User's Manual

LHA7126, LHA7127

Mini High Speed CCD Fixed Position Scanner

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Contents

Organization of this Manual

This manual provides the necessary instructions for installing and using an Opticon LHA7126/LHA7127 Fixed Position Scanner. The manual is organized as follows:

Section 1 Introduction and Getting Started
Describes the general operation of a LHA7126/LHA7127 scanner. Also provides a Quick Start-Up Procedure that allows you to begin using the scanner immediately.

Section 2 Technical Specifications
Provides complete specifications, including mechanical details, optical performance, RS232 communications and other technical data.

Section 3 Positioning the Scanner for Optimal Performance
Provides detailed instructions and tips for mounting and positioning the scanning to obtain the best scanning performance. Application Notes describe guidelines for maximizing specific characteristics.

Section 4 Configuring the Scanner
Describes how various parameters can be programmed to customize the scanner for your specific application.

Section 5 Application Engineering Support
Discusses the most common questions and concerns when adapting a LHA7126/LHA7127 scanner in your application.

Section 6 Scanner Servicing and Maintenance
Discusses the LHA7126/LHA7127 scanner warranty, maintenance and cleaning procedures.

Appendices Detailed Supporting Information
Provides detailed information in specific areas such as the programming commands for configuring various parameters of a LHA7126/LHA7127 scanner.

Section 1
Introduction and Getting Started

Product Overview

LHA7126/LHA7127 Fixed Position Scanners are miniature, 700 scan per second, bar code readers designed to be easily incorporated into host equipment. CCD scanning technology features 100% solid state design with absolutely no moving parts. Durability and reliability are assured.

Advanced 32-bit microprocessor technology coupled with Opticon's proven decoding algorithms result in high speed operation with superior accuracy. The scanners are fully programmable allowing the user to customize parameters including changing communication settings, selecting symbologies, adding prefixes and appending suffixes. Programmable settings can be downloaded from the host CPU or computer directly to the scanner.

The LHA7126/LHA7127 scanners are encased in compact, rugged steel enclosures. The compact size permits installation in the tightest areas. Scanners are available in both front and side view configurations allowing great flexibility in mounting and positioning the scanner for optimum performance.

Quick Start-Up Procedure

This section is for those who wish to start using the scanner before reading the complete manual. In only a few steps the scanner will be operable.

Turn off the power to your PC and connect the scanner to an RS232 communications port. Note: You must provide +5 Volt DC power to the scanner. This can be accomplished using the power supply and patch cable available from Opticon. If the power supply is obtained from another source verify that it is identified with the ***CE*** mark. Turn on the power to the PC.

1) Using communications software (e.g., Procom), set the communication parameters: 9600 baud, 1 Start/Stop Bit, 8 Data Bits, No Parity, No Handshaking, No Flow Control

2) If you are operating in a **Microsoft Windows 3.1** environment, skip to Step 5.

3) If you are operating in a **Microsoft Windows 95/98/ 2000/ XP** environment, you can set the communication parameters using Hyper Terminal as follows:

   - Open Hyper Terminal. This can be done from Start→Programs→Accessories/ Communications
   - Select Hypertrm.exe to create a New Connection
   - In the Connection Description dialog screen enter a name for the new file. If desired, select an Icon. Click OK
   - In the *Connect To* (*Phone Number)* dialog screen, in the box entitled: *Connect using*. select the communication port, for example, "Direct to Com 1" Click OK
   - In the *Com 1 Properties* screen, enter the appropriate Port Settings: Bits per second = 9600, Data bits = 8, Parity = None, Stop Character = 1, Handshaking = None, Click OK
   - The hyper-terminal folder you just created will open. From the File pull-down menu, select *Properties* then click on the *Setting* Tab

- In the *Properties Settings* dialog screen, Select *Terminal keys* for the Function, arrow and control key; then Select *ANSI* for Emulation; the *Back scroll* buffer line can remain at the default 500
- Click on the ASCII Setup button. In the ASCII Setup screen, select Echo typed locally so that any keyboard commands you input will appear on your screen. Click OK. This returns you to the Properties Setting. Click OK

4) Your PC and the scanner should now communicate. Skip to Step 6.

5) In a Microsoft Windows 3.1 environment, set the communication parameters using the Terminal function of Windows.

   a) From Window's *Program Manager* Main Menu, select *Terminal.*

   - From the *Terminal* menu, select Settings.
   - From the *Settings* menu, select Terminal Emulation.
   - Set the emulation to TTY (generic).
   - From the *Settings* menu, select Terminal Preferences and select the following Terminal Modes:
     Line Wrap
     Local Echo
     Sound
     CR /LF: Inbound, Outbound
     Columns: 80
     From the *Settings* menu, select Communications , select the COM port, and set communication parameters as shown in Step 2, including no flow control

6) To verify that the scanner and the PC are communicating properly, send the following command from your PC keyboard to activate the scanner's buzzer.
   Send the command: <Escape> V5 <Carriage Return>
   Note: Be sure to use capital letters, e.g. "V5", not "v5".
   The buzzer should sound, indicating that good communications have been established

7) A red scanning light should be visible. If it is not visible, the scanner may be in a mode that requires a "Trigger" Command from the PC to activate it. You can exit that mode by sending the following command from your PC keyboard:
   <Escape> S7 <Carriage Return>

8) The "Trigger" mode will now be deactivated and the red scanner light will be continuously illuminated.

This Quick Start-Up procedure will get you started. However, to best understand the full capabilities of this scanner, you should read the complete manual.

Section 2
Technical Specifications

Physical Specifications

Case Material	Steel (Black)	
Dimensions	Side View	Front View
(LxHxW)	52 x 20 x 55 mm	47 x 20 x 55 mm
	(1.85 x 0.78 x 2.2 in)	(1.95 x 0.78 x 2.2 in)
Weight	100 g (3.5 ounces) w/o cable	
Cable Length	2.8 m (6 ft) with DB25 pin female connector	
Mounting	4 threaded (M-3) mounting holes (2 on each side) (not to extend more than 3 mm into the case)	

Symbologies Supported

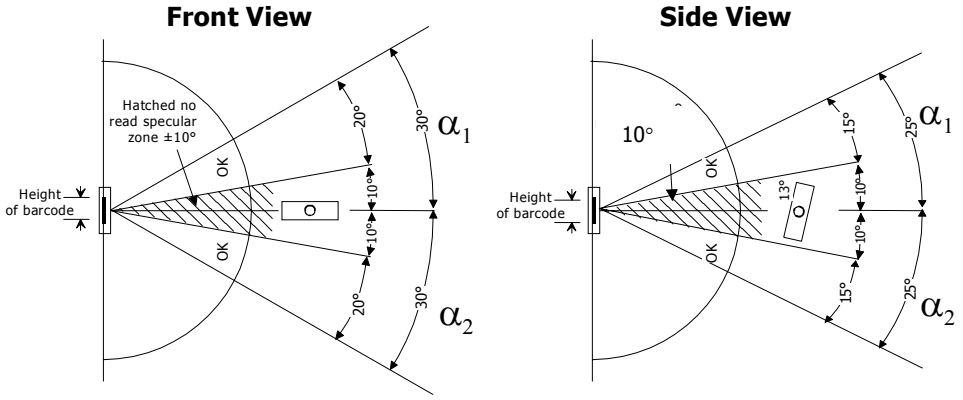
- Codabar (NW-7)
- Code 39
- Code 93
- Code 128
- Industrial 2 of 5

- Interleaved 2 of 5
- MSI / Plessey
- WPC (UPC / EAN / JAN)
- IATA

Optical Specifications

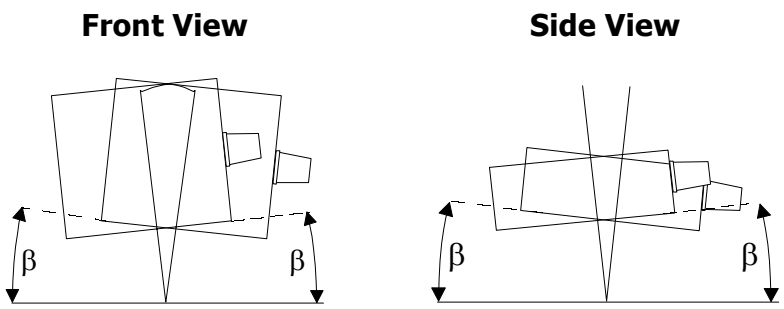
Scan Rate	700 scans per second ±10%	
Wavelength of LED Illumination	660 nanometers	
Read Sensor	CCD linear array	
Focal Distance	Side View	Front View
(nominal):	1.2 inches from window	1.4 inches from window
Narrow Bar Resolution	5.0 mil at 0.9 PCS	
Minimum PCS	0.45 (min. background reflectance of 70%)	

Pitch



Recommended operation at $10° \leq \alpha_1, \alpha_2 \leq 15°$.
Avoid specular reflection dead zone (hatched).

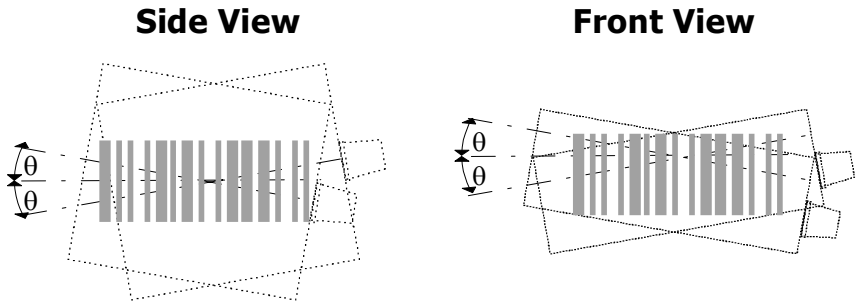
Skew



β = 0 to 6°
(h = 35.4 mm, α_2 = 10°,
θ = 0°, R = ∞)

β = 0 to 6°
(h = 31.4 mm, α_2 = 10°,
θ = 0°, R = ∞)

Tilt (Rotation)

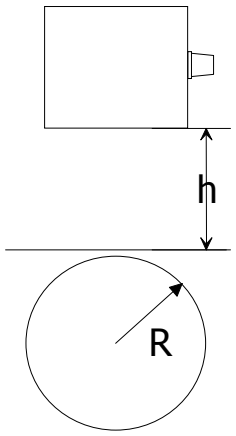


θ = 0 to 10°
(h = 31.4 mm, α_2 = 10°,
β = 0°, R = ∞)

θ = 0 to 10°
(h = 35.4 mm, α_2 = 10°,
β = 0°, R = ∞)

Note: Front View is LHA7127, Side View is LHA7126.

Curvature



JAN 13: R = 30 mm (1.2") or
JAN 8: R= 20 mm (0.8") or
Where: PCS 0.9, h = 35.4
$\alpha 2$ = 10°,$\beta = 0°$, θ= 0°

Electrical Specifications

Operating Voltage	+5VDC $\pm$ 5%
Current	
Operating	158 mA typical; 220 mA max.
Static	150 mA max.
Surge	3 A max.

RS232 Communications Specifications

RS232 Data Transmission Format

Parameter	Default	Optional Settings
Timing	Asynchronous	
No. of Start Bits	1 bit	
No. of Stop Bits	1 bit	1 or 2 bits
No of Data Bits	8 bit	7 or 8 bits
Parity	None	Odd / Even / None
Baud Rate	9600 baud	300 to 38,400 baud
Handshaking	None	Hardware / Software/ None

RS232 Transmit / Receive Character Format

TXD/ RXD	Start Bit	LSB	7 or 8 Data Bits	MSB	Parity Bit	Stop Bit

RS232 Data Format

Transmit	Decoded Data		CR
Receive	ESC	Command	CR
	STX	Command	ETX

RS232 Signal Level

Signal Name	In / Out	Mark/Off	Space/On
TXD	Out	-5 to -15	+5 to +15
RXD	In	-3 to -15	+3 to +15

Connector Pin-outs

DB25 pin Female connector with screws

Pin No.	Signal	Color	Direction
1	Frame Ground	Black	-
2	RXD	White	Input
3	TXD	Green	Output
4	CTS	Blue	Input
5	RTS	Gray	Output
7	Signal Ground	Purple	-
16	Trigger	Brown	Input
25	+5V	Red	-

Environmental Specifications

Temperature

Operating	0° to +40° C (+32 to +104° F)
Storage	-10° to +60° C (+14 to +140° F)

Humidity (non- condensing)

Operating	20 to 80%
Storage	20 to 90%

Ambient Light Fluorescent or incandescent: below 5 kilolux

Ordering Information

Part No.	**Model**
LHA7127RR1S-xxx*	Front View
LHA7126RR1S-xxx*	Side View

* Where "xxx" is configuration dependant.

Section 3
Positioning the Scanner

Achieving Optimum Performance

Three items greatly impact performance:

1) Distance (from the scan window) to the bar code
2) Specular Reflection; and
3) Quality of Bar Code Labels

1) Distance to the Bar Code

The operation of the scanner is similar to a camera. If you photograph an object that is out of focus, the resulting picture will be blurry. The same is true with the scanner. If the bar code label is out of focus, the scanner may have difficulty decoding what appears to be fuzzy bars and spaces.

Focal Distance

Ideally, the distance from the window of the scanner to the bar code label should be equal to the focal distance of the scanner. For the LHA7126/LHA7127 fixed position scanners, the nominal focal distances are:

Side View (LHA7126)	1.2 inches (31 mm)
Front View (LHA7127)	1.4 inches (35 mm)

Depth-of-Field

Just as with a camera, the scanner has a depth-of-field. It can read bar codes that are not precisely at the focal distance - maybe a little closer, or a little farther away. However, if the bar code label is positioned too far from the focal distance, the scanner may not be able to successfully decode it.

The depth-of-field varies based on the density of the bar code, i.e., the thickness of the bars. Very high density bar codes (which have very narrow bars) are readable over a much shorter distance range than low density bar codes with larger bars.

The following table shows the "typical" depth-of-field (closest to farthest reading distances) for the LHA7126/LHA7127 scanners. The actual performance may differ slightly from unit to unit. Also, it is important to note that this data was measured under ideal conditions using high quality bar code labels. In a "real world" environment the conditions will not be as ideal. Therefore, the best practice is to position the scanner at its focal distance rather than at the extremes of its depth-of-field.

Typical Reading Distance from Window
(Depth of Field)

	Front View		Side View	
Density of Bar Code	**Near Distance**	**Far Distance**	**Near Distance**	**Far Distance**
15 mil	0.6″	2.3″	0.3″	2.5″
10 mil	0.8″	2.2″	0.5″	2.0″
6 mil	1.1″	1.8″	0.7"	1.7"
4 mil	1.3″	1.65″	0.9″	1.4″

Readable Bar Code Width
(Field-of-View)

	Front View	Side View
Distance from Window	**Max. Width**	**Max. Width**
0.5″	2.0″	2.4″
1.0″	2.7″	3.1″
1.5″	3.4″	3.5″
2.0″	3.9″	3.9″
2.5″	4.5"	3.2"

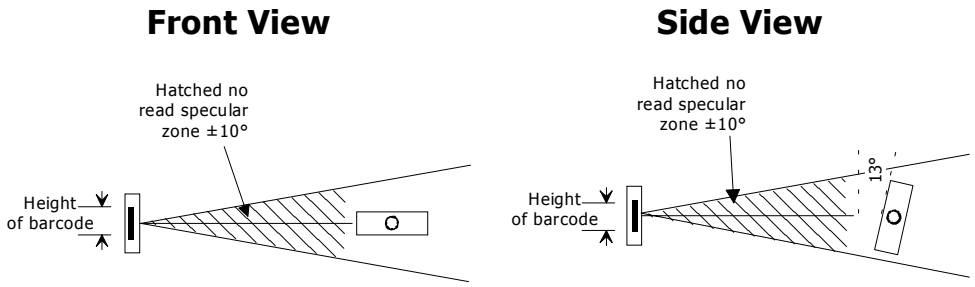
The table above shows the field-of-view at various distances from the window. The field-of-view is the maximum width that the scanner is capable of reading. A bar code label positioned anywhere within this field-of-view can be decoded. The field-of-view is also a measure of the widest bar code label that can be read. *Remember*: The width of a bar code label includes not only the bars and spaces but also the required white space (quiet zone) on each end.

Good design policy is to position the scanner at its focal distance and at the center of the field-of-view. Do not position it near the extremes of the reading range.

2) Avoiding Specular Reflection

Do not position the scanner at an angle that causes the LED illumination to be reflected directly back into the scanner. This is called specular reflection. Too much reflected light can "blind" the scanner preventing a good decode.

If the bar code label is located on a flat surface, specular reflectivity occurs between 0 to 10 degrees off perpendicular. (See diagram) If the bar code label is located on a cylindrical surface, such as a test tube, the angle of specular reflection is measured tangent to the curve. If the curved surface is also moving, there may be more than one position causing specular reflection. The following diagram indicates the area to avoid:



3) Quality Bar Code Labels

The quality of the bar code label can affect the scanning performance. Poor quality labels are more difficult to decode and may result in non-reads or potential misreads. The bar code label should be printed to specifications. This means that the bars are printed within spec, with the correct widths, no ink spread, crisps edges and no voids. There should be a sufficient quiet zone on both end of the bar code label. For best results, the paper or label stock should have a matte finish to diffuse light. The print contrast signal (which is a comparison of the reflectance of the bars and the background stock) should be as high as practical.

Measuring Scanner Performance

Two methods are helpful in determining the optimum position of the scanner. The first method is to program the scanner for Trigger Disable and Continuous Read modes. The scanner will be always on and will continuously read the same bar code. Since the buzzer sounds each time the bar code is read, the sound of the buzzer can be used like a "Geiger counter". As the position of the scanner changes the sound of the buzzer will change. The buzzer sound will be loudest and most continuous at the best reading positions.

The Read Rate Test

The second method, the Read Rate Test, provides a mathematical calculation of scanning performance. In this test the scanner scans a bar code 700 times and then calculates the number of those scans that resulted in a good decode. That number, expressed as a percentage, will be transmitted to the host. For example, 93% means that the scanner decoded the bar code symbol 93 times out of the 650 scan attempts. By performing the Read Rate Test with the scanner mounted in various positions you can determine which of those locations results in the best performance.

How to perform the Read Rate Test

Perform the following steps after you have correctly configured communications to the computer via your RS232C port and power is made available to the scanner:

Send the command: **<Escape> U8 <Carriage Return>** Note: Be sure to use capital letters, e.g. "U8", not "u8".

The scanner will read the barcode continuously and will display the ratio of the number of successful reads to the total number of attempts.

The printout on the screen will appear as follows:

(Example)

700d OK 93.5%
CODE-39 TEST

The number in the upper left indicates the number of times the decoder ran while scanning at 700 scans per second. The number can be lower than 700 when reading noisy barcodes. The upper right percentage indicates the ratio of the number of successful reads to the total number of attempts. By positioning the scanner at the optimal distance from the barcode with the correct orientation and with a grade-A quality barcode readings of 95% or higher are expected. Reset the scanner after testing.

Application Notes

Tips for Achieving High Throughput

In some applications your primary objective may be to achieve the highest possible throughput rate. The following list identifies the parameters and scanner settings that can maximize scanning and decode throughput speed. Note, by emphasizing maximum throughput, other areas of performance may be affected. For example, the number of non-reads could increase.

If high throughput is critical, consider some or all of these settings:

- Operate in the Trigger Disabled mode. Operation of the trigger can require as much as 200 msec before decoding begins, slowing down throughput rate.
- Only enable those symbologies that you will be decoding.
- Eliminate all suffixes and prefixes.
- Minimize the number of redundant reads required before transmitting data.
- Transmit the decoded data at the highest baud rate, 38,400 baud.
- Disable buzzer functions.

Tips for Insuring Highest Data Integrity

There are several parameters that can enhance your confidence that the correct bar code data is transmitted. Note that by emphasizing the accuracy and security of the data other areas of the scanner operation may be affected, for example, you may not achieve the highest throughput.

If accuracy and data integrity are critical, consider some or all of these settings:

- Program the scanner to require a high number of redundant decodes prior to transmitting. For example, program the scanner to decode a bar code exactly the same way three consecutive times before transmitting the data. Then decoding the bar code the same way 2 out of 3 times or any 3 out of 4 times is not sufficient. It must obtain three consecutive and identical decodes.
- Utilize a predetermined, fixed-length of bar code. Program the scanner to only decode a bar code of that length. Bar codes of any other length will be ignored.
- The quality of the printed bar code must be excellent.
- Use a bar code symbology that contains an internal check digit and program the scanner to calculate that check digit for validity prior to transmitting.
- Do not use a symbology with poor internal verification, or subject to partial decodes, such as 2 of 5 or MSI/Plessey.
- Only enable those symbologies that you will be decoding.
- Transmit data at low baud rates to minimize communication errors.

Enable the "Number of Characters Transmitted". The scanner will calculate and transmit a number indicating the total number of characters it is transmitting. Your host application program can compare this number with the actual number of characters received to verify that the correct amount of data is received.

Tips for Verifying the Presence of a Bar Code

If the scanner is operated in the "trigger enabled" mode and the trigger is activated, one of three conditions may occur:

A bar code is scanned and decoded.	Decoded data is transmitted
A bar code is scanned but is not decoded (e.g., print quality was poor)	No data is transmitted
No bar code is present	No data is transmitted

In some applications, when no data is transmitted, it may be important to know why. Was there a bar code present that could not be decoded, or was no bar code present at all?

This requirement is common in applications such as automated blood analysis equipment. Test tubes containing blood samples from many different people are loaded into a rack for automatic analysis. The bar code on each tube ties that sample and the results back to a specific individual. If no bar code data is transmitted it is critical to understand the reason.

Your Opticon scanner, when operated in the Trigger Enabled mode, can be programmed to transmit an error message which indicates whether or not a bar code was present. The following table shows the message that will be transmitted for each condition.

Presence/Absence of bar code	**Scanner Transmits**
Bar code was present and correctly decoded	Decoded Data
No bar code was present	<STX> "?" <ETX>
Bar code was present but could not be decoded	<STX> ">" <ETX>

Section 4
Configuring the Scanner

Since the operation of a LHA7126/LHA7127 scanner is microprocessor controlled, it is possible to modify or program its operation to match your specific application. Changes in parameter settings can be changed or programmed in two ways. (1) The first method employs specially designed programming bar codes which instruct the scanner to modify specific parameters. (2) The scanner can also be programmed by sending software instructions from the host PC to the scanner via the RS232 connection.

Programming Menus & Commands

Appendix A contains full instructions on how to configure the scanner as well as a complete listing of the computer commands and programming bar codes that are available to customize the scanner for your application.

Default Settings

When you modify or change any parameters, the scanner can be programmed to retain the new parameter in memory, even if power is interrupted or terminated. If for any reason, however, the scanner is instructed to "return all parameters to default settings," it will return to the U4 default settings. Default settings are indicated by a pointing hand symbol (☜) throughout the menus to follow.

To restore the "out-of-the-box" settings shown in the following table, use the U4 setting.

Parameter	**"Out-of-the-Box" Setting (U4)**
RS 232 Communications	9600 baud 8 data bits 1 stop bit No parity No handshaking
Scan Rate	700 Scans/Second
Trigger Function	Disabled Scanner Timeout 2 Seconds After Triggering
Read Mode	Multiple Read Mode
Redundant Decodes	Read Barcode Twice
Bar Code Symbologies	WPC , 2 of 5 , NW-7 , Code 39 Code 93 , Code 128, IATA, MSI/Plessey
Buzzer	Maximum Volume After Decode 3kHz, 2kHz After Decode Duration 200 ms
Error Indications	No Bad Read
Good Read LED	After Decode 200 ms
Filter	Output From Low or High Gain

Section 5
Application Engineering Support

Technical Assistance and Support

Opticon is eager to help you integrate the LHA7126/LHA7127 scanner into your application. Our technical support staff is available to answer any questions or work with you to adapt the scanner to your specific situation. We are happy to answer your questions, assist in configuring and positioning the scanner for optimum operation, and help resolve any problems you encounter. Call us at 1 (800) 636-0090.

Common Causes of Poor Performance

The most common reasons for poor scanning performance are listed below:

- Bar codes are not positioned at the focal distance of the scanner.
- Specular reflection is impacting the scanner. Change the angle/position of the scanner or the bar code.
- Poor quality of printed bar codes. Bar codes are out of specification.
- The paper on which the bar code is printed is highly reflective or has a glossy finish causing light to be reflected into the scanner.
- The distance from the scanner to the bar code is not suitable for the density of the bar code. Or the density of the bar code beyond the scanners capability. If the red illuminating light of the scanner is not on, the scanner may be in the "Trigger Enable" mode expecting a trigger signal.

Modified and/or Customized Scanners

Opticon will work with you to modify or customize scanners to match your requirements. Scanners can be modified in terms of connectors type, pin-outs, cable length, default settings, custom software and many other areas.

Opticon will modify scanners in our factory and ship you scanners that match your specific requirements. By incorporating your modifications directly into production scanners, you receive scanners tailored for your need. They can be used immediately without the need for further modification or rework.

Section 6
Scanner Servicing and Maintenance

The LHA7126/LHA7127 scanner contains no user adjustable or serviceable parts in the interior of the scanner. All product service must be performed by the Opticon Service Department in Orangeburg, NY. Opening the scanner will void the warranty and could expose the operator to LED light. The LED's are classified as a Class 1 LED Product per IEC 825-1 (1997).

⚠ CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous LED light exposure.

⚠ CAUTION: Class 1 LED power up to 15 mW in a 0.1ms pulse at 635-670 nm could be accessible in the interior.

The LHA7126/LHA7127 is warranted for 5 years including parts and workmanship. If you need warranty or out-of-warranty repair, first **call 1-800-636-0090** to obtain a **Returned Material Authorization (RMA)** number. You will be provided a number and shipping instructions.

There is no scheduled maintenance required for the LHA7126/LHA7127. The scanner can be cleaned using a water dampened, lint free or lens cloth. Be careful to avoid excessive moisture that would penetrate the housing or obscure the window. While use of cleaning fluids other than water are not recommended, a neutral detergent or ethanol would be preferred if necessary. Do not use bleach at full or diluted strength as damage to the painted case and/or window may result.

Appendix A
Programming Menus & Commands

Index

1. Global Default & Scanner Configurations

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
1Y	Clear all prefixes	
1Z	Clear all suffixes	
P6	Disable Graph Mode	
P9	Enable Graph Mode	
U0	Scanner Test Mode	
U3	Straight Across Scan Mode	
U4	Return to Default Settings	 ☜
U8	Read Rate Mode	
U9	Graph Mode (TBD)	

CONTINUED ON NEXT PAGE...

1. Global Default & Scanner Configurations (continued)

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
Z1	Reset all values set by command	
Z2	Save all values set by command (not lost upon power off)	
Z3	Display software settings and version number	
Z4	Display prefix/suffix value length (expressed in hexadecimal format)	

Note: Where computer commands appear in parenthesis, bar code commands must be used to program the scanner.

Note: Scanner default settings are indicated by a pointing hand (☜) symbol throughout the menus to follow.

* Use Z2 (Save all values set by command) after computer command to store settings in memory prior to power off.

U4 Command (U4) - The U4 command resets all parameters for an established set of defaults defined as follows:

- Discriminates the following symbologies: WPC (UPC, EAN, JAN), I 2 of 5, NW-7 (Codabar), Code 39, Code 128, Code 93, MSI/Plessey and IATA.
- No fixed number of digits defined (32 digits maximum).
- Normal scan, Multiple read.
- Low or high analog gain.
- Small and large.
- No verification, no "Bad Read (BR)".
- Buzzer 3KHz and 2KHz, volume maximum
- Buzzer after decoding (200 ms).
- Good LED after decoding (green 200 ms).
- RS232C (9600 bps, 8, 1, np, no handshaking).
- LED ON – Trigger disabled

Scanner Test Mode (U0) - This mode resets all unit parameters to a predefined set of defaults for the purpose of putting the scanner into a test mode which reads barcodes continuously. The predefined defaults are the following:

- Reads all barcodes by symbology
- No fixed number of digits defined (32 digits minimum).
- Normal scan, continuous scan.
- Large only.
- No verification, no "Bad Read (BR)".
- Buzzer 3KHz, volume maximum.
- Buzzer after decoding (10 ms).
- Good LED after decoding (green, 100 ms).
- RS232C (9600 bps, 8, 1, np, no handshaking).

Straight Across Scan Mode (U3) - This mode resets all unit parameters to a predefined defaults for the purpose of allowing straight across scanning of up to 4 labels. The predefined defaults are the following:

- Reads all barcodes by symbology.
- No fixed number of digits defined (32 digits max.)
- Normal scan, multiple scan.
- Trigger disable.
- Small and large.
- No verification, no "Bad Read (BR)".
- Buzzer 3KHz and 2KHz, volume max.
- Buzzer after decoding (200 ms).
- Good LED after decoding (green, 200 ms).
- RS232C (9600 bps, 8, 1, np, no handshaking).

Read Rate Mode (U8) - This mode resets all unit parameters to a predefined set of defaults for the purpose of checking the scanner read rate. When activated, the test result is sent via RS232C and indicates the ration of the number of successful read to the total number of attempts. The test result is reported in the following format:

700 d OK: 93.5%
CODE-39 TEST

Where:

- 700d indicates the number of times the decoder ran while scanning at 700 scans per second (the number can be lower than 700 with poor quality barcodes).
- 93.5% indicates the percentage of good reads to total attempts. T
- The control character to be output is CR (0DE carriage return line fed), "ESC[3A" (cursor 3 line UP).

The predefined defaults are the following:

- Reads all barcodes by symbology.
- No fixed number of digits defined (32 digits max.).
- Normal scan, multiple scan.
- Trigger disabled.
- Small and large.
- Buzzer 3 KHz, volume max.)
- Buzzer after decoding (10 ms).
- Good LED after decoding (green 100 ms)
- RS232C (9600 bps, 8, 1, np, no handshaking).

2. Symbology Selection

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
A0	Enable all bar code symbologies	 ☜
A1	Only WPC (including Addon)	
A2	Only Code 39	
A3	Only Codabar (NW-7)	
A4	Only 2 of 5 (Industrial or Interleaved)	
A5	Only Code 93	
A6	Only Code 128	
A7	Only MSI/Plessey	
A8	Only IATA	
J1	Only UPC (A/E)	
J2	Only UPC (A/E)+2	
J3	Only UPC (A/E)+5	
J4	Only EAN	
J5	Only EAN +2	

CONTINUED ON NEXT PAGE…

2. Symbology Selection (continued)

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
J6	Only EAN +5	
J7	Only Industrial 2 of 5	
J8	Only Interleaved 2 of 5	
Z9	Remote Menu	

3. Add/Activate Specific Bar Code Symbologies

Computer Command	Function /Description	Bar Code Command	
(Z7)	START/END Programming Menu		
B1	Enable all WPC (including Addon)		☜
B2	Enable Code 39		☜
B3	Enable Codabar (NW-7)		☜
B4	Enable 2 of 5 (Industrial/Interleaved)		☜
B5	Enable Code 93 (Factory Set)		☜
B6	Enable Code 128 (Factory Set)		☜

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3. Add/Activate Specific Bar Code Symbologies (continued)

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
B7	Enable MSI/Plessey	 ☜
B8	Enable IATA	 ☜
R1	Enable UPC (A/E)	
R2	Enable UPC (A/E) +2	
R3	Enable UPC (A/E) +5	
R4	Enable EAN (13/8)	
R5	Enable EAN (13/8) +2	
R6	Enable EAN (13/8) +5	
R7	Enable Industrial 2 of 5	
R8	Enable Interleaved 2 of 5	

4. Delete/Deactivate Specific Bar Code Symbologies

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
4A	Disable all WPC (including Addon)	
4B	Disable UPC (A/E)	
4C	Disable UPC (A/E) +2	
4D	Disable UPC (A/E) +5	
4E	Disable EAN (13/8)	
4F	Disable EAN (13/8) +2	
4G	Disable EAN (13/8) +5	
4H	Disable Code 39	
4I	Disable Codabar (NW-7)	
4J	Disable 2 of 5 (Industrial/Interleaved)	
4K	Disable Industrial 2 of 5	
4L	Disable Interleaved 2 of 5	
4M	Disable Code 93	

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4. Delete/Deactivate Specific Bar Code Symbologies (continued)

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
4N	Disable Code 128	
4O	Disable MSI/Plessey	
4P	Disable IATA	
4Z	Disable all symbologies	

5. Options for UPC

Computer Command	Function /Description	Bar Code Command	
(Z7)	START/END Programming Menu		
E2	UPC-A (13 Digits) Add leading zero; Enable check digit		☜
E3	UPC-A (12 Digits) Do not add leading zero; Enable check digit		
E4	UPC-A (12 Digits) Add leading zero; Disable check digit		
E5	UPC-A (11 Digits) Do not add leading zero; Disable check digit		
E6	UPC-E (8 Digits) Add leading zero; Enable check digit		
E7	UPC-E (7 Digits) Do not add leading zero; Enable check digit		☜
E8	UPC-E (7 Digits) Add leading zero; Disable check digit		
E9	UPC-A (6 Digits) Do not add leading zero; Disable check digit		

6. Options for Code 39

Computer Command	Function /Description	Bar Code Command	
(Z7)	START/END Programming Menu		
7C	Enable 1 character (3 characters including start/stop characters)		
7D	Disable 1 character		☜
C0	Disable check digit calculation		☜
C1	Enable check digit calculation		
C2	Transmit check digit		☜
C3	Do not transmit check digit		
D0	Do not transmit start/stop characters (*……*)		
D1	Transmit start/stop characters (*……*)		☜

- 43 Data digits are available: 0 to 9, A to Z (caps only) plus . - $ / + % and space.
  If a check digit is present, it will appear as part of the data.
- If the scanner is programmed to calculate the check digit, and the bar code is not printed with a check digit, the bar code will not read.
- Another option available for Code 39 is to enable the reading of a single character bar code. See the section on Fixing the Digit for this option.

7. Options for Codabar (NW-7)

Computer Command	Function /Description	Bar Code Command	
(Z7)	START/END Programming Menu		
7K	Enable 1 character (3 characters including start/stop characters)		
7L	Disable 1 character		☜
F0	Do not transmit start/stop characters		
F1	Transmit start/stop characters as ABCD/TN*E		
F2	Transmit start/stop characters as abcd/tn*e		
F3	Transmit start/stop characters as ABCD/ABCD		
F4	Transmit start/stop characters as abcd/abcd		☜
F5	Transmit check digit		☜
F6	Do not transmit check digit		
F7	Do not calculate check digit		☜
F8	Calculate check digit (Modulo 10)		
F9	Calculate check digit (Modulo 16) (AIM specifications)		
FB	Calculate check digit (Modulo 7)		

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Codabar (NW-7) Format

Start Character	1 to 42 data digits	Check digit	Stop Character
A			. . . . T
a			. . . . t
A			. . . . A
a			. . . . a

- Codabar (NW-7) has four different start/stop character schemes as shown above. The check digit is optional and, if present, would be the last character.
- If the scanner is programmed to calculate the check digit and the bar code is not printed with a check digit, the bar code will not be read.

8. Options for 2 of 5

Computer Command	Function /Description	Bar Code Command	
(Z7)	START/END Programming Menu		
G0	Do not calculate check digit		☜
G1	Calculate check digit		
G2	Transmit Check digit		☜
G3	Do not transmit check digit		
7M	Enable 2 characters		
7N	Disable 2 characters		☜

2 of 5 Format (Standard and Interleaved)

1 to 44 data digits	CD
numeric only (0 to 9)	Check Digit

Opticon strongly recommends that the "Fixing the Number of Digits" featured on page 32 be employed whenever 2 of 5 bar codes are used.

9. Options for IATA

Computer Command	Function /Description	Bar Code Command	
(Z7)	START/END Programming Menu		
D2	Do not calculate check digit		☜
D3	Calculate check digit (CPN + Form + Serial)		
D4	Calculate check digit (Form + Serial)		
D5	Calculate check digit (All data)		
D6	Transmit check digit		☜
D7	Do not transmit check digit		

The IATA code is a variable length symbology with an optional check digit and non-printable start/stop characters. The following characters are supported: Digits 0 up to 9.

The checksum is calculated as the modulo seven of the data string. IATA is an acronym for International Air Transport Association.

String format	**CPN**	**AC**	**FC**	**SN**	**CD**
Meaning of Acronym	Coupon	Airline Code	Form Code	Serial Number	Check Digit
Number of digits (15 total)	1	3	2	8	1

- Enable check digit check
- Selection of the check digit calculation
- Disable transmission of the check digit

Check digit calculation: If the check digit calculation is required, then the appropriate calculation method must be selected.

10. Fixing the Number of Digits

Computer Command	Function /Description	Bar Code Command	
(Z7)	START/END Programming Menu		
7V	Enable fixation (1st Length)		
7W	Enable fixation (2nd Length)		
(H0)	Disable fixation		☜
H2	Disable 1 character Code 39 and Codabar (NW-7); Disable 2 characters 2 of 5		☜
H3	Enable 1 character Code 39 and Codabar (NW-7); Enable 2 characters 2 of 5		

To avoid truncation errors, the scanner can be programmed to only decode bar codes of one specific length, i.e., containing a specific number of digits. It is also possible to program the scanner to only decode bar codes of either of two specific lengths.

To fix one (1) length (or number of digits) of bar code:

1. Scan "START" to enter the programming mode
2. Scan "Enable fixation" bar code
3. Scan a sample bar code of the desired length
4. Repeat Step #3, re-scanning the sample bar code
5. Scan "STOP" to exit the programming mode

To fix two (2) different lengths of bar codes:

1. Scan "START" to enter the programming mode
2. Scan "Enable fixation" bar code
3. Scan a sample bar code of the desired length #1
4. Scan a sample bar code of the desired length #2
5. Scan "STOP" to exit the programming mode

NOTE: Fixation can also be programmed using computer commands through your RS232 by typing <ESC>7V<CR> followed by <+>2 digit length 1<CR>. 7W would be appropriate for length 2. Type<+>00<CR> to define either length as no fixed number.

"Fixing the Number of Digits" can only be applied to Code 39, Codabar (NW-7), 2 or 5 and MSI/Plessey. PC, Code 93, IATA and Code 128 are not affected.

11. Creating a Prefix and/or Suffix

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
1Y	Clear all Prefixes	
Z4	Display Prefix/Suffix value and length (expressed in hexidecimal format)	

The scanner can be programmed to transmit a prefix and/or suffix with the decoded data. A Prefix (or a Suffix) is composed of up to 4 characters. The following steps are used to establish a Prefix that will be transmitted with the bar code data:

1. Scan Start
2. Scan the bar code representing the symbology to which you wish to add a Prefix
3. Scan the character(s) that will comprise the Prefix. Up to four numeric, alpha or control character(s) may be used.
4. Scan "STOP" to exit the Programming Mode.

Example: To add the alpha character "A" as a Prefix and "B" as a Suffix to UPC-A bar code data:

1. Scan "START/END Programming Mode"
2. Scan N1, representing a Prefix for UPC-A
3. Scan 0A, representing the alpha character "A"
4. Scan N6, representing a Suffix for UPC-A
5. Scan 0B, representing the alpha character "B"
6. Scan "START/END Programming Mode"

The same steps are used to establish a Suffix.

12. Setting Prefixes (Identifying the Symbology)

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
1Y	Clear all Prefixes	
N1	UPC-A	
M0	UPC-A +2 or +5	
N2	UPC-E	
M1	UPC-E +2 or +5	
N3	EAN-13	
M2	EAN –13 +2 or +5	
N4	EAN-8	
M3	EAN-8 +2 or +5	
M4	Code 39	
M5	Codabar (NW-7)	
M6	Industrial 2 of 5	
M7	Interleaved 2 of 5	

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12. Setting Prefixes (Identifying the Symbology) (continued)

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
M8	Code 93	
M9	Code 128	
D8	IATA	
N0	MSI/Plessey	
Z4	Display Prefix/Suffix value and length (expressed in hexidecimal format)	

13. Setting Suffixes (Identifying the Symbology)

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
1Z	Clear all Suffixes	
N6	UPC-A	
O0	UPC-A +2 or +5	
N7	UPC-E	
O1	UPC-E +2 or +5	
N8	EAN-13	

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13. Setting Suffixes (Identifying the Symbology) (continued)

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
O2	EAN–13 +2 or +5	
N9	EAN-8	
O3	EAN-8 +2 or +5	
O4	Code 39	
O5	Codabar (NW-7)	
O6	Industrial 2 of 5	
O7	Interleaved 2 of 5	
O8	Code 93	
O9	Code 128	
D9	IATA	
N5	MSI/Plessey	
Z4	Display Suffix value and length	

NOTE: The global default, also clears all suffixes.

14. Direct Input of Numeric Characters

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
Q0	0	
Q1	1	
Q2	2	
Q3	3	
Q4	4	
Q5	5	
Q6	6	
Q7	7	
Q8	8	
Q9	9	
(Z7)	START/END Programming Menu	

15. Direct Input of Alpha Characters

(Z7)	START/END Program Menu	
0A	A	
0B	B	
0C	C	
0D	D	
0E	E	
0F	F	
0G	G	
0H	H	
0I	I	
0J	J	
0K	K	
0L	L	
0M	M	

0N	N	
0O	O	
0P	P	
0Q	Q	
0R	R	
0S	S	
0T	T	
0U	U	
0V	V	
0W	W	
0X	X	
0Y	Y	
0Z	Z	
(Z7)	START/END Program Menu	

16. Direct Input of Control Characters

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
1A	STX	
1B	ETX	
1C	CR	
1D	LF	

17. Enable Number of Characters/Digits Transmitted

This feature instructs the scanner to calculate and transmit a number indicating the total number of characters that are being transmitted to the host. This feature allows the host to verify that the correct amount of data was received.

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
3A	UPC-A	
3B	UPC-A +2 or +5	
3C	UPC-E	
3D	UPC-E +2 or +5	
3E	EAN-13	
3F	EAN-13 +2 or +5	

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17. Enable Number of Characters/Digits Transmitted (continued)

(Z7)	START/END Programming Menu	
3G	EAN-8	
3H	EAN-8 +2 or +5	
3I	Code 39	
3J	Codabar (NW-7)	
3K	Industrial 2 of 5	
3L	Interleaved 2 of 5	
3M	Code 93	
3N	Code 128	
3O	MSI/Plessey	
3P	IATA	
3Z	Transmit data length (all symbologies)	

18. Disable Number of Characters/Digits Transmitted

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
2A	UPC-A	
2B	UPC-A +2 or +5	
2C	UPC-E	
2D	UPC-E +2 or +5	
2E	EAN-13	
2F	EAN-13 +2 or +5	
2G	EAN-8	
2H	EAN-8 +2 or +5	
2I	Code 39	
2J	Codabar (NW-7)	
2K	Industrial 2 of 5	
2L	Interleaved 2 of 5	
2M	Code 93	

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18. Disable Number of Characters/Digits Transmitted (continued)

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
2N	Code 128	
2O	MSI/Plessey	
2P	IATA	
2Z	Do not transmit data length (all symbologies)	

19. Communication Parameters

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
K1	300 Baud *	
K2	600 Baud *	
K3	1,200 Baud *	
K4	2,400 Baud *	
K5	4,800 Baud *	
K6	9,600 Baud	

* Use Z2 Command after computer command to store settings in memory prior to power off.

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19. Communication Parameters (continued)

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
K7	19,200 Baud *	
K8	38,400 Baud *	
L0	7 Data Bits *	
L1	8 Data bits *	
L2	Parity = None	
L3	Parity = Even *	
L4	Parity = Odd *	
L5	1 Stop Bit *	
L6	2 Stop Bits *	

* Use Z2 Command after computer command to store settings in memory prior to power off.

20. Handshaking

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
I0	Wait for CTS from terminal = Unlimited	
I1	Wait for CTS from terminal = 100 mS	
I2	Wait for CTS from terminal = 200 mS	
I3	Wait for CTS from terminal = 400 mS	
I4	ACK/NAK Delay Time Unlimited	
I5	ACK/NAK Delay Time = 100 mS	
I6	ACK/NAK Delay Time = 500 mS	
I7	ACK/NAK Delay Time = 1000 mS	
P0	No Handshaking * (Factory Set)	 ☜
P1	Busy/Ready *	
P2	Modem *	
P3	ACK/NAK *	
P4	ACK or No response NAK *	
P5	No ACK/NAK *	

* Use Z2 Computer Command to store in memory prior to power off.

21. Buzzer Operation

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
T0	Volume = Maximum	 ☜
T1	Volume = Upper Mid-range	
T2	Volume = Lower Mid-range	
T3	Volume = Minimum	
V5	Ring buzzer once at 3kHz for 200 mS	
V6	Ring buzzer once at 3kHz, 2kHz interval for 200 mS	
V7	Ring buzzer once at 2kHz, 3kHz interval for 200 mS	
W0	Disable buzzer	
W1	Enable buzzer at 3kHz	
W2	Enable buzzer at 3kHz with 2.5kHz interval	 ☜
W3	Enable buzzer at 2kHz with 3kHz interval	
W4	Buzzer duration 0.10 sec	

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21. Buzzer Operation (continued)

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
W5	Buzzer duration 0.20 sec	 ☜
W6	Buzzer duration 0.40 sec	
W7	Buzzer duration 0.05 sec	
W8	Buzzer duration 0.01 sec	

22. Positive & Negative Bar Codes

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
V2	Positive bar code only (black bars/white spaces)	
V4	Both positive & negative bar code	

23. Setting the Trigger Function

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
S7	Disable the trigger function / Red scanning light is ON continuously (Factory Set)	 ☜
S8	Enable the trigger function /Red scanning light is OFF until trigger is activated or "pulled"	
Z	Activate the trigger; turns on the red scanning light	Use Computer Command

The Trigger function is disabled in the default setting. This means that the red scanning light is "ON" continuously and the scanner is always ready to read. For some applications, you may wish to activate the scanner only at a specific time. This can be done by enabling the Trigger function. Once in the "Trigger Enabled" mode, the red scanning light is OFF until the trigger is activated or "pulled." Either a hardware trigger or a software trigger pulse may be used to activate the scanner.

The hardware trigger is actuated by pulling Pin #16 (on the standard DB25 female connector) LOW. The software trigger is actuated by downloading and <ESC> Z <CR> computer command from the host. (See Scanner Timeout to establish the length of time the scanning light remains ON after the trigger is activated.)

24. Selecting the Read Mode

Computer Command	Function /Description	Bar Code Command	
(Z7)	START/END Programming Menu		
S0	Single Read Mode (Trigger enabled mode only)		
S1	Multiple Read Mode		☜
S2	Continuous Read Mode		
7E	Scan 2 labels straight across		
7F	Scan 3 labels straight across		
7G	Scan 4 labels straight across		
7H	Does not allow first bar distortion		
7I	Allow first bar distortion *		
7O	Normal Scan		☜
7P	Slanted Scan		
7Y	Regular expression up to 5 labels		

* Relaxes tolerance on first bar, increasing to 8x narrow bar width on first bar. Decoding time may be increased.

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24. Selecting the Read Mode (continued)

The operation of the scanner in the various read modes is described in the table below. The "Continuous Read" mode is helpful in positioning the scanner for optimum reading. In "Continuous Read," the scanner's buzzer functions like a Geiger counter, sounding the most active at the position achieving the greatest number of good reads.

Mode	Trigger Function Enabled	Trigger Function Disabled
Multiple Read	After receiving a trigger pulse, scanner will read multiple, different bar codes in succession until it times out.	Scanner will read different bar codes in succession if they are presented to the read window.
	Scanner will not read the same bar code twice if they are consecutive.	Scanner will not read the same bar code twice if they are consecutive.
Continuous Read	Scanner will read the same bar code continuously after receiving a trigger pulse until scanner times out.	Scanner will read the same bar code continuously.
Single Read	Scanner will read only one bar code after receiving a trigger pulse.	Same as Multiple Read mode, above.

25. Scanner Timeout (Trigger Enabled Mode only)

These commands, which are only applicable in the Trigger Enabled mode, establish the time-out period after the trigger pulse is received. The Time-out period is the same whether the scanner is operating in Single, Multiple or Continuous Read mode.

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
Y0	Trigger remains ON as long as trigger is pulled (hardware trigger only)	
Y1	1 Second after triggering	
Y2	2 Seconds after triggering	 ☜
Y3	3 Seconds after triggering	
Y4	4 Seconds after triggering	
Y5	6 Seconds after triggering	
Y6	8 Seconds after triggering	
Y7	10 Seconds after triggering	

26. Redundant Decoding

The Number of Redundant Decodes determines how many times the scanner must decode a bar code and obtain the same value before it will transmit the data. For example, if the redundancy is set at three times, the scanner will not transmit data until it has decoded the bar code and obtained the same values three times in succession. If it obtains the same value twice in a row, but a different value on the third read attempt, it will not transmit. If it gets the same value three out of four times, it will not transmit. It must receive three consecutive, identical reads.

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
X0	Read bar code once	
X1	Read bar code twice	 ☜
X2	Read bar code three times	
X3	Read bar code four times	
7R	Read bar code five times	
7S	Read bar code six times	

27. Transmitting Error Indications (Trigger Enabled only)

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
5E	Do not transmit error code	 ☜
5F	Transmit "BR" <CR> for bad read or no read	
5G	Transmit <STX>">"<ETX> for bad read; <STX>"?"<ETX> for no read	
5H	Transmit ">"<CR> for bad read Transmit "?"<CR> for no read	
5I	Transmit "CAN"<CR> for bad read or no read	
5J	Transmit <STX>"CAN"<ETX> for bad read or no read	

28. Print Quality Adjustments

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
X4	For lower density, poor print quality bar code, e.g., dot matrix with voids (low analog gain)	
X5	For high density, good print quality bar code without voids (high analog gain)	
X6	Output data obtained from Low or High analog gain	 ☜
X7	Output data obtained from Low and High analog gain	

29. LED Operation

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
T4	Good read LED disabled after decode	
T8	Good read LED ON after decode for .10 seconds	
T5	Good read LED ON after decode for .20 seconds	 ☜
T6	Good read LED ON after decode for .40 seconds	
T7	Good read LED ON after decode for .80 seconds	
V0	LED ON Red for .40 seconds	
V1	LED ON Red for .80 seconds	
V8	LED ON Green for .40 seconds	
V9	LED ON Green for .80 seconds	

30. Sequencer Controls

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
8A	Trigger Input (sync signal positive logic) High active	
8B	Trigger Input (sync signal negative logic) Low Active	 ☜
8C	Sequencer output synchronous transmission *	 ☜
8D	Sequencer output synchronous transmission * (negative – true logic)	
8E	Sequencer output one-shot transmission *	
8F	Sequencer output one-shot transmission * (negative – true logic)	
8G	Sequencer output one-shot duration 10 mS	
8H	Sequencer output one-shot duration 20 mS	
8I	Sequencer output one-shot duration 30 mS	
8J	Sequencer output one-shot duration 40 mS	
8K	Sequencer output one-shot duration 50 mS	
8L	Sequencer output one-shot duration 60 mS	

* Use Z2 computer command to store in memory prior to power off.

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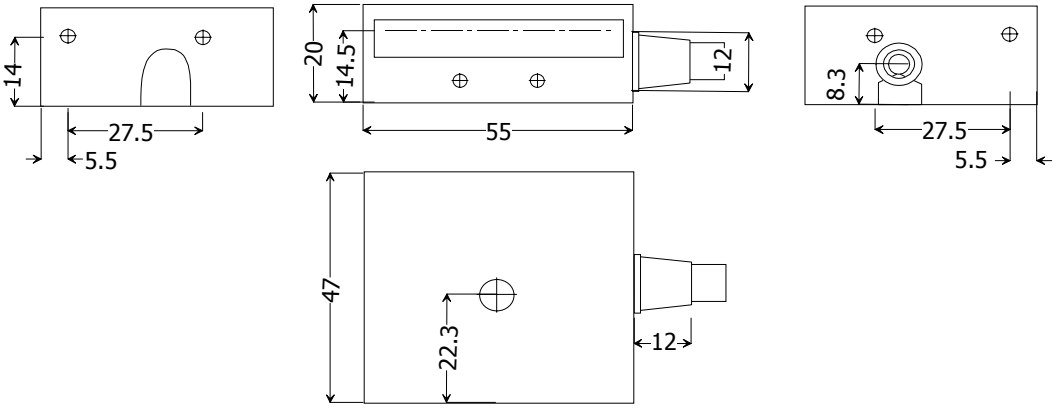
30. Sequencer Controls

Computer Command	Function /Description	Bar Code Command
(Z7)	START/END Programming Menu	
8M	Sequencer output one-shot duration 70 mS	
8N	Sequencer output one-shot duration 80 mS	
8O	Sequencer output one-shot duration 90 mS	
8P	Sequencer output one-shot duration 100 mS	 ☜
8Q	Outputs sequencer *	
8R	Does not output sequencer *	

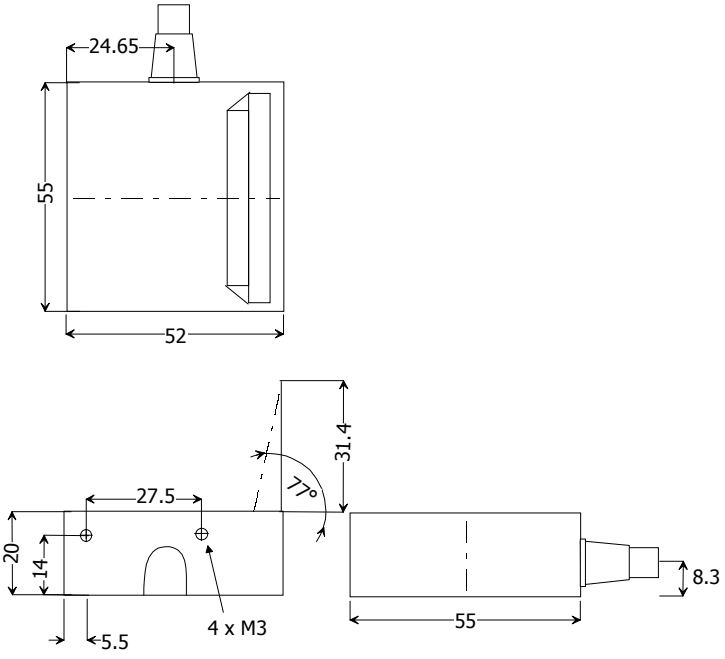
* Use Z2 computer command to store in memory prior to power off.

Appendix B
Dimensional Drawings

Front View



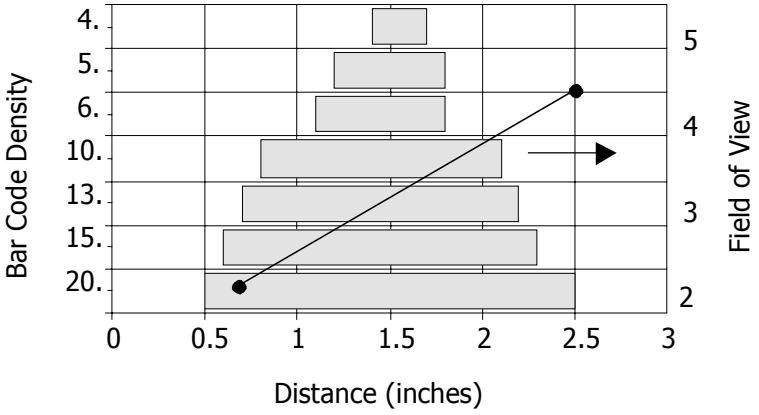
Side View



Note: To prevent infiltration of dust or other contaminants into the scanner through the mounting holes provided in the unit's case, short screws (M3-6) may be placed in each hole location. The shafts must not penetrate into the case further than 0.25 inches (6mm).

Appendix C
Optical Performance Charts

Front View



Side View