Laser Inspector

Model L1000™

Operator's Guide

Manual P/N 002-5568
Release Version: G
June 2011

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Reference RJS P/N 002-5568 Revision G (June 2011)
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1.0 Preface

1.1 Proprietary Statement

The RJS Model L1000 Laser Inspector™ Operator's Guide contains proprietary information of RJS. It is intended solely for the use of parties operating and maintaining the equipment described herein. This information may not be used, reproduced, or disclosed to any other parties for any other purpose without the express written permission of RJS.

1.2 Statement of FCC Compliance: USA

The equipment described in this manual has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide a reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this operator's manual, may cause harmful interference to radio communications. Operating this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the problem at his own expense.

1.3 Statement of FCC Compliance: Canada

This Class A digital apparatus meets all requirements of the Canadian interference-Causing Equipment Regulations.

Cet appareil numénque de la classe A respecte toutes les exigences du Règlement sur le maténel brouilleur du Canada.

1.4 CE:

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this operator's manual, may cause harmful interference to radio communications. Operating this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the problem at his own expense.

1.5 Documentation Updates

RJS strives to provide the best possible documentation. This manual, or any of our manuals, may be updated without notice.

1.6 Copyrights

The copyrights in this manual are owned by RJS. All rights are reserved. Unauthorized reproduction of this manual or unauthorized use of the software may result in imprisonment of up to one year and fines of up to $10,000 (17 U.S.C.506). Copyright violations may be subject to civil liability.

1.7 Unpacking and Inspection

Carefully unpack the components and **save the container**. If the container is crushed, punctured or water damaged save the container to prove a claim against the carrier. RJS is not responsible for transportation damage.

Your Laser Inspector is packaged in a custom made container. After removing the unit from the shipping box make sure you have:

- Main display unit
- Laser gun
- Alkaline size AA batteries (4)
- Operator's manual
- Bar code "test" symbol sheet

1.8 Installing Batteries

Slide open the plastic cover on the back of the unit. Position the cloth battery "pull strip" down then insert 4 (included) batteries according to the positive/negative markings.

Note: If all 4 batteries are inadvertently installed backwards, the inspector unit will be damaged.

Remove batteries when the unit will not be used for a period of weeks. Also, remove batteries when storing the unit.

Warning: Never charge alkaline batteries—this will damage the unit.

1.9 Technical Support

Please read the manual and try to understand it, first.

If you need assistance over the phone, please have the following information ready:

- Model and serial number of your unit
- Do you have a maintenance contract in effect
- Have a test print available if applicable
- Detailed explanation of the problem or question
- Your company's phone and fax numbers

RJS
701 Decatur Avenue North
Suite 107
Minneapolis, MN 55427
(763) 746-8034 - phone

2.0 Warranty

2.1 General Warranty

Warranty information: (763) 746-8034

RJS warrants your L1000 Laser Inspector™ to be free from defects in material and workmanship for a period of 1 year from the date of shipment from RJS' factory location.

The liability of RJS under this warranty is limited to repairing or replacing the defective part and/or unit. RJS may optionally choose to issue credit for any unit returned during the warranty period.

You must promptly notify RJS of any defect in order to receive the full protection of this warranty.

2.2 Warranty Limitations

The warranty set forth above is exclusive and no other warranty, whether written or oral is expressed or implied. RJS specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

Some states or provinces do not allow limitation on how long an implied warranty lasts, so the above limitation or exclusion may not apply to you. However, any implied warranty of merchantability or fitness is limited to the one year duration of this written warranty.

RJS shall in no event be liable for any indirect, incidental, or consequential damages, including but not limited to damages which may arise from loss of anticipated profits or production delivery delays, spoilage of material, increased costs of operation of business or otherwise.

2.3 Service During The Warranty Period

If your Laser Inspector should fail during the warranty period, contact RJS or its authorized representative immediately upon discovery of the defect. A Return Authorization Number (RMA number) may be obtained by visiting our website address: http://www.rjs1.com/request_rma.php

You will be asked to ship the product in its original packing, freight prepaid, with the RMA number visibly written on the outside of the carton to RJS' factory location.

Be sure to include any samples or printouts or other information that will help us to understand the problem. Your repair will be given priority treatment, or your unit may be replaced at RJS' option. The repaired item will be returned UPS/RPS ground, freight prepaid.

At your request we will ship express or overnight if you need premium service and agree to pay the additional cost.

2.4 Trademarks

The following are trademarks of RJS:

- RJS
- RJS Systems International
- Inspector
- Laser Inspector Model L1000

3.0 Introduction

3.1 Warnings

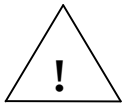
- Do not point the laser gun in the direction of the eyes so that the light beam emitted by the unit strikes the eyes directly—this could result in eye damage.
- Keep the unit and gun away from a water source such as a faucet—this could short the unit and cause injury.
- Users of the verifier (unit and gun) are not authorized to open case(s) or in any way modify circuitry.
- The following caution labels should already be on the laser gun (and **must** remain on the laser gun):

LASER LIGHT - DO NOT STARE INTO BEAM
EMITTED WAVELENGTH 630-680nm
MAX. OUTPUT RADITATION 1.0mW
CLASS 2 LASER PRODUCT
EN 60825-1:2007

This product complies with 21 CFR Subchapter J
CLASS 2 LASER LIGHT WHEN OPEN
AVOID EXPOSURE - LASER LIGHT IS
EMITTED FROM THIS APERTURE
DO NOT STARE INTO BEAM

If a caution label(s) with equivalent information as shown on the examples to the right are not on the laser gun, notify RJS at once.

This equipment complies with the requirements in part 15 of FCC rules for a class A computing device. Operation of this equipment in a residential area may cause interference in radio and TV reception, requiring the operator to take whatever steps are necessary to correct the interference.
Class II laser product.
This product conforms to DHMS regulation 21 CFR subchapter J for use with listed class II EDP equipment



3.2 Maintenance

To ensure the best possible scanning conditions, keep the laser window and display clean. Use a soft, damp, lint-free cloth to clean scanner window.

Do not use solvents on the unit or on any of the components. You may use alcohol to clean the unit.

Temperature Specs

Do not operate or store your unit or components in temperatures outside the range of 50° - 105°. Do not operate or store your unit in conditions of high humidity—over 80%.

3.3 Laser Inspector Description and Features

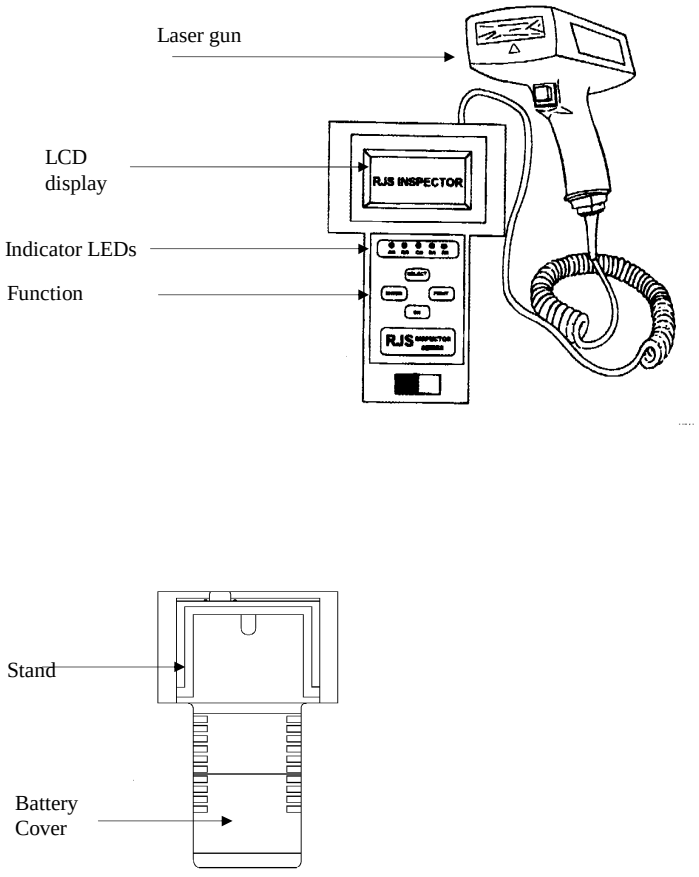
The Model L1000 Laser Inspectors are advanced technology barcode verifiers that make it easy to decode barcode symbols and to evaluate symbol compliance with industry specifications. The Model L1000 emits a very precise laser light that provides very accurate scan analysis; these units do not, however, provide PCS analysis. See *Figure 4-1 (Laser Inspector).*

Features

- Automatic power-on by pressing trigger
- Automatic power-down after short period of disuse
- Automatic print mode
- Database lookup function
- Can scan curved surfaces
- Barcode symbol data and deviation displays
- Visual and audible signals
- Low battery indicator
- Store and print capabilities
- Multiple scan averaging
- Auto-discriminates between many different symbologies
- Serial interface permits analysis data to be printed on an optional RJS portable printer

4.0 The Laser Inspector

Figure 4-1 (Laser Inspector—Model L1000)



5.0 Main Menu Selections

Note: Even though your Inspector may have a 4 row display, only 2 are currently used and only 2 are shown in the examples.

After turning on the unit, the "Ready Menu" will display:

L1000 Rev. X.XX
Ready

X.XX Current Revisions of Software

Press **Enter** and **Select** at the same time to bring up the Main Menu:

SCAN SETUP
DATABASE/STORAGE

Note: For all menu displays, toggle through the choices by pressing **Select**. Accept the selection by pressing **Enter**.

5.1 Scan

Select **Scan** (from the Main Menu) to display the initial Pass/Fail Analysis screen for the previously scanned barcode.

Note: A barcode can be scanned at any time except when the unit is printing.

Note: When scanning any barcode, the surrounding background should be the same color as the barcode background. **For example**, if your scan is picking up part of a dark table top, slip a white piece of paper under the bar code to assure a good read.

5.2 Setup

Select **Setup** (from the Main Menu) to set various system parameters:

D/bility Warning
D

Select an ANSI decodability grade to use in your analysis (See *Appendix G* for an explanation of the grades.)

A warning message will be produced for the selected grade or any lower grades:

B C D F NONE

- Press **Select** to scroll the choices for warning threshold grade
- Press **Enter** to initiate processing for that option

If **NONE** is selected, the decodability grade will not be used to trigger a warning message. However, the decodability grade will be calculated and available for viewing.

The next selection allows selection from a range of UPC/EAN symbol magnifications:

UPC/EAN tol.
90 - 115% Mag.

The magnifications selections are:
(See *Appendix D* for an explanation of magnifications.)

80 - 89 % Mag
90 - 115 % Mag
116 - 150 % Mag
151 - 200 % Mag

The next selection is;

UPC/EAN Rnd. Wt. **OFF**

Note: Select *ON* to activate UPC/EAN random weight check digit calculations. *(See Appendix F)*

- Press **Select** to scroll the choices
- Press **Enter** to initiate processing for that option

The next selection is Decode 3of 9 as:

Decode 3of 9 as **ANSI 3of 9**

This selection is for choosing the Code 39 sub-specifications to be analyzed:

ANSI 3 of 9
3of9 w/43
AIAG B-1
AIAG B-3/4/5
LOGMARS
HIBC 3 of 9

The next selection is:

Decode I 2of 5 **ANSI I 2 of 5**

This allows a selection from 2 types of Interleaved 2 of 5:

ANSI I 2 of 5
Case Code

The next selection is:

Auto Print Mode **Off**

Note: Select *ON* to activate the automatic printing mode; analysis data will print after each scan and the LCD will display "Printing Scan Analysis." (See *Appendix E*)

The next selection is:

Printer Type **TP140**

Selections are: TP40, TP140, or Computer.

The next selection is :

Database Storage
XX kb XX kb

Enter the percentages. (See the following note.)

Note: **Storage** and **Database** buffers are two separate areas but each shares a total of 20K of memory. For example, if 5K of memory is used for Storage, the Database buffer will have 15K. If 15K of memory is used by the Database, Storage will have 5K. Allocations are made in blocks of 5K.

The next selection is:

Scans/Analysis
XXXXX

From this screen choose the number of scans (from 2 to 10) to be used in the analysis. Or Select "Single" for a single scan, or "Continuous" for continuous scanning.

See *8.1 Continuous and Multi-scan modes*

The last menu setup selection is:

Comparison Mode OFF

Note: Comparison Mode is not accessed if "Continuous" scans/analysis mode is enabled.

Selecting *ON* in the Comparison Mode causes the next scanned symbol to be the "target." A "No Match" will display when subsequent symbols do not match the "target."

To generate a new "target" while remaining in the Comparison Mode, toggle the Comparison Mode selection to *OFF* and then to *ON* again.

When all Setup selections have been made, the Laser Inspector will navigate back to the Main Menu automatically.

Note: All setup parameters are retained in non-volatile memory and will be saved until changed by you—even after the power is turned off.

5.3 Storage

Storage is used to hold scan data for future print or review. Up to approximately 75 barcodes may be held in storage.

From the main menu press **Enter** and **Select** at the same time the following will be displayed.

Scan Setup
Database/Storage

Select Database and press **Enter**

The display will show either "Storage Inactive" or "Storage %."

Database Empty
Storage Inactive

- Store and Print is inactive

Scan Setup
Storage XX%

- Store and Print is active
- If a % is displayed, it represents the percentage of the buffer that is filled with scan data.

You may enable or disable **Store and Print** by pressing **Enter** with the cursor on Storage. (Toggle from one option to the other.)

When Storage is active, press **Select** to move the cursor to the % sign. Press **Enter** on the % sign to clear the Store and Print buffer.

5.4 Storage and Database

A special serial interface cable that connects to your personal computer is available (Part Number 002-2979).

The **Database** function is used to validate barcode data or compare barcode data to a pre-defined description that is placed into the database. When using the Database function the barcodes that are scanned must be in the database on the L1000; otherwise, the following message will display (unless the database function is turned off):

Data Base Record
Does Not Exist

The Model L1000 contains 20K of memory that is used by Storage and the Database. All or part of this 20K can be used by the Database (the remainder is used as Storage).

With the L1000, a database file can be created on a PC. The file consists of barcode data and display messages (described later in this section). Download this database (using a serial communication port) from the PC to the Inspector unit. Scans may then be performed.

As a barcode is scanned, the Inspector unit's database is searched for a match. When a match is found, the message from the database (that was previously entered) will display along with the verification analysis.

The **Storage** function is used to hold barcode data, to be printed or reviewed later. Up to approximately 75 barcodes may be held in storage.

Please note that **Database** and **Storage** percentages are allocated in the **Setup** menus explained in a previous section.

The **database** function is defaulted to *OFF* and becomes active when data is placed in the database. The storage function is activated or deactivated in the Database/Storage menus explained in this section.

SCAN SETUP
DATABASE/STORAGE

- Press **Select** until the cursor is on the Database/Storage option
- Press **Enter** to initiate the option

Database XX
Storage YY

The cursor will be on the "D" in **database**.

The "Xs" in the above sample represent one of the following displays for the **database**:
- **EMPTY** (There is no data in the database buffer)
- **XX%** (Percentage of active **database** buffer that is filled, 0 - 99%)

The "Ys" in the above sample represent one of the following displays for **storage**:
- **Inactive** (Store and Print buffer not enabled)
- **YY%** (Percentage of active **storage** buffer that is filled, 0 - 99%)
- **0 KB** (No storage was reserved in the Setup procedure)

With the cursor on **Storage**, press **Enter** to toggle the Storage function between enabled and disabled.

When **Storage** is activated, by pressing **Select**, the cursor will position to the percentage sign (%). To **clear the storage buffer**, press **Enter** with the cursor on the % sign—00% will display. (Press **Enter** again if you cleared the buffer by mistake.)

Press **Select** again to return to the Main Menu.

Note: For an explanation about printing the contents of the Store and Print buffer See *Appendix E.*

Note: Deactivating the database function does not alter the contents of the database buffer. See *Appendix J (Downloading Data).*

6.0 Scanning Symbols

To scan a barcode simply pull the trigger and position the beam across the symbol. A crisp, clear chirp (or beep) sound will indicate a good read. See *Appendix H* for details.

Decoded data and symbology type will display:

01928374 **ANSI I 2 of 5**

Press **Enter** to navigate to the Pass/Fail Analysis screen, then begin pressing **Select** to scroll through the analysis screens.

ANSI I 2 of 5 **Acceptable**

(See *Pass/Fail Analysis Screen* section)

7.0 Pass/Fail Analysis Screen

After a symbol is scanned the Pass/Fail Analysis Screen may be displayed. (See *6.0 Scanning Symbols*)

Note: Even though your Inspector may have a 4 row display, only 2 are currently used and only 2 are shown in the examples.

An example of an analysis screen for an acceptable symbol is shown below:

01928374
ANSI I 2 of 5

The upper row is the decoded data. (If more than 16 characters are present, those characters will wrap to the next row of the display.) Press **Select** to scroll through the data.

If the symbology code is 128 or 93, only printable characters will be displayed. See *Appendices A and B* for descriptions of how these codes are displayed.

The lower row provides the following:

- Symbology type (if symbol acceptable) See *Table 1*.
- Symbology type and warning or rejected message (if symbol not acceptable) See *Table 2*.
- Scans remaining in multiple scan mode if the last scan has not been completed.

Table 1 (Code Identifiers Laser Inspector)

Displays	Type
LOGMARS	Code 39 Symbology
AIAG B-1	Code 39 symbology
AIAG B 3/4/5	Code 39 symbology
ANSI 3 of 9	Code 39 symbology (AIM Spec.)
HIBC 3 of 9	Code 39 symbology
3 of 9 w/43	Code 39 symbology
ANSI I 2 of 5	Interleaved 2 of 5
Case Code	Interleaved 2 of 5
Codabar Variant	Codabar (AIM Specification)
Code 93	Code 93 (AIM Specification)
Code 128	Code 128 (AIM Specification)
128 Case Code	UCC 128, AI 00

X - Y % UPC-A	Uniform Product Code, Ver. A
X - Y % UPCA+2	Uniform Product Code, Ver. A with 2 digit addendum
X - Y % UPCA+5	Uniform Product Code, Ver. A with 5 digit addendum
X - Y % UPC-E	Uniform Product Code, Ver. E
X - Y % UPCE+2	Uniform Product Code, Ver. E with 2 digit addendum
X - Y % UPCE+5	Uniform Product Code, Ver. E with 5 digit addendum
X - Y % EAN-13	European Article Number 13 digit
X - Y % EAN13+2	European Article Number 13 digit with 2 digit addendum
X - Y % EAN13+5	European Article Number 13 digit with 5 digit addendum
X - Y % EAN-8	European Article Number 8 digit
X - Y % EAN8+2	European Article Number 8 digit with 2 digit addendum
X - Y % EAN8+5	European Article Number 8 digit with 5 digit addendum

Note: (Previous Tables) All ANSI symbologies are traditional specifications using bar width deviation. X and Y represent the magnification range selected for UPC/EAN tolerances.

Table 2 (Identifier Descriptions for Pass/Fail Analysis Screens)

Identifier	Symbology Type
B-1	Code 39; B-1 sub-specification for AIAG
B345	Code 39; B3, 4 or 5 sub-specification for AIAG
LOG	Code 39; LOGMARS sub-specification
HIBC	Code 39; HIBC sub-specification
3 of 9	Code 39
39+C	Code 39; with Mod 43
I25	Interleaved 2 of 5
CC	Interleaved 2 of 5 Case Code sub-specification
CC8	128 Case Code (UCC 128, AI 00)
C128	Code 128
UPCA	UPC version A
UA+2	UPC version A plus 2 digit addendum
UA+5	UPC version A plus 5 digit addendum
UPCE	UPC version E
UE+2	UPC version E plus 2 digit addendum
UE+5	UPC version E plus 5 digit addendum
EAN8	EAN 8 character
E8+2	EAN 8 plus 2 digit addendum
E8+5	EAN 8 plus 5 digit addendum
EN13	EAN 13 character
13+2	EAN 13 plus 2 digit addendum
13+5	EAN 13 plus 5 digit addendum
C93	Code 93
CBRV	Codabar Variant

8.0 Data Analysis Screens

After doing a scan, the Data Analysis Screens can be accessed from the Pass/Fail Analysis screen by pressing **Enter**. (The sequence of displays you see may vary slightly from these examples depending on the symbology and Inspector model.)

The following displays are brought up by pressing **Select**. The first screen to display is the Decoded Symbol Data from the **Pass/Fail Screen**:

If multiple scans were selected in Setup →

1234ABCDEF456
01 Scans Remain.

(If more than 16 characters are present, those characters will wrap to the next row of the display.)

Note: Code 128 is an exception. See *Appendix A* for details.

Press **Select** to bring up the next screen (if applicable):

Modck: 5 PASS
Expect: 5

This display indicates (when applicable) the Mod check character decoded and the Mod check character that should have been decoded (expected) in the symbol. PASS or FAIL is also indicated.

For Code 128, the Mod check character is displayed as the symbology's character value (a number from 000 to 102). One or two numeric Mod check characters may precede the 3-digit Code 128 Mod check described above. These digits represent the Mod 10 check character(s) that might be included, depending on the format.

Code 93 will display 2 Mod check characters. See *Appendix B* for Code 93 character representations.

Press **Select** to bring up the next screen:

AIAG B-1 **Acceptable**

Symbology type is indicated on the top row and the analysis overview on the bottom row.

Note: A database message screen may be displayed, if database is enabled. The screen displayed will be the first screen shown on the next analysis. This allows you to "program" the first screen to be displayed. If the database is disabled, only the Pass/Fail Analysis screen will display. If the database function is enabled, but the data scanned is not found, the following database message will display:

"Data Base Record
Does Not Exist"

(See *Appendix J Downloading the Database*)

Press **Select** to bring up the next screen:

Ratio: 2.9 **D/bility .81 A**

This screen provides the ratio calculation result on the top row (if applicable) and the decodability calculation and grade on the bottom row. If Ratio is not appropriate (UPC, EAN, Code 93 or Code 128), the Ratio field will be omitted.

Press **Select** to bring up the next screen.

Bar width deviations are represented graphically on the display.

-100 % Tol. +100% **--------RRARR+++++**

- "R" letters represent "range"
- "A" represents the average of all character bar width deviations

The closer the "A" is to the center of the display, the better.

Note: The location of the "A" is also indicated with the 5 LED indicators on the front of the verifier unit. See *Table 3*.

The following shows the percentage of the tolerance represented by each position on the display:

-	-	-	-	-	-	-	-		+	+	+	+	+	+	+
93	79	65	50	36	22	8	1	0	8	22	36	50	65	79	93

- Negative numbers to the left indicate bars are narrower
- Positive numbers to the right indicate bars are wider

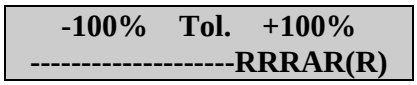
The closer the "A" is to the edge, the more likely a Warning or Reject message will display.

A symbol is "Acceptable" until the calculated bar width deviation exceeds 100% of the tolerance for the symbology decoded; for example:

Acceptable

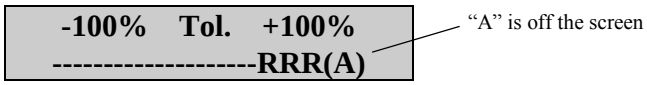
All bar widths are within tolerance

Warning



Most deviant element exceeded tolerance

Rejected



Average of all widths exceeded tolerance

Press **Select** again to display the first technical Data Analysis screen.

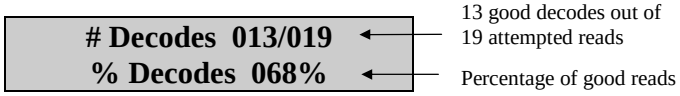
Table 3 (LED, Barcode Width Deviations)

5 LED Display Pattern	Average Bar width deviation as a % of tolerance (range)
○ ○ ● ○ ○	within +/- 21%
○ ○ ● ● ○	+ 22 to +49%
○ ○ ○ ● ○	+ 50 to +78%
○ ○ ○ ● ●	+ 79 to +99%
○ ○ ○ ○ ●	Out of tolerance (wide)
○ ● ● ○ ○	-22 to -49%
○ ● ○ ○ ○	-50 to -78%
● ● ○ ○ ○	-79 to - 99%
● ○ ○ ○ ○	Out of tolerance, narrow

Note: Solid indicators represent LEDs turned on
The 9 possible patterns are displayed

8.1 Continuous and Multi-scan modes

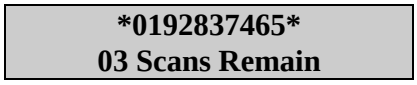
In the Continuous Mode, an additional data analysis screen displays:



There is a limit of 100 **good** scans in the Continuous Mode—or 250 **total** scans—whichever comes first. When a limit is reached, the unit automatically stops scanning.

In continuous mode the unit continues to attempt reads as long as the trigger is depressed. When using this mode the beam may be moved around the symbol to provide extra analysis. The analysis result is based on the average.

When multi-scans are selected the number of remaining scans needed to complete the analysis is displayed:



After the last scan a double beep or chirp will signal completion of the scan. The resulting analysis is an average of the scans.

9.0 Connect to other Devices

Connect to Computer

Your Laser Inspector will connect to a computer with the optional laser to PC database downloading cable.

Connect to Printer

Your Laser Inspector will connect to an RJS printer (models TP-140, TP140A, or TP140B) with a serial interface cable.

(Your Inspector will connect to a computer or printer with a serial interface cable; 9600 BPS, 8 bit, no parity, 1 stop bit.)

Contact RJS for details:

RJS Technologies
701 Decatur Ave North, Suite 107
Minneapolis, MN 55427
(763) 746-8034 Phone
www.rjs1.com Website

Appendix A (Code 128)

Code 128

Code 128 can encode all the characters currently encodable in the various code formats presently in existence. This includes: all ASCII alphanumeric characters (numbers, letters, special characters, control characters in the 128 character set and the distinction of the 3 subsets, A, B and C).

Code subset A includes the standard alphanumeric (upper case only) keyboard characters plus control and special characters.

Code subset B includes all the standard alphanumeric keyboard characters and special characters (upper and lower case).

Code subset C includes a set of 100 digit pairs from 00 to 99 inclusive, allowing definition of double density numeric digits per symbol, plus special characters.

The last 7 characters in Subsets A and B (96 - 102) and the last 3 characters in Subset C (100 - 102) are special characters that are specific to the scanning device.

The Laser Inspector display can accommodate up to 16 characters. However, in order to display symbols greater than 16 (maximum of 32), press **Select** to display the additional characters.

(See *Data Analysis Screens*).

Table A-1 shows the encodable code subsets for 128. The Laser Inspector display (in the shaded boxes) is just below the encodable code 128 character sets.

Due to the flexibility and nature of Code 128, it is difficult to display "printable" and "nonprintable" control codes side by side without confusion. However, the approach taken here (detailed below) simplifies the displaying of this information.

- As indicated before, each of the 3 subsets have "unique" features:
- **Subset A** allows for encodation of control codes but not lower case characters.
- **Subset B** allows for lower case characters but not control codes.
- **Subset C** allows for only numeric data in a compressed format.

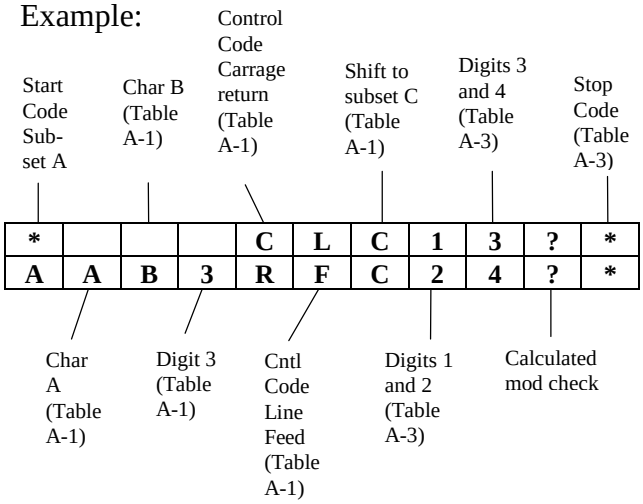
Code 128 also offers the flexibility to "shift" to other subsets in order to combine the "unique" features into one condensed barcode.

The encoded data occupies 2 rows on the LCD and is encoded in a columnar display with one character above the other.

Display of Code 128 (Rules)

- The first character (column) displays the subset (*A = Subset A).
- The last character is a stop code (**).
- The second from the last is a mod 103 check character.
- Double characters beginning with alphanumeric characters designate nonprintable control codes applicable to all subsets.
- Double numeric characters designate the compressed digit mode in subset C only.
- Single characters will always be displayed on the lower row and are applicable to only subsets A and B (normal printable characters.)

Example:



Refer to Code 128 tables (subsets) on the following pages:

Note: Only the first and last alphanumerics of each ASCII character are displayed by the Laser Inspector.

Shaded boxes are the Inspector's display.

Data
Display

Table A-1 (Code 128 — Subset A)

| | | |

Table A-2 (Code 128 — Subset B)

SP	!	"	#	$	%	&	'	( )	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;

	!	"	#	$	%	&	'	( )	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;

<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W

<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
W																										

Y	Z	[	\	]	^	_	`	a	b	c	d	e	f	g	h	I	j	k	l	m	n	o	p	q	r	s	t

Y	Z	[	¥	]	^	_	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t

u	v	w	x	y	z	{	|	}	~	DEL	FNC-3	FNC-2	SHIFT	CODE-C	FNC-4

										D	F	F	S	C	F
u	v	w	x	y	z	{	|	}	->	L	3	2	T	C	4

CODE—A	FNC—1

C	F
A	1

START (CODE A)	START (CODE B)	START (CODE C)	STOP

*	*	*	*
A	B	C	*

Table A-3 (Code 128 — Subset C)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19

0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39

2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59

4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9

60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79

6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9

80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99

8	8	8	8	8	8	8	8	8	8	9	9	9	9	9	9	9	9	9
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8

CODE-B	CODE-C	FNC-1

C	C	F
B	A	1

START (CODE A)	START (CODE B)	START (CODE C)	STOP

*	*	*	*
A	B	C	*

Note: On the LCD Display the Inspector will show a Yen symbol "¥"instead of a backslash "\" however it will print out as a backslash. On the LCD Display the Inspector will show a right arrow "®" instead of a tilde "~" however it will print out as a tilde.

USS Shipping Container Code (Case Code 128)

When a Code 128 symbol is decoded and the first four characters are:

Start C FNC1 0 0

The symbol is automatically analyzed as a USS Case Code symbol. For details consult the USS specification entitled Application Specification for the USS-128 Serial Shipping Container Code: (with symbol and shipping label guidelines).

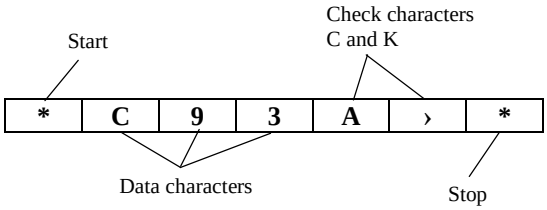
Appendix B (Code 93)

Code 93

Code 93 encodes 43 data characters consisting of 0-9, A-Z,
6 symbols, 4 control characters and a unique start/stop character.

The entire 128 ASCII character set is represented in code 93 using combinations of control characters and basic data characters.

Each symbol includes 2 check characters. The symbols are checked by the Laser Inspector and displayed on the Mod Check Data Analysis screen.



The 2 check characters are referred to in the USS-Code 93 specifications as "C" and "K." They are displayed in that order on the Data Analysis screen.

The entire Code 93 character set is shown in Table B-1. The Laser Inspector displays the characters shown in the columns labeled Code 93 in the figure. Remember, some ASCII characters require 2 Code 93 symbol characters.

The Start/Stop and control characters cannot be displayed on the LCD as shown in Table B-1. They are displayed as:

* is substituted for Stop/Start characters
< is substituted for encircled $
> is substituted for encircled %
; is substituted for encircled /
@ is substituted for encircled +

The characters are also transmitted in this form in print and real time communications modes.

See *Table B-1* (Next Page)

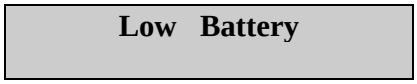
Table B-1 (Code 93 Character Set)

ASCII	CODE 93	ASCII	CODE 93	ASCII	CODE 93	ASCII	CODE 93
NUL	% U	SP	Space	@	% V	’	% W
SOH	$ A	!	/ A	A	A	a	+ A
STX	$ B	"	/ B	B	B	b	+ B
ETX	$ C	#	/ C	C	C	c	+ C
EOT	$ D	$	$	D	D	d	+ D
ENQ	$ E	%	%	E	E	e	+ E
ACK	$ F	&	/ F	F	F	f	+ F
BEL	$ G	'	/ G	G	G	g	+ G
BS	$ H	(	/ H	H	H	h	+ H
HT	$ I	)	/ I	I	I	i	+ I
LF	$ J	·	/ J	J	J	j	+ J
VT	$ K	+	+	K	K	k	+ K
FF	$ L	,	/ L	L	L	l	+ L
CR	$ M	—	—	M	M	m	+ M
SO	$ N	•	•	N	N	n	+ N
SI	$ O	/	/	O	O	o	+ O
DLE	$ P	0	0	P	P	p	+ P
DC1	$ Q	1	1	Q	Q	q	+ Q
DC2	$ R	2	2	R	R	r	+ R
DC3	$ S	3	3	S	S	s	+ S
DC4	$ T	4	4	T	T	t	+ T
NAK	$ U	5	5	U	U	u	+ U
SYN	$ V	6	6	V	V	v	+ V
ETB	$ W	7	7	W	W	w	+ W
CAN	$ X	8	8	X	X	x	+ X
EM	$ Y	9	9	Y	Y	y	+ Y
SUB	$ Z	:	/ Z	Z	Z	z	+ Z
ESC	% A	;	% F	[	% K	{	% P
FS	% B	<	% G	\	% L	;	% Q
GS	% C	=	% H	]	% M	}	% R
RS	% D	>	% I	^	% N	~	% S
US	% E	?	% J	—	% O	DEL	% T

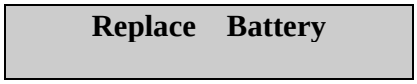
Appendix C (Battery Displays)

Battery Displays

If the "**Low Battery**" condition displays, there is still power left in the battery to advance to the next screen or even do a scan.



If the "**Replace Battery**" condition displays, batteries should be replaced immediately. The unit will not operate properly in this condition.



Appendix D (Magnifications)

UPC/EAN Magnifications & Bar Width Deviations

UPC and EAN symbols have fixed lengths and formats; therefore, the only way to change their sizes is to magnify them. Specifications relative to bar/space tolerances are published for 80% to 200% magnifications.

While the Laser Inspector does not measure the bars and spaces to derive a magnification, it does determine the relative sizes of the elements and therefore the bar width deviations.

When UPC and EAN symbols are analyzed, the approximate symbol magnification must be known in order to most accurately determine if the symbol is within tolerance.

For example, if a range of 90 - 115% magnification is selected and a 200% symbol is analyzed, there will be a greater chance of a warning message for the symbol (despite its being within specification) because of the stricter tolerances of a smaller symbol.

Conversely, if a range of 151% - 200% magnification is selected and a 100% symbol is analyzed, there will be a greater chance of an acceptance message for the symbol (despite its possibly not being within specification) because of the more liberal tolerances of a larger symbol.

Appendix E (Print Functions)

Print Functions

Scanned data may be printed if the Laser Inspector is connected to a printer with a serial interface cable.

Press the Print button at any time to display "Printout Type" on the upper row of the display. The lower row will contain one of two options that are scrolled with the **Select** button.

With the selected option chosen, press either **Enter** or **Print** to start printing. (The choice is saved in non-volatile memory so that printing can be halted by pressing **Select** and **Enter** at the same time, until the Main Menu displays.)

Printout Options

Analysis

This option prints the analysis data for the last symbol scanned. This option can also be used to print each individual symbol in the multiple scan mode prior to the last scan being completed.

Storage

This option prints all analysis data stored in the buffer. The last barcode that was scanned is printed first.

When printing the buffer in multiple scan mode, don't initiate printing before all scans of the current analysis are complete, otherwise, some completed scans could be lost.

Figure E-1 (Continuous scan)

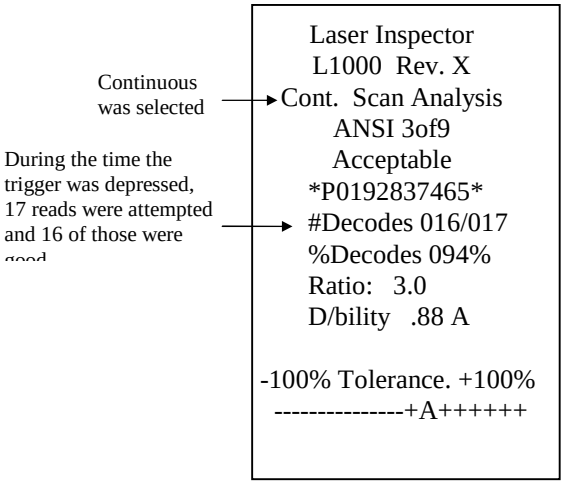
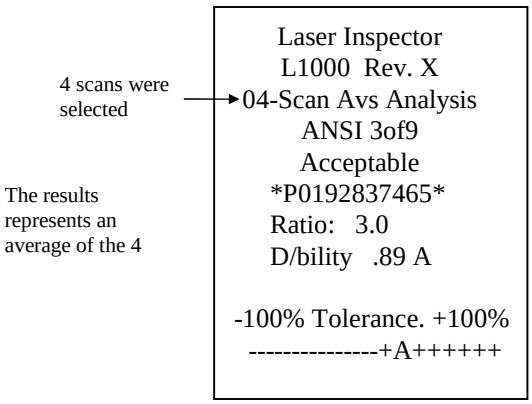


Figure E-2 (Multi-Scan)



Appendix F (Symbology Analysis)

Symbology Analysis Parameters

Table F-1 shows error messages that will be displayed for each parameter type checked by the Laser Inspector.

Table F-1 (Parameter/Error Message)

Parameter	Data Analysis Message
Ratio	Warning Ratio
Inter-Character Gap (ICG)	Invalid Format
Data Character	Invalid format
Mod Check Digits	Bad Mod Check
Bar Width Deviation Range	Warning Wide (or narrow)
Bar Width Deviation Ave.	Rejected Wide (or narrow)
Addendum Parity (UPC/EAN)	Invalid Format
ANSI Decodability (if enabled)	Warn D/bility (DCD, in initial Pass/Fail screen)
Object in Quiet Zone	Warning QZ/SS

Table F-2, (Parameters Checked for Each Symbology)

Symbology	Ratio	ICG	Data Character	Mod Check	Tolerance
AIAG B-1	2.2-3.2	.5X-8X	STD CODE 39	N/A	((12R-8)/81)X
AIAG B-3/4/5	2.8-3.2	.5X-8X	$/+% Not Allowed	N/A	((12R-8)/81)X
LOGMARS	2.2-3.0	.5X-8X	STD CODE 39	N/A	((12R-8)/81)X
ANSI 3 of 9	2.2-3.0	.5X-8X	STD CODE 39	N/A	((12R-8)/81)X
3 of 9 w/43	2.2-3.0	.5X-8X	STD CODE 39 4 CHARS Min	MOD 43	((12R-8)/81)X
HIBC 3 of 9	2.2-3.0	.5X-8X	STD CODE 39 Min 2 CHARS 1ST. = "+"	MOD 43	((12R-8)/81)X
ANSI 2 of 5	2.2-3.0	N/A	N/A	N/A	((18R-21)/80)X
Case Code	2.3-2.9	N/A	3 Data Chars Min.	MOD 10	((18R-21)/80)X
Code 128	N/A	N/A	N/A	MOD 103	.35X
128 Case Code	N/A	N?A	16 Data Char. Format Check	Mod 10 Mod 103	.35X
UPC/EAN	N/A	N/A	N/A	MOD 10 See *Note 3*	See *Note 5*
Codabar Variant	2.2-3.0	.5X-8X	STD CODABAR	N/A	((5R-8)/20)X
Code 93	N/A	N/A	STD CODE 93	C&K	.35X

NOTES:

1. **X = X dimension**
2. Tolerance is expressed as a fraction of the X dimension
   R = Ratio in the calculations
3. **UPC/EAN tolerances**:
   80 - 89% = .14X
   90 - 115% = .30X
   116 - 150% = .34X
   151 - 200% = .38X

4. See *Appendix I* for Quiet Zone Analysis descriptions.
5. UPC-A symbols with a number system character value of 2 and EAN-13 symbols with a prefix of 20 contain a random weight check digit in addition to the normal Mod 10 check digit. This extra digit is automatically analyzed and displayed in the Mod Check Data Analysis screen as shown below:

Modck: 1 5 PASS
Expect: 1 5

The 1 is the random weight check digit and the 5 is the Mod 10 check digit. The symbology specifications allow the check digit to have a value of zero in cases where it is not used

In cases where the random weight check digit is zero, when another value is expected, a Bad Mod Check Warning will not be issued. The LCD display and corresponding printout will note the discrepancy with a "CHK" message in place of "FAIL" as shown below:

Modck: 0 5 CHK
Expect: 1 5

Appendix G (ANSI Decodability)

ANSI Decodability Calculations

There is a specified method for calculating decodability for each symbol. But the method is generally the same for all. Each element width in a barcode symbol should be consistent across the symbol.

Code 39

In the case of Code 39, two element widths are needed to produce a symbol.

For optimum scanning, each narrow element, whether a bar or space, should have the same width dimension. And each wide element should have the same width dimension.

Simply stated, the Decodability grade indicates the amount of tolerance remaining in the width of the most deviant element in the symbol. The more tolerance remaining, the higher the grade.

The grade is displayed showing both a calculated numeric and a letter grade, i.g. "D/bility .90 A."

UPC/EAN

In the case of UPC and EAN symbols, the grade is calculated per a proposed guideline draft dated September 4, 1990 issued by the USS.

Decodability Grade Conversions

>= .62 = A
>= .50 = B
>= .37 = C
>= .25 = D
< .25 = F

Appendix H (Scanning Technique)

The RJS Inspector bar code verifier that is supplied with this document incorporates a model CR1 scanner. The new CR1 provides three major improvements when compared to the previous model:

1. Codes with X dimensions as small as 5 mils (.005 inch, .127 mm) can be analyzed (vs. .0075 inch, .190 mm).
2. More accurate correlation to the ANSI Decodability calculation is achieved.
3. Bi-directional scanning movement provides better quiet zone analyses.

The CR1 is compatible with all previous models of Laser Inspector L1000 and D4000 w/laser.

Scanning Technique

For most accurate analysis calculations, the laser beam should strike the bar code at an angle of approximately 30 degrees from vertical as shown in Figure 1. The scan distance is a function of the width of the bar code. **Adjust the scan distance so it is a minimum of two inches (51 mm) or longer where the width of the laser beam is twice the width of the bar code and the bar code is centered in the beam as shown in Figure 2.**

A label containing this information is also attached to the top of the scanner for quick reference.

Figure 1 – Scanning angle and distance

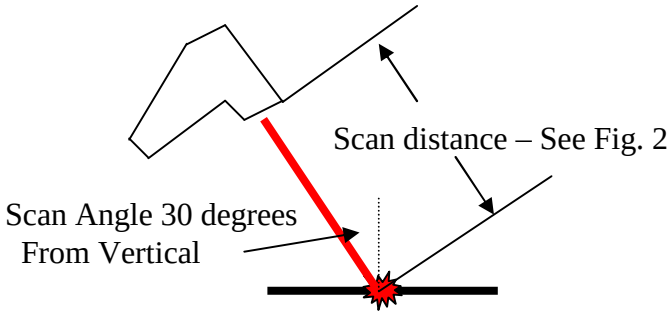
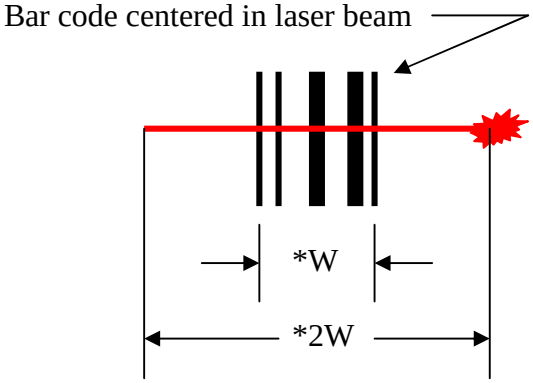


Figure 2 – Optimum beam width and placement



* Adjust scan distance at minimum 2" (51 mm) or the width of the laser beam is approximately two times the width of the bar code.

Special Considerations

When scanning codes on a low contrast substrate like brown corrugated material or a specular substrate such as shiny aluminum or plastic material, a scan angle other than 30 degrees from vertical may produce better decoding characteristics. Contact RJS Technical support if scanning problems occur.

Appendix I (Quiet Zone Analysis)

Quiet Zone Analysis

The Laser Inspector trims data gathered during a scan to approximately 10 times the X dimension on each side of a bar code for all symbologies except UPC and EAN. The areas are assumed to be quiet zones and are included in the symbol analysis. If a low reflectance object is detected in these areas, the message "Warning QZ/SS" is displayed. This means a quiet zone is too narrow or the start (or stop) code may have extra elements encoded.

Quiet Zone Analysis for UPC and EAN symbols are described in the following tables. In cases where an addendum is included in the bar code, an addendum gap analysis is also performed.

Table I-1 (Acceptable Parameters for Symbols

<u>Without</u> Addendums)

Symbology	Leading QZ	Trailing QZ
UPC-A	9X Minimum	9X Minimum
UPC-E	9X Minimum	7X Minimum
EAN-13	11X Minimum	7X Minimum
EAN-8	7X Minimum	7X Minimum

Table I-2 (Acceptable Parameters for Symbols

<u>With</u> Addendums)

Symbology	Leading QZ	Trailing QZ	GAP Size
UPC-A	9X Minimum	5X Minimum	9 - 12X
UPC-3	9X Minimum	5X Minimum	9 - 12X
EAN-13	11X Minimum	5X Minimum	7 - 10X
EAN-8	7X Minimum	5X Minimum	7 - 10X

Appendix J

Downloading the Database

See also *5.4 Storage and Database*

Database Setup

To setup a PC database use the standard comma delimited text file.

- Use any text editor or application to create a database file.
- Use commas and quotes as field delimiters as shown in the sample on the next page.
- A quote (") cannot be part of the field data—it is only a delimiter.
- Each message field can contain up to 16 characters.

Database Record

There are 3 fields in a database record:

"01234567890512", "GREEN BEANS","16oz $.99"

Each field is in quotes (" ") separated by commas (,).

Fields:

1. The first field is the key containing the data that is searched and matched to the scanned "data." (01234567890512 in sample)
2. The second field contains the message entered in the database file; it displays on the first row of the LCD when the scanned barcode matches the database.
3. The third field contains a message in the database file; it displays on the second row of the LCD when the scanned barcode matches the database.

(You can have many records (like the record above), stacked in a file. The start character for the file is an ASCII STX (hex 02), i.e. **ALT-2**. The end character for the file is an ASCII ETX (hex 03), i.e. **ALT-3**)

Sample Database

STX
"01234567890512","UPC A+2","SAMPLE # 1",
"9876543212344","EAN 13","SAMPLE # 2",
"01234565","UPC E","SAMPLE # 3",
"0192837243645","EAN 8+5","SAMPLE # 4",
"123ABCDEF456","CODE 3of9","SAMPLE # 5",
"987WXYZ","CODE 93","SAMPLE # 6",
"01928374","CODE I 2 OF 5","SAMPLE # 7",
"567RSTUVW","CODE 128","SAMPLE # 8",
"124589","CODABAR SYMBOL","SAMPLE # 9",
"00123456789012345675","CC 128 SYMBOL","SAMPLE # 10", ETX

Database Download

Step 1) Plug the cable (002-2979) into the serial communications port of an IBM compatible PC/AT/386/486 computer.

Step 2) Plug the connector of the cable into the Laser Inspector unit.

Step 3) Turn on the Laser Inspector by pressing the ON switch or pressing the scanner trigger.

Step 4) Using the MODE command of MS-DOS, enter the following:

MODE COMx:9600,n,8,1

Where x is the number of the communications port to be used.

Step 5) Using the COPY command, download the sample data base:

COPY DBSAMPLE.TXT COMx:

Again, where x is the number of the communications port.

Once the start character is received, the existing database in the Inspector unit is erased and the new database is placed in the database buffer.

After the end character is received, 4 messages are displayed in succession on the LCD:

1. **Database Parsing**
2. **Database Sorting**
3. **Database Loading**
4. **Completed**

A few seconds after the "Database Loading Completed" message has displayed, the Main Menu will display.

Or you may encounter one of the following error messages:

Memory Overflow

(If the database exceeds the buffer limit)

Format Error

(If the data format is incorrect)

Data Base Record Does Not Exist

(If the scanned symbol does not match the record in the database)

Communication Parameters

- Serial communication, RS-232 signal levels
- Baud rate: 9600
- Data Length: 8 bit
- Parity: None
- Stop bits: 1
- Hardware/Software protocols: RJS PC database download serial interface cable (002-2979)
- Database buffer size: 0 - 20K allocated via the Setup Menu

Key Field Descriptions

Symbology characteristics to consider when creating key fields in your database:

UPC Version "A"

The UPC-A database key must be made up of all 12 digits in the barcode (including the Mod check digit). When a 2 or 5 digit addendum is scanned, these additional digits must be appended to the end of the database key.

UPC Version "E"

The UPC-E database key must be made up of all 8 digits in the barcode (including the Mod check digit). When a 2 or 5 digit addendum is scanned, these additional digits must be appended to the end of the database key.

EAN-13
The EAN-13 database key must be made up of all 13 digits in the barcode (including the Mod check digit). When a 2 or 5 digit addendum is scanned, these additional digits must be appended to the end of the database key.

EAN-8
The EAN-8 database key must be made up of all 8 digits in the barcode (including the Mod check digit). When a 2 or 5 digit addendum is scanned, these additional digits must be appended to the end of the database key.

Code 3 of 9
The Code 3 of 9 database key must be made up of all data characters in the barcode (including the Mod check digits or prefix indicators, such as those used within the HIBC specification).

The standard Start/Stop characters used in Code 3 of 9 symbology are not to be included.

Interleaved 2 of 5
The Interleaved 2 of 5 (I2of5) database key must be made up of all the digits in the barcode (including the Mod check digit found in the I2of5 Case Code specification, if applicable).

Codabar
The Codabar database key must be made up of all the digits in the barcode (excluding the Start/Stop codes).

Code 93

The Code 93 database key must be made up of all the printable data characters in the barcode (excluding the Mod check digit and the Start/Stop codes).

Code 128

The Code 128 database key must be made up of all the printable data characters in the barcode (excluding the Mod check digit, the Start/Stop codes or any function characters). For Case Code 128, the Mod-10 check digit must be included in the database key.

Appendix K

Barcode Definitions

(Some of these definitions may not be applicable to the L1000)

Achieved Width

The calculated element width based on measurements.

Alphanumeric

A character set that contains letters, digits, and other characters such as punctuation marks. Also, a character that is either numeric or alpha.(In programming an alphanumeric cannot be used to do arithmetic.)

ANSI

American National Standards Institute, Inc. 1430 Broadway, New York, New York 10018

Aperture

The effective opening in an optical system that established the field of view.

Application Specification

A set of rules for using barcode symbols.

Aspect Ratio

The ratio of height to width of a barcode symbol.

Bar

An element of a barcode symbol whose reflectance is less than the global threshold. A Bar is the dark (reflective) element of a barcode. (As opposed to a space which is the light reflective element.)

Barcode

A group of parallel bars and spaces constituting characters that are machine and human readable. (See barcode symbol.)

Barcode Reader

A device used to identify and decode a barcode symbol.

Barcode symbol

An array of rectangular bars and spaces which are arranged in a predetermined pattern following specific rules to represent elements of data that are referred to as characters. A barcode symbol typically contains a leading quiet zone, start character, data character(s) including a check character (if any), stop character and a trailing quiet zone.

Bar Height

The bar dimension perpendicular to the element width. The measurement of the long dimension of a bar element. (Also called bar length.)

Bar Width

The lateral dimension of a bar; bar thickness.

Bar Width Ratio

The ratio of the widest bar or space to the narrowest.

Bar Reflectance (Rb)

The smallest reflectance value in a bar.

Bi-directional Code

A barcode that can be read left to right or right to left.

Bit

The narrowest code element (bar of space) that may contain information.

Character

The smallest group of elements assigned by a symbology to uniquely represent one or more numbers, letters, punctuation marks or other information.

Character Set

The numbers and/or letters and markings included in a barcode symbol.

Check Character (or Check Digit)

A character included within a barcode symbol whose value is used for performing a mathematical check of the validity of the decoded data.

Contact Code Reader

A light pen or other scanning device that must come into physical contact with the code medium in order to read the symbol.

Continuous Code

A barcode or symbol wherein the space between the characters is part of the code.

Decodability

This parameter grade can be "A," "B," "C," "D" or "F." The decodability grade indicates the amount of error in the width of the most deviant element in the symbol. The less deviation, the higher the grade. Decodability is a measure of print accuracy using the symbology reference decode algorithm.

Decode
Determining the information which has been encoded in a barcode symbol.

Decoder
The portion of a barcode reading system that performs the decode function.

Diffuse Reflection
Reflected light which emanates uniformly in all directions from the reflecting surface.

Dimensional Deviation (DD)
The measured deviation of bars and/or spaces of a scanned symbol from the specification.

Discrete Code
A barcode or symbol wherein the spaces between the characters are not part of the data.

Edge Contrast (EC) See Edge Contrast(min)
The difference between the space reflectance (Rs) and adjoining bar reflectance (Rb).

EC = Rs - Rb

Edge Contrast (min)
This parameter grade can be "A" or "F." Edge contrast is the Reflectance difference between adjoining bars and spaces. The minimum edge contrast is the smallest value of EC = Rspace - Rbar found in the scan.

The grade is determined by calculating the edge contrast of every element in a symbol and then comparing the lowest value to a fixed threshold in the specification (15%).

If the value is equal to or greater than the threshold, the grade is "A." If the value is less than the threshold, the grade is "F."

Element

A generic term used to refer to either a bar or space in a barcode symbol.

Element Edge

The location where the scan reflectance profile intersects the midpoint between the space reflectance (Rspace) and bar reflectance (Rbar) of adjoining elements. Visual measuring techniques will generally locate the element edge closer to the center of the bar.

Element Reflectance Nonuniformity (ERN)

The reflectance difference between the highest peak and lowest valley within each individual element and quiet zone. When an element consists of a single peak or valley, its element reflectance non-uniformity is zero.

Element Width

The thickness or width of a bar or space as measured from its leading edge to its trailing edge.

Encoded Area

The total linear dimensional space taken by all characters of a code pattern including start/stop and data.

First Read Rate

The percentage of successful "reads" of a barcode symbol on the first attempt.

Fixed Beam Scanner

A barcode reading device wherein coded items pass across a stationary incandescent or LED light source.

Flexo Film Master

A measurement standard symbol produced by printing the symbol on clear plastic film using the Flexograph printing process.

Gloss

A phenomenon related to the specular reflection of incident light. The effect of gloss is to reflect more of the incident light in a specular manner, and to scatter less. This effect occurs at all angles of incidence and should not be confused with the grazing angle which is specular reflection often referred to as sheen.

Global Threshold (GT)

The global threshold is drawn through the middle of a profile, to distinguish spaces above the line and bars below. The reflectance value is determined by dividing the symbol contrast (SC) by 2 and adding the minimum reflectance, Rmin.

GT = Rmin + (SC/2)

Guard Bar

The first and last bars of a barcode symbol usually having the pattern 101. A guard bar generally follows the leading quiet zone and precedes the trailing quiet zone. This term is used mostly for UPC/EAN symbologies.

Infinite Pad Method

The method for measuring reflectance in which the sample substrate being measured is backed with enough thickness of the same type of substrate so that doubling the number of sheets does not change the measured value of reflectance.

Inspection Band

An area of the barcode symbol where measurements shall be taken spanning from 10% to 90% of the average bar height.

Inter-character Gap

In discrete barcodes, the space that separates two adjacent characters. When present, inter-character gaps are considered spaces (elements) for purposes of edge determination and reflectance parameter grades.

Interleaved

A barcode in which characters are paired together using bars to represent the first character and spaces to represent the second.

Ladder Code

A barcode or symbol printed vertically with the individual bars looking like the rungs of a ladder.

Laminate

See Over-laminate

Laser Scanner

A barcode reading device that uses a low energy laser light source for illumination.

Magnification Factor

The size of a printed barcode compared to a standard (nominal) size.

Maximum Element Reflectance Nonuniformity (ERN max)

The largest element reflectance non-uniformity in a scan reflectance profile.

Maximum Reflectance (Rmax)

The largest reflectance value in a scan reflectance profile.

Minimum Edge Contrast (Ecmin)

The smallest edge contrast in a scan reflectance profile.

Minimum Reflectance (Rmin)

The smallest reflectance value in a scan reflectance profile.

Misread

A condition that occurs when the data output of a reader does not agree with the encoded data.

Modulo Check Character

The mod check character is included in the string of data and its value is used for performing a mathematical check to ensure the accuracy of the data. The laser Inspector's printout shows expected (**Expect**) mod check character and this should match the **Modchk**.

Modulation (MOD)

(Scanners and verifiers perceive the narrower bars and spaces to have less intensity than wider bars and spaces; the comparison of this diminished intensity of narrow elements to wide elements is called modulation. This condition is affected by aperture size.)

This parameter grade can be "A," "B," "C," "D" or "F."

The modulation grade is based on the relationship between minimum edge contrast (Ecmin) and symbol contrast (SC).

MOD = ECmin/SC

The greater the difference between minimum edge contrast and symbol contrast, the lower the grade.

Since "ink spread" will reduce the width and intensity of single module space within a symbol, this is one thing to check in seeking to correct a low modulation grade.

Module

The narrowest expected bar or space width.

Moving Beam Scanner

A laser device that dynamically searches for a barcode pattern by sweeping a moving optical beam through a field of view.

N (wide to narrow ratio)

In symbologies with two element widths, the wide to narrow ratio of elements is calculated by summing the average wide bar width and average wide space width and dividing the sum by 2 times Z. Inter-character gaps, if applicable, are not included.

N = (avg.wide bar + avg. wide space) / (2*Z)

Nanometer (nm)

A unit of measure used to define the wavelength of light, equal to 10-9 meter.

Nominal

The intended value for a specific parameter. Tolerances are generally specified as positive and negative deviations from this value.

No-Read (Non-read, Non-scan)
The absence of data at the scanner output after an attempted scan because of no code, defective code or operator error.

Nominal Size
The target size for a specific element or group of elements.

Numeric
A character set that contains only numbers.

Omni-directional
The ability to read a barcode symbol from any angle as long as the barcode passes across the scanner window.

Opacity
The property of a material that minimizes the show-through of printing from the back side or the next sheet.

Overhead
The number of characters in a symbol required for start, stop and checking.

Over-laminate
A coating or material adhered to the scanning surface of a barcode symbol.

Parity
A system for encoding characters as "odd" or "even" for self checking of barcodes.

Peak

The graphical pattern on a scan reflectance profile which looks like an upside down "U" or "V." Within a profile a peak represents a space. One or more peaks could also be found within an element representing a reflectance change within an element.

Plaque

A template used as a reflectance calibration standard (RCS). The known reflectance values are posted on the back of the plaque.

Print Contrast Signal (PCS)

A comparison between the reflectance (brightness difference) of bars and spaces in a symbol. PCS under a given set of illumination conditions is defined as follows:

PCS is calculated as follows:

$$\frac{L - D}{L} \times 100\%$$

Where:
L = Lightest (highest reflectance)
D = Darkest (lowest reflectance)

The Model L1000 does not check for PCS.

Profile

See Scan Reflectance Profile

Quiet Zone

The area immediately preceding the start character and following the stop character in a barcode symbol as specified in a particular application and/or symbology specification.

Reference Decode

Each symbology type specifies a specific decoding method to be used in determining overall symbol grade.

This parameter grade can be "A" or "F." ("A" is pass and "F" is fail.) If this parameter is "F" the overall symbol grade will also be "F" regardless of any other parameter. If this parameter is "A" the lowest of the other parameter grades determines the overall symbol grade.

Reflectance

A measure of the amount of light reflected from an illuminated surface.

Refl(min) / Refl (max)

This parameter grade can be "A" or "F." The reflectance value of the "lightest" space in a symbol must be equal to or greater than twice the reflectance value of the "darkest" bar.

Refl(max) = or > Refl(min) x 2 if "yes" "A" else "F"

Reflectance Calibration Standard

A standard or "known" reflectance value, usually printed on the back of a template or plaque. Barcode readers and verifiers are calibrated for reflectance using these known values.

Required PCS

This is the minimum PCS percent required for the symbol.

Resolution

The dimension of the smallest code element that can be printed; the higher the resolution the clearer the image.

Scanner

An electronic device that converts printed information into electrical signals.

Scan Reflectance Profile

A record (usually graphically represented) of the reflectance measured using the reference reflectivity method as a function of distance across the entire barcode symbol.

Segment

Refers to the left and right grouping of modules or elements into segments to designate parity for checking validity of a scan.

Self-checking

A barcode or symbol that uses a checking algorithm, that can be applied to each character, to guard against undetected errors. (Non-self-checked codes may use a check digit or other redundancy in addition to the data message.)

Show-through

The generally undesirable property of a substrate that allows underlying markings of materials to affect reflectance.

Space

The element of a barcode symbol whose reflectance is greater than the global threshold. A Space is the light reflective element. (As opposed to a bar which is the dark reflective element.)

Space Reflectance (Rs)

Reflectance of a space.

Specular Reflection

Reflection of light from a surface at an angle equal and opposite to the angle of incidence.

Start and Stop Characters

Characters typically used at the beginning and end of each barcode symbol.

Substitution Error

This error can be seen in a mis-encodation, mis-read or human operator error where characters that were to be entered were substituted with erroneous information.

Substrate

The material (paper, plastic, metal, etc.) upon which a barcode symbol is "printed" or reproduced.

Symbol

See Barcode symbol.

Symbol Contrast (SC)

This parameter grade can be "A," "B," "C," "D" or "F."

Symbol contrast is the difference in reflectance values of the "lightest" space (including the quiet zone) and the "darkest" bar of the symbol. The greater the difference, the higher the grade.

SC = Rmax - Rmin

Symbol Grade

The simple average of all the overall profile grades using the standard weighing

4.0 = A
3.0 = B
2.0 = C
1.0 = D
0.0 = F

The symbol grade may be stated as a decimal or converted to a letter grade. A measuring aperture number and nominal wavelength are also specified.

Symbology

A set of rules for encoding information in a barcode symbol.

Symbology Reference Decode Algorithm

A decoding algorithm that may be found in a particular application and/or symbology specification.

TAPPI

Technical Association of Pulp and Paper Industry.
Technology Park/Atlanta, P.O. Box 105113
Atlanta, GA 30348-5115

Threshold (Global Threshold)

see Global Threshold)

Transmission Mode

The mode where light is transmitted through a film master symbol rather than reflected from a printed symbol.

Truncation

Decreasing the length of the bars in a barcode symbol below the normal specification. Truncation decreases a symbol's omni-directional readability and should be avoided.

Valley

The graphical pattern on a scan reflectance profile which looks like a "U" or "V." Within a profile a valley represents a bar. One or more valleys could also be found within an element representing a reflectance change within an element.

Vertical Redundancy

The availability of more than one scan path through a barcode symbol.

Visual Measurement

Measurements obtained by using human vision in the determination of characteristics of the barcode symbol.

Void

White or light reflective area in a bar caused by a printing error that can cause a bar to scan as a space.

Wide/Narrow Ratio

Ratio of narrow to wide elements.

X Dimension

The intended width of the narrow elements dictated by the application and/or symbology specification.

Zero Suppression

Technique used to shorten UPC symbols by omitting zeros from the barcode.

Z Dimension

The achieved width of the narrow elements. Computation of Z is accomplished using different factors for some symbologies.