OPTICON

Fixed Position 2D Imager Scanner

NLV-3101-SR

SR : Standard Range type

This manual provides specifications for the NLV-3101 fixed position 2D imager scanner.

Specifications Manual

All information subject to change without notice.

Document History

Model Number:	NLV-3101	Specification Number:	SS12019
Edition:	3rd	Original Spec Number:	SS12018
Date:	2013.05.29		

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Revision History

Specification No. : SS12019
Product name : NLV-3101 (SR)

Edition	Date	Page	Section	Description of Changes
First	2012/10/10	-	-	Initial release
Second	2012.11.02	-	-	Minor text corrections throughout
		-	-	Added US measurements to barcode resolutions throughout
			-	Convert term "Loose End" to "Flying Lead" where mentioned in reference to a "no connector" interface throughout
		-	-	Clarified unit of measure in graphics throughout
		4	3	Added USA part number for power supply and updated accessory list to include universal plug adapters for power supply
		38	18.1	Added USA Order number for power supply
Third	2013.05.29	3	3	Adjusted power specs

Contents

1. Abstract

This manual provides specifications for the NLV-3101 fixed position 2D imager scanner.
It is a product that has the SR (Standard Range) performance.

2. Overview

The NLV-3101 is a fixed position 2D imager scanner that enables high speed scanning of standard linear (1D) and 2D symbologies.
Main features of the NLV-3101 are as follows:

- High-speed scanning
  Extremely high-speed performance ensures stress free scanning and fast response without being affected by hand movement and light conditions.

- Editing function
  A new function “Data Editing Program” captures up to 16 codes on multiple images simultaneously in one go. Output editing process, such as GS1 format, also can be set easily.

- World's most compact 2D scanner in its class
  The NLV-3101 offers ultra-compact size and easy operation.

- LED aiming
  A sharp single line of green LED makes it easy to aim the scanner while providing safety and long-life.

- Various interfaces
  Four types of interfaces, RS-232C, Keyboard Wedge PS/2, USB-HID, and USB-COM, are supported.

- RoHS compliance
  The NLV-3101 is a RoHS compliant product, which is declared by Optoelectronics Co., Ltd.

* Refer to “NLV-3101 user’s manual” for supported codes and function commands.

3. Basic Specifications

Item			Specification		Note
Control Section	CPU		32-bit RISC		
	SDRAM		256 Mbits (2 M × 4 Banks × 32 bits)		
	Flash ROM		16 Mbits (1 M × 16 bits) Flash Memory		
Interface	RS-232C		300 bps ~ 115200 bps		Default: 9600 bps
	USB		・Full-Speed 12 Mbps (HID/COM)		
	Wedge		PS/2 Keyboard (selectable 'with or without keyboard connection')		
Optical Section	Scanning method		WVGA (0.36 million-pixel) CMOS area sensor		Frame rate: 60 fps
	Scanning light source		2 red LEDs		
	Aiming light source		1 green LED		
	Effective pixels		0.36 million pixels (H: 752 x V: 480)		
	View angle		Horizontal: about 40.6° Vertical: about 26.4°		
Supported 1D Symbologies	Symbologies		UPC-A, UPC-A Add-on, UPC-E, UPC-E Add-on, EAN-13, EAN-13 Add-on, EAN-8, EAN-8 Add-on, JAN-8, JAN-13, Code 39, Tri-Optic, Codabar (NW-7), Industrial 2 of 5, Interleaved 2 of 5, S-Code, IATA, Code 93, Code 128, MSI/Plessey, UK/Plessey, TELEPEN, Matrix 2 of 5, Chinese Post Matrix 2 of 5, Code 11, Korean Postal Authority code, Postal Code		
	Minimum resolution		Code 39 : 5 mils (0.127 mm)		PCS 0.9
	Curvature		Radius ≥ 16 mm (12-digit UPC) Radius ≥ 20 mm (10-digit Codabar)		PCS 0.9
	Wide Bar Code		Possible to read: Code 39 with 100 mm width and resolution 0.2 mm (DOF: 155 mm)		
	Motion tolerance		Possible to read: UPC 100% moving at 2 M/s (DOF: 125 mm)		
	Depth of field	Code 39	Resolution 5 mils (0.127 mm)	90 ~ 125 mm	
			Resolution 10 mils (0.254 mm)	70 ~ 190 mm	PCS 0.9 * The depth of field depends on the view angle and symbol length
			Resolution 20 mils (0.508 mm)	*65~ 235 mm	
		Code 128	Resolution 7.5 mils (0.20 mm)	80 ~ 160 mm	
		UPC 100%	Resolution 13 mils (0.33 mm)	55~ 185 mm	
GS1 DataBar	Symbologies		GS1 DataBar, GS1 DataBar Limited, GS1 DataBar Expanded, Composite GS1 DataBar, Composite GS1-128, Composite EAN, Composite UPC		GS1 DataBar: formerly called "RSS"
	Minimum resolution		GS1 DataBar : 6.7 mils (0.169 mm) Composite Code : 6.7 mils (0.169 mm)		

Item			Specification		Note
Supported 2D Symbologies	Symbologies		PDF417, MicroPDF417, Codablock F, QR Code , Micro QR Code, DataMatrix (ECC 0 - 140 / ECC 200), MaxiCode (Modes 2 to 5), Aztec Code, Chinese Sensible Code		Disable Code 128 when Codablock F is enabled.
	Minimum resolution (mm)		PDF417 : 6.7 mils (0.169 mm) QR Code : 8.3 mils (0.212 mm) DataMatrix : 8.3 mils (0.212 mm)		PCS 0.9
	Depth of field	PDF417	Resolution 6.7 mils (0.169 mm)	85 ~ 130 mm	PCS 0.9
			Resolution 10 mils (0.254 mm)	65 ~ 180 mm	
		QR Code	Resolution 8.3 mils (0.212 mm)	95 ~ 115 mm	
			Resolution 15 mils (0.381 mm)	60 ~ 185 mm	
		DataMatrix	Resolution 10 mils (0.254 mm)	80 ~ 145 mm	
Common	Scan angle		Pitch : ±50°		
			Skew : ±50°		
			Tilt : ±180°		
	Minimum PCS		0.3 or more		MRD: 32% or more
Imager	Image data format		Windows Bitmap, JPEG		Black spot may appear on images, however, it does not affect the scanning performance.
	Shades of gray		1024, 256, 16, 2		
	Range of output image		Select top/bottom (row) and left/right (column)		
	Resolution of output image		Full, 1/2, 1/4		
	Interface of output image		RS-232C, USB-COM		
	Baud rate		USB-COM (full-speed)	About 3 sec	Resolution: Full
			RS-232C (baud-rate: 15.2 kbps)	About 40 sec	
Power	Range of operating voltage		4.5 ~ 5.5 V: USB / RS-232C (flying lead) 4.5 ~ 6.6 V: RS-232C (D-Sub9pin) / Wedge (external power supply)		RS-232C (D-Sub9pin) / Wedge External power supply: Dedicated AC adapter 6.0 V ±5%
	Current consumption (RS-232C)	Reading	265 mA (max)		Except the communication speed of 115200 bps.
		Standby	70 mA (max)		
Environmental Specifications	Temperature	Operating	-20 ~ 50°C		AC adapter: 0 ~ 40°C
		Storage	-20 ~ 60°C		
	Humidity	Operating	20 ~ 85% (no condensing, no frost)		
		Storage	20 ~ 90% (no condensing, no frost)		
	Ambient light immunity	Fluorescent	10,000 lux or less		UPC 100% Optical axis angle: 75° Distance: 125 mm
		Sunlight	100,000 lux or less		
	Vibration		10 Hz ~ 100 Hz, acceleration of 19.6 m/s2, 60 minutes per cycle, repeat once in each X, Y and Z-direction		
	Drop		Drop 3 times, at each 5 faces (right, left, front, back and top), from a height of 75 cm onto a concrete surface.		* Excluding the part where the interface cable is attached
	Dust and drip proof		IP65		

Item			Specification	Note
Regulatory	This scanner is an Exempt Risk Group LED product.			
	LED safety		IEC 62471-1:2006 Exempt Risk Group	Peak Wavelength: 624 nm
	EMI/RFI		VCCI / EN55022 / FCC Class-B	For residential, commercial and light-industrial environments
	Product safety		CE Marking	
	Electromagnetic compatibility (EMC)		EN55024 (EN61000-6-1) Class-B	For residential, commercial and light-industrial environments
Immunity Test	ESD immunity	No destruction	15 kV (Apply static electricity 50 times to the surface of the scanner)	Condition: IEC61000-4-2 compliant
		No malfunction	Contact discharge (direct / indirect): ±6 kV Air discharge (direct): ±8 kV	
	Radio-frequency electromagnetic field. Amplitude modulation	Frequency	80 ~ 1000 MHz	Condition: IEC61000-4-3 compliant
		Level	3 V/m	
		AM	80% (AM)	
	Fast transient	Voltage	Alternating-current input cable: ±1 kV	Condition: IEC61000-4-4 compliant
		Pulse	5 / 50 ns (Tr / Tw)	
		Frequency	5 kHz	
	Surge	Pulse	1.2 / 50 ns (Tr / Th)	Condition: IEC61000-4-5 compliant
		Voltage	From L to P: ±2 kV (closed-loop voltage)	
			From L to L: ±1 kV (closed-loop voltage)	
	Radio-frequency common mode	Frequency	0.15 ~ 80 MHz	Condition: IEC61000-4-6 compliant
		Level	3 V	
		AM	80% (AM)	
	Power frequency magnetic field	Frequency	50 and 60 Hz	Condition: IEC61000-4-8 compliant
		Level	3 A/m	
	Voltage dip, momentary voltage drop, fluctuation	Dip 1	Drop 30%, 0.5 cycles	Condition: IEC61000-4-11 compliant
		Dip 2	Drop 60%, 5 cycles	
		Momentary drop	Drop > 95%, 250 cycles	
Physical Features	Dimensions		33.0 × 41.1 × 24.0 (WDH mm)	
	Weight		Approx. 30 g	Excluding the interface cable
External Power Supply	Model name		SFP0602000P-PSE (USA P/N 32-00606-00)	Accessories: Universal AC plug set
	Input	Voltage range	AC 90 ~ 265 V	
		Supply current	0.5 A (max)	
	Output	Voltage range	5.7 ~ 6.3 V	
		Maximum current	2.0 A (max)	

4. Detailed View

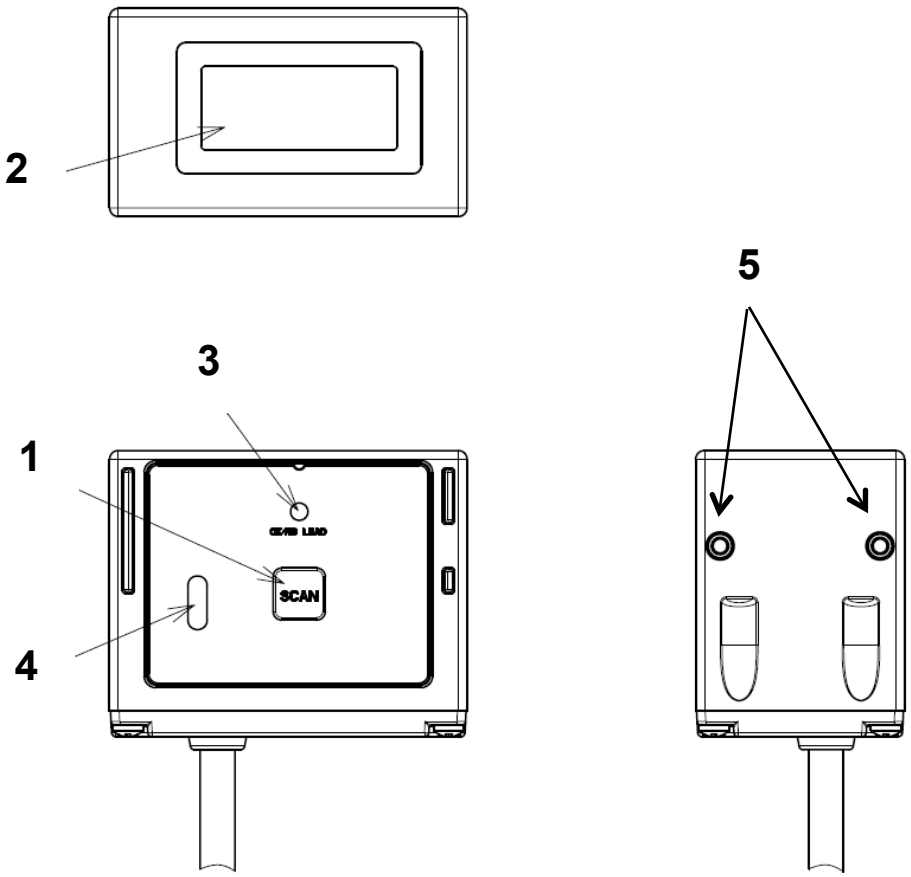


Figure 1: Detailed View of NLV-3101

No	Name	Description
1	Trigger Button	By pressing this key, the scanner starts taking an image from the scanning window and LED illumination is emitted to read 1D/2D codes.
2	Scanning Window	Light paths of the imager, LED illumination and LED aiming. Ensure that the lens is not exposed to dust and dirt before scanning.
3	Status LED	The operating status is indicated by different colors.
4	Beeper Hole	A sound from a built-in beeper comes out through these holes. When they are covered, the beeper sound may not be able to be heard. The sound varies depending on the status. Beeper settings can be configured in various ways: enable or disable beeper as well as change the loudness and duration.
5	Mounting Holes	Screw holes for installing the scanner. Two more holes are located on the bottom side, the opposite side of where the trigger key is located.

5. Electrical Specifications

5.1. AC Adapter Specifications

For RS-232C (D-Sub 9pin) and Wedge PS/2 models

5.1.1. Input Specifications

Power supply voltage	: AC 90 ~ 265 V
Power supply frequency	: 47 ~ 63 Hz
Maximum current	: 0.5 A (max)

5.1.2. Output Specifications

Output voltage	: 6.0 V ±5% / Output current: 0 ~ 2.0 A (max)
Power ripple	: 100 mVp-p (max, rated load)

5.2. Wedge PS/2 Power Supply (Host)

Input power supply voltage	: DC 5.0 V
Range of working voltage	: 4.5 ~ 5.5 V
Power ripple	: 100 mVp-p max (10 ~ 100 kHz, power supply voltage 5.0 V)
Current consumption	: 250 mA (max) without main power supply (AC adapter)
	5 mA (max) in standby state with main power supply (AC adapter)

* Current consumption from the main power supply in standby state: 155 mA (max)
* Current consumption from the main power supply during reading operation: 305 mA (max)
* Keyboard operation is possible when the main power supply is off.
* The current consumption was measured at 25°C.

5.3. USB Power Supply

Power supply	: 500 mA High-Power
Current consumption	: 85 mA (max) in stand-by mode
	: 400 mA (max) during reading operation

* The current consumption was measured at 25°C.

6. Interface Specifications

The NLV-3101 supports four types of interfaces; RS-232C, USB-HID, USB-COM and Wedge PS/2.

6.1. RS-232C

The RS-232C interface has two specifications for connecting to the host: D-Sub9pin with DC jack and (10 wires) with sequencer signals.

Communication Setting

Baud rate : 300 ~ 115200 bps
Data length : 7 / 8 bits
Parity bits : No / Even / Odd parity
Stop bits : 1 / 2 bit

* Multi byte character data or images can be transmitted via RS-232C interface.

Signal Level: signal names are based on the signals transmitted from the scanner to the host.

Signal Name	IN/OUT	Voltage(V)	
		Mark	Space
TxD	OUT	-5 ~ -15	+5 ~ +15
RxD	IN	-3 ~ -15	+3 ~ +15
RTS	OUT	-5 ~ -15	+5 ~ +15
CTS	IN	-3 ~ -15	+3 ~ +15

Signal Level: sequencer signals (Flying lead (no connector) cable specification only)

Signal Name	IN/OUT	Voltage(V)	
		L level	Space / ON
External trigger	IN	-0.3 ~ 0.6 V	3 V ~ Vcc +0.3 V
OK	OUT	0.3 V / 10 mA	OC output / Vcc +0.3 V
NG	OUT	0.3 V / 10 mA	OC output / Vcc +0.3 V

6.1.1. D-Sub9pin

6.1.1.1. Pin Assignment

Signal Name	Pin No.	Note
Shield	1	
TxD	2	
RxD	3	
(NC)	4	Connect to pin 6
GND	5	
(NC)	6	Connect to pin 4
CTS	7	
RTS	8	
(NC)	9	Open (not connected)

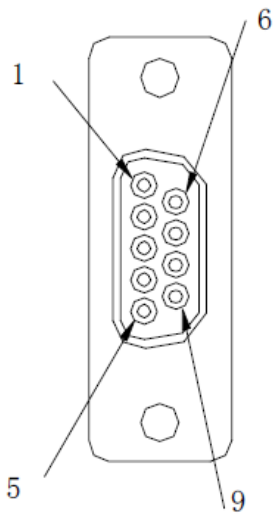


Figure 2: RS-232C D-Sub9pin Connector

6.1.1.2. RS-232C D-Sub 9pin Circuit

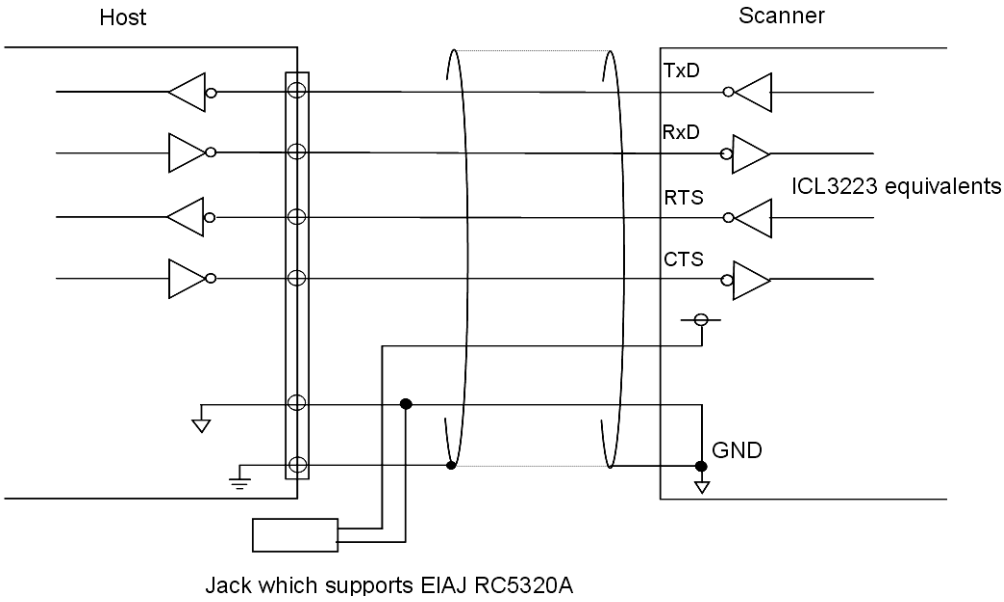


Figure 3: RS-232C D-Sub 9pin Circuit

Connector : D-Sub 9pin, female
Power supply : EIAJ RC5320A (voltage classification 2) jack

6.1.1.3. RS-232C D-Sub 9pin Interface Cable

Weight: approx. 90 g

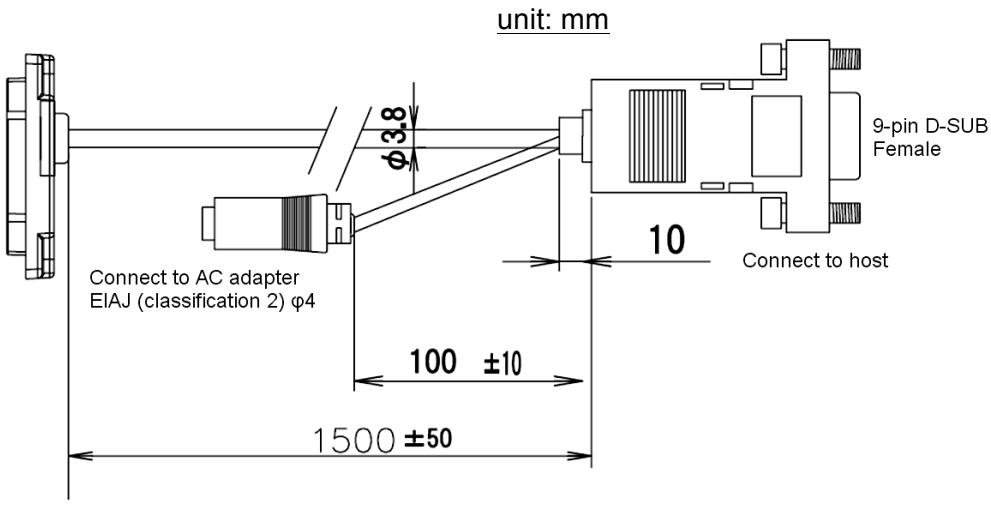


Figure 4: Cable (RS-232C D-Sub 9pin)

6.1.2. Flying Lead Cable

6.1.2.1. Pin Assignment

Signal Name	Cable Color	Note
VCC	Red	Power-supply voltage 4.5 ~ 5.5 V (Typ. 5 V)
Trigger	Brown	External trigger input terminal
OK	Yellow	External OK output terminal
NG	Orange	External NG output terminal
S-GND	Black	
RTS	Gray	
CTS	Blue	
TxD	Green	
RxD	White	
Shield GND	(Black)	Heat shrinkable tube

* Be sure the wiring is done correctly.

6.1.2.2. RS-232C Flying Lead Circuit

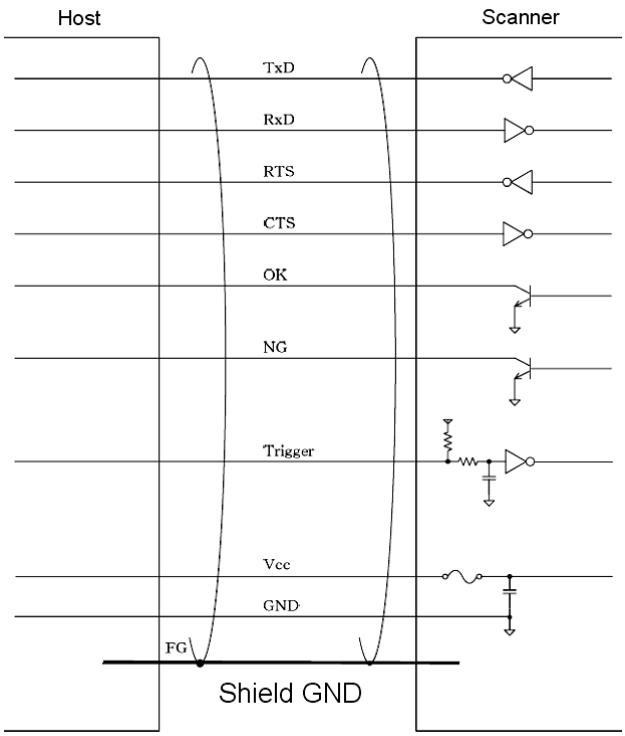


Figure 5: RS-232C Circuit

6.1.2.3. RS-232C Flying Lead Cable

Weight: approx. 45 g

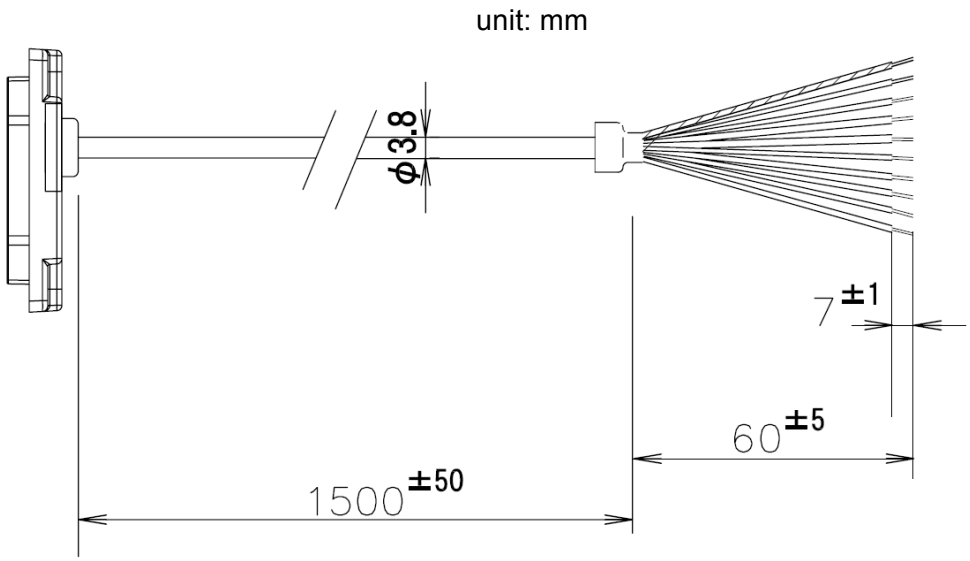


Figure 6: Cable (RS-232C)

6.2. USB

The USB interface models have two specifications: HID (Human Interface Device Class) and COM (Communication Device Class). With USB-COM model, VCP (Virtual Communication Port) allows virtual serial communication and the commands can be transmitted from the host computer.
* Multi byte character data or images can be transmitted via USB-COM interface.

6.2.1. USB Interface Specifications

Power supply : 500mA (High-Power).
Speed : Full-speed (12 Mbps)
Interface : USB-HID / USB-COM (VCP)

* The USB model is bus powered and no AC adapter is required.
* Images cannot be transmitted via the USB-HID interface.
* Multi byte character data can be transmitted via USB-HID interface with settings.
* Make sure to connect to a High-power bus (500 mA max) USB terminal.

6.2.2. Connector

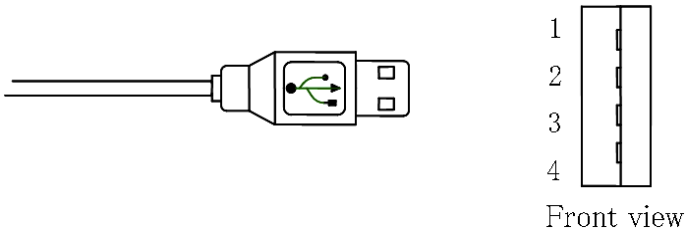


Figure 7: USB Plug (A)

Pin No.	Signal name	Note
1	V bus	
2	Data (－)	
3	Data (＋)	
4	GND	

6.2.3. USB Interface Circuit

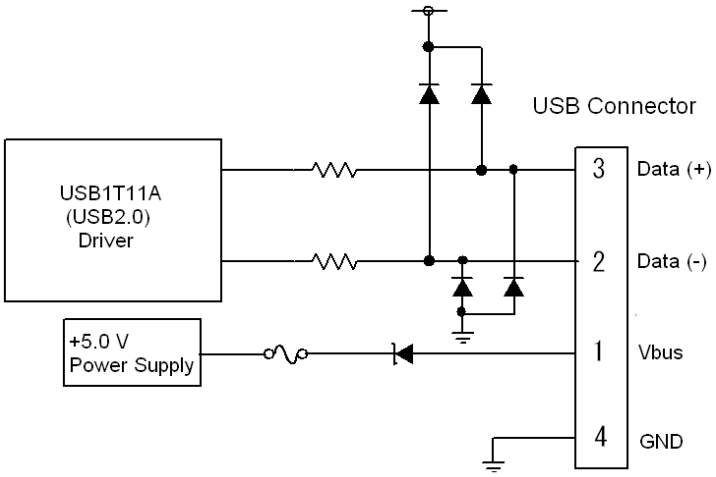


Figure 8: Interface Circuit (USB)

6.2.4. USB Interface Cable

Weight: approx. 70 g

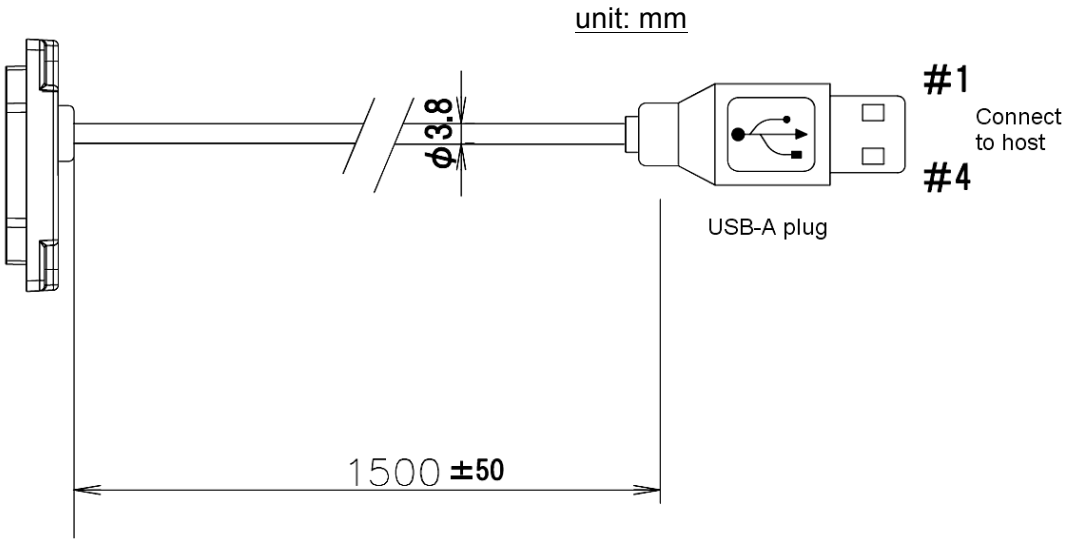


Figure 9: Cable (USB)

6.3. Wedge PS/2

6.3.1. How to Connect

- Connect the branch cable (without label on, 6-pin Mini-DIN female) to the NLV-3101 Wedge interface cable connector (6-pin Mini-DIN male).
- Connect the branch cable connector (6-Pin Mini-DIN male) to the host keyboard connector.
- Connect the other branch cable connector (with DOS/V KEY label on, 6-pin Mini-DIN, female) to the keyboard.
- Insert the AC adapter plug to the DC jack of the interface cable and start the host computer.

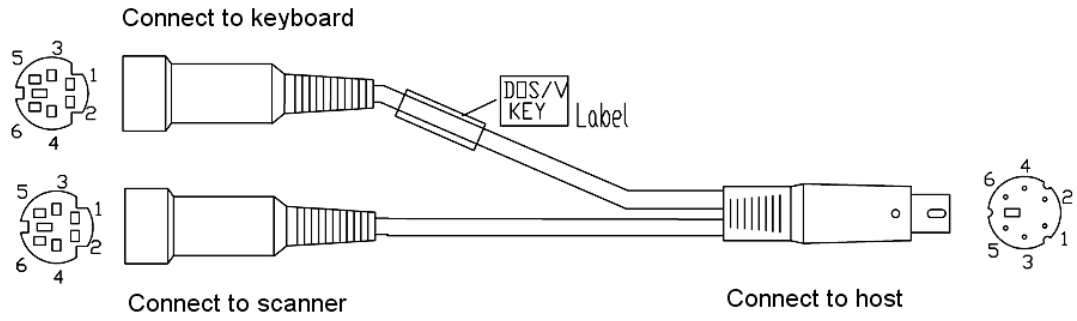
6.3.2. Caution

- Do not operate on the keyboard during the data transmission to the host or the data transmission may fail.
- The keyboard can operate without connecting to the AC adapter when this device is not used. However, do not turn ON or OFF the adapter while operating on the keyboard. It may cause malfunctions.
- Images cannot be transmitted via this wedge interface.
- Do not start any scanning operation or keyboard operation before the OS of the host computer is fully activated.

6.3.3. Pin Assignment

Wedge PS/2 Branch Cable

Pin No.	Signal Name
1	KEY DATA
2	N.C
3	GND
4	VCC
5	KEY CLK
6	N.C



Pin No.	Signal Name
1	CPU DATA
2	N.C
3	GND
4	VCC
5	CPU CLK
6	N.C

Wedge PS/2 Interface Cable for the NLV-3101

Pin No.	Signal Name
1	CPU DATA
2	KEY DATA
3	GND
4	VCC
5	CPU CLK
6	KEY CKL

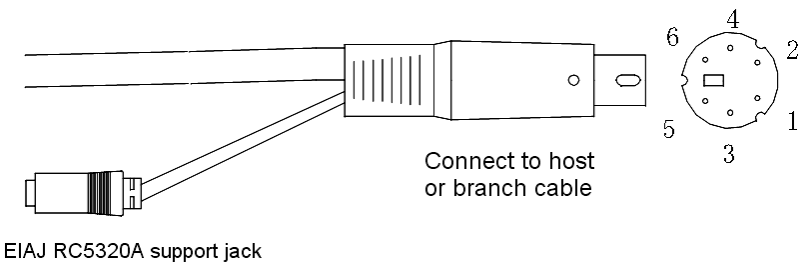


Figure 10: Pin Assignment (Wedge PS/2)

6.3.4. Wedge PS/2 Interface Cable

Weight: approx. 75 g

unit: mm

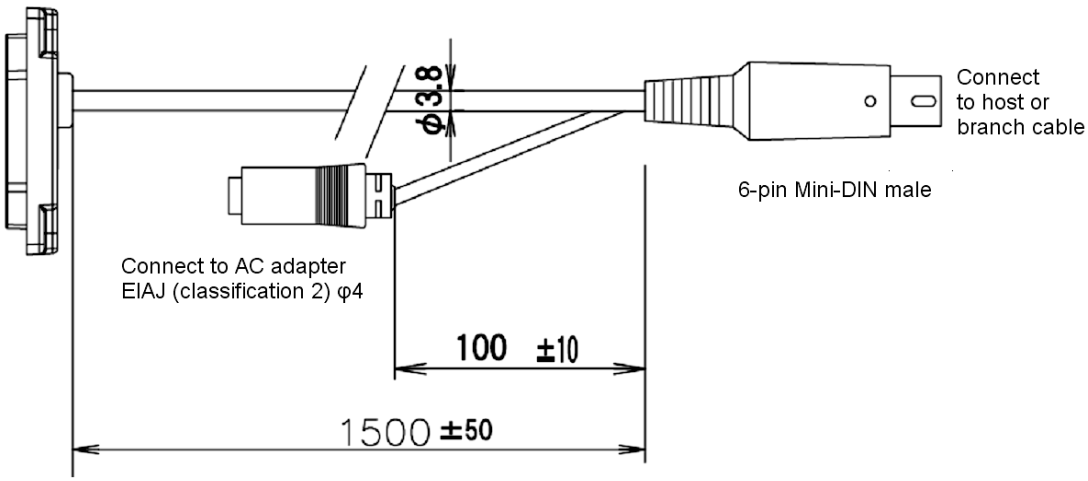
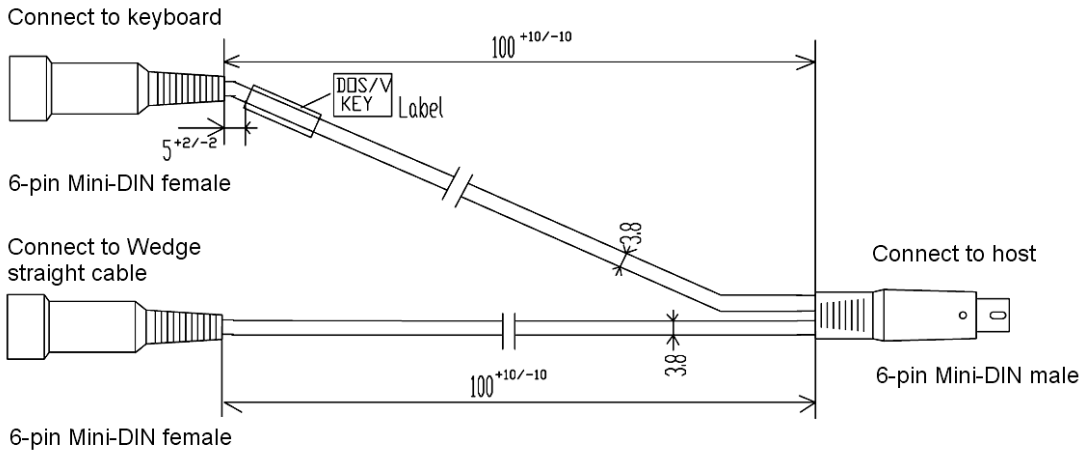


Figure 11: Cable (Wedge PS/2)

6.3.5. Wedge PS/2 Branch Cable

Weight: approx. 25 g

This cable is required when connecting both the scanner and the keyboard to the host.



unit: mm

Figure 12: Branch Cable (Wedge PS/2)

7. Optical Specifications

7.1. Basic Optical Specifications

Item		Characteristics
Scan method	CMOS area sensor	grey-scale
Number of effective pixel	(Column) × (Row)	752 × 480 pixels
Image capture speed (*1)	Frame rate	60 fps
Focal distance	Distance from the front edge of scanner	125 mm
View angle	Horizontal	Approx. 40.6°
	Vertical	Approx. 26.4°
Illumination light source (LED × 2)	Red LED	-
	Peak wavelength	617 nm
	Directivity angle: 2Φ 1/2 (*2)	60°
	Maximum radiation output (*3)	15000 mcd
Aiming light source	Green LED	-
	Peak wavelength	528 nm
	Maximum radiation output (*4)	18700 mcd

*1 The fastest seed of image capture
*2 Reference value extracted from the datasheet.
*3, *4 Reference value based on the datasheet (25°C, IF = 50 mA).

7.2. Aiming Pattern

The aiming is used for the following purpose:
1. Fill light to recognize the appropriate reading range.
2. Fill light when auto trigger is used.

The aiming specifications are as follows:
- An optical axis of imaging field of view and the center of horizontal aiming width coincide at a distance of L = 105 ± 20 mm from the front edge of the scanner.
- The horizontal aiming width to the horizontal width of imaging filed of view at a distance of L = 105 is 80% ± 10%.

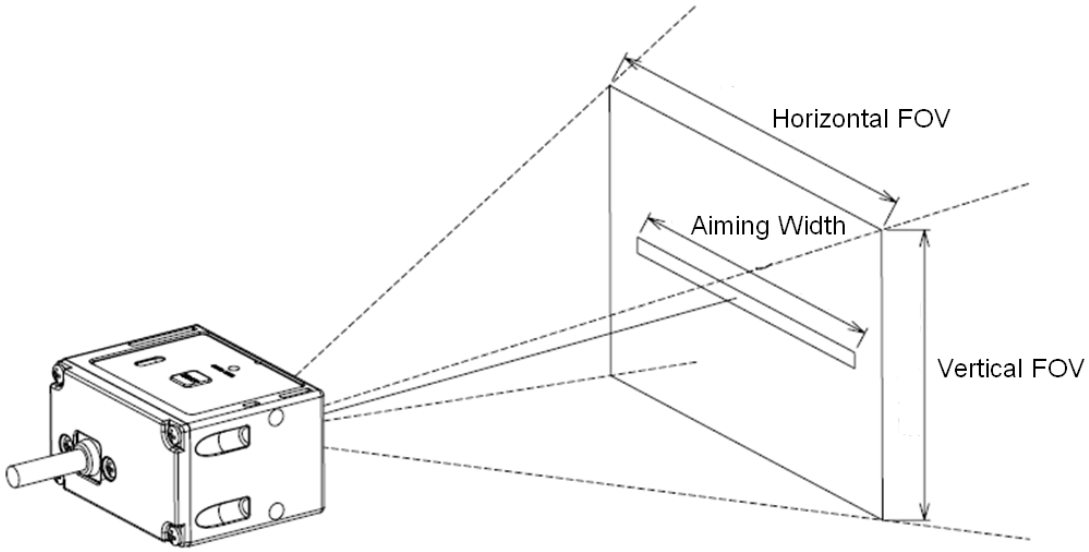


Figure 13: Aiming Pattern and Imaging Range

7.3. Imaging Range

The range is ±5% from the following values.

L: Distance from the front edge of scanner	[mm]	80	100	125	140	160	180
H: Horizontal imaging range	[mm]	59	74	93	104	118	133
V: Vertical imaging range	[mm]	38	47	59	66	75	85

The imaging range is no the scanning range but the imaging field of view.

8. Technical Specifications

Aim the green bar illumination at the center of a code to scan it. For long distance scanning, ambient light entering the angle of view may affect the scanning performance. The conditions for technical specifications are as follows, unless otherwise specified in each section.

<Conditions>

Ambient Temperature and Humidity	Room temperature, room humidity
Ambient Light	100 ~200 lux (on the surface of a bar code)
Angles	Pitch: α = 0°, Skew: β = 15°, Tilt: γ = 0°
Curvature	R = ∞
Power Supply Voltage	5.0 V
PCS (1D and 2D)	0.9 or higher
Scanning Test	Accept the performance with 90% or more success rate for 10 tries of scan. One scan should be tested within 1 second.
Barcode Test Sample (1D and 2D)	Specified below.

< Test chart >
For 1D codes, OPTOELECTRONICS test samples
For GS1 Databar, stacked codes and 2D codes, printed by a dedicated printer for bar code

8.1. Barcode Test Sample

1D Bar Codes

<Code 39>

Resolution	Symbology	PCS	Size (mm)	No. of Digits
5 mils (0.127 mm)	Code 39	0.9	32 × 10	15
8 mils (0.20 mm)			100 × 10	31
10 mils (0.254 mm)			32.5 × 12	7
20 mils (0.508 mm)			36 × 25	4

<Code 128>

Resolution	Symbology	PCS	Size (mm)	No. of Digits
8 mils (0.20 mm)	Code 128	0.9	42 × 10	16

<UPC>

Resolution	Symbology	PCS	Size (mm)	No. of Digits
13 mils (0.330 mm)	12-digit UPC	0.9/0.3	31.5 × 25.0	12

<Codabar>

Resolution	Symbology	PCS	Size (mm)	No. of Digits
6 mils (0.15 mm)	Codabar	0.9	20 × 10	10

GS1 Databar/Composite

<GS1-limited>

Resolution	Symbology	PCS	Size (mm)	No. of Digits
6.7 mils (0.169 mm)	Limited	0.9	12 × 1.5	14
6.7 mils (0.169 mm)	Limited-Composite	0.9	12 × 3.0	26

2D Codes

<PDF417>

Resolution	Error Correction	PCS	Size (mm)	No. of Character
0.169 mm (6.7 mil)	Level-3	0.9	23 × 10	58
0.254 mm (10 mil)			35 × 15	

<QR Code: Model-2>

Resolution	Error Correction	PCS	Size (mm)	No. of Character
8.4 mils (0.212 mm)	M	0.9	6 × 6	44
15 mils (0.381 mm)			11 × 11	

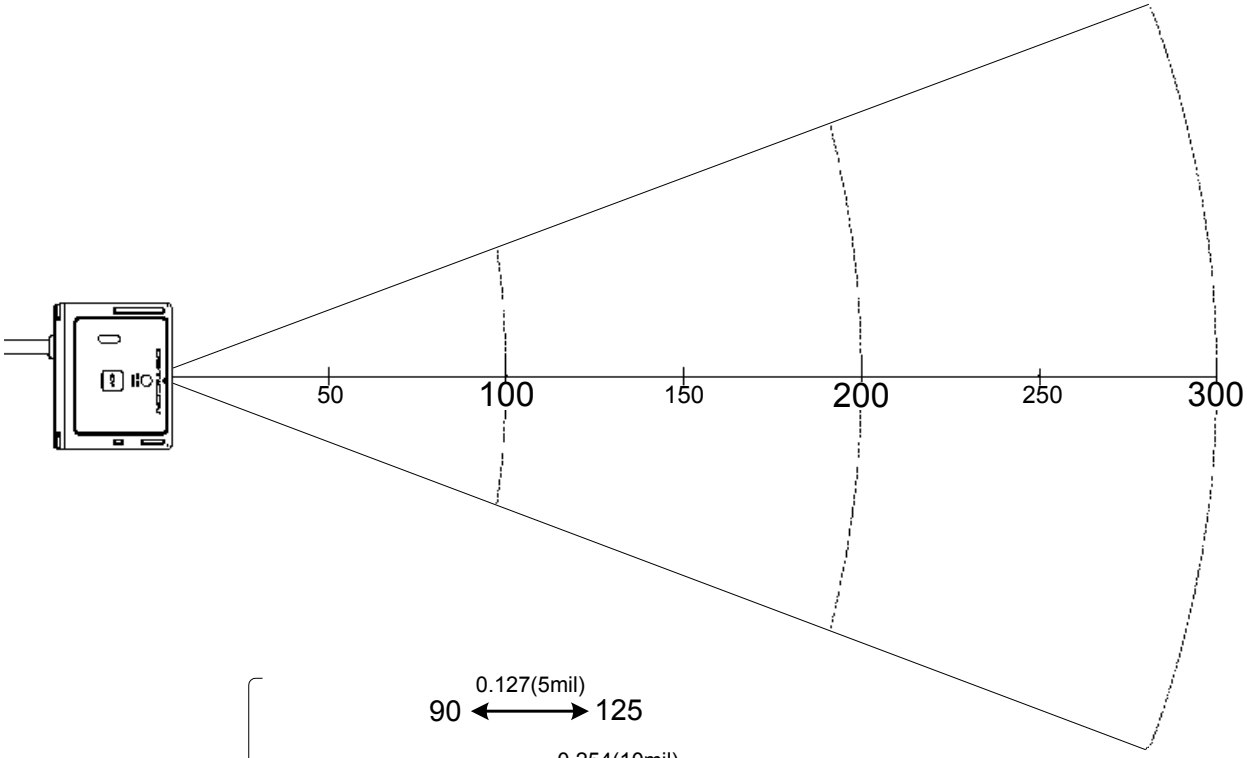
<Data Matrix>

Resolution	Model	PCS	Size (mm)	No. of Character
8.4 mils (0.212 mm)	ECC200	0.9	5 × 5	40
10 mils (0.254 mm)			6 × 6	

* The size is outline dimensions excluding the quiet zones.

8.2. Scan Area and Depth of Field

The scan area is measured from the front edge of the scanner.



Code 39	0.127(5mil)	90 ↔ 125	[Unit : mm]
	0.254(10mil)	70 ↔ 190	
	0.508(20mil)	* 65 ↔ 235	
Code 128	0.20(7.9mil)	80 ↔ 160	
UPC 100%	0.33(13mil)	55 ↔ 185	
PDF417	0.169(6.7mil)	85 ↔ 130	
	0.254(10mil)	65 ↔ 180	
QR Code	0.212(8.4mil)	95 ↔ 115	
	0.381(15mil)	60 ↔ 185	
Data Matrix	0.254(10mil)	80 ↔ 145	

* The depth of field depends on the view angle and symbol length.
* Please consider the mounting position by placing a label near the middle of depth of field and eliminate ambient light and specular light from LED illumination.

Figure 14: Scan Area and Depth of Field

8.3. Printed Contrast Signal (PCS)

0.3 or higher

<Conditions>
MRD : 32% and higher
(70% or higher reflectivity of space and quiet zone)
Distance : 125 mm from the front edge of the scanner
Bar Code Sample : UPC specified in Chapter 8.1. (Resolution: 0.33 mm, PCS: 0.3)

MRD = Minimum reflectance of white bar - Maximum reflectance of black bar

$$PCS = \frac{\text{Reflectance of white bar} - \text{Reflectance of black bar}}{\text{Reflectance of white bar}}$$

8.4. Minimum Resolution

1D Code : 5 mils (0.127 mm) Code 39 specified in Chapter 8.1
GS1-Databar : 6.7 mils (0.169 mm) GS1 Databar Limited specified in Chapter 8.1
Stacked Code : 6.7 mils (0.169 mm) PDF417, GS1 Databar Limited Composite specified in Chapter 8.1
2D Code : 8.4 mils (0.212 mm) QR Code and Data Matrix specified in Chapter 8.1

<Conditions>
Bar Code Sample : The above codes specified in Chapter 8.1
Distance : 100 mm from the front edge of the scanner
Angle : $\alpha = 0°$, $\beta = +15°$, $\gamma = 0°$
Curvature : R = ∞

8.5. Wide Bar Code

Code 39 with width of 100 mm and resolution of 7.9 mils (0.20 mm) can be read

<Conditions>
Bar Code Sample : 7.9 mils (0.20 mm) Code 39 / PCS 0.9 specified in Chapter 8.1
Distance : 155 mm from the front edge of the scanner
Angle : $\alpha = 0°$, $\beta = +15°$, $\gamma = 0°$
Curvature : R = ∞

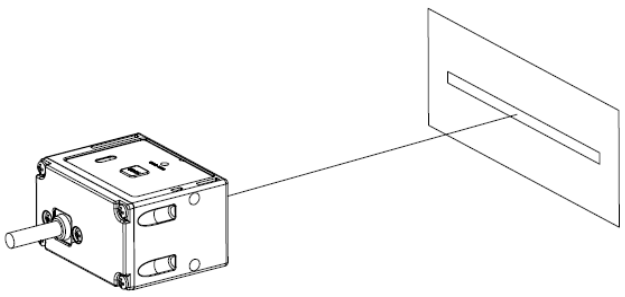


Figure 15: Wide Bar Code

8.6. Pitch, Skew and Tilt

Pitch : α = ±50°
Skew : β = ±50°
Tilt : γ = ±180°

<Conditions>
Bar Code Sample : 13 mils (0.33 mm) UPC specified in Chapter 8.1
Distance : 125 mm from the front edge of the scanner
Curvature : R = ∞
* For the pitch angle and tilt angle measurement, set the skew angle β = +15°

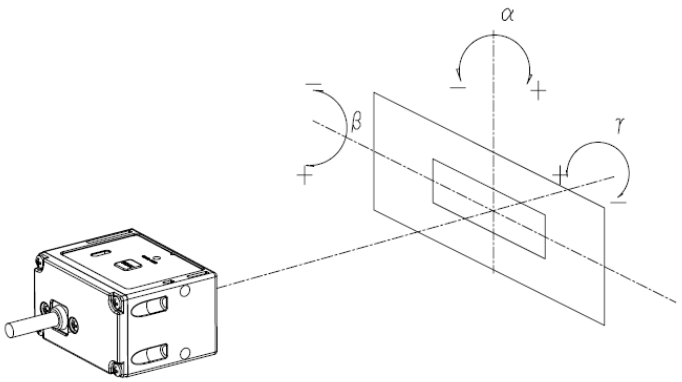


Figure 16: Pitch, Skew and Tilt

8.7. Curvature

0.33 mm 12-digit UPC : R ≥ 20 mm
0.15 mm 10-digit Codabar : R ≥ 16 mm

<Conditions>
Bar Code Sample : 13 mils (0.33 mm) UPC, 0.15 mm Codabar specified in Chapter 8.1
Distance : 105 mm from the front edge of the scanner
Angle : α = 0°, β = +15°, γ = 0°

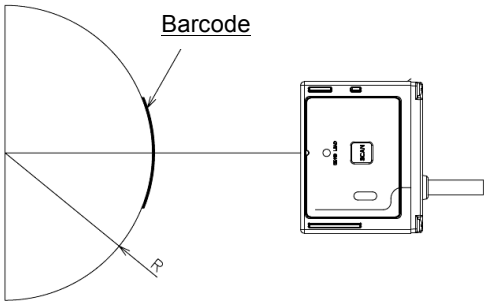


Figure 17: Curvature

Note: Scanning may fail due to the specular reflection of LED illumination when the reflectivity is high.

8.8. Auto Trigger

The scanner starts scanning automatically when it detects a change in brightness that occurs when a bar code label is presented in front of it.
Trigger should be enabled when inserting a gray-colored paper on a black backing paper.
Trigger also should be enabled when inserting a black-colored paper on a gray backing paper.

<Conditions>
Paper used : Black paper from Glory called as Black 010010016
: Gray paper from Glory called as Silver-gray 010010016
Ambient Light : 500 ~ 1000 lux
Moving Speed of Detected Paper : 1 M/s or slower
Ambient Temperature and Humidity : Room temperature and room humidity

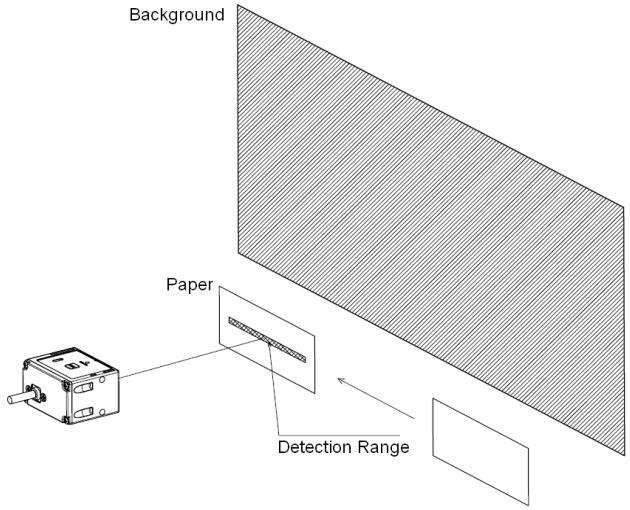


Figure 18: Auto Trigger

8.9. Motion Tolerance

UPC 100% can be read when it is moving at 1 M/s.
<Conditions>
Ambient Temperature and Humidity : Room temperature and Room humidity
Ambient Light : 500 ~ 1000 lux
Distance : 125 mm from the front edge of the scanner
PCS (1D and 2D) : 0.9 or higher
Bar Code Sample : Refer to Chapter 8.1.

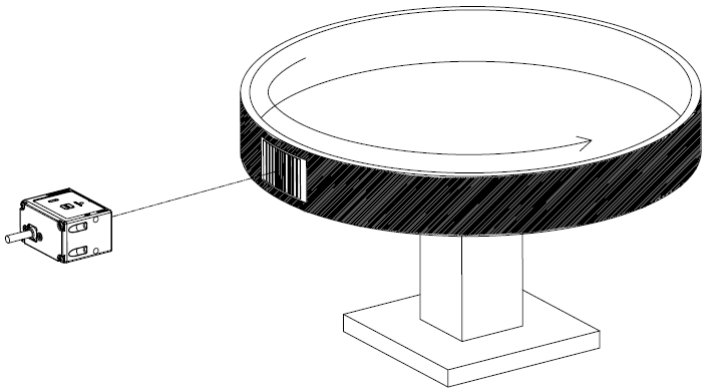


Figure 19: Motion Tolerance

* Scanning may fail due to the specular reflection of LED illumination when the reflectivity is high.

9. Environmental Specifications

9.1. Temperature

Scanning performance is guaranteed when the range of ambient temperature around the scanner is the following values:

Operating Temperature : -20 ~ 50 °C
Storage Temperature : -20 ~ 60 °C

<Conditions>
Bar Code Sample : 13 mils (0.33 mm) UPC specified in Chapter 8.1
Distance : 125 mm from the front edge of the scanner
Angle : α = 0°, β = ＋15°, γ = 0°
Curvature : R = ∞
Scanning Test : Read at intervals of 300 ms

* When you attach this scanner to a place with few crevices, or the bad place of breathability, please check the circumference temperature of this scanner.

9.2. Humidity

Scanning performance is guaranteed when the range of ambient humidity around the scanner is the following values:

Operating Humidity : 20 ~ 85% RH (no condensation, no frost)
Storage Humidity : 20 ~ 90% RH (no condensation, no frost)

<Conditions>
Bar Code Sample : 13 mils (0.33 mm) UPC specified in Chapter 8.1
Distance : 125 mm from the front edge of the scanner
Angle : α = 0°, β = ＋15°, γ = 0°
Curvature : R = ∞

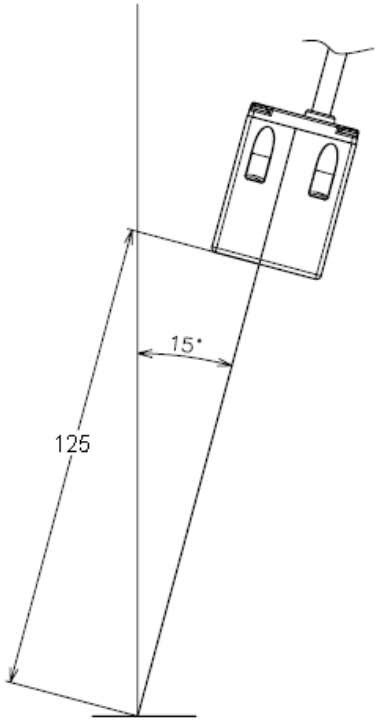
9.3. Ambient Light Immunity

Scanning performance is guaranteed when the range of illumination on a barcode surface is between zero and the following values:

Incandescent light : 10,000 lux
Fluorescent light : 10,000 lux
Sunlight : 100,000 lux

<Conditions>

Bar Code Sample	: 13 mils (0.33 mm) UPC specified in Chapter 8.1
Distance	: 125 mm from the front edge of the camera module
Angle	: α = 0°, β = ＋15°, γ = 0°
Curvature	: R = ∞
Power Supply Voltage	: 3.3 and 5.0 V



unit: mm

Figure 20: Ambient Light Immunity

* Be sure that the direct light or specular reflection from the light source does not enter the light receiving section of the NLV-3101.

9.4. Dust and Drip Proof

Enclosure: IEC IP65 Rated

9.5. Cable Strength

There shall be no sign of malfunction after the following cable strength test.
Cable Strength Test: Affix the scanner to an immovable object and pull it using a force of 24.5 N (2.5 kgf static loading) for 1 second. Repeat this 20 times continuously.

9.6. Cable Bending Strength

There shall be no sign of malfunction after the following cable bending test.
Cable Bending Test: Add a load of 4.9 N (500 gf) to a cable and bend it at an angle of 60° to both right and left. Repeat this 1000 times continuously.

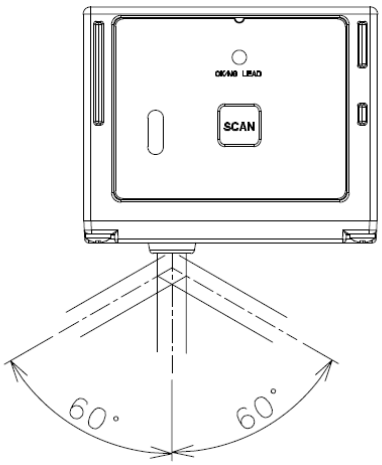


Figure 21: Cable Bending

9.7. Vibration Strength (without packing)

There shall be no sign of malfunction after the following vibration test.
Vibration test: Increase the frequency of the vibration from 10 Hz to 100 Hz at an accelerated velocity of 19.6 m/s^2 (2.0 G) for 30 minutes (60 minutes per cycle) in the non-operating state. Repeat this in each X, Y and Z direction.

9.8. Vibration Strength (in individual packing)

There shall be no sign of malfunction after the following vibration test.
Vibration test: Increase the frequency of the vibration from 10 Hz to 100 Hz at an accelerated velocity of 19.6 m/s^2 (2.0 G) for 30 minutes (60 minutes per cycle) in individually packaged state. Repeat this in each X, Y and Z direction.

9.9. Drop Impact Strength (without packaging)

There shall be no sign of malfunction after the following drop test.
Drop test: Drop the scanner three times (15 times in total), at each 5 face, from a height of 75 cm onto a concrete floor as shown below.

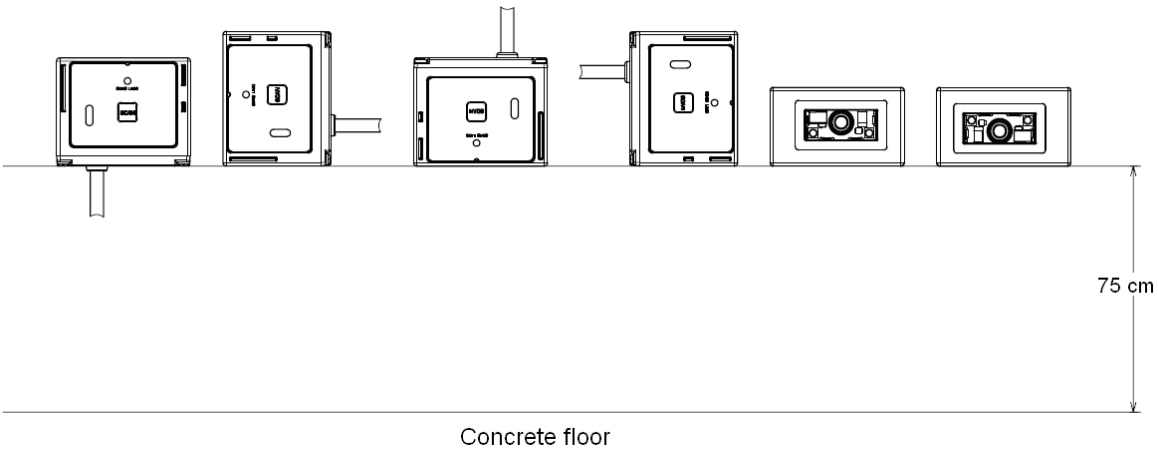


Figure 22: Drop Test

9.10. Drop Impact Strength (in individual packaging)

There shall be no sign of malfunction after the following drop test.
Drop test: Drop an individually packaged scanner 10 times in total, at any of 1 corner, 3 edges, and 6 faces, from a height of 100 cm onto a concrete floor.

9.11. Electrical Specifications

Withstand Voltage	: AC 1500 V / 60 seconds, 10 mA or less
Insulation Resistance	: DC 500 V, 2 MΩ or higher
Current Leakage	: 250 µA or less / AC 250 V 60 Hz
Power Line Noise Immunity	: ±1 kV or lower
Electrostatic Discharge Immunity	: No destruction found (±15 kV, air or direct discharge)
	: No malfunction found (±10 kV, air or direct discharge)
	: ±6 kV (contact, direct or indirect discharge)

*Testing method is compliant with IEC-61000-4-2. (150 pF, 330 Ω)

10. Regulatory Compliance

10.1. LED Safety

IEC 62471-1:2006 Exempt Risk Group

10.2. EMC

EN55022
EN55024
FCC Part 15 Subpart B Class B

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful Interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

VCCI Class B

This is a Class B product, to be used in a domestic environment, based on the Technical Requirement of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this is used near a radio or television receiver in a domestic environment, it may cause radio interference.

11. RoHS

The NLV-3101 is compliant with RoHS.

RoHS: The restriction of the use of certain hazardous substances in electrical and electronic equipment, 2002/95/EC

12. Reliability

MTBF (Mean Time Between Failures) 50,000 hours

Note: The reliability of the NLV-3101 is guaranteed as far as it is operated under normal operating conditions in the range of advised operating temperature and without excessive electrical or mechanical shock.

13. Precautions

Handle this product carefully. Do not deliberately subject it to any of the following.

13.1. Shock

- Do not throw or drop the imager.
- Do not place heavy objects on the cables.

13.2. Temperature Conditions

- Do not use the imager at temperatures outside the specified range.
- Do not pour boiling water on the imager.
- Do not throw the imager into the fire.
- Do not forcibly bend the cables at low temperatures.

13.3. Foreign Materials

- Do not subject the imager to chemicals.

13.4. Other

- Do not plug/unplug the connectors before disconnecting the power.
- Do not disassemble this product.
- Do not place the product near a radio or a TV receiver, as the imager may cause reception problems.
- The imager may be damaged by voltage drops.

14. Product Label

The product label is affixed to the scanner as shown below.

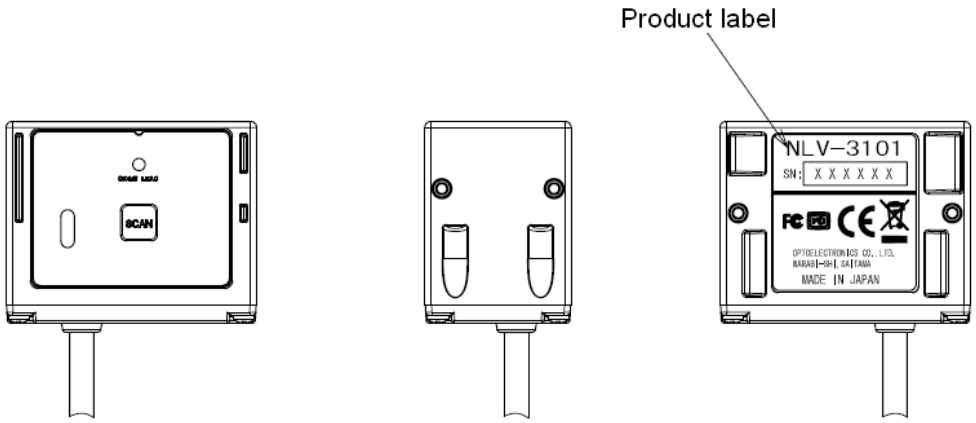


Figure 23: Product Label Position

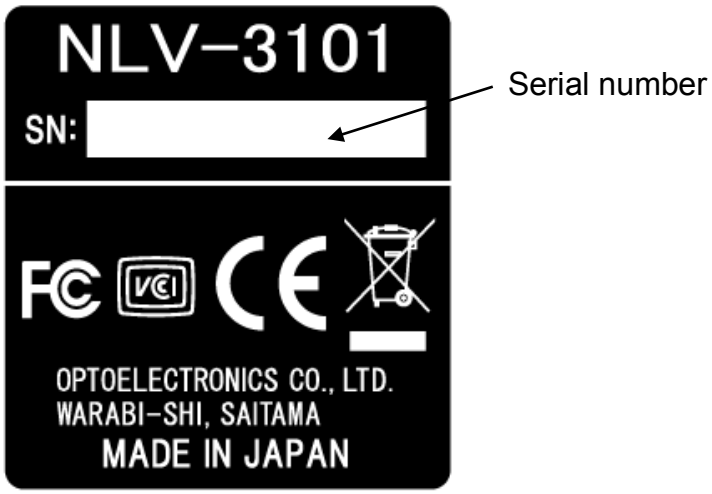


Figure 24: Enlarged View of Label

15. Packaging Specifications

15.1. Individual Packaging

15.1.1. Included AC Adapter

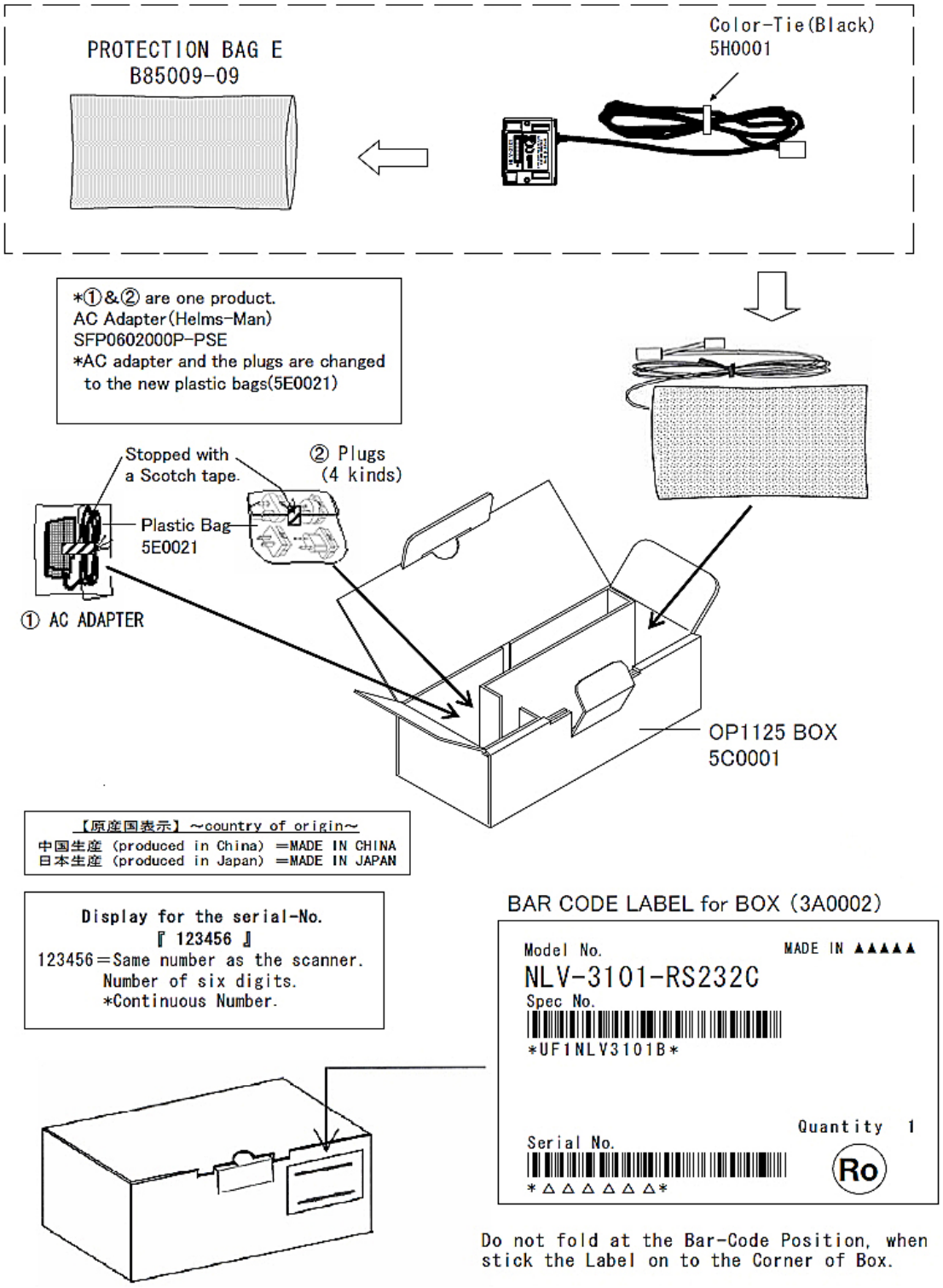


Figure 25: Individual Packaging (with AC adapter RS-232C (D-Sub 9pin) - example)

15.1.2. Non Included AC Adapter

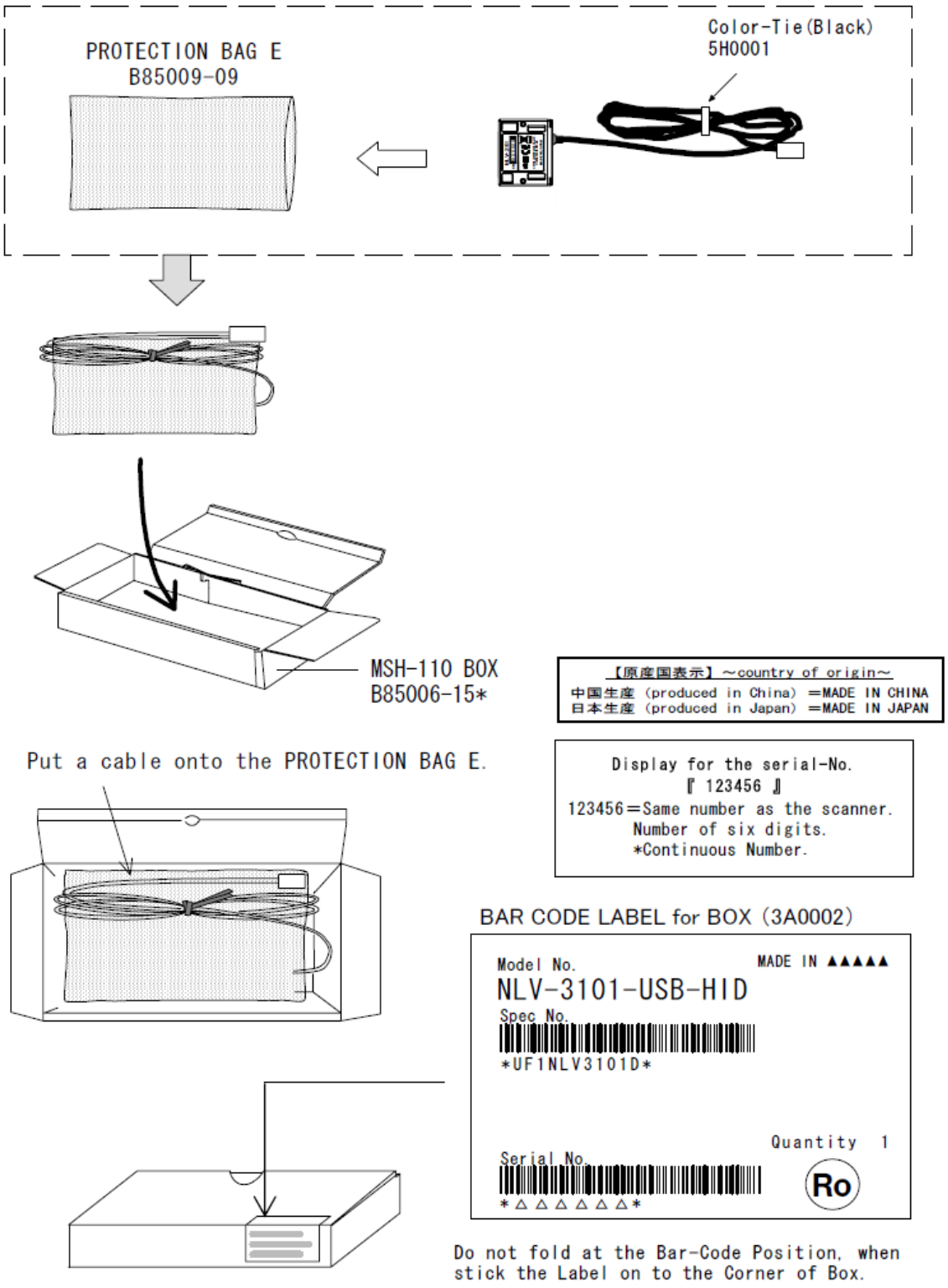


Figure 26: Individual Packaging (without AC adapter USB-HID - example)

15.2. Collective Packaging

30 units with AC adapter package size : 600 x 525 x 290 (WDH mm)
50 units without AC adapter package size : 600 x 525 x 250 (WDH mm)

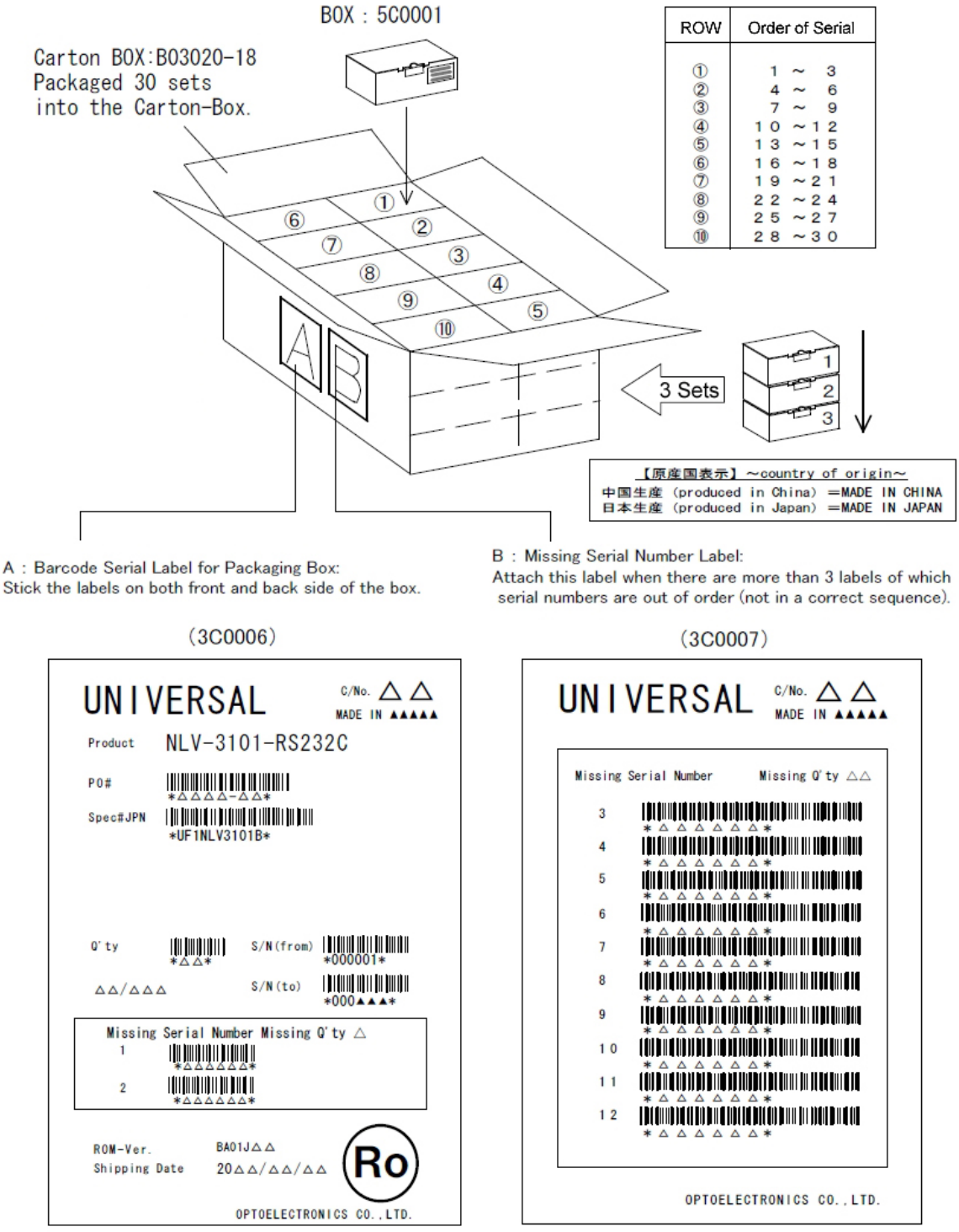


Figure 27: Collective Packaging (with AC adapter RS-232C (D-Sub 9pin) - example)

Note: 'Ro mark' on the trays and the boxes for the product indicates that the product is RoHS compliant, which is declared by Optoelectronics Co., Ltd.

16. Physical Features

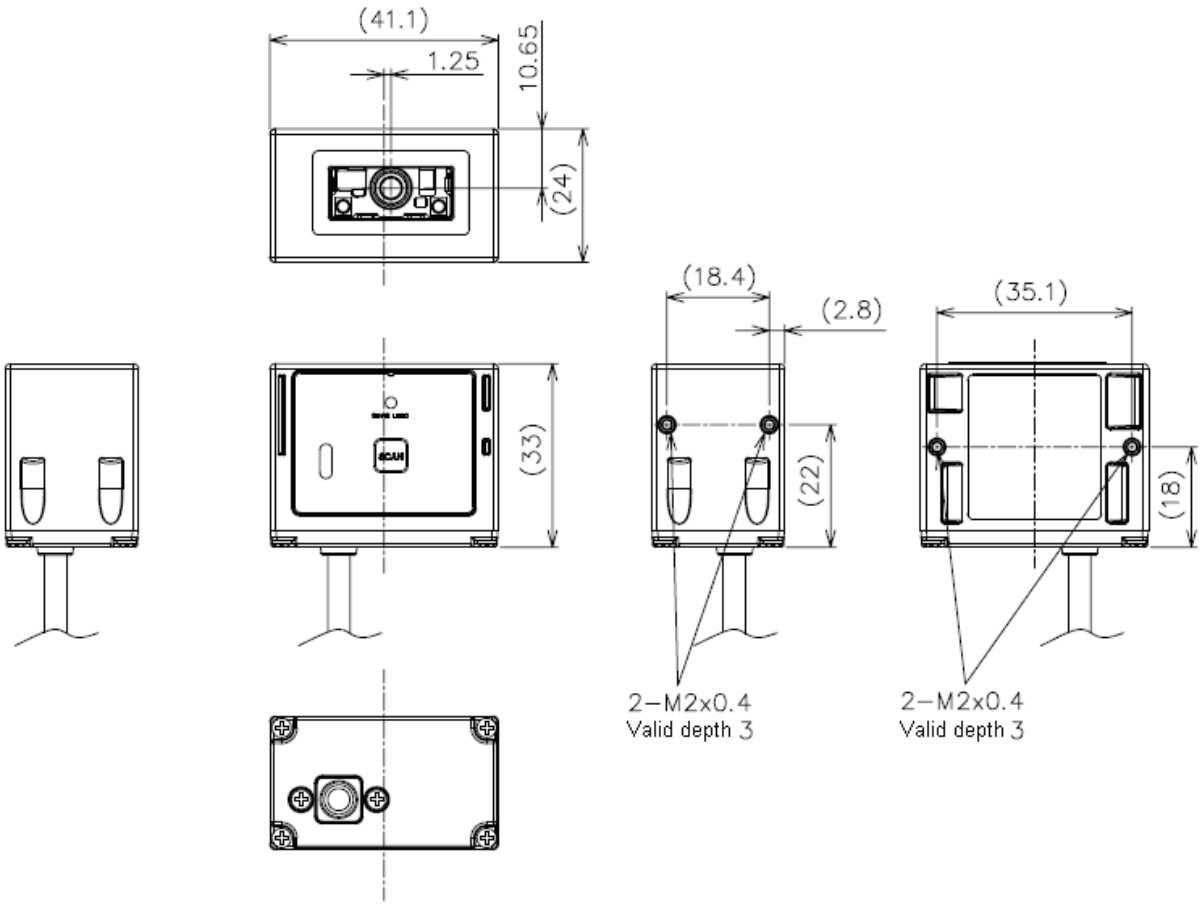
16.1. Dimensions

Approx. 33.0 × 41.1 × 24.0 (WDH mm)

16.2. Weight

Approx. 30 g (excluding the cable)

16.3. Mechanical Drawing



unit: mm

Figure 28: Mechanical Drawing

17. Default Setting

17.1. Default Setting Menu Code

The NLV-3101 is set to default settings by reading the following menu label regardless of the interface types.

Default

@MENU OPTO@ZZ@BAP@ZZ@OTPO UNEM@

17.2. Supported Symbologies

17.2.1. 1D Bar Codes

Code type	Default	Minimum length	Remarks
UPC	☐	-	
UPC Add-on 2 UPC Add-on 5			
EAN(JAN)	☐	-	
EAN Add-on 2 EAN Add-on 5			
EAN-13	☐		
EAN-13 Add-on 2 EAN-13 Add-on 5			
EAN-8	☐		
EAN-8 Add-on 2 EAN-8 Add-on 5			
Code 39	☐	1	Not transmit ST/SP
Tri-Optic	☐	-	Not transmit ST/SP
Codabar (NW7)	☐	1	Not transmit ST/SP
Industrial 2of 5	☐	5	
Interleaved 2of 5	☐	6	
S-Code		5	
Code 128	☐	1	GS1 conversion (setting required)
Code 93	☐	1	
IATA	☐	5	
MSI/Plessey		3	
UK/Plessey		2	
Telepen		1	
Code 11		1	
Matrix 2 of 5		5	
Chinese Post Matrix 2 of 5		-	
Korean Postal Authority		-	
Intelligent Mail Barcode		-	
POSTNET		-	
JPN (Customer Bar Code)		-	

17.2.2. GS1 Databar, Composite Code

Code type	Default	Remarks
GS1 DataBar ・GS1 DataBar Omnidirectional ・GS1 DataBar Truncated ・GS1 DataBar Stacked ・GS1 DataBar Stacked Omnidirectional	□	GS1 conversion (setting required)
GS1 DataBar Limited	□	
GS1 DataBar Expanded ・GS1 DataBar Expanded ・GS1 DataBar Expanded Stacked	□	
Composite GS1-DataBar ・CC-A ・CC-B ・Limited CC-A ・Limited CC-B ・Expanded CC-A ・Expanded CC-B		GS1 conversion (setting required)
Composite GS1-128 ・CC-A ・CC-B ・CC-C		GS1 conversion (setting required)
Composite EAN ・EAN-13 CC-A ・EAN-13 CC-B ・EAN-8 CC-A ・EAN-8 CC-B		GS1 conversion (setting required)
Composite UPC ・UPC-A CC-A ・UPC-A CC-B ・UPC-E CC-A ・UPC-E CC-B		GS1 conversion (setting required)

17.2.3. 2D Codes

Code type	Default	Remarks
PDF417	□	
Micro PDF417		
Codablock F		
QR Code	□	GS1 conversion (setting required)
Micro QR	□	
Data Matrix (ECC 200)	□	GS1 conversion (setting required)
Data Matrix (ECC 000-140)		
Aztec Code	□	
Aztec Runes		
Chinese-sensible code		
Maxi Code		

17.3. Other Default

Item	Default Setting
Read mode	Single read
Extended read time	Disable
Beeper duration	100 ms
Beeper tone	2.7 kHz
Startup beeper	Enable
Beeper loudness	Max (100%)
Beeper timing	Before data transmission
Good read LED indicator duration	200 ms
Data buffering	Buffered mode

[Data buffering]
Not all output data can be received depending on the host system. Therefore, it is recommended to use buffered mode for USB-HID and Wedge PS/2 interfaces and Unbuffered mode for RS-232C and USB-COM interfaces.

Unbuffered mode	Buffered mode (default)
@MENU_OPTO@ZZ@D80@ZZ@OTPO_UNEM@	@MENU_OPTO@ZZ@D81@ZZ@OTPO_UNEM@

* Refer to “NLV-3101 User’s Manual” for supported commands.

17.4. RS-232C Default

Item	Default Setting
Baud rate	9600 bps
Parity bits	No parity
Data length	8 bits
Stop bits	1 bit
Handshaking	No handshake
ACK/NAK	ACK/NAK no response
CTS time out	Indefinitely
ACK/NAK time out	1 second
Command header	ESC or STX
Command terminator	CR or ETX
Response to the commands	Disable

17.5. USB-COM

It is necessary to install OPTOELECTRONICS USB Driver to a host.

Item	Description
Baud rate	USB2.0 Full Speed
Power supply	500 mA
Vender ID	065A
Product ID	A002
Supported OS	Microsoft Windows 2000 / XP/ Vista / 7 (32/64 bit)
Standards	CDC-ACM

17.6. USB-HID, Wedge Defaults

Item	Default Setting
Keyboard language	USA
Output mode	Output all values
Character encoding	None
“LF” output	Disable

18. Accessories

18.1. AC Adapter Specifications

The NLV-3101 with RS-232C and Wedge PS/2 interfaces are shipped with a dedicated AC adapter "Universal AC Adapter Kit." Plug connectors can be changed for each region. Refer to 18.2 for the detailed view.

Item		Specifications
Model Name		SFP0602000P-PSE
Order Part No. (USA)		32-00606-00
Dimensions		47.5 x 28.0 x 75.0 (WDH mm)
DC Output Cable Length		1.8 M
Input Spec	Voltage Range	AC 90 ~ 265 V
	Supply Current	0.5 A max
Output Spec	Voltage Range	5.7 ~ 6.3 V
	Maximum Current	2 A max
Operating Temperature		0 ~ 40°C

18.2. AC Adapter Mechanical Drawing

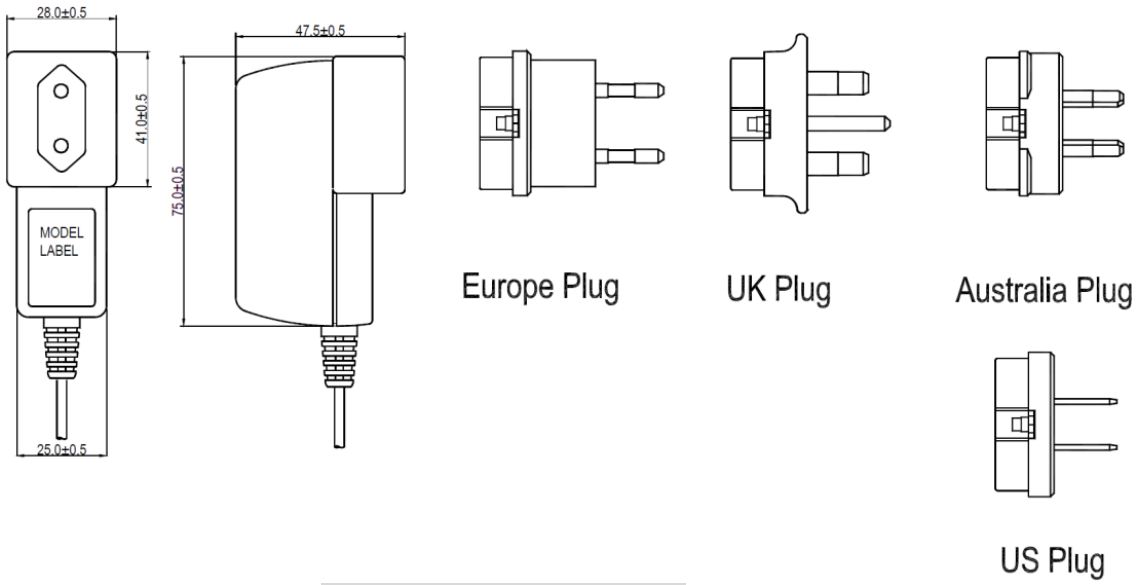


Figure 29: AC Adapter (input side)

The polarity of the center of DC jack is plus (+).

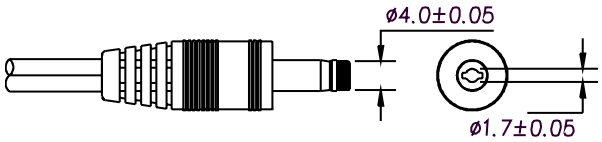


Figure 30: AC Adapter (output side: DC jack)