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

Patents

This product is covered by one or more of the patents listed on the website: http://www.symbol.com/patents

Warranty

For the complete Motorola hardware product warranty statement, go to: http://www.symbol.com/warranty.
**Revision History**

Changes to the original manual are listed below:

<table>
<thead>
<tr>
<th>Change</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
</table>
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Introduction

The Symbol SE1200 Series Scan Engine Integration Guide provides general instructions for mounting and set up of the Symbol SE1200 series scan engines.

NOTE: This guide provides general instructions for the installation of the scan engine into a customer’s device. 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 scan engines as well as the Theory of Operation and the Electrical Interface information.
- **Chapter 2, Installation**, explains how to install the scan engines. Provides detailed information on Mounting, Installation, Housing Design, Grounding, ESD, Environmental, Optical, Location and Positioning requirements are provided. Information on accessories is also provided.
- **Chapter 3, Symbol SE1200HP-I10xA Specifications**, provides the Symbol SE1200HP-I10xA scan engine technical specifications.
- **Chapter 4, Symbol SE1200WA-I200A Specifications**, provides the Symbol SE1200WA-I200A scan engine technical specifications.
- **Chapter 5, Symbol SE1200VHD-I000A Specification**, provides the Symbol SE1200VHD-I000A scan engine technical specifications.
- **Chapter 6, Symbol SE1200LR-I001A Specification**, provides the Symbol SE1200LR-I001A scan engine technical specifications.
- **Chapter 7, Symbol SE1200ALR-I000A Specification**, provides the Symbol SE1200ALR-I000A scan engine technical specifications.
- **Chapter 8, Regulatory Requirements**, describes the integration, documentation, and labeling requirements for Class 1 and Class 2 laser products.
• Chapter 9, Troubleshooting, provides the scan engines Troubleshooting procedures.

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.

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

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

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

Service Information

If you have a problem with your equipment, contact Motorola Enterprise Mobility Support for your region. Contact information is available at: http://www.symbol.com/contactsupport.

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

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

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

If your problem cannot be solved by Motorola Enterprise Mobility Support, you may need to return your equipment for servicing and will be given specific directions. Motorola is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty.

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

The Symbol SE1200 is a miniaturized, high performance, visible-laser based scan engine intended for integration into OEM equipment.

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

Available versions include:

- Symbol SE1200HP-I10xA Specifications on page 3-1
- Symbol SE1200WA-I200A Specifications on page 4-1
- Symbol SE1200VHD-I000A Specification on page 5-1
- Symbol SE1200LR-I001A Specification on page 6-1
- Symbol SE1200ALR-I000A Specification on page 7-1

A zif connector mounted on the scan engine provides connection between the scanner and host, or hardware acquisition/decoder element.

**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.
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 reflect it. A photodiode 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 Symbol SE1200 Scan Engine Block Diagram (Figure 1-1) provides the functional relationship of the Symbol SE1200 components. A detailed functional description of each of the components in the block diagram is also provided.

Visible Laser Diode

The Visible Laser Diode (VLD) 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 & Mirror Assembly

The mylar motor 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 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 Symbol SE1200 interface.

> **NOTE** When the Scan Enable and Laser Enable lines are both low, the control circuitry activates the laser and motor driver circuits, turning on the laser and motor.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Pin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power**</td>
<td>Supplies power to the engine. 5 VDC ± 10%; approx 60 mA</td>
</tr>
<tr>
<td>2†</td>
<td>Range Limiter*</td>
<td>When low, scanner range is reduced. When high, or not connected, scanner operates with full performance.</td>
</tr>
<tr>
<td></td>
<td>AIM*</td>
<td>AIM: Controls the scanner motor when power is supplied to pin 1 and the Scan Enable signal on pin 4 is low. When this pin is high, the scan engine operates in normal scanning mode. When this pin is low, the scan engine operates in aim or pointing mode. When the scan engine is in aim mode and the Aim signal transitions from low to high, the scan engine switches to scanning mode. Creates a stationary spot used to help aim the scan beam on a bar code.</td>
</tr>
<tr>
<td></td>
<td>Symbol SE1200HP-I100A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Symbol SE1200LR-I001A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scan Stand*</td>
<td>Scan Stand: Controls the gain of the receiver, when low, the receiver is in low gain mode, when high, the receiver is in normal gain mode.</td>
</tr>
<tr>
<td></td>
<td>Symbol SE1200HP-I102A</td>
<td></td>
</tr>
<tr>
<td>3†</td>
<td>Laser Enable*</td>
<td>Turns the laser beam on and off, when power is supplied to pin 1 and the Scan Enable signal on pin 4 is low. When this pin is high, the laser is off. When this pin is low, the laser beam is on.</td>
</tr>
<tr>
<td>4†</td>
<td>Scan Enable*</td>
<td>Controls the switching of the power supplied through pin 1 to the rest of the scan engine electronics. When this pin is low, power is supplied to the scan engine electronics. When this pin is high the scan engine is in its power down mode.</td>
</tr>
<tr>
<td>5</td>
<td>Digitized Bar Pattern</td>
<td>This output represents the widths of the bars and spaces in the symbol being scanned. An internal 10K ohm pull-up resistor is used. Valid DBP data should not be expected for about 55 msec after both Laser Enable and Scan Enable are active. high = bar, low = space</td>
</tr>
<tr>
<td>6</td>
<td>Start of Scan</td>
<td>Provides the start of scan signal to the decoding system. This signal toggles each scan line and is a square wave with a frequency of about 18 Hz. Note: This signal is high when the engine is in aim mode.</td>
</tr>
<tr>
<td>7, 8</td>
<td>Gnd</td>
<td>Ground</td>
</tr>
</tbody>
</table>

*Active Low.
†Minimum impedance between this pin and pin 1 is 1K ohm.
**This pin must always be connected, because power supplied to the engine is switched on and off by the Scan Enable signal.
Chapter 2 Installation

Introduction

This chapter provides the Symbol SE1200 scan engine unpacking, mounting and installing requirements information. Physical and electrical considerations are provided, together with the recommended window properties.

Unpacking

Remove the Symbol SE1200 from its packing and inspect the scanner for evidence of physical damage. If the scanner was damaged in transit, see Service Information on page x for more information.

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

Mounting

Mounting holes (M2x0.4-6H), are provided on the bottom of the chassis. Figure 2-1 on page 2-2 provides an outline drawing of the Symbol SE1200 scan engines.

The Symbol SE1200 scan engines may be mounted in any orientation without any degradation in performance.
Installing the Scan Engine

Before installing the Symbol SE1200 scan engine into your host equipment, there are two important points to consider:

1. The scan engine chassis is electrically connected to $V_{CC}$. It must be isolated from ground.

2. Use only non-magnetic screws, or locating pins when mounting the scan engine. Magnetic screws, or pins will change the motor/mirror neutral position. Recommended screw torque is 2.5 to 3.5 in. lbs.
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.

The Exit Window Information tables (see Exit Window Characteristics on page 2-4) provide minimum exit window dimensions and tilt angles for particular scan engine variants. One should note that these dimensional requirements can vary for different engine types. In addition to these minimum dimensional requirements, the designer may want to consider the use of baffles, matte-finished dark internal housing colors, as well as anti-reflection coated windows.

Environment

The scan engine must be sufficiently enclosed to prevent dust particles from gathering on the mirrors, laser lens, and the photodiode. Dust and other external contaminants will eventually cause degradation in unit performance. Motorola does not warrant performance of the engine when used in an exposed application. An exit window is required in all housing designs. Refer to Optical on page 2-3 for positioning of the exit window.

Grounding

The scan engine chassis is at $V_{CC}$. If the scan engine is being mounted on a grounded host, they must be electrically isolated.

An insulator can be inserted between the two chassis, and if metallic (non-magnetic) screws are used, shoulder washers must be used to isolate the screws from the host. Non-metallic screws may also be used if mechanical considerations permit.

When installing metallic, non-magnetic screws, make sure that the screwdriver or screw tip is non-magnetic. Magnetic screwdrivers or screw tips will change the motor/mirror neutral position.

ESD

The scan engines are 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.

Optical

The scan engine uses a sophisticated optical system that is capable of providing scanning performance that can match or exceed the performance of much larger scanners. However, the performance of the scan engine can be affected by an improperly designed enclosure, or improper selection of the window material.

CAUTION  This guide provides general instructions for the installation of the scan engine in a customer's device. It is recommended that an opto-mechanical engineer perform an opto-mechanical analysis prior to integration.
Positioning the Exit Window

The exit window must be positioned so that laser light reflected off the inside of the exit window is not reflected back into the collection optics of the scan engine. If an anti-reflective coating is used, the window can be positioned more nearly parallel to the face of the scanner. It is important to allow for manufacturing tolerances when determining the angles, it is essential to maintain the minimum angles specified in Exit Window Characteristics on page 2-4.

Larger angles are generally preferred. To maximize your system's potential, including use with the entire scan engine family (including 2-D scanners), a minimum angle of 24° is recommended. If your enclosure design cannot accommodate the recommended window angle, contact Motorola to discuss your requirements. An improperly positioned window can result in significant performance degradation.

Exit Window Characteristics

Table 2-1 on page 2-4 and Figure 2-2 on page 2-6 provide the minimum exit window dimensions and tilt angles for the Symbol SE1200 scan engines.

Table 2-1 Exit Window Information

| Values are for all Symbol SE1200 scan engines models (except as specified). | Distance from engine at scan center line (in) |
|---|---|---|---|---|---|---|---|
| | 0.15 | 0.25 | 0.50 | 0.75 | 1.00 | 1.50 | 2.00 |
| Minimum Window Height (in)* | | | | | | | |
| All models | 0.62 | 0.59 | 0.57 | 0.58 | 0.60 | 0.65 | 0.70 |
| Minimum Window Width, (listed by Scan Engine model number) (in)* | | | | | | | |
| Symbol SE1200WA-I100A | 0.83 | 0.92 | 1.15 | 1.40 | 1.65 | 2.15 | 2.65 |
| Symbol SE1200WA-I200A & Symbol SE1200WA-I100A & | 0.80 | 0.90 | 1.15 | 1.40 | 1.65 | 2.15 | 2.65 |
| Symbol SE1200HP-I10xA & | 0.70 | 0.78 | 0.97 | 1.16 | 1.35 | 1.75 | 2.15 |
| Symbol SE1200VHD-I000A & | 0.70 | 0.75 | 0.95 | 1.10 | 1.30 | 1.65 | 2.00 |
| Symbol SE1200LR-I001A & Symbol SE1200ALR-I000A | 0.58 | 0.63 | 0.75 | 0.87 | 0.99 | 1.23 | 1.47 |
| Minimum Window Tilt Uncoated, (listed by Scan Engine model number) ** | | | | | | | |
| All models (except listed below) | 25° | 20° | 15° | 12° | 10° | 10° | 10° |
| Symbol SE1200LR-I001A & Symbol SE1200ALR-I000A | 25° | 20° | 15° | 15° | 12° | 10° | 10° |
| Minimum Window Tilt One Side A/R Coated (listed by Scan Engine model number)** | | | | | | | |
| All models (except listed below) | 15° | 12° | 10° | 10° | 10° | 10° | 10° |

* Measured parallel to window surface.
** Window may tilt as shown in Figure 2-2 or in opposite direction (top of window furthest from or closest to engine). Reflectivity of window coating should not exceed 0.5% per side from 640 nm to 690 nm.
### Table 2-1  Exit Window Information (Continued)

| Values are for all Symbol SE1200 scan engines models (except as specified). | Distance from engine at scan center line (in) |
|---|---|---|---|---|---|---|---|
| Symbol SE1200LR-I001A & Symbol SE1200ALR-I000A | 15° | 15° | 15° | 12° | 10° | 10° |

**Minimum Window Tilt Two Sides A/R Coated (listed by Scan Engine model number)**

| All models (except listed below) | 8° | 8° | 8° | 8° | 8° | 8° |
| Symbol SE1200LR-I001A & Symbol SE1200ALR-I000A | 12° | 12° | 10° | 10° | 8° | 8° |

* Measured parallel to window surface.

** Window may tilt as shown in Figure 2-2 or in opposite direction (top of window furthest from or closest to engine). Reflectivity of window coating should not exceed 0.5% per side from 640 nm to 690 nm.
Avoiding Scratched Windows

Scratches on the window can greatly reduce scan engine performance. A design that recesses the window into the housing and/or the use of a scratch resistance coating is recommended.
Window Material

Many window materials that look perfectly clear to the eye can contain stresses and distortions that can reduce scan engine performance. For this reason cell-cast acrylic with an anti-reflection coating is highly recommended. Following is a description of acrylic, and CR-39, another popular window material. Table 2-2 outlines the suggested window properties.

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

NOTE Do not use polycarbonate material for exit windows.

Acrylic

Easily fabricated by extruding, injection-molding, or by cell-casting. Very good optical quality and low initial cost, but surface must be protected from the environment due to its susceptibility to attack by chemicals, mechanical stresses, and UV light. Reasonably good impact resistance. Acrylic can be ultrasonically welded.

CR-39

A thermal-setting plastic produced by the cell-casting process. Excellent chemical and environmental resistance, including good surface hardness. Typically it does not require hard-coating, but may be hard coated for severe environments. Reasonably good impact resistance. CR-39 cannot be ultrasonically welded. It is the material most commonly used in plastic eye glasses lenses.

Table 2-2  Suggested Window Properties

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

Exit Window coatings may be used to improve the performance and/or abrasion resistance characteristics. Table 2-3 on page 2-8 lists some exit window manufacturers and anti-reflection coaters.

Anti-Reflection Coatings

An anti-reflection coating should be applied to the inside and/or outside of the window. This greatly reduces the amount of light reflected off the window, back into the scan engine. The coating can also improve the range of acceptable window positions and minimize performance degradation due to signal loss as the light passes through the window. It is highly recommended that anti-reflection coatings be used on both the inside and outside of the window.

Polysiloxane Coating

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

Table 2-3 Exit Window Manufacturers and Coaters

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

**Specular Reflection**

When laser beams reflect *directly* back into the scanner from the bar code, they can “blind” the scanner and make decoding difficult. This is called specular reflection.

To avoid this, scan the bar code so that the beam does not bounce *directly* back. But don’t scan at too oblique an angle; the scanner needs to collect scattered reflections from the scan to make a successful decode. Practice quickly shows what tolerances to work within.

**Figure 2-3  Avoiding Specular Reflection**

When scanning a 1D bar code, there is only a small specular dead zone to avoid (+/- 2° from the direct laser beam). However, the scanner is not as effective if its beams hit the bar code’s surface at an angle greater than 30° from the normal to that surface.
Using the Symbol SE1200 as an Embedded Scanner

Some applications require the Symbol SE1200 be mounted to read symbols that are automatically presented, or that are presented in a pre-determined location. In these applications the Symbol SE1200 positioning (with respect to the symbol) is critical. Failure to properly position the Symbol SE1200 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 2-10, 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 2-11, 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 2-4 on page 2-10):

\[ L = 1.8 \times (D+d) \times \tan \left( \frac{A}{2} \right) \]

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 \( A^\circ \) (see Technical Specifications table for each scan engine model).

![Usable Scan Length Diagram](image)

\( \checkmark \) **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.
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. Motorola can provide advice on how to improve the installation.

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) 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 scan engines ability to read symbols. The orientation of the symbol with respect to the conveyor direction is another consideration. *Figure 2-5 on page 2-12* illustrates the relationship of the conveyor velocity with respect to a symbol positioned perpendicular to the conveyor direction and *Figure 2-6 on page 2-13* 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:

\[ V = \frac{R \times (F-W)}{N} \]

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 2-5  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:

\[ V = \frac{R \times H}{N} \]

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 2-6  Symbol Parallel To Conveyor Movement**
Accessories

Table 2-4 lists the available scan engine accessories.

Table 2-4  Accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flex Strip, undecoded only (8-pin fanout)</td>
<td>15-81327-01</td>
</tr>
<tr>
<td>Flex Strip Variable Length, undecoded only (8-pin fanout)</td>
<td>15-09306-01</td>
</tr>
<tr>
<td>8-pin Connector</td>
<td>50-12171-008</td>
</tr>
</tbody>
</table>

Hardware Accessories

Table 2-5 lists the available hardware accessories for the scan engine.

Table 2-5  Hardware Accessories

<table>
<thead>
<tr>
<th>Company</th>
<th>Discipline</th>
<th>Specifics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tower Fasteners Co., Inc.</td>
<td>Fasteners</td>
<td>Metallic, non-magnetic screws</td>
</tr>
<tr>
<td>1690 North Ocean Ave.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holtsville, New York 11742-1823</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(516) 289-8800</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Flex Cable

A flex strip cable is used to connect the scan engine to a host interface. Two flex strips are available from Motorola, an 8-pin tapered flex strip (p/n 15-81327-01, see Figure 2-7) and an 8-pin cut-to-length flex strip (p/n 15-09306-01, see Figure 2-8). These flex strips should be used only for evaluation purposes and not for production units.

Figure 2-7  8-Pin Tapered Flex Cable, P/N 15-81327-01
software development kit

the universal sdk (software development kit, part number: se-dk-i000) provides the software and hardware tools required to integrate and communicate to the symbol se1200 scan engines. with over 70 programmable parameters, the symbol se1200 can be configured by scanning bar code menus or through the serial interface. using symbol technologies’ simple serial protocol, your product can support every scanning function via the serial port.

whether your device is windows®, dos, or even an embedded system, the symbol se1200 sdk will help the user take full advantage of the symbol se1200 features and obtain maximum performance.
The SDK contains:

- Media CD
- Development Board
- User Documentation
- Power supply
- Cable.

**Media CD**

The Media CD provides the software and user documentation:

- Simple Serial Interface Header Files
- DOS Serial Communication Library and Source Code
- Windows Serial Communication Library and Source Code
- Simple Serial Interface Library and Source Code
- DOS and Windows Demo Programs and Source Code
- Library Documentation.

**Development Board**

The Development Board is useful for connecting the scan engine to your PC development workstation. Functions of the development board include:

- Conversion of the Symbol SE1200 CMOS Serial Output to RS-232
- Mounting location for Symbol SE1200 Scan Engine (any version)
- Beeper and LED drivers
- 9 pin RS-232 for connection to PC workstation
- Aim and Trigger Buttons
- Beeper
- 990Power, Decode, Low Power Mode LEDs
- Test Points.

**User Documentation**

The Integration Guide provides the detailed technical specifications for the scan engine.

**Power Supply**

Power supplies are available in either 110VAC or 220VAC.

**Cable**

The cable provides a connection between the development board and your PC workstation.
Chapter 3 Symbol SE1200HP-I10xA Specifications

Introduction

This chapter provides the technical specifications for the High Performance, Symbol SE1200HP-I10xA (with Adaptive Logic) 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 Symbol SE1200HP-I10xA technical specifications.

Electrical Interface

Table 1-1 on page 1-4 lists the pin functions of the scan engine interface for the Symbol SE1200HP-I10xA.
### Table 3-1  Symbol SE1200HP-I10xA Technical Specifications @ 23°C

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Requirements</strong></td>
<td></td>
</tr>
<tr>
<td>Input Voltage</td>
<td>3.0 - 5.5 VDC</td>
</tr>
<tr>
<td>Input Current</td>
<td>65 mA typical; 100 mA maximum</td>
</tr>
<tr>
<td>Standby Current</td>
<td>50 µA max.</td>
</tr>
<tr>
<td>Surge Current</td>
<td>160 mA max.</td>
</tr>
<tr>
<td>V&lt;sub&gt;cc&lt;/sub&gt; Noise Level</td>
<td>200 mV p to p max., 75% of specified working range will be maintained.</td>
</tr>
<tr>
<td>Scan Repetition Rate</td>
<td>35 (± 5) scans/sec (bidirectional)</td>
</tr>
<tr>
<td>Laser Power</td>
<td>0.8 mW ± 0.05 mW, λ = 650 nm nominal</td>
</tr>
<tr>
<td>Print Contrast</td>
<td>minimum 20% absolute dark/light reflectance measured at 650 nm.</td>
</tr>
<tr>
<td>Scan Angle</td>
<td>42° ± 2°</td>
</tr>
<tr>
<td>Skew Tolerance</td>
<td>± 60° from normal (see Figure 3-1 on page 3-3)</td>
</tr>
<tr>
<td>Pitch Angle</td>
<td>± 65° from normal (see Figure 3-1 on page 3-3)</td>
</tr>
<tr>
<td>Roll</td>
<td>± 30° from vertical (see Figure 3-1 on page 3-3)</td>
</tr>
<tr>
<td>Decode Depth of Field</td>
<td>See Figure 3-2 on page 3-4</td>
</tr>
<tr>
<td>Ambient Light Immunity</td>
<td></td>
</tr>
<tr>
<td>Sunlight</td>
<td>10,000 ft. candles (107,640 lux)</td>
</tr>
<tr>
<td>Artificial Light</td>
<td>450 ft. candles (4,844 lux)</td>
</tr>
<tr>
<td>Shock</td>
<td>2000 G applied via any mounting surface @ 23°C (for 0.25 msec)</td>
</tr>
</tbody>
</table>
| Vibration                     | Unpowered engine withstands a random vibration along each of the X, Y and Z axes for a period of one hour per axis, defined as follows:  
20 to 80 Hz  Ramp up to 0.04 G^2/Hz at the rate of 3dB/octave.  
80 to 350 Hz  0.04 G^2/Hz  
350 to 2000 Hz  Ramp down at the rate of 3 dB/octave. |
| Laser Class                   | The scan engine, by itself, is an unclassified component. It is intended for use in CDRH/IEC Class II/2 devices with proper housing, labeling, and instructions to comply with U.S. Federal and/or international standards. |
| Operating Temperature         | -22° to 140°F (-30° to 60°C)                                                                     |
| Storage Temperature           | -40° to 140°F (-40° to 60°C)                                                                     |
| Humidity                      | 5% to 95% non-condensing                                                                        |
| Height                        | 0.76 in. max. (1.93 cm max.)                                                                    |
| Width                         | 1.51 in. max. (3.84 cm max.)                                                                    |
| Depth                         | 1.0 in. max. (2.54 cm max.)                                                                     |
| Weight                        | 1.19 oz. max. (34.0 gm max.)                                                                    |

**Note:** Environmental and/or Tolerance Parameters are not cumulative.
Figure 3-1  Symbol SE1200HP-I10xA Skew, Pitch and Roll

Note: Tolerances will be reduced at extreme ends of the working range.
The scan engine decodes the symbols as shown in Figure 3-2. The figures shown are typical values. Table 3-2 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 2-10.

![Figure 3-2 Symbol SE1200HP-I10xA Decode Zone (Typical)](image)

*Minimum distance determined by symbol length and scan angle

**Figure 3-2** Symbol SE1200HP-I10xA Decode Zone (Typical)

**Table 3-2 Symbol SE1200HP-I10xA Decode Distances**

<table>
<thead>
<tr>
<th>Symbol Density/ Bar Code Type/ W-N Ratio</th>
<th>Bar Code Content/ ContrastNote 1</th>
<th>Typical Working Ranges</th>
<th>Guaranteed Working Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Near</td>
<td>Far</td>
</tr>
<tr>
<td>5.0 mil</td>
<td>ABCDEFGH 80% MRD</td>
<td>2.75 in.</td>
<td>7.0 in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.98 cm</td>
<td>17.78 cm</td>
</tr>
<tr>
<td>7.5 mil</td>
<td>ABCDEF 80% MRD</td>
<td>2.25 in.</td>
<td>11.0 in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.72 cm</td>
<td>27.94 cm</td>
</tr>
<tr>
<td>10 mil</td>
<td>ABCDE 80% MRD</td>
<td>1.75 in.</td>
<td>15.75 in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.45 cm</td>
<td>40.00 cm</td>
</tr>
</tbody>
</table>
### Usable Scan Length

*Calculating The Usable Scan Length Method on page 2-10*, 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*.

### Exit Window Characteristics

*Table 2-1 on page 2-4 and Figure 2-2 on page 2-6* provide the minimum exit window dimensions and tilt angles for the Symbol SE1200 scan engines.
Chapter 4 Symbol SE1200WA-I200A Specifications

Introduction

This chapter provides the technical specifications for the Symbol SE1200WA-I200A 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 4-5* provides the Symbol SE1200WA-I200A technical specifications.

Electrical Interface

*Table 1-1 on page 1-4* lists the pin functions of the scan engine interface for the Symbol SE1200WA-I200A scan engine.
Table 4-1. Symbol SE1200WA-I200A Technical Specifications @ 23°C

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Requirements</td>
<td>3.0 - 5.5 VDC</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>65 mA typical; 100 mA maximum</td>
</tr>
<tr>
<td>Standby Current</td>
<td>50 µA max.</td>
</tr>
<tr>
<td>Surge Current</td>
<td>160 mA max.</td>
</tr>
<tr>
<td>(V_{cc}) Noise Level</td>
<td>200 mV peak to peak, 75% of specified working range will be maintained.</td>
</tr>
<tr>
<td>Scan Repetition Rate</td>
<td>35 (± 5) scans/sec (bidirectional)</td>
</tr>
<tr>
<td>Laser Power</td>
<td>0.51 mW maximum, (\lambda = 650) nm nominal</td>
</tr>
<tr>
<td>Print Contrast</td>
<td>minimum 20% absolute dark/light reflectance measured at 650 nm.</td>
</tr>
<tr>
<td>Scan Angle</td>
<td>53° ± 2°</td>
</tr>
<tr>
<td>Skew Tolerance</td>
<td>± 65° from normal (see Figure 4-1 on page 4-3)</td>
</tr>
<tr>
<td>Pitch Angle</td>
<td>± 55° from normal (see Figure 4-1 on page 4-3)</td>
</tr>
<tr>
<td>Roll</td>
<td>± 20° from vertical (see Figure 4-1 on page 4-3)</td>
</tr>
<tr>
<td>Decode Depth of Field</td>
<td>See Figure 4-2 on page 4-4</td>
</tr>
<tr>
<td>Ambient Light Immunity</td>
<td></td>
</tr>
<tr>
<td>Sunlight</td>
<td>8,000 ft. candles (86,112 lux)</td>
</tr>
<tr>
<td>Artificial Light</td>
<td>450 ft. candles (4,844 lux)</td>
</tr>
<tr>
<td>Shock</td>
<td>2000 G applied via any mounting surface @ 23°C (for 0.25 msec)</td>
</tr>
<tr>
<td>Vibration</td>
<td>Unpowered engine withstands a random vibration along each of the X, Y and Z axes for a period of one hour per axis, defined as follows: 20 to 80 Hz Ramp up to 0.04 G^2/Hz at the rate of 3 dB/octave. 80 to 350 Hz 0.04 G^2/Hz 350 to 2000 Hz Ramp down at the rate of 3 dB/octave.</td>
</tr>
<tr>
<td>Laser Class</td>
<td>The scan engine, by itself, is an unclassified component. It is intended for use in CDRH Class II (or IEC Class 1 with software to control the laser duty cycle) devices with proper housing, labeling, and instructions to comply with U.S. Federal and/or international standards.</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>32° to 104°F (0° to 40°C)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40° to 140°F (-40° to 60°C)</td>
</tr>
<tr>
<td>Humidity</td>
<td>5% to 95% non-condensing</td>
</tr>
<tr>
<td>Height</td>
<td>0.76 in. max. (1.93 cm max.)</td>
</tr>
</tbody>
</table>

Note: Environmental and/or Tolerance Parameters are not cumulative.
Table 4-1. Symbol SE1200WA-I200A Technical Specifications @ 23°C (Continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>1.51 in. max. (3.84 cm max.)</td>
</tr>
<tr>
<td>Depth</td>
<td>1.0 in. max. (2.54 cm max.)</td>
</tr>
<tr>
<td>Weight</td>
<td>1.19 oz. max. (34 gm max.)</td>
</tr>
</tbody>
</table>

*Note: Environmental and/or Tolerance Parameters are not cumulative.*

---

**Figure 4-1**  
*Symbol SE1200WA-I200A Skew, Pitch and Roll*
Decode Zone

The Symbol SE1200WA-I200A scan engine decodes the symbols as shown in Figure 4-2. The figures shown are typical values. Table 4-1 on page 4-5 lists the typical and guaranteed distances for selected bar code densities. The minimum element width (or “symbol density”) is the width in mils of the narrowest element (bar or space) in the symbol. 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 2-10.

Figure 4-2  Symbol SE1200WA-I200A Decode Zone (Typical)
Table 4-1  Symbol SE1200WA-I200A Decode Distances

<table>
<thead>
<tr>
<th>Symbol Density/ Bar Code Type</th>
<th>Bar Code Content/ Contrast(^{\text{Note 1}})</th>
<th>Typical Working Ranges</th>
<th>Guaranteed Working Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Near</td>
<td>Far</td>
</tr>
<tr>
<td>5.0 mil Code 39</td>
<td>ABCDEFGH 80% MRD</td>
<td>2.0 in</td>
<td>5.08 cm</td>
</tr>
<tr>
<td>7.5 mil Code 39</td>
<td>ABCDEFG 80% MRD</td>
<td>1.5 in</td>
<td>3.81 cm</td>
</tr>
<tr>
<td>13 mil 100% UPC</td>
<td>012345678905 80% MRD</td>
<td>1.5 in</td>
<td>3.81 cm</td>
</tr>
<tr>
<td>20 mil Code 39</td>
<td>123 80% MRD</td>
<td>Note 2</td>
<td>16.0 in</td>
</tr>
<tr>
<td>40 mil Code 39</td>
<td>AB 80% MRD</td>
<td>Note 2</td>
<td>20.0 in</td>
</tr>
<tr>
<td>55 mil Code 39</td>
<td>CD 80% MRD</td>
<td>Note 2</td>
<td>25.0 in</td>
</tr>
</tbody>
</table>

Notes:
1. CONTRAST measured as Mean Reflective Difference (MRD) at 650 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: Photographic quality symbols, pitch = 15°, skew = 0°, roll = 0°, ambient light < 150 ft. candles, and temperature = 23 °C

Usable Scan Length

*Calculating The Usable Scan Length Method on page 2-10,* provides a detailed description of how to calculate the usable scan length. The scan angle is provided in *Table 4-1 on page 4-5.*

Exit Window Characteristics

*Table 4-1 on page 4-5 and Figure 2-2 on page 2-6* provide the minimum exit window dimensions and tilt angles for the Symbol SE1200 scan engines.
Chapter 5 Symbol SE1200VHD-I000A Specification

Introduction

This chapter provides the technical specifications for the Symbol SE1200VHD-I000A (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.

Symbol SE1200VHD-I000A Technical Specifications

*Table 5-1 on page 5-2* provides the Symbol SE1200VHD-I000A technical specifications.

Electrical Interface

*Table 1-1 on page 1-4* lists the pin functions of the scan engine interface for the Symbol SE1200VHD-I000A scan engine.
Table 5-1  Symbol SE1200VHD-I000A Technical Specifications @ 23°C

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Requirements</td>
<td>Symbol SE1200VHD-I000A</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>5.0 VDC ± 10%</td>
</tr>
<tr>
<td>Input Current</td>
<td>60 mA typical @ 5V; 85 mA max.</td>
</tr>
<tr>
<td>Standby Current</td>
<td>50 µA max.</td>
</tr>
<tr>
<td>Surge Current</td>
<td>130 mA max.</td>
</tr>
<tr>
<td>( V_{cc} ) Noise Level</td>
<td>50 mV p to p typical, 200 mV p to p max.</td>
</tr>
<tr>
<td>Scan Repetition Rate</td>
<td>35 (± 5) scans/sec (bidirectional)</td>
</tr>
<tr>
<td>Laser Power</td>
<td>0.36 mW ± 10%, 670 nm</td>
</tr>
<tr>
<td>Print Contrast</td>
<td>Minimum 40% absolute dark/light reflectance measured at 670 nm.</td>
</tr>
<tr>
<td>Scan Angle</td>
<td>37° ± 2°</td>
</tr>
<tr>
<td>Skew Tolerance</td>
<td>± 60° from normal (see Figure 5-1 on page 5-3)</td>
</tr>
<tr>
<td>Pitch Angle</td>
<td>± 65° from normal (see Figure 5-1 on page 5-3)</td>
</tr>
<tr>
<td>Roll</td>
<td>± 10° from vertical (see Figure 5-1 on page 5-3)</td>
</tr>
<tr>
<td>Decode Depth of Field</td>
<td>See Usable Scan Length on page 5-5</td>
</tr>
<tr>
<td>Ambient Light Immunity</td>
<td></td>
</tr>
<tr>
<td>Sunlight</td>
<td>8,000 ft. candles 86,112 lux</td>
</tr>
<tr>
<td>Artificial Light</td>
<td>450 ft. candles 4,844 lux</td>
</tr>
<tr>
<td>Shock</td>
<td>2,000 G applied via any mounting surface @ 23°C (for 0.25 msec)</td>
</tr>
<tr>
<td>Vibration</td>
<td>Withstands a sinusoidal vibration of 1G along each of the 3 mutually perpendicular axes for a period of 1 hr per axis, over a frequency range of 5 Hz to 2,000Hz.</td>
</tr>
<tr>
<td>Laser Class</td>
<td>The scan engine, by itself, is an unclassified component. It is intended for use in CDRH/IEC Class II/2 devices with proper housing, labeling, and instructions to comply with U.S. Federal and/or international standards.</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>32° to 104°F 0° to 40°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40° to 140°F -40° to 60°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>5% to 95% non-condensing</td>
</tr>
<tr>
<td>Height</td>
<td>0.76 in. max. 1.93 cm max.</td>
</tr>
<tr>
<td>Width</td>
<td>1.51 in. max. 3.84 cm max.</td>
</tr>
<tr>
<td>Depth</td>
<td>1.0 in. max. 2.54 cm max.</td>
</tr>
<tr>
<td>Weight</td>
<td>1.19 oz. max. 34 gm max.</td>
</tr>
</tbody>
</table>

Note: Environmental and/or Tolerance Parameters are not cumulative.
Figure 5-1  Symbol SE1200VHD-I000A Skew, Pitch and Roll

Note: Tolerances will be reduced at extreme ends of the working range.
Symbol SE1200VHD-I000A Decode Zone ($V_{cc} = 5V$)

The Symbol SE1200VHD-I000A decodes the symbols as shown in Figure 5-2. The figures shown are typical values. Table 5-2 on page 5-5 lists the typical and guaranteed distances for selected bar code densities. The minimum element width (or "symbol density") is the width in mils of the narrowest element (bar or space) in the symbol. 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 2-10.

Note: Typical performance at 73.4˚F (23˚C) on high quality symbols.

Figure 5-2  Symbol SE1200VHD-I000A Decode Zone (Typical)
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.

### Usable Scan Length

*Calculating The Usable Scan Length Method on page 2-10,* 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.*

### Exit Window Characteristics

*Table 2-1 on page 2-4* and *Figure 2-2 on page 2-6* provide the minimum exit window dimensions and tilt angles for the Symbol SE1200 scan engines.
Chapter 6 Symbol SE1200LR-I001A Specification

Introduction

This chapter provides the technical specifications for the Symbol SE1200LR-I001A (Long Range) 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.

Symbol SE1200LR-I001A Technical Specifications

Table 6-1 on page 6-2 provides the Symbol SE1200LR-I001A technical specifications.

Electrical Interface

Table 1-1 on page 1-4 lists the pin functions of the scan engine interface for the Symbol SE1200LR-I001A scan engine.
Table 6-1  Symbol SE1200LR-I001A Technical Specifications @ 23°C

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Requirements</td>
<td>Symbol SE1200LR-I001A</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>5.0 VDC ± 10%</td>
</tr>
<tr>
<td>Input Current</td>
<td>72 mA typical @ 5V; 109 mA max.</td>
</tr>
<tr>
<td>Standby Current</td>
<td>50 µA max.</td>
</tr>
<tr>
<td>Surge Current</td>
<td>130 mA max.</td>
</tr>
<tr>
<td>V&lt;sub&gt;cc&lt;/sub&gt; Noise Level</td>
<td>50 mV p to p typical, 200 mV p to p max.</td>
</tr>
<tr>
<td>Scan Repetition Rate</td>
<td>35 (± 5) scans/sec (bidirectional)</td>
</tr>
<tr>
<td>Laser Power</td>
<td>Scan Mode: 1.3 mW ± 0.1 mW, 650 nm</td>
</tr>
<tr>
<td></td>
<td>Aim Mode: &lt; 1.0mW maximum, 650nm</td>
</tr>
<tr>
<td>Print Contrast</td>
<td>Minimum 40% absolute dark/light reflectance measured at 650 nm.</td>
</tr>
<tr>
<td>Scan Angle</td>
<td>23° ± 2°</td>
</tr>
<tr>
<td>Skew Tolerance</td>
<td>± 60° from normal (see Figure 6-1 on page 6-3)</td>
</tr>
<tr>
<td>Pitch Angle</td>
<td>± 65° from normal (see Figure 6-1 on page 6-3)</td>
</tr>
<tr>
<td></td>
<td>(Measured on a 100% UPC symbol at mid working range.)</td>
</tr>
<tr>
<td>Roll</td>
<td>± 10° from vertical (see Figure 6-1 on page 6-3)</td>
</tr>
<tr>
<td>Decode Depth of Field</td>
<td>See Figure 6-2 on page 6-4</td>
</tr>
<tr>
<td>Ambient Light Immunity</td>
<td></td>
</tr>
<tr>
<td>Sunlight</td>
<td>8,000 ft. candles 86,112 lux</td>
</tr>
<tr>
<td>Artificial Light</td>
<td>450 ft. candles 4,844 lux</td>
</tr>
<tr>
<td>Shock</td>
<td>2,000 G applied via any mounting surface @ 25°C (for 0.25 msec)</td>
</tr>
<tr>
<td>Vibration</td>
<td>Withstands a sinusoidal vibration of 1G along each of the 3 mutually perpendicular axes for a period of 1 hr per axis, over a frequency range of 5 Hz to 2000Hz.</td>
</tr>
<tr>
<td>Laser Class</td>
<td>The scan engine, by itself, is an unclassified component. It is intended for use in CDRH/IEC Class II/2 devices with proper housing, labeling, and instructions to comply with U.S. Federal and/or international standards.</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-22° to 131°F -30° to 55°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40° to 140°F -40° to 60°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>5% to 95% non-condensing</td>
</tr>
<tr>
<td>Height</td>
<td>0.76 in. max. 1.93 cm max.</td>
</tr>
<tr>
<td>Width</td>
<td>1.51 in. max. 3.84 cm max.</td>
</tr>
<tr>
<td>Depth</td>
<td>1.0 in. max. 2.54 cm max.</td>
</tr>
<tr>
<td>Weight</td>
<td>1.19 oz. max. 34 gm max.</td>
</tr>
</tbody>
</table>

*Note: Environmental and/or Tolerance Parameters are not cumulative.*
Figure 6-1  *Symbol SE1200LR-I001A Skew, Pitch and Roll*

Note: Tolerances will be reduced at extreme ends of the working range.
Symbol SE1200LR-I001A Decode Zone \((V_{cc} = 5V)\)

The Symbol SE1200LR-I001A decodes the symbols as shown in Figure 6-2. The figures shown are typical values. Table 6-2 on page 6-5 lists the typical and guaranteed distances for selected bar code densities. The minimum element width (or "symbol density") is the width in mils of the narrowest element (bar or space) in the symbol. 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 2-10.

**Note:** Typical performance at 73.4°F (23°C) on high quality symbols.

**Figure 6-2  Symbol SE1200LR-I001A Decode Zone (Typical)**
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.

### Usable Scan Length

*Calculating The Usable Scan Length Method on page 2-10,* provides a detailed description of how to calculate the usable scan length. The scan angle is provided in *Table 6-1 on page 6-2.*

### Exit Window Characteristics

*Table 2-1 on page 2-4 and Figure 2-2 on page 2-6* provide the minimum exit window dimensions and tilt angles for the Symbol SE1200 scan engines.

---

**Table 6-2. Symbol SE1200LR-I001A Decode Distances**

<table>
<thead>
<tr>
<th>Symbol Density/ Bar Code Type/ W-N Ratio</th>
<th>Bar Code Content/ Contrast Note 1</th>
<th>Typical Working Ranges</th>
<th>Guaranteed Working Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Near</td>
<td>Far</td>
</tr>
<tr>
<td>10 mil Code 39; 2.5:1</td>
<td>ABCDE 80% MRD</td>
<td>11 in. 27.94 cm</td>
<td>24 in. 60.96 cm</td>
</tr>
<tr>
<td>15 mil Code 39; 2.8:1</td>
<td>STI 80% MRD</td>
<td>7.5 in. 19.05 cm</td>
<td>39 in. 99.06 cm</td>
</tr>
<tr>
<td>20 mil Code 39; 2.2:1</td>
<td>123 80% MRD</td>
<td>7.5 in. 19.05 cm</td>
<td>48 in. 121.92 cm</td>
</tr>
<tr>
<td>40 mil Code 39; 2.2:1</td>
<td>AB 80% MRD</td>
<td>10 in. 25.40 cm</td>
<td>90 in. 228.60 cm</td>
</tr>
<tr>
<td>55 mil Code 39; 2.2:1</td>
<td>CD 80% MRD</td>
<td>10 in. 25.40 cm</td>
<td>120 in. 304.80 cm</td>
</tr>
<tr>
<td>70 mil Code 39; 3.0:1</td>
<td>123477 80% MRD</td>
<td>48 in. 121.92 cm</td>
<td>200 in. 508.00 cm</td>
</tr>
<tr>
<td>100 mil Code 39; 3.0:1</td>
<td>1234 80% MRD</td>
<td>60 in. 152.40 cm</td>
<td>240 in. 609.60 cm</td>
</tr>
</tbody>
</table>

**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.
Chapter 7 Symbol SE1200ALR-I000A Specification

Introduction

This chapter provides the technical specifications for the Symbol SE1200ALR-I000A (Advanced Long Range) 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.

Symbol SE1200ALR-I000A Technical Specifications

Table 7-1 on page 7-2 provides the Symbol SE1200ALR-I000A technical specifications.

Electrical Interface

Table 1-1 on page 1-4 lists the pin functions of the scan engine interface for the Symbol SE1200ALR-I000A scan engine.
Table 7-1  *Symbol SE1200ALR-I000A Technical Specifications @ 23°C*

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Requirements</td>
<td>Symbol SE1200ALR-I000A</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>5.0 VDC ± 10%</td>
</tr>
<tr>
<td>Input Current</td>
<td>72 mA typical @ 5V; 110 mA max.</td>
</tr>
<tr>
<td>Standby Current</td>
<td>50 µA max.</td>
</tr>
<tr>
<td>Surge Current</td>
<td>130 mA max.</td>
</tr>
<tr>
<td>Vcc Noise Level</td>
<td>50 mV p to p typical, 200 mV p to p max.</td>
</tr>
<tr>
<td>Scan Repetition Rate</td>
<td>35 (± 5) scans/sec (bidirectional)</td>
</tr>
<tr>
<td>Laser Power</td>
<td>1.5 mW ± 0.2 mW, 650 nm</td>
</tr>
<tr>
<td>Print Contrast</td>
<td>Minimum 40% absolute dark/light reflectance measured at 650 nm.</td>
</tr>
<tr>
<td>Scan Angle</td>
<td>13° ± 2°</td>
</tr>
<tr>
<td>Skew Tolerance</td>
<td>± 30° from normal (see <em>Figure 7-1 on page 7-3</em>)</td>
</tr>
<tr>
<td>Pitch Angle</td>
<td>± 55° from normal (see <em>Figure 7-1 on page 7-3</em>)</td>
</tr>
<tr>
<td>Roll</td>
<td>± 10° from vertical (see <em>Figure 7-1 on page 7-3</em>)</td>
</tr>
<tr>
<td>Decode Depth of Field</td>
<td>See <em>Figure 7-2 on page 7-4</em></td>
</tr>
<tr>
<td>Ambient Light Immunity</td>
<td></td>
</tr>
<tr>
<td>Sunlight</td>
<td>4,000 ft. candles 43,056 lux</td>
</tr>
<tr>
<td>Artificial Light</td>
<td>450 ft. candles 4,844 lux</td>
</tr>
<tr>
<td>Shock</td>
<td>2,000 G applied via any mounting surface @ 25°C (for 0.25 msec)</td>
</tr>
<tr>
<td>Vibration</td>
<td>Withstands a sinusoidal vibration of 1G along each of the 3 mutually perpendicular axes for a period of 1 hr per axis, over a frequency range of 5 Hz to 2000Hz.</td>
</tr>
<tr>
<td>Laser Class</td>
<td>The scan engine, by itself, is an unclassified component. It is intended for use in CDRH/IEC Class II/3A devices with proper housing, labeling, and instructions to comply with U.S. Federal and/or international standards.</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-22° to 131°F -30° to 55°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40° to 140°F -40° to 60°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>5% to 95% non-condensing</td>
</tr>
<tr>
<td>Height</td>
<td>0.76 in. max. 1.93 cm max.</td>
</tr>
<tr>
<td>Width</td>
<td>1.51 in. max. 3.84 cm max.</td>
</tr>
<tr>
<td>Depth</td>
<td>1.0 in. max. 2.54 cm max.</td>
</tr>
<tr>
<td>Weight</td>
<td>1.19 oz. max. 34 gm max.</td>
</tr>
</tbody>
</table>

*Note: Environmental and/or Tolerance Parameters are not cumulative.*
Figure 7-1  Symbol SE1200ALR-I000A Skew, Pitch and Roll

Note: Tolerances will be reduced at extreme ends of the working range.
Symbol SE1200ALR-I000A Decode Zone \((V_{cc} = 5V)\)

The Symbol SE1200ALR-I000A decodes the symbols as shown in Figure 7-2. The figures shown are typical values. Table 7-2 on page 7-5 lists the typical and guaranteed distances for selected barcode densities. All specified working ranges are tested with Code 39 and 100% UPC on photographic quality prints with minimum of 90% MRD. 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 2-10.

![Diagram](image)

Note: Typical performance at 68°F (20°C) on high quality symbols.

**Figure 7-2**  Symbol SE1200ALR-I000A Decode Zone (Typical)
Calculating The Usable Scan Length Method on page 2-10, provides a detailed description of how to calculate the usable scan length. The scan angle is provided in Table 7-1 on page 7-2.

Exit Window Characteristics

Table 2-1 on page 2-4 and Figure 2-2 on page 2-6 provide the minimum exit window dimensions and tilt angles for the Symbol SE1200 scan engines.
Introduction

The sections that follow describe the integration, documentation, and labeling requirements for Class 1 and Class 2 laser products.

General Regulatory Requirements

When integrating the scan engines described in this guide, the following requirement must be met to maintain laser classification:

- The scan engine may not have the capability to be placed into AIM mode for more than 5 seconds continuously.

Required Documentation for Class 1 Laser Products

The documentation accompanying the end product should contain the following:

- "Complies with 21CFR1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001."
- "Class 1 Laser devices are not considered to be hazardous when used for their intended purpose. The following statement is required to comply with US and international regulations:

  CAUTION  Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous laser light exposure.".
A label such as the one below should appear in the product documentation, depending on the end product. Refer to the current applicable laser safety standards for the end product or specific requirements.

Figure 8-1  Example of Class 1 Laser Warning Label

**Required Documentation for Class 2 Laser Products**

The documentation accompanying the end product should contain the following:

- “Complies with 21CFR1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001.”
- “Caution: Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous laser light exposure.

Class 2 laser scanners use a low power, visible light diode. As with any very bright light source, such as the sun, the user should avoid staring directly into the light beam. Momentary exposure to a Class 2 laser is not known to be harmful.”

A copy of the product’s laser safety label, such as the one below, should appear in the product documentation, depending on the end product. Refer to the current applicable laser safety standards for the end product or specific requirements.

Figure 8-2  Example of Class 2 Laser Warning Label
# Chapter 9 Troubleshooting

## Introduction

*Table 9-1 on page 9-1* provides troubleshooting information.

**NOTE** If after performing the Troubleshooting checks the symbol still does not scan, contact your distributor or see Service Information on page viii for more information.

## Troubleshooting

### Table 9-1  Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing happens when you attempt to scan.</td>
<td>No power to the scanner.</td>
<td>Check the system power. Confirm that the correct host interface cable is used.</td>
</tr>
<tr>
<td>Scanner cannot read the bar code</td>
<td>Interface/power cables are loose.</td>
<td>Check for loose cable connections.</td>
</tr>
<tr>
<td></td>
<td>Scanner is not programmed for the correct bar code type.</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Incorrect communication parameters.</td>
<td>Check that the communication parameters (baud rate, parity, stop bits, etc.) are set properly.</td>
</tr>
<tr>
<td></td>
<td>Bar code symbol is unreadable.</td>
<td>Check the symbol to make sure it is not defaced. Try scanning similar symbols of the same code type.</td>
</tr>
</tbody>
</table>
Glossary

A

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 is decoded.

B

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

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

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

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

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

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

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

Bluetooth. A technology that provides a way to connect and exchange information between devices such as scanners, mobile phones, laptops, PCs, and printers over a secure, globally unlicensed short-range radio frequency.
Boot or Boot-up. The process a computer goes through when it starts. During boot-up, the computer can run self-diagnostic tests and configure hardware and software.

bps. See Bits Per Second.

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

C

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

CDRH Class 1. This is the lowest power CDRH laser classification. This class is considered intrinsically safe, even if all laser output were directed into the eye's pupil. There are no special operating procedures for this class.

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

Character. A pattern of bars and spaces which either directly represents data or indicates a control function, such as a number, letter, punctuation mark, or communications control contained in a message.

Character Set. Those characters available for encoding in a particular bar code symbology.

Check Digit. A digit used to verify a correct symbol decode. The scanner inserts the decoded data into an arithmetic formula and checks that the resulting number matches the encoded check digit. Check digits are required for UPC but are optional for other symbologies. Using check digits decreases the chance of substitution errors when a symbol is decoded.

Codabar. A discrete self-checking code with a character set consisting of digits 0 to 9 and six additional characters: ( - $ : / , +).

Code 128. A high density symbology which allows the controller to encode all 128 ASCII characters without adding extra symbol elements.

Code 3 of 9 (Code 39). A versatile and widely used alphanumeric bar code symbology with a set of 43 character types, including all uppercase letters, numerals from 0 to 9 and 7 special characters (- . / + % $ and space). The code name is derived from the fact that 3 of 9 elements representing a character are wide, while the remaining 6 are narrow.

Code 93. An industrial symbology compatible with Code 39 but offering a full character ASCII set and a higher coding density than Code 39.

Code Length. Number of data characters in a bar code between the start and stop characters, not including those characters.

Cold Boot. A cold boot restarts a computer and closes all running programs.

COM Port. Communication port; ports are identified by number, e.g., COM1, COM2.
**Continuous Code.** A bar code or symbol in which all spaces within the symbol are parts of characters. There are no intercharacter gaps in a continuous code. The absence of gaps allows for greater information density.

**Cradle.** A cradle is used for charging the terminal battery and for communicating with a host computer, and provides a storage place for the terminal when not in use.

---

**D**

**Dead Zone.** An area within a scanner's field of view, in which specular reflection may prevent a successful decode.

**Decode.** To recognize a bar code symbology (e.g., UPC/EAN) and then analyze the content of the specific bar code scanned.

**Decode Algorithm.** A decoding scheme that converts pulse widths into data representation of the letters or numbers encoded within a bar code symbol.

**Decryption.** Decryption is the decoding and unscrambling of received encrypted data. Also see, Encryption and Key.

**Depth of Field.** The range between minimum and maximum distances at which a scanner can read a symbol with a certain minimum element width.

**Discrete Code.** A bar code or symbol in which the spaces between characters (intercharacter gaps) are not part of the 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.

---

**E**

**EAN.** European Article Number. This European/International version of the UPC provides its own coding format and symbology standards. Element dimensions are specified metrically. EAN is used primarily in retail.

**Element.** Generic term for a bar or space.

**Encoded Area.** Total linear dimension occupied by all characters of a code pattern, including start/stop characters and data.

**ENQ (RS-232).** ENQ software handshaking is also supported for the data sent to the host.

**ESD.** Electro-Static Discharge

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**H**

**HID.** Human Interface Device. A Bluetooth host type.

**Host Computer.** A computer that serves other terminals in a network, providing such services as computation, database access, supervisory programs and network control.
Hz. Hertz; A unit of frequency equal to one cycle per second.

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 2 of 5. A binary bar code symbology representing character pairs in groups of five bars and five interleaved spaces. Interleaving provides for greater information density. The location of wide elements (bar/spaces) within each group determines which characters are encoded. This continuous code type uses no intercharacter spaces. Only numeric (0 to 9) and START/STOP characters may be encoded.

Interleaved Bar Code. A bar code in which characters are paired together, using bars to represent the first character and the intervening spaces to represent the second.

Input/Output Ports. I/O ports are primarily dedicated to passing information into or out of the terminal’s memory. Series 9000 mobile computers include Serial and USB ports.

I/O Ports. interface The connection between two devices, defined by common physical characteristics, signal characteristics, and signal meanings. Types of interfaces include RS-232 and PCMCIA.

Key. A key is the specific code used by the algorithm to encrypt or decrypt the data. Also see, Encryption and Decrypting.

LASER. Light Amplification by Stimulated Emission of Radiation. The laser is an intense light source. Light from a laser is all the same frequency, unlike the output of an incandescent bulb. Laser light is typically coherent and has a high energy density.

Laser Diode. A gallium-arsenide semiconductor type of laser connected to a power source to generate a laser beam. This laser type is a compact source of coherent light.

Laser Scanner. A type of bar code reader that uses a beam of laser 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.
Light Emitting Diode. See LED.

M

**MIL.** 1 mil = 1 thousandth of an inch.

**MIN.** Mobile Identification Number. The unique account number associated with a cellular device. It is broadcast by the cellular device when accessing the cellular system.

**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.

**MRD.** Minimum reflective difference. A measurement of print contrast.

N

**Nominal.** The exact (or ideal) intended value for a specified parameter. Tolerances are specified as positive and negative deviations from this value.

**Nominal Size.** Standard size for a bar code symbol. Most UPC/EAN codes are used over a range of magnifications (e.g., from 0.80 to 2.00 of nominal).

O

**ODI.** See Open Data-Link Interface.

**Open Data-Link Interface (ODI).** Novell’s driver specification for an interface between network hardware and higher-level protocols. It supports multiple protocols on a single NIC (Network Interface Controller). It is capable of understanding and translating any network information or request sent by any other ODI-compatible protocol into something a NetWare client can understand and process.

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

P

**PAN.** Personal area network. Using Bluetooth wireless technology, PANs enable devices to communicate wirelessly. Generally, a wireless PAN consists of a dynamic group of less than 255 devices that communicate within about a 33-foot range. Only devices within this limited area typically participate in the network.

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

**Percent Decode.** The average probability that a single scan of a bar code would result in a successful decode. In a well-designed bar code scanning system, that probability should approach near 100%.
Print Contrast Signal (PCS). Measurement of the contrast (brightness difference) between the bars and spaces of a symbol. A minimum PCS value is needed for a bar code symbol to be scannable. PCS = (RL - RD) / RL, where RL is the reflectance factor of the background and RD the reflectance factor of the dark bars.

Programming Mode. The state in which a scanner is configured for parameter values. See Scanning Mode.

Q

Quiet Zone. A clear space, containing no dark marks, which precedes the start character of a bar code symbol and follows the stop character.

QWERTY. A standard keyboard commonly used on North American and some European PC keyboards. “QWERTY” refers to the arrangement of keys on the left side of the third row of keys.

R

Reflectance. Amount of light returned from an illuminated surface.

Resolution. The narrowest element dimension which is distinguished by a particular reading device or printed with a particular device or method.

RF. Radio Frequency.

RS-232. An Electronic Industries Association (EIA) standard that defines the connector, connector pins, and signals used to transfer data serially from one device to another.

S

Scan Area. Area intended to contain a symbol.

Scanner. An electronic device used to scan bar code symbols and produce a digitized pattern that corresponds to the bars and spaces of the symbol. Its three main components are: 1) Light source (laser or photoelectric cell) - illuminates a bar code.; 2) Photodetector - registers the difference in reflected light (more light reflected from spaces); 3) Signal conditioning circuit - transforms optical detector output into a digitized bar pattern.

Scanning Mode. The scanner is energized, programmed and ready to read a bar code.

Scanning Sequence. A method of programming or configuring parameters for a bar code reading system by scanning bar code menus.

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

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

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

**Start/Stop Character.** A pattern of bars and spaces that provides the scanner with start and stop reading instructions and scanning direction. The start and stop characters are normally to the left and right margins of a horizontal code.

**Substrate.** A foundation material on which a substance or image is placed.

**Symbol.** A scannable unit that encodes data within the conventions of a certain symbology, usually including start/stop characters, quiet zones, data characters and check characters.

**Symbol Aspect Ratio.** The ratio of symbol height to symbol width.

**Symbol Height.** The distance between the outside edges of the quiet zones of the first row and the last row.

**Symbol Length.** Length of symbol measured from the beginning of the quiet zone (margin) adjacent to the start character to the end of the quiet zone (margin) adjacent to a stop character.

**Symbology.** The structural rules and conventions for representing data within a particular bar code type (e.g. UPC/EAN, Code 39, PDF417, etc.).

---

**T**

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

---

**U**

**UPC.** Universal Product Code. A relatively complex numeric symbology. Each character consists of two bars and two spaces, each of which is any of four widths. The standard symbology for retail food packages in the United States.

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**V**

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