LS 4000i Series

Product Reference Guide

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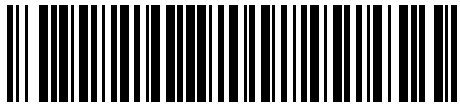

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Revision A — October 2000

Symbol Technologies, Inc. One Symbol Plaza, Holtsville N.Y. 11742-1300

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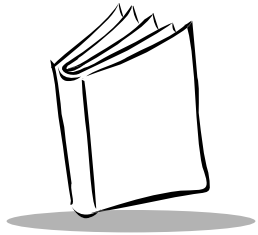

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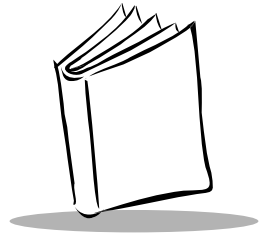

About This Manual

The *LS 4000i Series Product Reference Guide* provides general instructions for setup, operation, troubleshooting, maintenance, and programming of the LS 4000i Series scanners.

Chapter Descriptions

Topics covered in this guide are as follows:

- Chapter 1, *LS 4000i Series Scanners*, describes the different types of scanners and their functionality.
- Chapter 2, *Set Up*, explains how to unpack and set up your scanner.
- Chapter 3, *Scanning*, explains how to scan 1-D and 2-D bar codes.
- Chapter 4, *Maintenance & Specifications*, explains how to maintain your scanner and lists the available accessories, and provides the scanner technical specifications, decode zones, beeper indications, and troubleshooting.
- Chapter 5, *Parameter Menus*, provides you with the bar codes necessary to program your scanner.
- Appendix A, *Programming Reference*, provides you with the AIM code identifiers, prefix/suffix values, ASCII character set, GUI shift keys (LS 4007i only), and keyboard maps.

Notational Conventions

The following conventions are used in this document:

- LS 400Xi refers to the LS 4004i, LS 4005i, LS 4006i, and LS 4007i, unless specifically noted.
- Italics are used to highlight specific items in the general text, and to identify chapters and sections in this and related documents.
- Bullets (•) indicate:
  - action items
  - lists of alternatives
  - lists of required steps that are not necessarily sequential
- Sequential lists (e.g., those that describe step-by-step procedures) appear as numbered lists.

Related Publications

- *LS 400Xi Quick Reference Guide*, p/n 70-33849-xx
- *LS 4000 and LS 400Xi Series Advanced Programmer's Guide,* p/n 70-35834-xx

Service Information

If you have a problem with your equipment, contact the *Symbol Support Center* for your region. See page xi for contact information. Before calling, have the model number, serial number, and several of your bar code symbols at hand.

Call the Support Center from a phone near the scanning equipment so that the service person can try to talk you through your problem. If the equipment is found to be working properly and the problem is symbol readability, the Support Center will request samples of your bar codes for analysis at our plant.

If your problem cannot be solved over the phone, you may need to return your equipment for servicing. If that is necessary, you will be given specific directions.

Note: *Symbol Technologies 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 the*

original shipping container was not kept, contact Symbol to have another sent to you.

Symbol Support Center

For service information, warranty information or technical assistance contact or call the Symbol Support Center in:

United States

Symbol Technologies, Inc.
One Symbol Plaza
Holtsville, New York 11742-1300
1-800-653-5350

Canada

Symbol Technologies Canada, Inc.
2540 Matheson Boulevard East
Mississauga, Ontario, Canada L4W 4Z2
905-629-7226

United Kingdom

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Winnersh Triangle, Berkshire RG41 5TP
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0800 328 2424 (Inside UK)
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Solna
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84452900 (Inside Sweden)
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If you purchased your Symbol product from a Symbol Business Partner, contact that Business Partner for service.

Warranty

Symbol Technologies, Inc (“Symbol”) manufactures its hardware products in accordance with industry-standard practices. Symbol warrants that for a period of sixty (60) months from date of shipment, products will be free from defects in materials and workmanship.

This warranty is provided to the original owner only and is not transferable to any third party. It shall not apply to any product (i) which has been repaired or altered unless done or approved by Symbol, (ii) which has not been maintained in accordance with any operating or handling instructions supplied by Symbol, (iii) which has been subjected to unusual physical or electrical stress, misuse, abuse, power shortage, negligence or accident or (iv) which has been used other than in accordance with the product operating and handling instructions. Preventive maintenance is the responsibility of customer and is not covered under this warranty.

Wear items and accessories having a Symbol serial number, will carry a 90-day limited warranty. Non-serialized items will carry a 30-day limited warranty.

Warranty Coverage and Procedure

During the warranty period, Symbol will repair or replace defective products returned to Symbol's manufacturing plant in the US. For warranty service in North America, call the Symbol Support Center at 1-800-653-5350. International customers should contact the local Symbol office or support center. If warranty service is required, Symbol will issue a Return Material Authorization Number. Products must be shipped in the original or comparable packaging, shipping and insurance charges prepaid. Symbol will ship the repaired or replacement product freight and insurance prepaid in North America. Shipments from the US or other locations will be made F.O.B. Symbol's manufacturing plant.

Symbol will use new or refurbished parts at its discretion and will own all parts removed from repaired products. Customer will pay for the replacement product in case it does not return the replaced product to Symbol within 3 days of receipt of the replacement product. The process for return and customer's charges will be in accordance with Symbol's Exchange Policy in effect at the time of the exchange.

Customer accepts full responsibility for its software and data including the appropriate backup thereof.

Repair or replacement of a product during warranty will not extend the original warranty term.

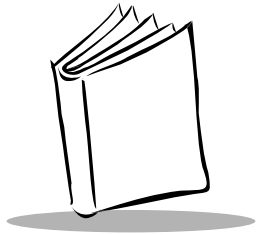
Symbol's Customer Service organization offers an array of service plans, such as on-site, depot, or phone support, that can be implemented to meet customer's special operational requirements and are available at a substantial discount during warranty period.

General

Except for the warranties stated above, Symbol disclaims all warranties, express or implied, on products furnished hereunder, including without limitation implied warranties of merchantability and fitness for a particular purpose. The stated express warranties are in lieu of all obligations or liabilities on part of Symbol for damages, including without limitation, special, indirect, or consequential damages arising out of or in connection with the use or performance of the product.

Seller's liability for damages to buyer or others resulting from the use of any product, shall in no way exceed the purchase price of said product, except in instances of injury to persons or property.

Some states (or jurisdictions) do not allow the exclusion or limitation of incidental or consequential damages, so the proceeding exclusion or limitation may not apply to you.



Chapter 1
LS 4000i Series Scanners

Introduction

Symbol Technologies, the world leader in hand-held laser scanning, now offers 21st century technology while maintaining compatibility with today's existing systems. The LS 4000i Series hand-held laser scanners offer the best performance in retail and light industrial applications. Advanced ergonomic design ensures comfortable use for extended periods of time.

The LS 400Xi uses a 650nm laser diode for improved scan line visibility, and has a scan rate of approximately 100 scans/second. These factors combined make the LS 400Xi even more aggressive on 1-D bar codes, and also offer entry-level PDF scanning.

The LS 400Xi is intended for applications where 1-D scanning is a priority, with an occasional need to scan PDF symbols. The product is ideal for applications such as point-of-sale where the majority of scanning is items with UPC or EAN/JAN bar codes, with an occasional scan of a PDF symbol on a courtesy card, a coupon, etc.

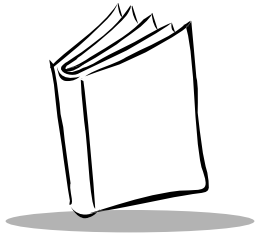
Here's what the LS 4000i Series offers you:

- **The LS 4004i** contains onboard discrete RS-232C communications for connecting to RS-232C asynchronous terminals and host systems. It also accommodates any of the Synapse™ "Smart Cables" which allows you to connect to a wide variety of host systems.
- **The LS 4005i** is fully compatible with the entire line of IBM 468X/469X terminals. It also accommodates the full line of Synapse Smart Cables.
- **The LS 4006i** scanner is a keyboard "wedge" interface which adds efficient bar code reading to your PC. Because scanned data is transmitted as keystrokes, no

software changes to the host system are necessary. The LS 4006i scanner contains on-board discrete keyboard wedge communications for connecting to PCs, and can accommodate any Synapse Smart Cable which allows connection to virtually any host.

- **The LS 4007i** connects to USB-capable host systems, including:
  - Desktop PCs and Notebooks
  - Apple™ iMac, G4, iBooks
  - IBM SurePOS terminals
  - Network computers.

  It also accommodates the full line of Synapse Smart cables.



Chapter 2
Set Up

Introduction

This chapter explains how to unpack and setup your LS 400Xi. The information for each scanner model is described under the scanner model heading.

General

Unpacking

Remove the scanner from its packing and inspect it for damage. If the scanner was damaged in transit, call the *Symbol Support Center* at one of the telephone numbers listed on page xi. KEEP THE PACKING. It is the approved shipping container and should be used if you need to return your equipment for servicing.

Scanner Cable

Installing the Cable

1. Switch off all devices connected to the cable.

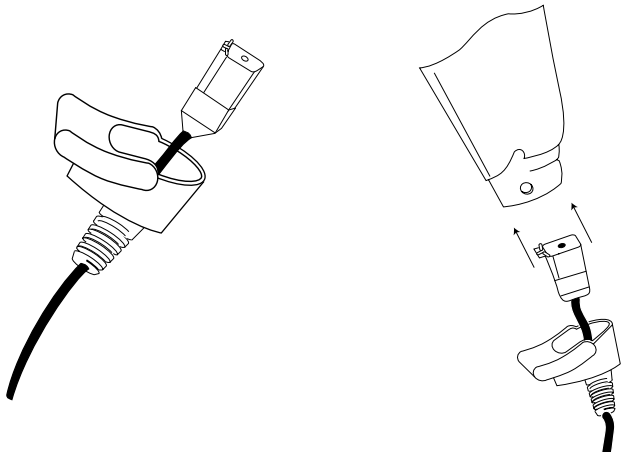


Figure 2-1. Scanner Cable

2. Pull the boot up over the cable until just the connector is protruding.
3. Plug the modular connector on the cable into the receptacle in the bottom of the LS 400Xi handle. Listen for a click.
4. Gently tug the cable to ensure the connector is properly secured.
5. Slide the boot up while observing its orientation until it is securely in place.

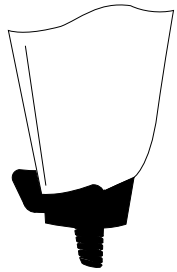


Figure 2-2. Boot Securely in Place

6. Make certain the semi-circular key on the boot slides inside the handle assembly, and that the boot snaps into place.
7. Gently pull the boot to be sure it is properly seated.

Switching Cables

Different cables are required for different hosts. To change the scanner cable:

1. Slide the boot down over the cable.
2. Unplug the modular connector by depressing the connector clip (through the access hole), and remove existing cable.
3. Follow steps for *Installing the Cable* on page 2-1.

LS 4004i

Power Options

Three power options are available:

- External power supply
- Battery box
- Direct host power.

Available power options are host dependent.

Battery Box Operation

When using the LS 4004i with a battery box, use either an alkaline battery (recommended), or a nickel-cadmium rechargeable battery.

Changing the Battery

1. To open the battery box, push up on the flanges at one end of the pack.
2. Remove the old battery.
3. Insert the new or recharged 9-volt battery into the battery box. Match the positive (+) and negative (-) terminals on the battery with the corresponding terminals in the battery box.

Recharging a Nickel-Cadmium Battery

Remove the battery from the battery box and place it in the recharging unit (not supplied by Symbol).

To recharge the battery, follow the instructions supplied with the recharging unit.

Connecting to a Host: 1-D Scanning

With some terminals, the scanner is unable to answer host terminal polls until the appropriate host type is selected. If the appropriate host type is not selected, the connected host may generate an error message. To correct this, select the proper parameter set and initialize the host terminal. See *Chapter 5* for more information.

RS-232C

Direct RS-232

For direct RS-232 connection, plug the LS 4004i interface cable directly into the scanner port on the back of the host. If necessary, connect a power supply to the host connector.

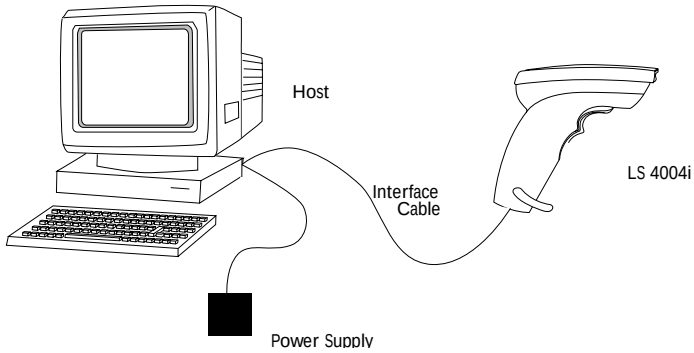


Figure 2-3. Direct RS-232 Configuration

External Power Operation with Single-Piece Cable

1. Plug the scanner into the appropriate port on the host device.
2. Connect the power supply to the power port on the cable. Depending on the cable being used, this is located on a “lump” on the cable or the cable’s host connector.

RS-232 via Synapse

To set up your RS-232 system via Synapse:

1. Connect the Synapse Smart Cable to the host.
2. Connect the Synapse Adapter cable to the Synapse cable, and the other end to the scanner.

3. If necessary, plug a power supply into the power port on the Synapse cable.

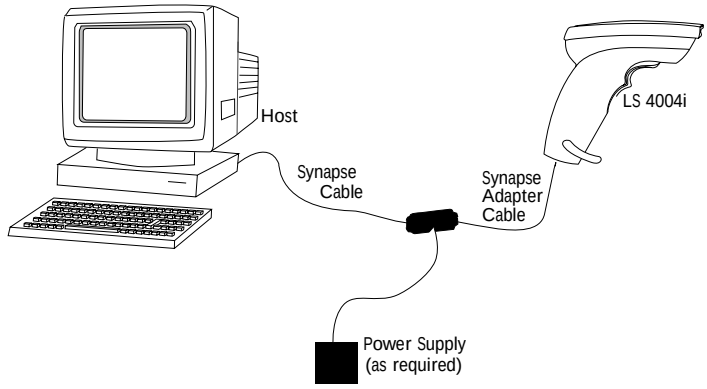


Figure 2-4. RS-232 via Synapse Configuration

RS-232C Battery Operation

1. Insert a 9-volt battery into the battery box. Refer to *Power Supply Requirements* on page 2-8.
2. Plug the 9-pin connector at the end of the scanner's coil cord into one end of the battery box.
3. Connect one end of the output cable to the battery box and the other end to the appropriate port on the RS-232C host device.

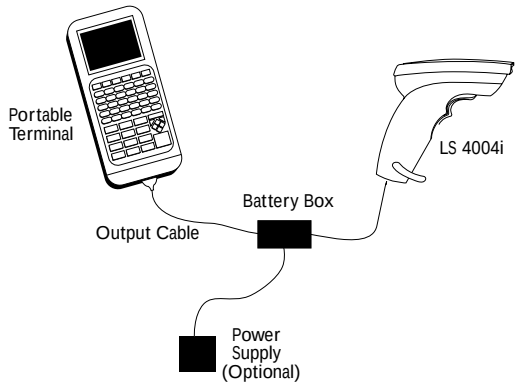


Figure 2-5. RS-232C Battery Operation Configuration

Note: *All RS-232 cables have a power receptacle on the side of the connector assembly.*

LS 4005i

Power Options

The LS 4005i uses direct host power. Available power options are host dependent.

Connecting to a Host: 1-D Scanning

With some terminals, the scanner is unable to answer host terminal polls until the appropriate host type is selected. If the appropriate host type is not selected, the connected host may generate an error message. To correct this, select the proper parameter set and initialize the host terminal. See *Chapter 5* for more information.

IBM 468X/9X (LS 4005i)

Plug the SDL modular connector at the end of the selected scanner cable into the appropriate port (**5, 5B**, **9B**, **9C**, **9E**, or **17**). Check that the connection is secure. No additional power connections are necessary. Figures 2-7 through 2-10 show the rear of the IBM terminals with the covers removed. Note that the unit may be connected to one hardware port, and configured for a different software port using the bar codes in *IBM 46XX Host Types* on page 5-7. The hardware ports available determine how the unit is connected to the host, while the software port configuration determines how it communicates.

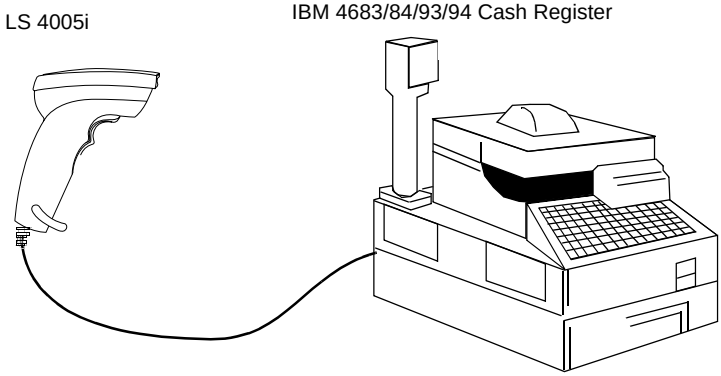


Figure 2-6. Typical System Configuration

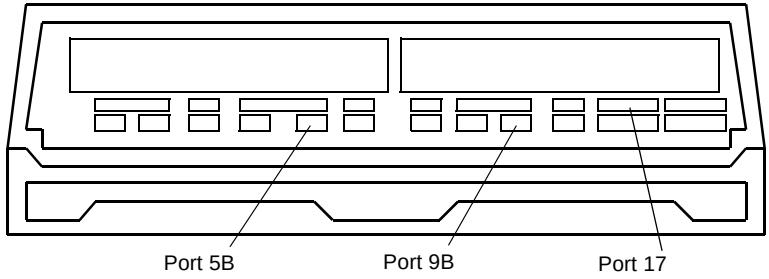


Figure 2-7. IBM 4683 Rear Panel With Cover Removed

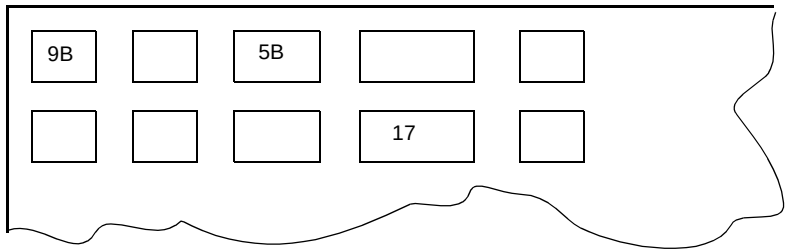


Figure 2-8. IBM 4684 Rear Panel With Cover Removed

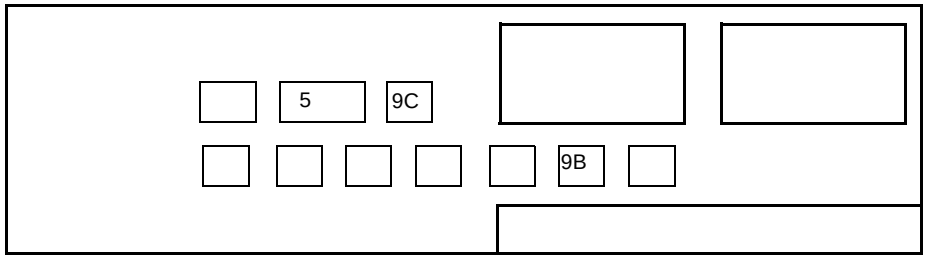


Figure 2-9. IBM 4693 Rear Panel With Cover Removed

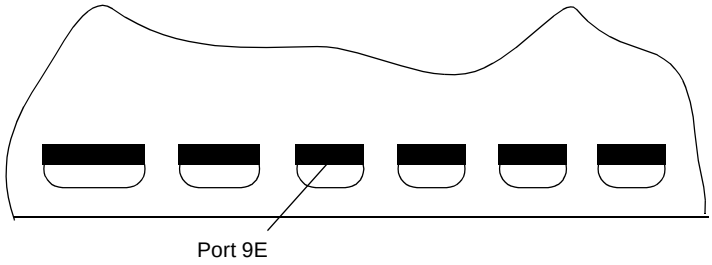


Figure 2-10. IBM 4694 Rear Panel With Cover Removed

LS 4006i

Power Options

Three power options are available:

- External power supply
- Battery box
- Direct host power.

Available power options are host dependent.

Power Supply Requirements

The following terminals are supported by the LS 4006i. Because system configurations vary, certain hosts may not provide enough power for the scanner to operate. In these systems, the scanner requires a power supply. If your host is listed in the first column below, contact your Symbol representative to see if a power supply is needed for your system.

May Require Power Supply	**Will Require Power Supply**
IBM PC/AT and compatibles IBM PS/2-50, 55SX, 60, 70, 80 IBM PC/XT and compatibles IBM PS/2-30	NCR 7052

Connecting to a Host: 1-D Scanning

With some terminals, the scanner is unable to answer host terminal polls until the appropriate host type is selected. If the appropriate host type is not selected, the connected host may generate an error message.To correct this, select the proper parameter set and initialize the host terminal. See *Chapter 5* for more information.

Keyboard Wedge

The following illustrates a typical keyboard wedge setup for the LS 4006i scanner.

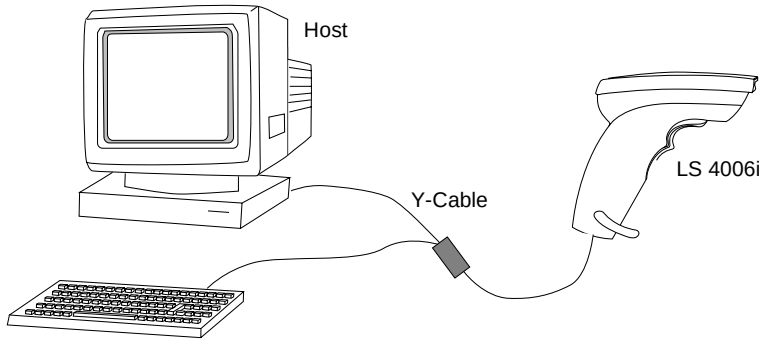


Figure 2-11. Keyboard Wedge Configuration

LS 4007i

Power Options

The LS 4007i uses direct host power. Available power options are host dependent.

Connecting to a Host: 1-D Scanning

With some terminals, the scanner is unable to answer host terminal polls until the appropriate host type is selected. If the appropriate host type is not selected, the connected host may generate an error message.To correct this, select the proper parameter set and initialize the host terminal. See *Chapter 5* for more information.

Universal Serial Bus (USB)

The LS 4007i connects through the USB and operates with USB capable hosts including:

- Desktop PCs and Notebooks
- Apple™ iMac, G4, iBooks
- IBM SurePOS terminals
- Network computers

The following operating systems support the LS 4007i through USB:

- Windows 98, 2000, ME
- MacOS 8.0 and above
- 4690 OS v2.3 and above.

Ask your vendor if your host supports USB, and if your version of the operating system supports USB. For more information on USB technology, hosts, and peripheral devices, visit *www.usb.org*.

Bus Power

An additional power supply is not required to operate the LS 4007i since the USB host or self-powered hub provides enough power.

To set up your LS 4007i:

1. Connect the cable to the scanner.
2. Plug the series A connector in the USB host or hub, or plug the power+ connector in an available teal colored port at the back of the IBM SurePOS terminal.

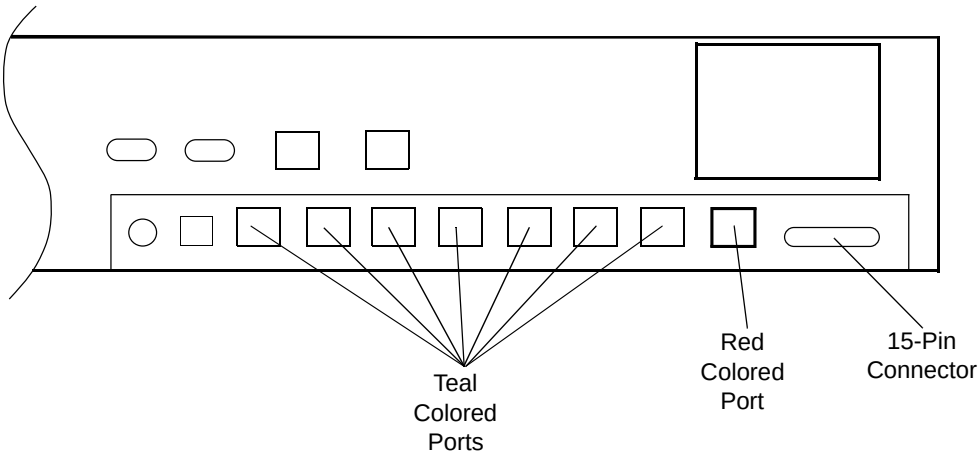


Figure 2-12. IBM SurePOS Rear Panel

3. Select the USB device type. See ***USB Device Type*** on page 5-99.
4. On first installation when using Windows, the software prompts you to select or install the USB device driver. Follow the installation instructions on the screen. The scanner powers up during this installation.
5. When using an HID keyboard, not a North American keyboard, scan the appropriate country bar code under ***Country Selection*** on page 5-102.

If you are having any problems with your system, see *Troubleshooting* on page 4-9.

Connecting to a Host: PDF Scanning

PDF417 is only supported by the following host types:

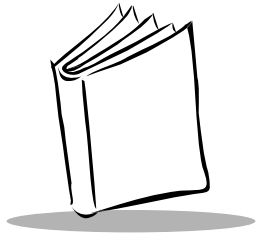
- Direct RS-232 (refer to *Direct RS-232* on page 2-4)
- RS-232 via Synapse (refer to *RS-232 via Synapse* on page 2-4)
- Keyboard Wedge (refer to *Keyboard Wedge* on page 2-9)
- Keyboard Wedge via Synapse.
- USB (refer to *Universal Serial Bus (USB)* on page 2-9)
- USB via Synapse

The RS-232 host types that support PDF417 are:

- Standard RS-232C
- PDT 3300.

Refer to *Host Type* on page 5-7 for more information.

Note: *PDF417 is not enabled by default. Scan the parameter bar code Enable PDF417 on page 5-76 to enable PDF417 scanning capabilities.*



Chapter 3
Scanning

Scanning 1-D Bar Codes

To scan a 1-D bar code:

1. Make sure all connections are secure, and the symbol you want to scan is within the scanning range (refer to *Technical Specifications* on page 4-3).
2. Aim the scanner at the symbol and press the trigger. The scanning beam remains on for approximately 3.0 seconds (default) or until a successful decode.

The scanner has read the symbol when:

- You hear a short, high tone beep (if the beeper is enabled).
- The yellow LED on the rear of the scanner turns green.

The green LED stays lit for two seconds or until the next trigger pull.

Aiming

Scan the Entire Symbol

- Cross every bar and space of the symbol with the scan beam.
- Hold the scanner further away for larger bar codes.
- Hold the scanner closer for symbols with bars that are close together.

Hold at an Angle

Do not hold the scanner directly over the bar code. Laser light reflecting *directly* back into the scanner from the bar code is known as specular reflection. This strong light can “blind” the scanner and make decoding difficult. The area where specular reflection occurs is known as a “dead zone.”

You can tilt the scanner up to 65° forward or back and still achieve a successful decode (Figure 3-1.) Simple practice quickly shows what tolerances to work within.

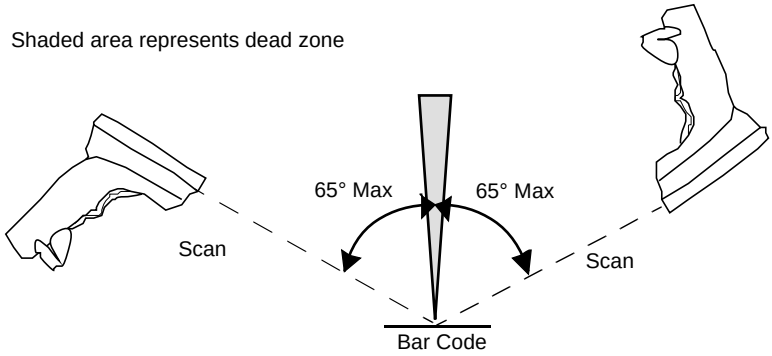


Figure 3-1. Maximum Tilt Angles and Dead Zone

Scanning PDF417 (2-D) Bar Codes

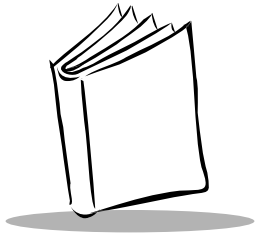
Before scanning a PDF bar code, enable PDF417 scanning using the parameter bar code in *Enable/Disable PDF417 on page 5-76*.

1. Aim the scanner at the PDF bar code and press the trigger.
2. Hold the trigger down and keep the scan line parallel to the rows of the symbol.
3. Manually raster the scan line by slowly moving the scanner up and down so it scans the entire bar code.

If PDF Decode Feedback is enabled, an audible feedback “clicking” lets you know the bar code is being decoded. If this parameter is enabled but there’s no clicking noise when you’re scanning the bar code, it’s not being scanned properly.

- Check that PDF417 scanning is enabled.
- Make sure the scan line extends at least 1/2” past the left and right edges of the bar code.
- Hold the scanner closer for denser symbols, farther away for larger symbols.
- Make sure you scan the top and bottom rows of the symbol.
- Be patient - it may take a few attempts to decode the symbol.

The bar code has been completely decoded when you hear a tone, followed by a short, high tone beep. The yellow LED on the rear of the scanner turns green. The green LED stays lit for two seconds or until the next trigger pull.



Chapter 4
Maintenance & Specifications

Maintenance

Cleaning the exit window is the only maintenance required.

- Do not allow any abrasive material to touch the window.
- Remove any dirt particles with a damp cloth.
- Wipe the window using a damp cloth, and if necessary, a non-ammonia based detergent.
- Do not spray water or other cleaning liquids directly into the window.

Accessories

LS 4000i Series scanners are sent as a package with required accessories. Optional accessories are available at extra cost.

Standard Accessories

LS 400Xi Quick Reference Guide p/n 70-33849-xx
LS 4000i Series Product Reference Guide p/n 70-37898-xx
Shipping Box p/n 50-01400-184

Optional Accessories

Optional accessories include various stands and holders which are supplied at extra cost. Additional units of standard accessories may also be purchased at extra cost.

Miscellaneous

Protective Boot (can attach to Pulley) p/n 11-17265-01
Holster p/n 20-08897-02
Holder Assembly (Desktop/Countertop) p/n 20-16547-01
Holder Assembly (Wall/Side of Counter Mount) p/n 20-16854-01
Hands Free IntelliStand
(User Adjustable, 5 - 10 inches) p/n 20-16561-01

Technical Specifications

Table 4-1. Technical Specifications

Item		Description
Power Requirements*		
LS 4004i	**RS-232C/Synapse** **Low Power**	4.8 to 14 VDC (max) 180 mA @ 5V typical 4.8 to 14 VDC (max) 2 mA @ 5V typical
LS 4005i	**IBM 46XX/Synapse**	4.8 to 14 VDC (max) 200 mA @ 5V typical
LS 4006i	**Keyboard Wedge/ Synapse**	4.8 to 14 VDC (max) 200 mA @ 5V typical
LS 4007i	**USB/Synapse** **Suspend**	4.625 to 5.25 VDC (max) 200 mA @ 5V typical 4.625 to 5.25 VDC (max) <500 µA @ 5V typical
Decode Capability		The LS 400Xi can be programmed to decode the following code types: UPC/EAN, Bookland EAN, Code 39, Code 39 Full ASCII, Trioptic Code 39, Code 93, Codabar, Interleaved 2 of 5, Code 128, EAN 128, Discrete 2 of 5, MSI Plessey, and PDF417. Set code length(s) for any linear code type. The LS 400Xi can autodiscriminate between all these code types except for Code 39 and Code 39 Full ASCII. Transmission of decoded information depends on the capabilities of the attached terminal.
Beeper Operation		User-selectable: Enabled, Disabled
Scan Repetition Rate		100 scans/sec (bidirectional)
Scan Angle		30°
Roll (Skew) Tolerance		± 10° from normal
Pitch		± 65° from normal
Yaw		± 60° from normal
1-D Decode Depth of Field		See *LS 400Xi 1-D Decode Zone* on page 4-5
2-D Decode Depth of Field		See *LS 400Xi 2-D Decode Zone* on page 4-6
Print Contrast Minimum		20% absolute dark/light differential, measured at 675 nm.
*For direct host power connection, make sure the host terminal supplies sufficient power for the specified operation. Symbol is not responsible for damage to host equipment or system mis-operation due to an insufficient power condition.		

Table 4-1. Technical Specifications (Continued)

Item	Description
Ambient Light Immunity **Artificial Lighting** **Sunlight**	 200 ft. candles 2153 lux 8000 ft. candles86112 lux (@8 in. (20 cm) on low density bar codes)
Operating Temperature	32° to 104°F0° to 40°C
Storage Temperature	-40° to 140°F-40° to 60°C
Humidity	5% to 95% (non-condensing)
Coil Cable Length	9-12 ft. 274-365 cm (depending on host)
Durability	4-ft. drop to concrete1.2 m
Dimensions **Height** **Length** **Width**	 6.3 in.16 cm 5 in.12.7 cm 2.8 in.7.1 cm
Laser Classifications	CDRH Class II IEC Class 1 IEC 825 Class 2
Laser Power	.92 mW ±5%

LS 400Xi 1-D Decode Zone

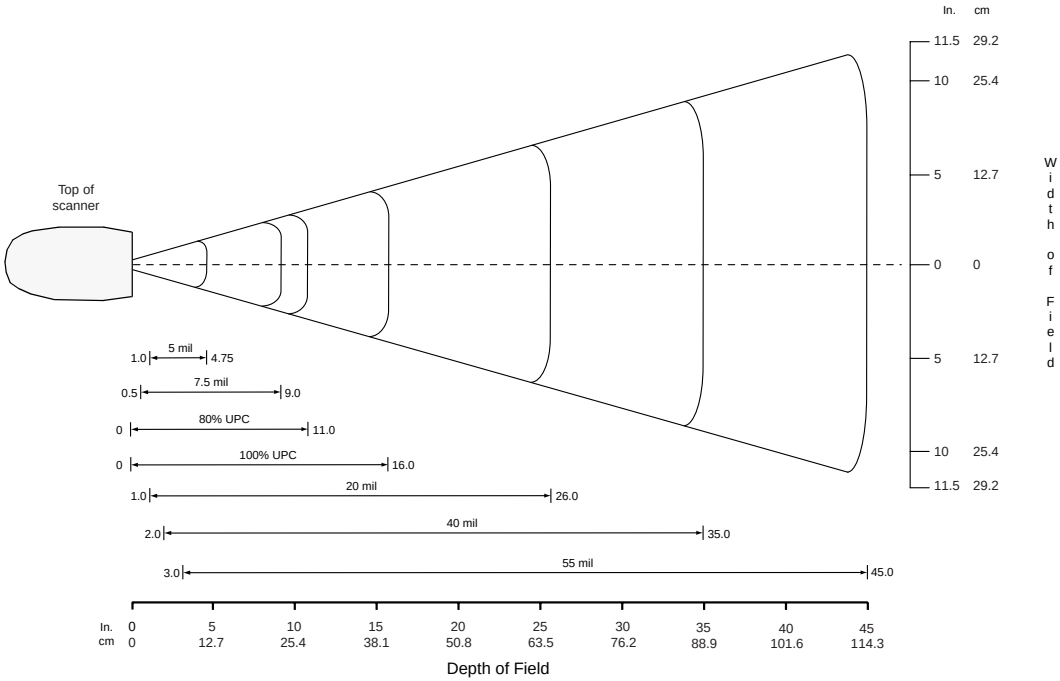


Figure 4-1. LS 400Xi 1-D Decode Zone

LS 400Xi 2-D Decode Zone

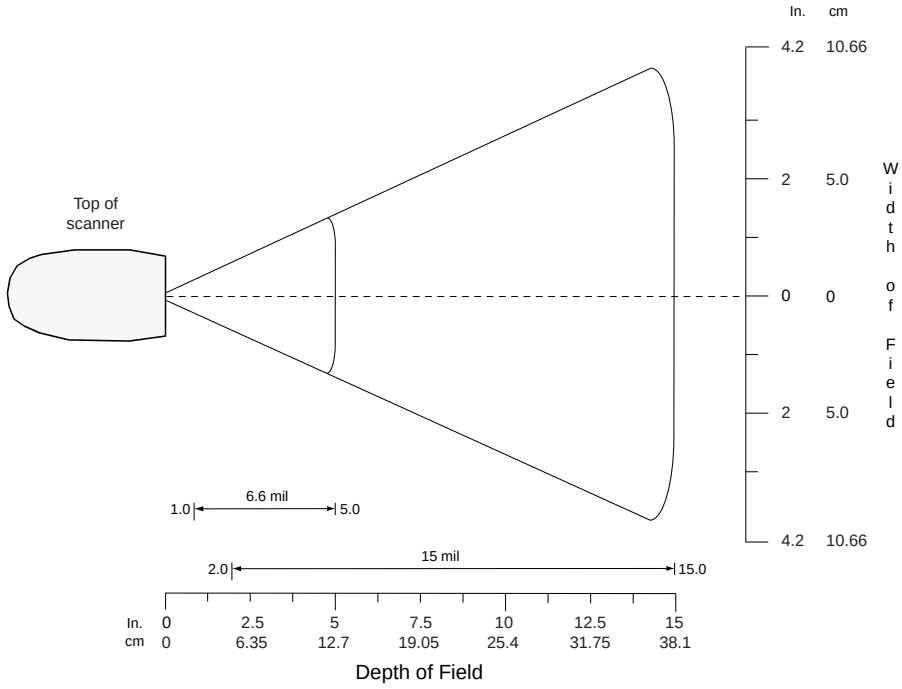


Figure 4-2. LS 400Xi 2-D Decode Zone

Note: *The measurements above are for 6.6 mil, 100 character PDF bar code and 15 mil, 64 character PDF bar code.*

Pin-outs

Table 4-2. Pin-outs

Pin	LS 4004i	LS 4005i	LS 4005i with EAS	LS 4006i	LS 4007i
1	Reserved	Reserved	Reserved	Reserved	Reserved
2	Power	Power	Power	Power	Power/V_{Bus}
3	Ground	Ground	Ground	Ground	Ground
4	Synapse Data	Synapse Data	Synapse Data	Synapse Data	Synapse Data
5	Synapse Clock	Synapse Clock	Synapse Clock	Synapse Clock	Synapse Clock
6	RxD	B IBM SERIAL	B IBM SERIAL	Keyboard Clock	D^-
7	TxD	A IBM SERIAL	A IBM SERIAL	Terminal Clock	D^+
8	DTR	Not used	Shield	Shield	Shield
9	CTS	Not used	EAS 1	Keyboard Data	Reserved
10	RTS	Not used	EAS 2	Terminal Data	Cable ID

Beeper Indications

Table 4-3. Beeper Indications

Beeper Sequence	Indication
Standard Use	
Short high tone	A bar code symbol was decoded (if decode beeper is enabled).
Low tone, followed by short high tone	A PDF417 bar code symbol was decoded (if decode beeper is enabled).
Clicking	A PDF417 bar code symbol is being decoded (if *PDF Decode Feedback* is enabled).
4 Beeps - long low tone	A transmission error has been detected in a scanned symbol. The data is ignored. This occurs if a unit is not properly configured. Check option settings.
5 Beeps - low tone	Convert or format error.
Low/high/low tone	ADF transmit error.
High/high/high/low tone	RS-232 receive error.
High/high/high/high tone	Transmit error. Scanner has not completed initializing between scans. Wait several seconds and scan again.
Parameter Menu Scanning	
Short high tone	Correct entry scanned or correct menu sequence performed.
Low/high tone	Input error, incorrect bar code or “Cancel” scanned, wrong entry, incorrect bar code programming sequence; remain in program mode.
High/low tone	Keyboard parameter selected. Enter value using bar code keypad.
High/low/high/low tone	Successful program exit with change in the parameter setting.
Scanner gives a reset beep after scanning a USB Device Type	Communication with the bus must be established before the scanner can operate at the highest power level.

Table 4-3. Beeper Indications (Continued)

The reset beep occurs more than once	The USB bus may put the scanner in a state where power to the scanner is cycled on and off more than once. This is normal and usually happens when the PC cold boots.
Code 39 Buffering	
Hi/lo tone	New Code 39 data was entered into the buffer.
3 Beeps - long high tone	Code 39 buffer is full.
Lo/hi/lo tone	The buffer was erased, or there was an attempt to transmit an empty buffer. When the Code 39 buffer was empty, the scanner read a command to clear or to transmit a Code 39 buffer.
4 Beeps - long low tone	Error in data transmission.
Lo/hi tone	A successful transmission of buffered data.

Troubleshooting

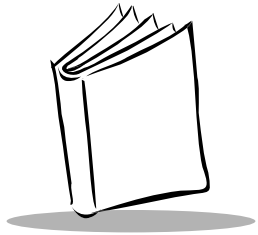
Table 4-4. Troubleshooting

Problem	Possible Solutions
Nothing happens when you follow the operating instructions.	Check the system power. Ensure there is a battery in the battery box. Be sure the scanner is programmed for the terminal in use. Make sure the scanner is programmed to read the type of bar code you are scanning. Check for loose cable connections. Check the symbol to make sure it is not defaced. Try scanning test symbols of the same code type.
Symbol is decoded, but not transmitted to the host terminal.	Be sure the proper host type is selected (See *Chapter 5*).

Table 4-4. Troubleshooting (Continued)

Problem	Possible Solutions
Scanned data is incorrectly displayed on the terminal.	Make sure the system is programmed for the correct keyboard type. Make sure the CAPS LOCK key is off. Be sure the proper host is selected. Be sure editing options (e.g., UPC-E to UPC-A Conversion) are properly programmed.
For the LS 4007i (USB), no data transmits, or incorrect data transmits, or a low/low/low/low tone sounds.	Check cable connection to scanner and host. Make sure the correct device options and country code parameters are set for the currently attached scanner. Increase Intercharacter Delay.
Parameters are not working.	Make sure you scan the parameters from the correct section in this guide. If you scanned a Set Defaults bar code, re-enter your parameters.
Scanner displays erratic behavior (laser doesn't come on, scanner emits frequent beeps).	Make sure your scanner can communicate with your host type.

Note: *If after performing these checks the symbol still does not scan, contact your distributor or call the Symbol Support Center. See page xi for the telephone number.*



Chapter 5
Parameter Menus

Operational Parameters

LS 400Xi scanners are shipped with the settings shown in *Default Parameters* on page 5-1. You can change these parameter values or settings by scanning the appropriate bar codes included in this chapter. These parameter values are stored in non-volatile memory and are preserved even when the scanner is powered down. The default parameter values can be recalled by scanning the *Set All Defaults* bar code on page 5-6.

Note: *The ability to scan PDF417 bar codes is not enabled by default. You must program the scanner to read PDF417 bar codes by scanning the Enable PDF417 bar code on page 5-76.*

Even if the default parameters suit your needs, if you are not using a Synapse cable you must select a terminal type. After you hear the power-up beeps, select a host type, which begin on page 5-7.

The following table lists the defaults for all parameters. If you wish to change any option, scan the appropriate bar code(s).

Table 5-1. Default Parameters

Parameter	Default	Page Number
Set Default Parameter	All Defaults	5-6
Host Type	See page 5-1	5-7
Beeper Tone	High Frequency	5-12

Table 5-1. Default Parameters (Continued)

Parameter	Default	Page Number
Beeper Volume	High	5-13
Laser On Time	3.0 seconds	5-14
Power Mode	Low Power	5-15
Beep After Good Decode	Enable	5-16
Transmit “No Read” Message	Disable	5-17
PDF Decode Feedback	Enable	5-18
Linear Code Type Security Levels	1	5-19
Bi-directional Redundancy	Disable	5-21
UPC/EAN		
UPC-A	Enable	5-22
UPC-E	Enable	5-22
UPC-E1	Disable	5-22
EAN-8	Enable	5-23
EAN-13	Enable	5-23
Bookland EAN	Disable	5-24
Decode UPC/EAN Supplementals	Ignore	5-25
Decode UPC/EAN Supplemental Redundancy	7	5-26
Transmit UPC-A Check Digit	Enable	5-27
Transmit UPC-E Check Digit	Enable	5-27
Transmit UPC-E1 Check Digit	Enable	5-27
UPC-A Preamble	System Character	5-28
UPC-E Preamble	System Character	5-29
UPC-E1 Preamble	System Character	5-30
Convert UPC-E to A	Disable	5-31
Convert UPC-E1 to A	Disable	5-32
EAN-8 Zero Extend	Disable	5-33

Table 5-1. Default Parameters (Continued)

Parameter	Default	Page Number
Convert EAN-8 to EAN-13 Type	Type is EAN-8	5-34
UPC/EAN Security Levels	0	5-35
UPC/EAN Coupon Code	Disable	5-37
Code 128		
Code 128	Enable	5-38
UCC/EAN-128	Disable	5-39
Code 39		
Code 39	Enable	5-40
Trioptic Code 39	Disable	5-41
Convert Code 39 to Code 32	Disable	5-43
Code 32 Prefix	Disable	5-44
Set Length(s) for Code 39	2 to 55	5-45
Code 39 Check Digit Verification	Disable	5-47
Transmit Code 39 Check Digit	Disable	5-48
Code 39 Full ASCII Conversion	Disable	5-49
Buffer Code 39	Disable	5-50
Code 93		
Code 93	Disable	5-53
Set Length(s) for Code 93	4-55	5-54
Interleaved 2 of 5		
Interleaved 2 of 5	Enable	5-56
Set Length(s) for I 2 of 5	14	5-57
I 2 of 5 Check Digit Verification	Disable	5-59
Transmit I 2 of 5 Check Digit	Disable	5-60
Convert I 2 of 5 to EAN 13	Disable	5-61

Table 5-1. Default Parameters (Continued)

Parameter	Default	Page Number
Discrete 2 of 5		
Discrete 2 of 5	Disable	5-62
Set Length(s) for D 2 of 5	12	5-63
Codabar		
Codabar	Disable	5-65
Set Lengths for Codabar	5-55	5-67
CLSI Editing	Disable	5-68
NOTIS Editing	Disable	5-69
MSI Plessey		
MSI Plessey	Disable	5-70
Set Length(s) for MSI Plessey	Any Length	5-72
MSI Plessey Check Digits	One	5-73
Transmit MSI Plessey Check Digit	Disable	5-74
MSI Plessey Check Digit Algorithm	Mod 10/Mod 10	5-75
PDF		
Enable/Disable PDF	Disable	5-76
Data Options		
Transmit Code ID Character	None	5-78
Pause Duration	0	5-79
Prefix/Suffix Values	7013 (<CR/LF> for serial)	5-80
Scan Data Transmission Format	Data as is	5-81
RS-232C (LS 4004i only)		
RS-232 Host Type	Standard	5-10
Baud Rate	9600	5-84
Parity	None	5-86
Check Receive Errors	Do Not Check	5-86

Table 5-1. Default Parameters (Continued)

Parameter	Default	Page Number
Hardware Handshaking	None	5-87
Software Handshaking	None	5-89
Host Serial Response Time-out	2 Sec.	5-91
RTS Line State	Low	5-91
Stop Bit Select	1	5-92
ASCII Format	8-Bit	5-92
Beep on <BEL>	Disable	5-93
Intercharacter Delay	0	5-93
Keyboard Wedge (LS 4006i only)		
Keyboard Wedge Host Type	IBM PC/AT, PS/2-50,55SX,60,70,80	5-11
Country Selection	North American	5-94
Unknown Characters	Send	5-96
Intercharacter Delay	Short (5 ms)	5-97
Fast Transmit	Enable	5-98
USB (LS 4007i only)		
Set USB Defaults	--	5-99
USB Device Type	IBM Hand-Held USB	5-99
Country Selection	North American, Standard	5-102
Keystroke Delay	No Delay (0 ms)	5-106
CAPS LOCK override	Disable	5-107
Ignore Unknown Characters	Send Bar Codes with Unknown Characters	5-108

Set Default Parameter

Scanning this bar code returns all parameters to the default values listed in Table 5-1 on page 5-1.

Note: *The ability to scan PDF417 bar codes is not enabled by default. You must program the scanner to read PDF417 bar codes by scanning the Enable PDF417 bar code on page 5-76.*

Set All Defaults

Host Type

If you are using a Synapse cable, Synapse auto-detects your host so no host bar codes need to be scanned. Otherwise, see the following sections to select your host.

IBM 46XX Host Types

To select one of the following as a POS Interface, scan the appropriate bar code below.

Note: *To properly communicate with 468X/9X terminals, the driver corresponding to the port being used must be loaded and enabled when you are configuring your terminal system. See your terminal's operating manual for details.*

Port 5B
(non-IBM scanner)

Port 9B
(IBM hand-held scanner)

Port 17
(IBM table top scanner)

RS-232C Host Types

Three RS-232C hosts are set up with their own parameter default settings (Table 5-2). Selecting the ICL, Fujitsu, or Nixdorf RS-232C terminal sets the defaults listed below. These defaults take precedence over standard defaults, and remain selected if the Set Defaults bar code is scanned.

Table 5-2. Terminal Specific RS-232C

Parameter	Standard	ICL	FUJITSU	NIXDORF Mode A/ Mode B	PDT 3300**
Transmit Code ID	No	Yes	Yes	Yes	Yes
Data Transmission Format	Data as is	Data/Suffix	Data/Suffix	Data/Suffix	STX/Data/ ETX/LRC
Suffix	CR/LF (7013)	CR (1013)	CR (1013)	CR (1013)	None
Baud Rate	9600	9600	9600	9600	19200
Parity	None	Even	None	Odd	Even
Hardware Handshaking	None	RTS/CTS Option 3	None	RTS/CTS Option 3	RTS/CTS Standard
Software Handshaking	None	None	None	None	ACK/NAK
Serial Response Time-out	2 Sec.	9.9 Sec.	2 Sec.	9.9 Sec.	9.9 sec.
Stop Bit Select	One	One	One	One	One
ASCII Format	8-Bit	8-Bit	8-Bit	8-Bit	7-Bit
Beep On <BEL>	Disabled	Disabled	Disabled	Disabled	Disabled
RTS Line State	Low	High	Low	*Low = No data to send	Low

*In the Nixdorf Mode B, if CTS is Low, scanning is disabled. When CTS is High, the user can scan bar codes.

**If Nixdorf Mode B or PDT 3300 is scanned without the scanner connected 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 scanner.

RS-232C Host Types (continued)

Selecting the ICL, Fujitsu, or Nixdorf RS-232C terminal enables the transmission of code ID characters as listed in Table 5-3 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 5-3. Terminal Specific Code ID Characters

	ICL	FUJITSU	NIXDORF
UPC-A	A	A	A
UPC-E	E	E	C0
EAN-8	FF	FF	B
EAN-13	F	F	A
Code 39	C <len>	None	M
Codabar	N <len>	None	N
Code 128	L <len>	None	K
I 2 of 5	I <len>	None	I
Code 93	None	None	L
D 2 of 5	H <len>	None	H
UCC/EAN 128	L <len>	None	P
MSI/Plessey	None	None	O
Bookland EAN	F	F	A
Trioptic	None	None	None

RS-232C Host Types (continued)

To select an RS-232C host interface, scan one of the following bar codes. If you are scanning PDF417 bar codes, only Standard RS-232C or PDT 3300 may be selected.

Standard RS-232C

ICL RS-232C

Nixdorf RS-232C Mode A

Nixdorf RS-232C Mode B

Fujitsu RS-232C

PDT 3300

Keyboard Wedge Host Types

To select one of the following as a host interface, scan the appropriate bar code below.

IBM PC/AT
IBM PS/2-50, 55SX, 60, 70, 80
(or compatible)

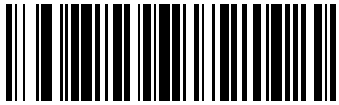
IBM PC/XT

IBM PS/2-30

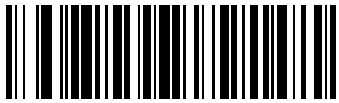
NCR 7052

Beeper Tone

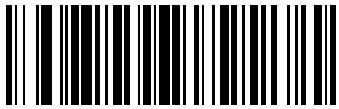
To select a decode beep frequency (tone), scan the **LOW FREQUENCY, MEDIUM FREQUENCY**, or **HIGH FREQUENCY** bar code.



Low Frequency



Medium Frequency



High Frequency

Beeper Volume

To select a beeper volume, scan the **LOW VOLUME, MEDIUM VOLUME**, or **HIGH VOLUME** bar code.

Low Volume

Medium Volume

High Volume

Laser On Time

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.

To set a Laser On Time, scan the bar code below. Next scan two numeric bar codes beginning on page 5-109 that correspond to the desired time on. Single digit numbers must have a leading zero. For example, to set an On Time of .5 seconds, scan the bar code below, then scan the “0” and “5” bar codes. If you make an error, or wish to change your selection, scan **CANCEL** on page 5-111.

Laser On Time

Power Mode

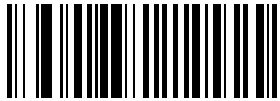
This parameter determines whether or not power remains on after a decode attempt. When in low power mode, the scanner enters into a low power consumption mode to preserve battery life after each decode attempt. When in continuous power mode, power remains on after each decode attempt.

Continuous On

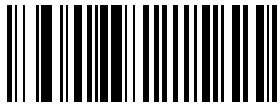
Low Power

Beep After Good Decode

Scan a bar code below to select whether or not the unit beeps after a good decode. If DO NOT BEEP is selected, the beeper still operates during parameter menu scanning and indicates error conditions.



Beep After Good Decode



Do Not Beep After Good Decode

Transmit “No Read” Message

Scan a bar code below to select whether or not a “No Read” message is transmitted. When enabled, if a symbol does not decode, “NR” is transmitted. Any prefixes or suffixes which are enabled are appended around this message. When disabled, if a symbol does not decode, nothing is sent to the host.

Enable No Read

Disable No Read

PDF Decode Feedback

Scan a bar code below to select whether or not the unit “clicks” during PDF417 decoding to indicate proper alignment, motion, and distance.

Enable PDF Decode Feedback

Disable PDF Decode Feedback

Linear Code Type Security Level

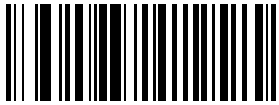
The LS 400Xi offers four levels of decode security for linear code types (e.g., Code 39, Interleaved 2 of 5). Higher security levels are selected for decreasing levels of bar code quality. As security levels increase, the scanner's aggressiveness decreases. Select the security level appropriate for your bar code quality.

Note: *This does not apply to Code 128.*

Linear Security Level 1

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

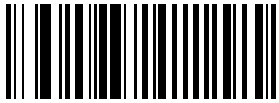
Code Type	Length
Codabar	All
MSI Plessey	4 or less
D 2 of 5	8 or less
I 2 of 5	8 or less



Linear Security Level 1

Linear Security Level 2

All code types must be successfully read twice before being decoded.

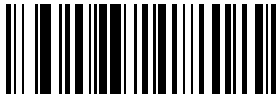


Linear Security Level 2

Linear Security Level 3

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

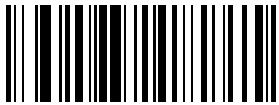
Code Type	Length
MSI Plessey	4 or less
D 2 of 5	8 or less
I 2 of 5	8 or less
Codabar	8 or less



Linear Security Level 3

Linear Security Level 4

All code types must be successfully read three times before being decoded.



Linear Security Level 4

Bi-directional Redundancy

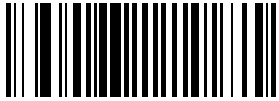
This parameter is only valid when a *Linear Code Type Security Level* (see page 5-19) is enabled. When this parameter is enabled, a bar code must be successfully scanned in both directions (forward and reverse) before being decoded.

Enable Bi-directional Redundancy

Disable Bi-directional Redundancy

Enable/Disable UPC-E/UPC-A/UPC-E1

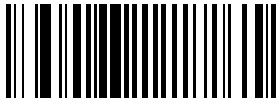
To enable or disable UPC-E, UPC-A or UPC-E1, scan the appropriate bar code below.



Enable UPC-E

Disable UPC-E

Enable UPC-A



Disable UPC-A

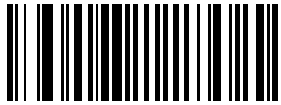
Note: *UPC-E1 symbology is not supported by UCC-EAN and is limited to specific applications.*

Enable UPC-E1

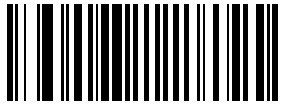
Disable UPC-E1

Enable/Disable EAN-8/EAN-13

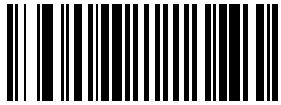
To enable or disable EAN-8 or EAN-13, scan the appropriate bar code below.



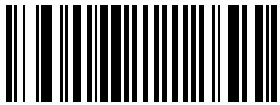
Enable EAN-8



Disable EAN-8



Enable EAN-13



Disable EAN-13

Enable/Disable Bookland EAN

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

Enable Bookland EAN

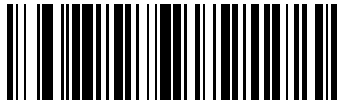
Disable Bookland EAN

Decode UPC/EAN Supplementals

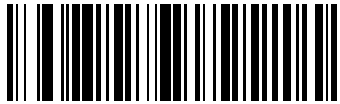
Supplementals are additionally appended characters (2 or 5) according to specific code format conventions (e.g., UPC A+2, UPC E+2, EAN 13+2). Three options are available.

- If UPC/EAN with supplemental characters is selected, UPC/EAN symbols without supplemental characters are not decoded.
- If UPC/EAN without supplemental characters is selected, and the LS 400Xi is presented with a UPC/EAN plus supplemental symbol, the UPC/EAN is decoded and the supplemental characters ignored.
- An autodiscriminate option is also available. If this option is selected, choose an appropriate *Decode UPC/EAN Supplemental Redundancy* value from the next page. A value of 5 or more is recommended.

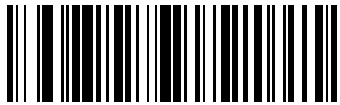
Note: *In order to minimize the risk of invalid data transmission, it is recommended that you select whether to read or ignore supplemental characters.*



Decode UPC/EAN With Supplementals



Ignore UPC/EAN With Supplementals

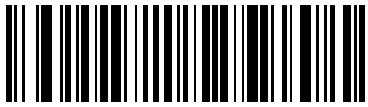


Autodiscriminate UPC/EAN Supplementals

Decode UPC/EAN Supplemental Redundancy

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

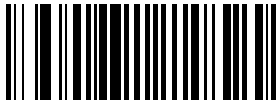
Scan the bar code below to select a decode redundancy value. Next scan two numeric bar codes beginning on page 5-109. Single digit numbers must have a leading zero. If you make an error, or wish to change your selection, scan **CANCEL** on page 5-111.



Decode UPC/EAN
Supplemental Redundancy

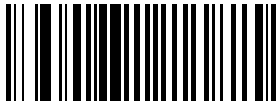
Transmit UPC-A/UPC-E/UPC-E1 Check Digit

Scan the appropriate bar code below to transmit the symbol with or without the UPC-A, UPC-E or UPC-E1 check digit.

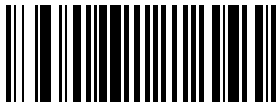


Transmit UPC-A Check Digit

Do Not Transmit UPC-A Check Digit



Transmit UPC-E Check Digit



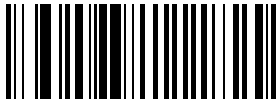
Do Not Transmit UPC-E Check Digit

Transmit UPC-E1 Check Digit

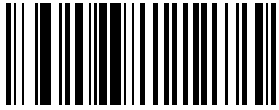
Do Not Transmit UPC-E1 Check Digit

UPC-A Preamble

Three options are given for lead-in characters for UPC-A symbols transmitted to the host device: transmit system character only, transmit system character and country code (“0” for USA), and no preamble transmitted. The lead-in characters are considered part of the symbol.



No Preamble
(<DATA>)

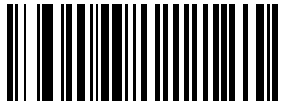


System Character
(<SYSTEM CHARACTER> <DATA>)

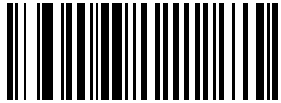
System Character & Country Code
(<COUNTRY CODE> <SYSTEM CHARACTER> <DATA>)

UPC-E Preamble

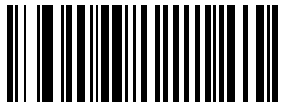
Three options are given for lead-in characters for UPC-E symbols transmitted to the host device: transmit system character only, transmit system character and country code (“0” for USA), and no preamble transmitted. The lead-in characters are considered part of the symbol.



No Preamble
(<DATA>)



System Character
(<SYSTEM CHARACTER> <DATA>)



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

UPC-E1 Preamble

Three options are given for lead-in characters for UPC-E1 symbols transmitted to the host device: transmit system character only, transmit system character and country code (“0” for USA), and no preamble transmitted. The lead-in characters are considered part of the symbol.

No Preamble
(<DATA>)

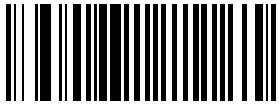
System Character
(<SYSTEM CHARACTER> <DATA>)

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

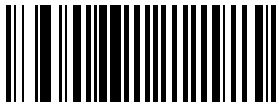
Convert UPC-E to UPC-A

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

Scanning **DO NOT CONVERT UPC-E TO UPC-A** allows you to transmit UPC-E (zero suppressed) decoded data.



Convert UPC-E to UPC-A (Enable)



Do Not Convert UPC-E to UPC-A (Disable)

Convert UPC-E1 to UPC-A

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

Scanning **DO NOT CONVERT UPC-E1 TO UPC-A** allows you to transmit UPC-E1 decoded data.

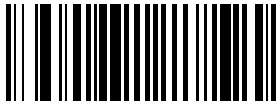
Convert UPC-E1 to UPC-A
(Enable)

Do Not Convert UPC-E1 to UPC-A
(Disable)

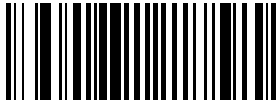
EAN Zero Extend

If this parameter is enabled, five leading zeros are added to decoded EAN-8 symbols to make them compatible in format to EAN-13 symbols.

Disabling this parameter returns EAN-8 symbols to their normal format.



Enable EAN Zero Extend



Disable EAN Zero Extend

Convert EAN-8 to EAN-13 Type

When EAN Zero Extend is enabled, this parameter gives you the option of labeling the extended symbol as either an EAN-13 bar code or an EAN-8 bar code. This affects Transmit Code ID Character.

When EAN Zero Extend is disabled, this parameter has no effect on bar code data.

Type is EAN-8

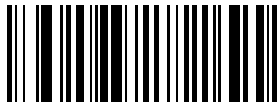
Type is EAN-13

UPC/EAN Security Level

The LS 400Xi offers four levels of decode security for UPC/EAN bar codes. Increasing levels of security are provided for decreasing levels of bar code quality. There is an inverse relationship between security and scanner aggressiveness, so be sure to choose only that level of security necessary for any given application.

UPC/EAN Security Level 0

This is the default setting which allows the scanner to operate in its most aggressive state, while providing sufficient security in decoding “in-spec” UPC/EAN bar codes.



UPC/EAN Security Level 0

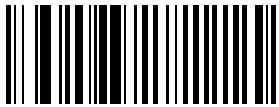
UPC/EAN Security Level 1

As bar code quality levels diminish, certain characters become prone to misdecodes before others (i.e., 1, 2, 7, 8). If you are experiencing misdecodes of poorly printed bar codes, and the misdecodes are limited to these characters, select this security level.

UPC/EAN Security Level 1

UPC/EAN Security Level 2

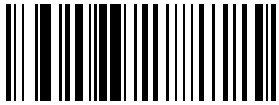
If you are experiencing misdecodes of poorly printed bar codes, and the misdecodes are not limited to characters 1, 2, 7, and 8, select this security level.



UPC/EAN Security Level 2

UPC/EAN Security Level 3

If you have tried Security Level 2, and are still experiencing misdecodes, select this security level. Be advised, selecting this option is an extreme measure against misdecoding severely out of spec bar codes. Selection of this level of security significantly impairs the decoding ability of the scanner. If this level of security is necessary, you should try to improve the quality of your bar codes.

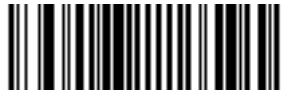


UPC/EAN Security Level 3

UPC/EAN Coupon Code

When enabled, this parameter decodes UPC-A, UPC-A with 2 supplemental characters, UPC-A with 5 supplemental characters, and UCC/EAN 128 bar codes. *Autodiscriminate UPC/EAN With Supplemental Characters* must be enabled.

Enable UPC/EAN Coupon Code

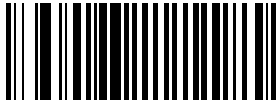


Disable UPC/EAN Coupon Code

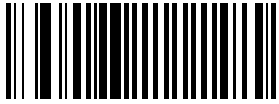
Enable/Disable Code 128

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

Note: *No length setting is required for Code 128.*



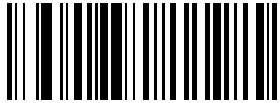
Enable Code 128



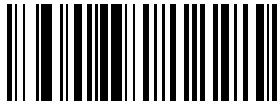
Disable Code 128

Enable/Disable UCC/EAN-128

To enable or disable UCC/EAN-128, scan the appropriate bar code below. (See *Appendix A* for details on *UCC/EAN-128*.)



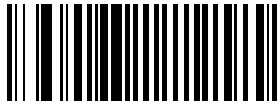
Enable UCC/EAN-128



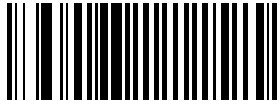
Disable UCC/EAN-128

Enable/Disable Code 39

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



Enable Code 39



Disable Code 39

Enable/Disable Trioptic Code 39

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

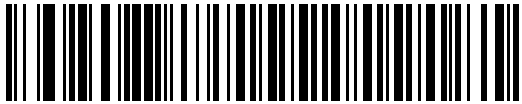
Disable Trioptic Code 39

Note: *Trioptic Code 39 and Code 39 Full ASCII cannot be enabled simultaneously. If you get an error beep when enabling Trioptic Code 39, disable Code 39 Full ASCII and try again.*

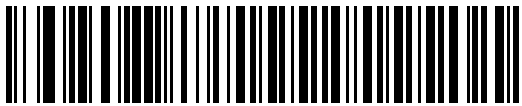
Convert Unsupported Types to Code 39 (LS 4005i Only)

Scan the appropriate bar code below to enable or disable converting unsupported bar code types to Code 39 (port 5B only).

Note: *Code 39 must be enabled in order for this parameter to function.*



Enable Convert Unsupported Types to Code 39



Disable Convert Unsupported Types to Code 39

Convert Code 39 to Code 32

Scan the appropriate bar code below to enable or disable converting Code 39 to Code 32.

Note: *Code 39 must be enabled in order for this parameter to function.*

Enable Convert Code 39 to Code 32

Disable Convert Code 39 to Code 32

Code 32 Prefix

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

Disable Code 32 Prefix

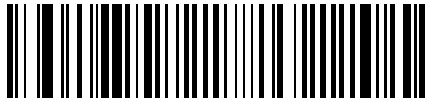
Set Lengths for Code 39

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

One Discrete Length - This option allows you to decode only those codes containing a selected length. For example, if you select **Code 39 One Discrete Length**, then scan **1**, **4**, only Code 39 symbols containing 14 characters are decoded. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

Code 39 - One Discrete Length

Two Discrete Lengths - This option allows you to decode only those codes containing two selected lengths. For example, if you select **Code 39 Two Discrete Lengths**, then scan **0**, **2**, **1**, **4**, only Code 39 symbols containing 2 or 14 characters are decoded. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.



Code 39 - Two Discrete Lengths

Set Lengths for Code 39 (continued)

Length Within Range - This option allows you to decode a code type within a specified range. For example, to decode Code 39 symbols containing between 4 and 12 characters, first scan **Code 39 Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

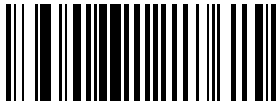
Code 39 - Length Within Range

Any Length - Scanning this option allows you to decode Code 39 symbols containing any number of characters.

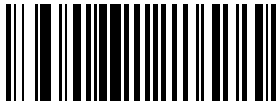
Code 39 - Any Length

Code 39 Check Digit Verification

When enabled, this parameter checks the integrity of a Code 39 symbol to ensure it complies with specified algorithms. Only those Code 39 symbols which include a modulo 43 check digit are decoded when this parameter is enabled.



Enable Code 39 Check Digit Verification



Disable Code 39 Check Digit Verification

Transmit Code 39 Check Digit

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

Transmit Code 39 Check Digit (Enable)

Do Not Transmit Code 39 Check Digit (Disable)

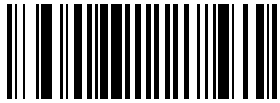
Enable/Disable Code 39 Full ASCII

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

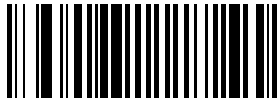
Code 39 Full ASCII interprets the bar code special character ($ + % /) preceding a Code 39 character and assigns an ASCII character value to the pair. For example, when Code 39 Full ASCII is enabled and a **+B** is scanned, it is interpreted as **b**, **%J** as **?**, and **$H** emulates the keystroke **BACKSPACE**. Scanning **ABC$M** outputs the keystroke equivalent of **ABC ENTER**. Refer to Table A-4 in *Appendix A*.

The first 32 codes are non-printable and are assigned to keyboard control characters such as BACKSPACE and RETURN. The other 96 are called printable codes because all but SPACE and DELETE produce visible characters.

The scanner cannot autodiscriminate between Code 39 and Code 39 Full ASCII.



Enable Code 39 Full ASCII



Disable Code 39 Full ASCII

Note: *Trioptic Code 39 and Code 39 Full ASCII cannot be enabled simultaneously. If you get an error beep when enabling Trioptic Code 39, disable Code 39 Full ASCII and try again.*

Code 39 Buffering (Scan & Store)

When you select the Scan and Store option, all Code 39 symbols having a leading space as a first character are temporarily buffered in the unit to be transmitted later. The leading space is not buffered.

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

When the scan and transmit option is selected, decoded Code 39 symbols without leading spaces are transmitted without being stored in the buffer.

Scan and Store affects Code 39 decodes only. If you select Scan and Store, we recommend that you configure the scanner to decode Code 39 symbology only.

Buffer Code 39
(Enable)

Do Not Buffer Code 39
(Disable)

While there is data in the transmission buffer, deleting Code 39 buffering capability via the parameter menu is not allowed. The buffer holds 200 bytes of information.

To allow disabling of Code 39 buffering, first force the buffer transmission (see *Transmit Buffer*) or clear the buffer. Both the **CLEAR BUFFER** and **TRANSMIT BUFFER** bar codes are length 1. *Be sure Code 39 length is set to include length 1.*

Buffer Data

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

- Unless symbol overflows the transmission buffer, the scanner issues a lo/hi beep to indicate successful decode and buffering. See *Overfilling Transmission Buffer*.
- The scanner adds the message, excluding the leading space to the transmission buffer.
- No transmission occurs.

Clear Transmission Buffer

To clear the transmission buffer, scan the following symbol, which contains only a start character, a dash (minus), and a stop character.

- The scanner issues a short hi/lo/hi beep to signal that the transmission buffer has been erased, and no transmission has occurred.
- The scanner erases the transmission buffer.
- No transmission occurs.

Clear Buffer

Transmit Buffer

To transmit the buffer, read a symbol containing either the first or second condition:

1. Only a start character, a plus (+), and a stop character, such as the following symbol.

- The scanner signals that the transmission buffer has been sent (a lo/hi beep).
- The scanner sends the buffer.
- The scanner clears the buffer.

Transmit Buffer

2. A Code 39 bar code with leading character other than a space.

- The scanner signals a good decode and buffering of that decode has occurred by giving a hi/lo beep.
- The scanner transmits the buffer.
- The scanner signals that the buffer has been transmitted with a lo/hi beep.

Overfilling Transmission Buffer

If the symbol just read results in an overflow of the transmission buffer:

- The scanner indicates that the symbol has been rejected by issuing three long, high beeps.
- No transmission occurs. Data in buffer is not affected.

Attempt to Transmit an Empty Buffer

If the symbol just read was the transmit buffer symbol and the Code 39 buffer is empty:

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

Enable/Disable Code 93

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

Enable Code 93

Disable Code 93

Set Lengths for Code 93

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

One Discrete Length - This option allows you to decode only those codes containing a selected length. For example, if you select **Code 93 One Discrete Length**, then scan **1**, **4**, only Code 93 symbols containing 14 characters are decoded. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

Code 93 - One Discrete Length

Two Discrete Lengths - This option allows you to decode only those codes containing two selected lengths. For example, if you select **Code 93 Two Discrete Lengths**, then scan **0**, **2**, **1**, **4**, only Code 93 symbols containing 2 or 14 characters are decoded. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

Code 93 - Two Discrete Lengths

Set Lengths for Code 93 (continued)

Length Within Range - This option allows you to decode a code type within a specified range. For example, to decode Code 93 symbols containing between 4 and 12 characters, first scan **Code 93 Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

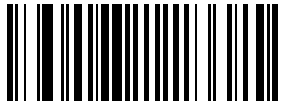
Code 93 - Length Within Range

Any Length - Scanning this option allows you to decode Code 93 symbols containing any number of characters.

Code 93 - Any Length

Enable/Disable Interleaved 2 of 5

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



Enable Interleaved 2 of 5

Disable Interleaved 2 of 5

Set Lengths for Interleaved 2 of 5

Lengths for I 2 of 5 may be set for any length, one or two discrete lengths, or lengths within a specific range. The length of a code refers to the number of characters (i.e., human readable characters) the code contains, and includes check digits.

One Discrete Length - This option allows you to decode only those codes containing a selected length. For example, if you select **I 2 of 5 One Discrete Length**, then scan **1**, **4**, the only I 2 of 5 symbols decoded are those containing 14 characters. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

I 2 of 5 - One Discrete Length

Two Discrete Lengths - This option allows you to decode only those codes containing two selected lengths. For example, if you select **I 2 of 5 Two Discrete Lengths**, then scan **0**, **2**, **1**, **4**, the only I 2 of 5 symbols decoded are those containing 2 or 14 characters. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

I 2 of 5 - Two Discrete Lengths

Set Lengths for Interleaved 2 of 5 (continued)

Length Within Range - This option allows you to decode a code type within a specified range. For example, to decode I 2 of 5 symbols containing between 4 and 12 characters, first scan **I 2 of 5 Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

I 2 of 5 - Length Within Range

Any Length - Scanning this option allows you to decode I 2 of 5 symbols containing any number of characters.

Note: *Selecting this option may lead to misdecodes for I 2 of 5 codes.*

I 2 of 5 - Any Length

I 2 of 5 Check Digit Verification

When enabled, this parameter checks the integrity of an I 2 of 5 symbol to ensure it complies a specified algorithm, either Uniform Symbology Specification (USS), or Optical Product Code Council (OPCC).

Disable

USS Check Digit

OPCC Check Digit

Transmit I 2 of 5 Check Digit

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

Transmit I 2 of 5 Check Digit
(Enable)

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

Convert I 2 of 5 to EAN-13

This parameter converts a 14 character I 2 of 5 code into EAN-13, and transmits to the host as EAN-13. In order to accomplish this, the I 2 of 5 code must be enabled, one length must be set to 14, and the code must have a leading zero and a valid EAN-13 check digit.

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

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

Enable/Disable Discrete 2 of 5

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

Enable Discrete 2 of 5

Disable Discrete 2 of 5

Set Lengths for Discrete 2 of 5

Lengths for D 2 of 5 may be set for any length, one or two discrete lengths, or lengths within a specific range. The length of a code refers to the number of characters (i.e., human readable characters) the code contains, and includes check digits.

One Discrete Length - This option allows you to decode only those codes containing a selected length. For example, if you select **D 2 of 5 One Discrete Length**, then scan **1**, **4**, the only D 2 of 5 symbols decoded are those containing 14 characters. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

D 2 of 5 - One Discrete Length

Two Discrete Lengths - This option allows you to decode only those codes containing two selected lengths. For example, if you select **D 2 of 5 Two Discrete Lengths**, then scan **0**, **2**, **1**, **4**, the only D 2 of 5 symbols decoded are those containing 2 or 14 characters. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

D 2 of 5 - Two Discrete Lengths

Set Lengths for Discrete 2 of 5 (continued)

Length Within Range - This option allows you to decode a code type within a specified range. For example, to decode D 2 of 5 symbols containing between 4 and 12 characters, first scan **D 2 of 5 Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

D 2 of 5 - Length Within Range

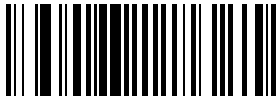
Any Length - Scanning this option allows you to decode D 2 of 5 symbols containing any number of characters.

Note: *Selecting this option may lead to misdecodes for D 2 of 5 codes.*

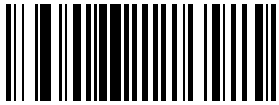
D 2 of 5 - Any Length

Enable/Disable Codabar

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



Enable Codabar



Disable Codabar

Set Lengths for Codabar

Lengths for Codabar may be set for any length, one or two discrete lengths, or lengths within a specific range. The length of a code refers to the number of characters (i.e., human readable characters) the code contains. It also includes any start or stop characters.

One Discrete Length - This option allows you to decode only those codes containing a selected length. For example, if you select **Codabar One Discrete Length**, then scan **1**, **4**, the only Codabar symbols decoded are those containing 14 characters. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

Codabar - One Discrete Length

Two Discrete Lengths - This option allows you to decode only those codes containing two selected lengths. For example, if you select **Codabar Two Discrete Lengths**, then scan **0**, **2**, **1**, **4**, the only Codabar symbols decoded are those containing 2 or 14 characters. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

Codabar - Two Discrete Lengths

Set Lengths for Codabar (continued)

Length Within Range - This option allows you to decode a code type within a specified range. For example, to decode Codabar symbols containing between 4 and 12 characters, first scan **Codabar Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

Codabar - Length Within Range

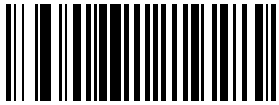
Any Length - Scanning this option allows you to decode Codabar symbols containing any number of characters.

Codabar - Any Length

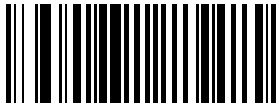
CLSI Editing

When enabled, this parameter strips the start and stop characters and inserts a space after the first, fifth, and tenth characters of a 14-character Codabar symbol.

Note: *Symbol length does not include start and stop characters.*



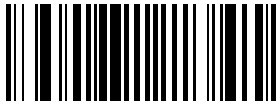
Enable CLSI Editing



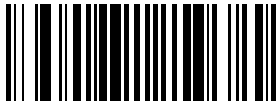
Disable CLSI Editing

NOTIS Editing

When enabled, this parameter strips the start and stop characters from a decoded Codabar symbol.



Enable NOTIS Editing



Disable NOTIS Editing

Enable/Disable MSI Plessey

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

Enable MSI Plessey

Disable MSI Plessey

Set Lengths for MSI Plessey

Lengths for MSI Plessey may be set for any length, one or two discrete lengths, or lengths within a specific range. The length of a code refers to the number of characters (i.e., human readable characters) the code contains, and includes check digits.

One Discrete Length - This option allows you to decode only those codes containing a selected length. For example, if you select **MSI Plessey One Discrete Length**, then scan **1**, **4**, the only MSI Plessey symbols decoded are those containing 14 characters. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

MSI Plessey - One Discrete Length

Two Discrete Lengths - This option allows you to decode only those codes containing two selected lengths. For example, if you select **MSI Plessey Two Discrete Lengths**, then scan **0**, **2**, **1**, **4**, the only MSI Plessey symbols decoded are those containing 2 or 14 characters. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

MSI Plessey - Two Discrete Lengths

Set Lengths for MSI Plessey (continued)

Length Within Range - This option allows you to decode a code type within a specified range. For example, to decode MSI Plessey symbols containing between 4 and 12 characters, first scan **MSI Plessey Length Within Range**. Then scan **0**, **4**, **1,** and **2** (single digit numbers must always be preceded by a leading zero). Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

MSI Plessey - Length Within Range

Any Length - Scanning this option allows you to decode MSI Plessey symbols containing any number of characters.

Note: *Selecting this option may lead to misdecodes for MSI Plessey codes.*

MSI Plessey - Any Length

MSI Plessey Check Digits

These check digits, located at the end of the bar code, verify the integrity of the data. At least one check digit is always required. Check digits are not automatically transmitted with the data (refer to *Transmit MSI Plessey Check Digit* on page 5-74).

One MSI Plessey Check Digit

Two MSI Plessey Check Digit

Transmit MSI Plessey Check Digit

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

Transmit MSI Plessey Check Digit (Enable)

Do Not Transmit MSI Plessey Check Digit (Disable)

MSI Plessey Check Digit Algorithm

When the two MSI Plessey check digits option is selected, one of the two following check digit verification algorithms may be selected.

MOD 10/MOD 11

MOD 10/MOD 10

Enable/Disable PDF417

Scan a bar code below to enable or disable PDF417 scanning capabilities.

Enable PDF417

Disable PDF417

Transmit Code ID Character

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

The user may select no code ID character, a Symbol Code ID character, or an AIM symbology ID character. The Symbol Code ID characters are listed below; see *AIM Code Identifiers* in *Appendix A*.

Symbol Code ID Characters

A = UPC-A, UPC-E, UPC-E1, EAN-8, EAN-13

B = Code 39

C = Codabar

D = Code 128

E = Code 93

F = Interleaved 2 of 5

G = Discrete 2 of 5, or Discrete 2 of 5 IATA

J = MSI Plessey

K = UCC/EAN-128

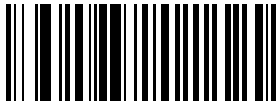
L = Bookland EAN

M = Trioptic Code 39

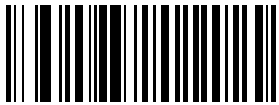
N = Coupon Code

O = PDF417

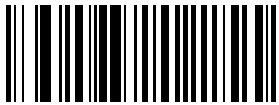
Transmit Code ID Character (continued)



Symbol Code ID Character



AIM Code ID Character



None

Pause Duration

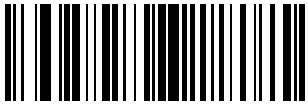
This parameter allows a pause to be inserted at any point in the data transmission. Pauses are set by scanning a two-digit number (i.e., two bar codes), and are measured in 0.1 second intervals. For example, scanning bar codes “0” and “1” inserts a 0.1 second pause; “0” and “5” gives you a 0.5 second delay. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **DATA FORMAT CANCEL** on page 5-82.

Pause Duration

Prefix/Suffix Values

A prefix/suffix may be added to scan data for use in data editing. These values are set by scanning a four-digit number (i.e., four bar codes) that corresponds to characters or key codes for various terminals. See Table A-4 in *Appendix A* for conversion information. Numeric bar codes begin on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

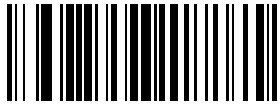
Scan Prefix



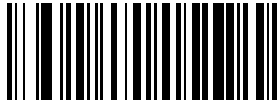
Scan Suffix

Scan Data Transmission Format

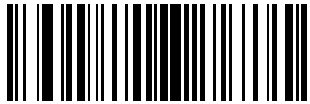
To change the Scan Data Transmission Format, scan the **SCAN OPTIONS** bar code below. Then select one of four options. When you have made your selection, scan the **ENTER** bar code on the next page. If you make a mistake, scan the **DATA FORMAT CANCEL** bar code on the next page.



Scan Options

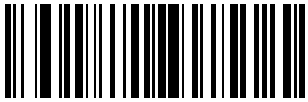


Data As Is

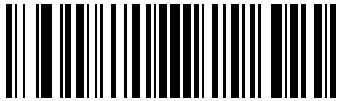


<DATA> <SUFFIX>

Scan Data Transmission Format (continued)



<PREFIX> <DATA>



<PREFIX> <DATA> <SUFFIX>

Enter

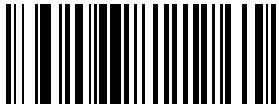
Data Format Cancel

RS-232C Parameters

The following RS-232 parameters apply to the LS 4004i only.

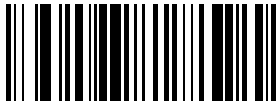
Baud Rate

Baud rate is the number of bits of data transmitted per second. The scanner's baud rate setting should match the data rate setting of the host device. If not, data may not reach the host device or may be corrupt.



Baud Rate 300

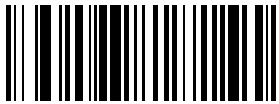
Baud Rate 600



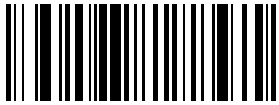
Baud Rate 1200

Baud Rate 2400

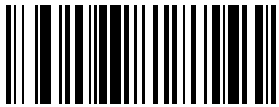
Baud Rate (continued)



Baud Rate 4800



Baud Rate 9600



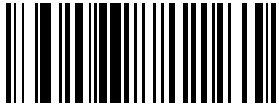
Baud Rate 19,200

Baud Rate 38,400

Parity

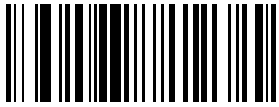
A parity check bit is the most significant bit of each ASCII coded character. Select the parity type according to host device requirements.

If you select **ODD** parity, the parity bit has a value 0 or 1, based on data, to ensure than an odd number of 1 bits are contained in the coded character.



Odd

If you select **EVEN** parity, the parity bit has a value 0 or 1, based on data, to ensure than an even number of 1 bits are contained in the coded character.



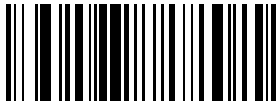
Even

Select **MARK** parity and the parity bit is always 1.

Mark

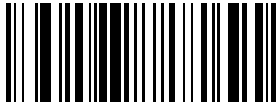
Parity (continued)

Select **SPACE** parity and the parity bit is always 0.



Space

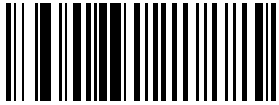
If no parity is required, select **NONE**.



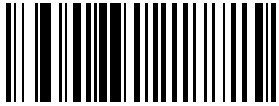
None

Check Receive Errors

Select whether or not the parity, framing, and overrun of received characters are checked. The type of parity used is selectable through the **PARITY** parameter.



Check For Received Errors



Do Not Check For Received Errors

Hardware Handshaking

The data interface consists of an RS-232C 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 selected, scan data is transmitted according to the following sequence:

- The controller reads the CTS line for activity. If CTS is asserted, the controller waits up to 2 seconds for the host to negate the CTS line. If, after 2 seconds (default), the CTS line is still asserted, the scanner sounds a transmit error and any scanned data is lost.
- When the CTS line is negated, the controller asserts the RTS line and waits up to 2 seconds for the host to assert CTS. When the host asserts CTS, data is transmitted. If, after 2 seconds (default), the CTS line is not asserted, the scanner sounds a transmit error and discards the data.
- When data transmission is complete, the controller negates RTS 10 msec after sending the last character.
- The host should respond by negating CTS. The controller checks for a negated CTS upon the next transmission of data.

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

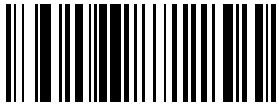
If the above communications sequence fails, the scanner issues an error indication. In this case, the data is lost and must be rescanned.

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

Note: *The DTR signal is jumpered active.*

None

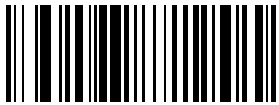
Scan the bar code below if no Hardware Handshaking is desired.



None

Standard RTS/CTS

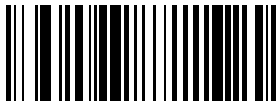
Scan the bar code below to select Standard RTS/CTS Hardware Handshaking.



Standard RTS/CTS

RTS/CTS Option 1

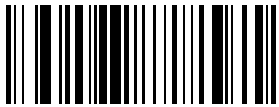
When RTS/CTS Option 1 is selected, the scanner asserts RTS before transmitting and ignores the state of CTS. The scanner deasserts RTS when the transmission is complete.



RTS/CTS Option 1

RTS/CTS Option 2

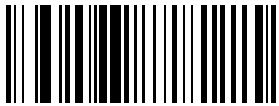
When Option 2 is selected, RTS is always high or low (user-programmed logic level). However, the scanner waits for CTS to be asserted before transmitting data. If CTS is not asserted within 2 seconds (default), the scanner issues an error indication and discards the data.



RTS/CTS Option 2

RTS/CTS Option 3

When Option 3 is selected, the scanner asserts RTS prior to any data transmission, regardless of the state of CTS. The scanner waits up to 2 seconds (default) for CTS to be asserted. If CTS is not asserted during this time, the scanner issues an error indication and discards the data. The scanner deasserts RTS when transmission is complete.



RTS/CTS Option 3

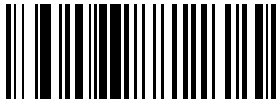
Software Handshaking

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.

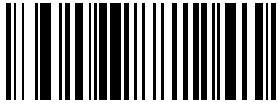


None

ACK/NAK

When this option is selected, after transmitting data, the scanner expects either an ACK or NAK response from the host. When a NAK is received, the 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 scanner issues an error indication and discards the data.

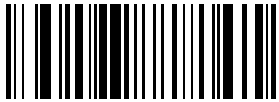
The scanner waits up to the programmable Host Serial Response Time-out to receive an ACK or NAK. If the scanner does not get a response in this time, it issues an error indication and discards the data. There are no retries when a time-out occurs.



ACK/NAK

ENQ

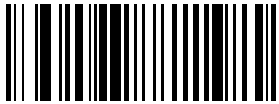
When this option is selected, the scanner waits for an ENQ character from the host before transmitting data. If an ENQ is not received within 2 seconds, the scanner issues an error indication and discards the data. The host must transmit an ENQ character at least every 2 seconds to prevent transmission errors.



ENQ

ACK/NAK with ENQ

This combines the two previous options.

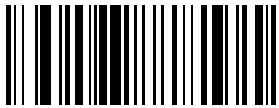


ACK/NAK with ENQ

XON/XOFF

An XOFF character turns the scanner transmission off until the scanner receives an XON character. There are two situations for XON/XOFF:

- XOFF is received before the scanner has data to send. When the scanner has data to send, it waits up to 2 seconds for an XON character before transmission. If the XON is not received within this time, the 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 scanner receives an XON character, it sends the rest of the data message. The scanner waits indefinitely for the XON.

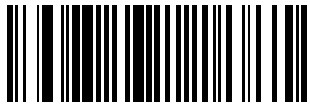


XON/XOFF

Host Serial Response Time-out

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

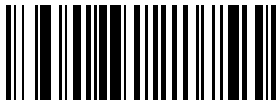
The delay period can range from 0.0 to 9.9 seconds in .1-second increments. After scanning the bar code below, scan two numeric bar codes beginning on page 5-109. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.



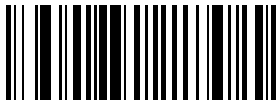
Host Serial Response Time-out

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.



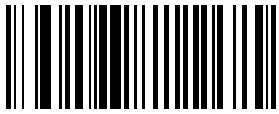
Host: Low RTS



Host: High RTS

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.

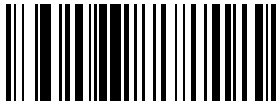


1 Stop Bit

2 Stop Bits

ASCII Format

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

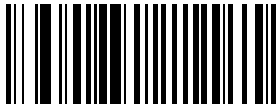


7-Bit

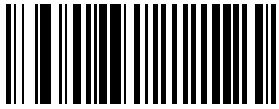
8-Bit

Beep on <BEL>

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



Beep On <BEL> Character (Enable)



Do Not Beep On <BEL> Character (Disable)

Intercharacter Delay

Select the intercharacter delay option matching host requirements. The intercharacter delay gives the host system time to service its receiver and perform other tasks between characters. The delay period can range from no delay to 99 msec in 1-msec increments. After scanning the bar code below, scan two bar codes beginning on page 5-109 to set the desired time-out. If you make an error or wish to change your selection, scan **CANCEL** on page 5-111.

Intercharacter Delay

Keyboard Wedge Parameters

The following Keyboard Wedge parameters apply to the LS 4006i only.

Country Selection

Select the country for your keyboard.

North America

German

French

French International

Spanish

Italian

Swedish

British

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. When Do Not Send Bar Codes With Unknown Characters is selected, no bar code data containing at least one unknown character is sent to the host.

Scan the appropriate bar code to enable or disable this parameter. The default is Send Bar Codes With Unknown Characters.

Send Bar Codes With Unknown Characters

Do Not Send Bar Codes With Unknown Characters

Intercharacter Delay

Selecting an intercharacter delay gives the host system time to service its receiver and perform other tasks between characters. The default is Short Delay, so if this is your preference, you don't need to scan this bar code unless you've previously selected another option.

Short (5 MS) Delay

For systems that can handle faster character transmission, the **NO DELAY** bar code below can be scanned.

No (1 MS) Delay

Medium (50 MS) Delay

Long (99 MS) Delay

Fast Transmit

Older systems may require a slower transmission method. If your system still needs additional time to process keyboard data after setting an Intercharacter Delay, scan **DISABLE FAST TRANSMIT**.

Enable Fast Transmit

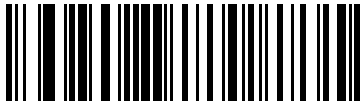
Disable Fast Transmit

USB Parameters (LS 4007i)

The following USB parameters apply to the LS 4007i only.

Set USB Defaults

Scan the bar code below to set USB defaults for the parameters on the following pages.



Set USB Defaults

USB Device Type

The LS 4007i attaches to a USB host or hub and supports the USB device options below, depending on the host type and desired mode of operation.

The mode of operation can be dynamically changed. However, the scanner resets and re-enumerates each time a new mode is selected. The re-enumeration process can take a few seconds to complete, during which the scanner turns off, disconnects, and reconnects to the host.

HID Keyboard Emulation

In this mode, the scanned data is presented to the system as if coming from a USB HID (Human Interface Device) keyboard. Most operating systems have native support for this device, so no additional driver installation is required.

IBM SurePOS Hand-Held Bar Code Reader

This mode is supported by an IBM hand-held bar code reader driver on IBM SurePOS terminals.

IBM SurePOS Tabletop Bar Code Reader

This mode is supported by an IBM tabletop bar code reader driver on IBM SurePOS terminals.

Symbol Native Bar Code Reader

This mode is supported by a Symbol bar code reader driver and provides maximal flexibility and control over the scanner. The software will prompt you to select or install the driver. Follow the instructions on the screen.

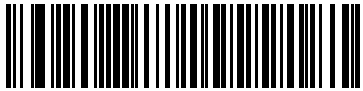
Symbol COM Port Emulation

In this mode, scanned data is presented to the host as if it originated in a COM port. A Symbol driver is required to support this mode, but it provides compatibility for an application which supports a bar code reader attached to a COM port. The software will prompt you to select or install the driver. Follow the instructions on the screen.

Select the desired type of USB device. The default is IBM Hand-Held USB.

Note: *When changing USB Device Types, the LS 4007i turns off briefly and re-enumerates to properly communicate with the host.*

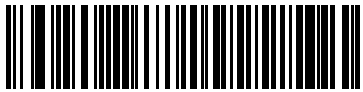
Default USB Type



IBM Hand-Held USB (Default)

IBM Table Top USB

HID Keyboard Emulation



Symbol Native USB

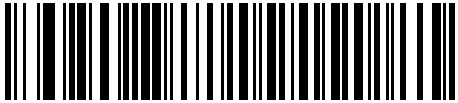
Symbol COM Port Emulation

Country Selection

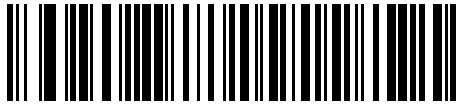
This setting applies only to the HID Keyboard Emulation device. The MacOS and Windows implement international keyboards differently. Select the desired country according to the USB host device. If your host platform does not appear here, select the Windows settings.

Note: *When changing the Country Selection, the LS 4007i turns off briefly and re-enumerates to properly communicate with the host.*

North American, Standard USB Keyboard

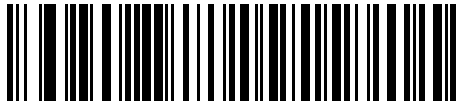


French, Windows



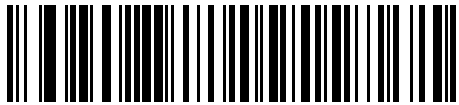
German, Windows

German, MacOS



French Canadian, Windows

French Canadian, MacOS



Spanish (Traditional), Windows

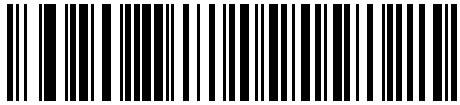
Spanish ISO, MacOS

Italian, Windows

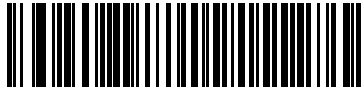
Italian, MacOS

Swedish, Windows

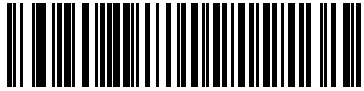
Swedish, MacOS



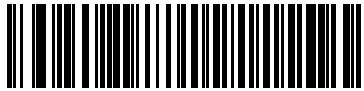
UK English, Windows



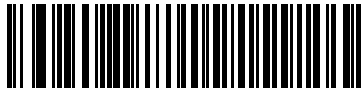
UK English, MacOS



French, MacOS



Japanese, Windows



Japanese, MacOS

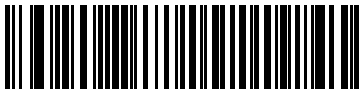
Keyboard Emulation

Keystroke Delay

This option applies only to the HID Keyboard Emulation device. Select the desired delay between transmitted keystrokes. Only change this setting for slower host PCs that cannot accommodate the speed of data transmitted.

No Delay (0 ms)

Medium Delay (20 ms)



Long Delay (40 ms)

Keyboard Emulation - CAPS LOCK Override

This option applies only to the HID Keyboard Emulation device. By default, if a bar code is scanned, Caps Lock Override is disabled and the case of the bar code data is not preserved. For example, if the CAPS LOCK is off and an uppercase character is transmitted, the host reads this as a lowercase character. By selecting “Enable Caps Lock Override”, the caps lock is turned off during transmission to preserve the case of the bar code data, then restored after transmission.

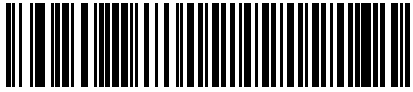
Disable Caps Lock Override

Enable Caps Lock Override

Keyboard Emulation and IBM - Ignore Unknown Characters

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

Send Bar Codes With Unknown Characters

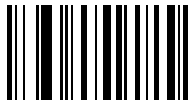


Do Not Send Bar Codes With Unknown Characters

Numeric Bar Codes

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

0



1

2

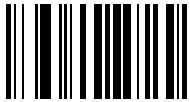
3

4

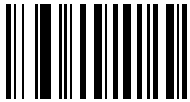
Numeric Bar Codes (continued)

5

6



7



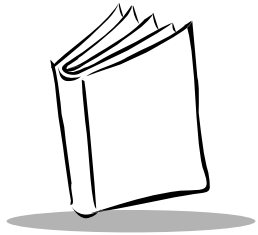
8

9

Cancel

If you make an error or wish to change your selection, scan the bar code below.

Cancel



Appendix A
Programming Reference

UCC/EAN-128

UCC/EAN-128 is a convention for printing data fields with standard Code 128 bar code symbols. UCC/EAN-128 symbols are distinguished by a leading FNC 1 character as the first or second character in the symbol. Other FNC 1 characters are used to delineate fields.

When EAN-128 symbols are read, they are transmitted after special formatting strips off the leading FNC 1 character and replaces other FNC 1 characters with the ASCII 29 GS control character.

When AIM code identifiers are transmitted, the modifier character indicates the position of the leading FNC 1 character according to AIM guidelines. For example, **]C1** indicates a UCC/EAN-128 symbol with a leading FNC1 character.

Standard Code 128 bar codes which do not have a leading FNC 1 may still be used but are not encoded according to the EAN-128 convention. Standard Code 128 and UCC/EAN-128 may be mixed in an application. The LS 400Xi scanners autodiscriminate between these symbols, and can enable or disable one or both code types via bar code menus. Table A-1 indicates the behavior of the LS 400Xi in each of the four possible parameter settings.

Table A-1. Reading Standard Code128 & UCC/EAN 128

Standard Code 128	UCC/EAN-128	Effect and Example
Disable	Disable	No Code 128 symbols can be read.
Disable	Enable	Read only symbols with leading FNC 1. Examples: ^{FNC1}ABCD^{FNC1}E are read as ABCD^{29}E A^{FNC1}BCD^{FNC1}E are read as ABCD^{29}E ^{FNC1FNC1}ABCD^{FNC1}E are read as ABCD^{29}E ABCD^{FNC1}E cannot be read ABCDE cannot be read
Enable	Disable	Read only symbols without leading FNC 1. Examples: ^{FNC1}ABCD^{FNC1}E cannot be read A^{FNC1}BCD^{FNC1}E cannot be read ^{FNC1FNC1}ABCD^{FNC1}E cannot be read ABCD^{FNC1}E is read as ABCD^{29}E ABCDE is read as ABCDE
Enable	Enable	Read both types of symbols. Examples: ^{FNC1}ABCD^{FNC1}E are read as ABCD^{29}E A^{FNC1}BCD^{FNC1}E are read as ABCD^{29}E ^{FNC1FNC1}ABCD^{FNC1}E are read as ABCD^{29}E ABCD^{FNC1}E is read as ABCD^{29}E ABCDE is read as ABCDE

AIM Code Identifiers

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

] =Flag Character (ASCII 93)
c =Code Identifier Character (see Table A-2)
m=Modifier Character (see Table A-3)

Table A-2. Code Identifier Characters

Code Identifier Character	Code Type
A	Code 39
C	Code 128
E	UPC/EAN
F	Codabar
G	Code 93
H	Code 11
I	Interleaved 2 of 5
L	PDF417
M	MSI Plessey
S	D2 of 5, IATA 2 of 5
X	Code 39 Trioptic
X	Bookland EAN
X	Coupon Code

The modifier character is the sum of the applicable option values based on Table A-3.

Table A-3. Modifier Characters

Code Type	Option Value	Option
Code 39	0	No check character or Full ASCII processing.
	1	Reader has checked one check character.
	3	Reader has checked and stripped check character.
	4	Reader has performed Full ASCII character conversion.
	5	Reader has performed Full ASCII character conversion and checked one check character.
	7	Reader has performed Full ASCII character conversion and checked and stripped check character.
	Example:A Full ASCII bar code with check character W, **A+I+MI+DW**, is transmitted as **]A7**AimId where 7 = (3+4).	
Trioptic Code 39	0	No option specified at this time. Always transmit 0.
	Example:A Trioptic bar code 412356 is transmitted as **]X0**412356	
Code 128	0	Standard data packet, no Function code 1 in first symbol position.
	1	Function code 1 in first symbol character position.
	2	Function code 1 in second symbol character position.
	Example:A Code (EAN) 128 bar code with Function 1 character in the first position, FNC1 Aim Id is transmitted as **]C1**AimId	
I 2 of 5	0	No check digit processing.
	1	Reader has validated check digit.
	3	Reader has validated and stripped check digit.
	Example:An I 2 of 5 bar code without check digit, 4123, is transmitted as **]I0**4123	
Codabar	0	No check digit processing.
	1	Reader has checked check digit.
	3	Reader has stripped check digit before transmission.
	Example:A Codabar bar code without check digit, 4123, is transmitted as **]F0**4123	

Table A-3. Modifier Characters (Continued)

Code Type	Option Value	Option
Code 93		
	0	No options specified at this time. Always transmit 0.
	Example:A Code 93 bar code 012345678905 is transmitted as **]G0**012345678905	
MSI Plessey	0	Single check digit checked.
	1	Two check digits checked.
	2	Single check digit verified and stripped before transmission.
	3	Two check digits verified and stripped before transmission.
	Example:An MSI Plessey bar code 4123, with a single check digit checked, is transmitted as **]M0**4123	
D 2 of 5	0	No options specified at this time. Always transmit 0.
	Example:A D 2 of 5 bar code 4123, is transmitted as **]S0**4123	
UPC/EAN	0	Standard packet in full EAN country code format, which is 13 digits for UPC-A and UPC-E (not including supplemental data).
	1	Two-digit supplement data only.
	2	Five-digit supplement data only.
	4	EAN-8 data packet.
	Example:A UPC-A bar code 012345678905 is transmitted as **]E0**0012345678905	
Bookland EAN	0	No options specified at this time. Always transmit 0.
	Example:A Bookland EAN bar code 123456789X is transmitted as **]X0**123456789X	

Prefix / Suffix Values

The following values can be assigned as prefixes or suffixes for ASCII character data transmission. If you're using a keyboard interface, refer to *Keyboard Maps on page A-12*.

Table A-4. Prefix/Suffix Values

Prefix/Suffix Value	Full ASCII Code 39 Encode Char.	ASCII Character	Prefix/Suffix Value	Full ASCII Code 39 Encode Char.	ASCII Character
1000	%U	NUL	1030	%D	RS
1001	$A	SOH	1031	%E	US
1002	$B	STX	1032	Space	Space
1003	$C	ETX	1033	/A	!
1004	$D	EOT	1034	/B	"
1005	$E	ENQ	1035	/C	#
1006	$F	ACK	1036	/D	$
1007	$G	BELL	1037	/E	%
1008	$H	BCKSPC	1038	/F	&
1009	$I	HORIZ TAB	1039	/G	‘
1010	$J	LF/NW LN	1040	/H	(
1011	$K	VT	1041	/I	)
1012	$L	FF	1042	/J	*
1013	$M	CR/ENTER	1043	/K	+
1014	$N	SO	1044	/L	,
1015	$O	SI	1045	-	-
1016	$P	DLE	1046	.	.
1017	$Q	DC1	1047	/	/
1018	$R	DC2	1048	0	0
1019	$S	DC3	1049	1	1
1020	$T	DC4	1050	2	2
1021	$U	NAK	1051	3	3
1022	$V	SYN	1052	4	4
1023	$W	ETB	1053	5	5
1024	$X	CAN	1054	6	6
1025	$Y	EM	1057	7	7
1026	$Z	SUB	1056	8	8
1027	%A	ESC	1057	9	9
1028	%B	FS	1058	/Z	:
1029	%C	GS	1059	%F	;

Table A-1. Prefix/Suffix Values (continued)

Prefix/Suffix Value	Full ASCII Code 39 Encode Char.	ASCII Character	Prefix/Suffix Value	Full ASCII Code 39 Encode Char.	ASCII Character
1060	%G	<	1095	%O	_
1061	%H	=	1096	%W	`
1062	%I	>	1097	+A	a
1063	%J	?	1098	+B	b
1064	%V	@	1099	+C	c
1065	A	A	1100	+D	d
1066	B	B	1101	+E	e
1067	C	C	1102	+F	f
1068	D	D	1103	+G	g
1069	E	E	1104	+H	h
1070	F	F	1105	+I	i
1071	G	G	1106	+J	j
1072	H	H	1107	+K	k
1073	I	I	1108	+L	l
1074	J	J	1109	+M	m
1075	K	K	1110	+N	n
1076	L	L	1111	+O	o
1077	M	M	1112	+P	p
1078	N	N	1113	+Q	q
1079	O	O	1114	+R	r
1080	P	P	1115	+S	s
1081	Q	Q	1116	+T	t
1082	R	R	1117	+U	u
1083	S	S	1118	+V	v
1084	T	T	1119	+W	w
1085	U	U	1120	+X	x
1086	V	V	1121	+Y	y
1087	W	W	1122	+Z	z
1088	X	X	1123	%P	{
1089	Y	Y	1124	%Q	|
1090	Z	Z	1125	%R	}
1091	%K	[	1126	%S	~
1092	%L	\	1127		Undefined
1093	%M	]			
1094	%N	^	7013		ENTER

ASCII Character Set

Table A-5. ASCII Character Se t

ALT Keys	Keystroke	ALT Keys	Keystroke	ALT Keys	Keystroke
ALT 2	2064	ALT K	2075	ALT V	2086
ALT A	2065	ALT L	2076	ALT W	2087
ALT B	2066	ALT M	2077	ALT X	2088
ALT C	2067	ALT N	2078	ALT Y	2089
ALT D	2068	ALT O	2079	ALT Z	2090
ALT E	2069	ALT P	2080	ALT [	2091
ALT F	2070	ALT Q	2081	ALT \	2092
ALT G	2071	ALT R	2082	ALT]	2093
ALT H	2072	ALT S	2083	ALT 6	2094
ALT I	2073	ALT T	2084	ALT -	2095
ALT J	2074	ALT U	2085		
Misc. Key	**Keystroke**	**Misc. Key**	**Keystroke**	**Misc. Key**	**Keystroke**
PA 1	3001	CMD 7	3009	°	3017
PA 2	3002	CMD 8	3010	1/2	3018
CMD 1	3003	CMD 9	3011	¶	3019
CMD 2	3004	CMD 10	3012	§	3020
CMD 3	3005	¥	3013	|	3021
CMD 4	3006	£	3014	0/00	3022
CMD 5	3007	¤	3015		
CMD 6	3008	¬	3016		

Table A-5. ASCII Character Set (Continued)

PF Keys	Keystroke	PF Keys	Keystroke	PF Keys	Keystroke
PF 1	4001	PF 9	4009	PF 17	4017
PF 2	4002	PF 10	4010	PF 18	4018
PF 3	4003	PF 11	4011	PF 19	4019
PF 4	4004	PF 12	4012	PF 20	4020
PF 5	4005	PF 13	4013	PF 21	4021
PF 6	4006	PF 14	4014	PF 22	4022
PF 7	4007	PF 15	4015	PF 23	4023
PF 8	4008	PF 16	4016	PF 24	4024
F Keys	**Keystroke**	**F Keys**	**Keystroke**	**F Keys**	**Keystroke**
F 1	5001	F 14	5014	F 27	5027
F 2	5002	F 15	5015	F 28	5028
F 3	5003	F 16	5016	F 29	5029
F 4	5004	F 17	5017	F 30	5030
F 5	5005	F 18	5018	F 31	5031
F 6	5006	F 19	5019	F 32	5032
F 7	5007	F 20	5020	F 33	5033
F 8	5008	F 21	5021	F 34	5034
F 9	5009	F 22	5022	F 35	5035
F 10	5010	F 23	5023	F 36	5036
F 11	5011	F 24	5024	F 37	5037
F 12	5012	F 25	5025	F 38	5038
F 13	5013	F 26	5026	F 39	5039

Table A-5. ASCII Character Set (Continued)

Numeric Keypad	Keystroke	Numeric Keypad	Keystroke	Numeric Keypad	Keystroke
*	6042	1	6049	8	6056
+	6043	2	6050	9	6057
Undefined	6044	3	6051	Enter	6058
-	6045	4	6062	Num Lock	6059
.	6046	5	6063	00	6060
/	6047	6	6064		
0	6048	7	6065		
Extended Keypad	**Keystroke**	**Extended Keypad**	**Keystroke**	**Extended Keypad**	**Keystroke**
Break	7001	Backspace	7008	Up Arrow	7015
Delete	7002	Tab	7009	Dn Arrow	7016
Pg Up	7003	Print Screen	7010	Left Arrow	7017
End	7004	Insert	7011	Right Arrow	7018
Pg Dn	7005	Home	7012	Back Tab	7019
Pause	7006	Enter	7013		
Scroll Lock	7007	Escape	7014		

GUI Shift Keys (LS 4007i Only)

Table A-6. GUI Shift Keys

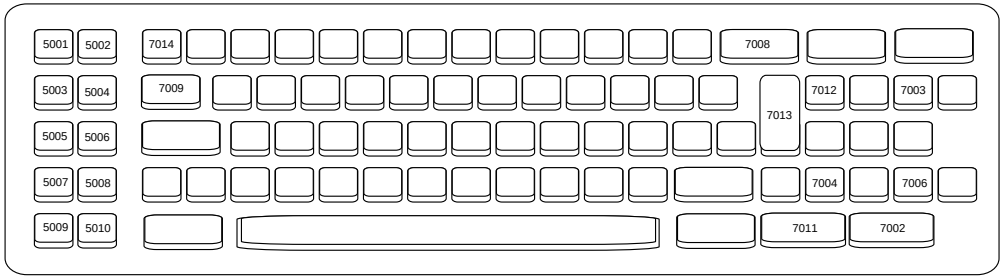
Value	Keystroke	Value	Keystroke	Value	Keystroke
3048	Apple/GUI 0	**3067**	Apple/GUI C	**3079**	Apple/GUI O
3049	Apple/GUI 1	**3068**	Apple/GUI D	**3080**	Apple/GUI P
3050	Apple/GUI 2	**3069**	Apple/GUI E	**3081**	Apple/GUI Q
3051	Apple/GUI 3	**3070**	Apple/GUI F	**3082**	Apple/GUI R
3052	Apple/GUI 4	**3071**	Apple/GUI G	**3083**	Apple/GUI S
3053	Apple/GUI 5	**3072**	Apple/GUI H	**3084**	Apple/GUI T
3054	Apple/GUI 6	**3073**	Apple/GUI I	**3085**	Apple/GUI U
3055	Apple/GUI 7	**3074**	Apple/GUI J	**3086**	Apple/GUI V
3056	Apple/GUI 8	**3075**	Apple/GUI K	**3087**	Apple/GUI W
3057	Apple/GUI 9	**3076**	Apple/GUI L	**3088**	Apple/GUI X
3065	Apple/GUI A	**3077**	Apple/GUI M	**3089**	Apple/GUI Y
3066	Apple/GUI B	**3078**	Apple/GUI N	**3090**	Apple/GUI Z

Keyboard Maps

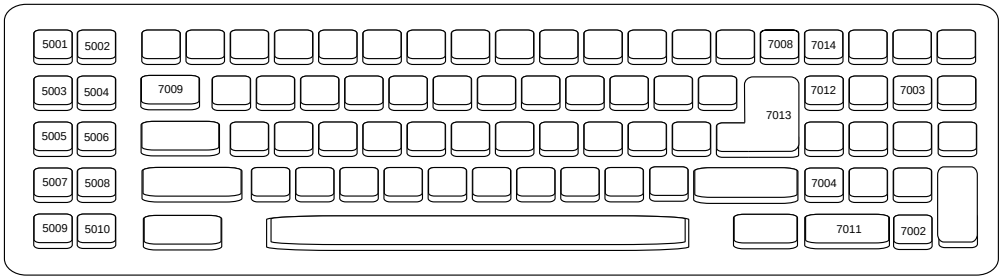
The following keyboard maps are provided for prefix/suffix keystroke parameters.

LS 4006i On-Board Keyboards

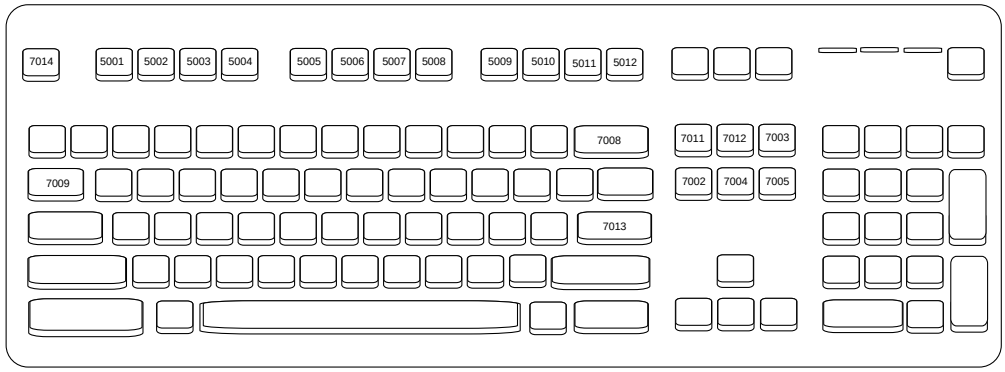
The LS 4006i provides on-board support of the following keyboards.



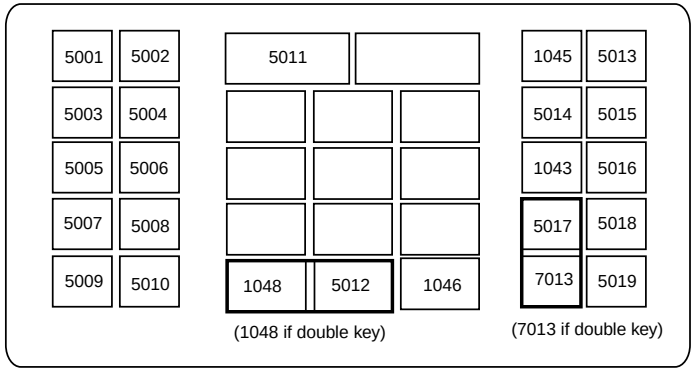
IBM PC/XT



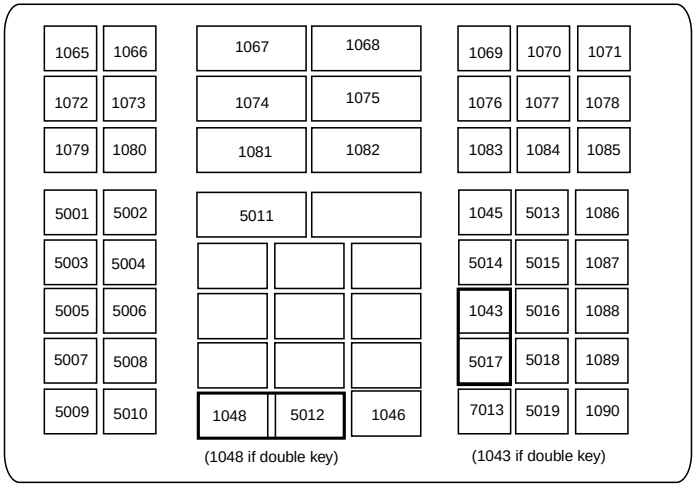
IBM PC/AT



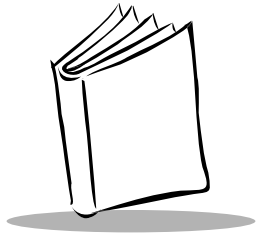
IBM PS2 type keyboard



NCR 7052 32-KEY



NCR 7052 58-KEY



Glossary

Aperture	The opening in an optical system defined by a lens or baffle that establishes the field of view.
ASCII	American Standard Code for Information Interchange. A 7 bit-plus-parity code representing 128 letters, numerals, punctuation marks, and control characters. It is a standard data transmission code in the U.S.
Autodiscrimination	The ability of an interface controller to determine the code type of a scanned bar code. After this determination is made, the information content can be decoded.
Bar	The dark element in a printed bar code symbol.
Bar Code Density	The number of characters represented per unit of measurement (e.g., characters per inch).
Bar Height	The dimension of a bar measured perpendicular to the bar width.
Bar Width	Thickness of a bar measured from the edge closest to the symbol start character to the trailing edge of the same bar.
Baud Rate	A measure of the data flow or number of signaling events occurring per second. When one bit is the standard "event," this is a measure of bits per second (bps). For example, a baud rate of 50 means transmission of 50 bits of data per second.
Bit	Binary digit. One bit is the basic unit of binary information. Generally, eight consecutive bits compose one byte of data. The pattern of 0 and 1 values within the byte determines its meaning.

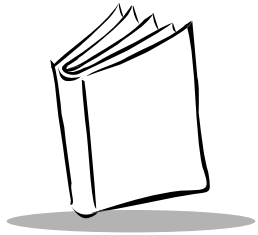
Byte	On an addressable boundary, eight adjacent binary digits (0 and 1) combined in a pattern to represent a specific character or numeric value. Bits are numbered from the right, 0 through 7, with bit 0 the low-order bit. One byte in memory can be used to store one ASCII character.
CDRH	Center for Devices and Radiological Health. A federal agency responsible for regulating laser product safety. This agency specifies various laser operation classes based on power output during operation.
CDRH Class 1	This is the lowest power CDRH laser classification. This class is considered intrinsically safe, even if all laser output were directed into the eye's pupil. There are no special operating procedures for this class.
CDRH Class 2	No additional software mechanisms are needed to conform to this limit. Laser operation in this class poses no danger for unintentional direct human exposure.
Character	A pattern of bars and spaces which either directly represents data or indicates a control function, such as a number, letter, punctuation mark, or communications control contained in a message.
Character Set	Those characters available for encodation in a particular bar code symbology.
Check Digit	A digit used to verify a correct symbol decode. The scanner inserts the decoded data into an arithmetic formula and checks that the resulting number matches the encoded check digit. Check digits are required for UPC but are optional for other symbologies. Using check digits decreases the chance of substitution errors when a symbol is decoded.
Codabar	A discrete self-checking code with a character set consisting of digits 0 to 9 and six additional characters: (- $: / , +).
Code 128	A high density symbology which allows the controller to encode all 128 ASCII characters without adding extra symbol elements.
Code 3 of 9 (Code 39)	A versatile and widely used alphanumeric bar code symbology with a set of 43 character types, including all uppercase letters, numerals from 0 to 9, and 7 special characters (- . / + % $ and space). The code name is derived from the fact that 3 of 9 elements representing a character are wide, while the remaining 6 are narrow.
Code 93	An industrial symbology compatible with Code 39 but offering a full character ASCII set and a higher coding density than Code 39.

Code Length	Number of data characters in a bar code between the start and stop characters, not including those characters.
Continuous Code	A bar code or symbol in which all spaces within the symbol are parts of characters. There are no intercharacter gaps in a continuous code. The absence of gaps allows for greater information density.
CTS	Clear to send.
Dead Zone	An area within a scanner's field of view, in which specular reflection may prevent a successful decode.
Decode	To recognize a bar code symbology (e.g., UPC/EAN) and then analyze the content of the specific bar code scanned.
Decode Algorithm	A decoding scheme that converts pulse widths into data representation of the letters or numbers encoded within a bar code symbol.
Decoder Asynchronous Serial Interface (DASI)	A half-duplex asynchronous serial interface with two hardware handshaking lines.
Depth of Field	The range between minimum and maximum distances at which a scanner can read a symbol with a certain minimum element width.
Digitized Bar Pattern (DBP)	A digital representation of a decoded bar code.
Discrete 2 of 5	A binary bar code symbology representing each character by a group of five bars, two of which are wide. The location of wide bars in the group determines which character is encoded; spaces are insignificant. Only numeric characters (0 to 9) and START/STOP characters may be encoded.
Discrete Code	A bar code or symbol in which the spaces between characters (intercharacter gaps) are not part of the code.
EAN	European Article Number. This European/International version of the UPC provides its own coding format and symbology standards. Element dimensions are specified metrically. EAN is used primarily in retail.
Element	Generic term for a bar or space.
Encoded Area	Total linear dimension occupied by all characters of a code pattern, including start/stop characters and data.

Host Computer	A computer that serves other terminals in a network, providing such services as computation, database access, supervisory programs, and network control.
IEC	International Electrotechnical Commission. This international agency regulates laser safety by specifying various laser operation classes based on power output during operation.
IEC (825) Class 1	This is the lowest power IEC laser classification.
Intercharacter Gap	The space between two adjacent bar code characters in a discrete code.
Interleaved Bar Code	A bar code in which characters are paired together, using bars to represent the first character and the intervening spaces to represent the second.
Interleaved 2 of 5	A binary bar code symbology representing character pairs in groups of five bars and five interleaved spaces. Interleaving provides for greater information density. The location of wide elements (bar/spaces) within each group determines which characters are encoded. This continuous code type uses no intercharacter spaces. Only numeric (0 to 9) and START/STOP characters may be encoded.
LASER - **Light Amplification by Stimulated Emission of Radiation**	The laser is an intense light source. Light from a laser is all the same frequency, unlike the output of an incandescent bulb. Laser light is typically coherent and has a high energy density.
Laser Diode	A gallium-arsenide semiconductor type of laser connected to a power source to generate a laser beam. This laser type is a compact source of coherent light.
LED Indicator	A semiconductor diode (LED - Light Emitting Diode) used as an indicator, often in digital displays. The semiconductor uses applied voltage to produce light of a certain frequency determined by the semiconductor's particular chemical composition.
MIL	1 mil = 1 thousandth of an inch.
Misread (Misdecode)	A condition which occurs when the data output of a reader or interface controller does not agree with the data encoded within a bar code symbol.
Nominal	The exact (or ideal) intended value for a specified parameter. Tolerances are specified as positive and negative deviations from this value.

Nominal Size	Standard size for a bar code symbol. Most UPC/EAN codes can be used over a range of magnifications (e.g., from 0.80 to 2.00 of nominal).
Parameter	A variable that can have different values assigned to it.
Percent Decode	The average probability that a single scan of a bar code would result in a successful decode. In a well-designed bar code scanning system, that probability should approach near 100%.
Print Contrast Signal (PCS)	Measurement of the contrast (brightness difference) between the bars and spaces of a symbol. A minimum PCS value is needed for a bar code symbol to be scannable. PCS = $(R_L - R_D) / R_L$, where R_L is the reflectance factor of the background and R_D the reflectance factor of the dark bars.
Programming Mode	The state in which a scanner is configured for parameter values. See SCANNING MODE.
Quiet Zone	A clear space, containing no dark marks, which precedes the start character of a bar code symbol and follows the stop character.
Random Access Memory (RAM)	Memory devices where any location in memory can be accessed as quickly as any other location.
Reflectance	Amount of light returned from an illuminated surface.
Resolution	The narrowest element dimension which can be distinguished by a particular reading device or printed with a particular device or method.
RTS	Request to send.
RxD	Received data.
Scan Area	Area intended to contain a symbol.
Scanner	An electronic device used to scan bar code symbols and produce a digitized pattern that corresponds to the bars and spaces of the symbol. Its three main components are: 1.Light source (laser or photoelectric cell) - illuminates a bar code. 2.Photodetector - registers the difference in reflected light (more light reflected from spaces). 3.Signal conditioning circuit - transforms optical detector output into a digitized bar pattern.
Scanning Mode	The scanner is energized, programmed, and ready to read a bar code.
Scanning Sequence	A method of programming or configuring parameters for a bar code reading system by scanning bar code menus.

Self-Checking Code	A symbology that uses a checking algorithm to detect encoding errors within the characters of a bar code symbol.
Space	The lighter element of a bar code formed by the background between bars.
Specular Reflection	The mirror-like reflection of light from a surface which can “blind” a scanner.
Start/Stop Character	A pattern of bars and spaces that provides the scanner with start and stop reading instructions and scanning direction. The start and stop characters are normally to the left and right margins of a horizontal code.
Substrate	A foundation material on which a substance or image is placed.
Symbol	A scannable unit that encodes data within the conventions of a certain symbology, usually including start/stop characters, quiet zones, data characters, and check characters.
Symbol Aspect Ratio	The ratio of symbol height to symbol width.
Symbol Height	The distance between the outside edges of the quiet zones of the first row and the last row.
Symbol Length	Length of symbol measured from the beginning of the quiet zone (margin) adjacent to the start character to the end of the quiet zone (margin) adjacent to a stop character.
Symbology	The structural rules and conventions for representing data within a particular bar code type (e.g. UPC/EAN, Code 39).
Tolerance	Allowable deviation from the nominal bar or space width.
TxD	Transmitted data.
UPC	Universal Product Code. A relatively complex numeric symbology. Each character consists of two bars and two spaces, each of which can be any of four widths. The standard symbology for retail food packages in the United States.
Visible Laser Diode (VLD)	A solid state device which produces visible laser light. Laser light emitted from the diode has a wavelength of 670 to 680 nanometers.



Index

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What topics need to be added to the index, if applicable? _____
_____

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_____
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