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LS 1220



Product Reference Guide

LS 1220
Product Reference Guide

70-12072-03
Revision A
January 2003

symbol®

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Patents

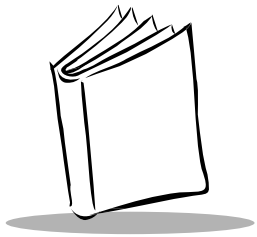
This product is covered by one or more of the following U.S. and foreign Patents:

U.S. Patent No. 4,593,186; 4,603,262; 4,607,156; 4,652,750; 4,673,805; 4,736,095; 4,758,717; 4,760,248; 4,806,742; 4,816,660; 4,845,350; 4,896,026; 4,897,532; 4,923,281; 4,933,538; 4,992,717; 5,015,833; 5,017,765; 5,021,641; 5,029,183; 5,047,617; 5,103,461; 5,113,445; 5,130,520; 5,140,144; 5,142,550; 5,149,950; 5,157,687; 5,168,148; 5,168,149; 5,180,904; 5,216,232; 5,229,591; 5,230,088; 5,235,167; 5,243,655; 5,247,162; 5,250,791; 5,250,792; 5,260,553; 5,262,627; 5,262,628; 5,266,787; 5,278,398; 5,280,162; 5,280,163; 5,280,164; 5,280,498; 5,304,786; 5,304,788; 5,306,900; 5,324,924; 5,337,361; 5,367,151; 5,373,148; 5,378,882; 5,396,053; 5,396,055; 5,399,846; 5,408,081; 5,410,139; 5,410,140; 5,412,198; 5,418,812; 5,420,411; 5,436,440; 5,444,231; 5,449,891; 5,449,893; 5,468,949; 5,471,042; 5,478,998; 5,479,000; 5,479,002; 5,479,441; 5,504,322; 5,519,577; 5,528,621; 5,532,469; 5,543,610; 5,545,889; 5,552,592; 5,557,093; 5,578,810; 5,581,070; 5,589,679; 5,589,680; 5,608,202; 5,612,531; 5,619,028; 5,627,359; 5,637,852; 5,664,229; 5,668,803; 5,675,139; 5,693,929; 5,698,835; 5,705,800; 5,714,746; 5,723,851; 5,734,152; 5,734,153; 5,742,043; 5,745,794; 5,754,587; 5,762,516; 5,763,863; 5,767,500; 5,789,728; 5,789,731; 5,808,287; 5,811,785; 5,811,787; 5,815,811; 5,821,519; 5,821,520; 5,823,812; 5,828,050; 5,848,064; 5,850,078; 5,861,615; 5,874,720; 5,875,415; 5,900,617; 5,902,989; 5,907,146; 5,912,450; 5,914,478; 5,917,173; 5,920,059; 5,923,025; 5,929,420; 5,945,658; 5,945,659; 5,946,194; 5,959,285; 6,002,918; 6,021,947; 6,029,894; 6,031,830; 6,036,098; 6,047,892; 6,050,491; 6,053,413; 6,056,200; 6,065,678; 6,067,297; 6,082,621; 6,084,528; 6,088,482; 6,092,725; 6,101,483; 6,102,293; 6,104,620; 6,114,712; 6,115,678; 6,119,944; 6,123,265; 6,131,814; 6,138,180; 6,142,379; 6,172,478; 6,176,428; 6,178,426; 6,186,400; 6,188,681; 6,209,788; 6,209,789; 6,216,951; 6,220,514; 6,243,447; 6,244,513; 6,247,647; 6,308,061; 6,250,551; 6,295,031; 6,308,061; 6,308,892; 6,321,990; 6,328,213; 6,330,244; 6,336,587; 6,340,114; 6,340,115; 6,340,119; 6,348,773; 6,380,949; 6,394,355; D305,885; D341,584; D344,501; D359,483; D362,453; D363,700; D363,918; D370,478; D383,124; D391,250; D405,077; D406,581; D414,171; D414,172; D418,500; D419,548; D423,468; D424,035; D430,158; D430,159; D431,562; D436,104.

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European Patent 367,299; 414,281; 367,300; 367,298; UK 2,072,832; France 81/03938; Italy 1,138,713

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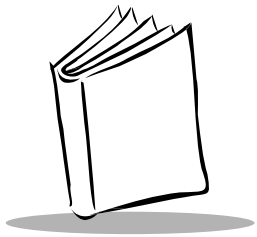
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About This Guide

Overview

The *LS 1220 Product Reference Guide* provides general instructions for setup, operation, troubleshooting, maintenance, and programming.

Note: *This guide provides general instructions for the installation of the scanner into a customer's application. It is recommended that an opto-mechanical engineer perform a opto-mechanical analysis prior to integration.*

Chapter Descriptions

Topics covered in this guide are as follows:

- Chapter 1, *Introduction*, provides an Overview of the scanner as well as the Theory of Operation and the Electrical Interface information.
- Chapter 2, *Installation*, explains how to install the scanner. Provides detailed information on Mounting, Installation, Housing Design, ESD, Location and Positioning requirements are provided. Information on accessories is also provided.
- Chapter 3, *LS 1220-I300A Standard Version*, provides the LS 1220-I300A scanner technical specifications.
- Chapter 4, *LS 1220WA-I300A Wide Angle*, provides the LS 1220WA-I300A scanner technical specifications.
- Chapter 5, *LS 1220VHD-I300A Very High Density*, provides the LS 1220VHD-I300A scanner technical specifications.

- Chapter 6, *Scanning*, provides information on scanning, the various triggering options, and aiming hints.
- Chapter 7, *Maintenance & Troubleshooting*, provides the LS 1220 Troubleshooting procedures.
- Chapter 8, *Programming*, provides the programming bar code menus, and the the RS-232 port programming options.
- Chapter 9, *Parameter Menus*, provides the necessary bar codes to program the LS 1220.
- Glossary, provides a listing of common terms used with the scan engines.

Notational Conventions

The following conventions are used in this document:

- 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 1220 Quick Reference Guidep/n 70-17676-xx*
- AIM’s Guidelines on Symbology Identifiersp/n X-50.

Service Information

If you have a problem with the 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 may 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, specific directions will be provided.

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 shipping container sent to you.*

Symbol Support Center

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

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Holtsville, New York 11742-1300
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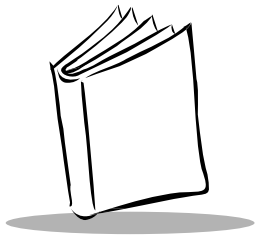
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If the Symbol product was purchased from a Symbol Business Partner, contact that Business Partner for service.

Warranty

(A) Seller's hardware Products are warranted against defects in workmanship and materials for a period of twelve (12) months from the date of shipment, provided the Product remains unmodified and is operated under normal and proper conditions. Warranty provisions and durations on software, integrated installed systems, Product modified or designed to meet specific customer specifications ("Custom Products"), remanufactured products, and reconditioned or upgraded products, shall be as provided in the applicable Product specification in effect at the time of purchase or in the accompanying software license. (B) Products may be serviced or manufactured with parts, components, or subassemblies that originate from returned products and that have been tested as meeting applicable specifications for equivalent new material and Products. The sole obligation of Seller for defective hardware Products is limited to repair or replacement (at Seller's option) on a "return to service depot" basis with prior Seller authorization. Shipment to and from Seller will be at Seller's expense, unless no defect is found. No charge will be made to Buyer for replacement parts for warranty repairs. Seller is not responsible for any damage to or loss of any software programs, data or removable data storage media, or the restoration or reinstallation of any software programs or data other than the software, if any, installed by Seller during manufacture of the Product. The aforementioned provisions do not extend the original warranty period of any Product that had either been repaired or replaced by Seller. (C) The above warranty provisions shall not apply to any Product (i) which has been repaired, tampered with, altered or modified, except by Seller's authorized service personnel; (ii) in which the defects or damage to the Product result from normal wear and tear, misuse, negligence, improper storage, water or other liquids, battery leakage or failure to perform operator handling and scheduled maintenance instructions supplied by Seller; (iii) which has been subjected to unusual physical or electrical stress, abuse, or accident, or forces or exposure beyond normal use within the specified operational and environmental parameters set forth in the applicable Product specification; nor shall the above warranty provisions apply to any expendable or consumable items, such as batteries, supplied with the Product. EXCEPT FOR THE WARRANTY OF TITLE AND THE EXPRESS WARRANTIES STATED ABOVE, SELLER DISCLAIMS ALL WARRANTIES ON PRODUCTS FURNISHED HERUNDER INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABLILTY AND FITNESS FOR A PARTICULAR USE. ANY IMPLIED WARRANTIES THAT MAY BE IMPOSED BY LAW ARE LIMITED IN DURATION TO THE LIMITED WARRANTY PERIOD. SOME STATES OR COUNTRIES DO NOT ALLOW A LIMITATION ON HOW LONG AN IMPLIED WARRANTY LASTS OR THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR CONSUMER PRODUCTS. IN SUCH STATES OR COUNTIRES, FOR SUCH PRODUCTS, SOME EXCLUSIONS OR LIMITATIONS OF THIS LIMITED WARRANTY MAY NOT APPLY. The stated express warranties are in lieu of all obligations or liabilities on the part of Seller for damages, including but not limited to, special, indirect or consequential damages arising out of or in connection with the use or performance of the Product or service. Seller's liability for damages to Buyer or others resulting from the use of any Product or service furnished hereunder shall in no way exceed the purchase price of said Product or the fair market value of said service, except in instances of injury to persons or property.



Chapter 1
Introduction



WARNING

Per FDA and IEC standards, the scan engines described in this guide are not given a laser classification. However, the following precautions should be observed.
This laser component emits FDA/IEC Class 2 laser light at the exit port. Do not stare into beam.

Overview

The LS 1220, is a compact reliable miniaturized scanner that features durable construction (die-cast metal housing) and uses Symbol's revolutionary patented mylar scan element (with no friction or wear for the highest reliability). Ideal for use as a fixed-mount scanner or embedded scan module it is intended for OEM equipment integration and it uses a RS-232C host interface. The LS1220 generates visible laser and provides for ease and flexiblity in bar code scanning integration.

Symbol's state-of-the-art laser technology provides the highest first read rates, accuracy, a wide decode zone, and excellent reliability.

Available versions include:

- *LS 1220-I300A Standard Version* on page 3-1
- *LS 1220WA-I300A Wide Angle* on page 4-1
- *LS 1220VHD-I300A Very High Density* on page 5-1.

The models are functionally similar, with the exception of the decode zones.

See *LS 1220-I300A Standard Range Decode Zone* on page 3-5, *LS 1220WA-I300A Decode Zone (Typical)* on page 4-5, and *LS 1220VHD-I300A Decode Zone (Typical)* on page 5-5. These scanners read bar codes printed on all substrates.

Typical Applications

The LS 1220 Wide Angle Scan Engine features a broad 60° scan angle to accommodate larger bar codes within extremely close range. The LS1220WA is ideal for high-volume, near-contact scanning such as Kiosks, ATM, Lottery Machines and other applications that require superior scanning performance in a complete package. The LS 1220 scan modules are also ideal for embedded applications such as chemical and blood analyzers, automated medical test and processing equipment, and many other automated data entry devices including Lottery Terminals. When used as a fixed-mount scanner, the LS 1220 modules are ideal for, library, document tracking, manufacturing and warehousing applications.



Figure 1-1. LS 1220

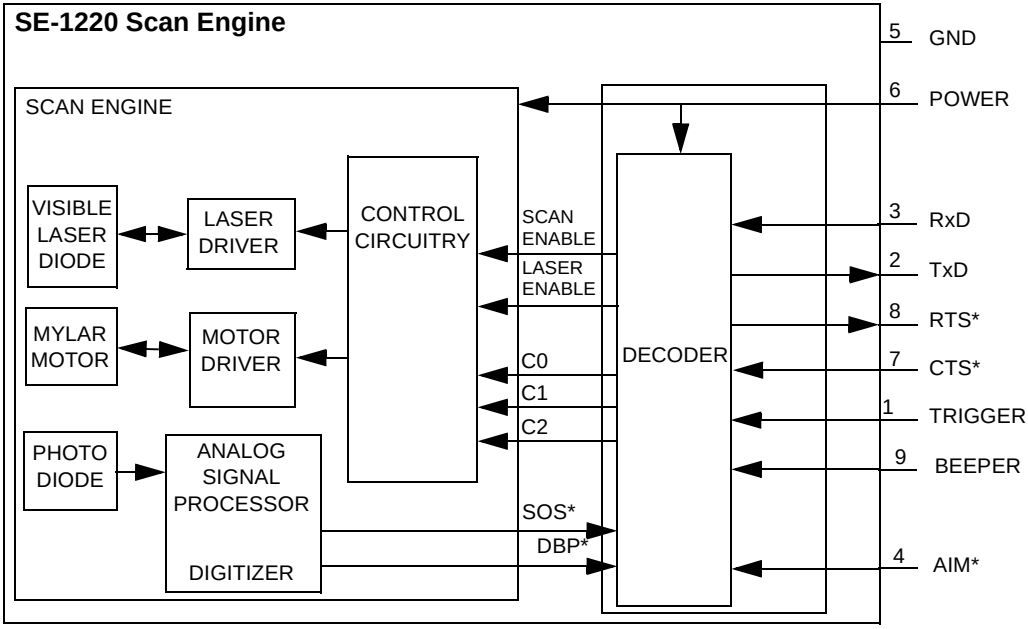
Theory of Operation

A laser diode produces a single beam of coherent light which is deflected off of an oscillating mirror to create the laser scan beam.

When the laser light strikes a bar code, the dark bars absorb the laser light and the light spaces reflects it. A photo diode senses the reflected light and generates a proportional current. That current is amplified and filtered to produce an analog voltage which is sent to a digitizer. The digitizer transforms the signal into a digital representation of the bar code called the Digitized Bar Pattern (DBP) and the DBP data is sent to the host or decode board for processing.

Block Diagram

The LS 1220 Scan Engine Block Diagram (Figure 1-2 on page 1-4) provides the functional relationship of the LS 1220 components. A detailed functional description of each of the components in the block diagram is also provided.



* = Logic Low

Figure 1-2. SE 1220 Scan Engine Block Diagram

Decoder

The Decoder contains a micro-controller that provides the capability for bar code decoding, host I/O interface protocol, and other decoder functions.

The micro-controller contains a watchdog timer. The enabling/disabling and maintenance of this watchdog are totally internal to the decoder; the host can not configure the watchdog.

The Decoder's reset circuitry holds the micro-controller in reset after power up to allow sufficient time for hardware initialization. This reset period is 70 msec. nominal at 5 V dc. A reset can occur upon power up, or power supply voltage falling below 2.8 V nominal. A reset time is generated in the CPU from an external resistor, capacitor, voltage detector, and internal pull-up resistor.

The non-volatile memory stores the Decoder capability parameters. After every reset, the decoder checks for faults in the memory; if no faults are found, its contents are copied into its internal RAM. If a fault is found, the decoder copies factory default values into RAM and the memory. The Decoder does not correct the fault unless requested by the host.

Visible Laser Diode

The VLD (Visible Laser Diode) is a semiconductor device that emits laser light. The laser output is different from conventional light sources in that it is coherent, both spatially and temporally. The VLD output can be focused to allow barcode scanning over long distances.

Laser Driver

The Laser Driver is an electronic feedback circuit that controls the laser diode operation. The circuit monitors and controls the VLD, providing a regulated optical output power level.

Mylar Motor

The Mylar Motor and Mirror Assembly is an electromechanical resonant scan element. The oscillating motor/mirror assembly deflects the laser beam across the barcode to be scanned. The resonant design minimizes power consumption, which is especially important in battery operated applications. The scan element has been designed to be highly rugged and reliable.

Motor Driver

The Motor Driver is an electromagnetic and electronic circuit that provides feedback control of the mylar motor scan element. The circuit regulates the scan amplitude of the motor/mirror assembly. The scan frequency is determined by the resonance characteristics of the mechanical design. The motor fail detector is a laser safety circuit that monitors the motor behavior, and turns off the VLD if the motor fails to operate. The SOS (Start Of Scan) signal transitions from high to low and low to high, corresponding to the edges of the scan line. The signal frames the data received by a complete scan line.

Control Circuitry

Interface Control Circuitry controls operation of the scanner, motor, and laser, depending on the states of the input signals from the host device.

Photodiode

The Photodiode is a transducer that converts incident light energy into an electrical current. It is the “eye” of the scan engine. When the laser beam passes over a barcode, the black bars absorb the light and the white spaces reflect the light. Collection optics focus the received reflected light onto the photodiode. The photodiode produces a photocurrent proportional to the received optical signal.

Analog Signal Processor

The Analog Signal Processor is a transimpedance preamplifier which converts the photocurrent into a voltage and provides amplification. Additional amplifier stages provide signal gain and bandpass filtering. The AGC (Automatic Gain Control) circuit is a feedback loop that monitors the received signal voltage level and varies the voltage gain to maintain a constant amplitude at the output. The output analog signal is then input into the digitizer.

Digitizer

The Digitizer is an edge detection circuit that takes the amplified and filtered analog signal and converts it into a digital representation of the scanned barcode. The output of the digitizer is called the DBP (Digitized Bar Pattern). The widths of the DBP elements are proportional to the printed bars and spaces of the barcode. The DBP signal is sent to the decoder board or host computer to decode the data.

Electrical Interface

Table 1-1 lists the pin functions of the LS 1220 interface.

Table 1-1. Electrical Interface

Pin No.	Pin Name	Type	Function
1	**Trigger***	**I**	This pin is normally pulled high. When this pin is grounded, the scan module begins scanning.
2	**TxD**	**O**	Serial data transmit output. It drives the serial data receive input on the device communicating with the scanner.
3	**RxD**	**I**	Serial data receive input. It is driven by the serial data transmit output on the device communicating with the scanner.
4	**Aim***	**I**	This pin is left floating, or pulled high for the standard and wide angle LS 1220s, models during normal scanning.
5	**Ground**		Power supply input ground pin and reference for both output signals. It must be capable of sinking all return current.
6	**Power**		5.0 VDC ± 5%
7	**CTS***	**I**	Clear-to-send handshaking input line. It may be optionally used by another device to signal the scanner that it may commence transmitting data. It can be used only in conjunction with the RTS line.
8	**RTS**	**O**	Request-to-send handshaking output line. It may be optionally used by the scanner to signal another device that data is available to send. It can only be utilized in conjunction with the CTS line.
9	**Beeper***	**O**	This is an open collector beeper output that can sink 50 mA maximum. Output frequency 2.5 kHz nominal, 50% duty cycle.
* Active Low, I = Input O = Output			

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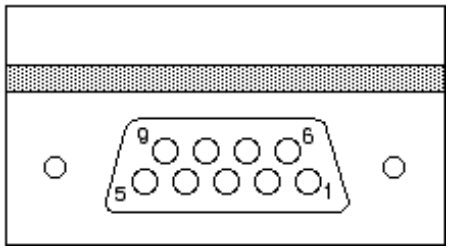
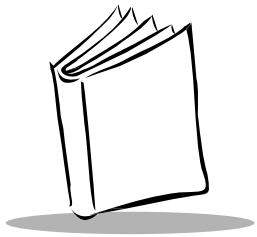


Figure 1-3. LS 1220 Connector



Chapter 2
Installation

Overview

This chapter provides the LS 1220 scan engine unpacking, mounting and installing requirements information. Physical and electrical considerations are provided, together with the recommended window properties.

Unpacking

Remove the LS 1220 from its packing and inspect the scanner for evidence of physical damage. If the scanner was damaged in transit, call the *Symbol Support Center* at the telephone number listed on page xi.

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

Mounting

There are four mounting holes (M3x0.5-6H), and two locator holes on the bottom of the chassis.

Refer to Figure 2-1 on page 2-2 for mounting dimensions.

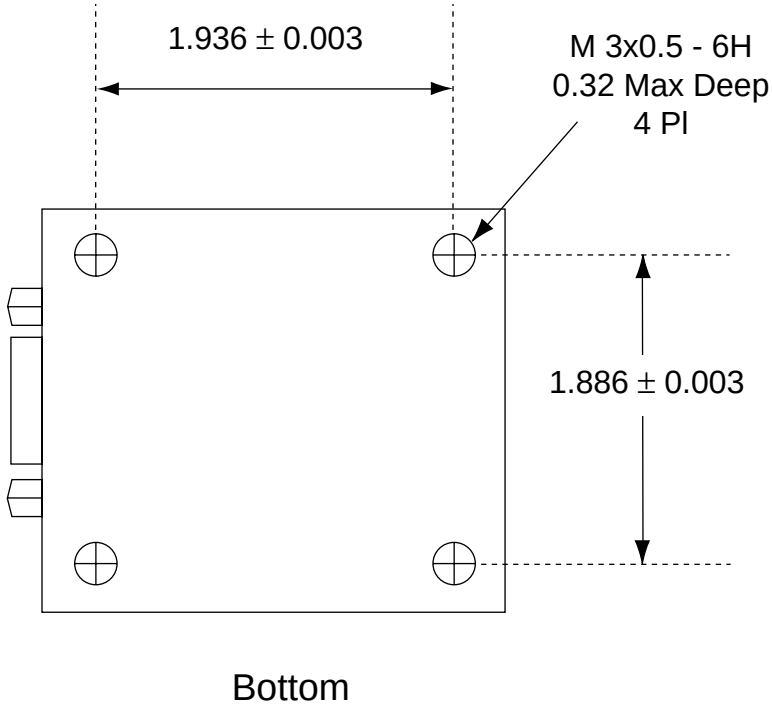


Figure 2-1. LS 1220 Mounting Dimensions

Connecting the LS 1220

To connect the LS 1220 to the host:

1. Plug the 9-pin D-connector into the LS 1220.
2. Plug the output cable from the power supply into the receptacle on the side of the 9-pin D-connector.
3. Plug the power supply into an appropriate AC receptacle.
4. An external triggering switch (or photo sensor) may be connected to the external triggering jack on the RS-232C cable. Refer to Figure 2-2. for wiring details.

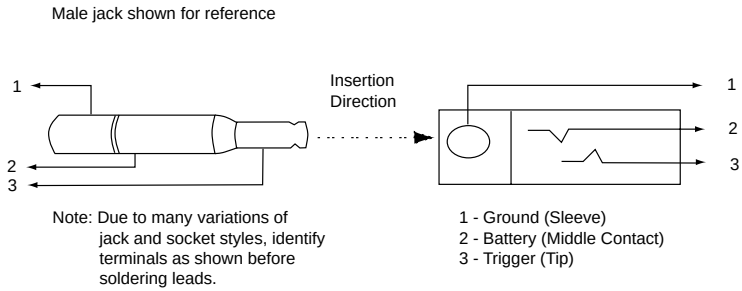


Figure 2-2. Stereo Mini Connector

5. Check connections. Be sure all cables and power supply connections are secure.
6. Program the LS 1220 according to your specific requirements. Consult Chapter 8, *Programming*, for more information.

Note: *If the LS 1220 came without a host cable, see Figure 4-2 on page 4-5 and Table 4-2 on page 4-6 for configuration and pin-outs.*

Housing Design

The scan engine housing design must be such that internal reflections from the outgoing laser beam are not directed back toward the detector. The reflections from the front corners of the scan engine housing near the exit window and from the window itself can often be troublesome. Also, for particular window tilt angles, reflections from the window can bounce off the top or bottom of the housing and reach the detector.

ESD

The LS 1220 is protected from ESD events that may occur in an ESD-controlled environment. Always exercise care when handling the module. Use grounding wrist straps and handle in a properly grounded work area.

Location and Positioning

Caution

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

Using the LS 1220 as an Embedded Scanner

Some applications require the LS 1220 be mounted to read symbols that are automatically presented, or that are presented in a pre-determined location. In these applications LS 1220 positioning (with respect to the symbol) is critical. Failure to properly position the LS 1220 with respect to the symbol may lead to degraded or unsatisfactory reading performance.

Two methods of positioning the scanner have been provided:

The *Calculating The Usable Scan Length Method* on page 2-5, can be used with consistently good quality symbols. It provides a mathematical solution to find the usable scan length.

The *Testing The Usable Scan Length Method* on page 2-6, uses real situation testing to adjust the usable scan length to fit the application conditions.

Calculating The Usable Scan Length Method

Usable scan length is calculated as follows (see Figure 2-3 on page 2-5):

$$L = 1.8 \times (D+d) \times \tan(A/2)$$

Where:

D = Distance (in inches) from the front edge of the housing to the bar code.

d = The housing's internal optical path from the edge of the housing to the front of the scanner.

A = Scan angle in degrees A° (see Technical Specifications table for each scan engine model).

Note: *Usable scan length determined by above formula, or 90% of scan line at any working distance. The calculation given above is based on good quality symbols in the center of the working range and length of bar code.*

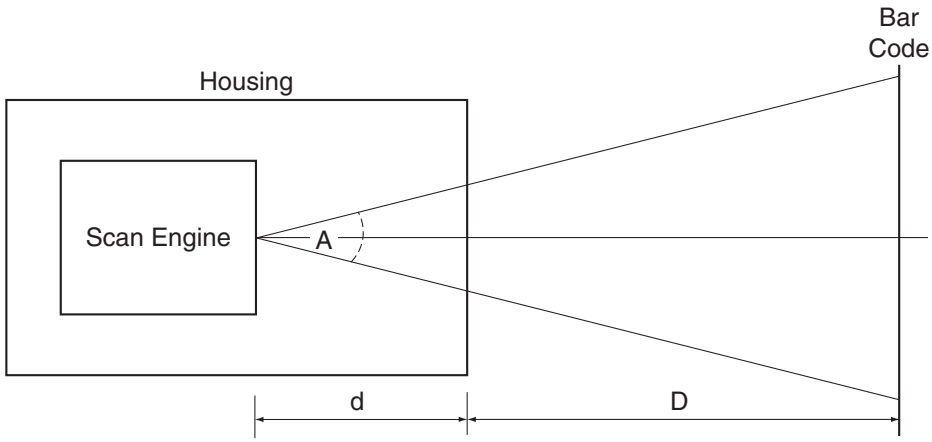


Figure 2-3. Usable Scan Length Diagram

Testing The Usable Scan Length Method

Due to the large variety of symbol sizes, densities, print quality, etc., there is no simple way to calculate the optimum symbol distance. To ensure optimum performance use the *Testing The Usable Scan Length* positioning method to maximize performance.

Determining the optimum distance between the scan engine and the symbol:

1. Measure the maximum and minimum distances at which the symbols can be read.
2. Check the near and far range on several symbols. If they are not reasonably consistent there may be a printing quality problem that can degrade the performance of your system. Symbol Technologies can provide advice on how to improve your installation.

Note: *Poor quality symbols (from bad printing, wear, or damage) may not decode well when placed in the center of the depth of field (especially true of higher density codes). The scan beam has a minimum width in the central area, and when the scanner tries to read all the symbol imperfections in this area it may end up with no decode. Therefore, after a preliminary spot is determined using good quality symbols, several of lessor quality symbols should be tested and the spot adjusted for the best overall symbol position.*

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3. Locate the scanner so the symbol is near the middle of the near/far range.
4. Center the symbol (left to right) in the scan line whenever possible.
5. Position the symbol so that the scan line is as near as possible to perpendicular to the bars and spaces in the symbol.
6. Avoid specular reflection (glare) off the symbol by tilting the top or bottom of the symbol away from the engine. The exact angle is not critical, but it must be large enough so that if a mirror were inserted in the symbol location, the reflected scan line would miss the front surface of the engine. For the maximum allowable angles refer to the Skew, Pitch and Roll angles listed in each scan engine's *Technical Specifications* Table.
7. If an additional window is to be placed between the scanner and the symbol, the determination of optimum symbol location should be made with a representative window in the desired window position. Review the sections of this chapter concerning window quality, coatings and positioning.
8. Give the scanner time to dwell on the symbol for several scans. When first enabled, the scan engine may take two or three scans before it reaches maximum performance. Enable the scan engine before the symbol is presented, if possible.

Conveyor Applications

Conveyor applications require that the conveyor velocity be set to optimize the scanner's ability to read symbols. The orientation of the symbol with respect to the conveyor direction is another consideration. Figure 2-4 on page 2-7 illustrates the relationship of the conveyor velocity with respect to a symbol positioned perpendicular to the conveyor direction and Figure 2-5 on page 2-8 illustrates the relationship of the conveyor velocity with respect to a symbol positioned parallel to the conveyor direction.

Symbol is Perpendicular to Conveyor Movement

With the symbol perpendicular to the conveyor belt direction (Picket Fence presentation) the relationship is:

V = (R x (F-W) / N

Where: V = Velocity of the Conveyor (inches/second)

R = Scan Rate (35 scans/second)

F = Field Width of Scan Beam

W = Symbol Width (inches)

N = Number of scans over symbol (minimum of 10 scans)

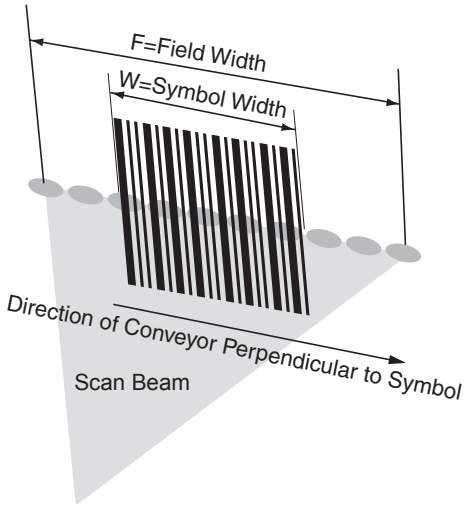


Figure 2-4. Symbol Perpendicular To Conveyor Movement

Symbol is Parallel to Conveyor Movement

With the symbol parallel to the conveyor belt direction (Ladder presentation) the relationship is:

V = (R x H) / N

Where:

V = Velocity of the Conveyor (inches/second)

R = Scan Rate (35 scans/second)

H = Symbol height

N = Number of scans over symbol (minimum of 10 scans)

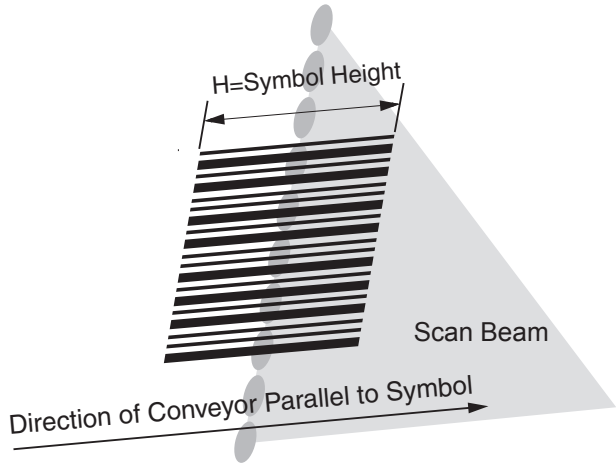


Figure 2-5. Symbol Parallel To Conveyor Movement

Accessories

Required Accessories

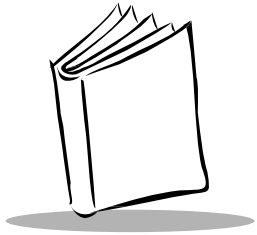
LS 1220 scanners are sent as a package with required accessories listed in the Product Ordering Guide.

Optional Accessories

Optional accessories, listed in the Product Reference Guide, include various stands and holders, which are supplied at extra cost. Additional units of standard accessories listed above may also be purchased at extra cost. See Table 2-1 on page 2-9.

Table 2-1. Accessories

Part Number	Description
21-12591-01	Hands-Free Stand
70-12072-03	LS 1220 Product Reference Guide**
SW-13193-01	PC Menu Configuration Program
25-13176-01	Photo Switch trigger and cable
25-04950-01	Push button trigger and cable
21-12548-02	Right Angle Mirror for LS 1220



Chapter 3
LS 1220-I300A Standard Version

Overview

This chapter provides the technical specifications for the LS 1220-I300A (Standard Version) scan engine.

Chapter 1, provides the detailed *Theory of Operation,* including a discussion of the functional components and the electrical inputs.

Chapter 2, provides the detailed *Installation Procedures*, including mounting, positioning, minimum window dimensions and application discussions.

Technical Specifications

Table 3-1 on page 3-2 provides the LS 1220-I300A technical specifications.

Electrical Interface

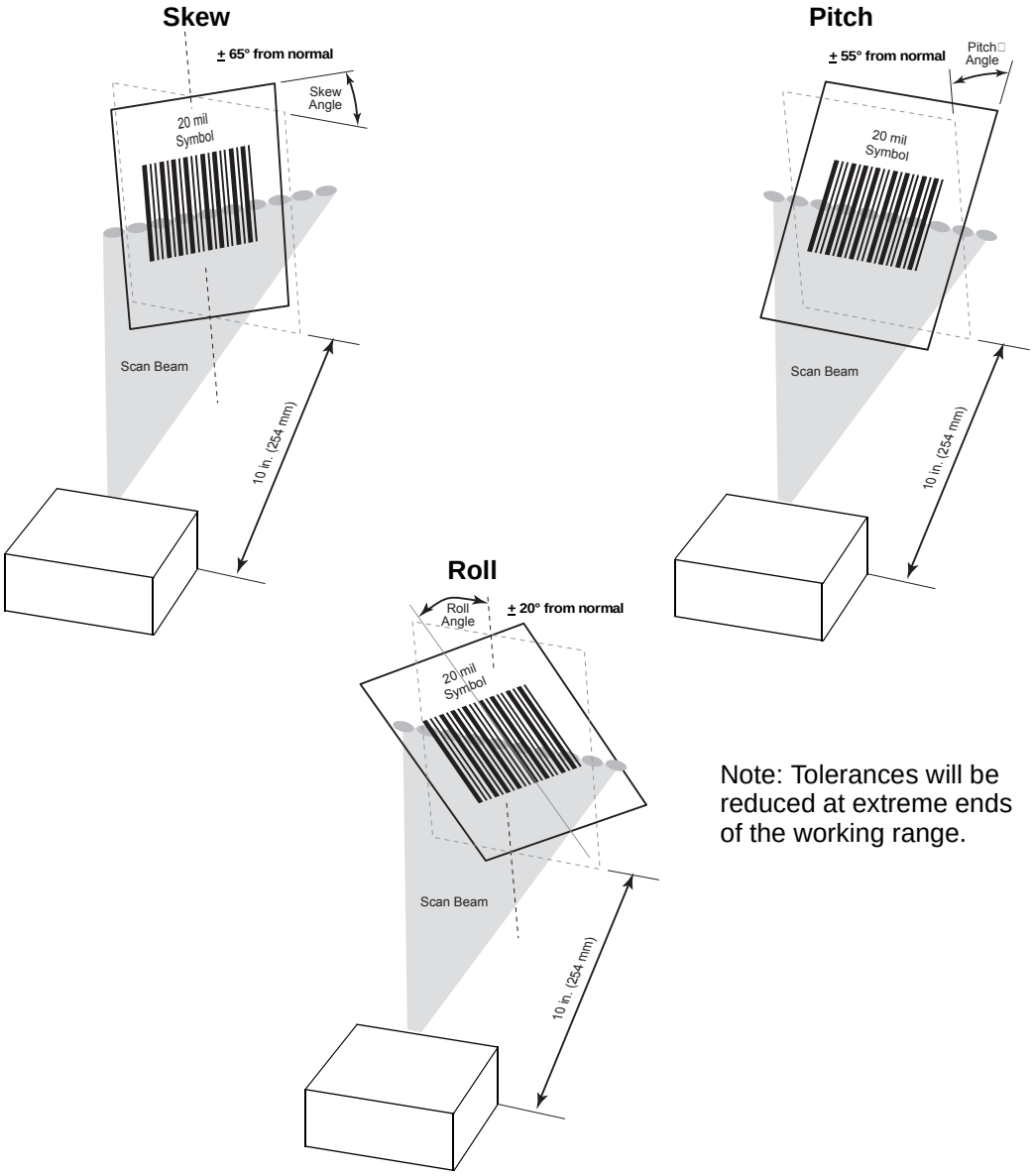
Table 1-1 on page 1-7 lists the pin functions of the scan engine interface for the LS 1220-I300A scan engine.

Table 3-1. LS 1220-I300A Standard Version Technical Specifications @ 23°C

Item	Description
Power Requirements	
Input Voltage	5.0 VDC ± 10%
Input Current	60 mA typical @ 5V; 85 mA max
Standby Current	47 mA max
V_{cc} Noise Level	50 mV p to p typical, 200 mV p to p max
Scan Repetition Rate	35 (± 5) scans/sec (bidirectional)
Decode Capability	UPC/EAN, Code 39, Code 39 full ASCII, Code 93, Codabar, I 2 of 5, Code 128, EAN 128, Discrete 2 of 5, MSI Plessey, and other popular code types.
Programmable Parameters	Laser on time, Trigger Mode, Bi-directional redundancy, Symbology types/lengths, Data formatting, RS 232 communication parameters
Interfaces Supported	RS 232
Laser Power	0.8 mW ± 10%, 650 nm
Print Contrast	Minimum 20% absolute dark/light reflectance differential measured at 650 nm
Scan	
Angle	42° ± 2°
Pattern	Linear
Skew Tolerance	± 65° from normal (see Figure 3-1 on page 3-4
Pitch Angle	± 55° L/R from normal (see Figure 3-1 on page 3-4)
Roll	± 20° from vertical (see Figure 3-1 on page 3-4)
Decode Depth of Field	Maximum working distance is 45 in. (114.3 cm) Minimum element width resolution is 5.0 mils (.127 mm) Maximum element width resolution is 55 mils (1.4 mm)
Ambient Light Immunity	
Sunlight	8,000 ft. candles 86,112 lux with correct enclosure
Artificial Light	450 ft. candles 4,844 lux
Drop	3 ft. to concrete

Table 3-1. LS 1220-I300A Standard Version Technical Specifications @ 23°C (Con-

Item	Description
Shock	1500 G applied via any mounting surface
Vibration	Withstands a sinusoidal vibration of 1 G along each of the 3 mutually perpendicular axes for a period of 1 hr. per axis, over a frequency range of 5 Hz to 2000 Hz
Laser Classification	CDRH/IEC Class II/2
Electrical Safety	UL, VDE, and CUL recognized laser component
Operating Temperature	-4° to 122°F -20° to 50°C
Storage Temperature	-40° to 140°F -40° to 60°C
Humidity	5% to 95% non-condensing
Depth	2.18 in. 5.5 cm
Width	2.13 in. 5.4 cm
Height	1.3 in. 3.3 cm
Weight	6.5 oz. 184 gm
Connector	9-pin, Male, D-Type, see Table 1-1 for pin-outs.



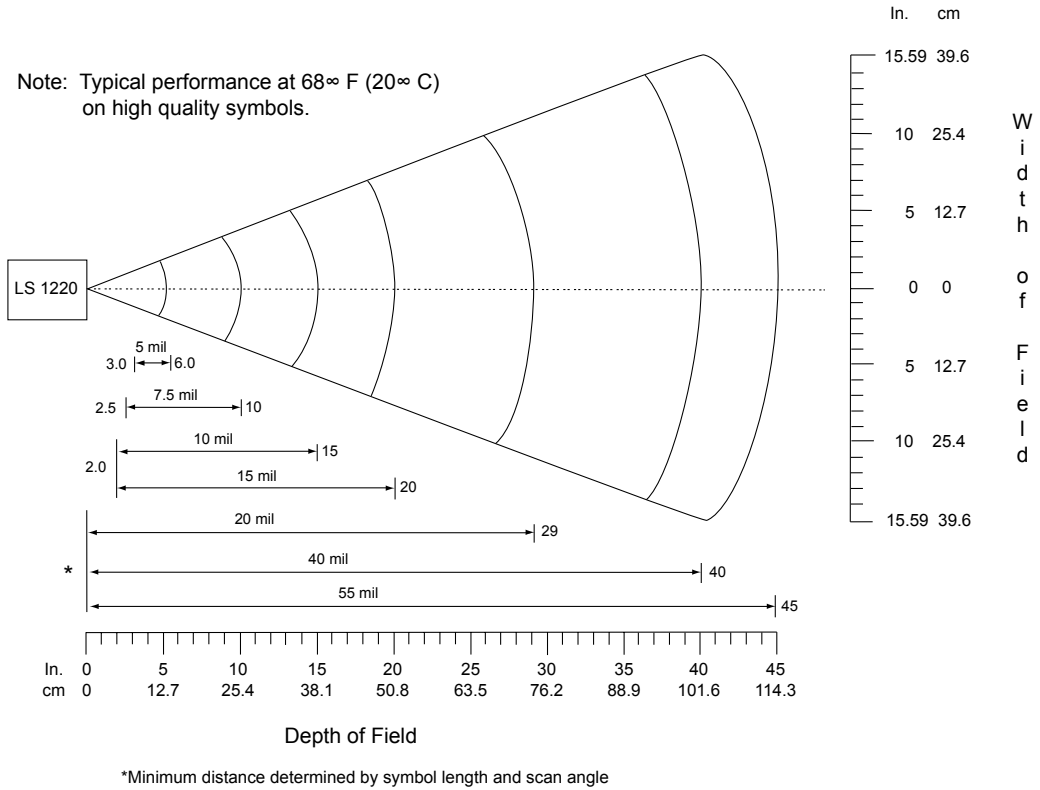
Note: Tolerances will be reduced at extreme ends of the working range.

Figure 3-1. Skew, Pitch and Roll

Decode Zone (V_{cc} = 5V)

The standard LS 1220-I300A decodes the symbols as shown in Figure 3-2. The figures shown are typical values. Table 3-2 on page 3-6 lists the typical and guaranteed distances for selected bar code densities. The minimum element width (or “symbol density”) is the width in mils of the narrowest element (bar or space) in the symbol. The maximum usable length of a symbol at any given range is shown below. *Calculating The Usable Scan Length Method* on page 2-5

LS 1220-I300A Standard Range Decode Zone



*Minimum distance determined by symbol length and scan angle

Figure 3-2. LS 1220-I300A Decode Zone (Typical)

Table 3-2. LS 1220-I300A Decode Distances

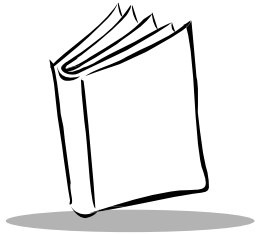
Symbol Density/ Bar Code Type/ W-N Ratio	Bar Code Content/ Contrast[Note 1]	Typical Working Ranges		Guaranteed Working Ranges	
		Near	Far	Near	Far
5 mil Code 39; 2.5:1	**ABCDEFGH** 80% MRD	**3.5 in.** 8.89 cm	**6.0 in.** 15.24 cm	**3.0 in.** 7.62 cm	**5.0 in.** 12.70 cm
7.5 mil Code 39; 2.5:1	**ABCDEF** 80% MRD	**2.5 in.** 6.35 cm	**10.0 in.** 25.40 cm	**2.75 in.** 6.98 cm	**9.0 in.** 22.86 cm
10 mil **Code 39; 2.5:1**	**FGH** 80% MRD	**2.0 in.** 5.08 cm	**15 in.** 38.1 cm	**2.5 in.** 6.35 cm	**13 in.** 33.02 cm
15 mil **Code 39; 2.5:1**	**ABCD** 80% MRD	**2.0 in.** 5.08 cm	**20 in.** 50.8 cm	**2.5 in.** 6.35 cm	**19 in.** 48.26 cm
20 mil Code 39; 2.2:1	**123** 80% MRD	*[Note 2]	**29.0 in.** 73.66 cm	*[Note 2]	**21.0 in.** 53.34 cm
40 mil Code 39; 2.2:1	**AB** 80% MRD	*[Note 2]	**40.0 in.** 101.60 cm	*[Note 2]	**30.0 in.** 76.20 cm
55 mil[Note 4] Code 39; 2.2:1	**CD** 80% MRD	*[Note 2]	**45.0 in.** 114.30 cm	*[Note 2]	**36.0 in.** 91.44 cm

Notes:

1. CONTRAST measured as Mean Reflective Difference (MRD) at 670 nm.
2. Near ranges on lower densities (not specified) are largely dependent upon the width of the bar code and the scan angle.
3. Working range specifications at ambient temperature (23 °C).
4. Reflective Symbol.

Usable Scan Length

The decode zone is a function of various symbol characteristics including density, print contrast, wide-to-narrow ratio, and edge acuity. Width of decode zone at any given distance must be considered when designing a system. *Calculating The Usable Scan Length Method* on page 2-5, provides a detailed description of how to calculate the usable scan length. The scan angle is provided in Table 3-1 on page 3-2.



Chapter 4
LS 1220WA-I300A Wide Angle

Overview

This chapter provides the technical specifications for the LS 1220WA-I300A (Wide Angle) scan engine.

Chapter 1, provides the detailed *Theory of Operation,* including a discussion of the functional components and the electrical inputs.

Chapter 2, provides the detailed *Installation Procedures*, including mounting, positioning, minimum window dimensions and application discussions.

Technical Specifications

Table 4-1 on page 4-2 provides the LS 1220WA-I300A technical specifications.

Electrical Interface

Table 1-1 on page 1-7 lists the pin functions of the scan engine interface for the LS 1220WA-I300A scan engine.

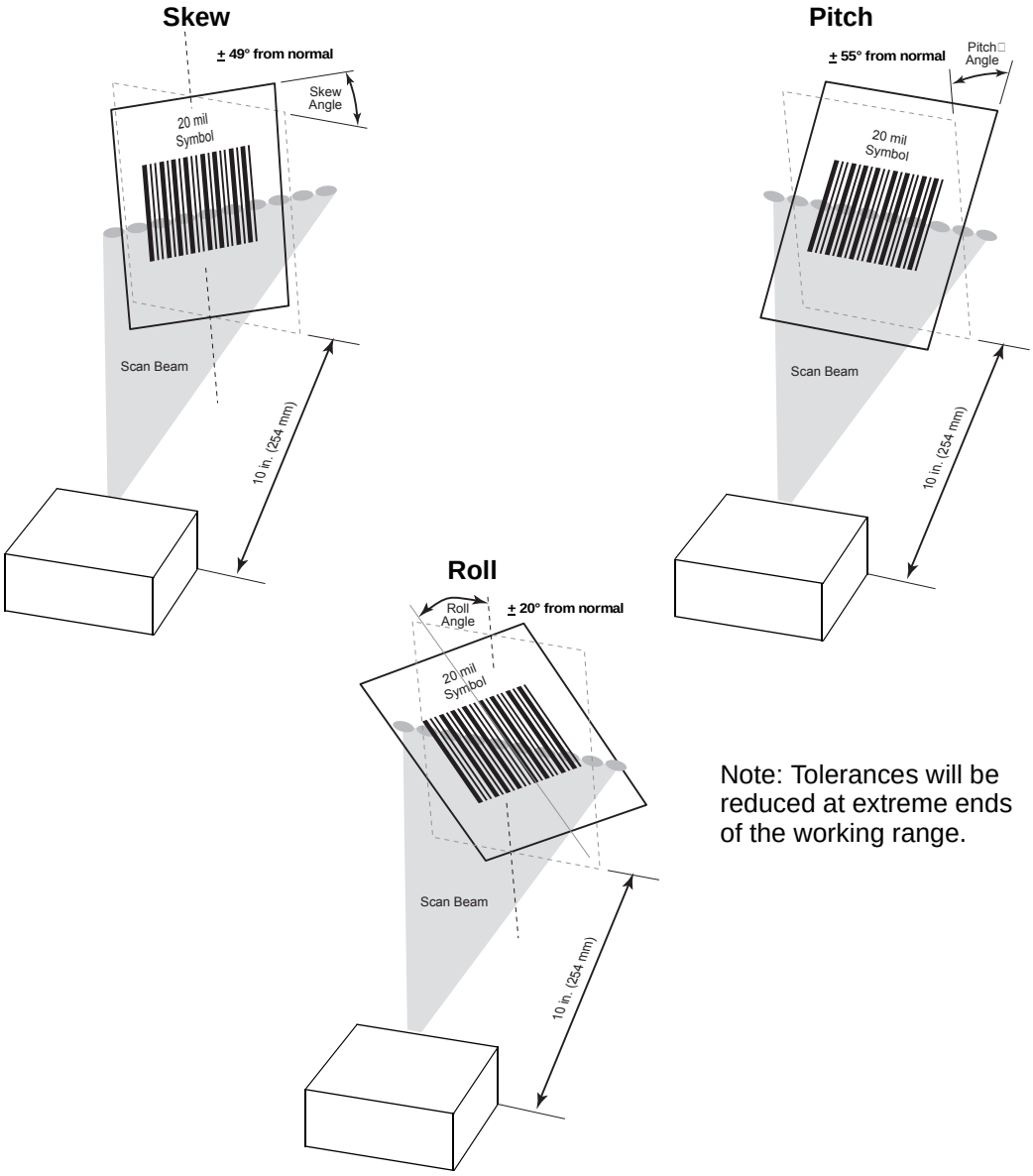
Note: *The LS 1220WA-I300A scan module does not support ScanStand operation; pin 2 on the electrical interface is not connected. It is recommended that pin 2 and pin 1 be tied together (at +5V).*

Table 4-1. LS 1220WA-I300A Technical Specifications @ 23°C

Item	Description
Power Requirements	
Input Voltage	5.0 VDC ± 10%
Input Current	60 mA typical @ 5V; 85 mA max
Standby Current	47 mA max
V_{cc} Noise Level	50 mV p to p typical, 200 mV p to p max
Scan Repetition Rate	35 (± 5) scans/sec (bidirectional)
Decode Capability	UPC/EAN, Code 39, Code 39 full ASCII, Code 93, Codabar, I 2 of 5, Code 128, EAN 128, Discrete 2 of 5, MSI Plessey, and other popular code types.
Programmable Parameters	Laser on time, Trigger Mode, Bi-directional redundancy, Symbology types/lengths, Data formatting, RS 232 communication parameters
Interfaces Supported	RS 232
Laser Power	0.8 mW ± 10%, 650 nm
Print Contrast	Minimum 20% absolute dark/light reflectance differential measured at 650 nm
Scan	
Angle	60° ± 2°
Pattern	Linear
Skew Tolerance	± 49° from normal (see Figure 4-1 on page 4-4)
Pitch Angle	± 55° L/R from normal (see Figure 4-1 on page 4-4)
Roll	± 20° from vertical (see Figure 4-1 on page 4-4)
Decode Depth of Field	Maximum working distance is 45 in. (114.3 cm) Minimum element width resolution is 5.0 mils (.127 mm) Maximum element width resolution is 55 mils (1.4 mm)
Ambient Light Immunity	
Sunlight	8,000 ft. candles 86,112 lux with correct enclosure
Artificial Light	450 ft. candles 4,844 lux

Table 4-1. LS 1220WA-I300A Technical Specifications @ 23°C (Continued)

Item	Description
Drop	3 ft. to concrete
Shock	1500 G applied via any mounting surface
Vibration	Withstands a sinusoidal vibration of 1 G along each of the 3 mutually perpendicular axes for a period of 1 hr. per axis, over a frequency range of 5 Hz to 2000 Hz
Laser Classification	CDRH/IEC Class II/2
Electrical Safety	UL, VDE, and CUL recognized laser component
Operating Temperature	-4° to 122°F -20° to 50°C
Storage Temperature	-40° to 140°F -40° to 60°C
Humidity	5% to 95% non-condensing
Depth	2.18 in. 5.5 cm
Width	2.13 in. 5.4 cm
Height	1.3 in. 3.3 cm
Weight	6.5 oz. 184 gm
Connector	9-pin, Male, D-Type see Table 1-1 for pin-outs.

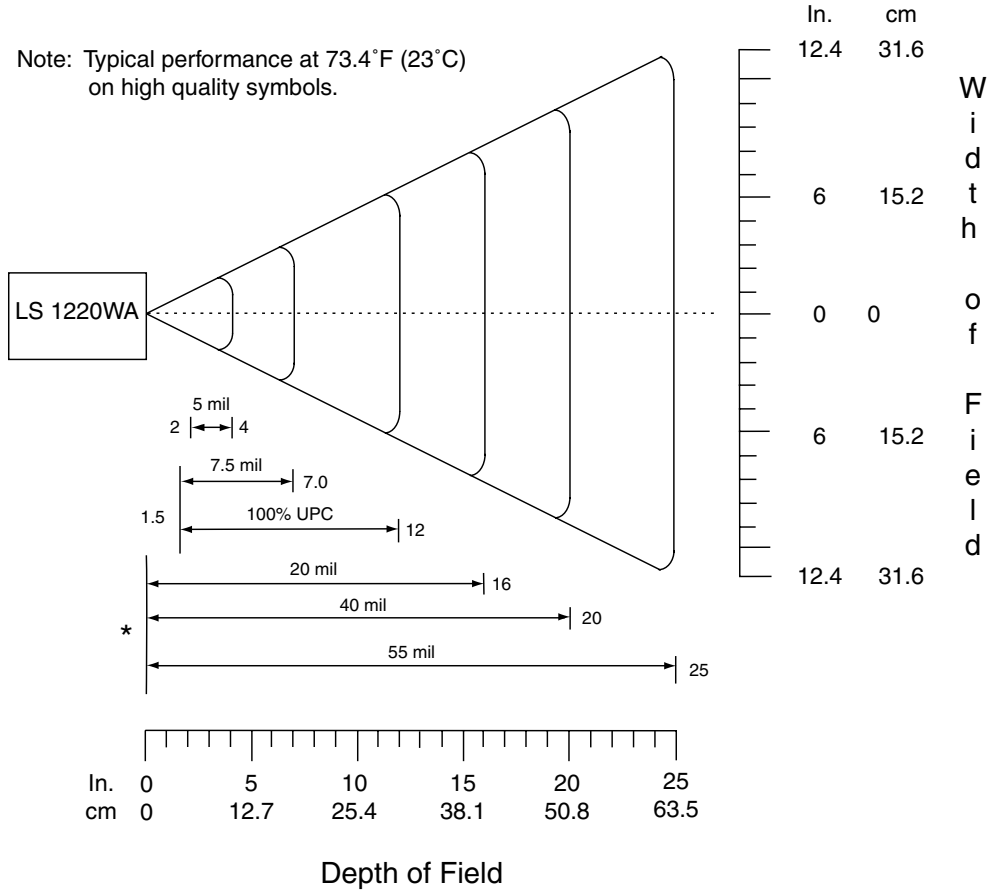


Note: Tolerances will be reduced at extreme ends of the working range.

Figure 4-1. Skew, Pitch and Roll

LS 1220 Wide Angle Decode Zone (V_{cc} = 5V)

The LS 1220 Wide Angle decodes the symbols as shown in Figure 4-2.. The figures shown are typical values. Table 4-2 on page 4-6 lists the typical and guaranteed distances for selected bar code densities. The minimum element width (or “symbol density”) is the width in mils of the narrowest element (bar or space) in the symbol. The maximum usable length of a symbol at any given range is shown below. *Calculating The Usable Scan Length Method* on page 2-5.



*Minimum distance determined by symbol length and scan angle

Figure 4-2. LS 1220WA-I300A Decode Zone (Typical)

Table 4-2. LS 1220 Wide Angle Decode Distances

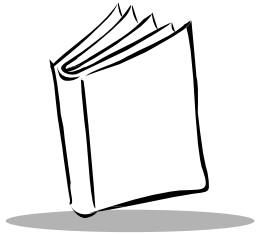
Symbol Density/ Bar Code Type/ W-N Ratio	Bar Code Content/ Contrast[Note 1]	Typical Working Ranges		Guaranteed Working Ranges	
		Near	Far	Near	Far
5 mil Code 39; 2.5:1	**ABCDEFGH** 80% MRD	**2.0 in** 5.08 cm	**4.0 in** 10.16 cm	**2.0 in** 5.08 cm	**4.0 in** 10.16 cm
7.5 mil Code 39; 2.5:1	**ABCDEF** 80% MRD	**1.5 in** 3.81 cm	**7.0 in** 12.0 cm	**2.75 in** 6.98 cm	**9.0 in** 22.86 cm
13 mil 100% UPC	**1234567890** 80% MRD	**1.5 in** 3.81 cm	**12.0 in** 30.48 cm	**1.5 in** 3.81 cm	**10.0 in** 25.40 cm
20 mil Code 39; 2.2:1	**123** 80% MRD	*****	**16.0 in** 40.64 cm	*****	**14.0 in** 35.56 cm
40 mil Code 39; 2.2:1	**AB** 80% MRD	*****	**20.0 in** 50.80 cm	*****	**18.0 in** 45.72 cm
55 mil Code 39; 2.2:1	**CD** 80% MRD	*	**25.0 in** 63.50 cm	*****	**23.0 in** 58.42 cm

Notes:

1. CONTRAST measured as Mean Reflective Difference (MRD) at 670 nm.
2. Near ranges on lower densities (not specified) are largely dependent upon the width of the bar code and the scan angle.
3. Working range specifications at ambient temperature (23 °C).

Usable Scan Length

The decode zone is a function of various symbol characteristics including density, print contrast, wide-to-narrow ratio, and edge acuity. Width of decode zone at any given distance must be considered when designing a system. *Calculating The Usable Scan Length Method* on page 2-5, provides a detailed description of how to calculate the usable scan length. The scan angle is provided in Table 4-1 on page 4-2.



Chapter 5
LS 1220VHD-I300A Very High Density

Overview

This chapter provides the technical specifications for the LS 1220VHD-I300A (Very High Density) scan engine.

Chapter 1, provides the detailed *Theory of Operation,* including a discussion of the functional components and the electrical inputs.

Chapter 2, provides the detailed *Installation Procedures*, including mounting, positioning, minimum window dimensions and application discussions.

Technical Specifications

Table 5-1 on page 5-2 provides the LS 1220VHD-I300A technical specifications.

Electrical Interface

Table 1-1 on page 1-7 lists the pin functions of the scan engine interface for the LS 1220VHD-I300A scan engine.

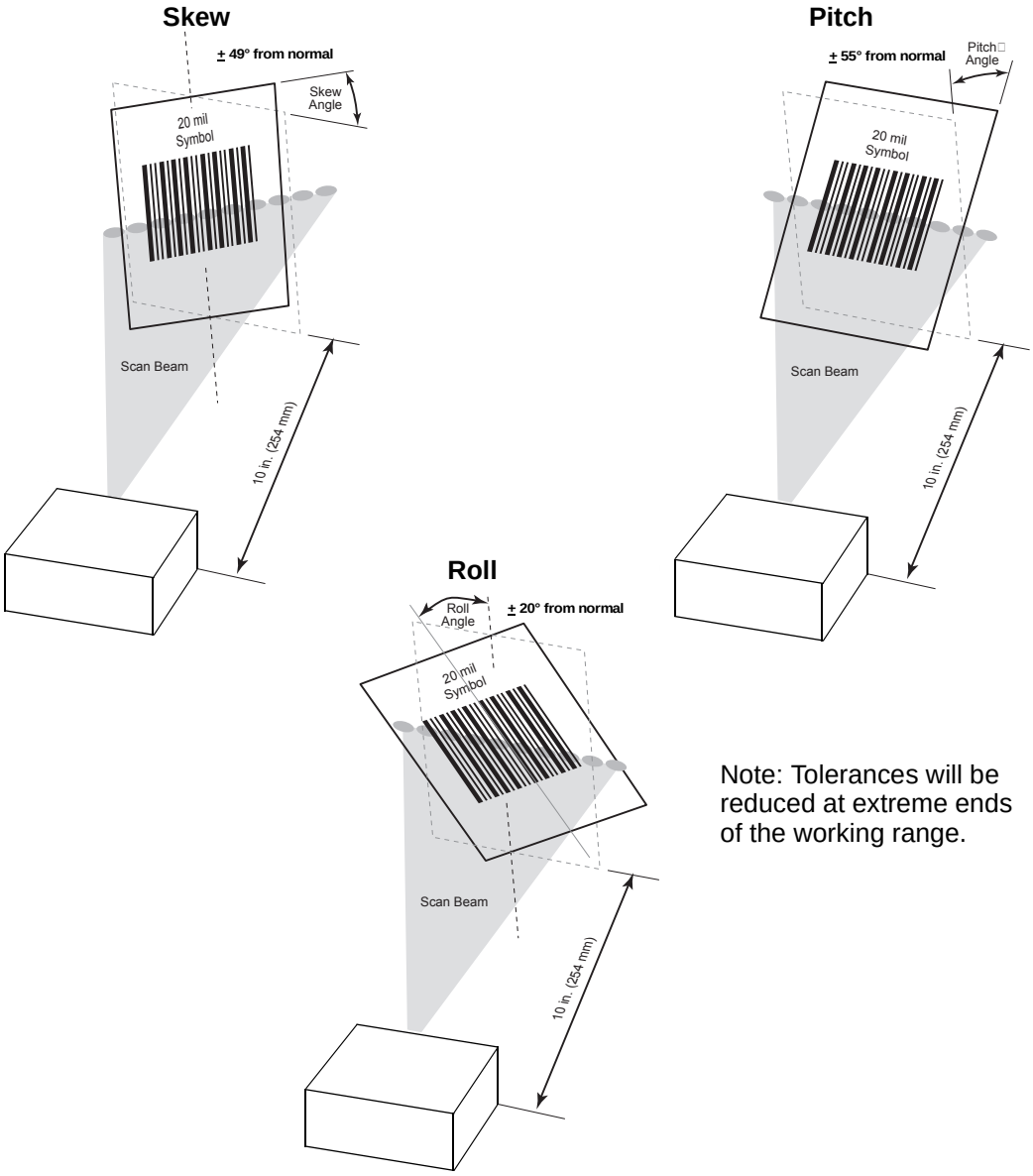
Note: The LS 1220VHD-I300A scan module does not support ScanStand operation; pin 2 on the electrical interface is not connected. It is recommended that pin 2 and pin 1 be tied together (at +5V).

Table 5-1. Technical Specifications @ 23°C

Item	Description
Power Requirements	
Input Voltage	5.0 VDC ± 10%
Input Current	60 mA typical @ 5V; 85 mA max
Standby Current	47 mA max
V_{cc} Noise Level	50 mV p to p typical, 200 mV p to p max
Scan Repetition Rate	35 (± 5) scans/sec (bidirectional)
Decode Capability	UPC/EAN, Code 39, Code 39 full ASCII, Code 93, Codabar, I 2 of 5, Code 128, EAN 128, Discrete 2 of 5, MSI Plessey, and other popular code types.
Programmable Parameters	Laser on time, Trigger Mode, Bi-directional redundancy, Symbology types/lengths, Data formatting, RS 232 communication parameters
Interfaces Supported	RS 232
Laser Power	0.8 mW ± 10%, 650 nm
Print Contrast	minimum 40% absolute dark/light reflectance differential measured at 650 nm
Scan	
Angle	37° ± 2°
Pattern	Linear
Skew Tolerance	± 49° from normal (see Figure 5-1 on page 5-4)
Pitch Angle	± 55° L/R from normal (see Figure 5-1 on page 5-4)
Roll	± 20° from vertical (see Figure 5-1 on page 5-4)
Decode Depth of Field	Maximum working distance is 45 in. (114.3 cm) Minimum element width resolution is 5.0 mils (.127 mm) Maximum element width resolution is 55 mils (1.4 mm)
Ambient Light Immunity	
Sunlight	8,000 ft. candles 86,112 lux with correct enclosure
Artificial Light	450 ft. candles 4,844 lux
Drop	3 ft. to concrete

Table 5-1. Technical Specifications @ 23°C (Continued)

Item	Description
Shock	1500 G applied via any mounting surface
Vibration	Withstands a sinusoidal vibration of 1 G along each of the 3 mutually perpendicular axes for a period of 1 hr. per axis, over a frequency range of 5 Hz to 2000 Hz
Laser Classification	CDRH/IEC Class II/2
Electrical Safety	UL, VDE, and CUL recognized laser component
Operating Temperature	-4° to 122°F -20° to 50°C
Storage Temperature	-40° to 140°F -40° to 60°C
Humidity	5% to 95% non-condensing
Depth	2.18 in. 5.5 cm
Width	2.13 in. 5.4 cm
Height	1.3 in. 3.3 cm
Weight	6.5 oz. 184 gm
Connector	9-pin, Male, D-Type see Table 1-1 for pin-outs.



Note: Tolerances will be reduced at extreme ends of the working range.

Figure 5-1. Skew, Pitch and Roll

LS 1220VHD Decode Zone (V_{cc} = 5V)

The LS 1220VHD decodes the symbols as shown in Figure 5-2. The figures shown are typical values. Table 5-2 on page 5-6 lists the typical and guaranteed distances for selected bar code densities. The minimum element width (or “symbol density”) is the width in mils of the narrowest element (bar or space) in the symbol. The maximum usable length of a symbol at any given range is shown below. To calculate this distance, see *Calculating The Usable Scan Length Method* on page 2-5.

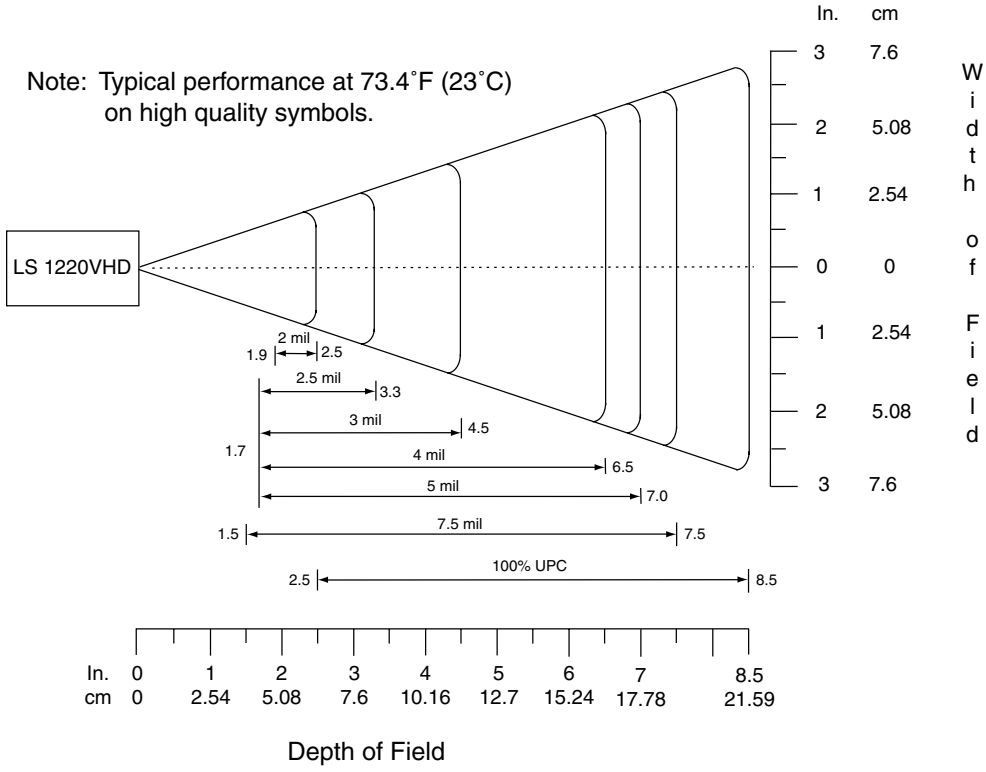


Figure 5-2. LS 1220VHD-I300A Decode Zone (Typical)

Table 5-2. LS 1220VHD-I300A Decode Distances

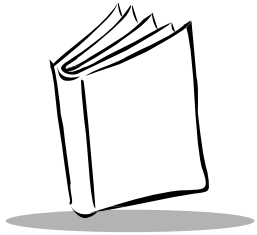
Symbol Density/ Bar Code Type/ W-N Ratio	Bar Code Content/ Contrast[Note 1]	Typical Working Ranges		Guaranteed Working Ranges	
		Near	Far	Near	Far
2 mil Code 39; 2.5:1	**STI2025** 80% MRD	**1.9 in** 4.82 cm	**2.5 in** 6.35 cm	-	-
2.5 mil Code 39; 2.5:1	**STI2525** 80% MRD	**1.7 in** 4.32 cm	**3.3 in** 8.38 cm	**2.25 in** 5.71 cm	**2.75 in** 6.98 cm
3 mil Code 39; 2.5:1	**STI3025** 80% MRD	**1.7 in** 4.32 cm	**4.5 in** 11.43 cm	**2.25 in** 5.71 cm	**3.6 in** 9.14 cm
4 mil Code 39; 2.2:1	**STI4022** 85% MRD	**1.7 in** 4.32 cm	**6.5 in** 16.51 cm	**2.0 in** 5.08 cm	**5.0 in** 12.70 cm
5 mil Code 39; 2.5:1	**STI5025** 80% MRD	**1.7 in** 4.32 cm	**7.0 in** 17.78 cm	**2.0 in** 5.08 cm	**5.0 in** 12.70 cm
7.5 mil Code 39; 2.5:1	**ABCDEF** 80% MRD	**1.5 in** 3.81 cm	**7.5 in** 19.05 cm	**2.0 in** 5.08 cm	**5.6 in** 14.22cm
13 mil 100% UPC	**1234567890** 80% MRD	**2.5 in** 6.35 cm	**8.5 in** 21.59 cm	**2.75 in** 6.98 cm	**6.9 in** 17.53 cm

Notes:

1. CONTRAST measured as Mean Reflective Difference (MRD) at 670 nm.
2. Near ranges on lower densities (not specified) are largely dependent upon the width of the bar code and the scan angle.
3. Working range specifications at ambient temperature (23 °C).

Usable Scan Length

The decode zone is a function of various symbol characteristics including density, print contrast, wide-to-narrow ratio, and edge acuity. Width of decode zone at any given distance must be considered when designing a system. *Calculating The Usable Scan Length Method* on page 2-5, provides a detailed description of how to calculate the usable scan length. The scan angle is provided in Table 5-1 on page 5-2.



Chapter 6
Scanning

Overview

This chapter provides information on scanning, the various triggering options, and aiming hints. See Chapter 3, *LS 1220-I300A Standard Version*, Chapter 4, *LS 1220WA-I300A Wide Angle*, and Chapter 5, *LS 1220VHD-I300A Very High Density* for decode zones.

Ready, Test, Scan

1. **Ready**

   Make sure connections are secure.

2. **Test**

   LS 1220 Standard Version
   When the LS1220 trigger is pulled, the scan beam is energized for approximately 3 seconds. The time on duration is programmable.

   LS 1220 Wide Angle (WA)
   A two-button switch is required. The first button energizes the aiming beam (which allows better alignment) and the second button triggers the scan.

   LS 1220 Very High Density (VHD)
   A two-button switch is required. The first button energizes the aiming beam (which allows better alignment) and the second button triggers the scan.

3. **Scan**

   Make sure the symbol to be scanned is within the scanning range. See *Calculating The Usable Scan Length Method* on page 2-5.

   Align the bar code and trigger the unit.

   - The scan beam lights until the programmed Laser On Time-out limit is reached, or until a successful decode.

The symbol is successfully decoded when the green DECODE LED lights.

Triggering

The LS 1220 can be energized using any one of seven different methods. Host download is not permitted with the scanner activated. To download, send the Laser Off command first. A Laser Off command from the host turns off the laser in all of the following modes. Refer to *Trigger Modes* on page 9-19 for further details.

Host

The host sends a Laser On command which activates the laser, and begins the decoding process. The external trigger also energizes the laser, and acts as a “Level Trigger” in this mode.

Laser and decoding are turned off by any of the following (whichever comes first):

- Completion of the variable time-on (set in 0.5 second increments to a maximum of 4.0 seconds)
- A good decode
- A Laser Off command from the host.

Level Trigger

When the Trigger signal is pulled to ground, the laser turns on. It turns off by any of the following (whichever comes first):

- Completion of the variable time-on (set in 0.5 second increments to a maximum of 4.0 seconds)
- A good decode
- The Trigger signal is pulled high.

No host download is permitted while the scanner is activated.

Pulse Trigger

A pulse on the Trigger line turns the laser on. The laser is turned off by any of the following (whichever comes first):

- Completion of the variable time-on (set in 0.5 second increments to a maximum of 4.0 seconds)
- A good decode.

Constant Scan and Report

Bar code information is continuously decoded and transmitted immediately.

Next New Code

The scanner decodes and transmits information, then waits until a new code is detected before transmitting again.

Continuous Level

Same as Level Trigger option, except the laser is on continuously, attempts a decode when the trigger line goes low, and stops the decode attempt when the line goes high.

Continuous Pulse

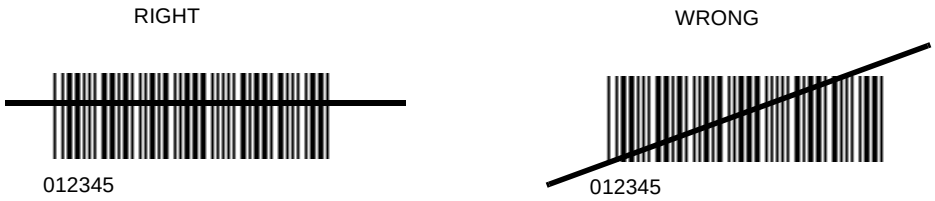
Same as Pulse Trigger option, except the laser is on continuously, attempts a decode when the trigger line goes low, and stops the decode attempt after the completion of the time-on period.

If the scanner is triggered by any option other than Constant Scan and Report or Next New Code, and fails to decode a symbol before the laser turns off, the scanner transmits a No Decode Message to the host (if that option is selected).

Aiming

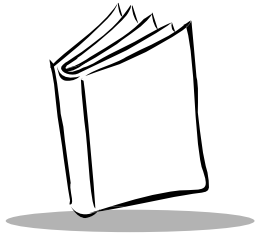
Scan the Entire Symbol

- The scan beam must cross every bar and space on the symbol.
- The larger the symbol, the farther away the scanner should be positiond.
- Position the scanner closer for symbols with bars that are close together.



Position at an Angle

Do not position the scanner exactly perpendicular to the bar code. In this position, light can bounce back into the scanner's exit window and prevent a successful decode.



Chapter 7
Maintenance & Troubleshooting

Overview

The chapter provides information on maintenance, accessories and troubleshooting.

Maintenance

Cleaning the exit window is the only maintenance required.

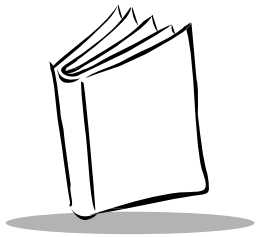
- Do not allow any abrasive material to touch the window.
- Remove any dirt particles with a damp cloth.
- The scan window is best cleaned with a damp cloth, and, if necessary, a non-ammonia based detergent.

Troubleshooting

Table 7-1. Troubleshooting

Problem	Possible Cause	Possible Solutions
Nothing happens when you attempt to scan.	No power to the scanner.	Check the system power. Confirm that the correct host interface cable is used.
Scanner cannot read the bar code	Interface/power cables are loose.	Check for loose cable connections.
	Scanner is not programmed for the correct bar code type.	Make sure the scanner is programmed to read the type of bar code to be scanned. Try scanning other bar code(s) and other bar code types.
	Incorrect communication parameters.	Check that the communication parameters (baud rate, parity, stop bits, etc.) are set properly.
	Bar code symbol is unreadable.	Check the symbol to make sure it is not defaced. Try scanning similar symbols of the same code type.
Laser does not activate, followed by a beep sequence.	Inappropriately hot environment.	Remove the scanner from the hot environment, and allow it to cool down.
Laser activates, followed by a beep sequence.	Optional beeper is configured.	Refer to *Optional Beeper Indications* on page 8-18 for Beeper indication descriptions.

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 8
Programming

Overview

The LS 1220 can be programmed by either a series of bar code menus, or by the host via the RS-232 port. Select decode options and RS-232C parameters that are compatible with your host system requirements.

Table 8-1 lists the available parameters and the descriptions location. Consult *Parameter Descriptions* on page 8-3 for parameter types explanations.

The LS 1220 can be set to its factory default values by scanning the SET DEFAULTS bar code. The defaults can also be set using the RS-232 port, refer to *Programming Examples* on page 8-24.

Scanning Sequence Examples

Parameters other than default values can be set by scanning sequences of bar codes. Table 8-1.*Parameter Description Location* contains the bar codes necessary to program the scanner for each parameter selection.

In most cases only one bar code scan is required to set a specific parameter. For example, to set the baud rate to 9600, simply scan the 9600 bar code listed under Baud Rate. If the LS 1220 is equipped with an optional beeper, it issues a warble tone, signifying a successful parameter entry.

To add or change prefixes and suffixes or customize the data transmission format, several bar codes scans are required. This procedure is described in Parameter Descriptions.

Errors While Scanning

If an error occurs during a scanning sequence simply reenter the correct parameter.

Table 8-1. Parameter Description Location

Parameter	Page
Set Defaults	8-3
Code Types	8-6
Code Lengths	8-6
Code 39 Full ASCII	8-6
Decode Options	
UPC-E/UPC-A Check Digit	8-7
Convert UPC-E to UPC-A	8-7
EAN Zero Extend	8-7
Xmit No Decode Message	8-7
UPC/EAN Supplemental	8-7
Decode UPC Only	8-8
MSI/Plessey Check Digit	8-8
MSI/Plessey 2 Check Digit Algorithm	8-8
Code 39 Check Digit	8-8
Buffer Code 39	8-8
Beep After Good Decode	8-9
CLSI Editing	8-9
NOTIS Editing	8-9
UPC-A and UPC/E Preamble	8-9
Prefix/Suffix Values	8-9
Security Options	8-10
Laser Control	8-11
RS-232C Options	
Baud Rate	8-12
Parity	8-12
Hardware Handshaking	8-13
Software Handshaking	8-15
Stop Bit Select	8-17
Intercharacter Delay	8-17
Code ID Character	8-17

Parameter Descriptions

The following paragraphs provide a description of each parameter.

Set Parameter Defaults

Scanning the SET DEFAULTS bar code returns all parameters to the values listed in Table 8-2.

Table 8-2. Default Table

Parameter	Options	Default
Code Types & Lengths		
Code 39	Enabled, Disabled	Enabled
Code 39 Full ASCII	Enabled, Disabled	Disabled
UPC/EAN	Enabled, Disabled	Enabled
Discrete 2 of 5	Enabled, Disabled	Enabled
Interleaved 2 of 5	Enabled, Disabled	Enabled
Codabar	Enabled, Disabled	Enabled
Code 128	Enabled, Disabled	Enabled
Code 93	Enabled, Disabled	Enabled
EAN 128	Enabled, Disabled	Disabled
MSI/Plessey	Enabled, Disabled	Enabled
Interleaved 2 of 5 Length 1	2-55	14
Interleaved 2 of 5 Length 2	0-55	0
Discrete 2 of 5 Length 1	1-55	12
Discrete 2 of 5 Length 2	0-55	0

Table 8-2. Default Table (Continued)

Parameter	Options	Default
Decode Options		
Xmit UPC-A Check Digit	Enabled, Disabled	Enabled
Xmit UPC-E Check Digit	Enabled, Disabled	Enabled
Convert UPC-E to UPC-A	Enabled, Disabled	Disabled
EAN Zero Extend	Enabled, Disabled	Disabled
Xmit No Decode Message	Enabled, Disabled	Disabled
2 Digit UPC Supplementals	Enabled, Disabled	Disabled
5 Digit UPC Supplementals	Enabled, Disabled	Disabled
UPC Supplementals Auto-D	Enabled, Disabled	Disabled
Decode UPC Only	Enabled, Disabled	Disabled
MSI Plessey Check Digit	1 Check Digit, 2 Check Digits	1 Check Digit
MSI 2 Check Digit Algorithm	Mod10 - Mod10, Mod11 - Mod10	Mod10 - Mod10
Code 39 Check Digit	Enabled, Disabled	Disabled
Code 39 Buffering	Enabled, Disabled	Disabled
Decode Beep	Enabled, Disabled	Enabled
CLSI Editing	Enabled, Disabled	Disabled
NOTIS Editing	Enabled, Disabled	Disabled
UPC-E Preamble	None, System Character, System Character and Country Code	System Character
UPC-A Preamble	None, System Character, System Character and Country Code	System Character
Prefix	Any ASCII Character (0-128)	None (ASCII 128)
Suffix 1	Any ASCII Character (0-128)	CR (ASCII 013)
Suffix 2	Any ASCII Character (0-128)	LF (ASCII 010)

Table 8-2. Default Table (Continued)

Parameter	Options	Default
Security Options		
UPC Security Level	No Security Checking, Check Ambiguous Characters Only, Check All Characters	No Security Checking
UPC Security Zone	2 through 10	4
Bidirectional Redundancy	Enabled, Disabled	Disabled
Laser Control		
Trigger Mode	Level Trigger, Host, Pulse, Constant Scan & Report, Next New Code, Continuous Level, Continuous Pulse	Level Trigger
Laser On Time-out	0.5 - 4.0 sec (in .5 sec increments)	1.0 sec
Laser Off Time-out*	0.0 - 3.5 sec (in .5 sec increments)	0.5 sec
RS-232 Options		
Baud Rate	300, 600, 1200, 2400, 4800, 9600, 19200	9600
Parity	None, Even, Odd, Mark, Space	Even
Hardware Handshaking	None, RTS/CTS	None
Software Handshaking	None, ACK-NAK, ENQ, ACK-NAK with ENQ	None
Stop Bits	1 Stop Bit, 2 Stops Bit	2 Stop Bit
ASCII Format	7 Bits, 8 Bits	7 Bits
Intercharacter Delay	00-99 msec (in 1 msec increments)	10 msec
Code ID Character	None, Symbol ID, Aim ID	None
*Only valid if Trigger Mode is set to *Constant Scan and Report*.		

Code Types

The scanner can be programmed to decode any or all of the following symbologies:

- UPC Versions A and E (EAN 8 and 13)
- Code 39
- Discrete 2 of 5
- Code 128
- EAN 128
- Codabar
- Code 39 Full ASCII
- Interleaved 2 of 5
- MSI Plessey
- Code 93

The scanner autodiscriminates between all of the above symbologies, except for Code 39 and Code 39 Full ASCII.

Code Lengths

Code lengths for Interleaved 2 of 5 and Discrete 2 of 5 only may be set for one or two discrete lengths. The length of a code refers to the number of characters (i.e., human readable characters) the code contains.

One Discrete Length - This option sets the scaner to decode only those codes containing a selected length. For example, if D 2 of 5 is selected One Discrete Length, then scan 1, 4, the only D 2 of 5 codes decoded are those containing 14 characters.

Two Discrete Lengths - This option sets the scanner to decode only those codes containing two selected lengths. For example, if D 2 of 5 is selected Two Discrete Lengths, then scan 0, 2, 1, 4, the only D 2 of 5 codes decoded are those containing 2 or 14 characters.

Code 39 Full ASCII

The ASCII character set assigns a code to letters, punctuation marks, numerals, and most control keystrokes on the keyboard.

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. See Table 8-5 on page 8-32.

Code 39 Full ASCII interprets the bar code control character ($ + % /) preceding a Code 39 symbol and assigns an ASCII character value. 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.

The LS 1220 does not autodiscriminate between Code 39 and Code 39 Full ASCII.

Decode Options

Transmit UPC-E/UPC-A Check Digit

Select if decoded UPC symbols are transmitted with or without a check digit.

Convert UPC-E to UPC-A

Use this parameter to convert 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).

EAN Zero Extend

This parameter adds five leading zeros to decoded EAN-8 symbols to make them compatible in format to EAN-13 symbols.

Xmit “No Decode” Message

This feature sets the scanner to transmit “NR” when a symbol does not decode. If Prefixes and suffixes are enabled, they are appended around this message.

Decode UPC/EAN Supplemental

Select whether UPC/EAN is decoded with or without supplemental characters. Supplementals are additionally appended characters (2 or 5) according to specific code format conventions (e.g., UPC A+2, UPC E+2, EAN 8+2). If UPC/EAN with supplemental characters is selected, UPC/EAN symbols without supplemental characters won't be decoded.

Decode of symbols containing 2 or 5 supplementals is enabled separately. For example, if “2 supplementals” is enabled, only those symbols with 2 supplementals are decoded. To decode symbols containing 2 supplementals and 5 supplementals, both must be enabled. If UPC/EAN without supplemental characters is selected and the scanner is presented with a UPC/EAN plus supplemental symbol, the UPC/EAN is decoded and the supplemental characters ignored. If autodiscrimination is chosen, the LS 1220, after additional processing to ensure a good decode, transmits either.

Note: *Select either read, or ignore supplemental characters (as approprate for your application) to minimize the risk of invalid data transmission. Autodiscrimination mode requires additional processing to ensure a good decode.*

Decode UPC Only

This option limits the LS 1220 UPC/EAN decode capability to UPC versions only. It disables EAN decode capability.

MSI Plessey Check Digit

This option appends one or two digits at the end of the bar code to check the integrity of the data. At least one check digit (default) is always required. Check digits are not transmitted with the data.

MSI Plessey 2 Check Digit Algorithm

When the Two MSI Plessey check digits option is selected, an additional verification is required to ensure integrity. Either of two algorithms may be selected; Mod10 - Mod10 (default), or Mod11 - Mod10.

Code 39 Check Digit

This parameter checks the integrity of a Code 39 symbol to ensure it complies with the modulo 43 check digit algorithm.

Code 39 Buffering (Scan & Store)

When Code 39 Buffering is selected, all Code 39 symbols having a leading space as a first character are temporarily buffered in the scanner and transmitted later. The leading space is not buffered.

When a Code 39 symbol with no leading space is decoded, all buffered data is transmitted in a first-in first-out format. See *Code 39 Buffering* on page 8-19 for further details.

When Code 39 Buffering is not selected, decoded Code 39 symbols with leading spaces are transmitted without being stored in the buffer.

Beep After Good Decode (only with optional beeper)

This parameter determines if the scanner's beeper sounds during normal scanning. It is usually desirable to operate the unit with the beeper enabled. In all cases, the beeper operates during parameter menu scanning and indicates error conditions. Beeper indications are found in Table 8-3.

CLSI Editing

Use this parameter to insert a space after the 1st, 5th, and 10th characters of a 14-character Codabar symbol. The symbol length includes start and stop characters. This option may be enabled even with NOTIS Editing enabled.

NOTIS Editing

This option strips the start and stop characters from decoded Codabar symbols. This option may be enabled even with CLSI Editing enabled.

UPC-A and E Preamble

Three options are given for the lead-in characters of decoded UPC-A or UPC-E symbols which are transmitted to the host. Select one preamble for UPC-A decodes and one for UPC-E decodes. These lead-in characters are considered part of the symbol itself. The three options are:

- a system character only
- the country code and system character
- no preamble

The system character is the digit printed to the extreme left of a UPC symbol. The country code for UPC is always zero, and it cannot be transmitted without the system character.

Prefix/Suffix Values

One prefix and up to two suffixes may be appended to scan data for use in data editing as shown below. They can be downloaded by the host (parameters 27, 28 and/or 29). See Table 8-4 Programming Protocol on 8-24 . Or, they may be set by scanning a three digit number (i.e., three bar codes) that corresponds to ASCII keycodes. See Table 8-5 on page 8-32.

<Prefix> <Data> <Suffix> <Suffix>
where:

<Prefix> = ASCII value selected by user
<Data> = scanned bar code data
<Suffix> = ASCII value selected by user

Note: *If ASCII value "128" is selected for either prefix or suffix, that function is disabled.*

Security Options

UPC/EAN Security Level

The LS 1220 offers two 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.

- **None** - 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.
- **Check Ambiguous Characters** - As bar code quality levels diminish, certain characters become prone to mis-decodes before others (i.e., 1, 2, 7, 8). If you are experiencing mis-decodes of poorly printed bar codes, and the mis-decodes are limited to these characters, select this security level.
- **Check All Characters** - If you are experiencing mis-decodes of poorly printed bar codes, and the mis-decodes are not limited to characters 1, 2, 7 and 8, select this security level.

UPC Security Zone

This parameter is valid only after UPC/EAN Security Level option Check Ambiguous Characters, or Check all Characters is enabled. If you are still experiencing mis-decodes, this parameter enhances the security level. The range is from two to ten times. The higher the number, the greater the level of security. The higher the number, however, the more the aggressiveness of the scanner is compromised. Conversely, any level below four, in effect, nullifies the Security Level parameter.

Bi-Directional Redundancy

When enabled, a bar code must be decoded successfully in both directions before qualifying as a successful decode.

Laser Control

Trigger Mode

In all modes, the only command that can be sent when the laser is on is the Turn Laser Off command. Select one of the following options:

- **Level Trigger** - A trigger pull or external switch closure activates the laser and decode processing. The laser remains on and decode processing continues until a trigger release, a valid decode, or the Laser On Time-out is reached.
- **Host** - The host sends a Laser On command. The laser remains on and decode processing continues until a good decode, the Laser On Time-out is reached, or the host sends a Laser Off command. External trigger acts as a Level trigger in this mode.
- **Pulse** - A trigger pull activates the laser and decoding processing. The laser remains on and decode processing continues until a valid decode or the Laser On Time-out is reached.
- **Constant Scan & Report** - Laser is always on and decoding. This option is not recommended when programming the scanner with bar code menus.
- **Next New Code** - The LS 1220 decodes and transmit information, then waits until a new code is detected before transmitting again.
- **Continuous Level** - The laser is always on. Decode processing begins with a trigger pull and continues until a trigger release, or the Laser On Time-out is reached.
- **Continuous Pulse** - The laser is always on. Decode processing begins with a trigger pull and continues until the Laser On Time-out is reached.

Laser On Time-out

The maximum time the laser remains on or decode processing continues during a trigger pull. Programmable in 0.5 second increments from 0.5 to 4.0 seconds.

Laser Off Time-out

The minimum time between decodes of the same symbol when in Constant Scan and Report mode. Programmable in 0.5 second increments from 0.0 to 3.5 seconds.

RS-232C Options

Baud Rate

Baud rate is the number of bits of data transmitted per second. The scanner's baud rate setting must match the baud rate setting of the host device. If not, data may not reach the host device or may reach it in distorted form.

Parity

A parity check bit is the most significant bit of each ASCII coded character. If ODD parity is selected, the parity bit has a value 0 or 1, based on data, to ensure that an odd number of 1 bits are contained in the coded character.

If EVEN parity is selected, the parity bit has a value 0 or 1, to ensure that an even number of 1 bits are contained in the coded character. Select MARK parity and the parity bit is always 1. Select SPACE parity and the parity bit is always 0. Select the parity type according to host device requirements.

If NONE is selected, no parity bits are transmitted.

Handshaking

Hardware and Software Handshaking can be enabled at the same time. When they are, Hardware Handshaking becomes the outermost layer of the communication. The next layer is the ENQ, followed by the ACK/NAK layer. These protocols are explained on the following pages. A typical communication sequence looks like this:

1. Scanner: Assert RTS (assuming CTS is initially negated)
2. Host: Assert CTS
3. Host: Send ENQ
4. Scanner: Send Data
5. Host: Send ACK
6. Scanner: Negate RTS
7. Host: Negate CTS

Hardware Handshaking

Hardware Handshaking allows a check of the host the readiness before transmitting data. If the host is periodically occupied with other tasks, Hardware Handshaking is needed to prevent loss of transmitted data. Refer to the Hardware Handshaking diagram, Figure 8-1.

RS-232C communications are designed to operate either with or without hardware handshaking lines - Request to Send (RTS), and Clear to Send (CTS).

If RTS/CTS handshaking is selected, scan data is transmitted with the following sequence (Note that the DTR signal is hard wired active):

1. The scanner (LS 1220) reads the CTS line for activity. If CTS is asserted, the scanner waits up to 2 seconds for the host to negate the CTS line. If, after 2 seconds the CTS line is still asserted, the scanner sounds a transmit error (if equipped with optional beeper), and any scanned data is lost.
2. When the CTS line is negated, the scanner asserts the RTS line and waits 2 seconds for the host to assert CTS. When the host asserts CTS, data is transmitted. If, after 2 seconds the CTS line is still not asserted, the scanner sounds a transmit error (if equipped with optional beeper), and any scanned data is lost.
3. When data transmission is complete, the scanner negates RTS 10 msec after sending the last character.
4. The host should respond by negating CTS. The scanner checks for a negated CTS upon the next transmission of data.

During the transmission of data, the CTS line should be asserted.

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

If no Hardware Handshaking is selected, data is transmitted based on the Software Handshaking options which follow.

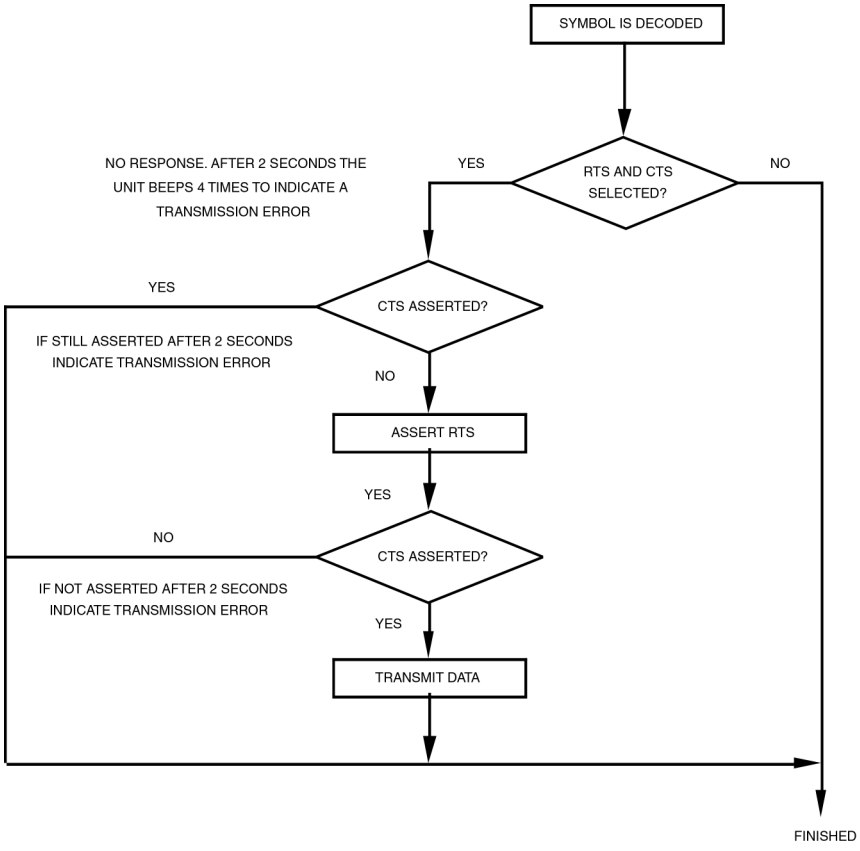


Figure 8-1. Hardware Handshaking

Software Handshaking

This parameter controls the data transmission process. It may be used in conjunction with Hardware Handshaking. However, Hardware Handshaking takes precedence. That is, it takes place before, and ends after Software Handshaking. All references to beepers presuppose a beeper is present.

The scanner provides four Software Handshaking options; NONE, ENQ, ACK/NAK, and ACK/NAK with ENQ. Refer to the Software Handshaking diagram, Figure 8-2.

1. None

   No handshaking is selected and data is transmitted immediately.

2. ACK/NAK Only

   The ACK/NAK option checks the success or failure of a transmission. The scanner expects one of the following host responses after a data transmission:

   <ACK> - Acknowledges a valid and successful transmission.

   <NAK> - Indicates a problem with the transmission.

   Whenever a <NAK> is received, the scanner retransmits the same data and awaits an ACK/NAK response. After three unsuccessful attempts to transmit the same data, the scanner aborts any further communication attempts on that message. The beeper indicates a transmission error by sounding 4 long beeps.

3. ENQ Only

   With this option, the host must request data before the scanner sends it. This ensures that data transmission occurs only when the host is ready to receive.

   When this option is selected, the scanner waits for an Enquire character (ENQ) from the host before it transmits data. With ENQ enabled, the scanner must receive an ENQ from the host within 2 seconds after the last activity or the scanner sounds four long beeps to indicate a transmission error; the unit is now ready to scan again.

4. ACK/NAK with ENQ

   This combines both handshaking options.

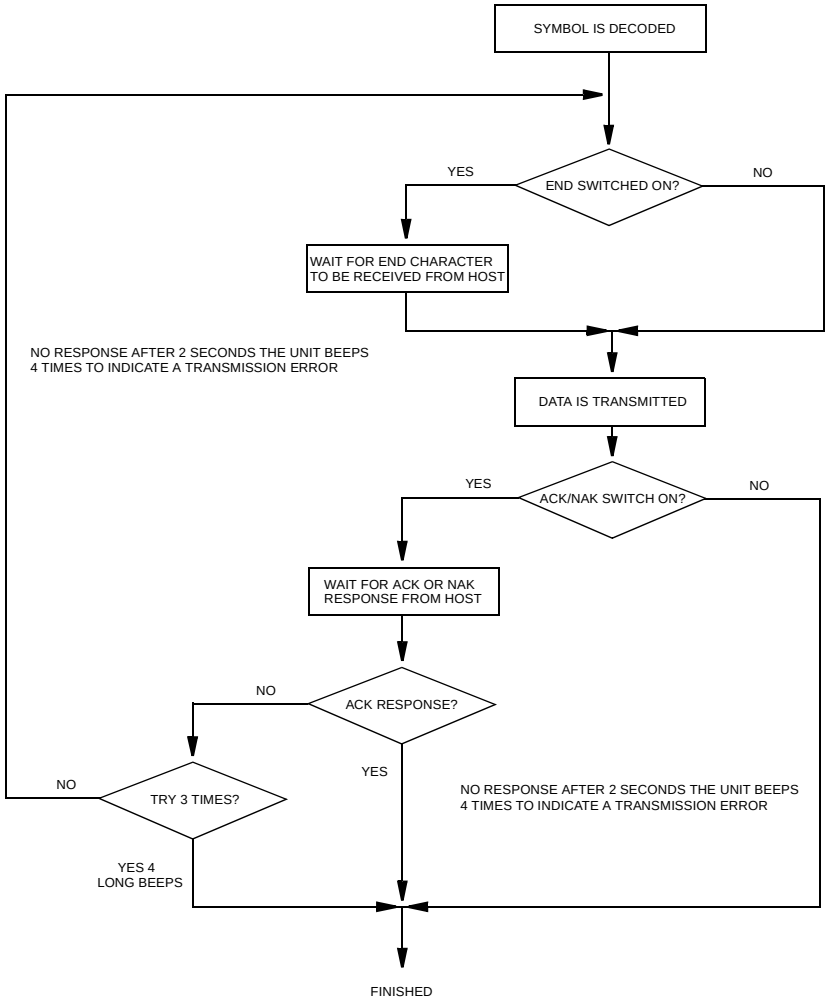


Figure 8-2. Software Handshaking

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 host device for the next character in the serial data stream. The number of stop bits selected (one or two) depends on the number the host is programmed to accommodate. Set the number of stop bits to match host device requirements.

ASCII Format

The number of data bits transmitted may be 7 or 8. This parameter is set to match the host device's requirements. The default is 7-bit ASCII.

Intercharacter Delay

Select the intercharacter delay option to match the host device requirements. The intercharacter delay gives the host system time to service its receiver and perform other tasks between characters. Select from no delay to a 99 msec delay between the transmission of each character.

Code ID Character

A code ID character identifies the code type of a scanned bar code. This is useful when the scanner is decoding more than one code type. If a prefix is selected, the code ID character is sent after the prefix. There are three options:

- Symbol ID - The identifier is sent as a one character prefix. Symbol Code ID characters are: A = UPC-A, UPC-E, EAN-13, or EAN-8; B - Code 39; C = Codabar; D = Code 128; F = Interleaved 2 of 5; G = Discrete 2 of 5.
- Aim ID - The identifier is sent as a three character prefix, in accordance with AIM specifications for symbology identifiers. See AIM's Guidelines on Symbology Identifiers for full details.
- None - No Code ID character is sent.

Optional Beeper Indications

Table 8-3 lists the beeper tones used by the LS 1220 when the optional beeper is configured.

Table 8-3. Beeper Indications

Standard Use **Beeper Sequence**	**Indication**
1 Beep - short high tone	A bar code symbol is decoded successfully (if decode beeper is enabled).
4 Beeps - long low tone	A format or transmission error is detected in a scanned symbol. The data is ignored. This occurs if a unit is not properly configured. Check option settings.
Parameter Menu Scanning	
1 Beep - short high tone	Correct entry scanned or correct menu sequence performed.
1 Beep - lo/hi tone	Input error, incorrect bar code or “Cancel” scanned, wrong entry, incorrect bar code programming sequence; remain in program mode.
1 Beep - hi/lo tone	Keyboard parameter selected. Enter value using bar code keypad.
1 Beep - hi/lo/hi/lo tone	Successful program exit with change in the parameter setting.
Code 39 Buffering	
1 Beep - hi/lo tone	New Code 39 data entered into the buffer.
3 Beeps - long high tone	Code 39 buffer is full.
1 Beep - lo/hi/lo tone	The buffer is erased, or there is 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.
2 Beeps - long high tone	Error in data transmission.
1Beep - lo/hi tone	A successful transmission of buffered data.

Code 39 Buffering

For a description of Code 39 Buffering, see page 8-8 .

Code 39 buffering cannot be disabled while there is data in the transmission buffer. The buffer holds 250 bytes of information.

To disable Code 39 buffering, first force the buffer transmission (see *Transmit Buffer*) or clear the buffer.

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.

- The scanner gives a hi/lo 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, read a 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.

- The scanner signals that the transmission buffer has been sent (a hi/lo 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 emitting a hi/lo beep.
- The scanner transmits the buffer.
- The scanner signals that the transmission buffer has been sent (a hi/lo 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.

Programming Protocol

This section discusses programming via the host computer. Refer to *Parameter Descriptions* on page 8-3 for an explanation of the parameters.

Regardless of whether or not ACK/NAK is enabled, the ACK/NAK protocol is used for the programming sequences that occur between the host and the scanner.

Except for the turn laser off command, all commands have the following format:

STX S T I [x] <Data> ETX LRC
where:

STX =	02h	(Start of Transmission)	
S =		53h	(ASCII value of S)
T =		54h	(ASCII value of T)
I =		49h	(ASCII value of I)
[x] =		character:	
	D	44h	Identify software
	E	45h	Turn laser on
	F	46h	Upload all parameters
	G	47h	Download all parameters
	H	48h	Download specific parameters

<Data> = 30h + upper nibble of parameter 30h + lower nibble of parameter

ETX= 03h

LRC = Exclusive-or of all characters transmitted except for the STX character.

For all commands that require a response, the response format is:

STX [x] <Data> ETX LRC
where:

STX =	02h	(Start of Transmission)	
[x] =		character:	
	D	44h	Identify software
	F	46h	Upload all parameters

<Data> = 30h + upper nibble of parameter 30h + lower nibble of parameter

ETX= 03h

LRC = Exclusive-or of all characters transmitted except for the STX character.

The exception to the above rule, is the turn laser off command. To turn the laser off, the host sends ESC

where:

ESC = 1bh (Escape Character)

Upon receiving a command from the host, the scanner sends the required information. If the command requires no information in return, such as a laser on command, the scanner sends an ACK to acknowledge receipt of the command.

For the identify software response, <Data> consists of an ASCII alphabetic string that defines the version of installed software.

For downloading specific parameters, <Data> takes the following format:

<Parameter number> <Parameter value>
where:

<Parameter number> = number of the parameter to be changed.
See Table 8-4 on page 8-24 for assignments.

<Parameter value> = value assigned to a specific parameter.
See Table 8-4 on page 8-24 for valid values.

These numbers follow the rule set forth for the data. That is, the number consists of two bytes consisting of 30 + high nibble, 30 + low nibble.

For downloading all parameters, <Data> takes the following format:

<Parameter value>
where:

<Parameter value> = value assigned to a specific parameter.
See Table 8-4 on page 8-24 for valid values.

These numbers follow the rule set forth for the data. That is, the number consists of two bytes consisting of 30 + high nibble, 30 + low nibble.

Note: *In order to maintain compatibility with future upgrades and enhancements, we recommend you do not change the reserved bits.*

For parameters 00 through 07, a value of 1 indicates a bit is set, and enables a parameter. A value of 0 disables that bit, which disables the parameter.

Programming Examples

To put the LS 1220 into Host Triggering mode, the following string is sent to the unit (All values are in hexadecimal format):

02 53 54 49 48 31 36 30 35 03 07

To put the LS 1220 into Host Triggering mode and disable all code types except code 39 and UPC/EAN, the following string would be sent to the unit (All values are in hexadecimal format):

02 53 54 49 48 30 30 30 33 30 31 30 30 31 36 30 35 03 05

To send a turn laser on command, the following string would be sent to the unit (All values are in hexadecimal format):

02 53 54 49 45 03 08

To put the unit back to the default state, the following string would be sent to the unit (All values are in hexadecimal format):

02 53 54 49 47 3E 33 31 33 30 3C 30 30 30 34 30 30 30 30 30 30 30 30 30 34 30 36 30 31 30 32 30 37 30 30 30 30 30 30 30 31 30 31 30 3A 30 31 30 31 30 30 30 3E 30 30 30 3C 30 30 38 30 30 3D 30 3A 03 0F

Refer to Table 8-4 on page 8-24 for a list of programmable parameters and values.

Table 8-4. Programming Protocol

Parameter #	Definition	Value
00	Bit 0 Enable/Disable Code 39	1/0
	Bit 1 Enable/Disable UPC/EAN	1/0
	Bit 2	Reserved
	Bit 3	Reserved
	Bit 4	Reserved
	Bit 5 Enable/Disable Discrete 2 of 5	1/0
	Bit 6 Enable/Disable Interleaved 2 of 5	1/0
	Bit 7 Enable/Disable Codabar	1/0

Table 8-4. Programming Protocol (Continued)

Parameter #	Definition	Value
01	Bit 0 Enable/Disable Code 128	1/0
	Bit 1 Enable/Disable Code 93	1/0
	Bit 2	Reserved
	Bit 3 Enable/Disable EAN 128	1/0
	Bit 4 Enable/Disable MSI/Plessey	1/0
	Bit 5	Reserved
	Bit 6	Reserved
	Bit 7	Reserved
02	Bit 0 Enable/Disable Convert UPC E to UPC A	1/0
	Bit 1 Enable/Disable EAN Zero extend	1/0
	Bit 2 Enable/Disable Xmit UPC A check digit	1/0
	Bit 3 Enable/Disable Xmit UPC E check digit	1/0
	Bit 4 Enable/Disable Verify code 39 check digit	1/0
	Bit 5 Enable/Disable CLSI editing	1/0
	Bit 6 Enable/Disable NOTIS editing	1/0
	Bit 7	Reserved

Table 8-4. Programming Protocol (Continued)

Parameter #	Definition	Value
03	Bit 0 Enable/Disable Send No Decode	1/0
	Bit 1 Enable/Disable Code 39 Full ASCII	1/0
	Bit 2 1 or 2 MSI/Plessey check digits	1/0
	Bit 3	Reserved
	Bit 4	Reserved
	Bit 5	Reserved
	Bit 6	Reserved
	Bit 7	Reserved
04	Bit 0	Reserved
	Bit 1 Enable/Disable Code 39 buffering	1/0
	Bit 2 Enable/Disable Beeper	1/0
	Bit 3	Reserved
	Bit 4	Reserved
	Bit 5	Reserved
	Bit 6	Reserved
	Bit 7	Reserved
05	Bit 0 Enable/Disable 2 digit UPC Supplementals	1/0
	Bit 1 Enable/Disable 5 digit UPC Supplementals	1/0
	Bit 2	Reserved
	Bit 3	Reserved
	Bit 4	Reserved
	Bit 5	Reserved
	Bit 6	Reserved
	Bit 7	Reserved

Table 8-4. Programming Protocol (Continued)

Parameter #	Definition	Value
06	Bit 0	Reserved
	Bit 1	Reserved
	Bit 2 Enable/Disable Bi-Directional Redundancy	1/0
	Bit 3	Reserved
	Bit 4	Reserved
	Bit 5	Reserved
	Bit 6	Reserved
	Bit 7	Reserved
07	Bit 0 Enable/Disable Polling	1/0
	Bit 1 Enable/Disable Decode UPC Only	1/0
	Bit 2 Enable/Disable UPC Supplementals Autodiscriminate	1/0
	Bit 3	Reserved
	Bit 4	Reserved
	Bit 5	Reserved
	Bit 6	Reserved
	Bit 7	Reserved
08	UPC Security Level	1/0
	No Security	00
	Check Ambiguous Characters	02
	Check All Characters	03

Table 8-4. Programming Protocol (Continued)

Parameter #	Definition	Value
09	UPC Security Zone	02-10
10	Baud Rate	
	300 Baud	01
	600 Baud	02
	1200 Baud	03
	2400 Baud	04
	4800 Baud	05
	9600 Baud	06
	19,200 Baud	07
11	Parity	
	Odd	00
	Even	01
	Mark	02
	Space	03
	None	04
12	Stop Bits	
	One Stop Bit	01
	Two Stop Bits	02
13	Data Bits	
	Seven Bits	07
	Eight Bits	08

Table 8-4. Programming Protocol (Continued)

Parameter #	Definition	Value
14	Hardware Handshaking	
	Disabled	00
	Enabled	01
15	Software Handshaking	
	None	00
	ACK-NAK	01
	ACK-NAK with ENQ	02
	ENQ Only	03
16	Triggering Options	
	Level Trigger	00
	Continuous Trigger	01
	Pulse Trigger	02
	Continuous Pulse	03
	Constant Scan & Report	04
	Host Triggering	05
	Next New Code	06
17	Laser On Time-Out	
	0.5 Seconds	00
	1.0 Seconds	01
	1.5 Seconds	02
	2.0 Seconds	03
	2.5 Seconds	04
	3.0 Seconds	05
	3.5 Seconds	06
	4.0 Seconds	07

Table 8-4. Programming Protocol (Continued)

Parameter #	Definition	Value
18	Laser Off Time-Out	
	0.0 Seconds	00
	0.5 Seconds	01
	1.0 Seconds	02
	1.5 Seconds	03
	2.0 Seconds	04
	2.5 Seconds	05
	3.0 Seconds	06
	3.5 Seconds	07
19	Intercharacter Delay	
	00-99 milliseconds	00-99
20	UPC-E Preamble	
	None	00
	System Character	01
	System Character & Country Code	02
21	UPC-A Preamble	
	None	00
	System Character	01
	System Character & Country Code	02
22	Code ID Character	
	None	00
	Symbol ID	01
	AIM ID	02

Table 8-4. Programming Protocol (Continued)

Parameter #	Definition	Value
23	I 2 of 5, Length 1	01-31
24	I 2 of 5, Length 2	00-31
25	D 2 of 5, Length 1	01-31
26	D 2 of 5, Length 1	00-31
27	Prefix, 8 Bit ASCII Value (Hexadecimal)	00-7F, 80=Disabled
28	Suffix 1, 8 Bit ASCII Value (Hexadecimal)	00-7F, 80=Disabled
29	Suffix 1, 8 Bit ASCII Value (Hexadecimal)	00-7F, 80=Disabled

ASCII Character Set

Table 8-5. ASCII Table

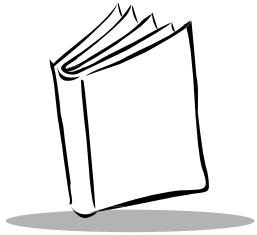
Character	Hexadecimal	Decimal	Character	Hexadecimal	Decimal
NUL	00	00 0	EM	19	025
SOH	01	00 1	SUB	1A	026
STX	02	00 2	ESC	1B	027
ETX	03	00 3	FS	1C	028
EOT	04	00 4	GS	1D	029
ENQ	05	00 5	RS	1E	030
ACK	06	00 6	US	1F	031
BEL	07	00 7	’	27	039
BS	08	00 8	(	28	040
HT	09	00 9	)	29	041
LF	0A	010	*	2A	042
VT	0B	011	+	2B	043
FF	0C	012	,	2C	044
CR	0D	013	-	2D	045
SO	0E	014	.	2E	046
SI	0F	015	/	2F	047
DLE	10	016	0	30	048
DC1	11	017	1	31	049
DC2	12	018	2	32	050
DC3	13	019	3	33	051
DC4	14	020	4	34	052
NAK	15	021	5	35	053
SYN	16	022	6	36	054
ETB	17	023	7	37	055

Table 8-5. ASCII Table (Continued)

Character	Hexadecimal	Decimal	Character	Hexadecimal	Decimal
CAN	18	024	8	38	056
9	39	057	S	53	083
:	3A	058	T	54	084
;	3B	059	U	55	085
<	3C	060	V	56	086
=	3D	061	W	57	087
>	3E	062	X	58	088
?	3F	063	Y	59	089
@	40	064	Z	5A	090
A	41	065	[	5B	091
B	42	066	\	5C	092
C	43	067	]	5D	093
D	44	068	^	5E	094
E	45	069	-	5F	095
F	46	070	‘	60	096
G	47	071	a	61	097
H	48	072	b	62	098
I	49	073	c	63	099
J	4A	074	d	64	100
K	4B	075	e	65	101
L	4C	076	f	66	102
M	4D	077	g	67	103
N	4E	078	h	68	104
O	4F	079	i	69	105
P	50	080	j	6A	106
Q	51	081	k	6B	107

Table 8-5. ASCII Table (Continued)

Character	Hexadecimal	Decimal	Character	Hexadecimal	Decimal
R	52	082	l	6C	108
m	6D	109	w	77	119
n	6E	110	x	78	120
o	6F	111	y	79	121
p	70	112	z	7A	122
q	71	113	{	7B	123
r	72	114	|	7C	124
s	73	115	}	7D	125
t	74	116		7E	126
u	75	117	DEL	7F	127
v	76	118			



Chapter 9
Parameter Menus

Overview

This chapter provides the necessary bar codes to program the LS 1220. Specific parameters are found on the pages indicated in Table 9-1.

Table 9-1. Parameter Menus Index

Parameter	Page
Set Defaults	9-2
Code Types	9-2
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Intercharacter Delay	9-28
Code ID Character	9-30

Set Defaults

Scan this bar code to set the LS 1220 to the defaults listed in Table 8-2 on page 8-3.



SET DEFAULTS

Code Type

Enable or disable specific code types by scanning the appropriate bar code(s).



ENABLE ALL CODE TYPES



DISABLE ALL CODE TYPES

Note: *When ENABLE ALL CODE TYPES is selected, EAN 128 is enabled, even though the default is Disabled.*

Code Type (cont'd)



ENABLE CODE 39



DISABLE CODE 39



ENABLE CODE 39 FULL ASCII*



DISABLE CODE 39 FULL ASCII*



ENABLE UPC/EAN



DISABLE UPC/EAN



ENABLE CODE 128



DISABLE CODE 128



ENABLE EAN 128



DISABLE EAN 128

*Enabling or disabling Code 39 Full ASCII only has an affect when Code 39 has been enabled.

Code Type (cont'd)



ENABLE D 2 of 5



DISABLE D 2 of 5



ENABLE I 2 of 5



DISABLE I 2 of 5



ENABLE CODABAR



DISABLE CODABAR



ENABLE CODE 93



DISABLE CODE 93



ENABLE MSI Plessey



DISABLE MSI Plessey

Code Lengths

To select one or two lengths for each code type:

1. Scan the desired option.
2. Scan two bar codes on the following page for each desired length. For example, for a length of “12,” scan “1” then “2.” For a length of “3,” scan “0,” then “3.” Always scan two bar codes for each length.
3. To change a selection, scan CANCEL.

Note: For additional information on Code Lengths see *Code Lengths on page 8-6.*



I 2 OF 5 1 DISCRETE LENGTH



D 2 OF 5 1 DISCRETE LENGTH



I 2 OF 5 2 DISCRETE LENGTHS



D 2 OF 5 2 DISCRETE LENGTHS

Code Lengths (cont'd)



0



1



2



3



4



5



6



7



8



9



CANCEL

Decode Options

Enable or disable a specific decode option by scanning the appropriate bar code.



TRANSMIT UPC-A CHECK DIGIT



DO NOT TRANSMIT UPC-A CHECK DIGIT



TRANSMIT UPC-E CHECK DIGIT



DO NOT TRANSMIT UPC-E CHECK DIGIT



CONVERT UPC-E TO UPC-A



DO NOT CONVERT UPC-E TO UPC-A



ENABLE EAN ZERO EXTEND



DISABLE EAN ZERO EXTEND

Decode Options (cont'd)



TRANSMIT "NO DECODE" MESSAGE



DO NOT TRANSMIT "NO DECODE" MESSAGE



DECODE UPC WITH 2 SUPPLEMENTALS



DISABLE DECODE UPC WITH 2 SUPPLEMENTALS



DECODE UPC WITH 5 SUPPLEMENTALS



DISABLE DECODE UPC WITH 5 SUPPLEMENTALS



AUTODISCRIMINATE UPC WITH OR WITHOUT SUPPLEMENTALS



DISABLE AUTODISCRIMINATE UPC WITH OR WITHOUT SUPPLEMENTALS

Decode Options (cont'd)



ENABLE DECODE UPC ONLY



DISABLE DECODE UPC ONLY



ENABLE 1 MSI Plessey CHECK DIGIT



ENABLE 2 MSI Plessey CHECK DIGITS



MSI 2 CHECK DIGITS MOD 10 - MOD 10



MSI 2 CHECK DIGITS MOD 11 - MOD 10



VERIFY CODE 39 CHECK DIGIT



DO NOT VERIFY CODE 39 CHECK DIGIT

Decode Options (cont'd)



BUFFER CODE 39



DO NOT BUFFER CODE 39



BEEP AFTER GOOD DECODE



DO NOT BEEP AFTER GOOD DECODE



ENABLE CLSI EDITING



DISABLE CLSI EDITING



ENABLE NOTIS EDITING



DISABLE NOTIS EDITING

UPC-A Preamble

Select one option for UPC-A preamble by scanning the appropriate bar code.



NONE



SYSTEM CHARACTER



SYSTEM CHARACTER
&
COUNTRY CODE

UPC-E Preamble

Select one option for UPC-E preamble by scanning the appropriate bar code.



NONE



SYSTEM CHARACTER



SYSTEM CHARACTER
&
COUNTRY CODE

Prefix/Suffix Values

To set a PREFIX/SUFFIX value:

1. Scan the option bar code to be set.
2. Scan three bar codes on the next page which correspond to the decimal value or keystroke to be assigned.
3. To change a selection, scan CANCEL.



PREFIX



SUFFIX 1



SUFFIX 2

Prefix/Suffix Values (cont'd)



0



1



2



3



4



5



6



7



8



9



CANCEL

Security Options

UPC Security Level

Select the desired security level option by scanning one of the bar codes below.



NONE



CHECK AMBIGUOUS CHARACTER



CHECK ALL CHARACTERS

UPC Security Zone

To set a UPC Security Zone value:

1. Scan the bar code below.
2. Scan two bar codes on the following page which correspond to the desired option. Single digit options (0-9) must be preceded by a leading zero.
3. To change a selection, scan CANCEL.



UPC SECURITY ZONE

UPC Security Zone (cont'd)



0



1



2



3



4



5



6



7



8



9



CANCEL

Bi-Directional Redundancy

Scan the appropriate bar code below to enable or disable bi-directional redundancy.



BI-DIRECTIONAL REDUNDANCY ENABLED



BI-DIRECITONAL REDUNDANCY DISABLED

Laser Control

Trigger Modes

Select a TRIGGER MODE from below.



LEVEL



PULSE



HOST



NEXT NEW CODE



CONSTANT SCAN & REPORT



CONTINUOUS LEVEL



CONTINUOUS PULSE

Laser On Time-out

Scan a bar code below which corresponds to the desired laser on time-out.



0.5 SEC



1.0 SEC



1.5 SEC



2.0 SEC



2.5 SEC



3.0 SEC



3.5 SEC



4.0 SEC

Laser Off Time-out

Scan a bar code below which corresponds to the desired laser off time-out.



0.0 SEC



0.5 SEC



1.0 SEC



1.5 SEC



2.0 SEC



2.5 SEC



3.0 SEC



3.5 SEC

RS-232C Options

Baud Rate

Set the baud rate for RS-232C transmission.



300



600



1200



2400



4800



9600



19200

Parity

Set the type of parity for RS-232C transmission.



ODD



EVEN



MARK



SPACE



NONE

Hardware Handshaking

Select the type of RS-232C Hardware Handshaking protocol.



NONE



RTS/CTS

Software Handshaking

Select the type of RS-232C Software Handshaking protocol.



NONE



ACK/NAK



ACK/NAK with ENQ



ENQ ONLY

Stop Bit Select

Select the desired number of stop bits for RS-232C communications.



1 STOP BIT



2 STOP BITS

ASCII Data Format

Select either 7-bit or 8-bit ASCII format for RS-232C communications.



7-BIT



8-BIT

Intercharacter Delay

To set a host communications intercharacter delay:

1. Scan the INTERCHARACTER DELAY bar code below.
2. Scan two bar codes on the next page which represent the desired delay. Delays less than 10 msec require a leading zero. Two bar codes must always be scanned.
3. To change a selection, scan CANCEL.



INTERCHARACTER DELAY

Intercharacter Delay (cont'd)



0



1



2



3



4



5



6



7



8



9



CANCEL

Code ID Character

Select the desired option from the bar codes below.



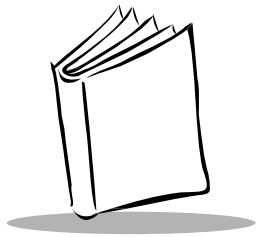
NO CODE ID



SYMBOL CODE ID



AIM CODE ID



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.
CLSI Editing	An option which inserts a space after the 1st, 5th, and 10th characters of a 14-character Codabar symbol. Length includes start and stop characters.
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.
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. Conformity is ensured through a software restriction of 120 seconds of laser operation within any 1000-second window and an automatic laser shutdown if the scanner's oscillating mirror fails.
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.
MSI Plessey	A numeric-only bar code type. It can accept a variable number of digits up to 13. MSI Plessey consists of four bars and four adjacent spaces. Each bar\space pair consists of one information bit. A zero bit consists of a narrow bar followed by a wide space, while one bit consist of a wide bar followed by a narrow bar. The zero bit is one unit bar followed by a two-unit space and the one bit is a two-unit bar followed by a one unit space. The primary application for the MSI Plessey code is marking of retail shelves and subsequent scanning with portable devices for inventory purposes.

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).

NOTIS Editing An option that strips the start and stop characters from a decoded Codabar symbol.

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.

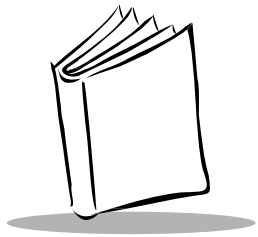
Scanner An electronic device used to scan bar code symbols and produce a digitized pattern that corresponds to the bars and spaces of the symbol. Its three main components are:

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.



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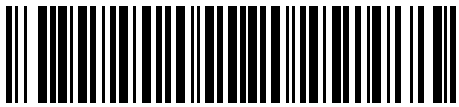
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