

**OPTICON**

Portable Data Collector

# OPN 2002



The OPN 2002 is a portable data collector. Scanned and stored data is transmitted to the host via a dedicated cradle, the USB interface, or a Bluetooth device.

## Specifications Manual

All information subject to change without notice.

## Document History

<b>Model Number:</b>	OPN 2002	<b>Specification Number:</b>	
<b>Edition:</b>	1	<b>Original Spec Number:</b>	CS06143
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## Limited Warranty and Disclaimers

**PLEASE READ THIS MANUAL CAREFULLY BEFORE INSTALLING OR USING THE PRODUCT.**

## Serial Number

A serial number appears on all Opticon products. This official registration number is directly related to the device purchased. Do not remove the serial number from your Opticon device. Removing the serial number voids the warranty.

## Warranty

Unless otherwise agreed in a written contract, all Opticon products are warranted against defects in materials and workmanship for two years after purchase. Opticon will repair or, at its option, replace products that are defective in materials or workmanship with proper use during the warranty period. Opticon is not liable for damages caused by modifications made by a customer. In such cases, standard repair charges will apply. If a product is returned under warranty and no defect is found, standard repair charges will apply. Opticon assumes no liability for any direct, indirect, consequential or incidental damages arising out of use or inability to use both the hardware and software, even if Opticon has been informed about the possibility of such damages.

## Packaging

The packing materials are recyclable. We recommend that you save all packing material to use should you need to transport your scanner or send it for service. Damage caused by improper packaging during shipment is not covered by the warranty.

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## 1. Abstract

This manual provides specifications for the OPN 2002 portable laser data collector.

## 2. Overview

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-ISMN-ISSN

Matrix 2of5

MSI/Plessey

S-Code

Telepen

Tri-Optic

UK/Plessey

### Postal

Chinese Post

Korean Postal Authority Code

### 2D

MicroPDF417

PDF417

## 3. Physical Features

### 3.1. Dimensions

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

### 3.2. Weight

29 g / 1.0 oz (max.) including battery

### 3.3. Color

Black

## 4. Environmental Specifications

### 4.1. Operating Temperature and Humidity

Temperature: 0 to 50° C

Humidity: 20% to 85% RH

### 4.2. Storage Temperature and Humidity

Temperature: -20 to 60° C

Humidity: 20% to 85% RH

### 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	3,000 lx
Fluorescent light	3,000 lx
Sunlight	80,000 lx

#### Conditions

Barcode Sample: OPTOELECTRONICS Test Sample

PCS:	0.9
Resolution:	0.25 mm
Symbology:	9-digit Code 39
Quiet zone:	10 mm
N/W ratio:	1:2.5
Distance:	150 mm
Angle (see note below):	$\alpha = 0^\circ \beta = 15^\circ \gamma = 0^\circ$
Curvature:	$R = \infty$
Power supply voltage:	3.7 V

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

Item	Specifications	Notes
SDRAM:	1 MB	SDCLK: 80 MHz
Flash ROM:	1 MB flash memory	Program storage + >25,000 barcodes + time stamp

## 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 (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
	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
Startup 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.

### 6.4. Main Battery

The main battery is a lithium-ion polymer battery.

Nominal capacity: 240 mAh



**6.5. Battery Life and Charging Time**

Parameter	Specification	Note
Battery Life	About 7 hours	Data retention time: 72 hours
Charging Time	About 2.5 hours	Charging method: Enclosed USB cable, or separate cradle from the CRD 2000 series

**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	Vibrating mirror	-
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.

**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 scanner. The scanning range is within the circular arc centered on the scan origin.

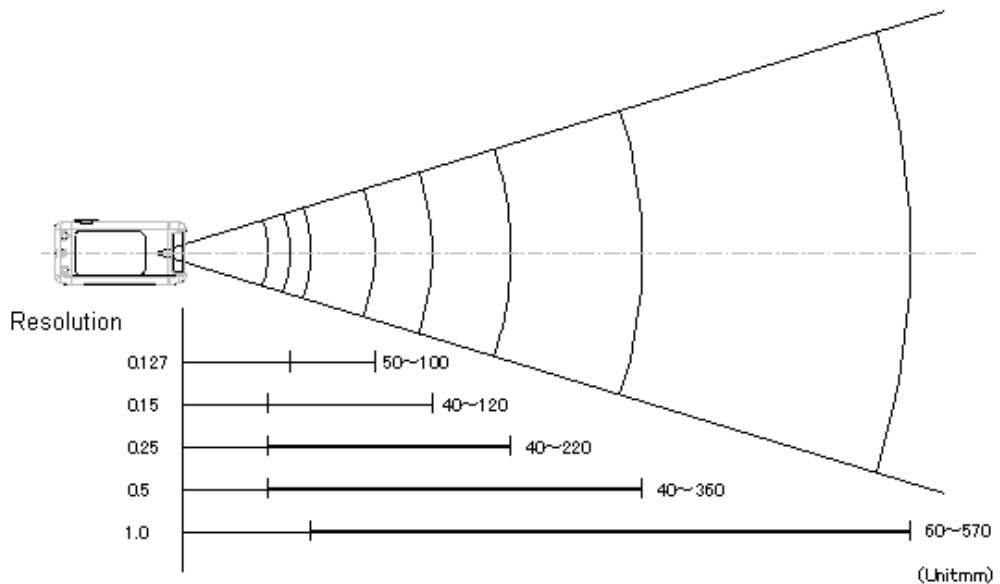


Figure 1: Depth of field

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

$\alpha = \pm 30^\circ$

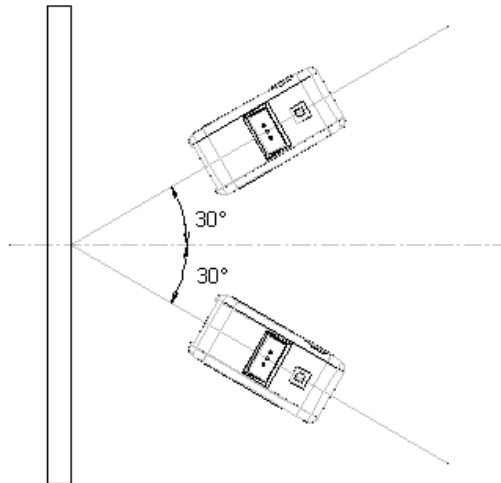


Figure 2: Pitch

**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)

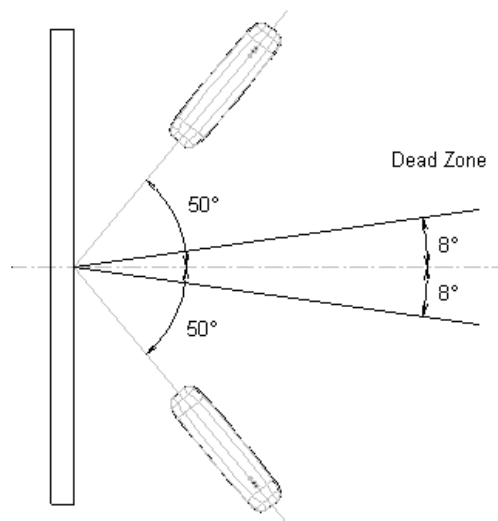


Figure 3: Skew and dead zone

**8.4.3. Tilt Angle**

$\gamma = \pm 20^\circ$

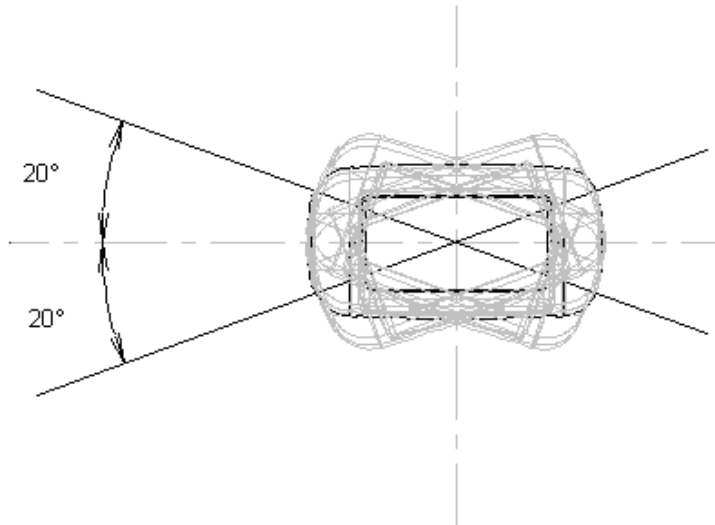


Figure 4: Tilt angle

**Conditions**

Barcode Sample: OPTOELECTRONICS Test Sample

Distance	100 mm from the edge of the data collector
Label	<p><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</p> <p><b>Tilt Angle</b>                  PCS = 0.9, Resolution = 0.26 mm, Symbology = 13-digit JAN, Quiet Zone = 10 mm</p>
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.

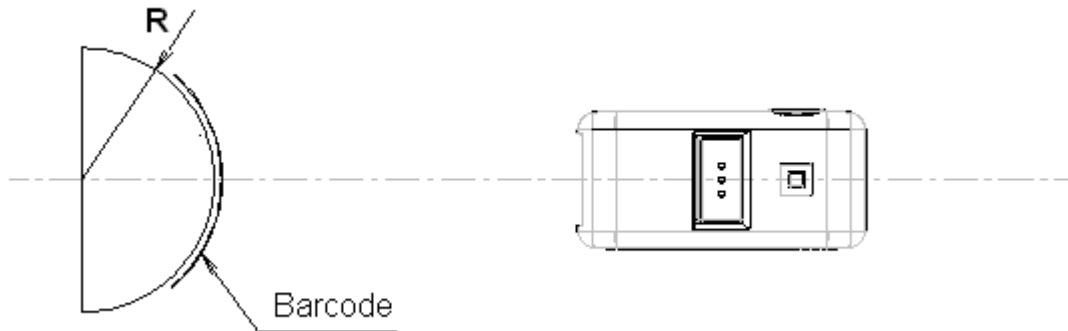


Figure 5: Curvature

#### 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-HID and USB-VCP Interface Specifications

Complies with MiniUSB Version 1.1 and VCP. The USB-COM model is referred to as USB-VCP because a VCP (Virtual Communication Port) allows virtual serial communication and the commands can be transmitted from the host computer.

### 9.2. Wireless Interface

Bluetooth® is a registered trademark owned by its proprietor and used by OPTOELECTRONICS Co., Ltd. under license.

Feature	Description
Version 1)	1.2
Supported profile 1)	SPP (Serial Port Profile) HID (Human Interface Device Profile)
Communication configuration 2)	1 to 1 One scanner to one host system (Do not connect multiple scanners to one host system.)
Scanner operating mode while connected to the host system	Master or Slave mode
Security mode	Authentication enabled: These settings can be configured using menu barcodes.
Encryption	Encryption is linked to the authentication setting and cannot be enabled or disabled separately.
Communication range 3)	Approximately 10 meters
Frequency	2400 MHz to 2483.5 MHz
Transmission power	2.5mW (4dBm) or less
Comm. range	10 m
Baud rate	115.2 kbps
Antenna	1/4λ (surface mounted)

#### Notes

1. This product complies with Bluetooth standards. The device that communicates with this product must support the same SPP. For other Bluetooth devices with other profiles we cannot guarantee a connection before the products have been tested.
2. The communication speed and range of the product may vary due to obstacles and radio wave conditions between this product and the device to which it is connected. Conditions on the host device may also affect the communication speed and communication range of the scanner.
3. The prospective distance may vary based on environmental characteristics. Also note the following frequency description.

**9.3. IEEE 802.15.4**

**9.3.1. Radio Equipment**

The electromagnetic wave absorption (2.4 GHz) used by this product is also shared by various other devices. Therefore, baud rate and communication distance may be negatively impacted, or their communications may be disconnected, by other devices using the same absorption rate.

Baud rate and communication distance are affected by obstacles, wave conditions, or a device at the other end.

This product is equipped with an antenna. Bringing this product too close to a metallic object may affect communication. Anticipated interference distance is 10 m or less.

**9.3.2. Frequency Band**

This product uses the 2.4 GHz frequency band. Scientific, medical, and industrial devices, including microwaves, wireless security (camera) systems and W-LAN use the same frequency band as this scanner. Other radio stations also use this frequency for mobile object identification, including local private radio stations that require a license (for example, manufacturing lines at factories), specific power-saving radio stations requiring no license, and amateur radio stations.

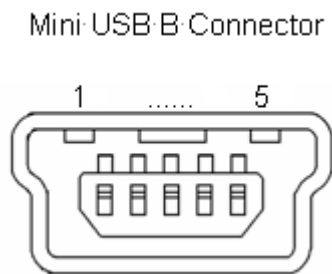
Interference from other devices may affect the communication speed or communication range of this scanner or vice versa.

**10. Cable and Connector**

**10.1. USB Cable**

A dedicated cable with PC connector is provided.

**10.2. Connector**



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

Figure 6: Mini USB B connector



## 11. Serial Number

The serial number shown below is affixed to the scanner.



Figure 7: Serial number diagram

Uppercase: Management Barcode

(Symbology: Code 39, Resolution: 0.12 to 0.2, N/W Ratio: 1:2.5 to 1:3)

Lowercase: Model Names, Serial Numbers (The height of letters is  $1.2 \pm 0.3$  )

Serial numbers are seven-digit numbers and start from number 0000001 regardless of batch.

## 12. Packaging Specifications

### 12.1. Individual Packaging Specification

Put the scanner 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

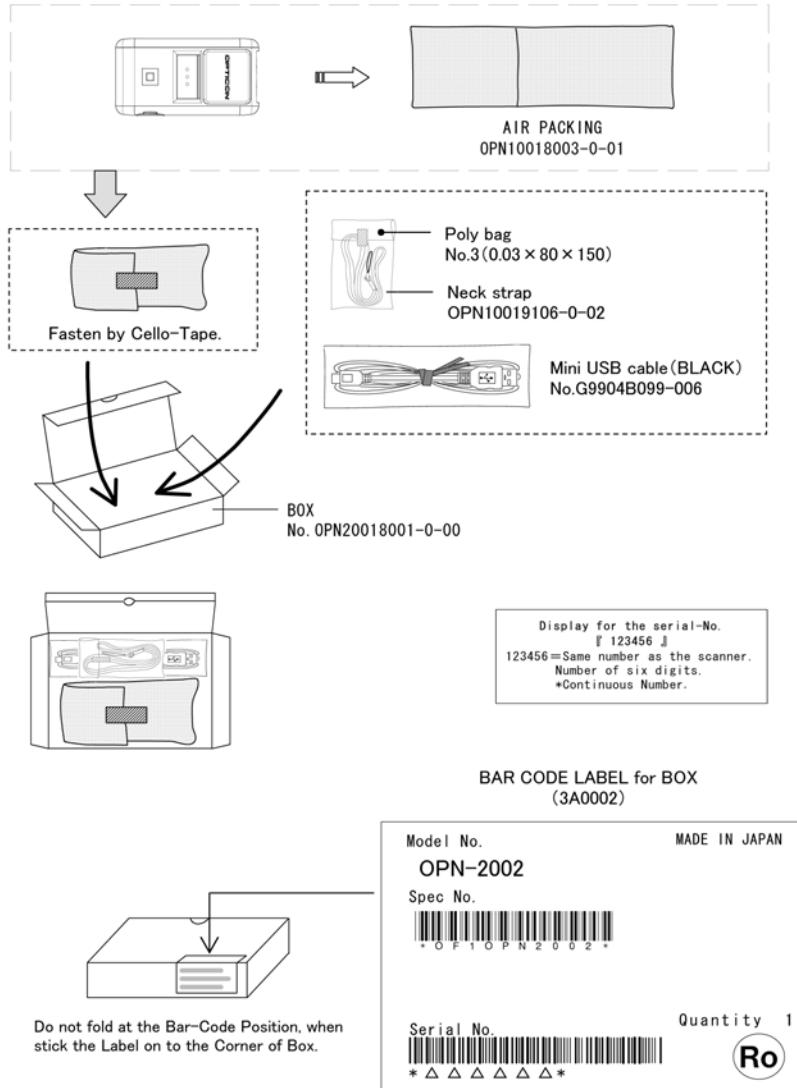


Figure 8: Individual packaging

### 12.2. Accessory Specifications

The following table shows a list of accessories sold separately.

Part Number	Description	Notes
CRD 2000 RU10	Multi-cradle, 10 slots	RS-232C + USB communication charging

### 12.3. Collective Packaging Specification

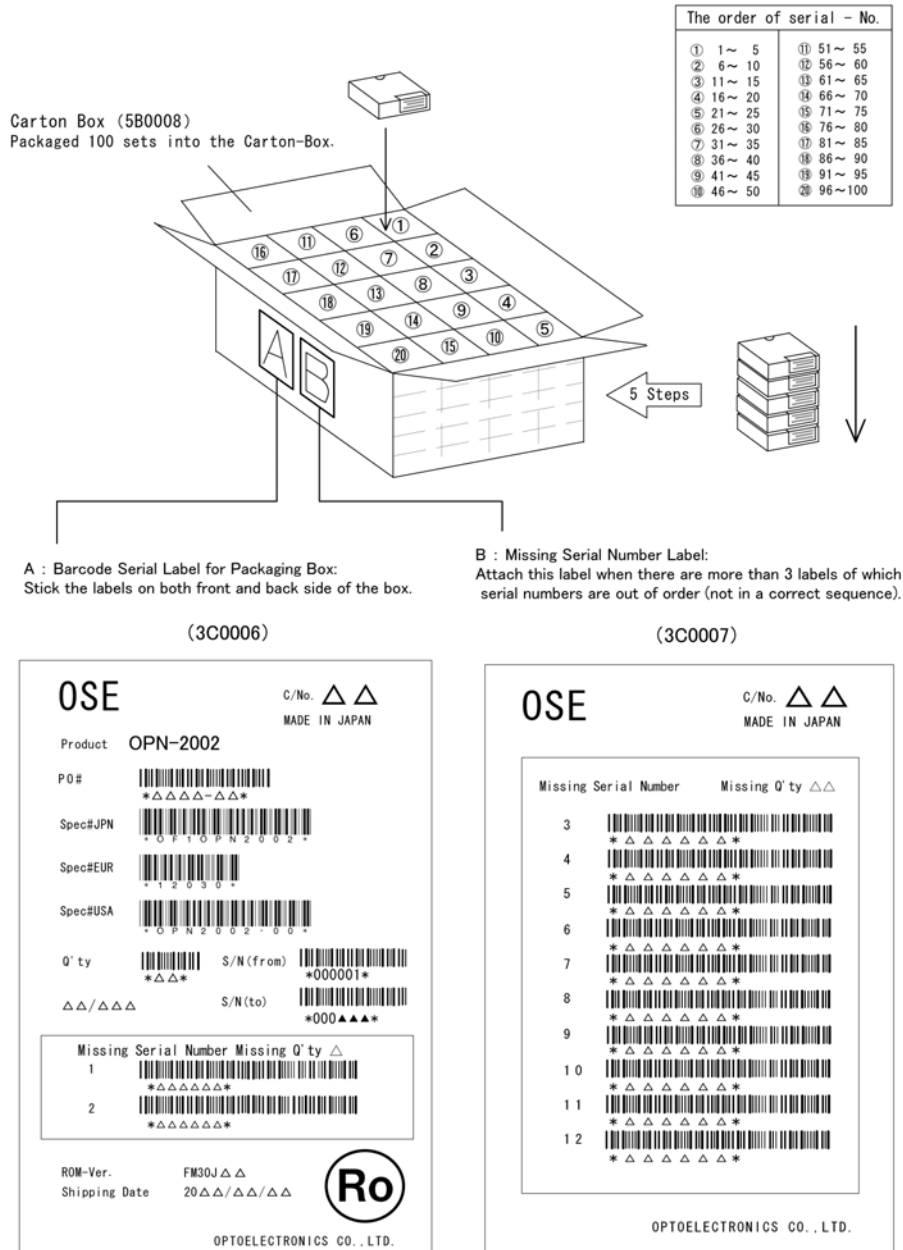


Figure 9: Collective packaging

**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. Shock

#### 13.1.1. Drop Test (without packaging)

No malfunction occurred after the following drop test.

Drop Test: Drop the data collector from a height of 70 cm onto a concrete floor (three times in each of 6 angles).

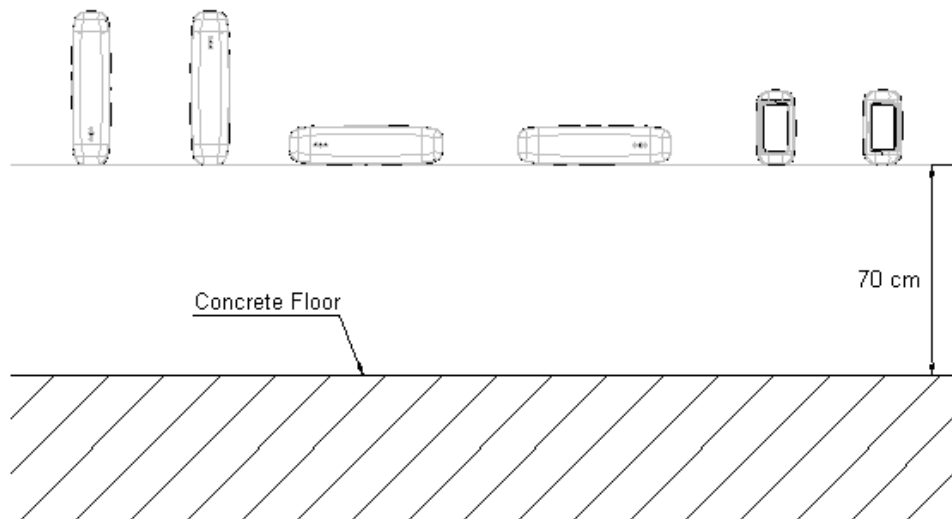


Figure 10: Shock (drop) test

#### 13.1.2. Drop Test (with individual packaging)

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

Drop the OPN 2002 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 drop test was done 10 times in all directions.

### 13.2. Vibration Strength

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  $19.6 \text{ m/s}^2$  (2G) for over 30 minutes in non-operating state (60 minutes for one cycle). Repeat this routine for X, Y, and Z directions.

### 13.3. 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 scanner emits laser beams.

JIS C6802: 2005: Laser class 2

IEC 825-1/EN 60825-1: 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.

Class II laser devices are not considered to be hazardous when used for their intended purpose. Avoid staring into the laser beam.

### 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.

#### **15.5. R&TTE**

This scanner conforms to the following standards of the Radio and Telecommunications Terminal Equipment (R&TTE) directive from the EU.

EN300 328

EN301 489

#### **15.6. Radio Law**

The scanner qualifies as radio equipment for low-power radio stations (2.4 GHz band advanced data communication systems) as specified in the Radio Law 38-24-1.

The scanner has obtained the Certification for Construction Design of Specified Radio Equipment. It does not have a radio station license in Japan.

The following activities are prohibited under the Radio Law:

- Remodeling and disassembly
- Peeling off the certificate label

#### **15.7. State of California: Perchlorate Best Management Practices**

The batteries on some Opticon products may contain Perchlorate. To comply with California Perchlorate Best Practice Regulations and the Law for the Promotion of Utilization of Recyclable Resources (Japan), products that may contain Perchlorate materials should be properly labeled on the exterior of all outer shipping packages and/or in locations that otherwise satisfy the California Perchlorate Best Management Practices.

## 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 scanner.

Do not drop or put heavy items on this product or its cable.

### 16.2. Temperature Conditions

Do not use the scanner at temperatures outside the specified range.

Do not use near heat sources such as radiators, heat registers, stoves, or other types of devices that produce heat.

Do not use in areas exposed to direct sunlight for long periods of time.

Do not pinch or forcibly bend the cable, especially at very low temperature.

### 16.3. Foreign Materials

Do not use the scanner near water or other liquids, as well as in extremely high humidity.

Do not immerse the scanner in liquids.

Do not use in dusty environments.

Do not subject the scanner to chemicals.

Do not insert foreign substances into the device.

### 16.4. Other

Do not plug/unplug the connectors before disconnecting the power.

Do not attempt to disassemble, modify or update this device.

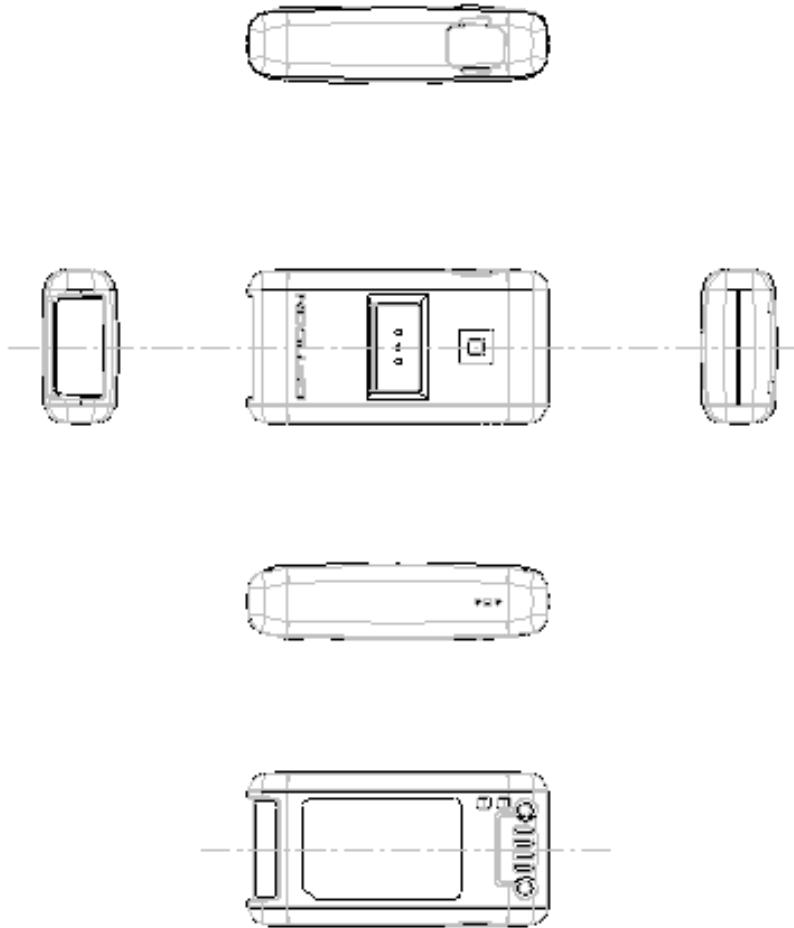
Do not use near microwaves, medical devices, or RF-emitting devices.

The scanner may not perform properly in environments when placed near a flickering light, such as a computer monitor, television, etc. Do not use in the reach of blinking lights such as CRT.

The scanner may be damaged by voltage drops.



## 17. Mechanical Drawing



*Figure 11: Mechanical drawing*