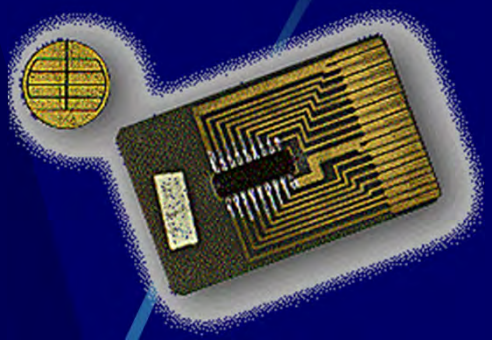
123456



Automatic Identification (ID)

by Richard B. Meyers

Automatic Identification (ID)

- Images
  - Bar Codes
  - Stacked Codes
  - Matrix Codes
- Printers
- Magnetics
- Biometrics
- Scanners
  - Wands
  - Imagers (CCD)
  - Lasers
- RFID Tags
- OCR (Optical Character Recognition)
- Memory Buttons

FOCUS

IMAGES

Bar Codes
- Linear
- Stacked

SCANNERS

Imagers
(CCD's)
Lasers

Bar Coding and Scanners

the Basics ....

Bar Coding

IS NOT: a System

Bar Coding

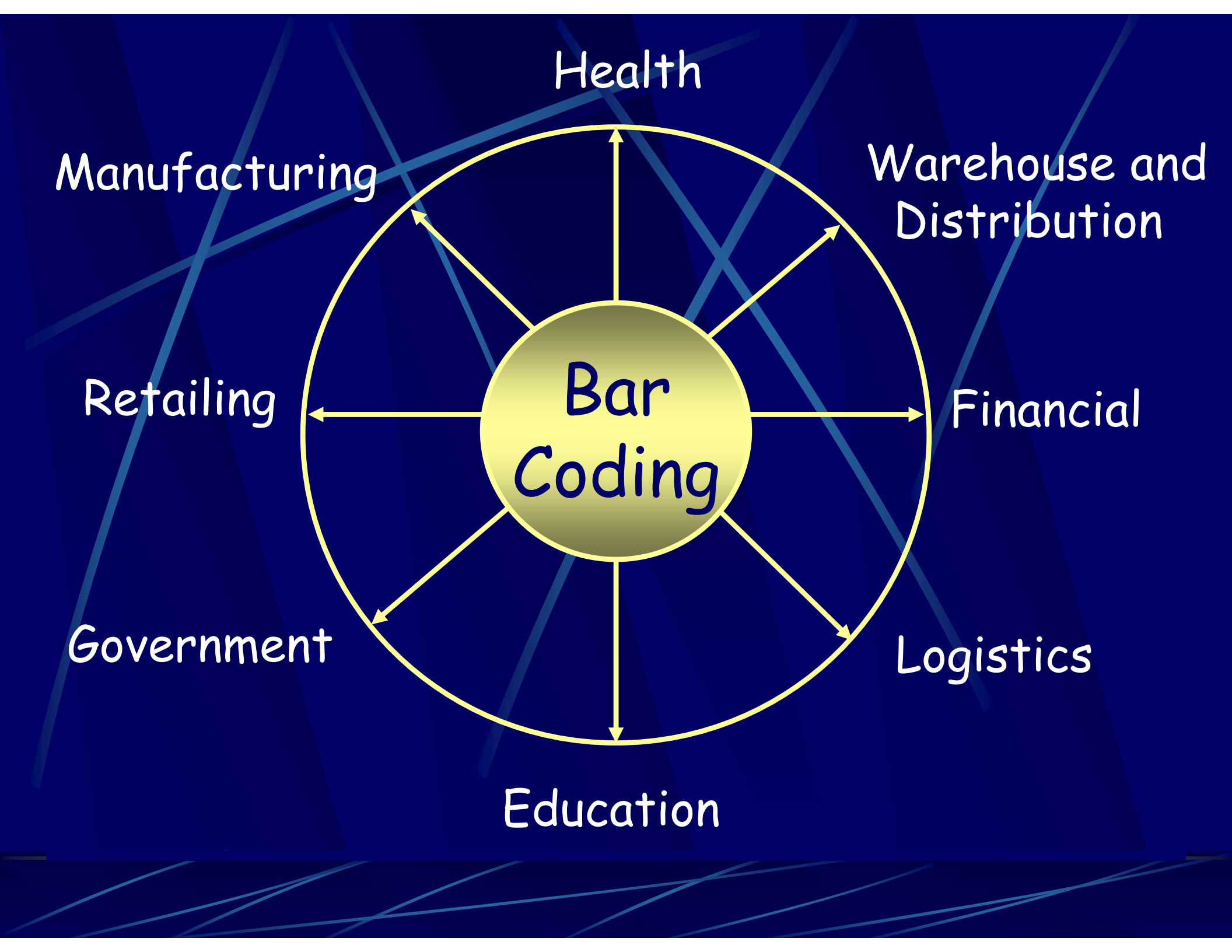
IS: a Modern Tool

It replaces antiquated data collection techniques like pencil and paper on an accurate and timely basis!

Bar Coding

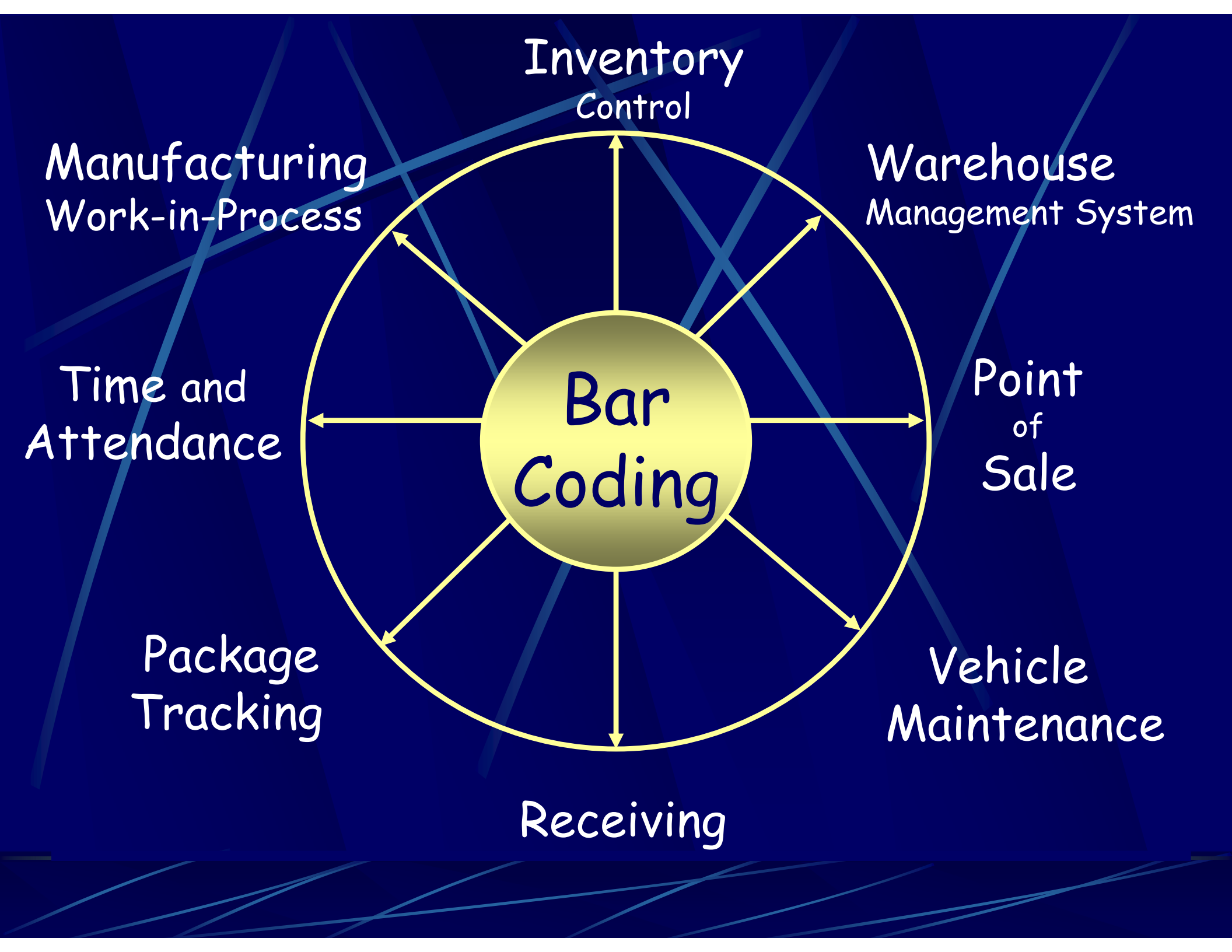
IS: a Language

It makes it efficient for humans and machines to easily communicate with computers!


Health
Manufacturing
Warehouse and Distribution
Retailing
Bar Coding
Financial
Government
Logistics
Education

Bar Coding

To Maximize the Benefits of Using Bar Coding, Scanning Devices are Most Generally Configured to Communicate with Host Computers


Inventory
Control
Manufacturing
Work-in-Process
Warehouse
Management System
Time and
Attendance
Bar
Coding
Point
of
Sale
Package
Tracking
Vehicle
Maintenance
Receiving

Point-of-Sale Operation

Scanner

POS Terminal

Host Computer

Point-of-Sale Operation

Scanner

1. **The Universal Product Code on a package is scanned.**

2. **Decoded data (Product ID) is sent to a POS terminal.**

Point-of-Sale Operation

POS Terminal

1. **Product ID is sent to host computer.**

Point-of-Sale Operation

Host Computer

1. **Product ID is "looked up" in memory.**
2. **Inventory quantity is decremented.**
3. **The price and description are sent back to the POS terminal.**

Point-of-Sale Operation

POS Terminal

1. **The Price and description of the scanned item is:**

- **indicated on the POS display.**
- **printed on the sales receipt.**

Warehouse Receiving Operation

Mobile Computer with Scanner at Receiving Dock

Host Computer

Warehouse Receiving Operation

Mobile Computer with Scanner at Receiving Dock

1. **Bar Code on a package is scanned.**

2. **Decoded data (Package ID) is sent to host computer.**

Warehouse Receiving Operation

Host Computer

1. **Package ID is "looked up" in memory.**
2. **Details of items received are added to inventory file.**
3. **Put away instructions are sent back to mobile computer.**

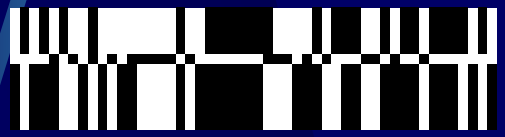
Warehouse Receiving Operation

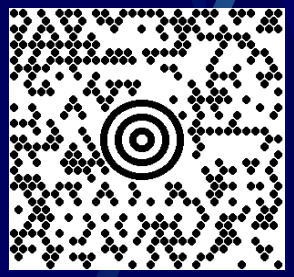
Mobile Computer with Scanner at Receiving Dock

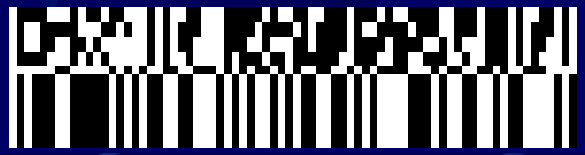
1. **Put away instructions are indicated on the display of the mobile computer.**

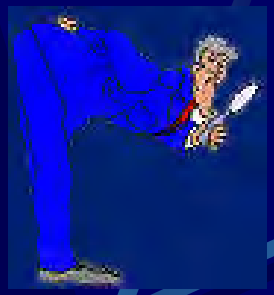
Images
(Symbologies or Languages)

More than 200 are Available!

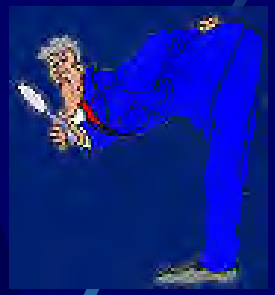








FOCUS



Bar Codes

- Linear
- Stacked

UNIVERSAL PRODUCT CODE

Linear
Numeric

..... A Retail Symbology

How Does the Universal Product Code Get on a Product?

It is printed on the box as part of the normal production process.

CODE 39

Linear
Alphanumeric

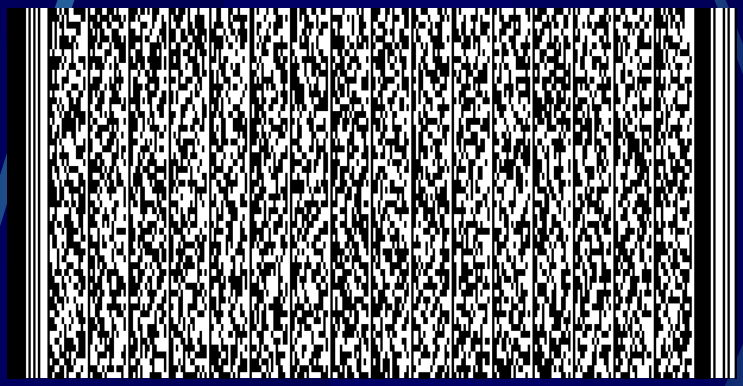
..... An Industrial Symbology

Universal Product Code and Code 39

Primarily Used for License Plate Applications

- Real Time Look Up at Host Computer
- Off Line Data Collection

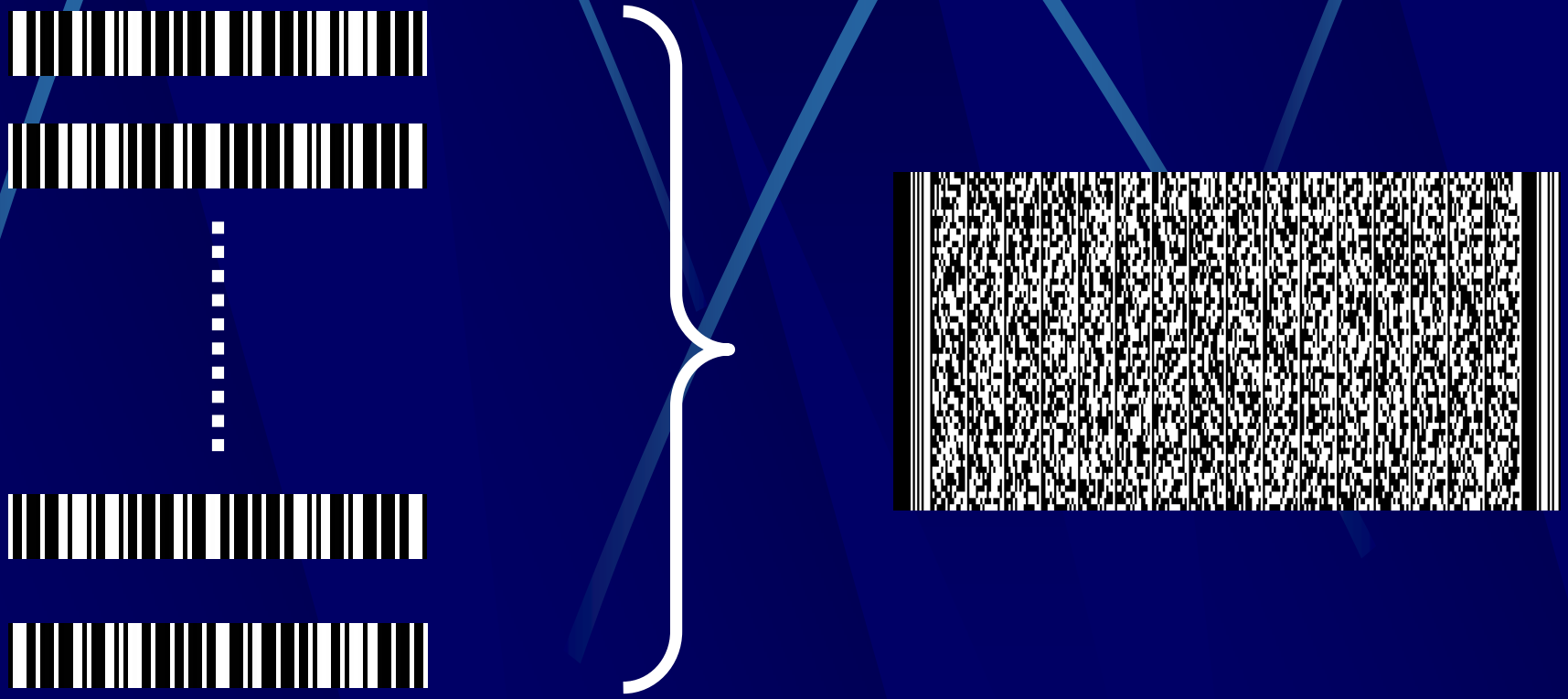
2-D (Stacked)



PDF 417

(Portable Data File)

PDF 417



2-D (Stacked) Application

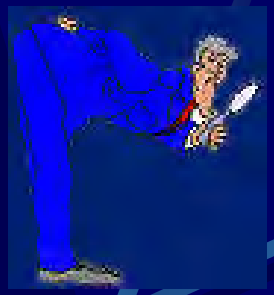
License Number	Sex
Issue Date	Height
Expire Date	Weight
Eye Color	Hair Color
Birthdate	Class

Portable Data File

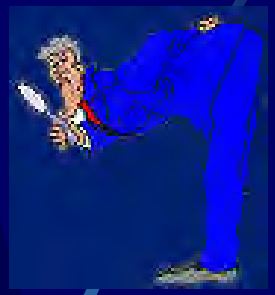
2-D (Stacked) PDF 417 Other Applications

- Control Machine Operations
- Patient Medical Records
- Shipping Manifests
- Production Records

How are Symbologies Scanned (or Read)?



FOCUS



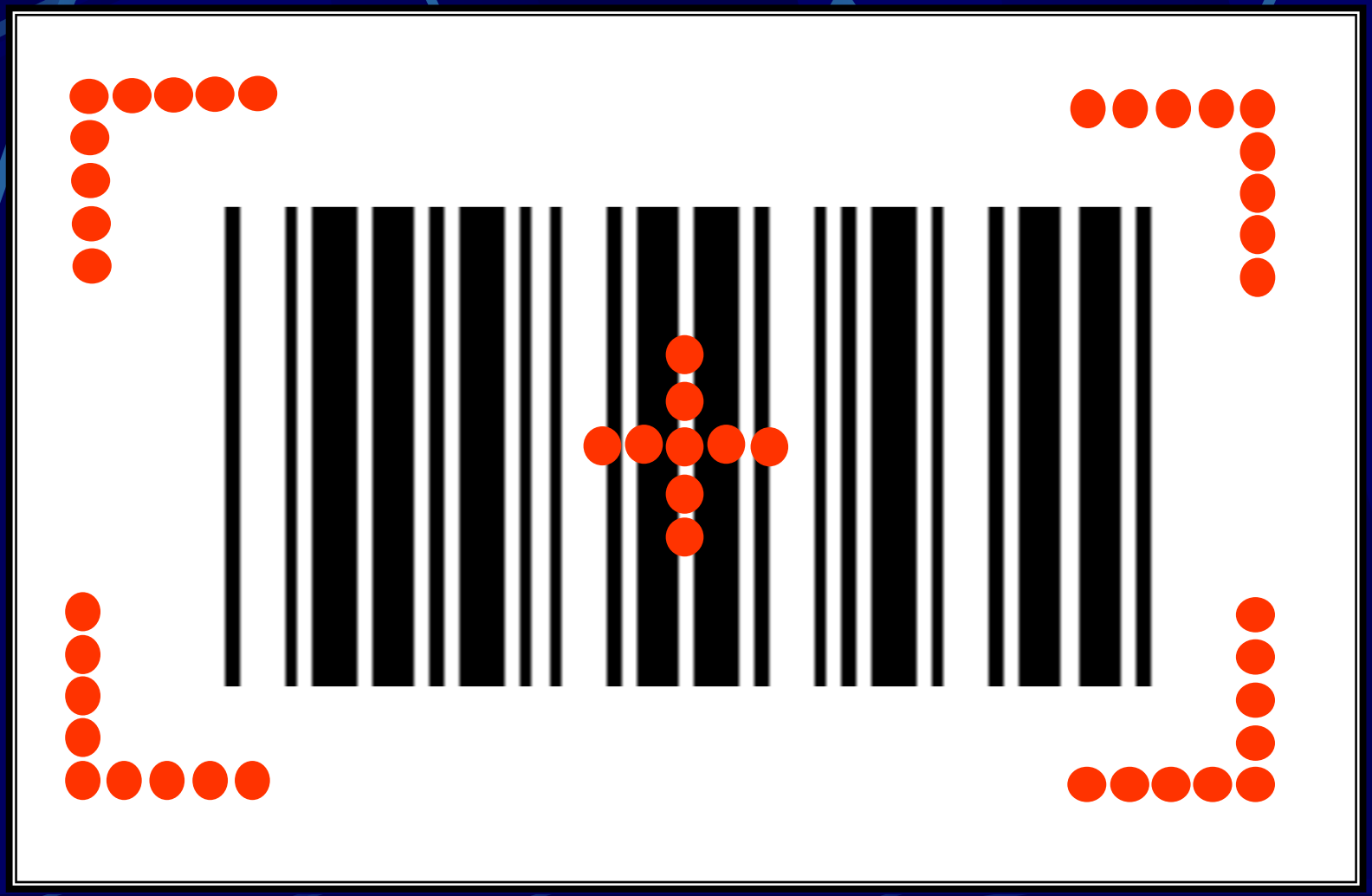
Scanners

- Imagers
  (CCD's)
- Lasers

Scanner Types

Imager (CCD)

Imager Aiming Pattern



Imager Collection Technique

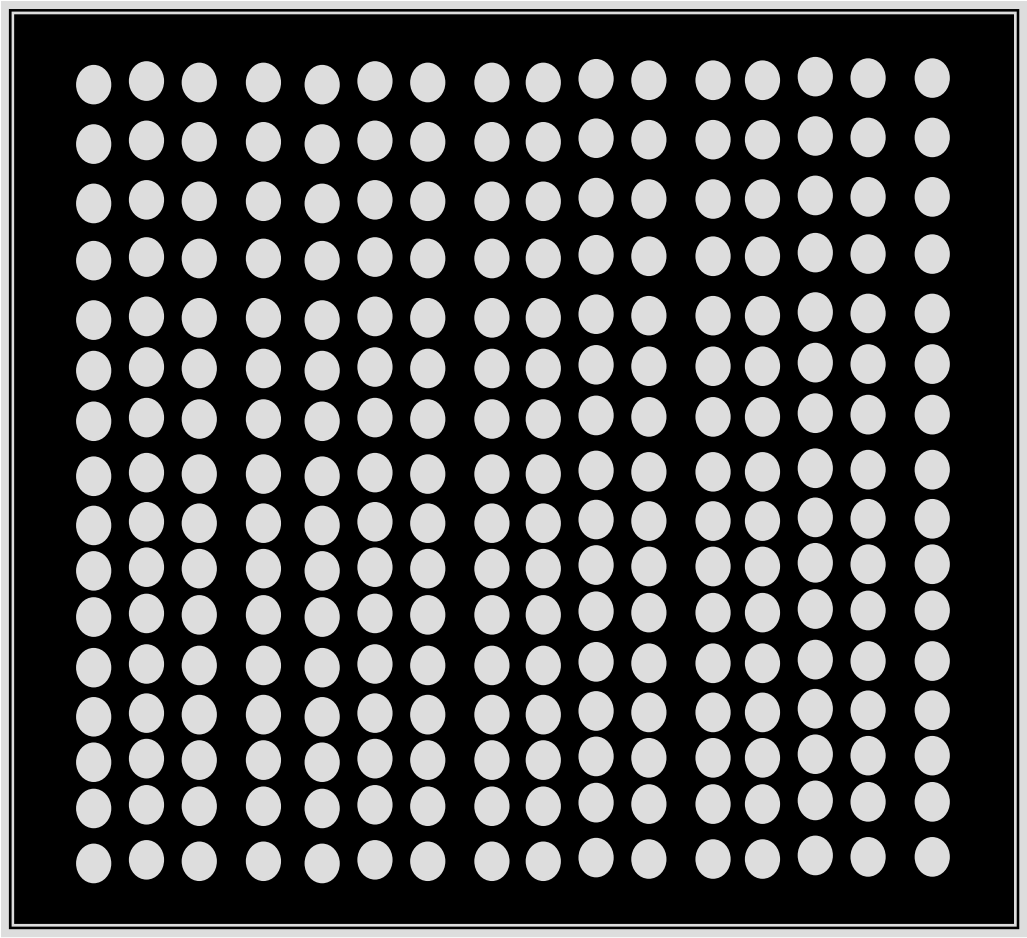
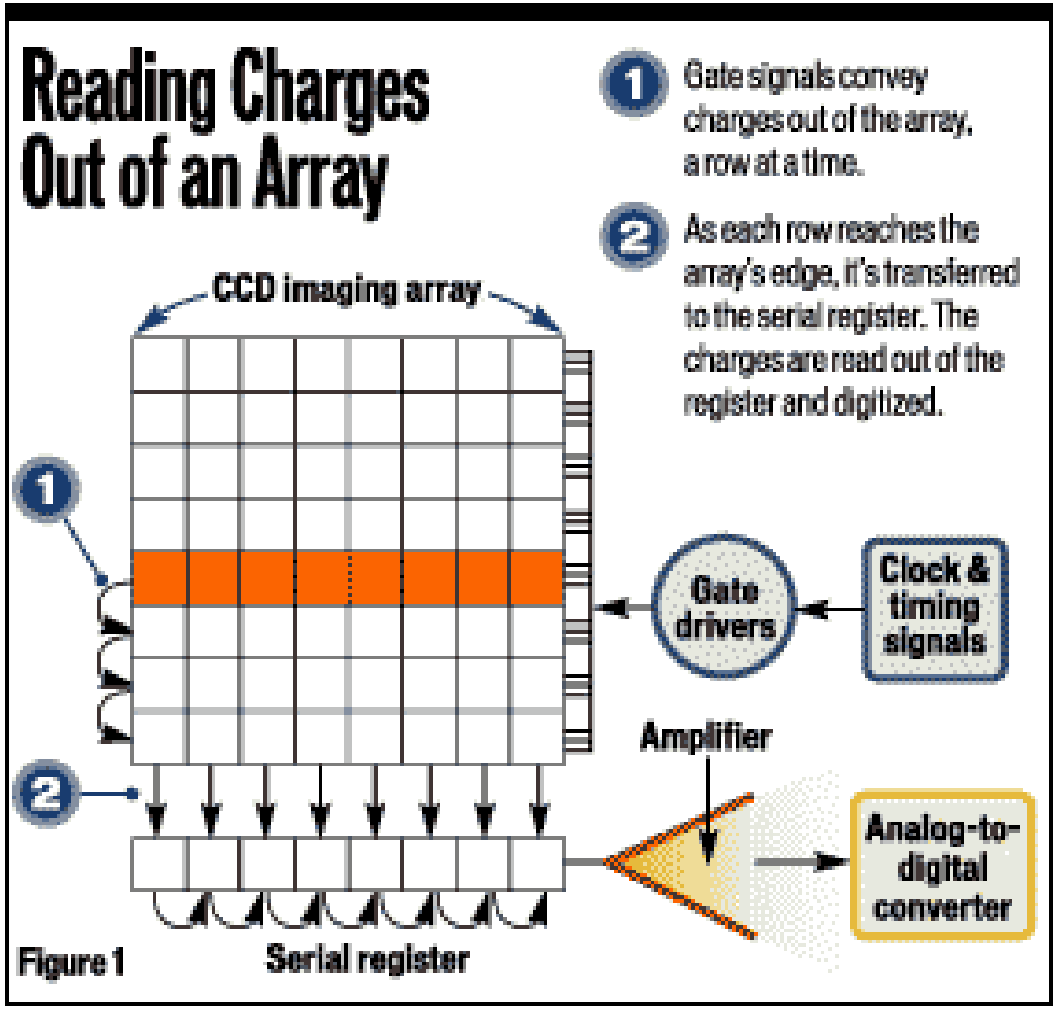


Photo Array
640 x 480
Pixels
or
Light
Receptors

Imager Output

At the heart of today's digital imaging devices are charge-coupled devices (CCD). A type of semiconductor that's sensitive to light, a CCD consists of a 2-D array of individual elements, each of which is, in essence, a capacitor - a device that stores an electrical charge.



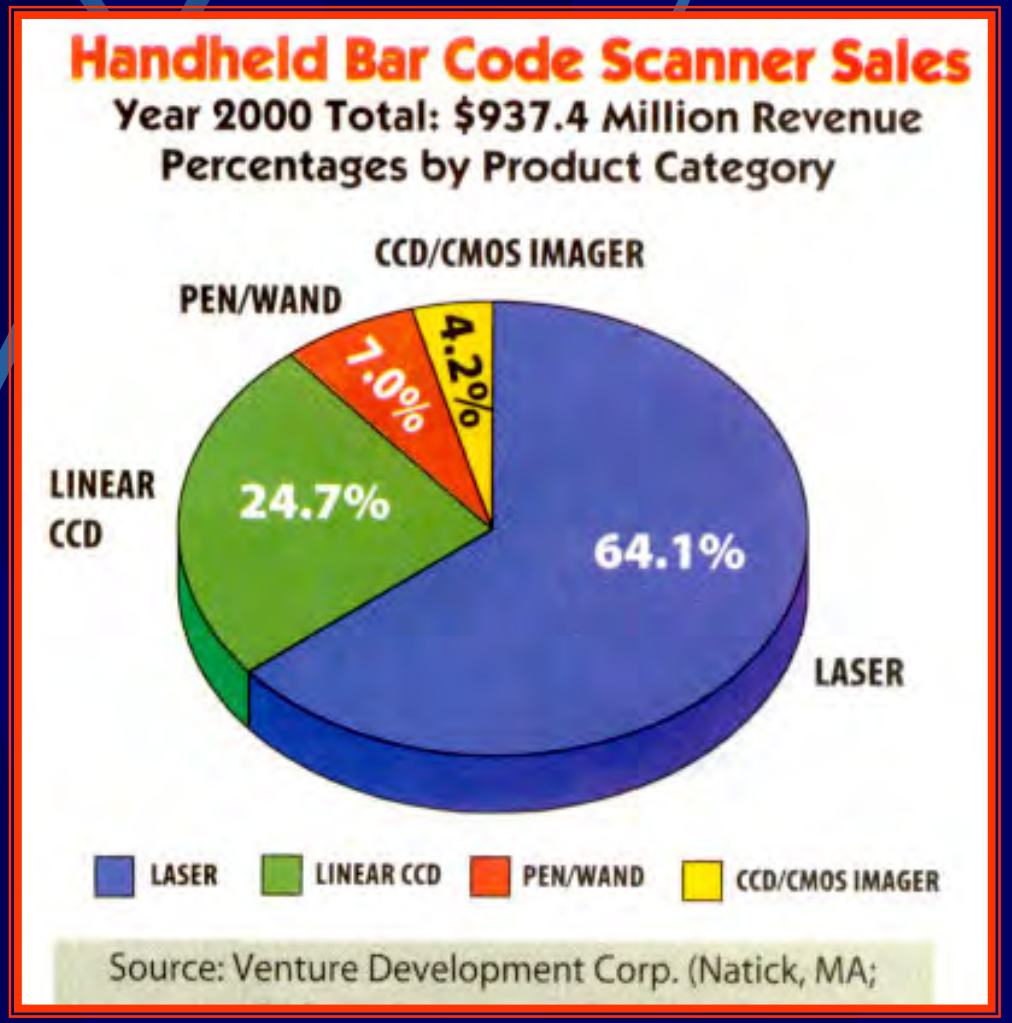
(Computerworld - August 6, 2001)

Scanner Types

Laser

Scanners

- Most Prevalent
- Wide Variety



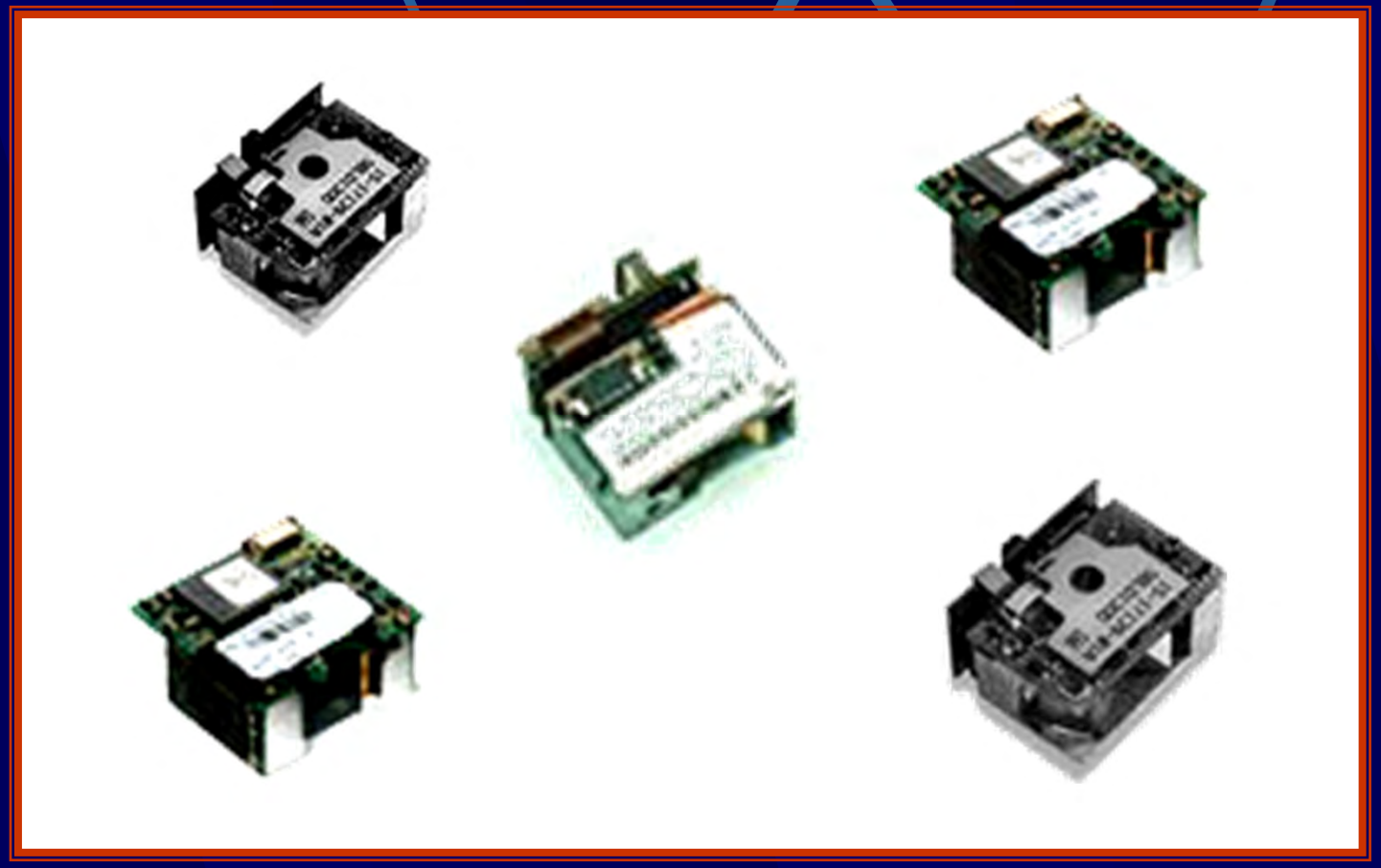
(~ 5.4 Million Units)

Symbol Technologies Hand-held

Symbol Technologies Hands-free

Symbol Technologies Mobile Computers
with Integrated/Tethered Scanners

Symbol Technologies Scan Engines



How Do Laser Scanners Work?

Essentially……

they ALL work the same way!

Laser Scanners

They Generate a Radiation Beam.

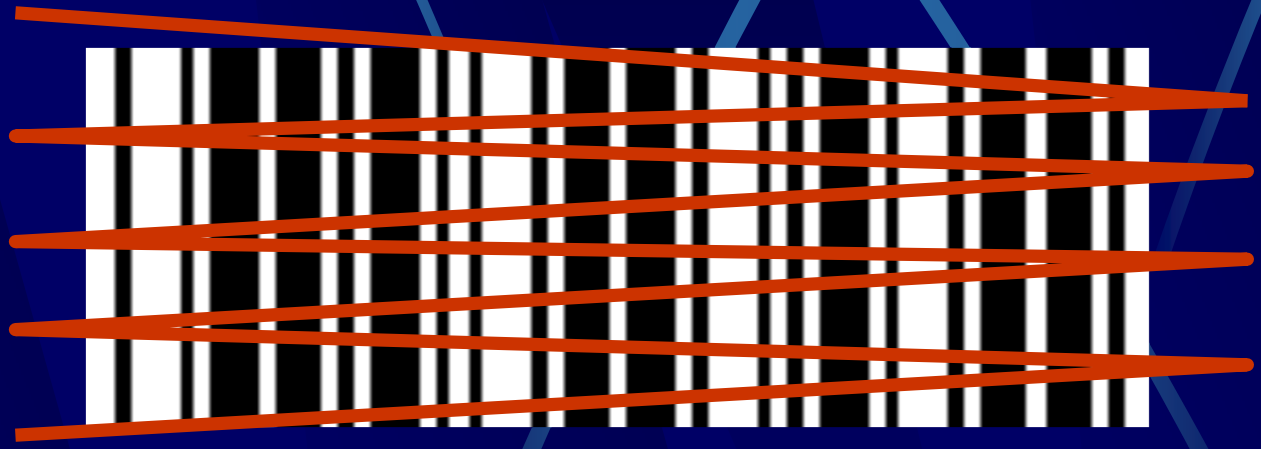
What Kind of Beam?

L = Light
A = Amplification by
S = Stimulated
E = Emission of
R = Radiation

Scanning (Linear)

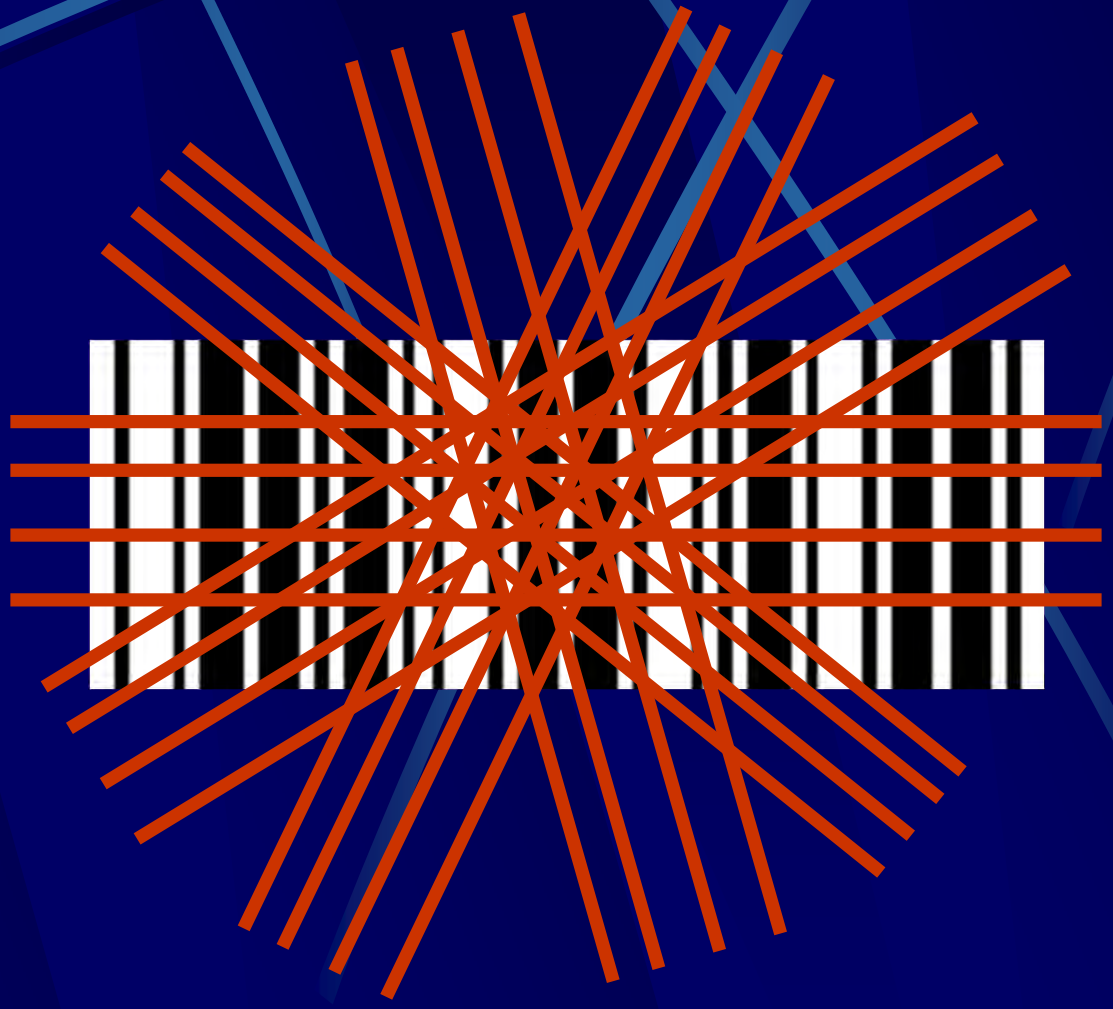
What the Eye Sees

Scanning (Raster)



What the Eye Sees

Scanning (Omni-directional)

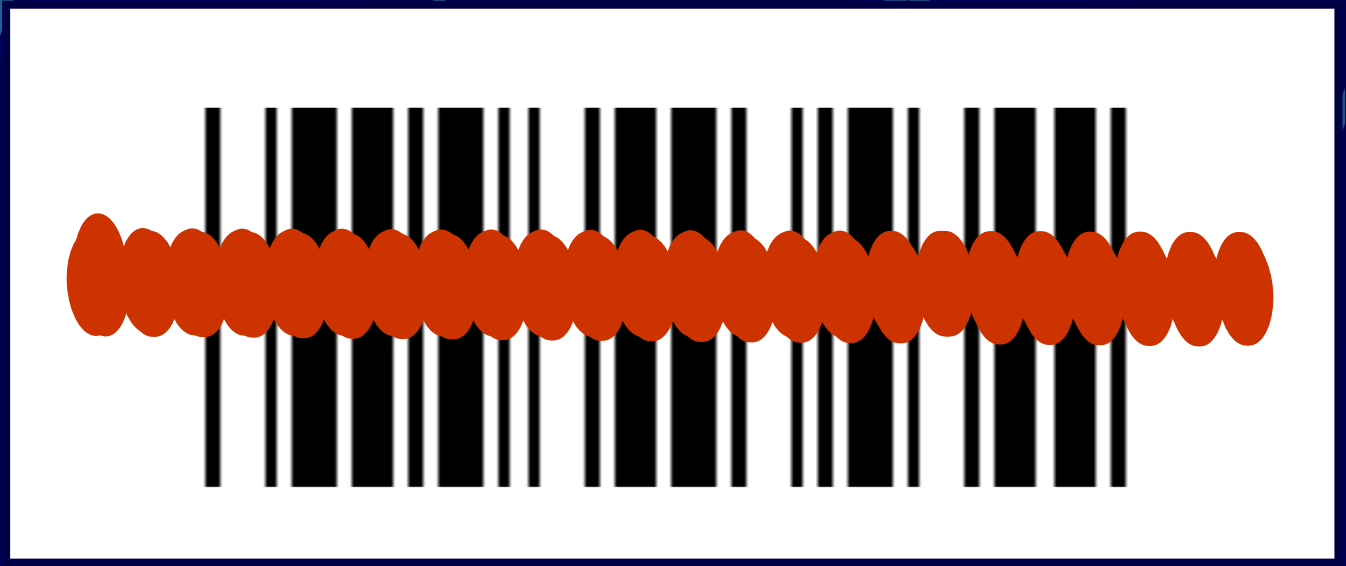


What the Eye Sees

Scanners

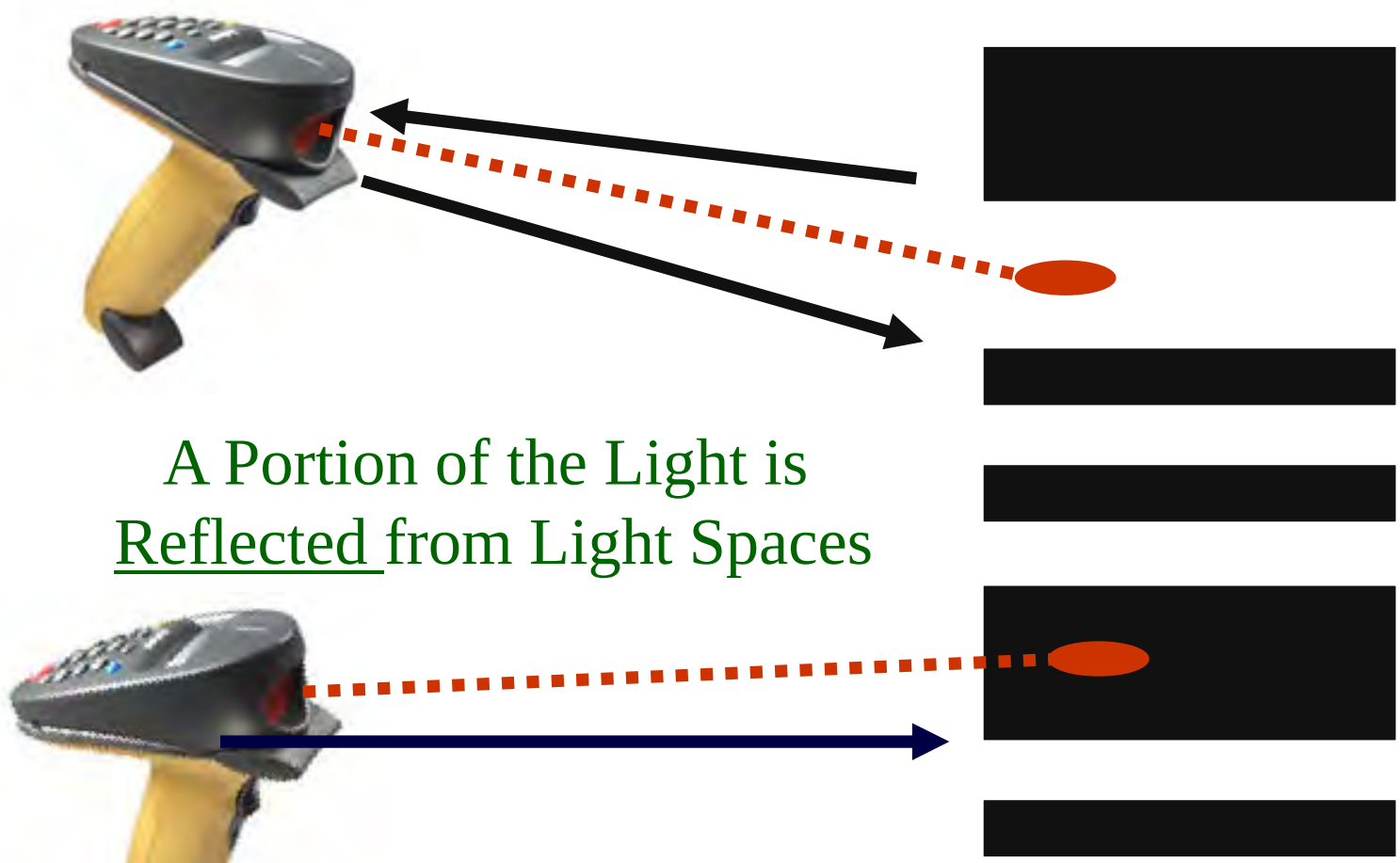
Rotating or oscillating mirror deflects a laser beam.

Scanning



What the Scanner Does

Scanning



A Portion of the Light is
Reflected from Light Spaces

A Portion of the Light is
Absorbed by Dark Bars

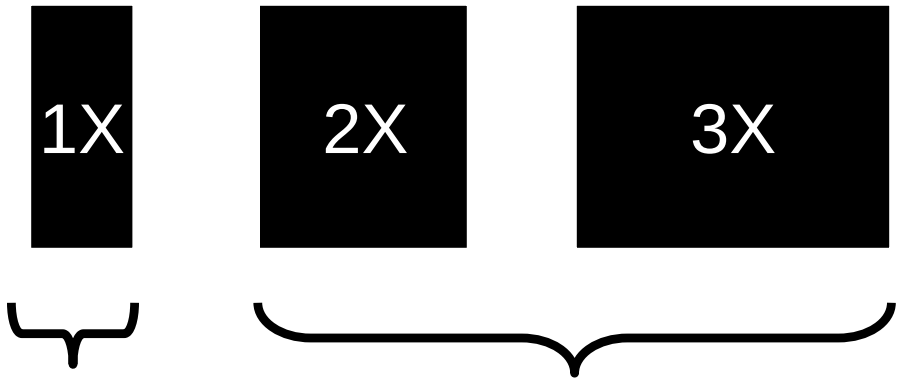
Scanning

Universal Product Code

Four Dark Bar and Light Space Widths

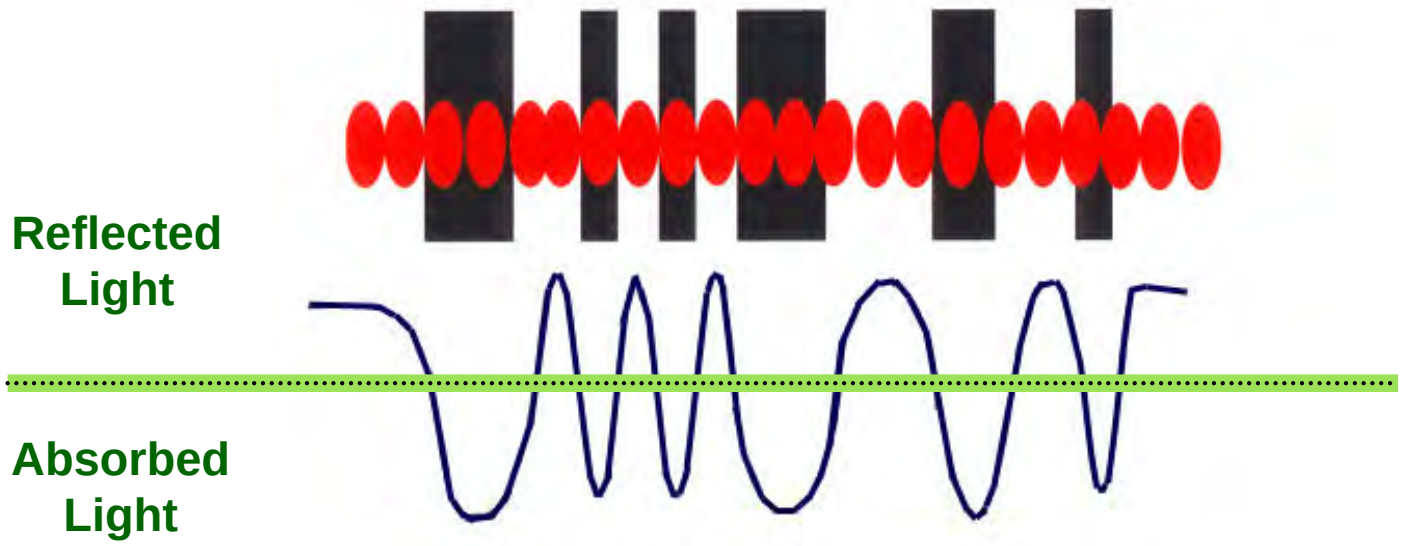
Scanning

Code 39



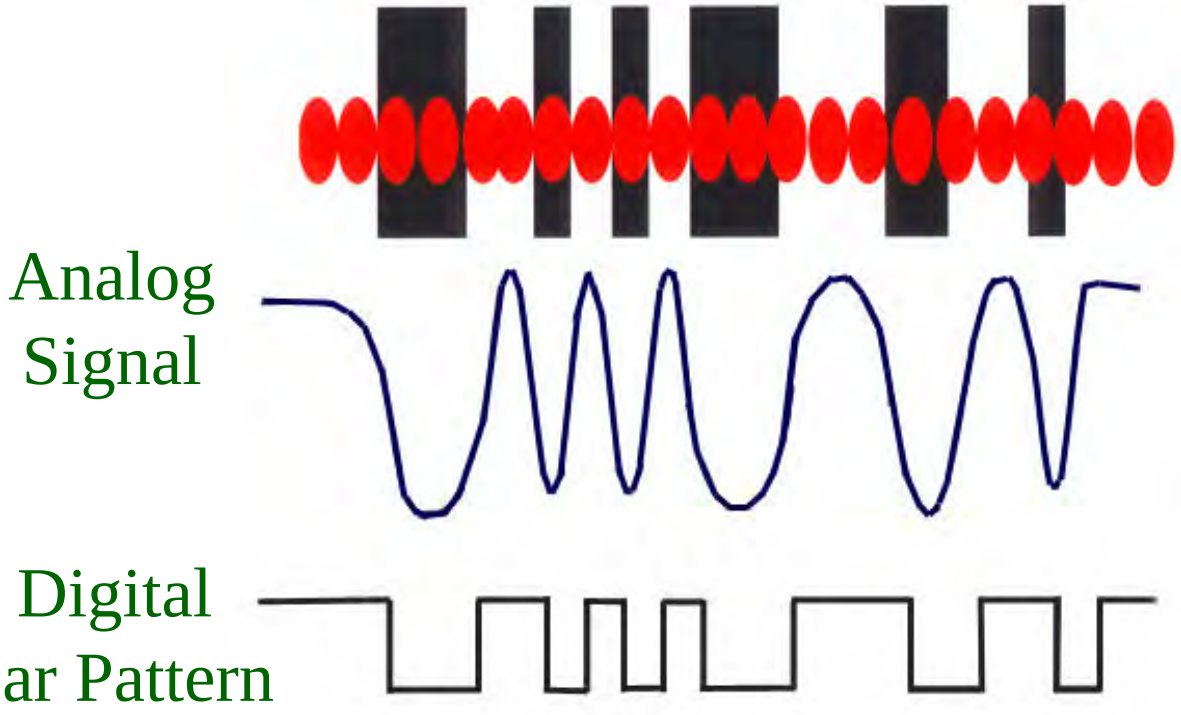
Two Dark Bar and Light Space Widths

Scanner Decoding



An Analog Signal is Generated

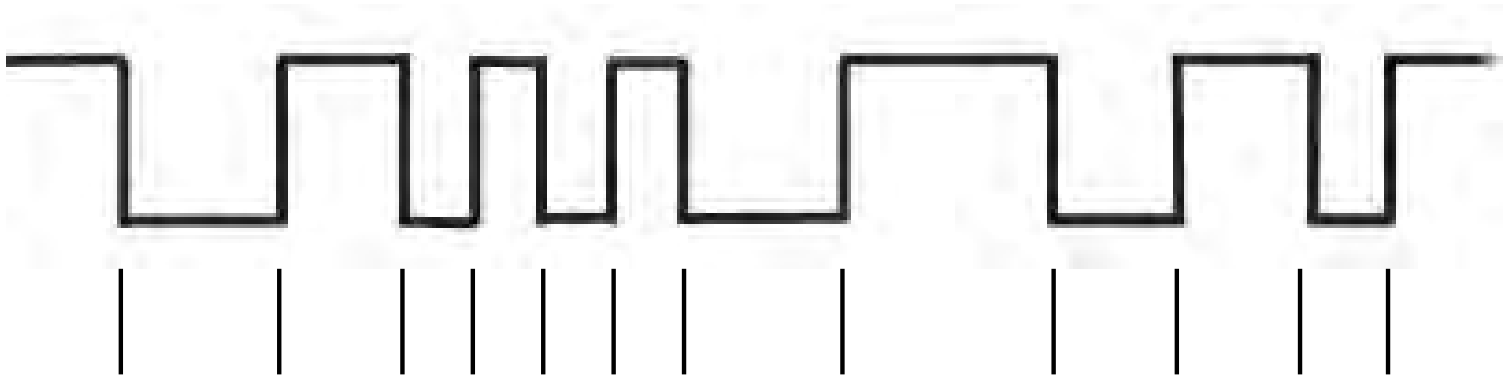
Scanner Decoding



Analog to Digital: HOW?

Decoding: Analog to Digital Signals

One of many decoding methods (algorithms):



Clock Counts →	110	48	40	42	38	41	112	114	50	52	42

Total clock counts = 689; divided by 11 (bars/spaces) = 62.64
All elements above 62.64 are WIDE; All elements below 62.64 are NARROW

Therefore:	**W**	**N**	**N**	**N**	**N**	**N**	**W**	**W**	**N**	**N**	**N**

Other Important Scanning Issues

1. Scanner Resolution and Symbol Density
2. Depth of Field and Width of View
3. Scanner Angle
4. Quiet Zones

Mil Size Relates to Density

6.5 → 

7.0 → 

10.5 → 

13.7 → 

20.5 → 

30.4 → 

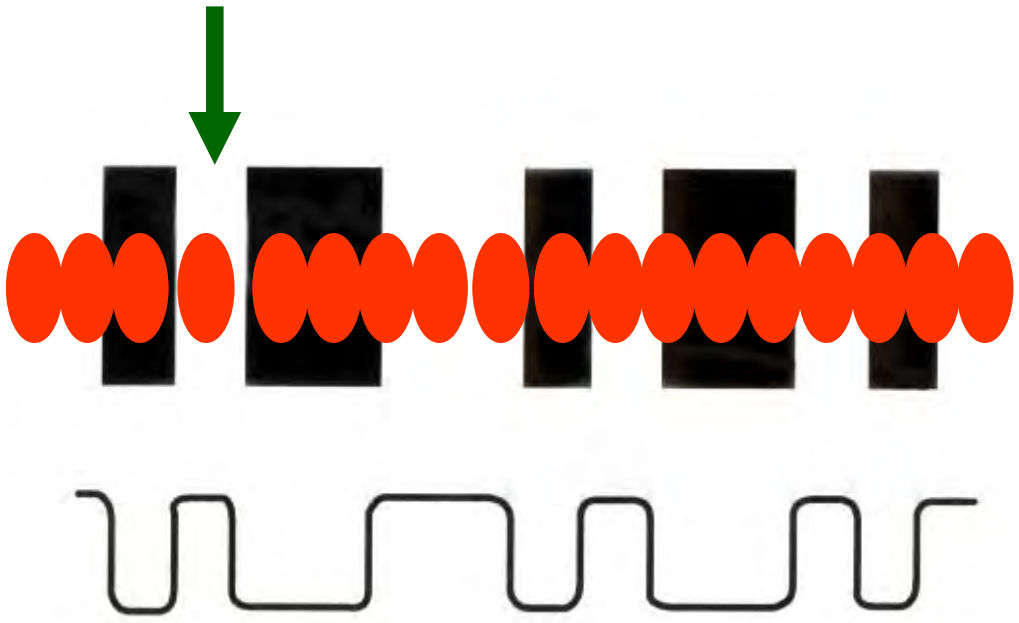
40.2 → 

Scanner Resolution and Symbol Density

Scanner Resolution (spot size)

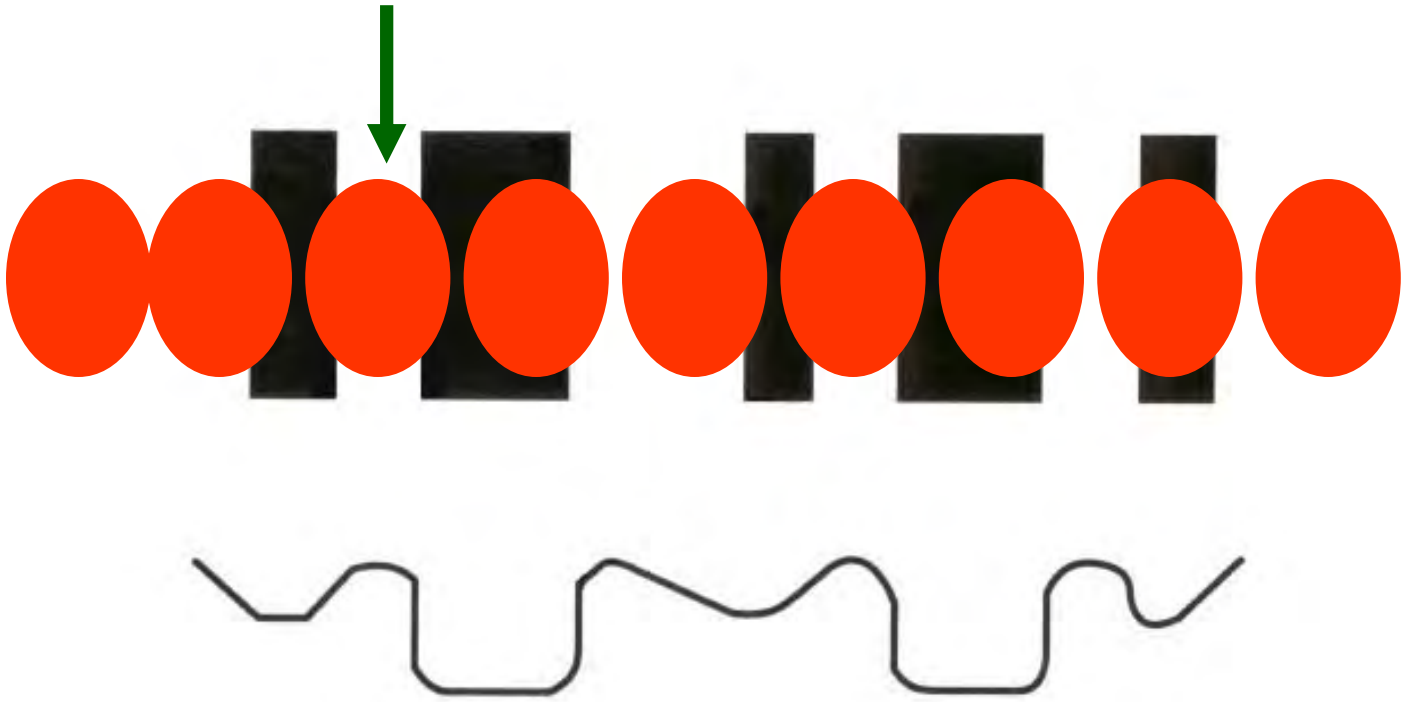
Should Approximate Smallest Bar or Space

Scanner Resolution
and
Symbol Density



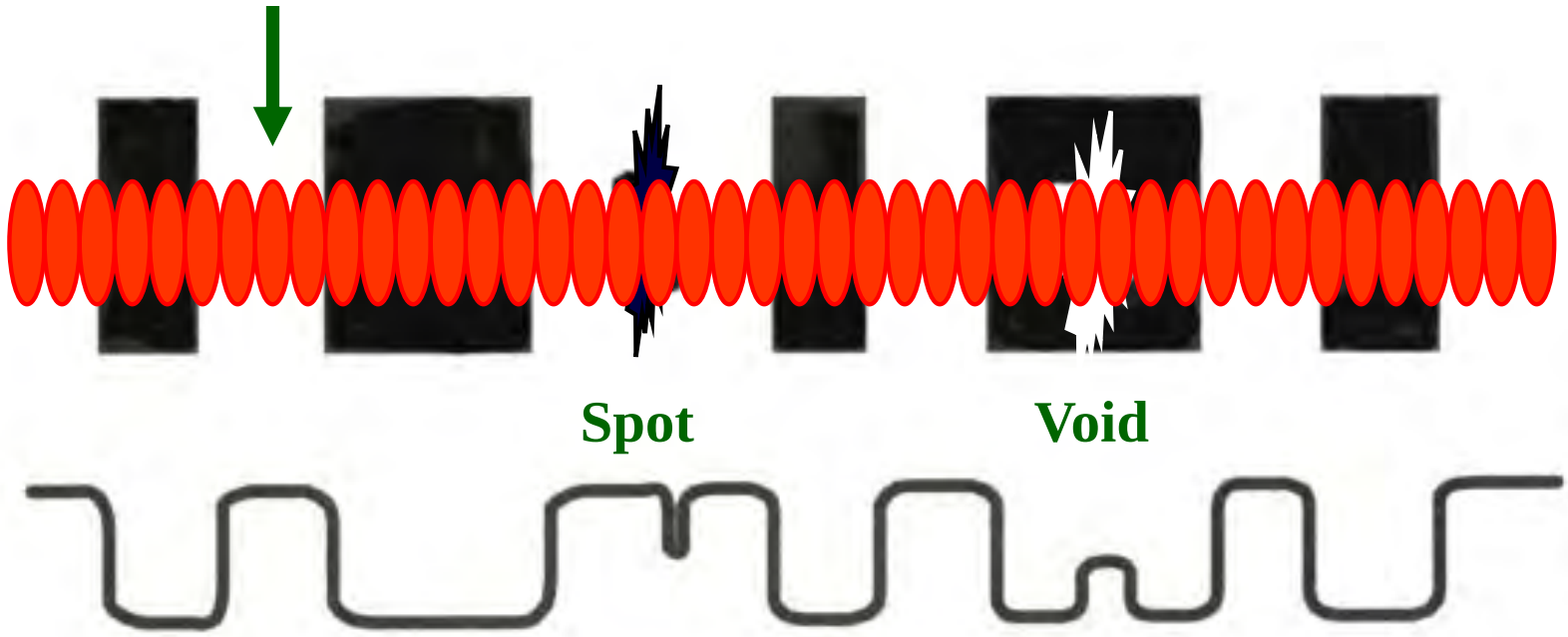
Excellent Analog Signal

Scanner Resolution and Symbol Density



Too Big: Distorted Analog Signal

Scanner Resolution
and
Symbol Density



Too Small: Distorted Analog Signal

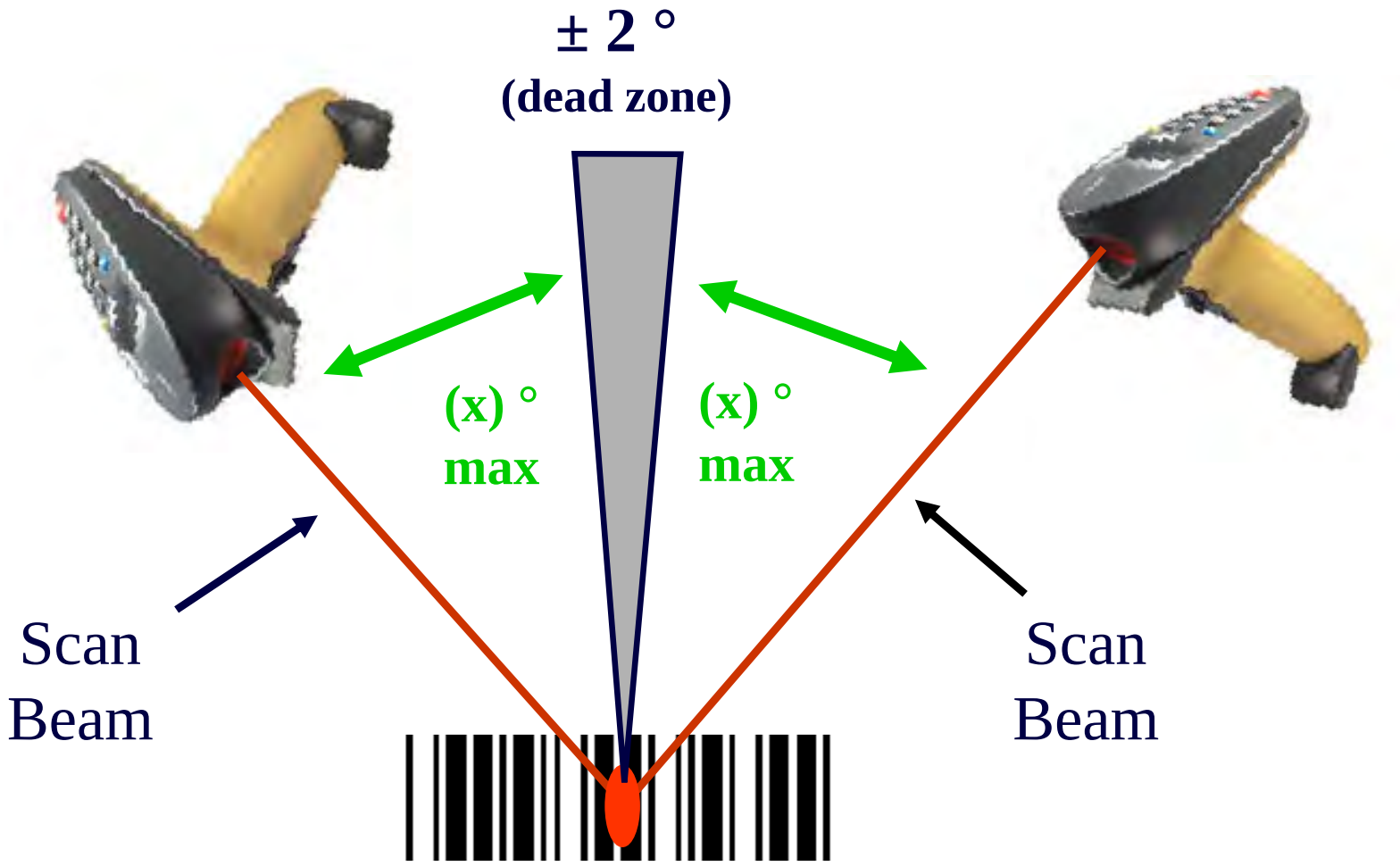
Scanning

Depth of Field

Width of Field

Both Parameters Will Vary Depending Upon Scanner Resolution and Size of the Smallest Symbol Element.

Scanner Angle



Quiet Zones

Yes

No

SUMMARY

The relationship between the scanner and the symbol being scanned is affected by the:

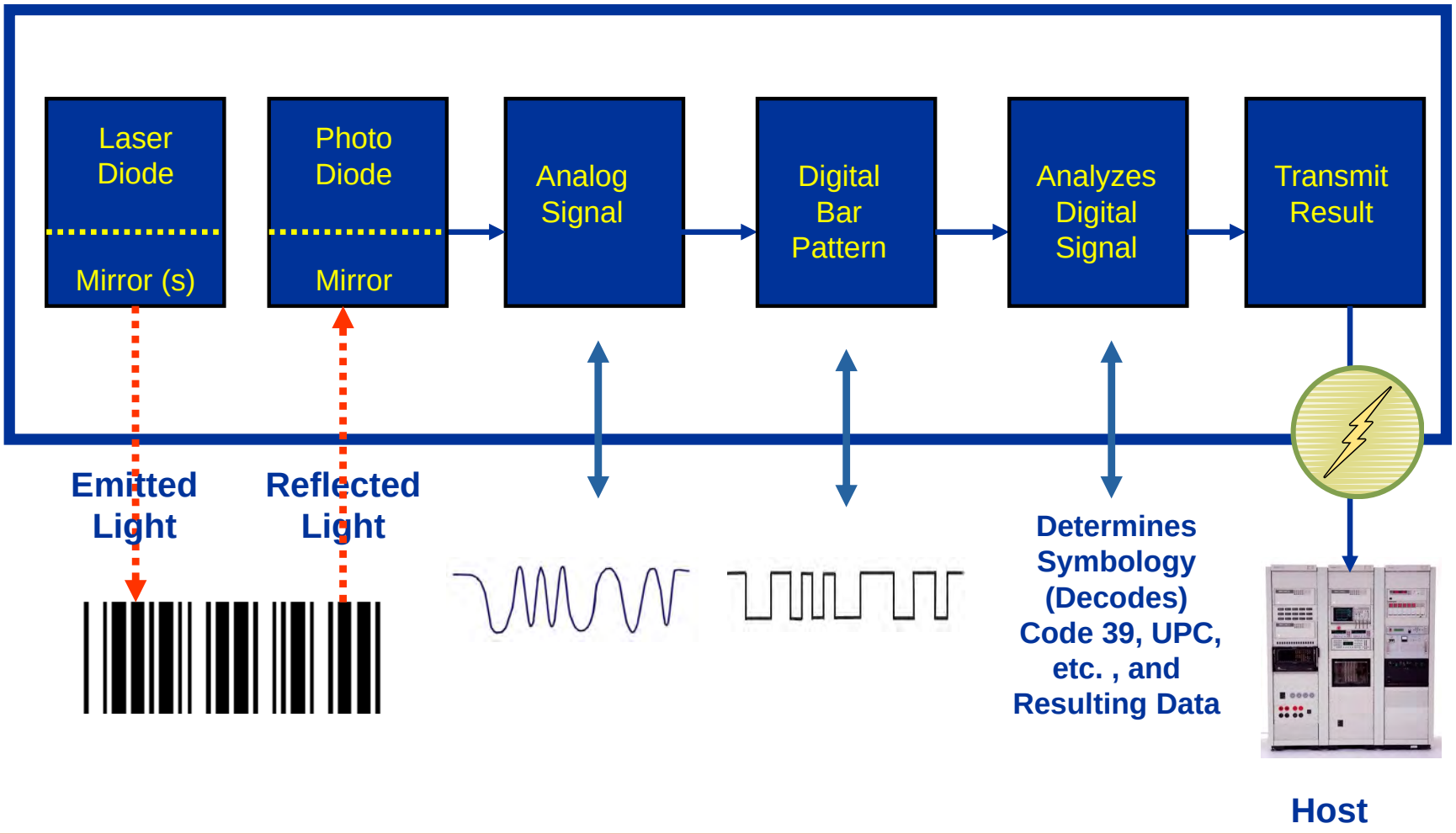
1. Narrow Element Size
2. Distance from the Scanner
3. Scanner Angle
4. Quiet Zones

What Major Components of a Scanner are Used to Interpret a Bar Code Symbol?

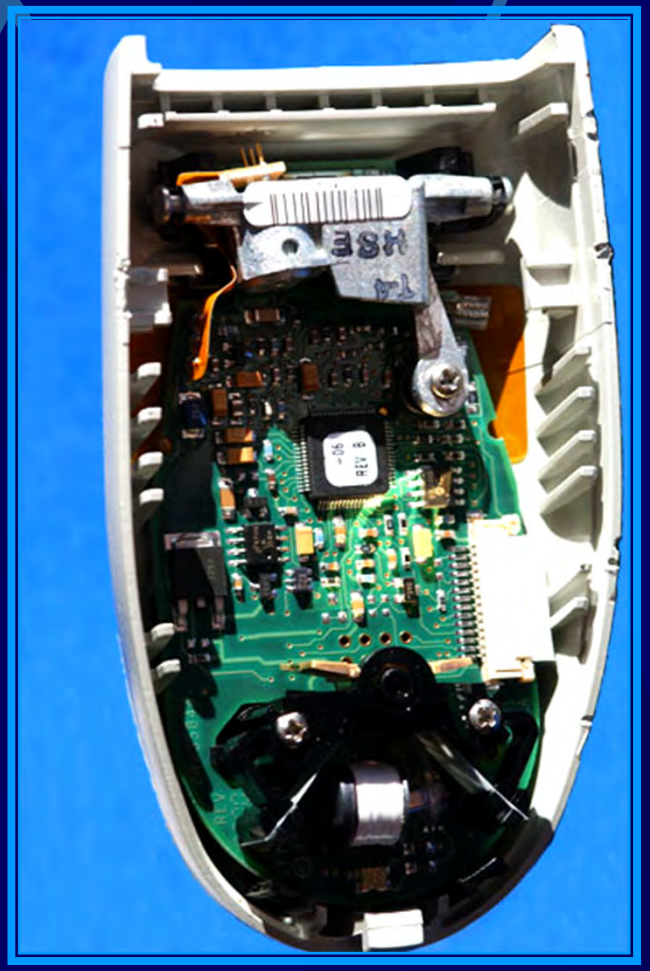
Laser Scanner Major Components

* Laser Diode (Light Source)
* Mirror or Mirrors (Scan Mechanism)
* Photo Diode (Light Collector)
* Amplification & Filtration (Analog Signal)
* Digitizer
* Decoder
* Microprocessor

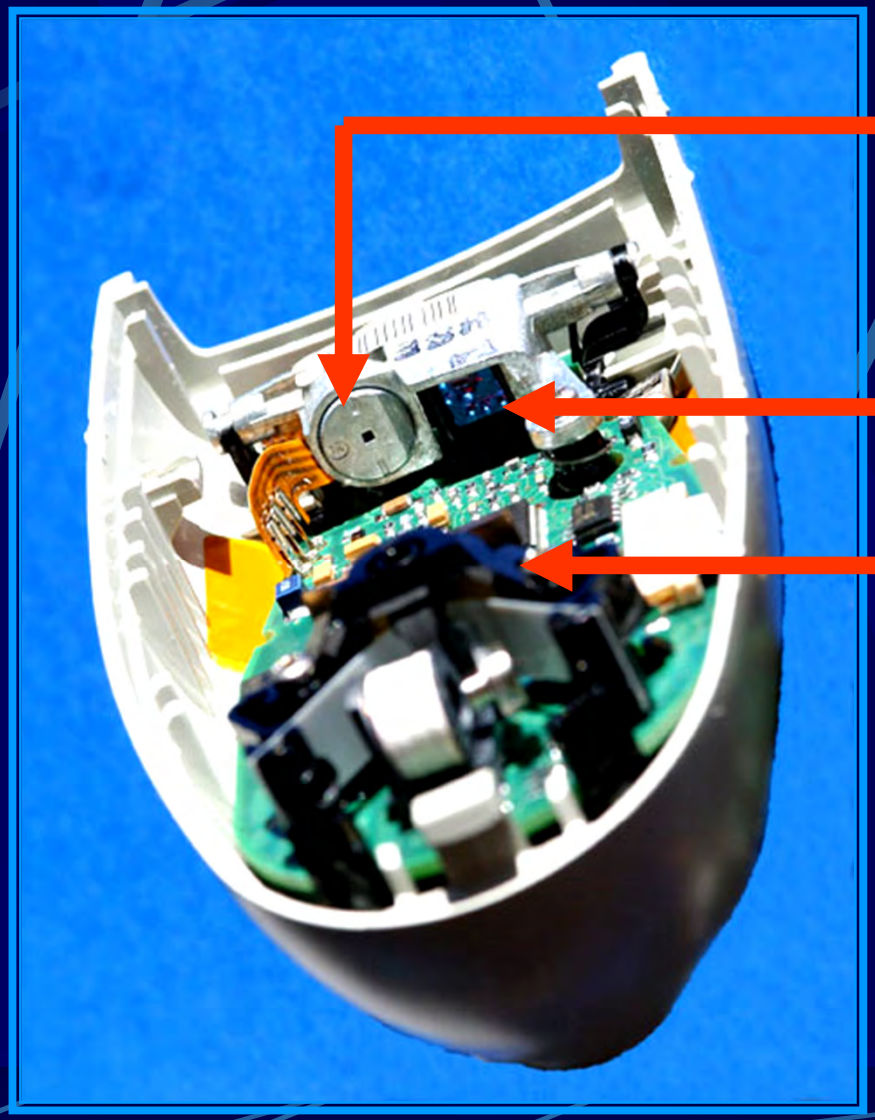
Laser Scanner Processing Steps



Symbol Technologies LS4004i



Symbol Technologies LS4004i

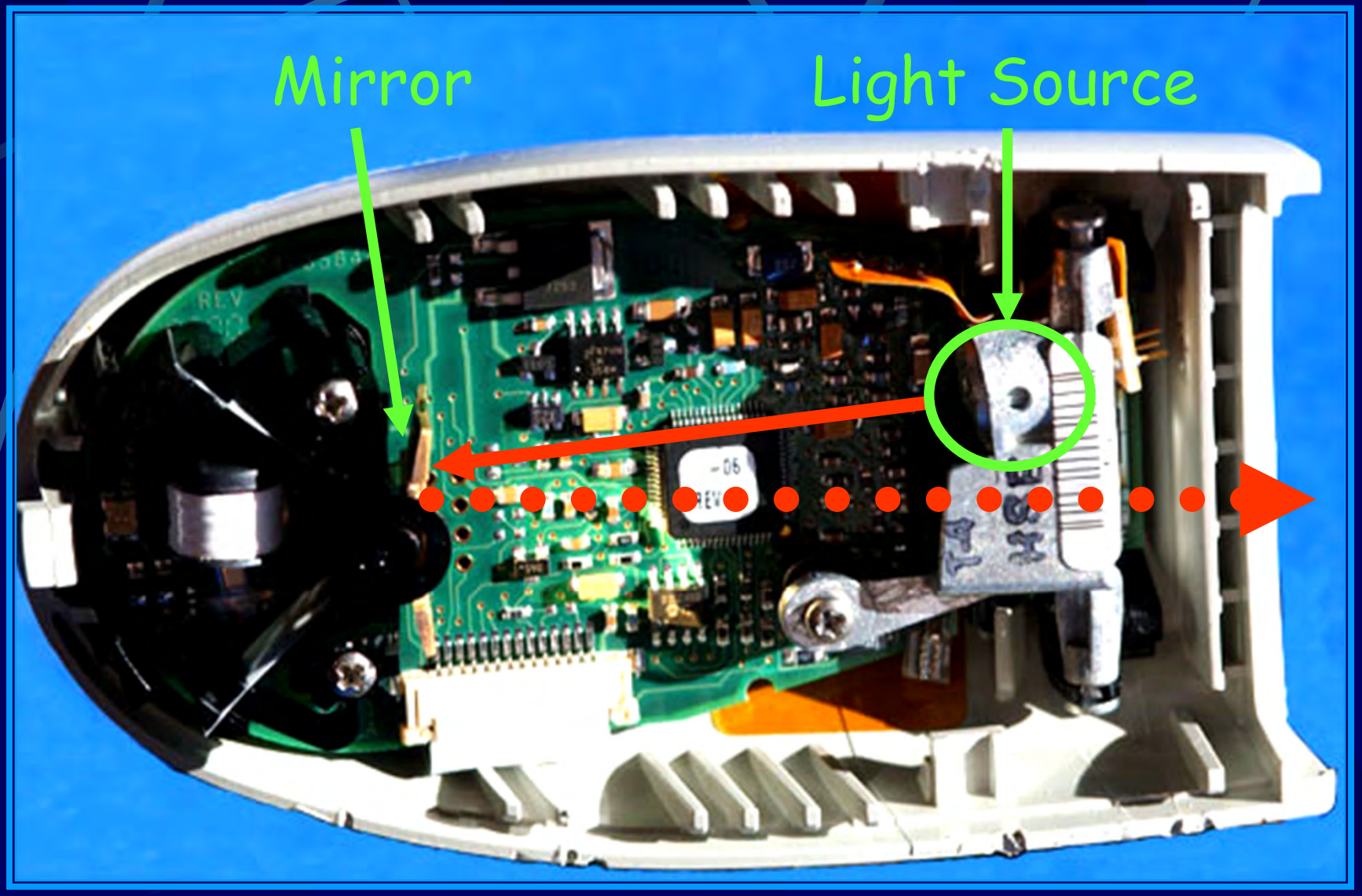


Light Source

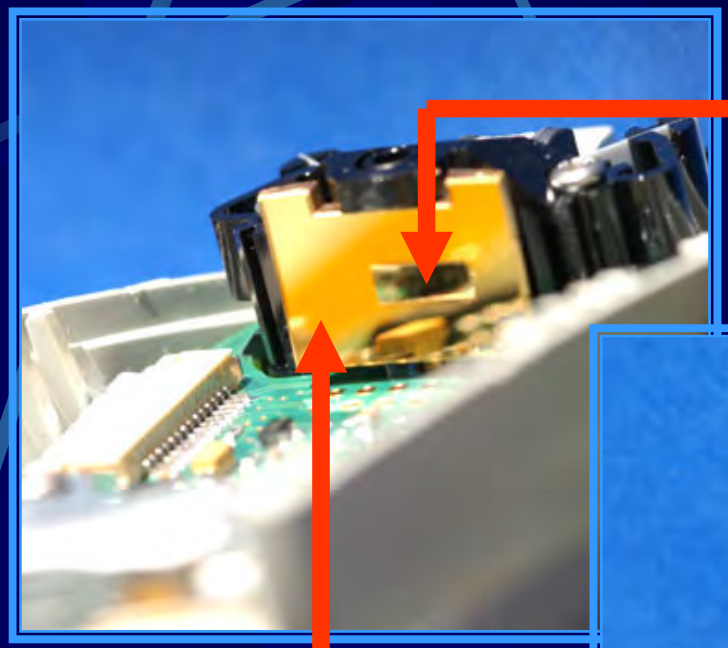
Photodiode

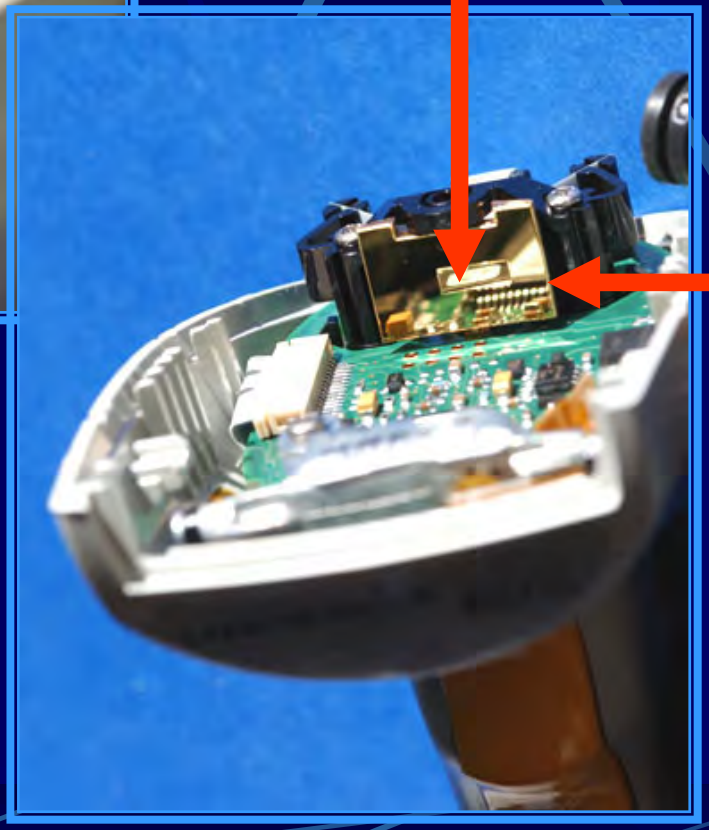
Emitting and Collecting Mirror

Symbol Technologies LS4004i



Symbol Technologies LS4004i





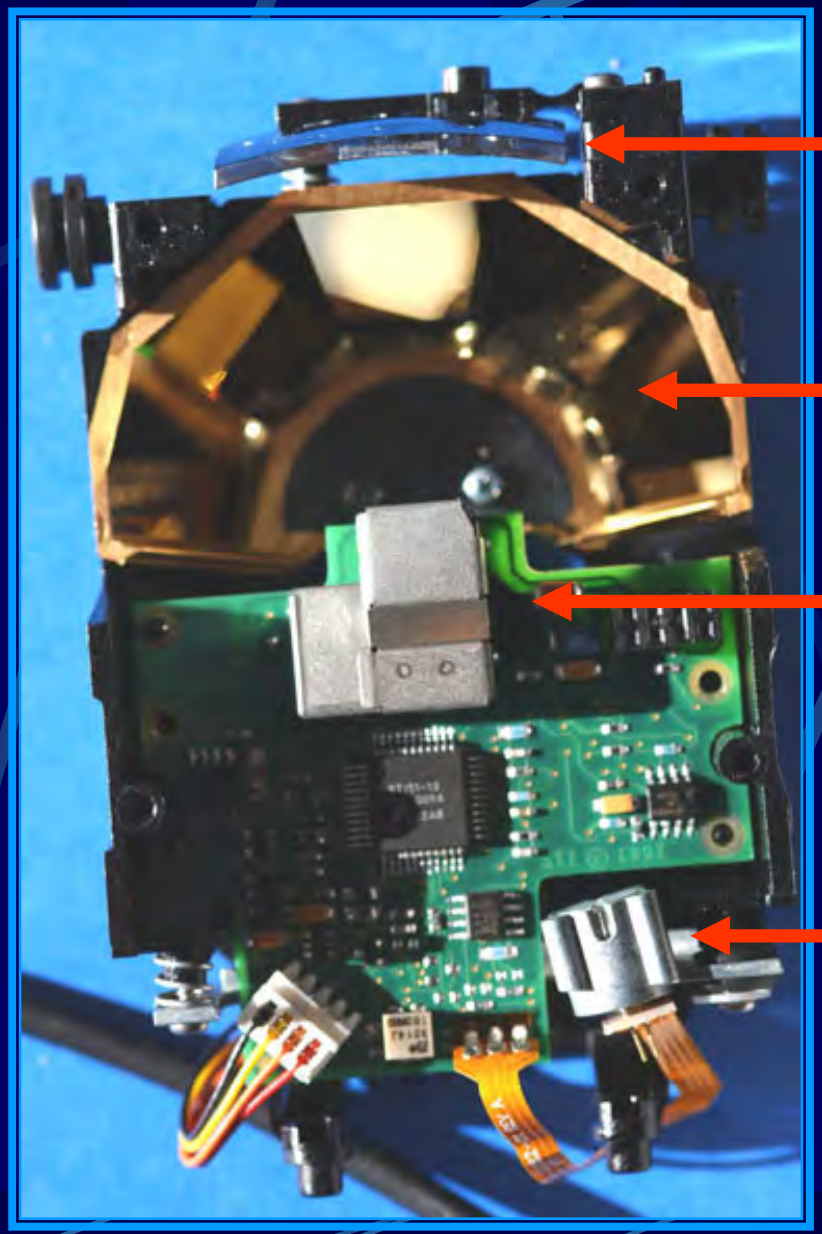
Emitting Mirror

Collection Mirror

Collection Mirror

Symbol Technologies LS9100

Symbol Technologies LS9100



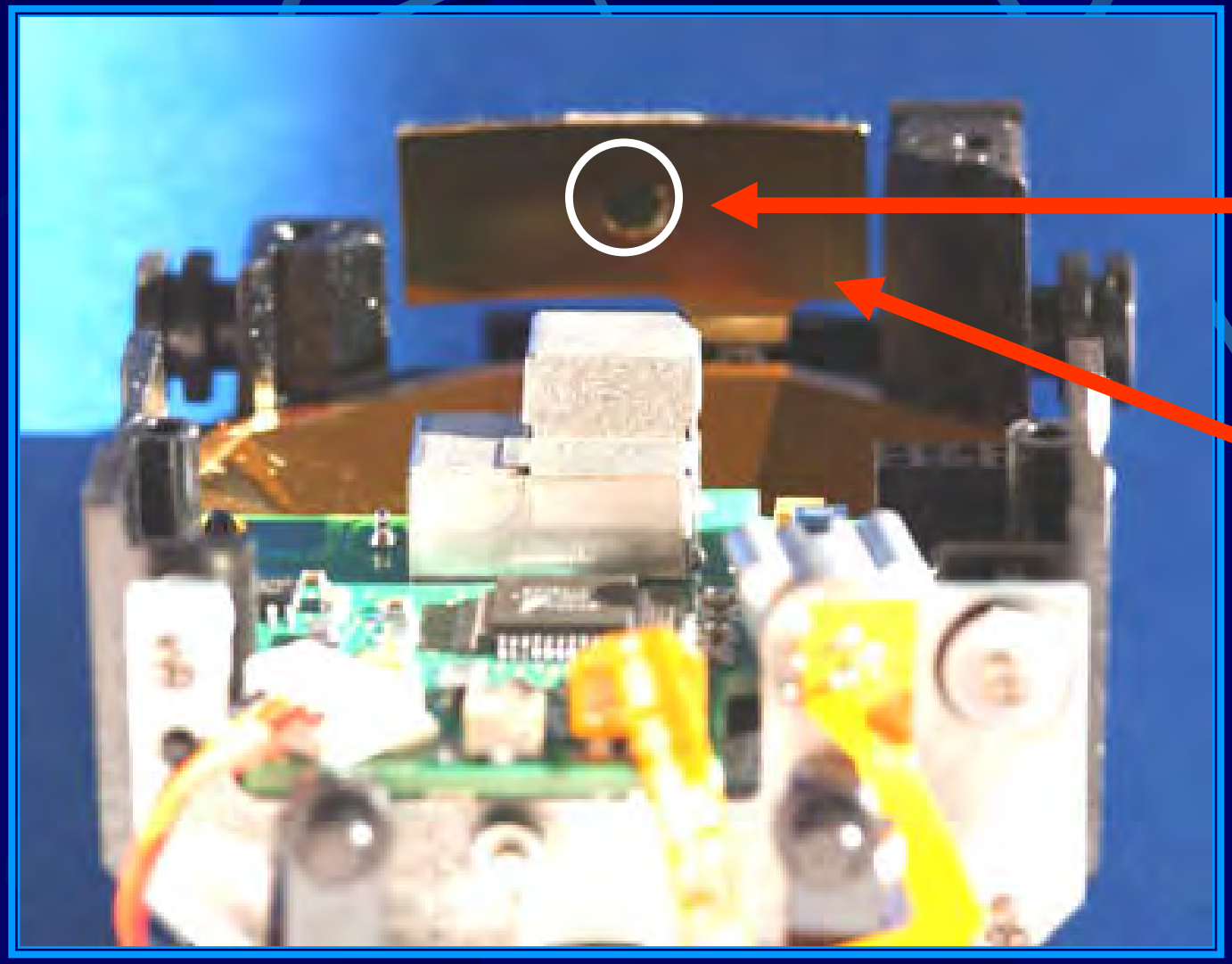
Emitting and Collection Mirror

Emitting Mirror

Photodiode

Light Source

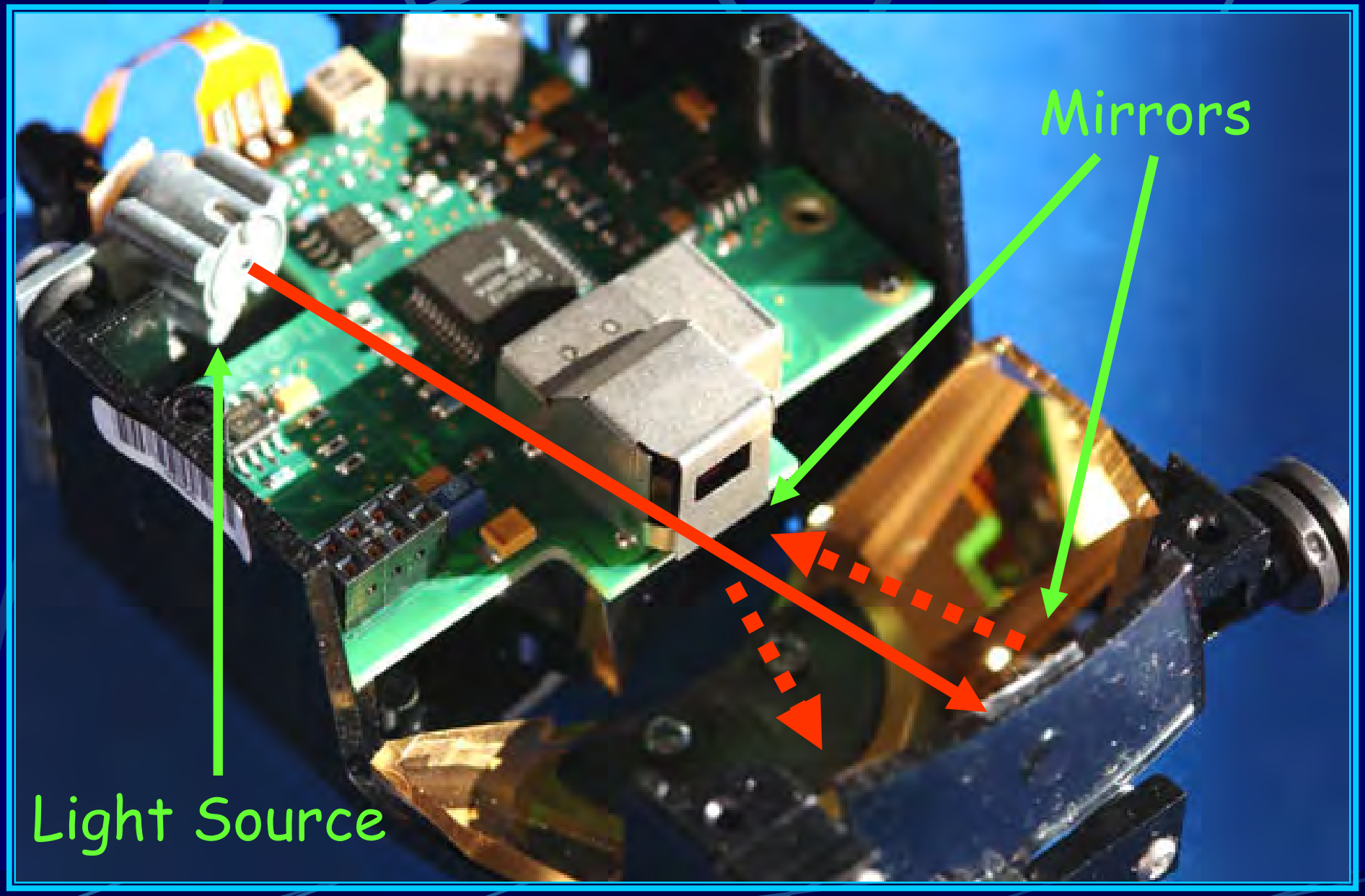
Symbol Technologies LS9100



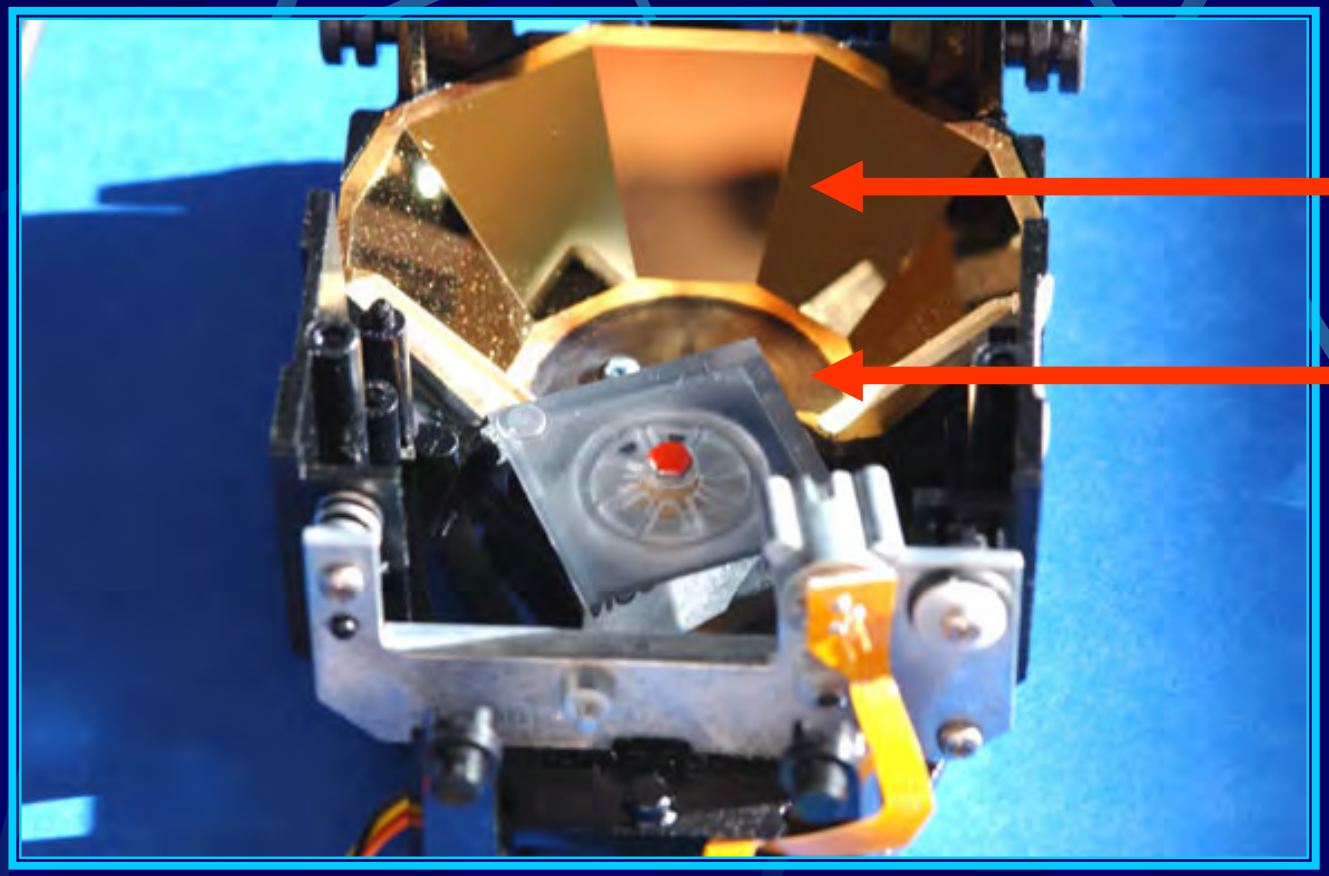
Emitting Mirror

Collection Mirror

Symbol Technologies LS9100

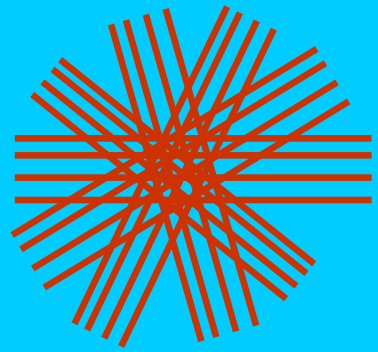


Symbol Technologies LS9100



5 Sided Mirror

4 Sided Rotating Mirror

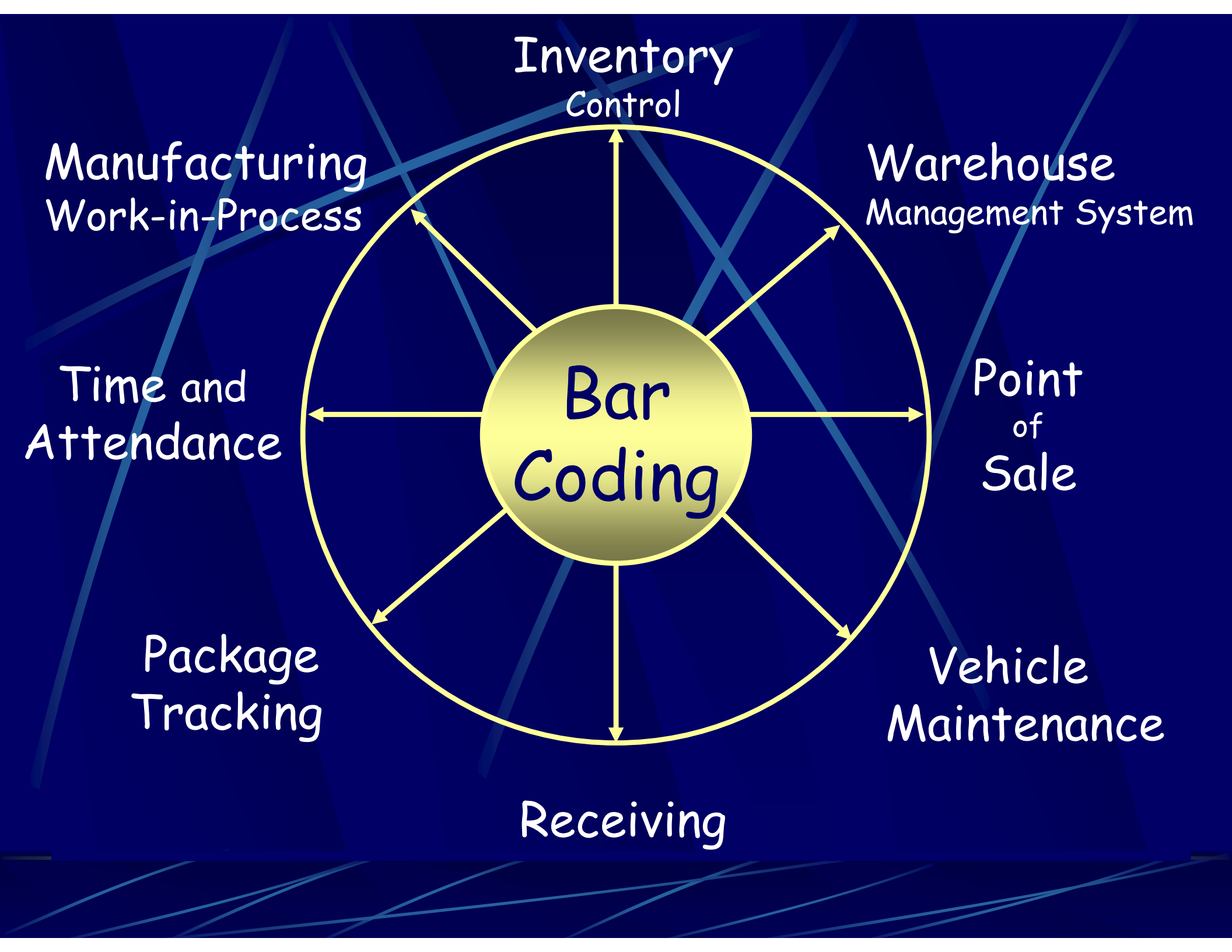


Omni-directional Pattern

User Programmable Options:

- Audio Response
  (on/off/frequency/volume)
- Power Mode
- Bi-directional Redundancy
  (forward and reverse)
- Check Digit Validation
- Autodiscrimination
  (enable/disable symbologies)
- Data Length Control
  (fixed, range or none)
- Laser On Time

What Happens to the Data that has been Interpreted and Forwarded to a Host as a Result of Scanning a Bar Code Image?


Inventory
Control
Manufacturing
Work-in-Process
Warehouse
Management System
Time and
Attendance
Bar
Coding
Point
of
Sale
Package
Tracking
Vehicle
Maintenance
Receiving

Summary

In the majority of all applications, automatic identification techniques have no value by themselves. There must be a scanner to interpret encoded characters and a computerized system to collect, store and process these data that have been interpreted. Only then can beneficial activities occur.