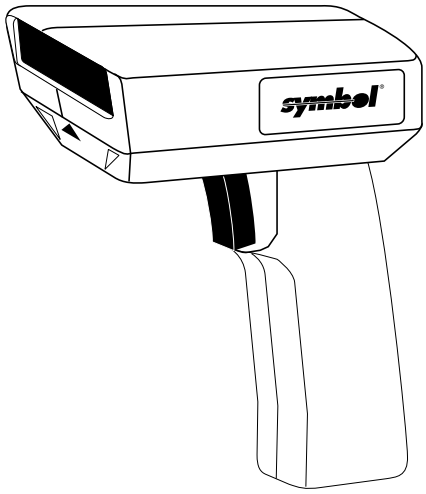
# *Chapter 1 User's Guide*

## Scanning Made Easy

The LS 2010MX is Symbol's new retail-specific hand-held scanner. Because this scanner emulates a wand, you can upgrade an existing wand-based system by simply replacing the wand with an LS 2010MX.

The LS 2010MX hand-held scanner is based on Symbol's unique "MX" advanced mylar™ technology scan engine. This state-of-the-art technology gives the scanner a wide decode zone, greater depth of field, and excellent reliability. This scanner reads color bar codes and symbols printed on all substrates.




The LS 2010MX scanner weighs 7.5 oz. (213 gm) without the cable and is made from a durable plastic. The ergonomic design ensures comfortable use over extended time periods.

# Set Up

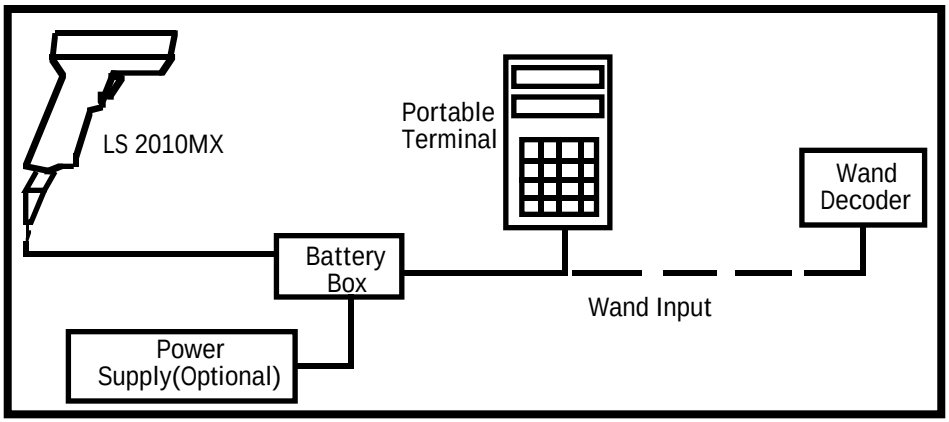
## Unpacking

Remove the LS 2010MX 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 1-11.

**KEEP THE PACKING**. It is the approved shipping container and should be used if you ever need to return your equipment for servicing.

## Connecting Your LS 2010MX

LS 2010MX scanners can be battery operated, or you can use an external power supply.




Typical System Configuration

## Battery Operated

- Insert a 9-volt battery into the battery box. See the *Battery Units* section.
- Plug the scanner's 9-pin connector at the end of the coil cord into one end of the battery box.
- An output cable from the battery box connects the LS 2010MX to the host device. Connect one end of this cable to the battery box and the other to the appropriate port on the host device.

## External Power Supply

- Plug the 9-pin connector at the end of the scanner's coil cord into one end of the battery box.
- Use the appropriate output cable from the battery box to connect the LS 2010MX to the host device.
- Connect one end of this cable to the battery box and the other to the appropriate port on the host device.
- Plug the power supply connector into the receptacle on the side of the battery box. Connect the power supply plug into an AC outlet.

**Note:** Not all applications require a power supply or battery box. The model number of the output cable will depend on the wand being replaced.

# Ready, Test, Scan

## 1. Ready

Make sure connections are secure.

## 2. Test

Aim the scanner away from you and press the trigger. When you press the trigger, the scanning beam is energized. The duration of on time is programmable.

## 3. Scan

Make sure the symbol you want to scan is within the scanning range. See the *LS 2010MX Decode Zone* diagram on page 1-7.

Aim and press the trigger.

- The scan beam and red SCAN LED will light until the programmed on time limit is reached, or until a successful decode.

The scanner has read the symbol when:

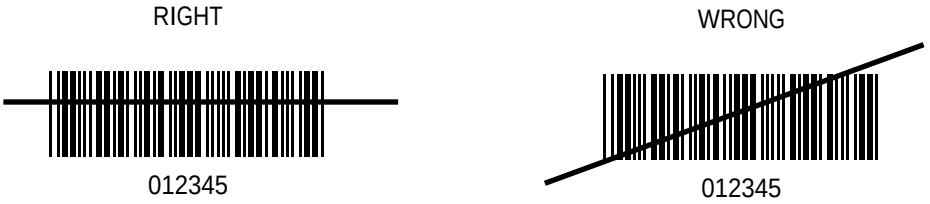
- You hear a short, high tone beep (if the beeper is enabled).
- The green DECODE LED lights.

The DECODE LED stays lit until the next trigger pull.

# Aiming

## Scan the Entire Symbol

- Your scan beam must cross every bar and space on the symbol.
- The larger the symbol, the farther away you should hold the scanner.
- Hold the scanner closer for symbols with bars that are close together.
- A short, high tone beep indicates a good decode.




## Hold at an Angle

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

# Problems

See *What If...* on page 1-6.

# Beeper Definitions

The beeper in the unit provides a variety of messages. See *Beeper Definitions* on page 2-9 for specifics.

# Programming the System

An LS 2010MX scanner is programmed by scanning sequences of bar codes. Refer to the *Programmer's Guide* for a discussion of available parameters and all the necessary bar codes.

# What If...

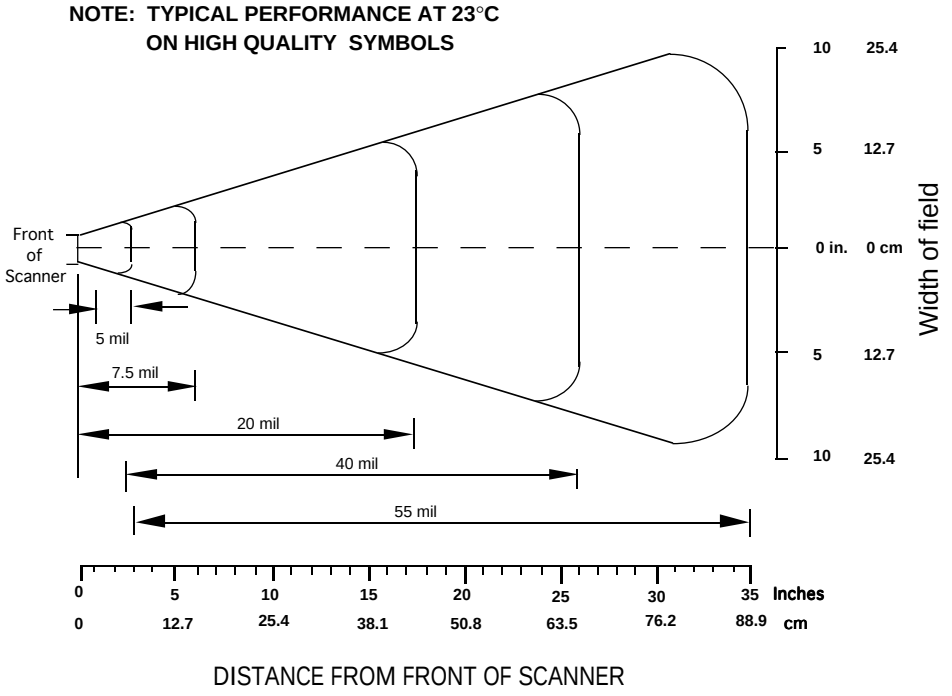
## Nothing happens when you follow the operating instructions.

### You Should

- Check the system power; is there a battery in the battery box?
- Check for loose cable connections.
- Make sure the scanner is programmed to read the type of bar code you are scanning.
- Check the symbol to make sure it is not defaced.
- Try scanning test symbols of the same code type.

**Note:** If after performing these checks the symbol still does not scan, contact your distributor or call the *Symbol Support Center*. See page 1-11 for the telephone number.

# LS 2010MX Decode Zone



# Battery Units

You can use either an alkaline battery, or a nickel-cadmium rechargeable battery, with an LS 2010MX scanner. Low battery power is signaled by four short, high tone beeps, coupled with scanning interruptions. If this occurs, change or recharge the battery as soon as possible.

## Changing the Battery

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

## Recharging a Nickel-Cadmium Battery

- Remove the battery from the battery box and place it in the recharging unit.
- To recharge the battery, follow the instructions supplied with the recharging unit.

# Maintenance

Cleaning the exit window is the only maintenance required. A dirty window may affect scanning accuracy.

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

# Factory Service

If you have a problem, contact the *Symbol Support Center* at the telephone number on page 1-11.

Before calling, have the model 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, Support will request samples of your bar codes for analysis at our plant.

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

**Note:** Symbol Technologies is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty. If the original shipping container was not kept, contact Symbol to have another sent to you.

# Symbol Support Center

In the U.S.A., for service information, warranty information or technical assistance call:

**SYMBOL SUPPORT CENTER**

**1-800-653-5350**

If you purchased your Symbol product from a Symbol Business Partner, contact that Business Partner for service.

## Canada

Mississauga, Ontario
Canadian Headquarters
(905) 629-7226

## Europe

Wokingham, England
European Headquarters
01734-771-222 (Inside UK)
+44-1734-771222 (Outside UK)

## Asia

Singapore
Symbol Technologies Asia, Inc.
337-6588 (Inside Singapore)
+65 337-6588 (Outside Singapore)

# Accessories

## Required Accessories

LS 2010MX scanners are sent as a package with required accessories, listed in the *Product Ordering Guide*. Optional accessories are available at extra cost.

## Optional Accessories

Optional accessories, listed in the *Product Ordering 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.

# Technical Specifications

| Item | Description |
|---|---|
| **Power Requirements** | 4.75 (min) to 14 VDC (max); 175 mA @ 5 VDC Typical. |
| **Decode Capability** | An LS 2010MX can be programmed to decode one or any combination of the following code types: UPC / EAN, Code 39, Codabar, Interleaved 2 of 5, Code 128, Discrete 2 of 5, and Code 93. Set code length(s) for any 2 of 5 code type. |
| **Beeper Operation** | User-selectable: Enable, Disable. |
| **Code 39 Conversion** | Selectable (via bar code menus) to convert data output to Code 39 format regardless of decoded symbol's actual code type. Any coded character not in the Code 39 character set is replaced by a Code 39 blank. |
| **Scan Repetition Rate** | 36 (± 3) scans / sec. (bidirectional) |
| **Decode Depth of Field** | Maximum typical working distance is 25 in. (63.5 cm); minimum element width resolution is 5 mils. |
| **Skew Tolerance** | ± 65˚ from normal |
| **Pitch Angle** | ± 55˚ L / R of normal |
| **Ambient Light Immunity** | 8000 ft. candles |
| **Durability** | 4 ft. drop to concrete |

| Item | Description | |
|---|---|---|
| **Print Contrast Minimum** | 25% absolute dark/light reflectance differential, measured at 675 nm. | |
| **Operating Temperature** | 32˚ to 104˚ F | 0˚ to 40˚ C |
| **Storage Temperature** | -40˚ to 140˚ F | -40˚ to 60˚ C |
| **Coil Cable Length** | 8 ft.<br>Data output cable varies according to interface type | 244 cm |
| **Weight** | 7.5 oz. | 213 gm (without cable) |
| **Height** | 5.8 in. | 14.7 cm |
| **Length** | 4.9 in. | 12.4 cm |
| **Width** | 2.6 in. | 6.5 cm |

# Wand Emulator Pin-outs

| Pin | Signal Name | Function |
|---|---|---|
| **2** | **Digital Bar Pattern** | This is an open collector signal capable of sinking 25 mA. An external pullup resistor connected to any voltage up to 20 V may be used. This 0 to 5 V signal output from the scanner provides a series of pulses with widths proportional to widths of scanned bar code elements. See signal description below. |
| **5** | **Analog Bar Pattern** | This output from the scanner provides a series of pulses with widths proportional to widths of scanned bar code elements. At a 5 kilohm minimum input impedance in the user's decoder the output will be 0 to 0.5 V nominal. See signal description below. |
| **7** | **Ground** | Current return for +9 V power supply and circuit ground reference. |
| **9** | **V+** | This pin is connected to the power supply. |

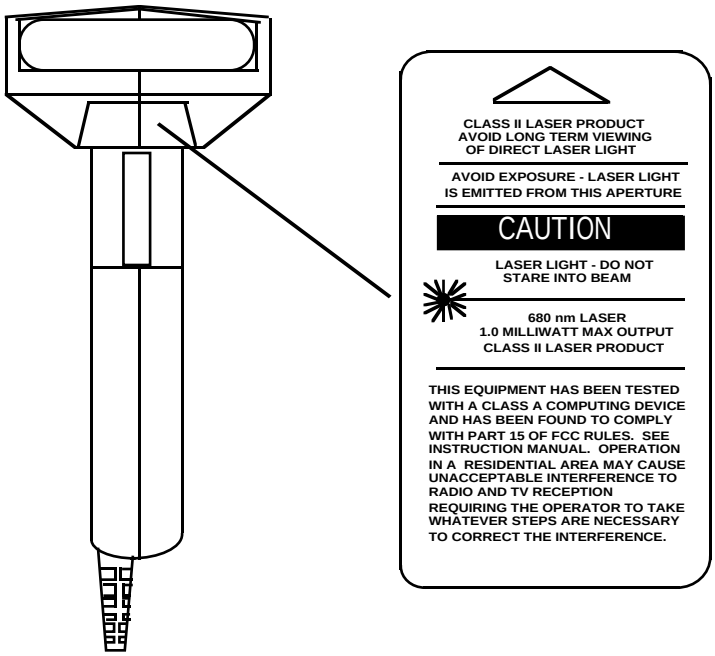
## Typical Signal Characteristics for Code 39 Output

| | | |
|---|---|---|
| Leading Margin | = | 80 ms (programmable) |
| Trailing Margin | = | 52 ms |
| Narrow Element | = | 0.95 ms |
| Wide Element | = | 1.9 ms |
| Wide-to-Narrow Ratio | = | 2.0 to 1.0 |

**Note:** All measurements are approximate.

# Scanner Labeling

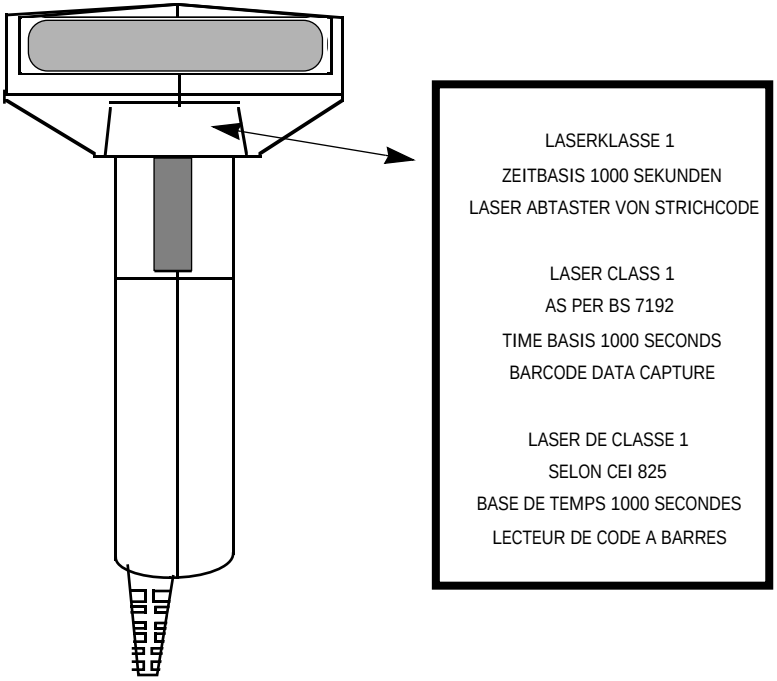
The LS 2010-IXXXAG scanner uses a low-power, visible laser diode. As with any very bright light source, such as the sun, the user should avoid staring directly into the light beam. Momentary exposure to a CDRH Class II laser is not known to be harmful. The following label is attached to the scanner.




## *Caution*

*Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous visible light exposure.*

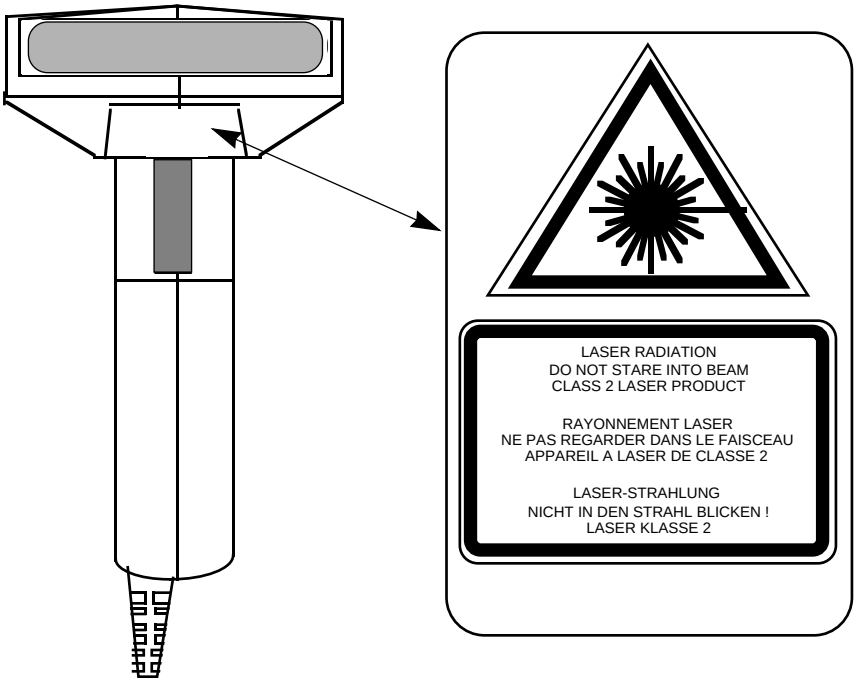
LS 2010-EXXXEG uses a low-power visible laser. The scanner is designed for laser safety according to IEC 825 Class 1. Class 1 laser products are inherently safe. Exposure to the laser beam will cause no harm to your eyes or skin. A safety label such as the following is attached to the scanner.




## *Caution*

*Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous visible light exposure.*

The LS 2010-I1XXXEG scanner uses a low-power, visible laser 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 an IEC Class 2, or BS4803 Class 1 laser is not known to be harmful. The following label is attached to the scanner.



# Glossary

**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.

**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 I** - 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 II** - No additional software mechanisms are needed to conform to this limit. Laser operation in this class poses no danger for unintentional direct human exposure.

**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.

**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.

**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.

**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.

**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.

**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 CLASS I (IEC 825 Class I) -** 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 represents 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 -** An acronym for 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.

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

**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.

**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.

**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.

**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.

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

**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.