

CLASS 1 VS. CLASS 2 BAR CODE LASER SCANNERS

A technology brief on bar code laser scanners

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Introduction

Socket now offers the popular In-Hand Scan Card (ISC) with either a Class 1 or Class 2 laser. This document describes the differences between the two devices and the appropriate applications for each.

The primary difference is the power output of the laser. The Class 1 laser has a nominal power output of 0.5 milliwatts, while the output of the Class 2 laser is 1.2 milliwatts. This difference impacts the scanning performance of the device in three ways:



*Socket In-Hand
Scan Card*

1. Distance — For scanning distances of up to 10 inches, there is very little difference in the ability of either the Class 1 or the Class 2 laser to scan a given bar code. Beyond 10 inches, the Class 2 laser will scan a standard, high quality bar code about 20% - 25% farther than the Class 1 laser.

Scanning a standard bar code of any size at a distance greater than 25 inches becomes difficult with the Class 1 laser, while the Class 2 laser will easily scan very large bar codes at 60 inches and beyond. There are a many variables involved in determining the distance at which a bar code can be scanned, including:

- a. The size of the bar code — The width of the narrowest bar in thousandths of an inch (or 'mils') is referred to as the "X dimension" or "size" of a bar code. Standard retail UPC or EAN bar codes are 10 mils (0.010 inches). Larger bar codes, such as warehouse location bar codes, can be 200 mils or larger. The larger a bar code, the greater the distance from which it can be scanned.

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Please refer to the *Decode Zone* charts in Appendix A for more detailed information on the relationship between the size of a bar code and the distance at which it can be scanned.

- b. The label media — The media is the material a bar code is printed on. This is usually some type of paper but can also be a plastic or even metallic material. Because the reading mechanism in a bar code scanner is based on contrast, the whiter and more reflecting a media is, the farther away it can be scanned. Retro-reflective media (like a stop sign) is used for scanning very large bar code labels at distances of 20 feet and more.
 - c. The bar code symbology — There are many different bar code symbologies (or ‘languages’), such as UPC, EAN, Code 39, Code 128, Code 93 and more. Some symbologies are easier to decode than others and can, therefore, be scanned at greater distances.
2. Packaging or covering materials — The Class 2 laser can more effectively scan through difficult packaging materials such as Mylar (used for electronic components) or thick plastic or glass such as automobile windshields.
 3. Ambient light — The Class 2 laser can more effectively scan in high ambient light conditions such as high intensity lighting or even daylight (indirect sunlight). Scanning bar codes in direct sunlight is extremely difficult because sunlight contains enough energy in the red spectrum used by the laser to ‘blind’ the scanner’s decode system.

The second difference between the Class 1 and Class 2 lasers in the Socket In-Hand Scan Card is the wavelength frequency of the laser beam. The Class 1 laser has a 670 nanometer (nm) beam common in most laser bar code scanners, while the Class 2 features a 650nm beam. There is no difference in the scanning capability of the two frequencies, but the 650nm beam is more visible to the human eye, making it appear brighter than the Class 1 laser.

The user must see the oscillating laser beam in order to aim it effectively at the bar code to be scanned. The Class 2, 650nm laser is easier to see and aim than the Class 1 laser, especially when scanning at greater distances, through difficult materials or in high ambient light.

A third difference between the Class 1 and Class 2 lasers is the current demand during scanning. At 3.3 Volt power (standard for CompactFlash card slots) the Class 1 laser draws about 67 milliamps (mA) and the Class 2 laser draws about 75mA. Both lasers draw about 3 - 4mA when idle. Therefore, for a given level of scanning activity, using the Class 1 laser should result in a slightly longer battery life.

A final consideration in the selection of either a Class 1 or Class 2 laser is safety. Staring directly into any laser beam for an extended period of time will cause damage to the eyes of humans and animals. The normal use of a bar code scanner is inherently very safe because (a) the laser is typically aimed away from the person using the scanner, and (b) the beam oscillates 39 times per second over a 53 degree arc, making it impossible to stare into the beam. Additionally, using the lower powered Class 1 laser makes it even less likely that eye damage will occur. There are certain organizations in Europe, in fact, that require a Class 1 laser in bar code scanners to meet more stringent safety standards. The Socket In-Hand Scan Card with Class 1 laser meets these European safety standards. Please refer to Appendix B for more detailed safety information.

Conclusion

The Class 1 laser is suitable for most applications with expected scanning distances of less than 20 inches and normal ambient light conditions. The Class 1 laser may be required by certain European organizations to meet more stringent safety standards.

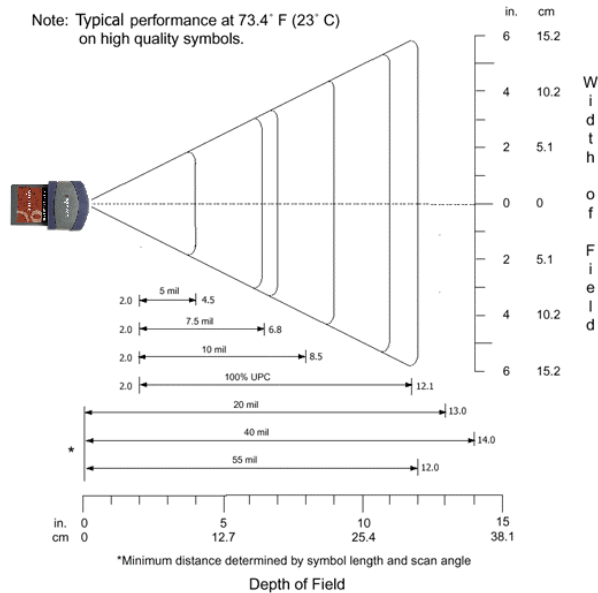
When an application is likely to require more demanding scanning capabilities, the Class 2 laser provides the assurance of maximum scanning performance.

Note: People who use portable computers to gather and manage data at the point of activity are typically very quick to learn how to use a laser bar code scanner and realize the resulting gains in productivity. They are easily discouraged, however, if time and effort are required to obtain a successful scan – thus the decline in popularity of the much less expensive bar code contact wands seen at most retail checkout counters during the 1980's. The higher cost of the Class 2 version of the In-Hand Scan Card is easily justified if the application requires higher scanning performance.

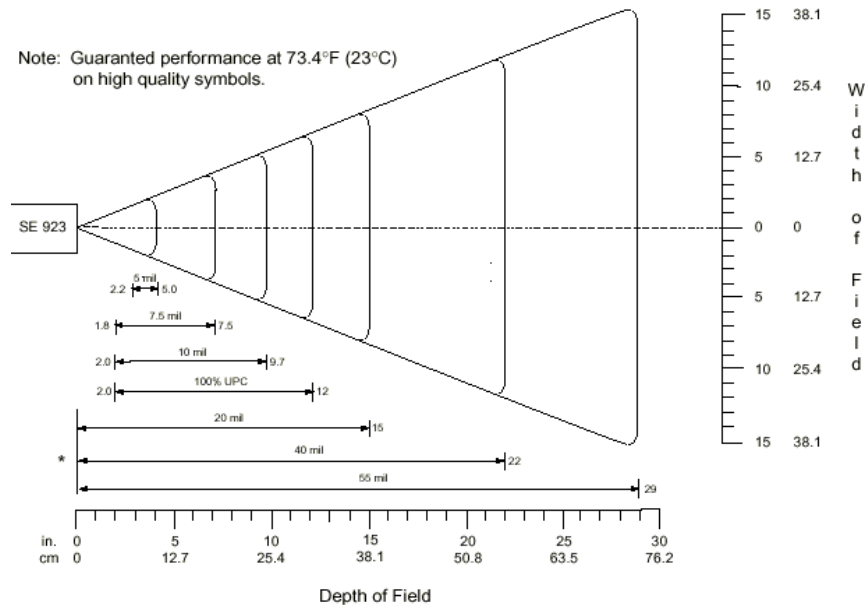
APPENDIX A Decode Zone Charts

The decode zones for the Class 1 and Class 2 lasers in the In-Hand Scan Card are shown below. The minimum element width (“X Dimension” or bar code “size”) is the width in thousandths of an inch (mils) of the narrowest element (bar or space) in the symbol. The figures shown are the typical scanning distances for selected bar code sizes. The maximum usable length of a bar code symbol (Width of Field) at any given range is also shown below.

Class 1 Laser Decode Zone



Class 2 Laser Decode Zone



Source: Symbol Technologies, Inc.

APPENDIX B
Symbol Technologies Laser Safety Statements

LASER DEVICES: Symbol products using lasers comply with US 21CFR1040.10, Subchapter J and IEC825/EN 60 825 (or IEC825-1/EN 60 825-1, depending on date of manufacture). The laser classification is marked on one of the labels on the product.

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.

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.