OPTICON

Portable 2D Data Collector

PX-20

The PX-20 is a portable data collector with a 2D barcode scanner. Scanned and stored data can be transmitted to the host via the USB interface, or via Bluetooth.

Specifications Manual

Preliminary. All information subject to change without notice.

Document History

Model Number:	PX-20
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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.

Trademarks

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1. Abstract

This manual provides specifications for the PX-20 portable 2D barcode data collector.

2. Overview

The PX-20 is a very compact data collector with a built-in 2D barcode scanner. Due to its compact size and its Bluetooth capabilities, the PX-20 is the ideal companion scanner for mobile devices like the iPhone/iPad and Android telephones and tablets. The supported Bluetooth profiles are HID (keyboard emulation) and SPP (serial port emulation) Special support is added for iOS devices that allows for the use of the on-screen keyboard, while the PX-20 is connected. Additional to the Bluetooth wireless capabilities, the PX-20 also has a 1MByte storage space for off-line use. The USB interface can then be used to download the data. This is then again either as HID (keyboard emulation) or VCP (serial port emulation). The PX-20 is fully programmable, using Opticon's easy to use development tools that are available for free.

3. Physical Features

3.1. Dimensions

(W) 36 x (L) 74 x (D) 16 mm
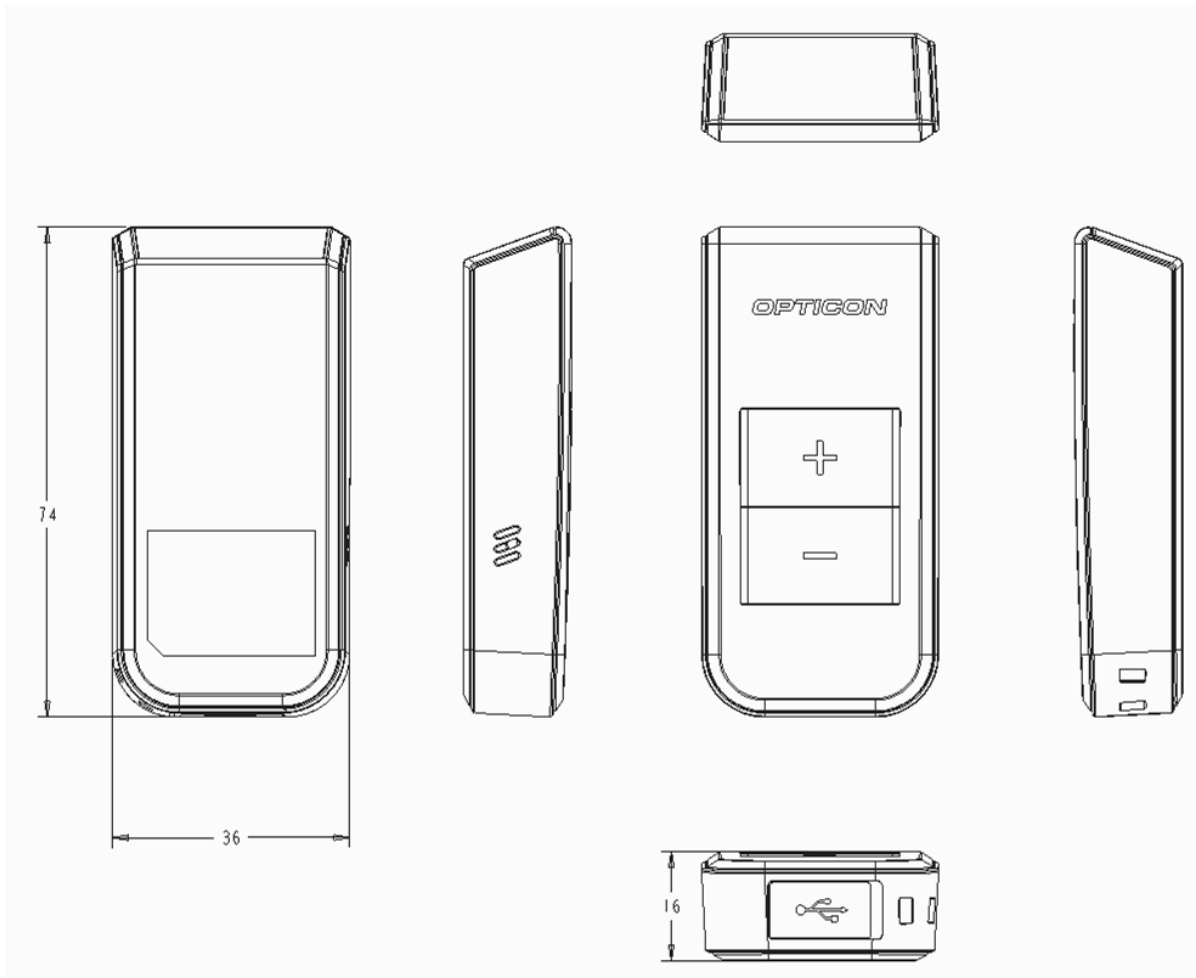
Figure 1: Dimensions

3.2. Weight

40 g (estimated)

3.3. Color

Black

4. Environmental Specifications

4.1. Operating Temperature and Humidity

Temperature: -10 to 50° C (Charging temperature range 0 to 45° C)

Humidity: 20% to 90% 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	10,000 lx
Fluorescent light	10,000 lx
Sunlight	100,000 lx

Conditions

Barcode Sample: OPTOELECTRONICS Test Sample

Bar Code Sample	: 0.33 mm UPC specified in Chapter 8
Distance	: 130 mm from the front edge of the camera module
Angle	: $\alpha = 0°$, $\beta = +15°$, $\gamma = 0°$
Curvature	: $R = \infty$
Power Supply Voltage	: 3.3 and 5.0 V

Note: α, β and γ respectively represent pitch, skew and tilt.

5. Component Specification

Item	Specifications	Notes
2D Engine	MDI-3100	Opticon's 2D imager with integrated high speed decoder
Application processor:	Renesas RX62N	96 MHz Clock speed
Flash ROM:	1 MByte serial flash	Barcode storage + >50,000 barcodes + time stamp. Might be used for other purpose as well, depending on the users application.
	512Kbyte program flash	128Kbyte available for user applications
	32Kbyte config flash	For configuration storage (e.g. Bluetooth link addresses)
RAM	96KByte	16Kbyte available for user applications
Keys	+ and -	Dome switches
LED	RGB	
Bluetooth	CSR 8811	

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	3.5	-	4.2	V
		USB	4.5	5.0	5.5	V
Input voltage	V_{in}		0	—	V_{DD}	V

6.3. Electrical Characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Operating current	While Scanning	I_{OP}		350	400	mA
	While in Standby	I_{PRE}		45	50	mA
	While Charging	I_{CHG1}		350	400	mA
When OFF		I_{off}		100	150	μA
Battery specifications	Voltage	V_{BAT}	2.75	3.7	4.2	V
	Rated capacity		350	355	-	mAh
	Charging current	I_{CHG2}		160		mA
	Charging time	T_{chg}	-	-	2.5	hour
	Scans when fully charged *1	-	1500	-	-	Times
	Operating time	-	20	-	-	Hours
	Scans when fully charged *2	-	2500	-	-	Times
	Operating time	-	35	-	-	Hours
Startup time (from deep sleep)		T_d	75	-	-	ms

Notes

*1 One scan of 1 second per minute, Bluetooth link active, data transmitted immediately after the scan..

*2 One scan of 1 second per minute, Bluetooth link not active.

7. Optical Specifications

Item		Characteristics
Scan method	CMOS area sensor (black and white)	
Nr of effective pixels	752 (H) x 480 (V)	Dots
Image capture speed (*1)	60 fps	Frames per second
Focal distance	130 mm	
View angle	Horizontal	40.6°
	Vertical	26.4°
Auxiliary light source (LED x 2)	Red LED	
	Peak wave length	617nm
	Directivity angle 2θ1/2 (*2)	60°
	Maximum radiation output (*3)	15000mcd
Light source for aiming	Green LED	
	Peak wave length	528nm
	Maximum radiation output (*3)	18700mcd

Notes:

*1 The fastest speed of image capture
*2 Typical value
*3 Typical value at 25 °C

8. Barcode reader Technical Specifications

Scanning is done by pointing the PX-20's aiming light to the center of a bar code for scanning.
The conditions for technical specifications are as follows, unless otherwise specified in each section.

<Conditions>

Ambient Temperature and Humidity	: Room temperature and room humidity
Ambient Light	: 100 ~200 lux (on the surface of a bar code)
Pitch Angle	: $\alpha = 0°$
Skew Angle	: $\beta = 15°$
Tilt Angle	: $\gamma = 0°$
Curvature	: $R = \infty$
Power Supply Voltage	: 3.3 and 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 2 seconds.
Bar Code 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. Bar Code Test Sample

1 D Bar Codes

\<Code 39>

Resolution	Symbology	PCS	Size (mm)	No. of Digits
0.127 mm (5mil)	Code 39	0.9	32 × 10	15
0.20 mm (7.9mil)			100 × 10	31
0.254 mm (10mil)			32.5 × 10	7
0.508 mm (20mil)			36 × 25	4

\<Code 128>

Resolution	Symbology	PCS	Size (mm)	No. of Digits
0.20 mm (7.9mil)	Code 128	0.9	42 × 10	16

\<UPC>

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

\<Codabar>

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

GS1 Databar

\<GS1-limited>

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

2 D Codes

\<PDF417>

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

\<QR Code: Model-2>

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

\<Data Matrix>

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

Note: The size is outline dimensions excluding quiet zone.

8.2. Scan Area and Depth of Field

The scan area is measured from the front edge of the camera module.

[Unit : mm]

Code 39
- 0.127(5mil): 90 ←→ 130
- 0.254(10mil): 70 ←→ 210
- * 65 ←→ 300 : 0.508(20mil)

Code 128
- 0.20(7.9mil): 80 ←→ 190

UPC 100%
- 0.33(13mil): 55 ←→ 225

PDF417
- 0.169(6.7mil): 85 ←→ 145
- 0.254(10mil): 65 ←→ 200

QR Code
- 0.212(8.4mil): 95 ←→ 120
- 0.381(15mil): 60 ←→ 200

Data Matrix
- 0.254(10mil): 80 ←→ 150
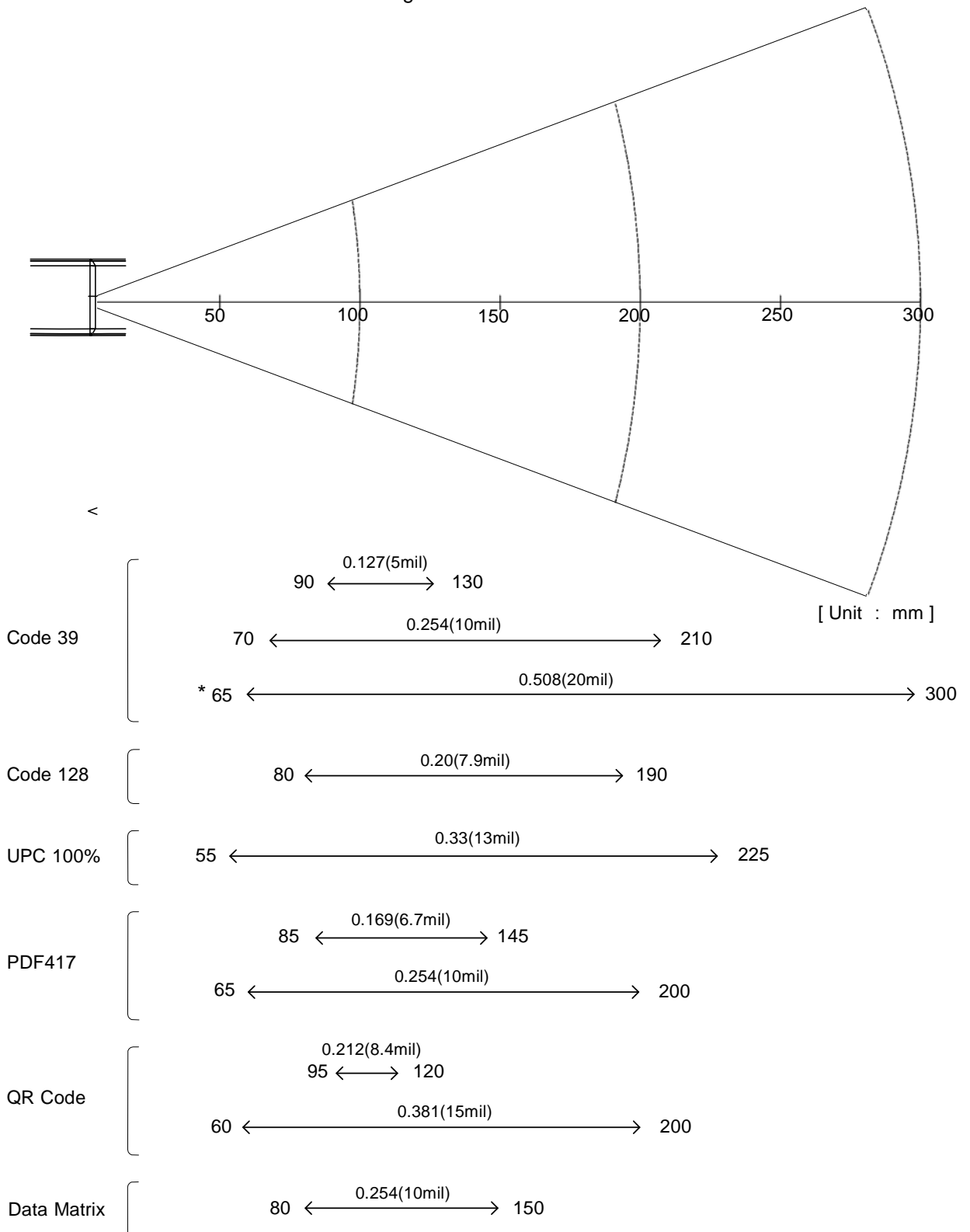
Note: The depth of field depends on the view angle and symbol length

8.3. Print Contrast Signal

PSC 0.3 or higher

        `<Conditions>`
MRD	: 32% and higher
	(70% or higher reflectivity of space and quiet zone)
Distance	: 130 mm from the front edge of the camera module
Bar Code Sample	: UPC specified in Chapter 8. (Resolution: 0.33 mm, PCS: 0.3)

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

PCS = **Error!**

8.4. Minimum Resolution

1D Code	: 0.127 mm (5 mil) Code 39 specified in Chapter 8
GS1-Databar	: 0.169 mm (6.7 mil) GS1 Databar-Limited specified in Chapter 8
Stacked Code	: 0.169 mm (6.7 mil) PDF417, GS1 Databar-Limited Composite specified in Chapter 8
2D Code	: 0.212 mm (8.4 mil) OR Code and Data Matrix specified in Chapter 8

        `<Conditions>`
Bar Code Sample	: The above codes specified in Chapter 8
Distance	: 100 mm from the front edge of the camera module
Angle	: α = 0°, β = ＋15°, γ = 0°
Curvature	: R = ∞

For the pitch angle and tilt angle measurement, set the skew angle β = +15°

8.5. Wide Bar Code

Code 39 with width of 100 mm and resolution of 0.2 mm can be read.

        `<Conditions>`
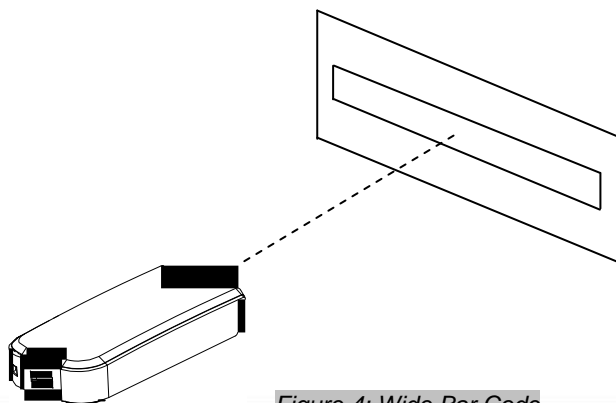|	
Bar Code Sample	: 0.20 mm Code 39 specified in Chapter 8
Distance	: 160 mm from the front edge of the camera module
Angle	: α = 0°, β = ＋15°, γ = 0°
Curvature	: R = ∞

Figure 4: Wide Bar Code

8.6. Motion Tolerance

UPC bar code 100% can be read when it is moving at 2m/s.

<Conditions>
Ambient Temperature and Humidity : Room temperature and Room humidity
Ambient Light : 500 lux to 1000 lux (on the surface of a bar code)
Distance : 130 mm from the front edge of the camera module
Angles : α= 0°
Skew : β = 15°
Tilt : γ = 0°
Curvature : R = ∞
Power Supply Voltage : 3.3 and 5.0 V
PCS (1D and 2D) : 0.9 or higher
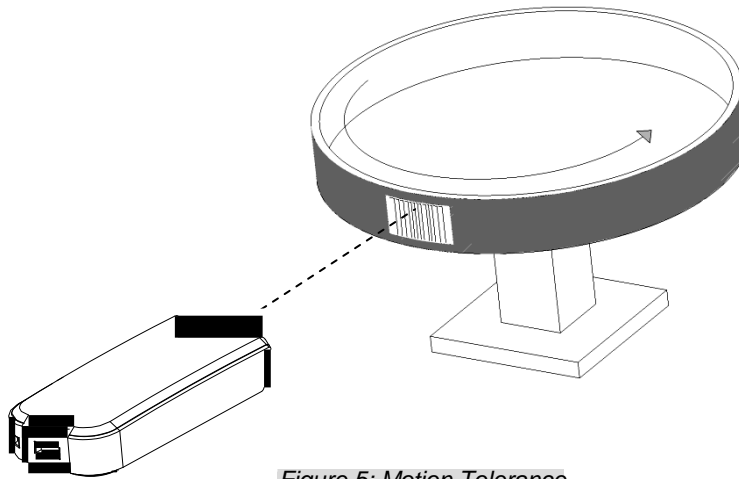Bar Code Sample : UPC with 0.33 mm resolution specified in Chapter 8

Figure 5: Motion Tolerance

Note: The above shows the possible speed of reading, but no guarantee of 100% reading.
 : Scanning may fail due to the specular reflection of illumination LEDs when the reflectivity is high.

8.7. Pitch, Skew, and Tilt

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

        <Conditions>
        Bar Code Sample   : 0.33 mm UPC specified in Chapter 8
        Distance   : 130 mm from the front edge of the camera module
        Curvature   : R = ∞
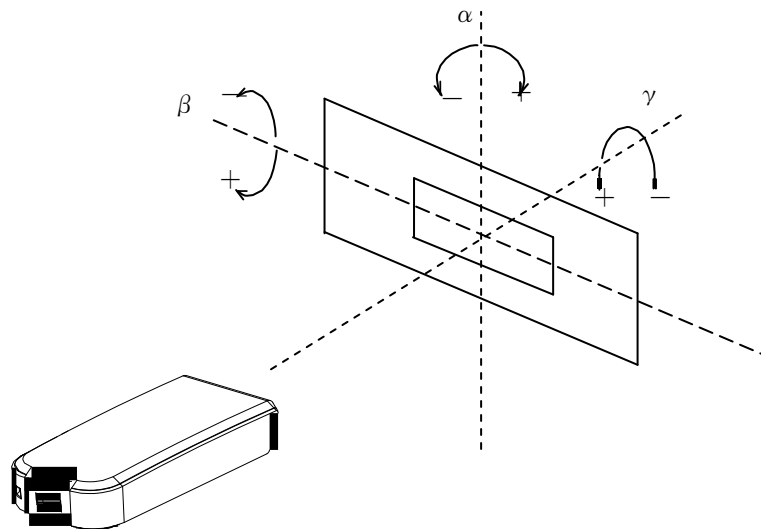   For the pitch angle and tilt angle measurement, set the skew angle β = +15°

Figure 6: Pitch, Skew, and Tilt

8.8. Curvature

0.33 mm 12-digit UPC   : R $\geqq$ 20 mm
0.15 mm 10-digit Codabar   : R $\geqq$ 16 mm

        <Conditions>
        Bar Code Sample   : 0.33 mm UPC specified in Chapter 8
        Distance   : 110 mm from the front edge of the camera module
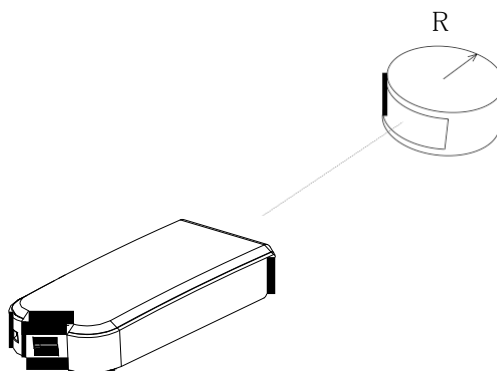   Angle   : α = 0°, β = ＋15°, γ = 0°

Figure 7: Curvature

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

9. External interfaces

9.1. USB-HID and USB-VCP Interface Specifications

Complies with USB Version 2.0. The supported profiles are USB-COM (also referred to as USB-VCP that stands for Virtual Communication Port). This port is used for charging and data communication.

9.2. Wireless Interface

PX-20 has a BT connection with the following features:

Feature	Description
Version 1)	2.1
Supported profiles 1)	SPP (Serial Port Profile) HID (Human Interface Device Profile)
Scanner operating mode while connected to the host system	Master or Slave mode
Security mode	As per the Bluetooth 2.1 specification. The settings for this can be configured in the user application.
Encryption	Encryption is linked to the authentication setting and cannot be enabled or disabled separately.
Communication range 3)	Approximately 10 meters
Frequency 4)	2400 MHz to 2483.5 MHz
Transmission power	2.5mW (4dBm) or less
Baud rate	115.2 kbps
Antenna 5)	Built in

Notes

1. This product complies with the Bluetooth 2.1 standard. The device that communicates with this product must support either SPP or HID as well. 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.
4. The frequency band of the electromagnetic radiation (2.4 GHz) used by this product is shared by various other devices. Therefore, baudrate and communication distance may be negatively impacted by other devices. Baudrate and communication distance are affected by obstacles, wave conditions, or a device at the other end.
5. This product is equipped with an antenna. Bringing this product too close to a metallic object may degrade performance.

10. Cable and Connector

10.1. USB Cable

A dedicated USB cable is provided. This cable has a USB-A connector on one end and a micro-USB B connector on the other end.
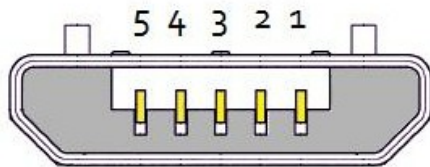
10.2. Connector

Figure 2: USB Micro-B connector

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

10.3. External trigger

It is possible to trigger the PX-20's barcode reader externally via a pin in the USB connector. The trigger is active low, edge triggered, enabled by grounding pin 4 in the USB connector.

11. Labeling

11.1. Product label

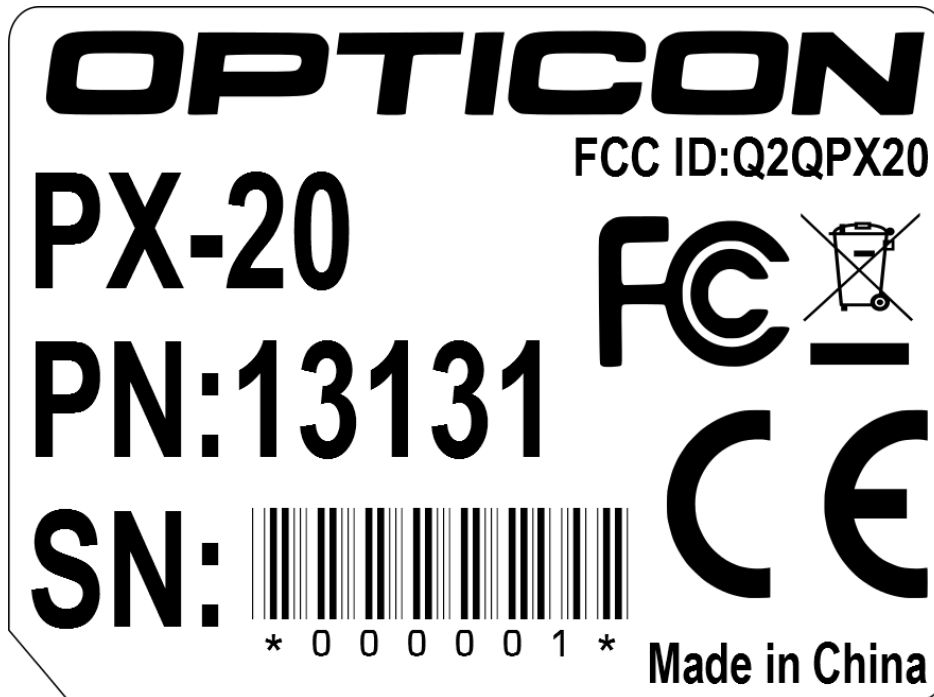The product label shown below is affixed to the scanner.

Figure 3: Product label

The serial number consists out of 6 numeric digits. It starts with 000001 and is incremented with 1 for each scanner. The serial number is also stored in the scanners non-volatile memory and API functions are available to retrieve the serial number for use in user applications.

Material: Base + laminate protection against wear.
Base: PP film, thickness 80µm, backing with glue.
Laminate: PET film, clear, thickness 50µm.
Size: 25 x 18.5 mm.

11.1. White box label

Size is 70mm x 25mm with a tolerance of ± 2 mm
Label material: Paper, white, with permanent adhesive backing.

Article number: Standard code 39 + human readable text , data = Jeeves number
Serial number: Standard code 39 + human readable text, data should match that of the product inside the box.

.

Figure 4: White box label

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
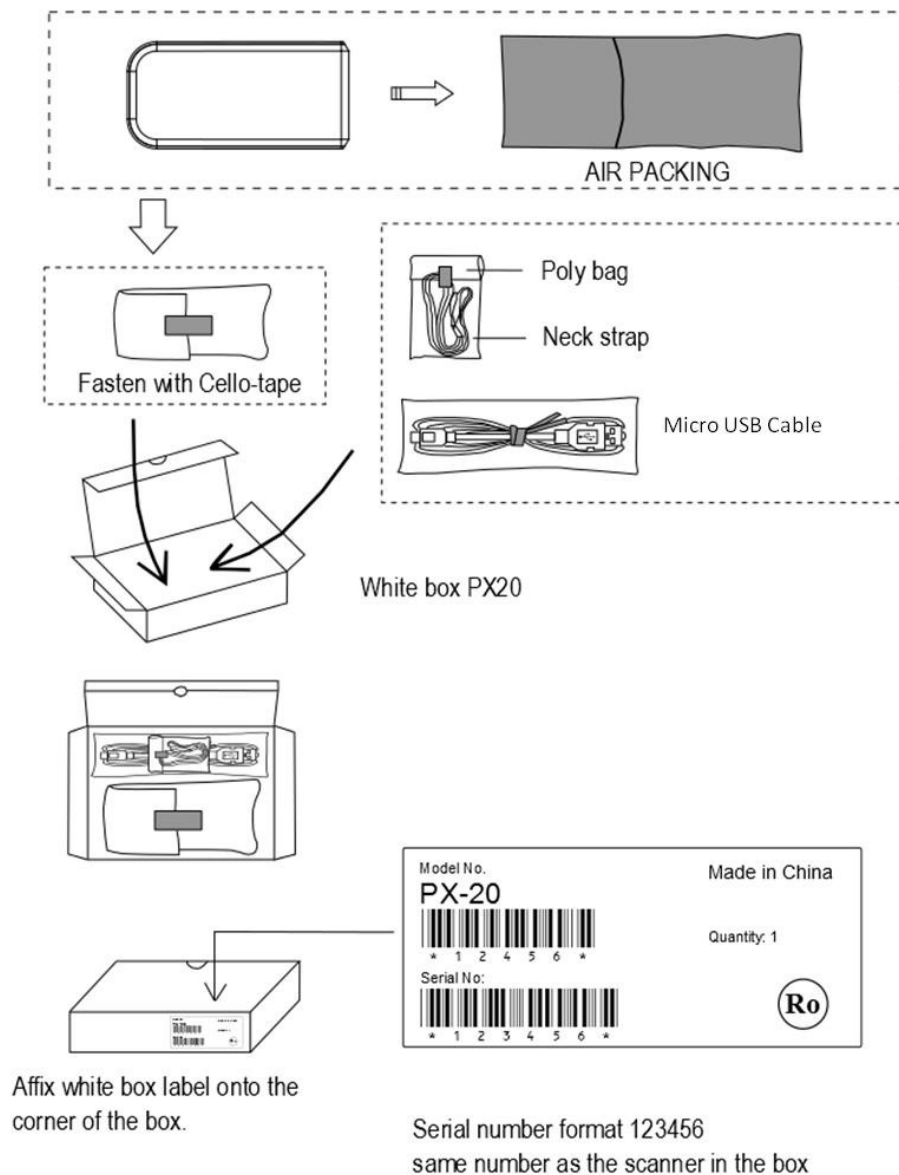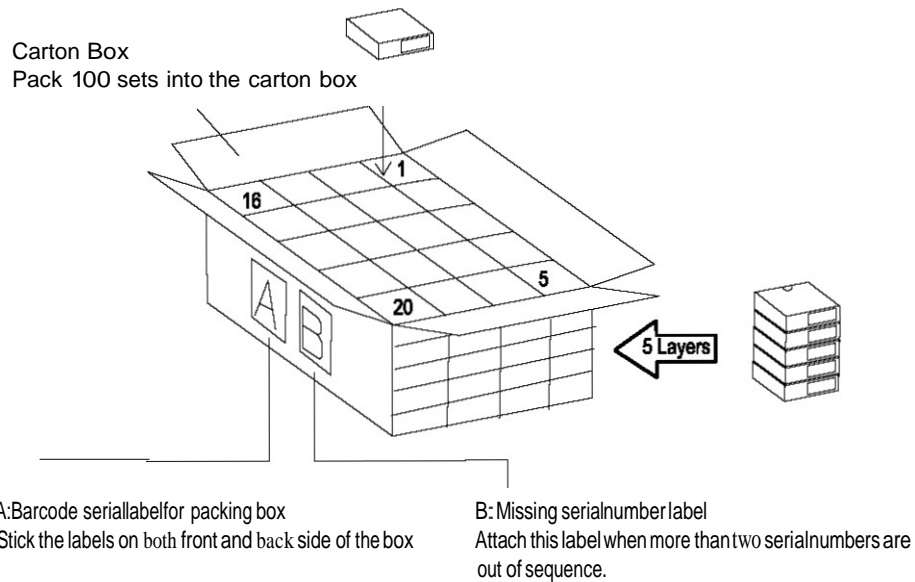

Figure 5: Individual packaging

12.2. Collective Packaging Specification

Size of the shipping box is: 500 0JV) x 560 (D) x 200 (H) mm

Carton Box
Pack 100 sets into the carton box

A: Barcode serial label for packing box
Stick the labels on both front and back side of the box

B: Missing serial number label
Attach this label when more than two serial numbers are out of sequence.

Figure 6: 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. Drop Test

No malfunction occurred after the following drop test.

Drop Test: Drop the data collector from a height of 180 cm onto a concrete floor (three times in each of 6 angles).
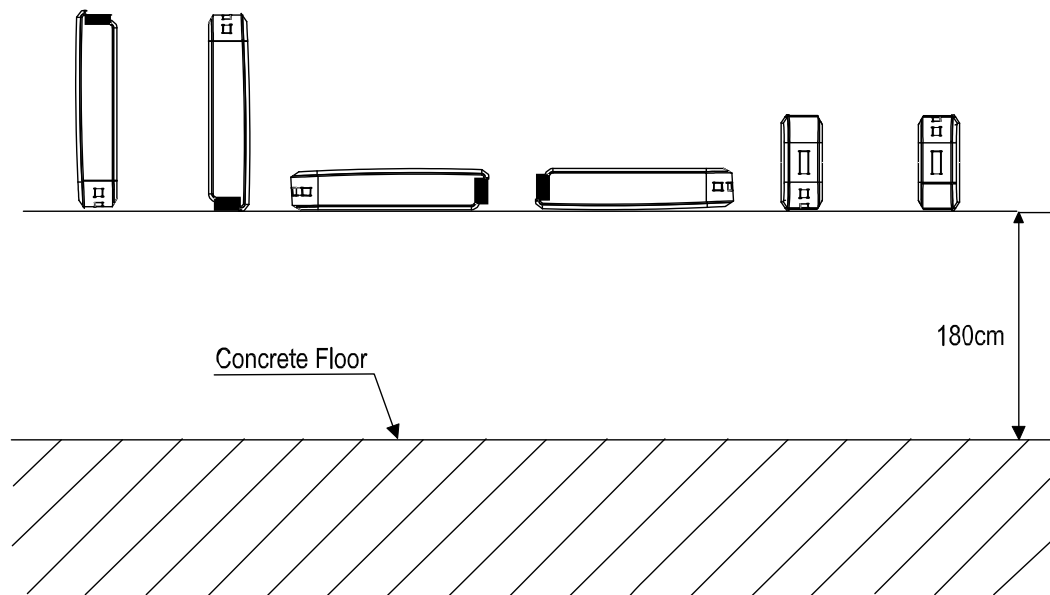

Figure 7: Drop test

14. Regulatory Compliance

14.1. Product Safety

EN 60950-1:2006+A11:2009+A1:2010+A12:2011

Lamp classification: IEC62471:2006 Exempt Group

14.2. EMC

EN55022

EN55024

FCC Part 15 Subpart B Class B and Part 15 Subpart C: 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.

14.3. REACH

Regulation (EC1907/2006) compliance

14.4. RoHS

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

14.5. 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. Handling

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

15.1. Shock

Do not throw or drop the scanner.

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

15.2. 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.

15.3. Foreign Materials

Do not immerse the scanner in liquids.

Do not subject the scanner to chemicals.

Do not insert foreign substances into the device.

15.4. Other

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

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.

16. Revision History

Revision	Date	Issued By	Comments
0.1	20120928	NiLe	Initial revision
0.2	20121010	NiLe	Changed chapter 10 to have micro USB
0.3	20121012	NiLe	Updates during review
0.4	20121015	NiLe	Updates according to review notes
0.5	20121030	NiLe	Updated pictures
0.6	20121123	NiLe	Updated label picture, Mech drawings
0.7	20121130	NiLe	Updates during review
1.0	20121221	NiLe	Version 1.0, updated according to comments from Ron de Vries
1.1	20130109	NiLe	Re-added RoHS in certification chapter
1.2	20130125	Kees	
1.3	20130530	NiLe	Updated according to review by Ron de Vries. Mainly changing data from MDI-3100 HD version to MDI-3100 SR version