** *Parameter Defaults*

Parameter	Parameter Number	Default	Page Number
<b>UPC/EAN</b>			
UPC-A	1	Enable	<a href="#">11-6</a>
UPC-E	2	Enable	<a href="#">11-6</a>
UPC-E1	12	Disable	<a href="#">11-7</a>
EAN-8/JAN 8	4	Enable	<a href="#">11-7</a>
EAN-13/JAN 13	3	Enable	<a href="#">11-8</a>
Bookland EAN	83	Disable	<a href="#">11-8</a>
Decode UPC/EAN/JAN Supplementals (2 and 5 digits)	16	Ignore	<a href="#">11-10</a>
User-Programmable Supplementals		000 (zeroes)	<a href="#">11-12</a>
Supplemental 1:	579		
Supplemental 2:	580		
UPC/EAN/JAN Supplemental Redundancy	80	10	<a href="#">11-12</a>
UPC/EAN/JAN Supplemental AIM ID Format	672	Combined	<a href="#">11-13</a>
Transmit UPC-A Check Digit	40	Enable	<a href="#">11-14</a>
Transmit UPC-E Check Digit	41	Enable	<a href="#">11-14</a>
Transmit UPC-E1 Check Digit	42	Enable	<a href="#">11-15</a>
UPC-A Preamble	34	System Character	<a href="#">11-16</a>
UPC-E Preamble	35	System Character	<a href="#">11-17</a>
UPC-E1 Preamble	36	System Character	<a href="#">11-18</a>
Convert UPC-E to A	37	Disable	<a href="#">11-19</a>

Table 11-1 Parameter Defaults (Continued)

Parameter	Parameter Number	Default	Page Number
Convert UPC-E1 to A	38	Disable	11-19
EAN-8/JAN-8 Extend	39	Disable	11-20
Bookland ISBN Format	576	ISBN-10	11-20
UCC Coupon Extended Code	85	Disable	11-21
Coupon Report	730	New Coupon Format	11-21
ISSN EAN	617	Disable	11-22
<b>Code 128</b>			
Code 128	8	Enable	11-23
Set Length(s) for Code 128	209, 210	Any Length	11-24
GS1-128 (formerly UCC/EAN-128)	14	Enable	11-25
ISBT 128	84	Enable	11-25
ISBT Concatenation	577	Disable	11-26
Check ISBT Table	578	Enable	11-27
ISBT Concatenation Redundancy	223	10	11-27
<b>Code 39</b>			
Code 39	0	Enable	11-28
Trioptic Code 39	13	Disable	11-28
Convert Code 39 to Code 32 (Italian Pharmacy Code)	86	Disable	11-29
Code 32 Prefix	231	Disable	11-29
Set Length(s) for Code 39	18, 19	2 to 55	11-30
Code 39 Check Digit Verification	48	Disable	11-31
Transmit Code 39 Check Digit	43	Disable	11-31
Code 39 Full ASCII Conversion	17	Disable	11-32
Buffer Code 39	113	Disable	11-33
<b>Code 93</b>			
Code 93	9	Disable	11-35
Set Length(s) for Code 93	26, 27	4 to 55	11-35
<b>Code 11</b>			
Code 11	10	Disable	11-37
Set Lengths for Code 11	28, 29	4 to 55	11-37

Table 11-1 Parameter Defaults (Continued)

Parameter	Parameter Number	Default	Page Number
Code 11 Check Digit Verification	52	Disable	<a href="#">11-39</a>
Transmit Code 11 Check Digit(s)	47	Disable	<a href="#">11-40</a>
<b>Interleaved 2 of 5 (ITF)</b>			
Interleaved 2 of 5 (ITF)	6	Disable	<a href="#">11-41</a>
Set Lengths for I 2 of 5	22, 23	14	<a href="#">11-41</a>
I 2 of 5 Check Digit Verification	49	Disable	<a href="#">11-43</a>
Transmit I 2 of 5 Check Digit	44	Disable	<a href="#">11-43</a>
Convert I 2 of 5 to EAN 13	82	Disable	<a href="#">11-44</a>
<b>Discrete 2 of 5 (DTF)</b>			
Discrete 2 of 5	5	Disable	<a href="#">11-45</a>
Set Length(s) for D 2 of 5	20, 21	12	<a href="#">11-45</a>
<b>Codabar (NW - 7)</b>			
Codabar	7	Disable	<a href="#">11-47</a>
Set Lengths for Codabar	24, 25	5 to 55	<a href="#">11-47</a>
CLSI Editing	54	Disable	<a href="#">11-49</a>
NOTIS Editing	55	Disable	<a href="#">11-49</a>
Codabar Upper or Lower Case Start/Stop Characters Detection	855	Upper Case	<a href="#">11-50</a>
<b>MSI</b>			
MSI	11	Disable	<a href="#">11-51</a>
Set Length(s) for MSI	30, 31	4 to 55	<a href="#">11-51</a>
MSI Check Digits	50	One	<a href="#">11-53</a>
Transmit MSI Check Digit	46	Disable	<a href="#">11-53</a>
MSI Check Digit Algorithm	51	Mod 10/Mod 10	<a href="#">11-54</a>
<b>Chinese 2 of 5</b>			
Chinese 2 of 5	408	Disable	<a href="#">11-55</a>
<b>Matrix 2 of 5</b>			
Matrix 2 of 5	618	Disable	<a href="#">11-56</a>
Matrix 2 of 5 Lengths	619, 620	14 (One Discrete Length)	<a href="#">11-57</a>
Matrix 2 of 5 Check Digit	622	Disable	<a href="#">11-58</a>



**Table 11-1** *Parameter Defaults (Continued)*

<b>Parameter</b>	<b>Parameter Number</b>	<b>Default</b>	<b>Page Number</b>
Transmit Matrix 2 of 5 Check Digit	623	Disable	<a href="#">11-58</a>
<b>Korean 3 of 5</b>			
Korean 3 of 5	581	Disable	<a href="#">11-59</a>
<b>Inverse 1D</b>			
Inverse 1D	586	Regular	<a href="#">11-60</a>
<b>GS1 DataBar</b>			
GS1 DataBar-14	338	Enable	<a href="#">11-61</a>
GS1 DataBar Limited	339	Disable	<a href="#">11-61</a>
GS1 DataBar Expanded	340	Enable	<a href="#">11-62</a>
GS1 DataBar Limited Security Level	728	Level 3	<a href="#">11-63</a>
Convert GS1 DataBar to UPC/EAN	397	Disable	<a href="#">11-64</a>
<b>Symbology-Specific Security Levels</b>			
Redundancy Level	78	1	<a href="#">11-66</a>
Security Level	77	1	<a href="#">11-67</a>
Intercharacter Gap Size	381	Normal	<a href="#">11-68</a>

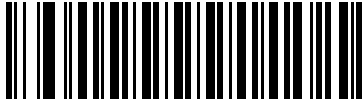
---

## UPC/EAN

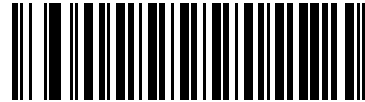
### Enable/Disable UPC-A

Parameter # 1

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



**\*Enable UPC-A  
(1)**

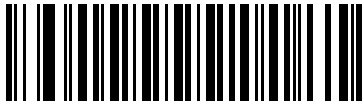


**Disable UPC-A  
(0)**

### Enable/Disable UPC-E

Parameter # 2

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



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



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

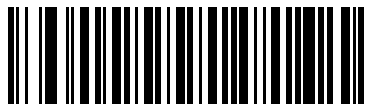
## Enable/Disable UPC-E1

Parameter # 12

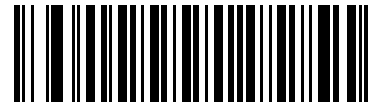
UPC-E1 is disabled by default.

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)**

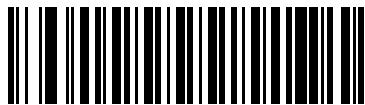


**\*Disable UPC-E1  
(00h)**

## Enable/Disable EAN-8/JAN-8

Parameter # 4

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



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

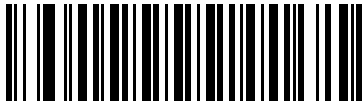


**Disable EAN-8/JAN-8  
(00h)**

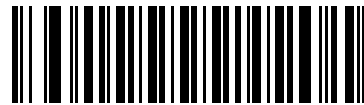
## Enable/Disable EAN-13/JAN-13

Parameter # 3

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



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

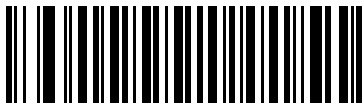


**Disable EAN-13/JAN-13  
(00h)**

## Enable/Disable Bookland EAN

Parameter # 83

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 11-20](#). Also select either Decode UPC/EAN Supplementals, Autodiscriminate UPC/EAN Supplementals, or Enable 978/979 Supplemental Mode in [Decode UPC/EAN/JAN Supplementals on page 11-9](#).

## Decode UPC/EAN/JAN Supplementals

### Parameter # 16

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 linear imager scanner is presented with a UPC/EAN plus supplemental symbol, the linear imager scanner decodes UPC/EAN and ignores the supplemental characters.
- If you select **Decode UPC/EAN with Supplementals**, the linear imager scanner only decodes UPC/EAN symbols with supplemental characters, and ignores symbols without supplementals.
- If you select **Autodiscriminate UPC/EAN Supplementals**, the linear imager scanner decodes UPC/EAN symbols with supplemental characters immediately. If the symbol does not have a supplemental, the linear imager scanner must decode the bar code the number of times set via [UPC/EAN/JAN Supplemental Redundancy on page 11-12](#) before transmitting its data to confirm that there is no supplemental.
- If you select one of the following **Supplemental Mode** options, the linear imager scanner immediately transmits EAN-13 bar codes starting with that prefix that have supplemental characters. If the symbol does not have a supplemental, the linear imager scanner must decode the bar code the number of times set via [UPC/EAN/JAN Supplemental Redundancy on page 11-12](#) before transmitting its data to confirm that there is no supplemental. The linear imager scanner transmits UPC/EAN bar codes that do not have that prefix immediately.
  - **Enable 378/379 Supplemental Mode**
  - **Enable 978/979 Supplemental Mode**



**NOTE** If you select 978/979 Supplemental Mode and are scanning Bookland EAN bar codes, see [Enable/Disable Bookland EAN on page 11-8](#) to enable Bookland EAN, and select a format using [Bookland ISBN Format on page 11-20](#).

- **Enable 977 Supplemental Mode**
- **Enable 414/419/434/439 Supplemental Mode**
- **Enable 491 Supplemental Mode**
- **Enable Smart Supplemental Mode** - applies to EAN-13 bar codes starting with any prefix listed previously.
- **Supplemental User-Programmable Type 1** - applies to EAN-13 bar codes starting with a 3-digit user-defined prefix. Set this 3-digit prefix using [User-Programmable Supplementals on page 11-12](#).
- **Supplemental User-Programmable Type 1 and 2** - applies to EAN-13 bar codes starting with either of two 3-digit user-defined prefixes. Set the 3-digit prefixes using [User-Programmable Supplementals on page 11-12](#).
- **Smart Supplemental Plus User-Programmable 1** - applies to EAN-13 bar codes starting with any prefix listed previously or the user-defined prefix set using [User-Programmable Supplementals on page 11-12](#).
- **Smart Supplemental Plus User-Programmable 1 and 2** - applies to EAN-13 bar codes starting with any prefix listed previously or one of the two user-defined prefixes set using [User-Programmable Supplementals on page 11-12](#).



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

## Decode UPC/EAN/JAN Supplementals (continued)



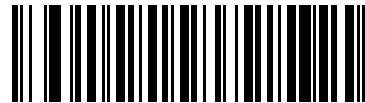
**Decode UPC/EAN/JAN Only With Supplementals  
(01h)**



**\*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 # 579

Supplemental 2: Parameter # 580

If you selected a Supplemental User-Programmable option from [Decode UPC/EAN/JAN Supplementals on page 11-9](#), 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](#). The default is 000 (zeroes).



User-Programmable Supplemental 1



User-Programmable Supplemental 2

## UPC/EAN/JAN Supplemental Redundancy

Parameter # 80

If you selected **Autodiscriminate UPC/EAN/JAN Supplementals**, this option adjusts the number of times to decode a symbol without supplementals 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. The default is 10.

Scan the bar code below to set a decode redundancy value. Next, scan two numeric bar codes in [Appendix D, NUMERIC BAR CODES](#). Enter a leading zero for single digit numbers. To correct an error or change a selection, scan [Cancel on page D-3](#).



UPC/EAN/JAN Supplemental Redundancy



## UPC/EAN/JAN Supplemental AIM ID Format

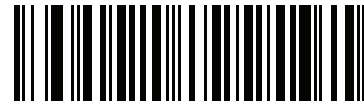
### Parameter # 672

Select an output format when reporting UPC/EAN/JAN bar codes with Supplementals with *Transmit Code ID Character on page 5-18* set to **AIM Code ID Character**:

- **Separate** - transmit UPC/EAN with supplementals with separate AIM IDs but one transmission, i.e.:  
]E<0 or 4><data>]E<1 or 2>[supplemental data]
- **Combined** – transmit UPC/EAN with supplementals with one AIM ID and one transmission, i.e.:  
]E3<data+supplemental data>
- **Separate Transmissions** - transmit UPC/EAN with supplementals with separate AIM IDs and separate transmissions, i.e.:  
]E<0 or 4><data>  
]E<1 or 2>[supplemental data]



**Separate  
(00h)**



**\*Combined  
(01h)**



**Separate Transmissions  
(02h)**

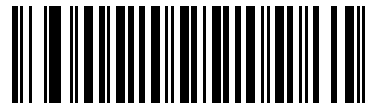
## Transmit UPC-A Check Digit

Parameter # 40

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 # 41

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)**

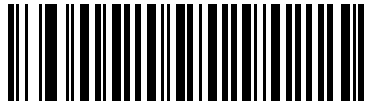


**Do Not Transmit UPC-E Check Digit  
(00h)**

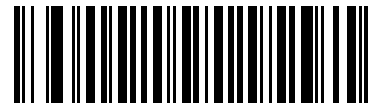
## Transmit UPC-E1 Check Digit

Parameter # 42

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)**

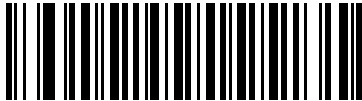


**Do Not Transmit UPC-E1 Check Digit  
(00h)**

## UPC-A Preamble

### Parameter # 34

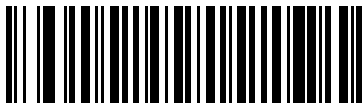
Preamble characters are part of the UPC symbol, and include Country Code and System Character. There are three options for transmitting a UPC-A preamble to the host device: transmit System Character only, transmit System Character and Country Code ("0" for USA), and transmit no preamble. Select the appropriate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



**No Preamble (<DATA>)**  
(00h)



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

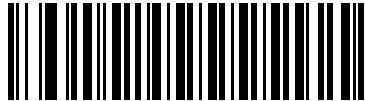


**System Character & Country Code**  
**(< COUNTRY CODE> <SYSTEM CHARACTER>**  
**<DATA>)**  
(02h)

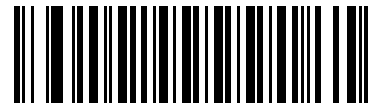
## UPC-E Preamble

### Parameter # 35

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)**

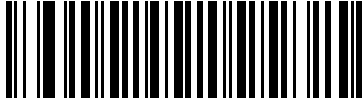


**System Character & Country Code**  
**(< COUNTRY CODE> <SYSTEM CHARACTER>**  
**<DATA>)**  
**(02h)**

## UPC-E1 Preamble

### Parameter # 36

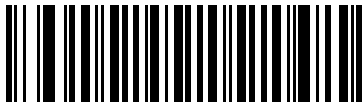
Preamble characters are part of the UPC symbol, and include Country Code and System Character. There are three options for transmitting a UPC-E1 preamble to the host device: transmit System Character only, transmit System Character and Country Code ("0" for USA), and transmit no preamble. Select the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



**No Preamble (<DATA>)**  
**(00h)**



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



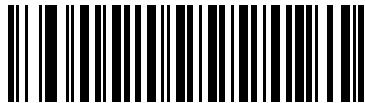
**System Character & Country Code**  
**(< COUNTRY CODE> <SYSTEM CHARACTER> <DATA>)**  
**(02h)**

## Convert UPC-E to UPC-A

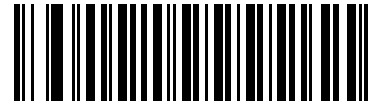
### Parameter # 37

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).

Disable this to transmit UPC-E decoded data 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

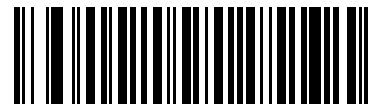
### Parameter # 38

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).

Disable this to transmit UPC-E1 decoded data as UPC-E1 data, without conversion.



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



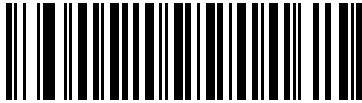
**\*Do Not Convert UPC-E1 to UPC-A (Disable)**  
(00h)

## EAN-8/JAN-8 Extend

### Parameter # 39

Enable this parameter to add five leading zeros to decoded EAN-8 symbols to make them compatible in format to EAN-13 symbols.

Disable this to transmit EAN-8 symbols as is.



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



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

## Bookland ISBN Format

### Parameter # 576

If you enabled Bookland EAN using [Enable/Disable Bookland EAN on page 11-8](#), select one of the following formats for Bookland data:

- **Bookland ISBN-10** - The linear imager 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 linear imager scanner reports Bookland data (starting with either 978 or 979) as EAN-13 in 13-digit format to meet the 2007 ISBN-13 protocol.



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



**Bookland ISBN-13  
(01h)**



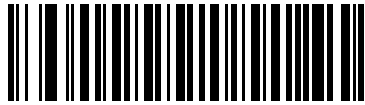
**NOTE** For Bookland EAN to function properly, first enable Bookland EAN using [Enable/Disable Bookland EAN on page 11-8](#), then select either Decode UPC/EAN Supplementals, Autodiscriminate UPC/EAN Supplementals, or Enable 978/979 Supplemental Mode in [Decode UPC/EAN/JAN Supplementals on page 11-9](#).



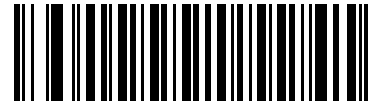
## UCC Coupon Extended Code

### Parameter # 85

Enable this parameter to decode UPC-A bar codes starting with digit '5', EAN-13 bar codes starting with digit '99', and UPC-A/GS1-128 Coupon Codes. UPCA, EAN-13, and GS1-128 must be enabled to scan all types of Coupon Codes.



**Enable UCC Coupon Extended Code  
(01h)**



**\*Disable UCC Coupon Extended Code  
(00h)**



**NOTE** See [UPC/EAN/JAN Supplemental Redundancy on page 11-12](#) to control autodiscrimination of the GS1-128 (right half) of a coupon code.

## Coupon Report

### Parameter # 730

Select an option to determine which type of coupon format to support.

- Select **Old Coupon Format** to support UPC-A/GS1-128 and EAN-13/GS1-128.
- Select **New Coupon Format** as an interim format to support UPC-A/GS1-DataBar and EAN-13/GS1-DataBar.
- If you select **Autodiscriminate Format**, the linear imager scanner supports both **Old Coupon Format** and **New Coupon Format**.



**Old Coupon Format  
(00h)**



**\*New Coupon Format  
(01h)**



**Autodiscriminate Coupon Format  
(02h)**

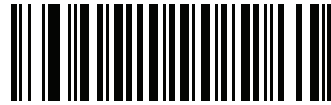
## ISSN EAN

Parameter # 617

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



**Enable ISSN EAN  
(01h)**



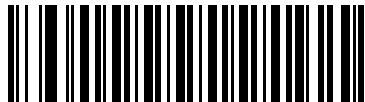
**\*Disable ISSN EAN  
(00h)**

## Code 128

### Enable/Disable Code 128

Parameter # 8

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

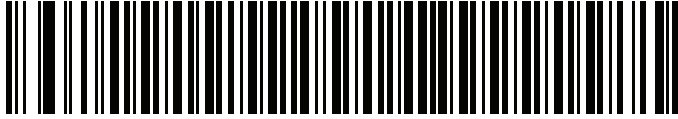
Parameter # 209, 210

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.

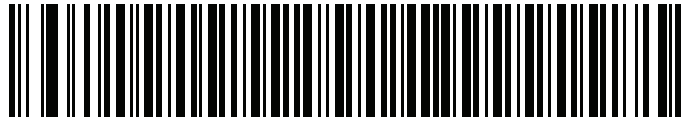
✓ **NOTE** When setting lengths for different bar code types, enter a leading zero for single digit numbers.

- **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 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** (enter a leading zero for single digit numbers). 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 linear imager scanner's capability.

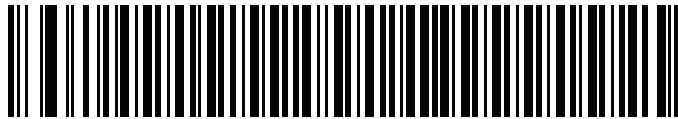
### Set Lengths for Code 128 (continued)



Code 128 - One Discrete Length



Code 128 - Two Discrete Lengths



Code 128 - Length Within Range

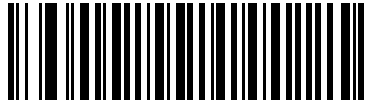
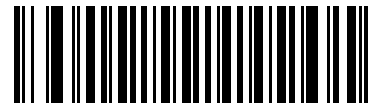


\*Code 128 - Any Length

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

Parameter # 14

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 # 84

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 # 577

Select an option for concatenating pairs of ISBT code types:

- If you select **Disable ISBT Concatenation**, the linear imager scanner 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 linear imager scanner to decode and perform concatenation. The linear imager scanner does not decode single ISBT symbols.
- If you select **Autodiscriminate ISBT Concatenation**, the linear imager scanner decodes and concatenates pairs of ISBT codes immediately. If only a single ISBT symbol is present, the linear imager scanner must decode the symbol the number of times set via [ISBT Concatenation Redundancy on page 11-27](#) before transmitting its data to confirm that there is no additional ISBT symbol.



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



**Enable ISBT Concatenation**  
(01h)



**Autodiscriminate ISBT Concatenation**  
(02h)

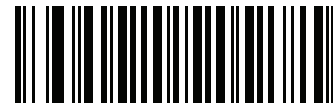
## Check ISBT Table

Parameter # 578

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)



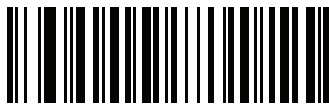
Disable Check ISBT Table  
(00h)

## ISBT Concatenation Redundancy

Parameter # 223

If you set **ISBT Concatenation** to **Autodiscriminate**, use this parameter to set the number of times the linear imager 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-3](#). The default is 10.



ISBT Concatenation Redundancy

---

## Code 39

### Enable/Disable Code 39

Parameter # 0

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 # 13

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** You cannot enable Trioptic Code 39 and Code 39 Full ASCII simultaneously.

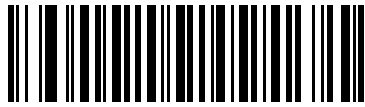


## Convert Code 39 to Code 32

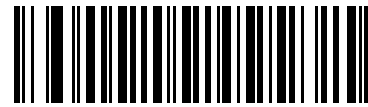
### Parameter # 86

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)**



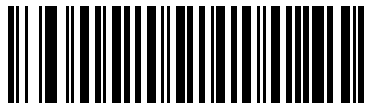
**\*Disable Convert Code 39 to Code 32  
(00h)**

## Code 32 Prefix

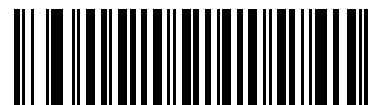
### Parameter # 231

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 # 18, 19

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. The default is 2 to 55.

✓ **NOTE** When setting lengths for different bar code types, enter a leading zero for single digit numbers.

- **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 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** (enter a leading zero for single digit numbers). 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 linear imager scanner's capability.



**Code 39 - One Discrete Length**



**Code 39 - Two Discrete Lengths**



**Code 39 - Length Within Range**

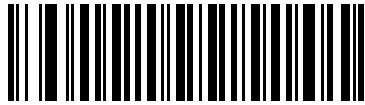


**Code 39 - Any Length**

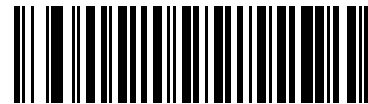
## Code 39 Check Digit Verification

### Parameter # 48

Enable this feature to check 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 # 43

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)**

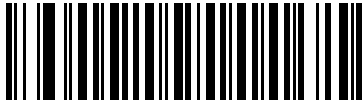


**NOTE** Code 39 Check Digit Verification must be enabled for this parameter to function.

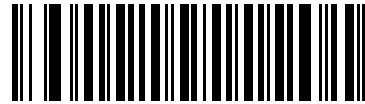
## Code 39 Full ASCII Conversion

### Parameter # 17

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** You cannot enable Trioptic Code 39 and Code 39 Full ASCII 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 the [ASCII Character Set for RS-232 on page 7-19](#) or the [ASCII Character Set for USB on page 8-19](#).

## Code 39 Buffering - Scan & Store

### Parameter # 113

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

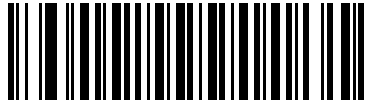
Selecting the Scan and Store option (Buffer Code 39) temporarily buffers all Code 39 symbols having a leading space as a first character for later transmission. The leading space is not buffered.

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

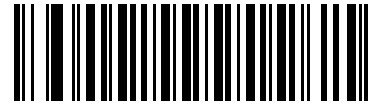
Select **Do Not Buffer Code 39** to transmit all decoded Code 39 symbols immediately without storing them in the buffer.

## Code 39 Buffering - Scan & Store (continued)

This feature affects Code 39 only. If selecting **Buffer Code 39**, we recommend configuring the linear imager scanner 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, you cannot select **Do Not Buffer Code 39**. The buffer holds 200 bytes of information.

To disable Code 39 buffering when there is data in the transmission buffer, first force the buffer transmission (see [Transmit Buffer on page 11-34](#)) or clear the buffer.

### Buffer Data

To buffer data, enable Code 39 buffering and scan a Code 39 symbol with a space immediately following the start pattern.

- Unless the data overflows the transmission buffer, the linear imager scanner issues a low/high beep to indicate successful decode and buffering. (For overflow conditions, see [Overfilling Transmission Buffer on page 11-34](#).)
- The linear imager scanner 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 linear imager scanner issues a short high/low/high beep.
- The linear imager scanner 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, set Code 39 lengths to include length 1.

## Transmit Buffer

There are two methods to transmit the Code 39 buffer.

1. Scan the **Transmit Buffer** bar code below, which includes only a start character, a plus (+), and a stop character.
2. The linear imager scanner transmits and clears the buffer.
  - The linear imager scanner issues a low/high beep.



**Transmit Buffer**

3. Scan a Code 39 bar code with a leading character other than a space.
  - The linear imager scanner appends new decode data to buffered data.
  - The linear imager scanner transmits and clears the buffer.
  - The linear imager scanner signals that it transmitted the buffer with a low/high beep.
  - The linear imager scanner transmits and clears the buffer.

✓ **NOTE** The Transmit Buffer contains only a plus (+) character. In order to scan this command, set Code 39 lengths to include length 1.

## Overfilling Transmission Buffer

The Code 39 buffer holds 200 characters. If the symbol just read overflows the transmission buffer:

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

## Attempt to Transmit an Empty Buffer

If you scan the **Transmit Buffer** symbol and the Code 39 buffer is empty:

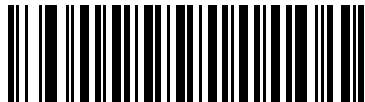
- A short low/high/low beep signals that the buffer is empty.
- No transmission occurs.
- The buffer remains empty.

## Code 93

### Enable/Disable Code 93

Parameter # 9

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 # 26, 27

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. The default is 4 to 55.

- **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 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** (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 Code 93 symbols containing any number of characters within the linear imager scanner'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**



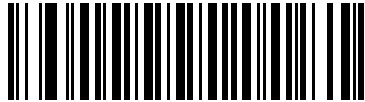
---

## Code 11

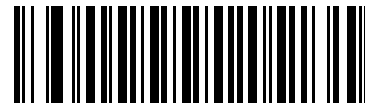
### Code 11

Parameter # 10

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 # 28, 29

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. The default is 4 to 55.

- **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 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** (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 Code 11 symbols containing any number of characters within the linear imager scanner's capability.

### Set Lengths for Code 11 (continued)



**Code 11 - One Discrete Length**



**Code 11 - Two Discrete Lengths**



**Code 11 - Length Within Range**



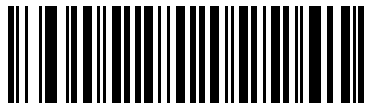
**Code 11 - Any Length**

## Code 11 Check Digit Verification

### Parameter # 52

This feature allows the linear imager scanner 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.

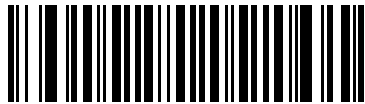
To enable this feature, scan the bar code below corresponding to the number of check digits encoded in the Code 11 symbols.



**\*Disable  
(00h)**



**One Check Digit  
(01h)**



**Two Check Digits  
(02h)**

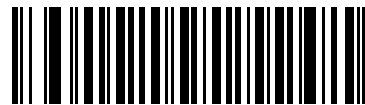
## Transmit Code 11 Check Digits

### Parameter # 47

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)**



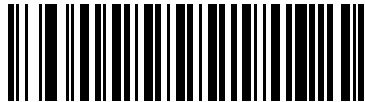
**NOTE** Code 11 Check Digit Verification must be enabled for this parameter to function.

## Interleaved 2 of 5 (ITF)

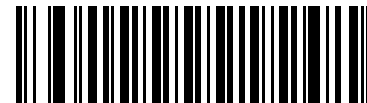
### Enable/Disable Interleaved 2 of 5

#### Parameter # 6

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 # 22, 23

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. The range for Interleaved 2 of 5 lengths is 0 - 55. The default is 14.

- **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 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** (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 I 2 of 5 symbols containing any number of characters within the linear imager scanner's 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 transmit as a complete scan, yielding less data than is encoded in the bar code. To prevent this, select specific lengths (I 2 of 5 - One Discrete Length, Two Discrete Lengths) for I 2 of 5 applications.

### Set Lengths for Interleaved 2 of 5 (continued)



I 2 of 5 - One Discrete Length



I 2 of 5 - Two Discrete Lengths



I 2 of 5 - Length Within Range



I 2 of 5 - Any Length

## I 2 of 5 Check Digit Verification

### Parameter # 49

Enable this feature to check 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)**

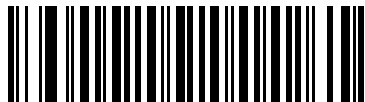


**OPCC Check Digit  
(02h)**

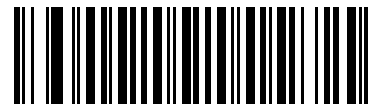
## Transmit I 2 of 5 Check Digit

### Parameter # 44

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)**

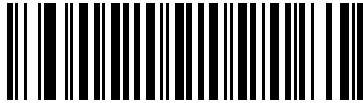


**\*Do Not Transmit I 2 of 5 Check Digit (Disable)  
(00h)**

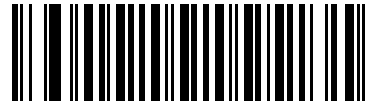
## Convert I 2 of 5 to EAN-13

### Parameter # 82

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)**

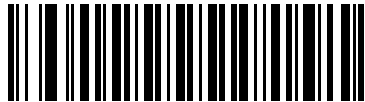


## Discrete 2 of 5 (DTF)

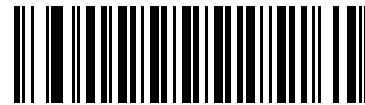
### Enable/Disable Discrete 2 of 5

Parameter # 5

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 # 20, 21

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. The range for Discrete 2 of 5 lengths is 0 - 55. The default is 12.

- **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 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** (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 D 2 of 5 symbols containing any number of characters within the linear imager scanner's capability.

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

### Set Lengths for Discrete 2 of 5 (continued)



D 2 of 5 - One Discrete Length



D 2 of 5 - Two Discrete Lengths



D 2 of 5 - Length Within Range



D 2 of 5 - Any Length

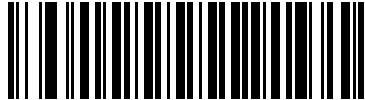
---

## Codabar (NW - 7)

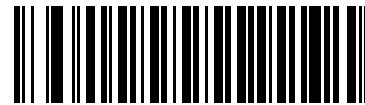
### Enable/Disable Codabar

Parameter # 7

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



**Enable Codabar  
(01h)**



**\*Disable Codabar  
(00h)**

### Set Lengths for Codabar

Parameter # 24, 25

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. The default is 5 to 55.

- **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** (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 Codabar symbols containing any number of characters within the linear imager scanner's capability.

## Set Lengths for Codabar (continued)



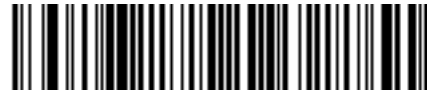
Codabar - One Discrete Length



Codabar - Two Discrete Lengths



Codabar - Length Within Range



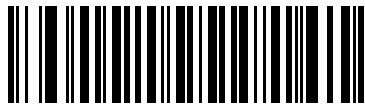
Codabar - Any Length

## CLSI Editing

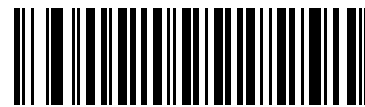
### Parameter # 54

Enable this parameter to strip the start and stop characters and insert 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)**

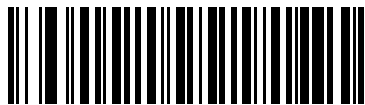


**\*Disable CLSI Editing  
(00h)**

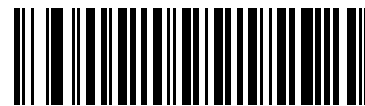
## NOTIS Editing

### Parameter # 55

Enable this parameter to strip 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)**

## Codabar Upper or Lower Case Start/Stop Characters Detection

Parameter # 855

Select whether to detect upper case or lower case Codabar start/stop characters.



**Lower Case  
(01h)**



**\*Upper Case  
(00h)**

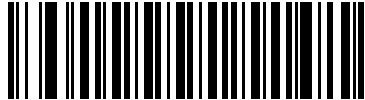
---

## MSI

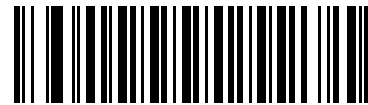
### Enable/Disable MSI

Parameter # 11

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



**Enable MSI**  
(01h)



**\*Disable MSI**  
(00h)

### Set Lengths for MSI

Parameter # 30, 31

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. The default is 4 to 55.

- **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** (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 MSI symbols containing any number of characters within the linear imager scanner's 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 transmit 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**

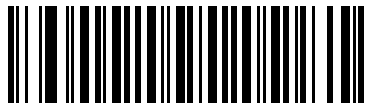


## MSI Check Digits

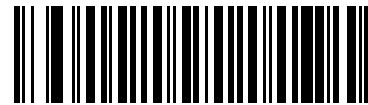
### Parameter # 50

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 11-54](#) for the selection of second digit algorithms.



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

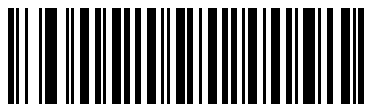


**Two MSI Check Digits  
(01h)**

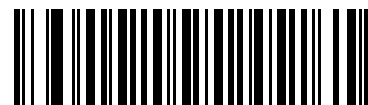
## Transmit MSI Check Digit(s)

### Parameter # 46

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



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

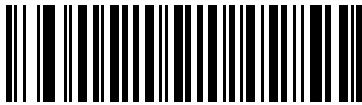


**\*Do Not Transmit MSI Check Digit(s) (Disable)  
(00h)**

## MSI Check Digit Algorithm

### Parameter # 51

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 11/MOD 10  
(00h)**



**\*MOD 10/MOD 10  
(01h)**

---

## Chinese 2 of 5

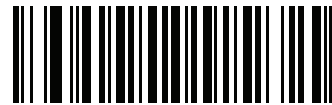
### Enable/Disable Chinese 2 of 5

Parameter # 408

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 # 618

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 # 619, 620

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. The default is 14 (One Discrete Length).

- **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 linear imager scanner's capability.

**Set Lengths for Matrix 2 of 5 (continued)****\*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 Check Digit

Parameter # 622

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 # 623

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)**

---

## Korean 3 of 5

### Enable/Disable Korean 3 of 5

Parameter # 581

To enable or disable Korean 3 of 5, scan the appropriate bar code below.

✓ *NOTE* The length for Korean 3 of 5 is fixed at 6.



**Enable Korean 3 of 5  
(01h)**



**\*Disable Korean 3 of 5  
(00h)**

---

## Inverse 1D

### Parameter # 586

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

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



**\*Regular  
(00h)**



**Inverse Only  
(01h)**



**Inverse Autodetect  
(02h)**



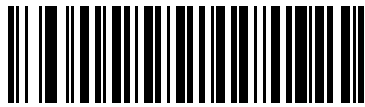
---

## GS1 DataBar

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 codes to enable or disable each variant of GS1 DataBar.

### GS1 DataBar-14

Parameter # 338



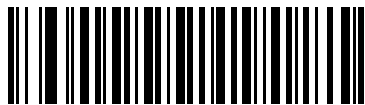
**\*Enable GS1 DataBar-14  
(01h)**



**Disable GS1 DataBar-14  
(00h)**

### GS1 DataBar Limited

Parameter # 339



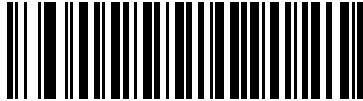
**Enable GS1 DataBar Limited  
(01h)**



**\*Disable GS1 DataBar Limited  
(00h)**

## GS1 DataBar Expanded

Parameter # 340



**\*Enable GS1 DataBar Expanded  
(01h)**



**Disable GS1 DataBar Expanded  
(00h)**

## GS1 DataBar Limited Security Level

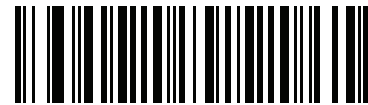
Parameter # 728

The linear imager scanner offers four levels of decode security for GS1 DataBar Limited bar codes. There is an inverse relationship between security and linear imager scanner aggressiveness. Increasing the level of security may result in reduced aggressiveness in scanning, so choose only that level of security necessary.

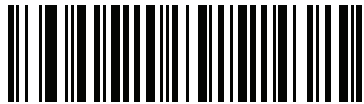
- Level 1 – No clear margin required. This complies with the original GS1 standard, yet might result in erroneous decoding of the DataBar Limited bar code when scanning some UPC symbols that start with digits “9” and “7”
- Level 2 – Automatic risk detection. This level of security may result in erroneous decoding of DataBar Limited bar codes when scanning some UPC symbols. The scanner defaults to Level 3, otherwise to Level 1.
- Level 3 – Security level reflects newly proposed GS1 standard that requires a 5 times trailing clear margin.
- Level 4 – Security level extends beyond the standard required by GS1. This level of security requires a 5 times leading and trailing clear margin.

**GS1 DataBar Limited Security Level (continued)**

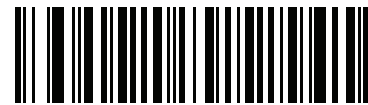
**GS1 DataBar Limited Security Level 1**  
**(01h)**



**GS1 DataBar Limited Security Level 2**  
**(02h)**



**\*GS1 DataBar Limited Security Level 3**  
**(03h)**



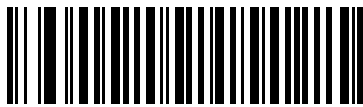
**GS1 DataBar Limited Security Level 4**  
**(04h)**

## Convert GS1 DataBar to UPC/EAN

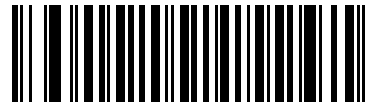
### Parameter # 397

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 DataBar-14 and 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)**

---

## Redundancy Level

### Parameter # 78

The linear imager scanner offers four levels of decode redundancy. Select higher redundancy levels for decreasing levels of bar code quality. As redundancy levels increase, the linear imager scanner'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:

**Table 11-2** *Redundancy Level 1 Codes*

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:

**Table 11-3** *Redundancy Level 2 Codes*

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:

**Table 11-4** *Redundancy Level 3 Codes*

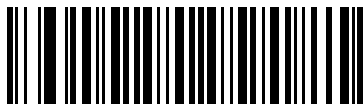
Code Type	Code Length
MSI	4 characters or less
D 2 of 5	8 characters or less
I 2 of 5	8 characters or less
Codabar	8 characters or less

## Redundancy Level 4

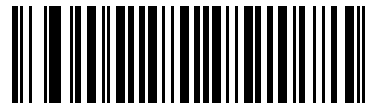
The following code types must be successfully read three times before being decoded:

Table 11-5 *Redundancy Level 4 Codes*

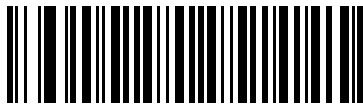
Code Type	Code Length
All	All



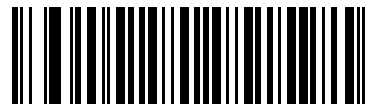
**\*Redundancy Level 1  
(01h)**



**Redundancy Level 2  
(02h)**



**Redundancy Level 3  
(03h)**



**Redundancy Level 4  
(04h)**

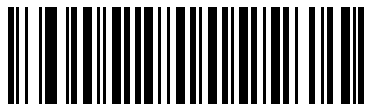
---

## Security Level

### Parameter # 77

The linear imager scanner offers four levels of decode security for 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 linear imager scanner aggressiveness, so choose only that level of security necessary for any given application.

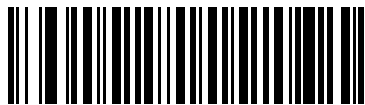
- **Security Level 0:** This setting allows the linear imager scanner to operate in its most aggressive state, while providing sufficient security in decoding most “in-spec” bar codes.
- **Security Level 1:** This default setting eliminates most misdecodes.
- **Security Level 2:** Select this option if Security level 1 fails to eliminate misdecodes.
- **Security Level 3:** If you selected Security Level 2 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 linear imager scanner. If you need this level of security, 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 # 381

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 linear imager scanner 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)**



# CHAPTER 12 ADVANCED DATA FORMATTING

---

## Introduction

Advanced Data Formatting (ADF) is a means of customizing data before transmission to the host device. Use ADF to edit scan data to suit requirements. Implement ADF by scanning a related series of bar codes which program the scanner with ADF rules.

For ADF information and programming bar codes, refer to the *Advanced Data Formatting Programmer Guide*, p/n 72E-69680-xx located at [zebra.com/support](http://zebra.com/support).



# APPENDIX A STANDARD DEFAULT PARAMETERS

✓ **NOTE** In this guide, the parameter numbers listed are the same as the attribute numbers for these parameters.

**Table A-1** Standard Default Parameters Table

Parameter	Parameter Number	Default	Page Number
<b>Radio Communications</b>			
Radio Communications (Host Type)		Cradle Host	4-5
BT Friendly Name	607	n/a	4-7
Discoverable Mode	610	General	4-7
Wi-Fi Friendly Mode	1299	Disable	4-8
Wi-Fi Friendly Channel Exclusion		Use All Channel	4-9
HID Features for Apple iOS	1114	Disable	4-11
Country Keyboard Types (Country Code)		North American	4-12
HID Keyboard Keystroke Delay		No Delay (0 msec)	4-14
CAPS Lock Override		Disable	4-14
Ignore Unknown Characters		Enable	4-15
Emulate Keypad		Disable	4-15
Keyboard FN1 Substitution		Disable	4-16
Function Key Mapping		Disable	4-16
Simulated Caps Lock		Disable	4-17
Convert Case		No Case Conversion	4-17

**Table A-1** Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
Beep on Reconnect Attempt	559	Disable	<a href="#">4-19</a>
Reconnect Attempt Interval	558	30 sec	<a href="#">4-20</a>
Auto-reconnect in Bluetooth Keyboard Emulation (HID Peripheral) Mode	604	On Bar Code Data	<a href="#">4-22</a>
Modes of Operation (Point-to-Point/Multipoint-to-Point)	538	Point-to-Point	<a href="#">4-24</a>
Parameter Broadcast (Cradle Host Only)	148	Enable	<a href="#">4-25</a>
Beep on Insertion	288	Enable	<a href="#">4-23</a>
Pairing Modes	542	Unlocked	<a href="#">4-26</a>
Pairing on Contacts	545	Enable	<a href="#">4-27</a>
Connection Maintenance Interval	5002	15 min	<a href="#">4-29</a>
Batch Mode	544	Normal (Do Not Batch Data)	<a href="#">4-32</a>
Page Button	746	Disable	<a href="#">4-33</a>
Authentication	549	Disable	<a href="#">4-34</a>
PIN Code (Set and Store)	552	12345	<a href="#">4-35</a>
Variable Pin Code	608	Static	<a href="#">4-35</a>
Encryption	550	Disable	<a href="#">4-36</a>
Secure Simple Pairing IO Capability (SPP Server and SPP Central Host Mode Only)	911	No Input/No Output	<a href="#">4-37</a>
<b>User Preferences</b>			
Set Default Parameter		Restore Defaults	<a href="#">5-4</a>
Report Version		N/A	<a href="#">5-5</a>
Parameter Bar Code Scanning	236	Enable	<a href="#">5-5</a>
Beep After Good Decode	56	Enable	<a href="#">5-6</a>
Decode Illumination Indicator	859	Disable	<a href="#">5-6</a>
Beeper Tone	145	Medium	<a href="#">5-7</a>
Suppress Power Up Beeps	721	Do Not Suppress	<a href="#">5-8</a>
Beeper Volume	140	High	<a href="#">5-8</a>
Beeper Duration	628	Medium	<a href="#">5-9</a>
Hand-Held Trigger Mode	138	Level	<a href="#">5-9</a>
Hands-Free Mode	630	Enable	<a href="#">5-10</a>
Low Power Mode	128	Enable	<a href="#">5-10</a>

Table A-1 Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
Time Delay to Low Power Mode	146	100 msec	5-11
Time Delay to Presentation Sleep Mode	662	5 Min	5-12
Timeout to Low Power Mode from Auto Aim	729	15 Sec	5-14
Continuous Bar Code Read	649	Disable	5-15
Unique Bar Code Reporting	723	Disable	5-15
Decode Session Timeout	136	9.9 Sec	5-15
Timeout Between Decodes, Same Symbol	137	0.5 Sec	5-16
Timeout Between Decodes, Different Symbols	144	0.2 Sec	5-16
Decoding Illumination	298	Enable	5-17
<b>Miscellaneous Options</b>			
Transmit Code ID Character	45	None	5-18
Prefix Value	99, 105	7013 <CR><LF>	5-19
Suffix 1 Value Suffix 2 Value	98, 104 100, 106	7013 <CR><LF>	5-19
Scan Data Transmission Format	235	Data as is	5-20
FN1 Substitution Values	103, 109	Set	5-21
Transmit "No Read" Message	94	Disable	5-22
Unsolicited Heartbeat Interval	1118	Disable	5-23
Dump Scanner Parameters			5-24
<b>Keyboard Wedge Host Parameters</b>			
Keyboard Wedge Host Type		IBM PC/AT& IBM PC Compatibles	6-4
Country Types (Country Codes)		North American	6-5
Ignore Unknown Characters		Send	6-7
Keystroke Delay		No Delay	6-7
Intra-Keystroke Delay		Disable	6-8
Alternate Numeric Keypad Emulation		Disable	6-8
Caps Lock On		Disable	6-9
Caps Lock Override		Disable	6-9
Convert Wedge Data		No Convert	6-10
Function Key Mapping		Disable	6-10

**Table A-1** Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
FN1 Substitution		Disable	6-10
Send and Make Break		Send	6-11
<b>RS-232 Host Parameters</b>			
RS-232 Host Types		Standard	7-6
Baud Rate		9600	7-8
Parity Type		None	7-9
Stop Bit Select		1 Stop Bit	7-9
Data Bits (ASCII Format)		8-Bit	7-10
Check Receive Errors		Enable	7-10
Hardware Handshaking		None	7-12
Software Handshaking		None	7-14
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
<b>USB Host Parameters</b>			
USB Device Type		USB HID Keyboard	8-5
Symbol Native API (SNAPI) Status Handshaking		Enable	8-6
USB Country Keyboard Types (Country Codes)		North American	8-7
USB Keystroke Delay		No Delay	8-9
USB CAPS Lock Override		Disable	8-9
USB Ignore Unknown Characters		Send	8-10
USB Convert Unknown to Code 39		Disable	8-10
Emulate Keypad		Disable	8-11
Emulate Keypad with Leading Zero		Disable	8-12
Quick Keypad Emulation		Disable	8-12
USB FN1 Substitution		Disable	8-12
Function Key Mapping		Disable	8-12
Simulated Caps Lock		Disable	8-13

Table A-1 Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
Convert Case		No Case Conversion	8-14
USB Static CDC		Enable	8-14
Ignore Beep		Disable	8-15
Ignore Bar Code Configuration		Disable	8-15
USB Polling Interval		8 msec	8-17
USB Fast HID		Enable	8-18
<b>IBM 468X/469X Host Parameters</b>			
Port Address		None Selected	9-4
Convert Unknown to Code 39		Disable	9-5
Ignore Beep		Disable	9-5
Ignore Bar Code Configuration		Disable	9-6
<b>UPC/EAN</b>			
UPC-A	1	Enable	11-6
UPC-E	2	Enable	11-6
UPC-E1	12	Disable	11-7
EAN-8/JAN 8	4	Enable	11-7
EAN-13/JAN 13	3	Enable	11-8
Bookland EAN	83	Disable	11-8
Decode UPC/EAN/JAN Supplementals (2 and 5 digits)	16	Ignore	11-10
User-Programmable Supplementals		000 (zeroes)	11-12
Supplemental 1:	579		
Supplemental 2:	580		
UPC/EAN/JAN Supplemental Redundancy	80	10	11-12
UPC/EAN/JAN Supplemental AIM ID Format	672	Combined	11-12
Transmit UPC-A Check Digit	40	Enable	11-14
Transmit UPC-E Check Digit	41	Enable	11-14
Transmit UPC-E1 Check Digit	42	Enable	11-15
UPC-A Preamble	34	System Character	11-16
UPC-E Preamble	35	System Character	11-17
UPC-E1 Preamble	36	System Character	11-18
Convert UPC-E to A	37	Disable	11-19

Table A-1 Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
Convert UPC-E1 to A	38	Disable	11-19
EAN-8/JAN-8 Extend	39	Disable	11-20
Bookland ISBN Format	576	ISBN-10	11-20
UCC Coupon Extended Code	85	Disable	11-21
Coupon Report	730	New Coupon Format	11-21
ISSN EAN	617	Disable	11-22
<b>Code 128</b>			
Code 128	8	Enable	11-23
Set Length(s) for Code 128	209, 210	Any Length	11-24
GS1-128 (formerly UCC/EAN-128)	14	Enable	11-25
ISBT 128	84	Enable	11-25
ISBT Concatenation	577	Disable	11-26
Check ISBT Table	578	Enable	11-27
ISBT Concatenation Redundancy	223	10	11-27
<b>Code 39</b>			
Code 39	0	Enable	11-28
Trioptic Code 39	13	Disable	11-28
Convert Code 39 to Code 32 (Italian Pharmacy Code)	86	Disable	11-29
Code 32 Prefix	231	Disable	11-29
Set Length(s) for Code 39	18, 19	2 to 55	11-30
Code 39 Check Digit Verification	48	Disable	11-31
Transmit Code 39 Check Digit	43	Disable	11-31
Code 39 Full ASCII Conversion	17	Disable	11-32
Buffer Code 39	113	Disable	11-33
<b>Code 93</b>			
Code 93	9	Disable	11-35
Set Length(s) for Code 93	26, 27	4 to 55	11-35
<b>Code 11</b>			
Code 11	10	Disable	11-37
Set Lengths for Code 11	28, 29	4 to 55	11-37
Code 11 Check Digit Verification	52	Disable	11-39



Table A-1 Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
Transmit Code 11 Check Digit(s)	47	Disable	11-40
<b>Interleaved 2 of 5 (ITF)</b>			
Interleaved 2 of 5 (ITF)	6	Disable	11-41
Set Lengths for I 2 of 5	22, 23	14	11-41
I 2 of 5 Check Digit Verification	49	Disable	11-43
Transmit I 2 of 5 Check Digit	44	Disable	11-43
Convert I 2 of 5 to EAN 13	82	Disable	11-44
<b>Discrete 2 of 5 (DTF)</b>			
Discrete 2 of 5	5	Disable	11-45
Set Length(s) for D 2 of 5	20, 21	12	11-45
<b>Codabar (NW - 7)</b>			
Codabar	7	Disable	11-47
Set Lengths for Codabar	24, 25	5 to 55	11-47
CLSI Editing	54	Disable	11-49
NOTIS Editing	55	Disable	11-49
Codabar Upper or Lower Case Start/Stop Characters Detection	855	Upper Case	11-50
<b>MSI</b>			
MSI	11	Disable	11-51
Set Length(s) for MSI	30, 31	4 to 55	11-51
MSI Check Digits	50	One	11-53
Transmit MSI Check Digit	46	Disable	11-53
MSI Check Digit Algorithm	51	Mod 10/Mod 10	11-54
<b>Chinese 2 of 5</b>			
Enable/Disable Chinese 2 of 5	408	Disable	11-55
<b>Matrix 2 of 5</b>			
Enable/Disable Matrix 2 of 5	618	Disable	11-56
Matrix 2 of 5 Lengths	619, 620	14 (One Discrete Length)	11-57
Matrix 2 of 5 Check Digit	622	Disable	11-58
Transmit Matrix 2 of 5 Check Digit	623	Disable	11-58
<b>Korean 3 of 5</b>			

**Table A-1** Standard Default Parameters Table (Continued)

Parameter	Parameter Number	Default	Page Number
Korean 3 of 5	581	Disable	<a href="#">11-59</a>
<b>Inverse 1D</b>			
Inverse 1D	586	Regular	<a href="#">11-60</a>
<b>GS1 DataBar</b>			
GS1 DataBar-14	338	Enable	<a href="#">11-61</a>
GS1 DataBar Limited	339	Disable	<a href="#">11-61</a>
GS1 DataBar Expanded	340	Enable	<a href="#">11-62</a>
GS1 DataBar Limited Security Level	728	Level 3	<a href="#">11-63</a>
Convert GS1 DataBar to UPC/EAN	397	Disable	<a href="#">11-64</a>
<b>Symbology-Specific Security Levels</b>			
Redundancy Level	78	1	<a href="#">11-66</a>
Security Level	77	1	<a href="#">11-67</a>
Intercharacter Gap Size	381	Normal	<a href="#">11-68</a>

# APPENDIX B PROGRAMMING REFERENCE

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## Symbol Code Identifiers

Table B-1 *Symbol Code Characters*

Code Character	Code Type
A	UPC-A, UPC-E, UPC-E1, EAN-8, EAN-13
B	Code 39, Code 32
C	Codabar
D	Code 128, ISBT 128, ISBT 128 Concatenated
E	Code 93
F	Interleaved 2 of 5
G	Discrete 2 of 5, or Discrete 2 of 5 IATA
H	Code 11
J	MSI
K	GS1-128
L	Bookland EAN
M	Trioptic Code 39
N	Coupon Code
R	GS1 DataBar Family
S	Matrix 2 of 5

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

<b>Code Character</b>	<b>Code Type</b>
U	Chinese 2 of 5
V	Korean 3 of 5
X	ISSN EAN

## AIM Code Identifiers

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

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

**Table B-2** *Aim Code Characters*

Code Character	Code Type
A	Code 39, Code 39 Full ASCII, Code 32
C	Code 128, ISBT 128, ISBT 128 Concatenated, GS1-128, Coupon (Code 128 portion)
E	UPC/EAN, Coupon (UPC portion)
e	GS1 DataBar Family
F	Codabar
G	Code 93
H	Code 11
I	Interleaved 2 of 5
M	MSI
S	Discrete 2 of 5, IATA 2 of 5
X	Bookland EAN, ISSN EAN, Trioptic Code 39, Chinese 2 of 5, Matrix 2 of 5, Korean 3 of 5

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

**Table B-3** *Modifier Characters*

Code Type	Option Value	Option
<b>Code 39</b>	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, <b>A+I+MI+DW</b> , is transmitted as <b>J</b> <b>A7</b> AIMID where 7 = (3+4).	
<b>Trioptic Code 39</b>	0	No option specified at this time. Always transmit 0.
	Example: A Trioptic bar code 412356 is transmitted as <b>J</b> <b>X0</b> 412356	
<b>Code 128</b>	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 <sup>FNC1</sup> in the first position, AIMID is transmitted as <b>J</b> <b>C1</b> AIMID	
<b>I 2 of 5</b>	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 <b>J</b> <b>I0</b> 4123	
<b>Codabar</b>	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 <b>J</b> <b>F0</b> 4123	
<b>Code 93</b>	0	No options specified at this time. Always transmit 0.
	Example: A Code 93 bar code 012345678905 is transmitted as <b>J</b> <b>G00</b> 12345678905	
<b>MSI</b>	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 <b>J</b> <b>M1</b> 4123	

Table B-3 *Modifier Characters (Continued)*

Code Type	Option Value	Option
<b>D 2 of 5</b>	0	No options specified at this time. Always transmit 0.
	Example: A D 2 of 5 bar code 4123, is transmitted as <b>JS04123</b>	
<b>UPC/EAN</b>	0	Standard data packet in full EAN format, i.e. 13 digits for UPC-A, UPC-E, and EAN-13 (not including supplemental data).
	1	Two digit supplemental data only.
	2	Five digit supplemental data only.
	3	Combined data packet comprising 13 digits from EAN-13, UPC-A or UPC-E symbol and 2 or 5 digits from supplemental symbol.
	4	EAN-8 data packet.
	Example: A UPC-A bar code 012345678905 is transmitted as <b>JE00012345678905</b>	
<b>Bookland EAN</b>	0	No options specified at this time. Always transmit 0.
	Example: A Bookland EAN bar code 123456789X is transmitted as <b>JX0123456789X</b>	
<b>ISSN EAN</b>	0	No options specified at this time. Always transmit 0.
	Example: An ISSN EAN bar code 123456789X is transmitted as <b>JX0123456789X</b>	
<b>Code 11</b>	0	Single check digit
	1	Two check digits
	3	Check characters validated but not transmitted.
<b>GS1 DataBar Family</b>		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., JC1).
	Example: A GS1 DataBar-14 bar code 0110012345678902 is transmitted as <b>Je00110012345678902</b> .	





# APPENDIX C SAMPLE BAR CODES

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## Code 39



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## UPC/EAN

### UPC-A, 100%



### **EAN-13, 100%**



---

### **Code 128**



---

### **Interleaved 2 of 5**



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## GS1 DataBar

✓ *NOTE* GS1 DataBar variants must be enabled to read the bar codes below (see [GS1 DataBar on page 11-61](#)).



**10293847560192837465019283746029478450366523**  
(GS1 DataBar Expanded Stacked)



**1234890hjio9900mnb**  
(GS1 DataBar Expanded)



**08672345650916**  
(GS1 DataBar Limited)

## GS1 DataBar-14



**55432198673467**  
(GS1 DataBar-14 Truncated)



**90876523412674**  
(GS1 DataBar-14 Stacked)

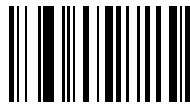


# APPENDIX D NUMERIC BAR CODES

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## Numeric Bar Codes

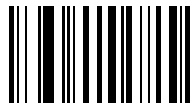
For parameters requiring specific numeric values, scan the appropriately numbered bar code(s).



0



1



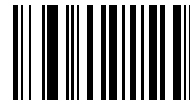
2



3



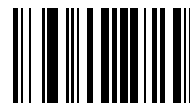
4



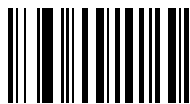
5



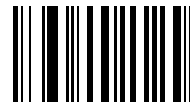
6



7



8



9

---

**Cancel**

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



**Cancel**





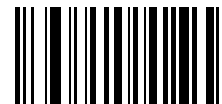
# APPENDIX E ALPHANUMERIC BAR CODES

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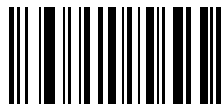
## Alphanumeric Keyboard



Space



#



\$



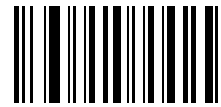
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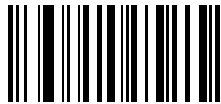
## Alphanumeric Keyboard (continued)



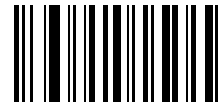
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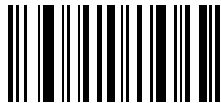
+



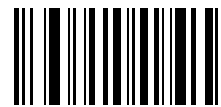
-



.



/



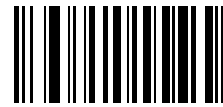
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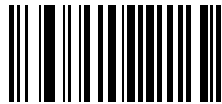
## Alphanumeric Keyboard (continued)



"



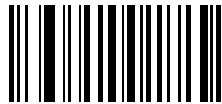
&amp;



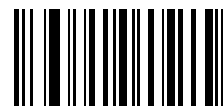
'



(



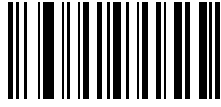
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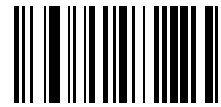
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## Alphanumeric Keyboard (continued)



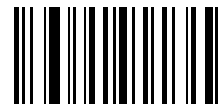
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<



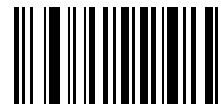
=



>



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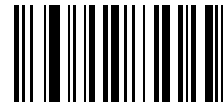


@

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**Alphanumeric Keyboard (continued)**

[



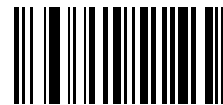
\



]



-

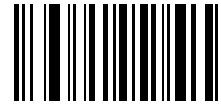


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## Alphanumeric Keyboard (continued)

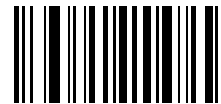
✓ *NOTE* The bar codes that follow should not be confused with those on the numeric keypad.



0



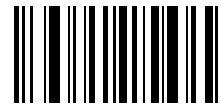
1



2



3



4



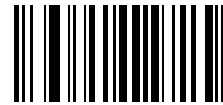
5

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**Alphanumeric Keyboard (continued)**



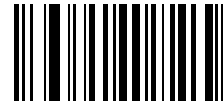
**6**



**7**



**8**



**9**



**End of Message**



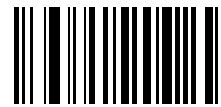
**Cancel**

---

## Alphanumeric Keyboard (continued)



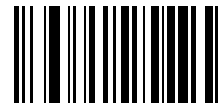
A



B



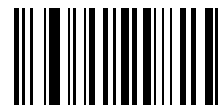
C



D



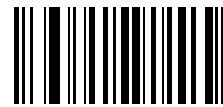
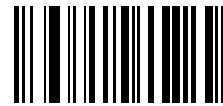
E



F



---

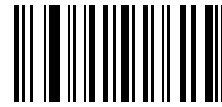
**Alphanumeric Keyboard (continued)****G****H****I****J****K****L**

---

## Alphanumeric Keyboard (continued)



M



N



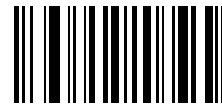
O



P



Q



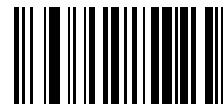
R

---

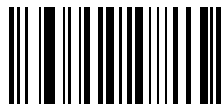
**Alphanumeric Keyboard (continued)**



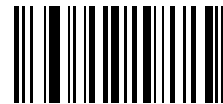
**S**



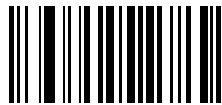
**T**



**U**



**V**



**W**



**X**

---

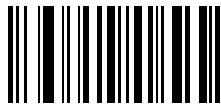
## Alphanumeric Keyboard (continued)



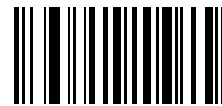
Y



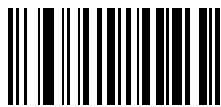
Z



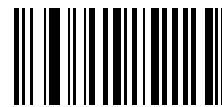
a



b



c



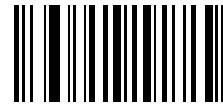
d

---

**Alphanumeric Keyboard (continued)**



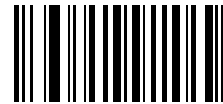
**e**



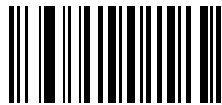
**f**



**g**



**h**



**i**



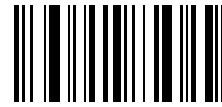
**j**

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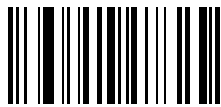
## Alphanumeric Keyboard (continued)



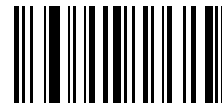
k



l



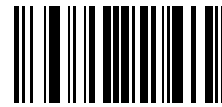
m



n



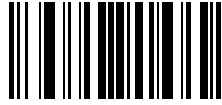
o



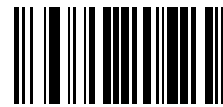
p

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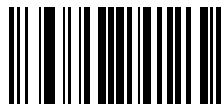
**Alphanumeric Keyboard (continued)**



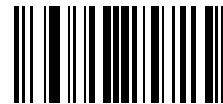
**q**



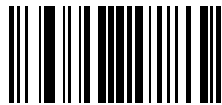
**r**



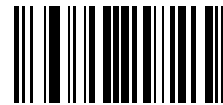
**s**



**t**



**u**



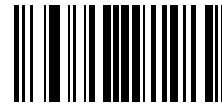
**v**

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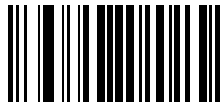
## Alphanumeric Keyboard (continued)



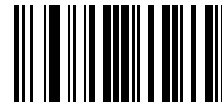
w



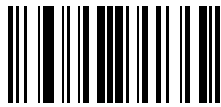
x



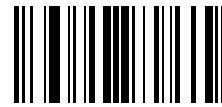
y



z



{

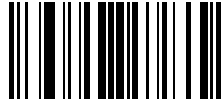


|

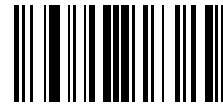


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**Alphanumeric Keyboard (continued)**



}



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# APPENDIX F ASCII CHARACTER SETS

Table F-1 ASCII Value Table

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

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

Table F-1 ASCII Value Table (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
1016	\$P	CTRL P
1017	\$Q	CTRL Q
1018	\$R	CTRL R
1019	\$S	CTRL S
1020	\$T	CTRL T
1021	\$U	CTRL U
1022	\$V	CTRL V
1023	\$W	CTRL W
1024	\$X	CTRL X
1025	\$Y	CTRL Y
1026	\$Z	CTRL Z
1027	%A	CTRL [
1028	%B	CTRL \
1029	%C	CTRL ]
1030	%D	CTRL 6
1031	%E	CTRL -
1032	Space	Space
1033	/A	!
1034	/B	"
1035	/C	#
1036	/D	?
1037	/E	%
1038	/F	&
1039	/G	'
1040	/H	(
1041	/I	)
1042	/J	*
1043	/K	+
1044	/L	,

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

Table F-1 ASCII Value Table (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
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
1072	H	H
1073	I	I

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

Table F-1 ASCII Value Table (Continued)

ASCII Value	Full ASCII Code 39 Encode Character	Keystroke
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	<b>a</b>
1098	+B	<b>b</b>
1099	+C	<b>c</b>
1100	+D	<b>d</b>
1101	+E	<b>e</b>
1102	+F	<b>f</b>

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

Table F-1 ASCII Value Table (Continued)

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

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

**Table F-2** *ALT Key Standard Default Tables*

<b>ALT Keys</b>	<b>Keystroke</b>
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 F-3** *Misc. Key Standard Default Table*

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

**Table F-4** *GUI Shift Keys*

Other Value	Keystroke
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

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 F-4** GUI Shift Keys (Continued)

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

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

**Table F-5** *PF Key Standard Default Table*

<b>PF Keys</b>	<b>Keystroke</b>
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 F-6** *F key Standard Default Table*

<b>F Keys</b>	<b>Keystroke</b>
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

**Table F-6** *F key Standard Default Table (Continued)*

<b>F Keys</b>	<b>Keystroke</b>
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 F-7** *Numeric Key Standard Default Table*

<b>Numeric Keypad</b>	<b>Keystroke</b>
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

**Table F-7** *Numeric Key Standard Default Table (Continued)*

<b>Numeric Keypad</b>	<b>Keystroke</b>
6057	9
6058	Enter
6059	Num Lock

**Table F-8** *Extended Keypad Standard Default Table*

<b>Extended Keypad</b>	<b>Keystroke</b>
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



# APPENDIX G COMMUNICATION PROTOCOL

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## Functionality Supported via Communication (Cable) Interface

*Table G-1* lists supported scanner functionality by communication protocol.

### LI4278 with CR0078-S (Standard Cradle)

**Table G-1** *LI4278 with CR0078-S Communication Interface Functionality*

Communication Interfaces	Functionality		
	Data Transmission	Remote Management	Image and Video Transmission
<b>USB</b>			
USB HID Keyboard	Supported	Not Available	Not Available
Simple COM Port Emulation	Supported	Not Available	Not Available
CDC COM Port Emulation	Supported	Not Available	Not Available
SSI over CDC COM Port Emulation	Not Available	Not Available	Not Available
IBM Table-Top USB	Supported	Supported	Not Available

**Table G-1** LI4278 with CR0078-S Communication Interface Functionality (Continued)

Communication Interfaces	Functionality		
	Data Transmission	Remote Management	Image and Video Transmission
IBM Hand-Held USB	Supported	Supported	Not Available
OPOS (IBM Hand-held with Full Disable)	Supported	Supported	Not Available
Symbol Native API (SNAPI) without Imaging Interface	Not Available	Not Available	Not Available
Symbol Native API (SNAPI) with Imaging Interface	Not Available	Not Available	Not Available
Toshiba TEC	Not Available	Not Available	Not Available
<b>RS-232</b>			
Standard RS-232	Supported	Not Available	Not Available
ICL RS-232	Supported	Not Available	Not Available
Fujitsu RS-232	Supported	Not Available	Not Available
Wincor-Nixdorf RS-232 Mode A	Supported	Not Available	Not Available
Wincor-Nixdorf RS-232 Mode B	Supported	Not Available	Not Available
Olivetti ORS4500	Supported	Not Available	Not Available
Omron	Supported	Not Available	Not Available
CUTE	Not Available	Not Available	Not Available
OPOS/JPOS	Supported	Not Available	Not Available
SSI	Not Available	Not Available	Not Available
<b>IBM 4690</b>			
Hand-Held Scanner Emulation (Port 9B)	Supported	Not Available	Not Available
Table-Top Scanner Emulation (Port 17)	Supported	Not Available	Not Available
Non-IBM Scanner Emulation (Port 5B)	Supported	Supported	Not Available
<b>Keyboard Wedge</b>			
IBM PC/AT & IBM PC Compatibles	Supported	Not Available	Not Available
IBM AT Notebook	Supported	Not Available	Not Available



**LI4278 with CR0078-P (Presentation Cradle)****Table G-2** *LI4278 with CR0078-P Communication Interface Functionality*

Communication Interfaces	Functionality		
	Data Transmission	Remote Management	Image and Video Transmission
<b>USB</b>			
USB HID Keyboard	Supported	Not Available	Not Available
Simple COM Port Emulation	Supported	Not Available	Not Available
CDC COM Port Emulation	Supported	Not Available	Not Available
SSI over CDC COM Port Emulation	Supported	Supported	Not Available
IBM Table-Top USB	Supported	Supported	Not Available
IBM Hand-Held USB	Supported	Supported	Not Available
OPOS (IBM Hand-held with Full Disable)	Supported	Supported	Not Available
Symbol Native API (SNAPI) without Imaging Interface	Supported	Supported	Not Available
Symbol Native API (SNAPI) with Imaging Interface	Supported	Supported	Supported
Toshiba TEC	Not Available	Not Available	Not Available
<b>RS-232</b>			
Standard RS-232	Supported	Not Available	Not Available
ICL RS-232	Supported	Not Available	Not Available
Fujitsu RS-232	Supported	Not Available	Not Available
Wincor-Nixdorf RS-232 Mode A	Supported	Not Available	Not Available
Wincor-Nixdorf RS-232 Mode B	Supported	Not Available	Not Available
Olivetti ORS4500	Supported	Not Available	Not Available
Omron	Supported	Not Available	Not Available
CUTE	Supported	Not Available	Not Available
OPOS/JPOS	Supported	Not Available	Not Available
SSI	Not Available	Not Available	Not Available
<b>IBM 4690</b>			
Hand-Held Scanner Emulation (Port 9B)	Supported	Not Available	Not Available
Table-Top Scanner Emulation (Port 17)	Supported	Not Available	Not Available
Non-IBM Scanner Emulation (Port 5B)	Supported	Not Available	Not Available

**Table G-2** *LI4278 with CR0078-P Communication Interface Functionality (Continued)*

Communication Interfaces	Functionality		
	Data Transmission	Remote Management	Image and Video Transmission
<b>Keyboard Wedge</b>			
IBM PC/AT & IBM PC Compatibles	Supported	Not Available	Not Available
IBM AT Notebook	Supported	Not Available	Not Available

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Zebra Technologies Corporation, Inc.  
3 Overlook Point  
Lincolnshire, IL 60069, U.S.A.  
[www.zebra.com](http://www.zebra.com)

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