

**OPTICON**

Data Collector—Single Tray

# OPN 2001



The OPN 2001 is a compact and cordless laser scanner that outputs all stored data through a USB interface.

## Specifications Manual

All information subject to change without notice.

## Document History

<b>Model Number:</b>	OPN 2001 USB	<b>Specification Number:</b>	CS06164
<b>Edition:</b>	1A	<b>Original Spec Number:</b>	CS06143
<b>Date:</b>	2006-12-5		

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# Contents

<b>1. Abstract</b> .....	<b>6</b>
<b>2. Overview</b> .....	<b>6</b>
<b>3. Physical Features</b> .....	<b>6</b>
3.1. Dimensions .....	6
3.2. Weight .....	6
<b>4. Environmental Specifications</b> .....	<b>7</b>
4.1. Operating Temperature and Humidity .....	7
4.2. Storage Temperature and Humidity .....	7
4.3. Ambient Light Immunity .....	7
<b>5. Controls</b> .....	<b>7</b>
<b>6. Electrical Specifications</b> .....	<b>8</b>
6.1. Absolute Maximum Ratings .....	8
6.2. Recommended Operating Conditions .....	8
6.3. Electrical Characteristics .....	8
6.4. Main Battery .....	9
6.5. Battery Operating Time and Charging Time .....	9
<b>7. Optical Specifications</b> .....	<b>9</b>
7.1. Laser Scan Specifications .....	9
7.2. Laser Scanning Standards .....	10
7.2.1. Laser Scanning Tilt .....	10
7.2.2. Scanning Curvature .....	10
<b>8. Technical Specifications</b> .....	<b>11</b>
8.1. Print Contrast Signal (PCS) .....	11
8.2. Minimum Resolution .....	11
8.3. Scan Area and Resolution .....	12
8.3.1. Depth of Field .....	12
8.4. Pitch, Skew, and Tilt .....	13
8.4.1. Pitch Angle .....	13
8.4.2. Skew Angle and Dead Zone .....	14
8.4.3. Tilt Angle .....	14
8.5. Curvature .....	15
<b>9. Interface Specifications</b> .....	<b>16</b>

9.1. USB Interface Specifications.....	16
9.1.1. Settings .....	16
9.1.2. Interface Circuit.....	16
<b>10. Cable and Connector .....</b>	<b>16</b>
10.1. USB Cable .....	16
10.2. Connector.....	16
<b>11. Serial Number .....</b>	<b>17</b>
<b>12. Packaging Specifications .....</b>	<b>18</b>
12.1. Individual Packaging Specification .....	18
12.2. Collective Packaging Specification .....	19
<b>13. Durability .....</b>	<b>20</b>
13.1. Static Electricity.....	20
13.2. Shock Test (without packaging) .....	20
13.3. Shock Test (with individual packaging) .....	20
13.4. Vibration (without packaging).....	21
13.5. Vibration (with individual packaging).....	21
13.6. Dust and Drip Proof.....	21
<b>14. Reliability.....</b>	<b>21</b>
<b>15. Regulatory Compliance .....</b>	<b>21</b>
15.1. Laser Safety .....	21
15.2. Product Safety.....	22
15.3. EMC .....	22
15.4. RoHS.....	22
<b>16. Safety.....</b>	<b>23</b>
16.1. Shock .....	23
16.2. Temperature Conditions.....	23
16.3. Foreign Materials .....	23
16.4. Other .....	23
<b>17. Mechanical Drawing.....</b>	<b>24</b>

## Table of Figures

Figure 1: Scanning curvature .....	10
Figure 2: Depth of field and resolution.....	12
Figure 3: Pitch .....	13

Figure 4: Skew and dead zone .....	14
Figure 5: Tilt angle .....	14
Figure 6: Curvature .....	15
Figure 7: Interface circuit .....	16
Figure 8: Mini USB B connector .....	16
Figure 9: Serial number label .....	17
Figure 10: Individual packaging .....	18
Figure 11: Collective packaging .....	19
Figure 12: Shock (drop) test .....	20
Figure 13: Mechanical drawing .....	24

## 1. Abstract

This manual provides specifications for the OPN 2001 compact data collector.

## 2. Overview

The OPN 2001 is a compact and cordless laser scanner that outputs all stored data through a USB interface. It has a 150 mAh lithium-ion battery that is charged via the USB interface.

Scan width is 44 mm and scan angle is 44° at a minimum scan distance.

Supported symbologies:

### Linear (1D)

JAN/UPC/EAN, incl. add-on  
 Codabar/NW-7  
 Code 11  
 Code 39  
 Code 93  
 Code 128  
 GS1-128 (EAN-128)  
 GS1 Databar (RSS)  
 IATA  
 Industrial 2of5  
 Interleaved 2of5  
 ISBN-ISSN  
 Matrix 2of5  
 MSI/Plessey  
 S-Code  
 Telepen  
 Tri-Optic  
 UK/Plessey

### Postal

Chinese Post Matrix 2of5  
 Korean Postal Authority Code

### 2D

Composite Codes  
 MicroPDF417  
 PDF417

## 3. Physical Features

### 3.1. Dimensions

W 32.0 x D 62.0 x H 16.0 mm

### 3.2. Weight

28 g max.

## 4. Environmental Specifications

### 4.1. Operating Temperature and Humidity

Temperature: 0 to 40° C

Humidity: 20 to 85%

### 4.2. Storage Temperature and Humidity

Temperature: -20 to 60° C

Humidity: 20 to 90%

### 4.3. Ambient Light Immunity

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

Incandescent light	to 3,000 lx
Fluorescent light	to 3,000 lx
Sunlight	to 50,000 lx

Direct light or specular reflection from a light source should be prevented from entering the acceptance area.

**Note:**  $\alpha$ ,  $\beta$  and  $\gamma$  respectively represent pitch, skew and tilt. Please see section 8 for how these values are defined.

## 5. Controls

Parameter	Specification
Memory: Flash ROM	512 KB (372 KB program storage + >1000 barcodes + time stamp)
Usable time / operating period	1000 decodes
Data hold time	Indefinite
Memory RAM	64 KB
Microprocessor	ARM7, 32 bits
Real-time clock	Quartz RTC, time and date programmable, leap year handling, (accuracy +/-60 sec./month)
Keyboard	1 scan button, 1 clear button
O/S	Proprietary

## 6. Electrical Specifications

### 6.1. Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Power supply voltage ( $V_{DD}$ to GND)	$V_{DD}$	-0.3 to 6.5	V
Input voltage	$V_{IN}$	-0.5 to $V_{DD} + 0.5$	V
Power ripple		0.1 V p-p max. (10-100 kHz)	V

### 6.2. Recommended Operating Conditions

Item	Symbol	Conditions	Min	Typ	Max	Unit
Power supply voltage	$V_{DD}$	Battery	3.1	-	4.2	V
		USB	4.5	5.0	5.5	V
Input voltage	$V_{in}$		0	-	$V_{DD}$	V

### 6.3. Electrical Characteristics

Parameter	During	Symbol	Min	Typ	Max	Unit
Operating current *	Scanning	$I_{OP}$	93	96	150	mA
	Communicating	$I_{com}$	41	43	45	mA
	Standby	$I_{PRE}$	24	25	26	mA
	Charging	$I_{CHG1}$	106	113	120	mA
When OFF		$I_{off}$	17	18	19	$\mu$ A
Battery specifications	Voltage between terminals	$V_{BAT}$	2.75	3.7	4.2	V
	Rated capacity		140	150	-	mAh
	Charging current	$I_{CHG2}$	59	66	73	mA
	Charging time	$T_{chg}$	-	-	2.5	hour
	Scans when fully charged **		1000	-	-	times
Start up time		$T_d$	-	50	-	ms

#### Conditions

- Connect 1 $\Omega$  resistance to a 3.7 volt power supply line in series and measure the current by the voltage between both ends of resistance.
- Power supply voltage is measured at the terminal of the secondary battery.
- The operating current specifications for power charging or communicating are described based on the power current from the USB interface.



- The number of scans when fully charged is determined based on a scanning operation where the laser beam is on for 4 seconds and the lighting LED is on for 1 second per scan.

**6.4. Main Battery**

The main battery is a lithium-ion rechargeable battery.

Nominal capacity: 150 mAh

Nominal voltage: 3.7 V DC

**6.5. Battery Operating Time and Charging Time**

Parameter	Specification	Notes
Main battery pack operating time	1000 scans	Conditions: Every scan, 2 seconds laser beam on and 1 second good read LED on
Current consumption	100 mAh operation, idle	
Power management	Extreme low power	
Charging time	2 ½ hours	
Charging method	Recharging lithium-ion pack in scanner via USB port	

**Note:** Battery life may be shorter than specified above when the quality of the battery pack is degraded.

**7. Optical Specifications**

**7.1. Laser Scan Specifications**

Parameter	Specification	Unit
Light-emitting element	Red laser diode	—
Emission wavelength	650 ±10 (25° C)	nm
Light output	1.0 or less	mW
Scanning method	Bi-directional scanning	—
Scanning speed	100 ±20	scans/s
Scan angle	Scan angle: 54 ±5	°
	Read angle: 44 (Min)	°

**Notes:**

Refer to chapter 8, “Technical Specifications,” to read about scanning performance.

## 7.2. Laser Scanning Standards

### 7.2.1. Laser Scanning Tilt

Laser scanning tilt is the vertical difference between both ends of a laser scan line. Measure it in the middle of the laser scan line.

- Up to 0.92 degrees angle in a vertical direction from the scan origin (mirror motor).
- Up to 2.46 mm at 150 mm from the scan origin.

### 7.2.2. Scanning Curvature

The maximum difference between the laser scan line and the line between both ends of the laser scan line. Measure it in the middle of the laser scan line.

- Up to 1.17 degrees angle in a vertical direction from the scan origin (mirror motor).
- Up to 3.06 mm at 150 mm from the scan origin.

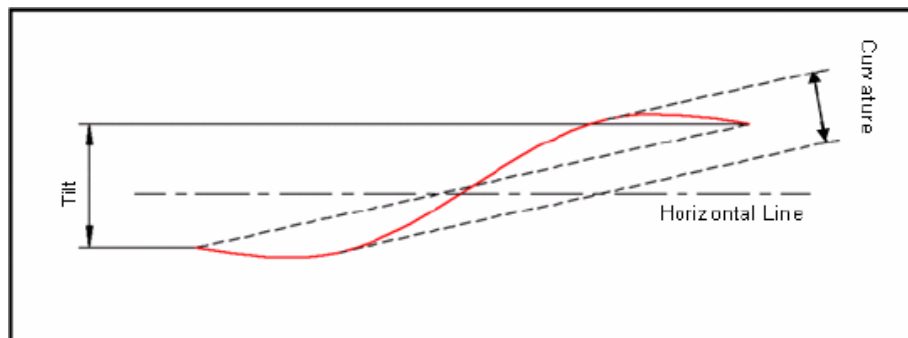


Figure 1: Scanning curvature

## 8. Technical Specifications

The conditions for technical specifications are as follows, unless otherwise specified in each section.

### Conditions

Ambient temperature and humidity:	Room temperature (5 to 35° C) Room humidity (45% to 85% RH)
Ambient light:	500 to 900 lx
Background:	Barcode = black Space = white Margin = white Background of label = black
Power supply voltage:	3.7 V
Decoding test:	Approve the performance when decoding is successful in all ten tests. (Decoding is deemed successful when completed in 0.5 seconds or less.)

### 8.1. Print Contrast Signal (PCS)

0.45 or higher (over 70% of reflectivity of space and quiet zone).

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

Scanning performance may decline if dirt or scratches mar the optical window. Keep the optical window clean.

### 8.2. Minimum Resolution

0.127 mm

**8.3. Scan Area and Resolution**

**8.3.1. Depth of Field**

The depth of field is measured from the edge of the data collector. The scan area is a circular area centered on the beam, which appears at various resolutions.

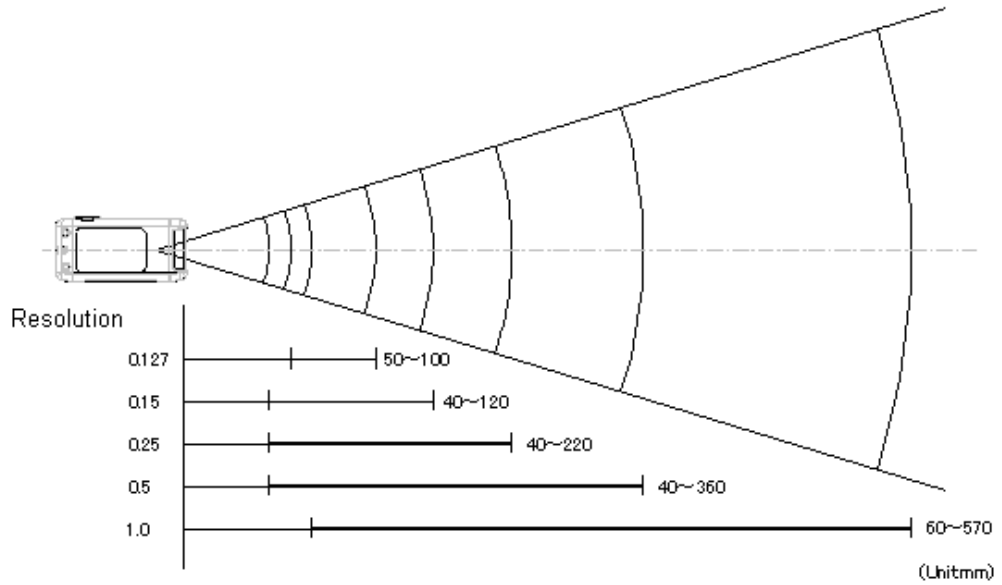


Figure 2: Depth of field and resolution

Symbology	Resolution (mm)	Decode Depth (mm)	PCS
Code 39	1.0 mm	60-570	0.9
Code 39	0.5 mm	40-360	0.9
Code 39	0.25 mm	40-220	0.9
Code 39	0.15 mm	40-120	0.9
Code 39	0.127 mm	50-100	0.9

**Conditions**

Barcode Sample: OPTOELECTRONICS Test Sample

- N/W Ratio: 1:2.5
- Angle:  $\alpha = 0^\circ, \beta = 15^\circ, \gamma = 0^\circ$
- Curvature:  $R = \infty$

Resolution	Symbology	PCS	Quiet Zone	Digit
1.0 mm	Code 39	0.9	25 mm	1
0.5 mm	Code 39	0.9	18 mm	3
0.25 mm	Code 39	0.9	10 mm	8
0.15 mm	Code 39	0.9	7 mm	10
0.127 mm	Code 39	0.9	5 mm	4

**8.4. Pitch, Skew, and Tilt**

**8.4.1. Pitch Angle**

$\alpha = \pm 30^\circ$

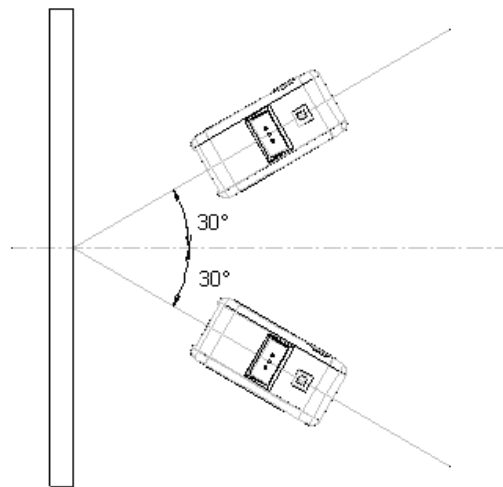


Figure 3: Pitch

#### 8.4.2. Skew Angle and Dead Zone

Skew angle:  $\beta = \pm 50^\circ$  (Excluding dead zone)

Dead zone:  $\beta = \pm 8^\circ$  (There are some areas in which decoding fails due to specular reflection)

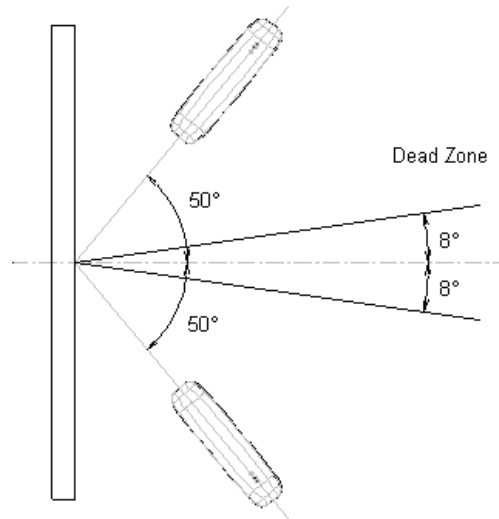


Figure 4: Skew and dead zone

#### 8.4.3. Tilt Angle

$\gamma = \pm 20^\circ$

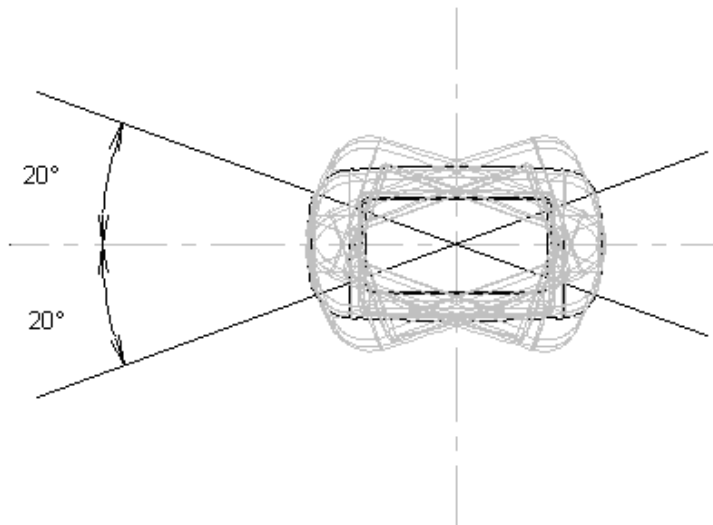


Figure 5: Tilt angle

**Conditions**

Barcode Sample: OPTOELECTRONICS Test Sample

Distance	100 mm from the edge of the data collector
Label	<b>Pitch, Skew Angle, Dead Zone</b> PCS = 0.9, Resolution = 0.25mm, Symbology = 9-digit Code 39, Quiet Zone = 10 mm, N/W Ratio = 1:2.5 <b>Tilt Angle</b> PCS = 0.9, Resolution = 0.26 mm, Symbology = 13-digit JAN, Quiet Zone = 10 mm
Pitch	Skew angle: $\beta = +15^\circ$ , tilt angle: $\gamma = 0^\circ$
Skew	Pitch angle: $\alpha = 0^\circ$ , tilt angle: $\gamma = 0^\circ$
Tilt	Pitch angle: $\alpha = 0^\circ$ , skew angle: $\beta = +15^\circ$
Curvature	$R = \infty$

**8.5. Curvature**

With 8-digit JAN/UPC/EAN barcodes, decoding performance is guaranteed when  $R \geq 15$  mm.

With 13-digit JAN/UPC/EAN barcodes, decoding performance is guaranteed when  $R \geq 20$  mm.

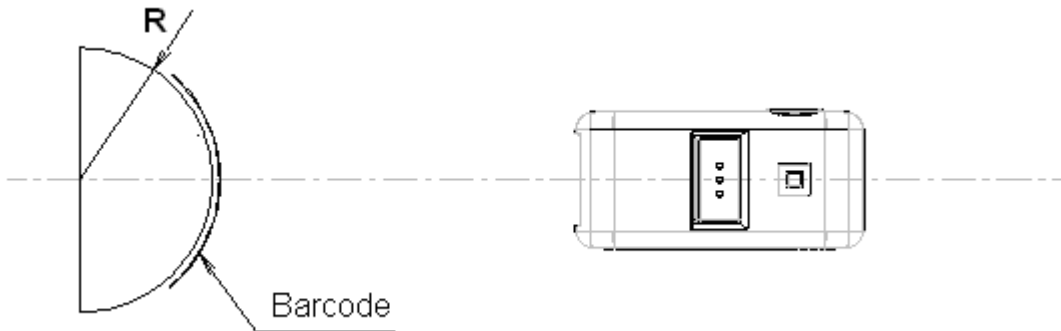


Figure 6: Curvature

**Conditions**

Barcode Sample: OPTOELECTRONICS Test Sample

PCS = 0.9, Resolution = 0.26 mm, Quiet Zone = 10 mm	
Distance:	100 mm from the edge of the data collector
Angle:	Skew Angle $\beta = +15^\circ$

## 9. Interface Specifications

### 9.1. USB Interface Specifications

#### 9.1.1. Settings

The interface is full-speed USB.

#### 9.1.2. Interface Circuit

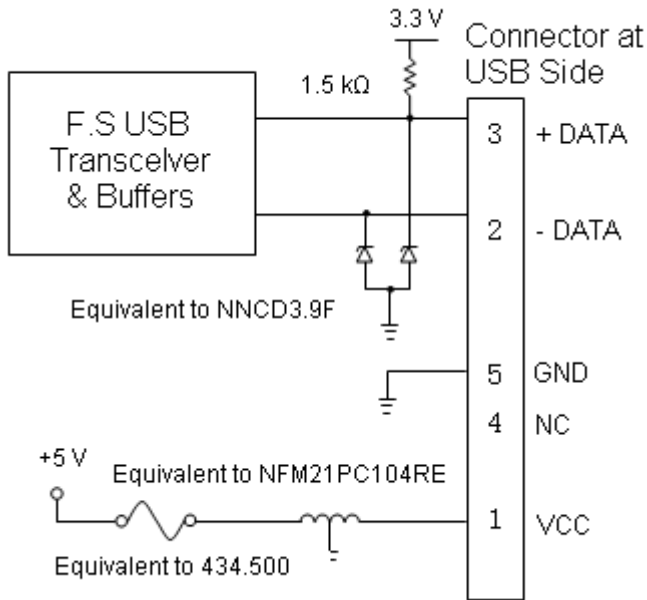


Figure 7: Interface circuit

## 10. Cable and Connector

### 10.1. USB Cable

A dedicated cable with PC connector is provided.

### 10.2. Connector

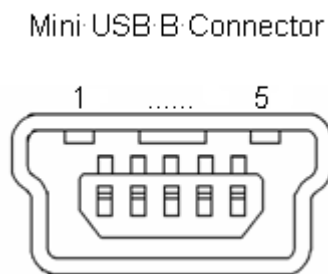


Figure 8: Mini USB B connector

Contact Number	Signal Name
1	VCC
2	-DATA
3	+DATA
4	NC
5	GND



### 11. Serial Number

The serial number label shown below is affixed to the data collector.



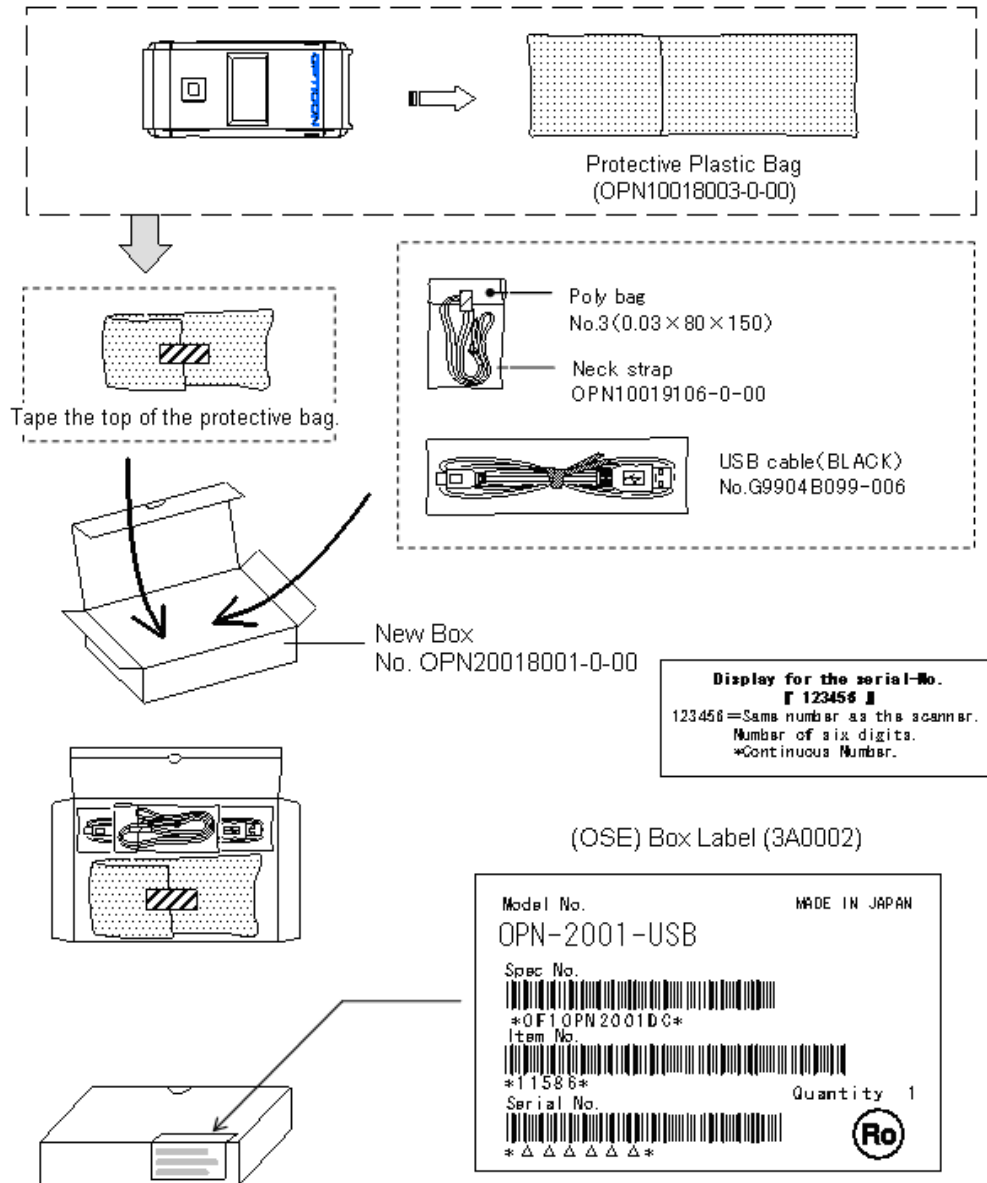
*Figure 9: Serial number label*

## 12. Packaging Specifications

### 12.1. Individual Packaging Specification

Put the OPN 2001 in a protective foam bag and place it in an individual packing box.

Size of the package after assembly: 125 (W) x 112 (D) x 40 (H) mm



Do not fold on the barcode when attaching the label on the corner of box.

Figure 10: Individual packaging

### 12.2. Collective Packaging Specification

Size of the package after assembly: 595 (W) x 520 (D) x 245 (H) mm

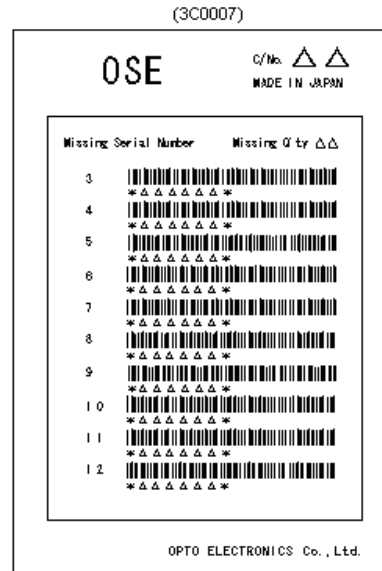
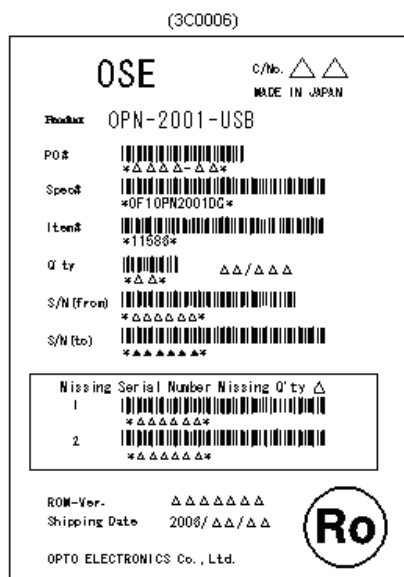
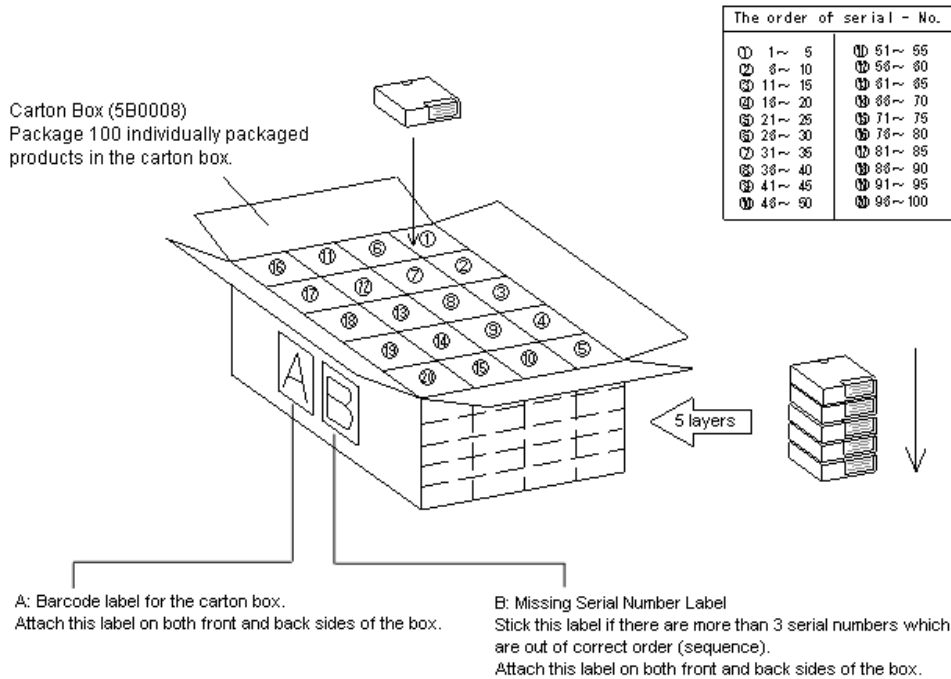


Figure 11: Collective packaging

Note: The “RO” mark labeled on the package tray or package box guarantees that the applicable product has passed our test of RoHS restrictions compliance (the restriction of the use of certain hazardous substances in electrical and electronic equipment, 2002/95 EC). However, this document does **not** have any legal weight in the European Union.

## 13. Durability

### 13.1. Static Electricity

Air discharge:	8 kV max. (No malfunction) 15 kV max. (No destruction)
Contact discharge:	4 kV max. (No malfunction) [Discharge point: USB connector frame.] 10 kV max. (No destruction)
Measurement environment:	Use electrostatic testing device compliant with IEC 61000-4-2
Discharge resistance:	330 $\Omega$
Capacitor charging:	150 pF

### 13.2. Shock Test (without packaging)

No malfunction should occur after the following drop test.

Drop Test: Drop the data collector from 0.7 meters onto a concrete floor. The shock test was done three times on each of six sides (total of 18 times).

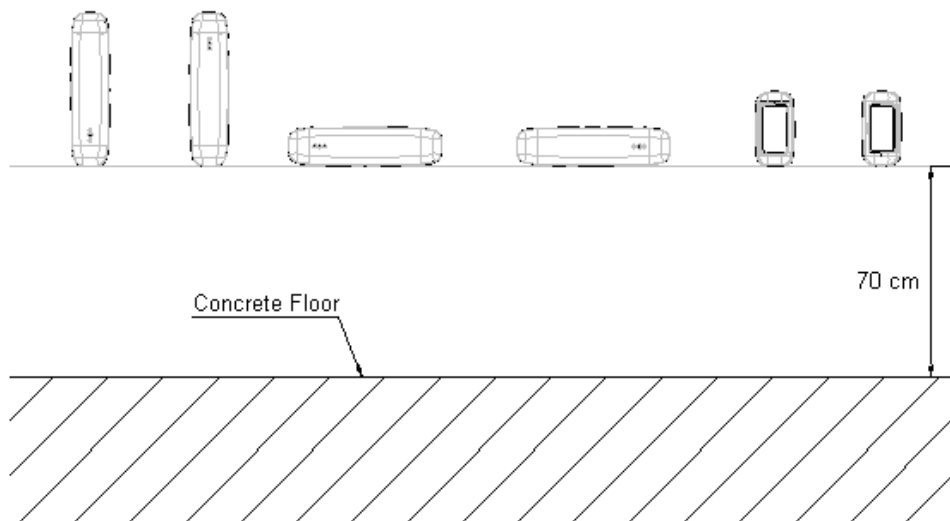


Figure 12: Shock (drop) test

### 13.3. Shock Test (with individual packaging)

There was no sign of malfunction after the following shock test.

Drop the OPN 2001 on all sides: face, top, bottom, left, right, top-left, top-right, bottom-left and bottom-right from a height of 0.7 meters onto a concrete surface. The shock test was done 10 times in all directions.

**13.4. Vibration (without packaging)**

No malfunction should occur after the following vibration test.

Vibration Test: Increase the frequency of the vibration from 10 Hz to 100 Hz with accelerated velocity 19.6 m/s<sup>2</sup> (2G) for over 30 minutes in non-operating state (60 minutes for one cycle). Repeat this routine for X, Y, and Z directions.

**13.5. Vibration (with individual packaging)**

No malfunction should occur after the following vibration test.

Vibration Test: Put the OPN 2001 in an individual packing box. Increase the frequency of the vibration from 10 Hz to 100 Hz with accelerated velocity 19.6 m/s<sup>2</sup> (2G) for over 30 minutes in a non-operating state (60 minutes for one cycle). Repeat this routine for X, Y, and Z directions.

**13.6. Dust and Drip Proof**

IEC IP42

**Dust Prevention**

Level	Details
4	Prevention of objects larger than 1 mm. Most wires, screws, etc.

**Water Prevention**

Level	Details
2	Vertically dripping water shall have no harmful effect when the enclosure is tilted at an angle up to 15° from its normal position.

**14. Reliability**

MTBF (Mean Time Between Failures) of this product is 10,000 hours.

The estimate of MTBF is based on standard operation of the product within the recommended temperature range and without extreme electronic or mechanical shock.

**15. Regulatory Compliance**

**15.1. Laser Safety**

The data collector emits laser beams.

JIS C6802: 2005: Laser Class 2

IEC 825-1/EN 60825-1+A2:2001: Laser Class 2

FDA CDRH Laser Class II. Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to laser notice No. 50 dated June 24, 2007. The scanner emits laser beams.

## 15.2. Product Safety

EN60950-1: 2001

IEC60950-1: 2001

## 15.3. EMC

EN55022

EN55024

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. Please install and use the equipment according to the instruction manual.

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.

These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

To assure continued compliance, any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. (Example: Use only shielded interface cables when connecting to computer or peripheral devices).

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.

## 15.4. RoHS

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

## 16. Safety

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

### 16.1. Shock

Do not throw or drop the data collector.

Do not place heavy objects on the cables.

### 16.2. Temperature Conditions

Do not use the data collector at temperatures outside the specified range.

Do not pour boiling water on the data collector.

Do not throw the data collector into the fire.

Do not forcibly bend the cables at low temperatures.

### 16.3. Foreign Materials

Do not immerse the data collector in liquids.

Do not subject the data collector to chemicals.

### 16.4. 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 data collector may cause reception problems.

The data collector may be damaged by voltage drops.

The data collector may not perform properly in environments when placed near a flickering light, such as a computer monitor, television, etc.

**17. Mechanical Drawing**

Dimensions: 62.0 (D) x 32.0 (W) x 16.0 (H) mm

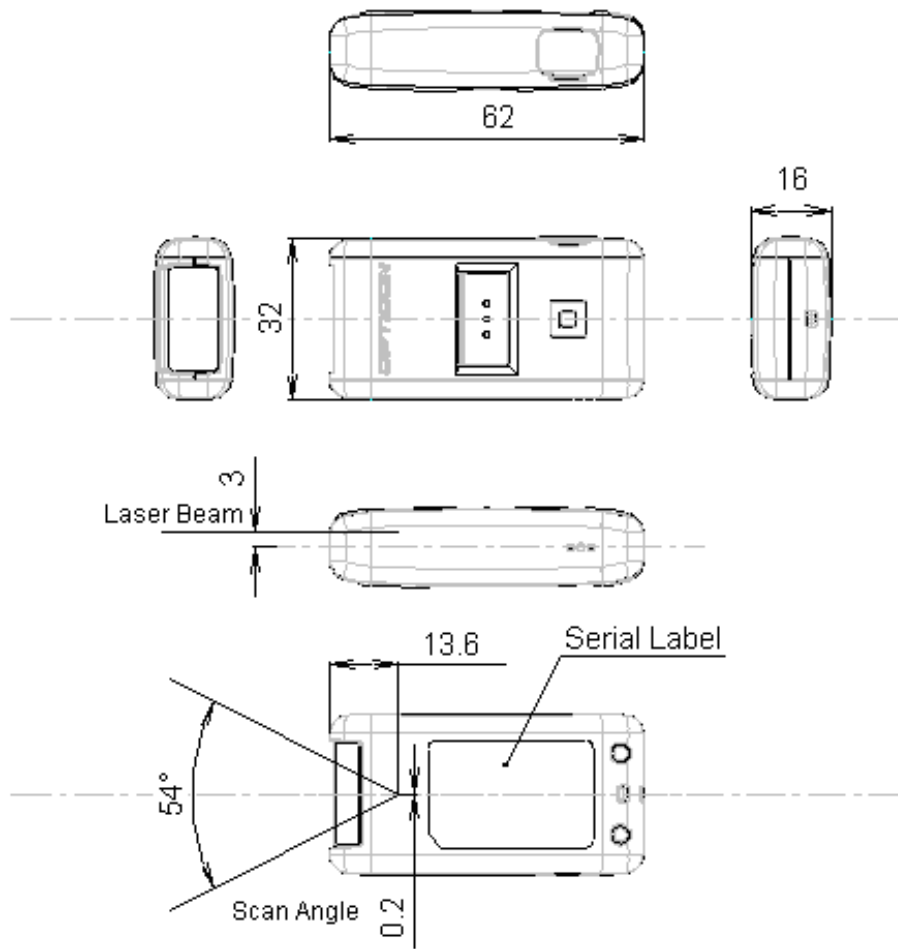


Figure 13: Mechanical drawing