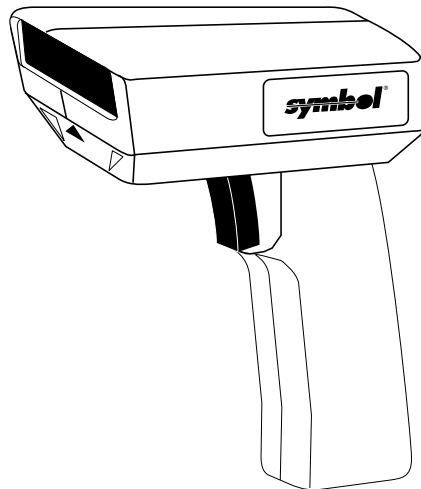


Chapter 1 User's Guide

Scanning Made Easy

The LS 2020MX hand-held scanner is based on Symbol's unique "MX" advanced mylar™ technology scan engine. This state-of-the-art technology gives the scanner excellent reliability and consistent outstanding scanning performance. This scanner reads most code symbologies, densities, and colors, produced by a wide range of printing techniques.

The battery-operated version of the LS 2020MX is ideal for portable data collection.



The LS 2020MX 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 2020MX 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 2020MX

External Power - Option 1

- Make sure that the host device is powered-down before you connect the scanner.
- Plug the connector at the end of the scanner's coil cord into the appropriate RS-232C receiving port on your host device.
- Plug the appropriate end of the power supply cable into the power supply port on the side of the host cable connector.
- Connect the power supply to an AC receptacle supplying voltage of the appropriate level.

External Power - Option 2

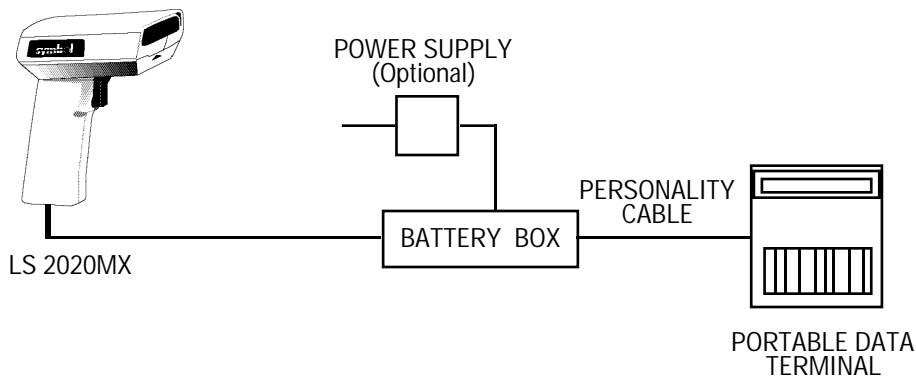
- Plug the 9-pin connector at the end of the scanner's coil cord into one end of the battery box.
- Use the personality cable to connect the LS 2020MX to the host device. Connect one end of this cable to the battery box and the other to the appropriate port on the host device.
- Plug the appropriate end of the power supply connector into the receptacle on the side of the battery box. Plug the other end of the connector into an AC outlet.

Programming the System

An LS 2020MX is programmed by scanning sequences of bar codes. Consult the LS 2020MX *Programmer's Guide*.

LS 2020MX Battery Operation

- Insert a 9-volt battery into the battery box. See the *Battery Units* section on page 1-8.
- Plug the connector at the end of the scanner's coil cord into one end of the battery box.
- Use a personality cable to connect the LS 2020MX 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 (either a stationary or portable terminal).



LS 2020MX Standard Configuration with battery pack

Note: The model number of the personality cable will depend on the host device. See *Accessories* on page 1-12.

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 2020MX Decode Zone* diagram on page 1-7.

Aim and press the trigger.

- The scan beam (and red LED at the back of the scanner) lights until the programmed on time limit is reached, or until a successful decode.

The scanner has read the symbol when:

- You hear a beep.
- The green DECODE LED lights.
- If you are using the scanner in default operating mode, LOW POWER, the DECODE LED remains on until power-down (a maximum of 1 second).

If the unit is programmed for CONTINUOUS mode, the DECODE LED stays green until the next trigger pull.

Aiming

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.

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.



Problems

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

What If...

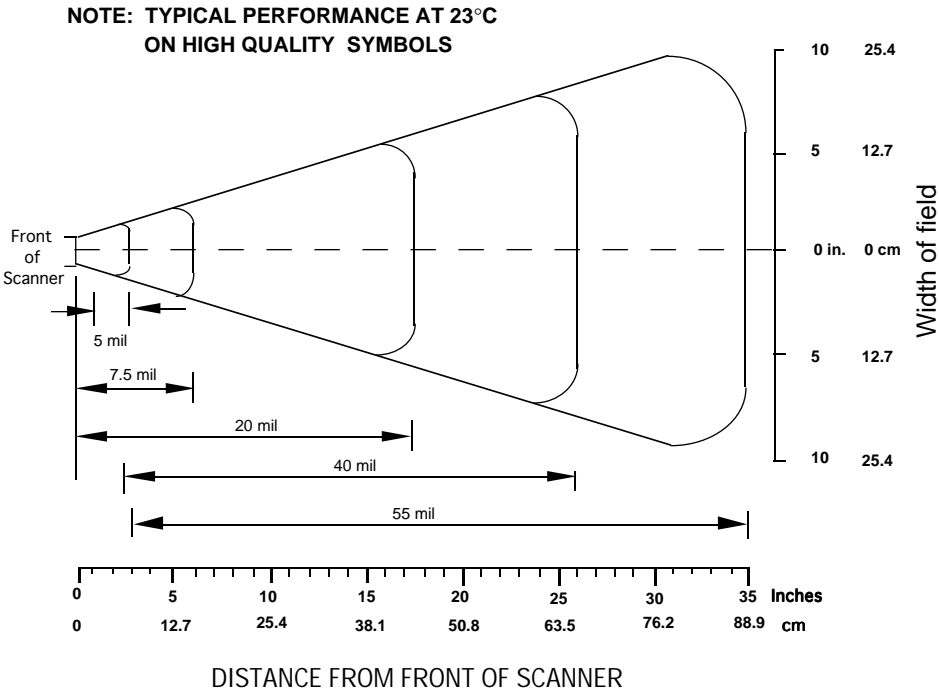
Nothing happens when you follow the operating instructions.

You Should

- Check the system power.
- Check for loose cable connections.
- Make sure the controller is programmed to read the type of bar code you want to scan.
- Check the symbol to make sure it is not defaced.
- Try scanning similar 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 2020MX Decode Zone



Battery Units

You can use either an alkaline battery, or a nickel-cadmium rechargeable battery, with an LS 2020MX 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.

Maintenance

Cleaning the exit window is the only maintenance required.

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

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 2020MX scanners are sent as a package with required accessories, listed in the *Product Ordering Guide*. Optional accessories are available at extra cost.

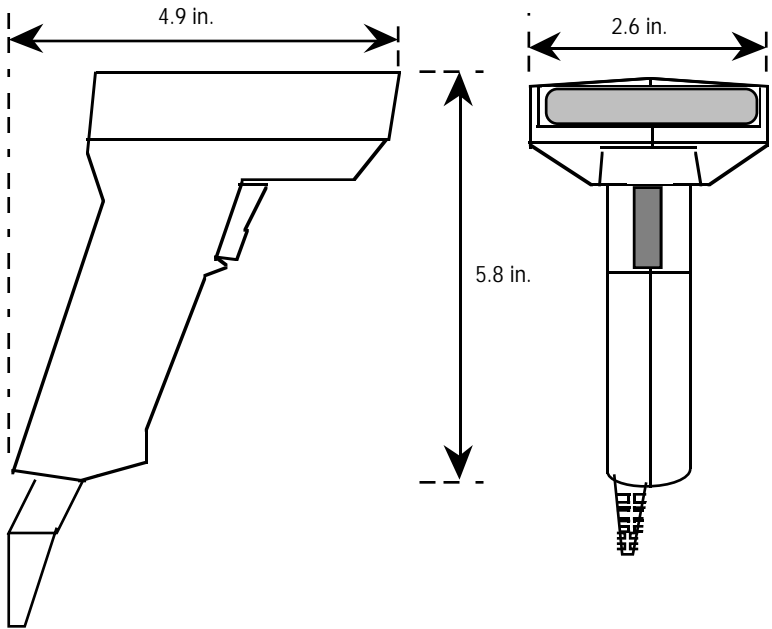
Optional Accessories

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); 180 mA @ 5 VDC Typical
Decode Capability	The LS 2020MX scanner can be programmed to decode the following code types: UPC/EAN, Code 39, Code 39 Full ASCII, 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. There is no autodiscrimination between Code 39 and Code 39 Full ASCII.
Beeper Operation	User-selectable: Enable, Disable.
Scan Repetition Rate	36 (\pm 3) scans/sec. (bidirectional)
Decode Depth of Field	Maximum typical working distance is 35 in. (88.9 cm); minimum element width resolution is 5.5 mils.
Skew Tolerance	\pm 65° from normal
Pitch Angle	\pm 55° L/R of normal
Print Contrast Minimum	25% absolute dark/light reflectance differential, measured at 675 nm.
Ambient Light Immunity	Immune to direct exposure from office-level lighting and direct exposure from sunlight.
Durability	3-ft. drop to concrete
Operating Temperature	32° to 104° F 0° to 40° C
Storage Temperature	-40° to 140° F -40° to 60° C

Item	Description	
Coil Cable Length	8 ft.	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



Interface Cable Pin-outs

25-Pin, Male, D-Type Connector

25-04552-01 for power supply version 20-03113-01 for battery pack version		
Pin	Signal Name	Function
2	RxD	Serial data receive input. It will be driven by the serial data transmit output on the device communicating with the scanner.
3	TxD	Serial data transmit output. It will drive the serial data receive input on the device communicating with the scanner.
4	CTS	Clear-to-send handshaking input line. It may be optionally used by another device to signal the scanner that it may commence transmitting data. It can be used only in conjunction with the RTS line
5	RTS	Request-to-send handshaking output line. It may be optionally used by the scanner to signal another device that data is available to send. It can only be utilized in conjunction with the CTS line.
6	DTR	Data Terminal Ready. This signal is hardwired active.
7	GROUND	Power supply input ground pin and reference for both output signals. It must be capable of sinking all return current.

Interface Cable Pin-outs

25-Pin, Male, D-Type Connector

25-04553-01 for power supply version 20-03114-01 for battery pack version		
Pin	Signal Name	Function
2	TxD	Serial data transmit output. It will drive the serial data receive input on the device communicating with the scanner.
3	RxD	Serial data receive input. It will be driven by the serial data transmit output on the device communicating with the scanner.
4	RTS	Request-to-send handshaking output line. It may be optionally used by the scanner to signal another device that data is available to send. It can only be utilized in conjunction with the CTS line.
5	CTS	Clear-to-send handshaking input line. It may be optionally used by another device to signal the scanner that it may commence transmitting data. It can be used only in conjunction with the RTS line.
7	GROUND	Power supply input ground pin and reference for both output signals. It must be capable of sinking all return current.
20	DTR	Data Terminal Ready. This signal is hardwired active.

Interface Cable Pin-outs

25-Pin, Female, D-Type Connector

25-04554-01 for power supply version 20-03115-01 for battery pack version		
Pin	Signal Name	Function
2	RxD	Serial data receive input. It will be driven by the serial data transmit output on the device communicating with the scanner.
3	TxD	Serial data transmit output. It will drive the serial data receive input on the device communicating with the scanner.
4	CTS	Clear-to-send handshaking input line. It may be optionally used by another device to signal the scanner that it may commence transmitting data. It can be used only in conjunction with the RTS line.
5	RTS	Request-to-send handshaking output line. It may be optionally used by the scanner to signal another device that data is available to send. It can only be utilized in conjunction with the CTS line.
6	DTR	Data Terminal Ready. This signal is hardwired active.
7	GROUND	Power supply input ground pin and reference for both output signals. It must be capable of sinking all return current.

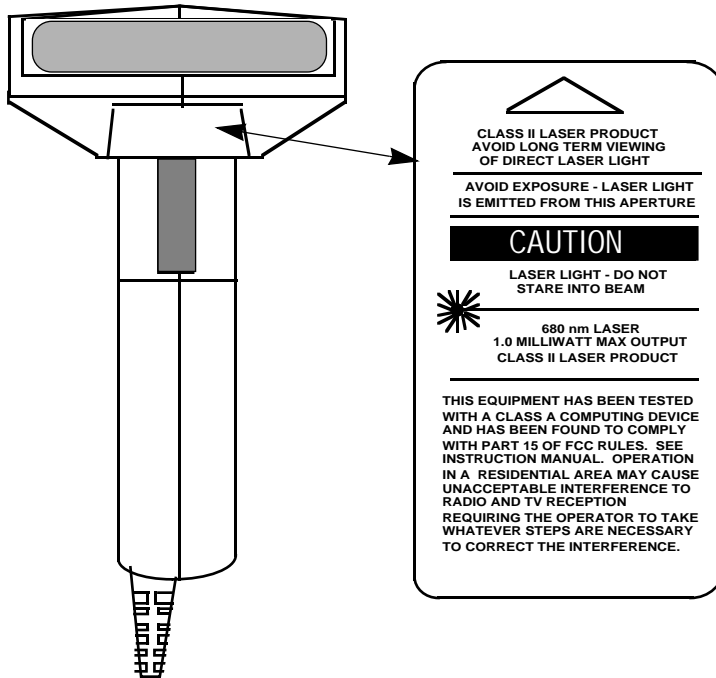
Interface Cable Pin-outs

25-Pin, Female, D-Type Connector

25-04555-01 for power supply version 20-03116-01 for battery pack version		
Pin	Signal Name	Function
2	TxD	Serial data transmit output. It will drive the serial data receive input on the device communicating with the scanner.
3	RxD	Serial data receive input. It will be driven by the serial data transmit output on the device communicating with the scanner.
4	RTS	Request-to-send handshaking output line. It may be optionally used by the scanner to signal another device that data is available to send. It can only be utilized in conjunction with the CTS line.
5	CTS	Clear-to-send handshaking input line. It may be optionally used by another device to signal the scanner that it may commence transmitting data. It can be used only in conjunction with the RTS line.
7	GROUND	Power supply input ground pin and reference for both output signals. It must be capable of sinking all return current.
20	DTR	Data Terminal Ready. This signal is hardwired active.

Scanner Labeling

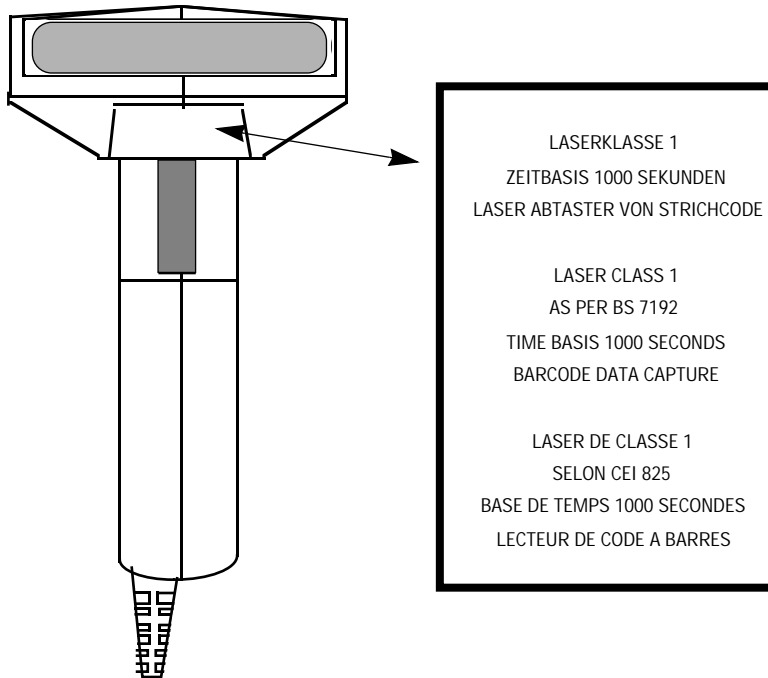
The LS 2020MX-IXXXAG scanner uses a low-power, visible laser diode. As with any very bright light source, such as the sun, the user should avoid staring directly into the light beam. Momentary exposure to a CDRH Class II laser is not known to be harmful. The following label is attached to the scanner.



Caution

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

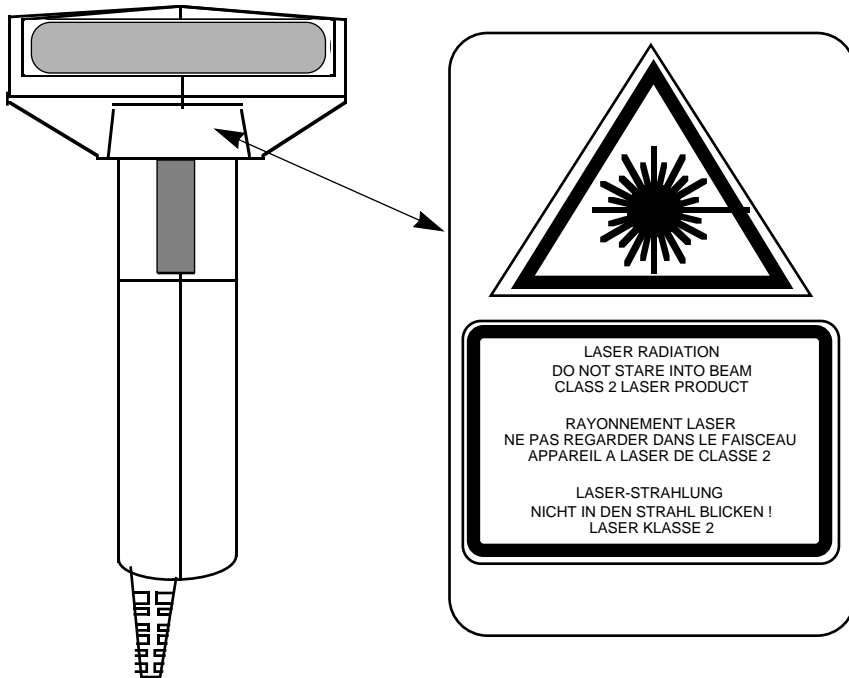
LS 2020MX-EXXXEG uses a low-power visible laser. The scanner is designed for laser safety according to IEC 825 Class 1. Class 1 laser products are inherently safe. Exposure to the laser beam will cause no harm to your eyes or skin. A safety label such as the following is attached to the scanner.



Caution

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

The LS 2020MX-IXXXEG 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 represent the first character and the intervening spaces to represent the second.

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

LASER - 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.