

**OPTICON**

Imager Scanner

# OPI 2201



The OPI 2201 scanner enables smooth scanning of linear (1D) and 2D symbologies with an autofocus function.

## Specifications Manual

All information subject to change without notice.

## Document History

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## 1. Abstract

This manual provides specifications for the OPI 2201 mager Scanner.

## 2. Overview

The OPI 2201 scanner enables smooth scanning of linear (1D) and 2D symbologies with an automatic focus function.

The main features of the OPI 2201 are:

**Effective use of liquid lens:** With an embedded liquid lens in the scanner, the OPI 2201 is able to read both high resolution and barcodes at large distances.

**Skillful laser aiming:** The laser pointer makes the scanner easy to aim and consequently enhances reading performance.

**Realization of auto-focus function:** Not only is the laser light used for aiming, but also for distance range so that hi-speed auto-focus is enabled. When the distance range with laser light is impossible due to environmental conditions, the focus adjustment will be done using the contrast method.

**High-speed, ultra-sensitive mega pixel CMOS image sensor:** A customized CMOS image sensor allows the scanner to achieve a frame rate of 30 fps with 1.3 million pixels. Due to the information capacity—which is four times more than that of VGA-class sensors—the image sensor makes it possible to scan images at wide angles and high resolutions.

**The world's fastest image processing speed:** High-speed ASIC enables a quick response—equal to that of VGA-class sensors—by processing the vast amount of information transferred from the mega-pixel CMOS image sensor in a very short time.

**Image capture mode:** In this mode, an adjustment to ensure sufficient brightness is enabled by configurations for photometrical area and  $\gamma$  (gamma), in order to capture clearer images than ever before.

**Strain-reducing rubber stabilizer:** The scanner features a rubber stabilizer around the handle to reduce operator strain during long periods of use. Recessing the image scanning section not only enhances resistance to hand movement, but also scanning performance.

**Various interfaces:** The OPI 2201 supports RS-232C, Keyboard Wedge, USB (HID), USB (VCP) interfaces. USB (VCP) enables command communication from the host through the Virtual Com Port.

**Complies with RoHS:** The OPI 2201 complies with RoHS (the restriction of the use of certain hazardous substances in electrical and electronic equipment, 2002/95 EC).



## Supported symbologies:

Linear (1D)	Postal	2D
JAN/UPC/EAN, incl. add-on	Chinese Post	Aztec Code
Codabar/NW-7	Korean Postal Authority Code	Aztec Runes
Code 11		Codablock F
Code 39		Composite Codes: GS1-128 (incl. CC-A/B/C)
Code 93		Data Matrix (ECC 0-140, ECC200)
Code 128		Maxi Code (mode 2~5)
GS1-128 (EAN/UCC-128)		MicroPDF417
GS1 Databar (RSS) (all, incl. CC-A/B); Omnidirectional/Truncated/Stacked/Limited/Expanded		Micro QR Code
IATA		PDF417
Industrial 2of5		QR Code
Interleaved 2of5		
ISBN-ISMN-ISSN		
Matrix 2of5		
MSI/Plessey–UK/Plessey		
S-Code		
Telepen		
Tri-Optic		

### 3. Physical Features

#### 3.1. Dimensions

W 72.0 x D 95.0 x H 175.0 mm

#### 3.2. Weight

175 g (max.), excluding the interface cable

### 4. Environmental Specifications

#### 4.1. Operating Temperature and Humidity

Temperature: -20 to 50° C

Humidity: 5 to 85% (no condensing, no frost)

#### 4.2. Storage Temperature and Humidity

Temperature: -20 to 60° C

Humidity: 5 to 85% (no condensing, no frost)

#### 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

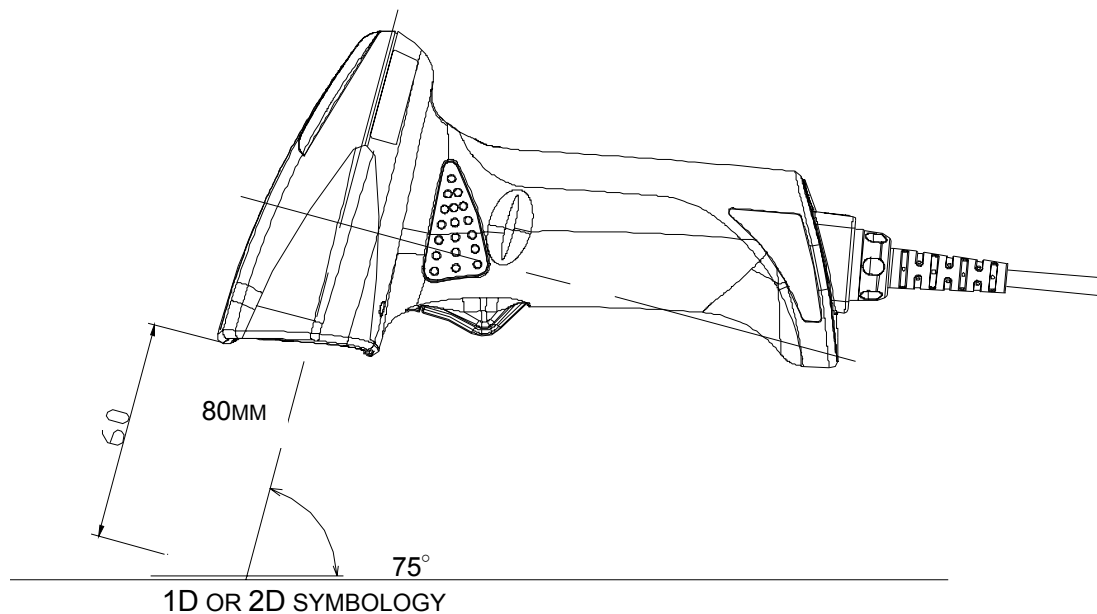


Figure 1: Ambient light immunity

### Conditions

Barcode Sample: OPTOELECTRONICS Test Sample. Lighting LEDs were kept on during the test.

PCS:	0.9
Resolution:	0.339 mm
Symbology:	QR code
Quiet zone:	90 mm
N/W ratio:	1:2.5
Distance:	150 mm
Angle (see note below):	$\alpha = 0^\circ \beta = 75^\circ \gamma = 0^\circ$
Curvature:	$R = \infty$
Power supply voltage:	5.0 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
ASIC:	OEY-0402	CPU: ARM-1026EJ-S Core: 160 MHz
SDRAM:	128 MB (1M × 4 banks × 32 bits)	SDCLK: 80 MHz
Flash ROM:	16 MB (1M × 16 bits) Flash memory	

## 6. Electrical Specifications

### 6.1. Configuration

The OPI 2201 consists of a focus control section which emits the laser; a liquid lens drive section; a CMOS sensor; a camera section in the lens; a decode and communication section that decodes 1D and 2D symbologies data from the scanned image; an interface section, which outputs the main power supply (3.3v) conversion and the result of decoding; and a power supply section.

The liquid lens is adjusted by trigonometry. (It determines the distance between the scanner and a scanning object using the actual distance between laser light and the center of the object.)

The USB models of the OPI 2201 operate on bus power and those models do not require adaptors for the power supply. However, the RS-232C and Wedge models of the OPI 2201 operate using the power supply (DC 6.0 V) supplied through a dedicated adaptor.

Since the interface cable of OPI 2201 Wedge model is connected to the host, it is possible to use the keyboard even if the scanner is not supplied power through the dedicated AC adaptor, though the scanner cannot scan barcodes unless it is receiving power through the adapter.

Do not suddenly turn off the adaptor power. Doing so could cause the OPI 2201 to malfunction.

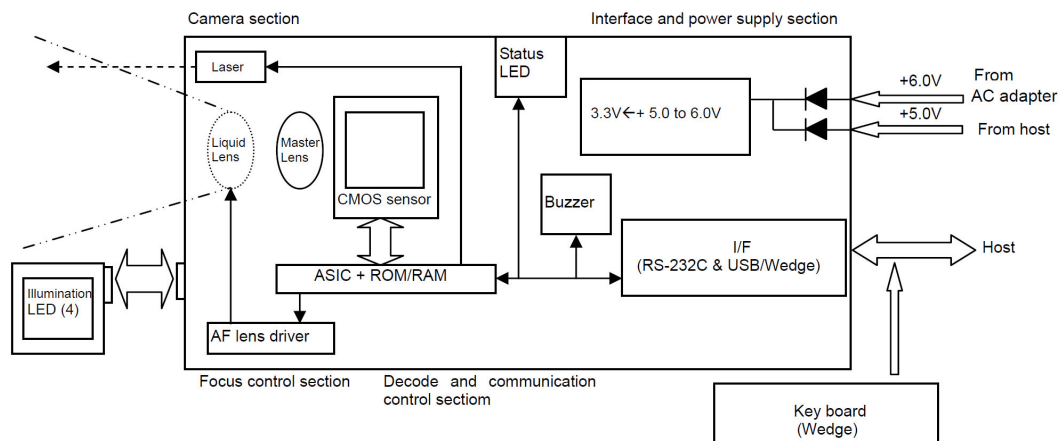


Figure 2: Electrical configuration

## 6.2. Absolute Maximum Ratings

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

## 6.3. Recommended Operating Conditions

Item	Symbol	Min	Typ	Max	Unit
Power supply voltage	RS232	5.7	6.0	6.3	V
	Wedge USB	4.5	5.0	5.5	
Input voltage	$V_{in}$	0	—	$V_{DD}$	V
Output voltage	$V_{out}$	0	—	$V_{DD}$	V

## 6.4. Electrical Characteristics

Parameter	Symbol	RS232 Max	Wedge Max	USB Max	Unit
Operating current (when scanning)	$I_{OP}$	350	305	350	mA
Stand-by current	$I_{PRE}$	75	155	85	mA

### Conditions

These figures were measured at 25°C.

Connect 1Ω resistance to a power supply line in series and measure the current by the voltage between both ends of resistance.

Power supply voltage is measured at a connector terminal area.

The current value depends on the interface type and host computer to which the device is connected.

## 6.5. AC Adaptor Specifications

### 6.5.1. Input Specifications

Parameter	Value
Power supply voltage	AC 90 V to 265 V
Power supply frequency	47 Hz to 63 Hz
Maximum current	0.5 A

### 6.5.2. Output Specifications

Parameter	Value
Output voltage	6.0 V $\pm$ 5%
Maximum current	2.0 A
Power ripple	0.1 Vp-p max. (10-100 kHz)

## 7. Optical Specifications

The auto-focus function is enabled after aiming the center of the barcode by the laser light. The aiming operation is activated when pressing the trigger key. The scan engine requires 100ms to capture the image with auto-focus after triggering. Ambient light might affect the detection of the scan field and the time that is required for scanning.

### 7.1. Imager Scanning

Parameter	Specification	Unit	Note
Light-emitting element	Red laser diode	—	
Emission wavelength	650 $\pm$ 10 (25° C)	nm	
Light output	1.0 or less	mW	
Light-emitting element (4 x LEDs)	InGaP red LED	—	
	Peak wave length	645 nm	
	Directivity angle: 2 $\Phi$ 1/2 (*1)	30° 60°	
	Maximum radiation output (*2)	12600 lx 5040 mcd	
Scanning method	SXGA (1.3 million pixels) CMOS area sensor (gray scale)	—	MCLK: 48MHz
Number of effective pixels	SXGA 1280 (column) x 1024 (row) Readable pixel count is 1282 dots (column) x 1026 dots (row)		Thermal protection
Frame rate	Up to 30	fps	
Scan angle	Horizontal: 40 Vertical: 32	°	

\*1: The radiation pattern features: 2pcs in 2 types of LED (which have different directivity angles).

\*2: The figure is measured at 25°C, IF = 50mA. Class 1M compliant output.

## 7.2. Imager Output

Item	Specification	Note
Image data format	Windows Bitmap, JPEG, TIFF	Black spot may appear on the images, however, it does not affect the scanning specifications.
Shades of gray	256, 16, 2	
Range of output image	Select in horizontal and vertical scale.	
Resolution of output image	Full, 1/2, 1/3, 1/4	
Interface of output image	RS-232C, USB-VCP	
Transmission time	USB-VCP (Full speed)    About 4 sec RS-232C (115.2 kbps)    About 120 sec	Shades of gray: 256 Resolution: Full

## 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:	1000 to 1500 lx (on the barcode surface)
Angles	Pitch: $\alpha = 0^\circ$ , Skew: $\beta = 15^\circ$ , Tilt: $\gamma = 0^\circ$
Background:	Barcode = black Space = white Margin = white Background of label = black
PCS (in scanning 2D symbologies)	0.9 or higher
Power supply voltage:	6.0 V
Decoding test:	Approve the performance when decoding is successful in all ten tests. (Decoding is deemed successful when scanning is successful in 70% of the tests.)
Barcode test sample (1D and 2D)	Code 39 (resolution 0.1 and 0.127 mm) and JAN codes used for the tests are OPTOELECTRONICS test samples printed by a normal printer. (NW ratio = 1: 1.25)

**Test Samples: 1D Symbologies**

**Code 39**

Resolution	Symbology	PCS	Size (mm)	Digits
0.1 mm	Code 39	0.9	10 x 9	4
0.127			11 x 10	
0.254 mm			14 x 10	2
1.0 mm			56 x 30	

**JAN**

Resolution	Symbology	PCS	Size (mm)	Digits
0.260 mm	13-digit JAN	0.9/0.45	25 x 19	13
0.260 mm	8-digit JAN	0.9	17.5 x 15.5	8

**Test Samples: 2D Symbologies**

**PDF417**

Resolution	Error Correction	PCS	Size (mm)	Characters
0.254 mm	Level-4	0.9	26 x 16.5	17
0.127 mm			13 x 8	

**QR Code (Model 2)**

Resolution	Error Correction	PCS	Size (mm)	Characters
0.339 mm	M	0.9	10 x 10	44
0.127 mm			4 x 4	

**Data Matrix**

Resolution	Model	PCS	Size (mm)	Characters
0.339 mm	ECC200	0.9	8 x 8	40
0.169 mm			4 x 4	

**Micro QR**

Resolution	Error Correction	PCS	Size (mm)	Characters
0.212 mm	L	0.9	5 x 5	11



**8.1. Print Contrast Signal (PCS)**

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

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

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

**Conditions**

MRD	32% and higher (With over 70% reflectivity of space and quiet zone.)
Distance	120 mm from the focal plane of the scanner.
Barcode test sample (1D & 2D)	PDF417 (Resolution: 0.254 mm, PCS: 0.45)

**8.2. Minimum Resolution**

Resolution	Symbology
0.1 mm	Code 39
0.127 mm	PDF417, QR Code
0.169 mm	Data Matrix
0.212 mm	Micro QR

### 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.

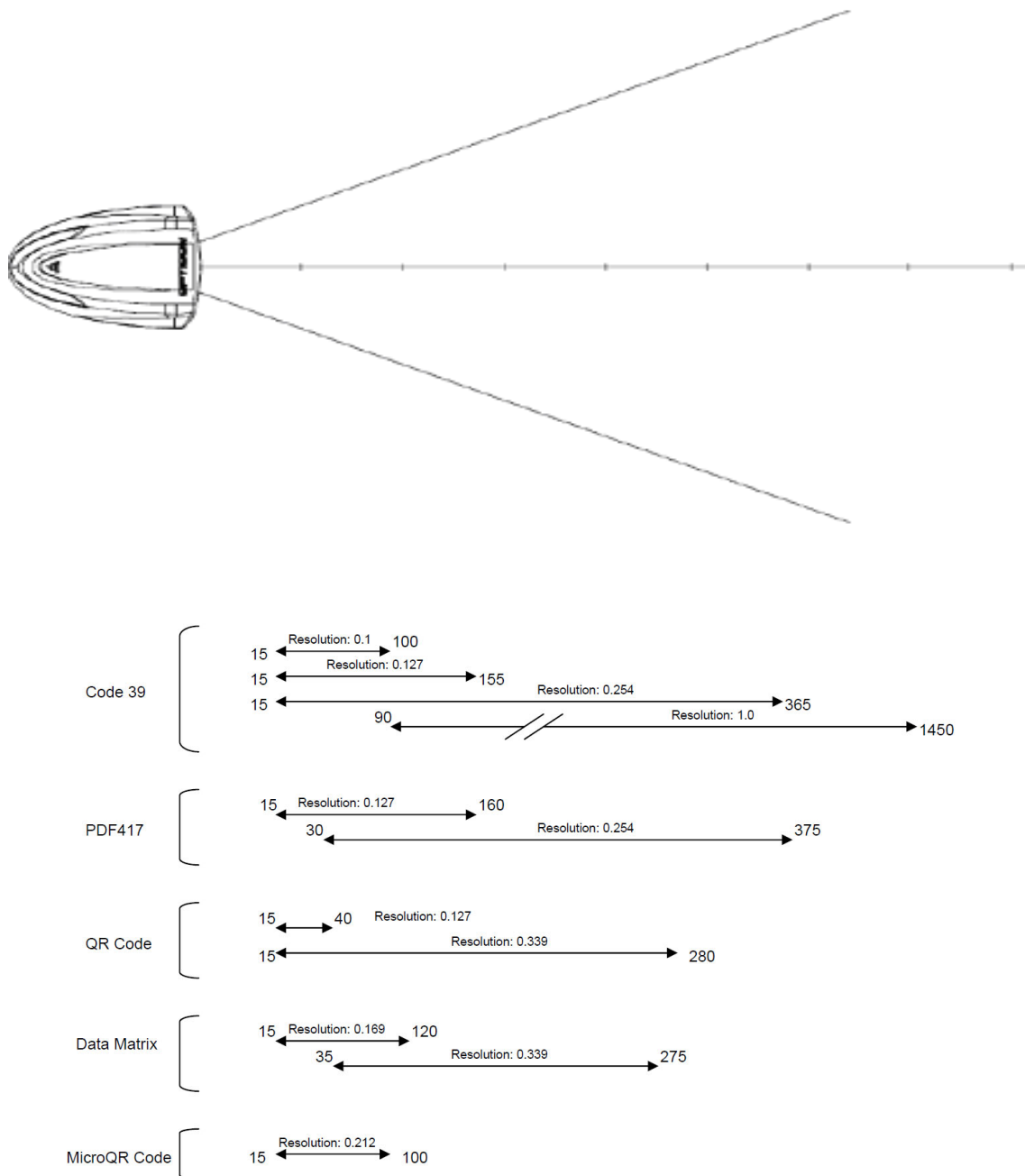


Figure 3: Depth of field

Symbology	Resolution (mm)	Decode Depth (mm)	PCS
Code 39	0.1 0.127 0.254 1.0	15-100 15-155 15-365 90-1450	0.9
PDF417	0.127 0.254	15-160 30-375	0.9
QR Code	0.127 0.339	15-40 15-280	0.9
Data Matrix	0.169 0.339	15-120 35-275	0.9
Micro QR Code	0.212	15-100	0.9

## 8.4. Pitch, Skew, and Tilt

### 8.4.1. Pitch Angle

$$\alpha = \pm 45^\circ$$

### 8.4.2. Skew Angle and Dead Zone

$$\text{Skew angle: } \beta = \pm 65^\circ$$

### 8.4.3. Tilt Angle

$$\gamma = 360^\circ$$

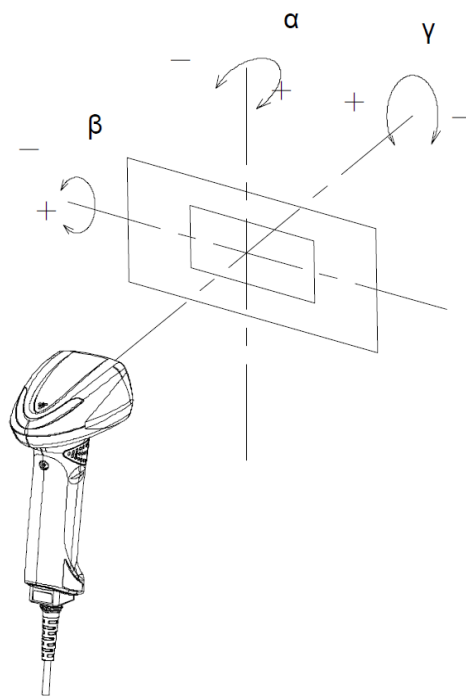


Figure 4: Pitch, skew, and tilt

## Conditions

Barcode Sample: OPTOELECTRONICS Test Sample

Distance: 120 mm from the edge of the scanner

Label: **Pitch, Skew Angle, Dead Zone**

PCS = 0.9, Resolution = 0.254 mm, Symbology = 9-digit Code 39,  
Quiet Zone = 10 mm, N/W Ratio = 1:2.5

Angle: Curvature:  $R = \infty$

For the pitch angle measurement, set the skew angle  $\beta = 15^\circ$ . For the tilt angle measurement, set the skew angle  $\beta = 15$  when pitch angle is  $0^\circ$  and rotate 1D and 2D barcodes afterwards.

## 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.

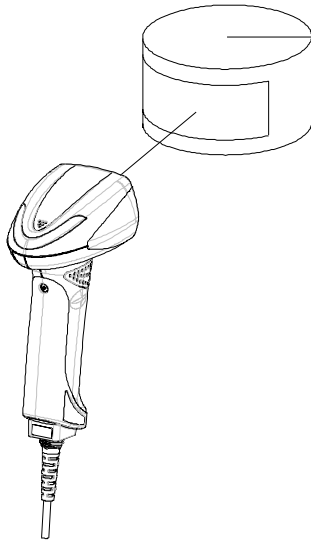


Figure 5: Curvature

### Conditions

Barcode Sample: OPTOELECTRONICS Test Sample

Distance:	120 mm from the edge of the scanner
Label:	PCS = 0.9, Resolution = 0.26 mm, Quiet Zone = 10 mm
Angle:	Skew Angle $\beta = +15^\circ$

Scanning performance may fail due to the specular reflection of illumination LED when the reflectivity is high. Either of the following solutions will help solve the problem.

- Tilt the scanner 15 degrees in the skew direction when scanning.
- Set the illumination LED OFF. When turning the illumination LED OFF, make sure the ambient light immunity is 500 lx or more; otherwise, scanning performance may be decreased.

## 8.6. Scanning Barcodes on Moving Items

The value of motion tolerance can only be met when the auto-focus adjustment has been performed. Ambient light reflections might affect the detection of the scan field and the time that is required for scanning.

### 8.6.1. Horizontal motion tolerance

Max. 10cm/s

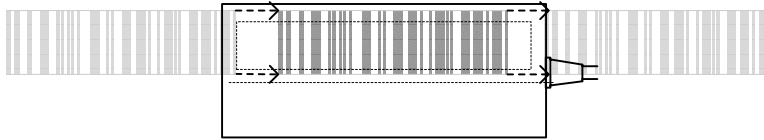


Figure 6: Horizontal motion

## 9. Interface Specifications

The OPI 2201 supports RS-232C, USB, and Wedge interfaces.

RS-232C interface: Power is supplied to the scanner using an AC adapter via power supply jack.

Keyboard Wedge interface: Power is supplied to the scanner using an AC adapter via power supply jack.

USB interface: Power is supplied to the scanner from the USB bus.

**Note:** Scanner malfunctions caused by the use of AC adaptors not provided by OPTOELECTRONICS are not covered under warranty.

### 9.1. RS-232C Interface Spec

#### 9.1.1. Settings and Communication

Reading the menu barcodes in section 11.1 can set the RS-232C interface default. Kanji codes and image data can be transmitted via the RS-232C interface.

Parameter	[U2] setting
Baud rate	9600 bps to 115.2 kbps
Start/stop bits	1 bit
Data bits	8 bits
Parity bits	No parity
Handshaking	No handshake
Flow control time out	Indefinitely

Communication settings can be configured by scanning corresponding menu barcodes.

**9.1.2. Signal Level**

Signal Name	I/O	RS-232C Level (V)	
		Mark/OFF	Space/ON
TxD	OUT	-5 to -15	+5 to +15
RxD	IN	-3 to -15	+3 to +15
RTS	OUT	-5 to -15	+5 to +15
CTS	IN	-3 to -15	+3 to +15

**9.1.3. Interface Circuit**

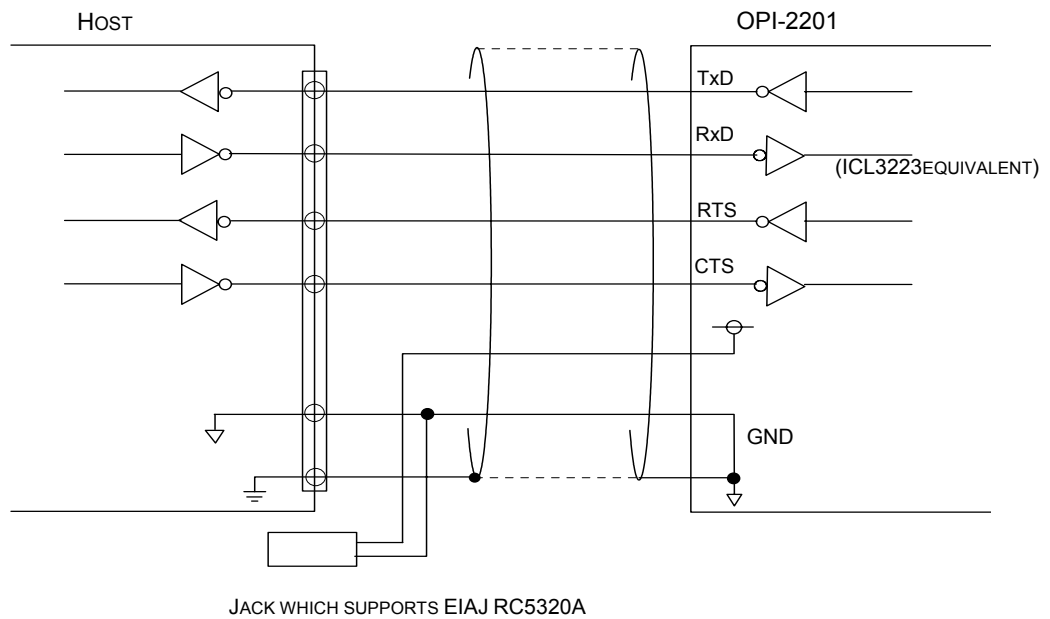


Figure 7: RS-232C interface circuit

**9.1.4. Character Format**

Uses the same format for both sending and receiving.

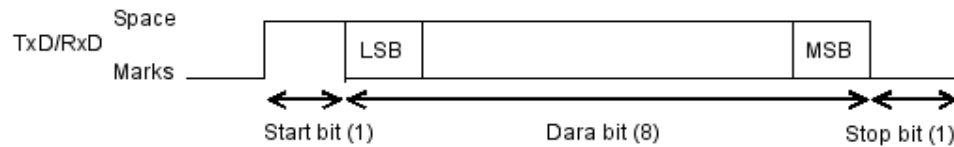


Figure 8: Character format

**9.1.5. Communication Format**

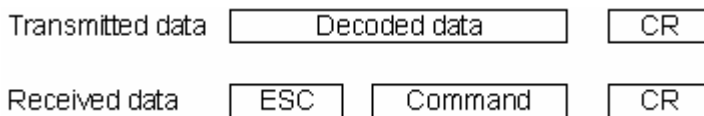


Figure 9: Communication format

**9.1.6. Handshaking**

Select handshaking options using the menu or command listed below.

Handshaking	Menu/Command
No handshake	P0
BUSY/READY	P1
MODEM	P2
ACK/NAK	P3
ACK/NAK NO RESPONSE	P4

**a) No Handshaking**

The scanner attempts the communication regardless of the state of the host computer.

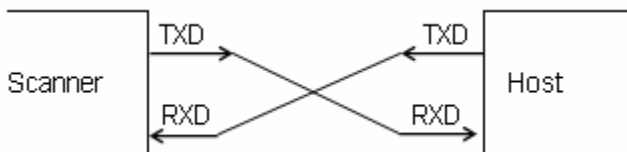


Figure 10: No handshaking

**b) BUSY/READY**

The scanner and the host computer notify each other of their state and whether they can receive data with BUSY/READY through an RTS line. They can communicate state to each other through a CTS line when connected as in the following figure.

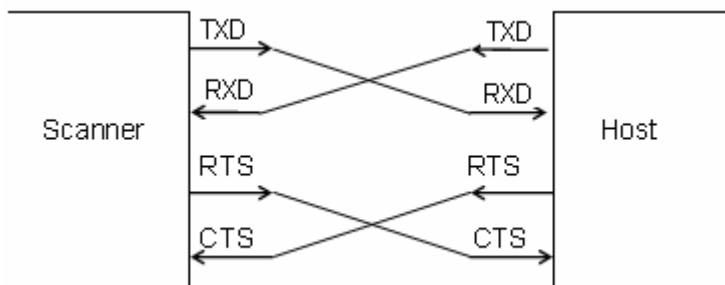


Figure 11: Busy/Ready communication



The scanner stays ON (is able to receive data) except during certain parts of the process, such as receiving data (buzzer command execution), transmitting data, and menu processing. The scanner checks the CTS line before transmitting data. When it is ON, the scanner transmits data. When it is OFF, the scanner waits for it to turn ON within a set time. The scanner will abort transmission with an error indication (buzzer) when the CTS line is not ON within a specified period. The Flow Control time-outs are as follows, and the default setting is “indefinitely” (I0).

Flow Control Time Out	Menu/Command
Indefinitely	I0
100 ms	I1
200 ms	I2
400 ms	I3

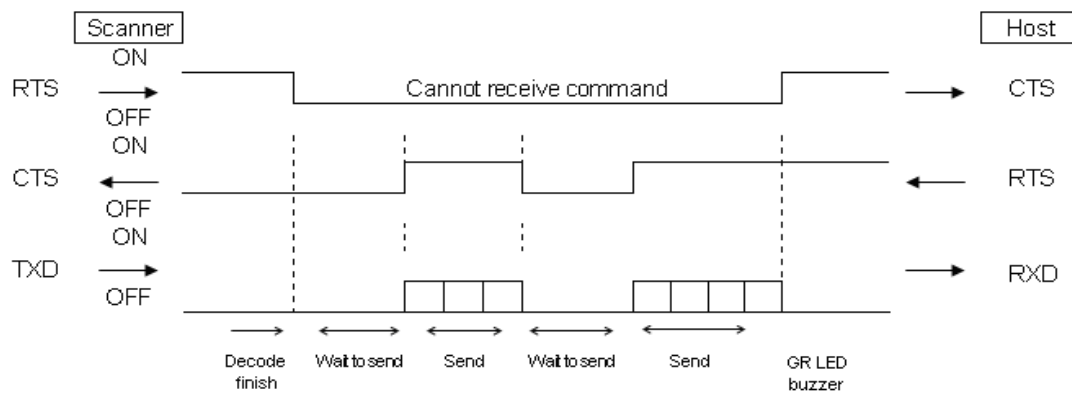


Figure 12: Cannot receive command

**CTS, TXD signal timing**

When the CTS line (RTS signal of the host) is turned OFF while sending a TxD signal, the scanner transmits one character and waits. When the CTS signal is turned ON while transmitting a character, the character will be transmitted.



Figure 13: Signal timing

**Note:** When using loopback (wire connection) for RTS, CTS line of the scanner in this setting, *No handshake* is not enabled.

**c) MODEM**

The scanner turns RTS line ON before transmitting data. Other processes are the same as BUSY/READY.

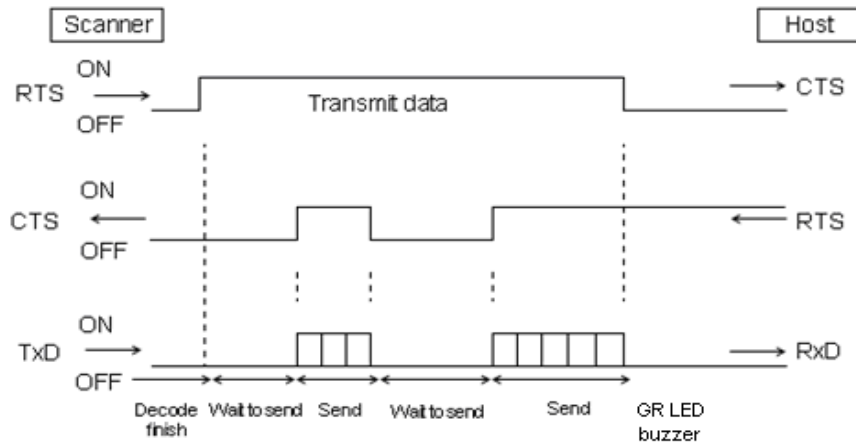


Figure 14: Modem transmit data

**d) ACK/NAK**

After data has been transmitted, the scanner expects to receive one of the following responses from the host:

**ACK response**—Action: The scanner completes transmission with the good-read buzzer and returns to the initial state.

**NAK response**—Action: The scanner sends the data again and waits for the response from the host.

**DC1 response**—Action: The scanner returns to waiting for the trigger, if it has a trigger (the initial state).

**None response**—Action: The scanner sounds the error buzzer and returns to the initial state.

The ACK/NAK timeout is 1 second.

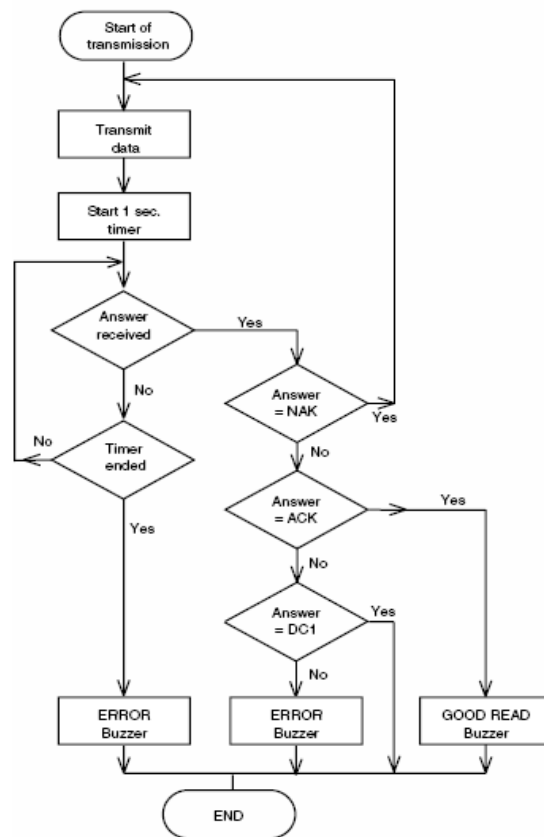


Figure 15: ACK/NAK

**e) ACK/NAK NO RESPONSE**

When no response from the host is received within the setting time, the scanner assumes an ACK response, and returns to the initial state without the error buzzer. The other actions are the same as ACK/NAK. The ACK/NAK timeout is 100 ms.

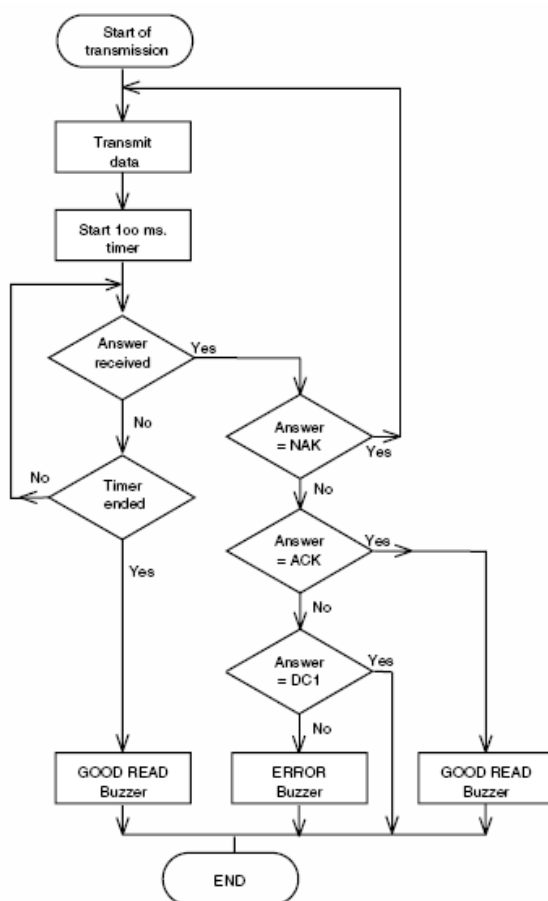


Figure 16: ACK/NAK—No response

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

The USB interface models have two specifications: HID (Human Interface Device Class) and COM (Communication Device Class).

With the USB-VCP model, a VCP (Virtual Communication Port) allows virtual serial communication and commands can be transmitted from the host computer.

### 9.2.1. Settings

Reading the menu barcodes in section 11.1 can set the USB interface default.

The interface is full-speed USB.

### 9.2.2. Interface Specification

**Device Class:** High-power bus-powered function. This interface does not require an AC adaptor.

**Speed:** Full-speed (12 Mbps).

Japanese Kanji data or images cannot be transmitted via this USB-HID interface.

Connect to a Hi-power bus (500 mA max.) USB terminal.

### 9.2.3. Circuit

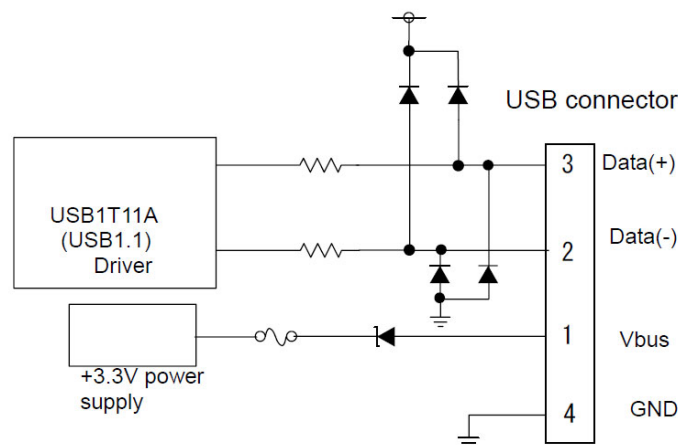


Figure 17: USB interface circuit

## 9.3. Wedge Interface Specification

Reading the menu barcodes in section 11.1 can set the Wedge interface default.

When connecting a keyboard, use the provided Y cable.

For either interface (USB or HID/Wedge)—Set the language for the scanner and PC keyboard to the same language before use; otherwise, the output may not be correct.

## 10. Cable and Connector

### 10.1. RS-232C Cable

(Standard specification)

Type:	Straight
Diameter:	$\Phi 4.8 \pm 0.5$ mm
Length:	$1500 \pm 50$ mm
Weight:	Approximately 90 g

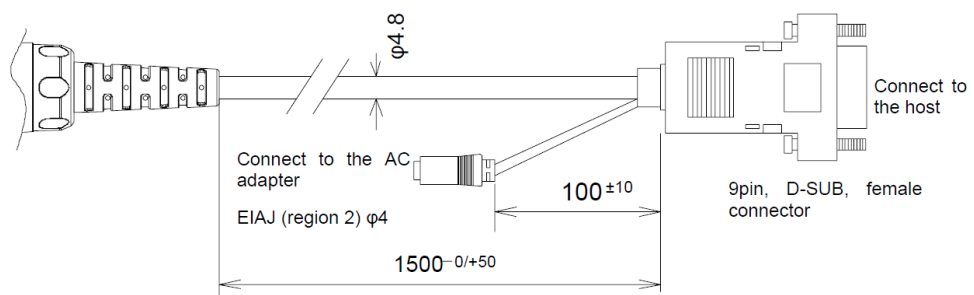


Figure 18: RS-232C cable

#### 10.1.1. Connectors

##### a) DB9 connector

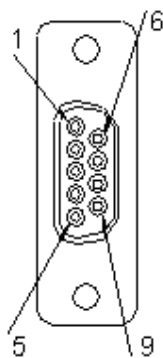


Figure 19: DB 9 connector

Connector used: D-sub 9-pin, female

Power supply: EIAJ RC5320A (voltage class2) jack

### 10.1.2. Pin Assignment

#### a) DB9 Pin Assignment

Pin	Signal	Remarks
1	Shield	
2	TxD	
3	RxD	
4	NC	Open (not connected)
5	GND	
6	NC	Open (not connected)
7	CTS	
8	RTS	
9	NC	Open (not connected)

## 10.2. USB Cable

(Standard specification)

Type:	Straight
Diameter:	$\Phi 4.8 \pm 0.5$ mm
Length:	$1500 \pm 50$ mm
Weight:	Approximately 70 g

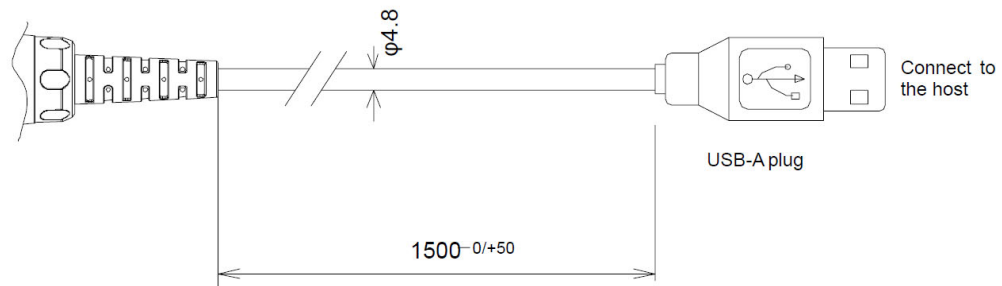


Figure 20: USB cable

### 10.2.1. Connector

#### a) USB "A" Connector

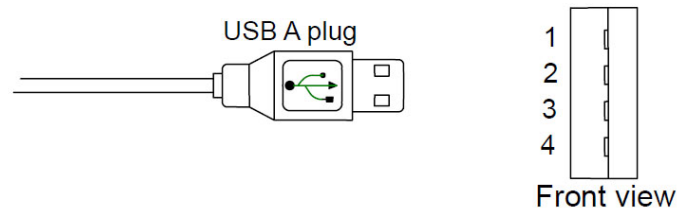


Figure 21: USB "A" connector

### 10.2.2. Pin Assignment

Pin	Signal
1	VCC
2	-DATA
3	+DATA
4	GND



### 10.3. Wedge Cable

(Standard specification)

Type:	Straight
Diameter:	$\Phi 4.8 \pm 0.5$ mm
Length:	$1400 \pm 50$ mm
Weight:	Approximately 75 g

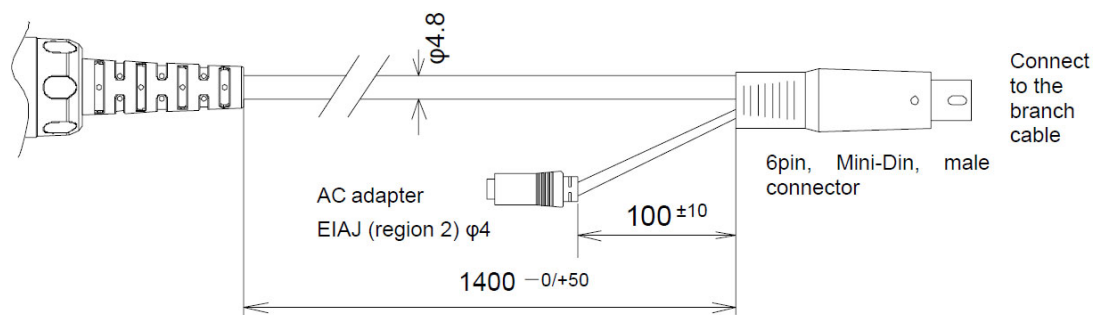


Figure 22: Wedge interface cable

Type:	Branch
Length:	$100 \pm 10$ mm
Weight:	Approximately 25 g

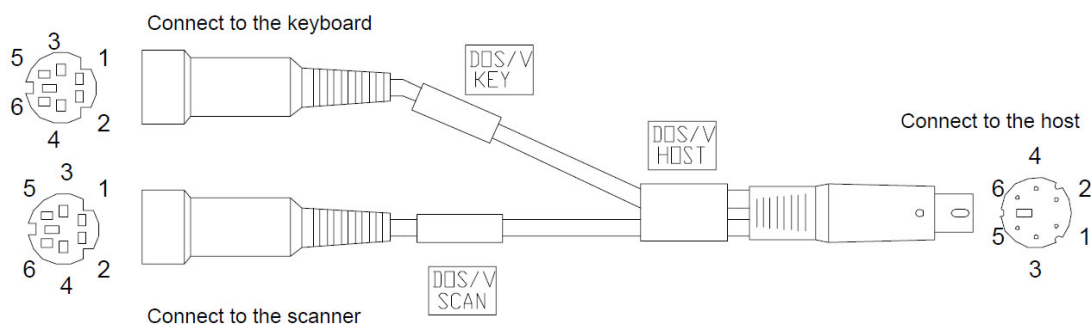


Figure 23: Wedge branch cable

## 10.3.1. Connectors

### a) Type of Connector

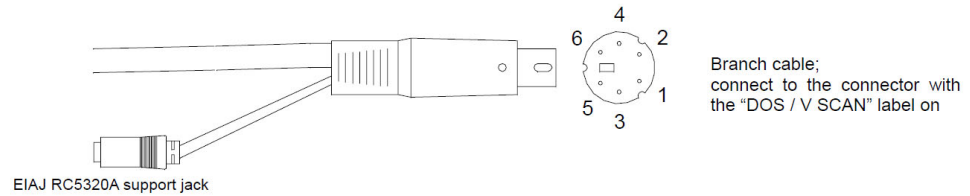


Figure 24: Wedge connector

## 10.3.2. Pin Assignment

Pin	Signal
1	CPU DATA
2	KEY DATA
3	GND
4	VCC
5	CPU CLOCK
6	KEY CLOCK

### a) DOS/V HOST Side

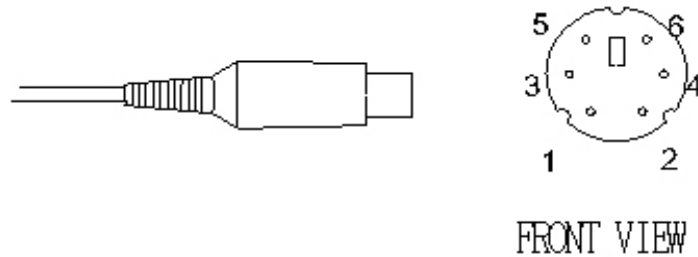


Figure 25: Front view

Contact Number	Signal Name
1	CPU_DATA
2	NC
3	GND
4	VCC
5	CPU_CLK
6	NC

**b) DOS/V KEYBOARD Side**

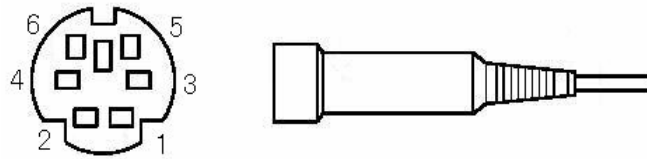


Figure 26: Front view

Contact Number	Signal Name
1	KEY_DATA
2	NC
3	GND
4	VCC
5	KEY_CLK
6	NC

Do not use the keyboard of host during data transmission from the scanner to host. It may cause problems with the data transmission.

## 11. Default Settings




### 11.1. Set Default Interface

Scan the following menu barcodes to return to the default settings.




#### RS-232C

Functions	Menu labels	Menu codes
SET		ZZ
RS-232C		U2
END		ZZ



## USB-HID

Functions	Menu labels	Menu codes
SET	 z z	ZZ
USB-HID	 s u	SU
END	 z z	ZZ





## USB-VCP

Functions	Menu labels	Menu codes
SET	 z z	ZZ
USB-VCP	 c 0	C01
END	 z z	ZZ

## Wedge (with external keyboard)

Functions	Menu labels	Menu codes
SET	 z z	ZZ
AT-Wedge	 u b	UB
Keyboard layout: with keyboard	 k m	KM
END	 z z	ZZ

## Wedge (without external keyboard)

Functions	Menu labels	Menu codes
SET	 z z	ZZ
AT-Wedge	 u b	UB
Keyboard layout: without keyboard	 k l	KL
END	 z z	ZZ

**11.2. Default Settings 1: Readable Codes**

Symbology	Re ad	Transmit Code Length	Transmit CD	Calculate CD	Set Prefix	Set Suffix	Other
UPC-A	■	X	■	■	—	CR	
UPC-A Add-on	X	X	■	■	—	CR	
UPC-E	■	X	■	■	—	CR	
UPC-E Add-on	X	X	■	■	—	CR	
EAN-13	■	X	■	■	—	CR	
EAN-13 Add-on	X	X	■	■	—	CR	
EAN-8	■	X	■	■	—	CR	
EAN-8 Add-on	X	X	■	■	—	CR	
Aztec Code	■	X	—	■	—	CR	
Aztec Runes	X	X	—	■	—	CR	
Chinese Post	X	X	■	X	—	CR	
Codabar / NW-7	■	X	■	X	—	CR	Not transmit ST/SP
Codablock F	X	X	—	■	—	CR	
Code 11	X	X	X	■	—	CR	
Code 39	■	X	■	X	—	CR	Not transmit ST/SP
Code 93	■	X	—	■	—	CR	
Code 128	■	X	—	■	—	CR	
Data Matrix (ECC0-140)	X	X	—	■	—	CR	
Data Matrix (ECC200)	■	X	—	■	—	CR	
GS1-128 (EAN/UCC-128)	X	X	—	■	—	CR	
GS1 DataBar (RSS) (all, incl. CC-A/B); Omnidirectional/ Truncated/ Stacked/Limited	X	X	■	■	—	CR	
GS1 DataBar (RSS) (all, incl. CC-A/B); Expanded/ Expanded Stacked	X	X	—	■	—	CR	
GS1 DataBar (RSS) (all, incl. CC-A/B);	■	X	■	■	—	CR	

Symbology	Read	Transmit Code Length	Transmit CD	Calculate CD	Set Prefix	Set Suffix	Other
Omnidirectional/ Truncated/ Stacked/Limited/ Expanded							
IATA	■	X	■	X	—	CR	
Industrial2of5	■	X	■	X	—	CR	
Interleaved2of5	■	X	■	X	—	CR	
Korean Postal Code (Code 3of5)	X	X	X	■	—	CR	
Matrix2of5	X	X	■	X	—	CR	
MicroPDF417	■	X	—	■	—	CR	
PDF417	■	X	—	■	—	CR	
MSI/Plessey	■	X	■	■	—	CR	Not transmit CD2
UK/Plessey	■	X	■	■	—	CR	
Postal Code (JPN, USPS, POSTNET)	X	X	—	■	—	CR	
S-Code	■	X	■	X	—	CR	
Telepen	■	X	X	■	—	CR	
Trioptic	■	X	—	—	—	CR	Not transmit ST/SP

### Notes:

In the “Reading” column, “■” means “Enable reading” and “X” means “Disable reading.”

In the “Transmit code length” column, “■” means “Transmit code length” and “X” means “Do not transmit code length.”

In the “Transmit CD” column, “■” means “Transmit check digit” and “X” means “Do not transmit check digit.”

In the “Calculate CD” column, “■” means “Calculate check digit” and “X” means “Do not calculate check digit.”

“—” means “not supported.”

In the “Prefix” column, “—” means “there is no prefix setting.”

In the “Suffix” column, suffix is set to “Enter [0x84]”. In addition, the command for “Direct input keyboard keys” is set to “71”. These are only for Wedge and USB models.

**11.3. Default Settings 2: Read Options, Trigger, Buzzer**

Item	Default Setting
Setting the number of characters	Fixed length OFF all codes
Read mode	Single read
Multiple label read (1D barcode only)	Disable
NW-7 intercharacter gap check	1 times the number of characters
Read time	2 seconds
Buzzer duration	50 ms
Buzzer tone	Single tone (3 kHz)
Buzzer loudness	Volume 1 (Maximum)
Buzzer transmission	Before transmission
Good read LED (blue)	200 ms duration

**11.4. Default Settings 3: Serial Communication Settings—RS-232C**

**11.4.1. Default Settings 3A: Serial Communication Settings—RS-232C**

Parameter	“U2” and “C01” Default Setting
ACK/NAK	ACK/NAK NO RESPONSE
CS time out	Indefinitely
ACK/NAK timeout	1 s
Command header	ESC/STX
Command terminator	CR/ETX
ACK/NAK for RS-232C comm.	Disable

**11.4.2. Default Settings 3B: Serial Communication Settings—RS-232C**

Parameter	“U2” Default Setting
Baud rate	9600 bps
Parity bits	No parity
Data length	8 bits
Stop bits	1 bit

**11.5. Default Settings 4: Keyboard Communication Settings—Wedge**

Parameter	“SU” and “UB” Default Setting
Transmit Enter key output as a suffix	Enable
Transmit Tab key output as a suffix	Disable
Transmit Arrow right key output as a suffix	Disable
Delay after transmission	6 ms
Scan code	Scan code set 2 (keyboard)
Select keyboard	US keyboard emulation

**11.6. Default Settings 5: Keyboard Communication Settings—USB-HID, USB-VCP**

Parameter	“SU”/“C01” Default Setting
Scanner power: Max power descriptor	500 mA
Keyboard (*1)	US keyboard
Vender ID	0x65a (OPTOELECTRONICS)
Transmit Enter key output as a suffix (*1)	Enable
Transmit Tab key output as a suffix (*1)	Disable
Transmit Arrow right key output as a suffix ( *1 )	Disable

(\*1): Settings are valid when using USB-HID interface.



## 12. Serial Number and Labeling

The serial number shown below is affixed to the scanner.

Additional labels on both sides of the scanner show compliance with the standards of Japan, Europe, and America.

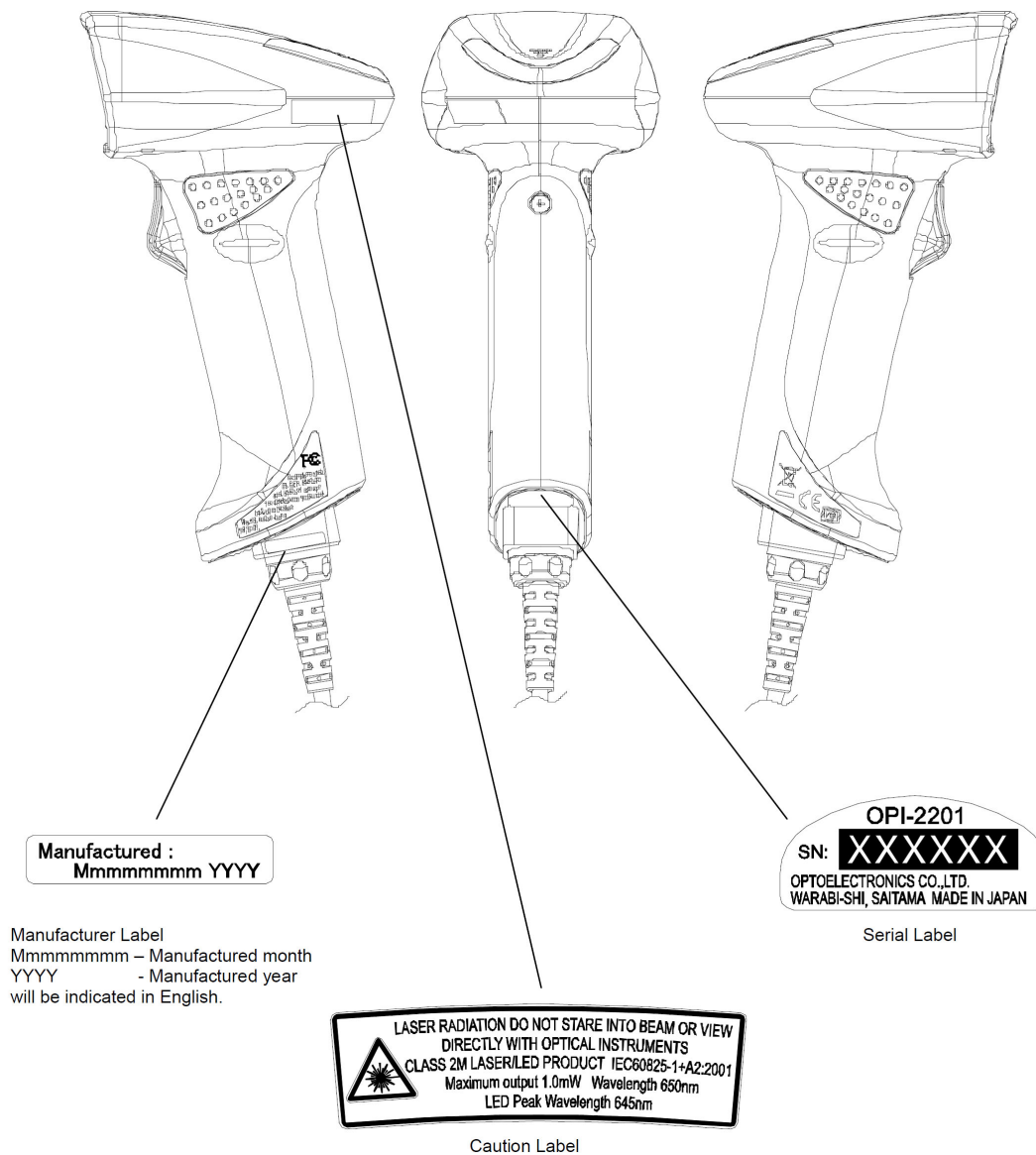


Figure 27: Serial number diagram

### 13. Packaging Specifications

#### 13.1. Individual Packaging Specification

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

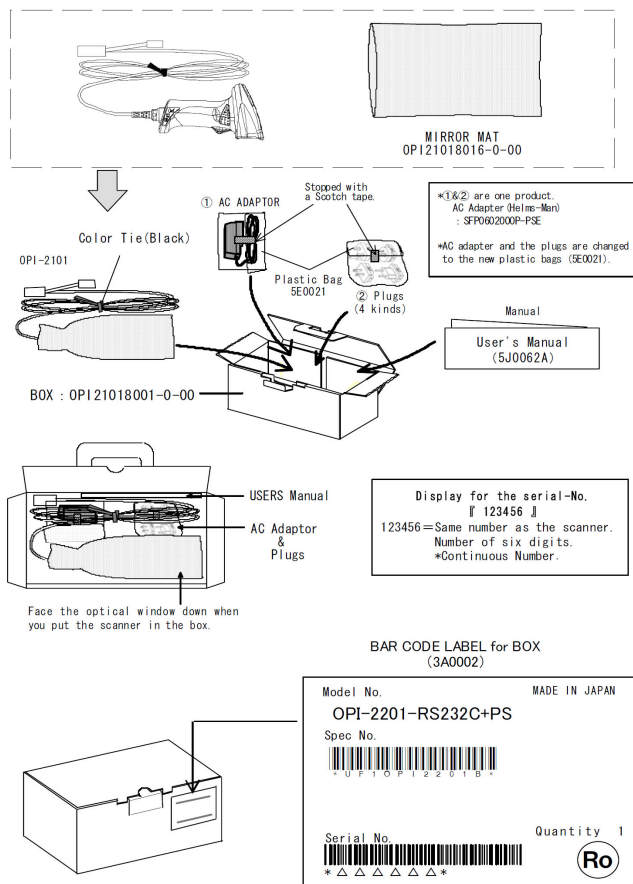


Figure 28: Individual packaging

#### 13.2. Accessory Specifications

The following table shows a list of accessories for each model.

Model	AC Adaptor (SFP0602000P-PSE)	Wedge Branch Cable
OPI 2201-LD RS-232C	Yes	N/A
OPI 2201-LD USB	N/A	N/A
OPI 2201-LD Wedge	Yes	Yes

Four types of conversion plugs are included with the AC adapter.

### 13.3. Collective Packaging Specification

The following figure shows an example of collective packaging for the OPI 2201 RS-232C model.

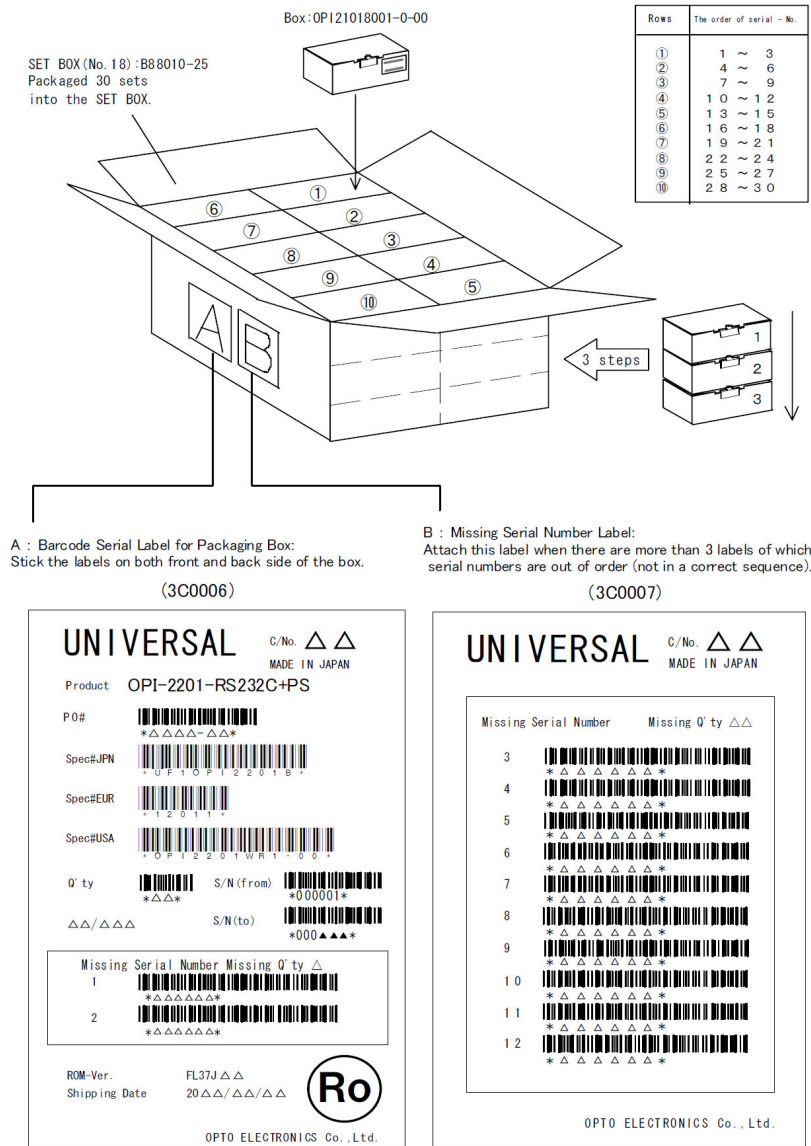


Figure 29: Collective packaging

**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.

## 14. Durability

### 14.1. Electrical Noise

No malfunction occurred when sinusoidal electrical noise (50 Hz–100 kHz, < 0.1 Vp-p) was added to the power supply line.

Withstand voltage: AC 1500 V/ per 60 seconds, 10mA 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: ± 1kV or lower

### 14.2. Static Electricity

Air discharge:	±8 kV max. (No malfunction) ±15 kV max. (No destruction)
Contact discharge:	±6 kV max. (No malfunction) ±15 kV max. (No destruction)
Measurement environment:	Use electrostatic testing device compliant with IEC 61000-4-2
Discharge resistance:	330 Ω
Capacitor charging:	150 pF

### 14.3. Shock

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

No malfunction occurred after the following drop test.

Drop Test: Drop the scanner for 5 cycles from a height of 150 cm onto a concrete floor. (One cycle = five sides—left, right, front, back, and top.)

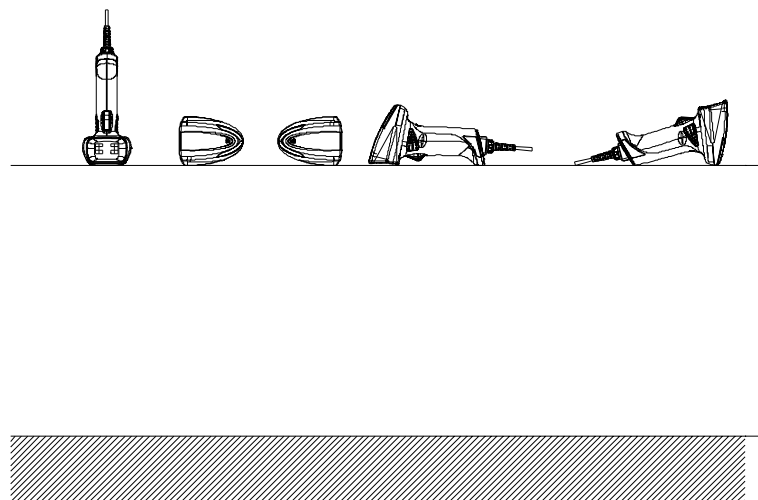


Figure 30: Drop test

**14.3.2. Drop Test (with individual packaging)**

No malfunction occurred after the following drop test.

Drop Test: Drop an individually packaged scanner from a height of 150 cm onto a concrete floor once on its 1 corner, 3 edges, and 6 sides (10 total drop tests).

**14.4. Vibration Strength**

No malfunction occurred after the following vibration test.

Vibration test: Increase the frequency of the vibration from 12 Hz to 100 Hz with accelerated velocity  $19.6 \text{ m/s}^2$  (2 G) for 60 minutes in non-operating state. Repeat this routine in each X, Y, Z direction once for 60 minutes each (180 minutes total).

**14.5. Dust and Drip Proof**

IEC IP42 equivalent

**Dust Prevention**

Level	Details
4	Protected against solid objects greater than 1.0mm

**Water Prevention**

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

**14.6. Cable Strength**

No malfunction occurred after the following cable strength test.

Affix the scanner to an immovable object, then pull it using a force of 2.5 kgf (static loading) for 1 second. Carry out this test 20 times.

**14.7. Cable Bending Test**

No malfunction occurred after the following cable bending test.

Add a load of 4.9 N (500 gf) to a cable, then bend it at an angle of  $90^\circ$  to both right and left. Repeat this bending test for 1 million times on the tail of the cable.

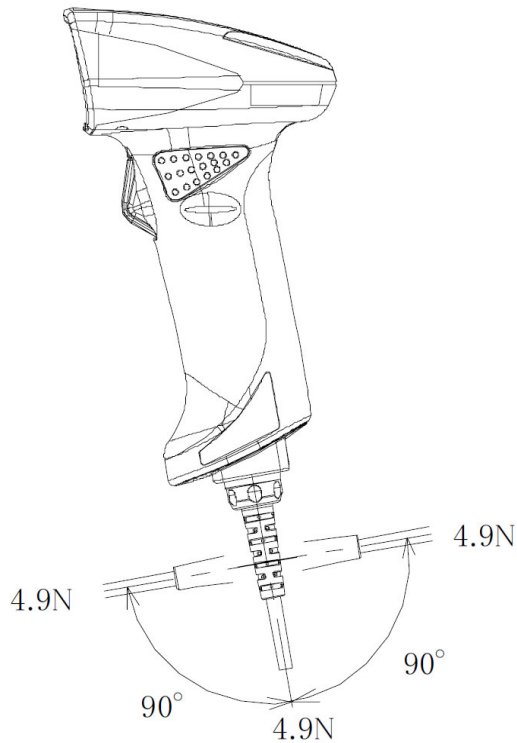


Figure 31: Cable strength

## 15. Reliability

MTBF (Mean Time Between Failures) of this product except for the laser diode, the CMOS sensor, and the liquid lens, is 40,000 hours.

Life cycle of the laser diode, the CMOS sensor, and the liquid lens 10,000 hours (each).

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

## 16. Trigger and Read Options

The OPI 2201 has read and trigger settings as follows:

### 16.1. Trigger Modes

Disabled: When this option is selected, the reader will stay on all the time.

Enabled: After receiving a trigger signal, the barcode reader will turn on and the read cycle starts. The reader will stay on for a time as set in 'Read time options'. The trigger signal can be initiated in the following ways:

Manual mode: When the trigger key is pressed, the read cycle starts.

Auto trigger mode: The read cycle automatically starts when a trigger signal is received via sensor detection.

### 16.2. Read Modes

Single read mode: When a symbol has been decoded, the reader will be turned off. The reader must be triggered again to read another symbol. This option and 'Disable trigger' cannot be programmed at the same time.

Multiple read mode: When a symbol has been decoded, the reader will stay on for a time (set by 'Read time options') or indefinitely, if the trigger switch has been disabled. The same symbol can only be decoded again after the symbol has not been detected for a set number of scans (multiple read reset time).

Continuous read mode: The reader will produce as much data as it can decode even if it is reading the same symbol. This mode is mainly used for demonstration and diagnosis.

## 16.3. Auto Trigger Options

### 16.3.1. Auto Trigger Overview

To capture a barcode, the scanner uses ambient light to detect differences in contrast between the light and dark areas of a barcode.

If the scanner is in auto trigger mode and it detects differences in movement, it begins scanning. Different time values can be specified to control how sensitive the scanning operation is to movement.

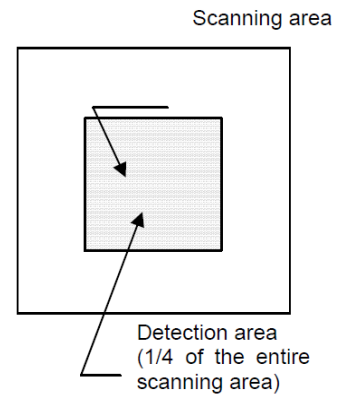


Figure 32: Auto trigger detection area

### Conditions

Auto trigger is enabled when inserting a silver gray-colored paper on a black backing paper. Trigger is also enabled when inserting a black-colored paper on a silver-gray backing paper.

Paper used for the test:	Black paper from Glory (Black 010010016) Gray paper from Glory (Silver-gray 010010016)
Size of backing paper:	Larger than the scanning area
Size of detected paper:	Larger than the detection area
Moving speed:	105 mm/s or slower
Ambient temperature and humidity:	Room temperature and humidity
Ambient illuminance:	300 lx or higher

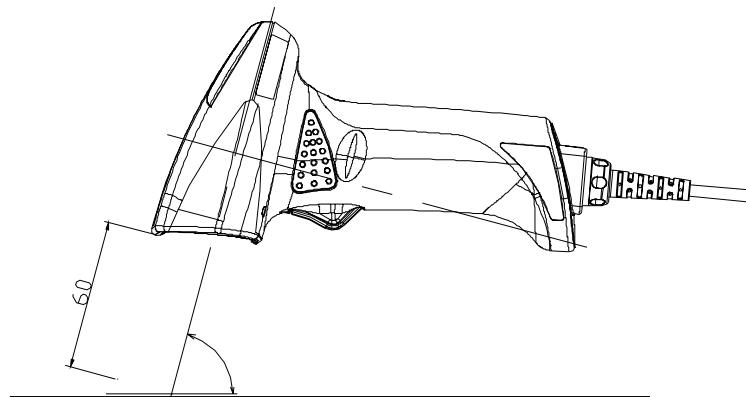


Figure 33: Auto trigger specifications



#### 16.4. Image Capture Options

Image capture mode is used to obtain a clear image from the scanned barcode by adjusting the brightness. The brightness is adjusted by changing the gamma configuration.

When the camera is set to image capture mode, it adjusts the focus automatically when capturing images. Aim the laser beam at the object to allow the auto focus time to work. Some materials, such as black cloth, may not reflect enough light for the auto focus to work properly. In such cases, aim the scanner's laser beam at a place near the object.

##### **Note**

In capture mode, the scanner's image adjustment is optimized for images, making it inappropriate for normal barcode scanning.

When scanning a low-resolution barcode from a distance, the scanner may start scanning when you don't want it to, as it can be affected by the surrounding and ambient lights, rather than by the brightness of the barcode (brightness of detecting field).











## 17. Trigger and Read Settings

### 17.1. Read Time Settings

#### 17.1.1. Read Time

This option allow you to configure the time period that the reader is ON after the trigger switch is pressed or after auto trigger mode is enabled.






To configure the read time, scan “ZZ”, “Yn”, and “ZZ”.

Functions	Menu labels	Menu codes
SET		ZZ
Indefinitely		Y0
1 second		Y1
2 seconds (default)		Y2
3 seconds		Y3
4 seconds		Y4
6 seconds		Y5
8 seconds		Y6
10 seconds		Y7
END		ZZ

**17.1.2. Multiple Read Reset Time**

This option allows you to configure the number of frames during which the scanner must be pointed away from the label before it can decode the same label again.

To configure the multiple read reset time, scan “ZZ”, “Ax”, and “ZZ”.

Functions	Delay	Menu labels	Menu codes
SET			ZZ
Multiple read reset time	1 frame		AH
	2 frames		AI
	3 frames		AJ
	4 frames		AK
	5 frames		AL
	6 frames (default)		AM
	7 frames		AN
END			ZZ

## 17.2. Auto Trigger Settings

### 17.2.1. Enable/Disable Settings





Use the following settings to enable or disable the auto trigger. (Auto trigger is disabled by default).

To enable auto trigger



scan “ZZ”, “+I” and “ZZ” in that order or use the 2D code setting.

To disable auto trigger

scan “ZZ”, “+F” and “ZZ” in that order or use the 2D code setting.

Functions	Menu labels	Menu codes
SET		ZZ
Disable auto trigger		+F
Enable auto trigger		+I
END		ZZ

### 2D Code Settings:

Functions	Menu labels
Disable auto trigger	
Enable auto trigger	

### 17.2.2. Auto Trigger Sensitivity Settings

This option allows you to configure the threshold level of the scanner to detect the dark pixels and light pixels.

**Note:** Please confirm the background and the operating environments (ambient light, etc) of the barcode when carrying out the following configuration.

To configure auto trigger sensitivity options, scan “ZZ”, “Mx”, and “ZZ”.

Functions	Menu labels	Menu codes
SET		ZZ
High		MF
Normal (default setting)		MH
Low		MJ
END		ZZ

### 17.3. Setting Image Capture Mode

Use the following settings to change the image capture mode. (Code reader mode is enabled by default).

To set the scanner to image capture mode,


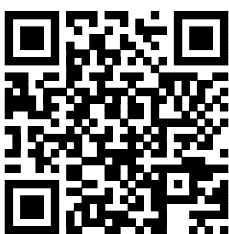
scan "ZZ", "D7I", "D7M", and "ZZ" in that order or use the 2D code setting.

To set the scanner to code reader mode,

scan "ZZ", "D37", "D7J", and "ZZ" in that order or use the 2D code setting.

Functions	Menu labels	Menu codes
SET		ZZ
Image capture mode		+F
Code reader mode		+I
END		ZZ

#### 2D Code Settings:

Functions	Menu labels
Image capture mode	
Code reader mode	













**Note:** To adjust the brightness of the captured image refer to the following gamma configuration settings.

**17.3.1. Configuring Gamma Values**

Gamma ( $\gamma$ ) adjusted values can be set from 1.0 (OFF) to 1.9. The higher the value, the brighter the captured image.

In the imager capture mode,  $\gamma = 1.3$  is the default gamma setting.

To change the gamma configuration, scan “ZZ”, “D7x”, and “ZZ” in that order.

Functions	Value	Menu labels	Menu codes
SET			ZZ
	$\gamma=1.0$ (Off)		D7J
	$\gamma=1.1$		D7K
	$\gamma=1.2$		D7L
	$\gamma=1.3$ (Default)		D7M
	$\gamma=1.4$		D7N
	$\gamma=1.5$		D7O
	$\gamma=1.6$		D7P
	$\gamma=1.7$		D7Q
	$\gamma=1.8$		D7R
	$\gamma=1.9$		D7S
SET			ZZ

## 18. Regulatory Compliance

### 18.1. Laser / LED Safety

The OPI 2201 is considered as a class 2M laser/LED product.

#### 18.1.1. Laser / LED 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.

#### 18.1.2. LED Safety

All LED-based products are LED class 1M and are safe under reasonably foreseeable operating conditions. Do not stare into the beam.

JIS C6802: 2005: Class 1M

IEC 60825-1+A2: 2001 Class 1M

### 18.2. 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.

### 18.3. RoHS

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



## 19. Safety

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

### 19.1. Shock

Do not throw or drop the scanner.

Do not place heavy objects on the cables.

### 19.2. Temperature Conditions

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

Do not pour boiling water on the scanner.

Do not throw the scanner into the fire.

Do not forcibly bend the cables at low temperatures.

### 19.3. Foreign Materials

Do not immerse the scanner in liquids.

Do not subject the scanner to chemicals.

### 19.4. Other

Please note that laser light is emitted when capturing an image. Make sure there is no one around the object that you are about to capture the image of. Do not take a picture of a human.

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 scanner may cause reception problems.

The scanner may be damaged by voltage drops.

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

Opticon shall not be held responsible for any damages caused by using an AC adapter not provided by Opticon.

## 20. Mechanical Drawing

Unit: mm

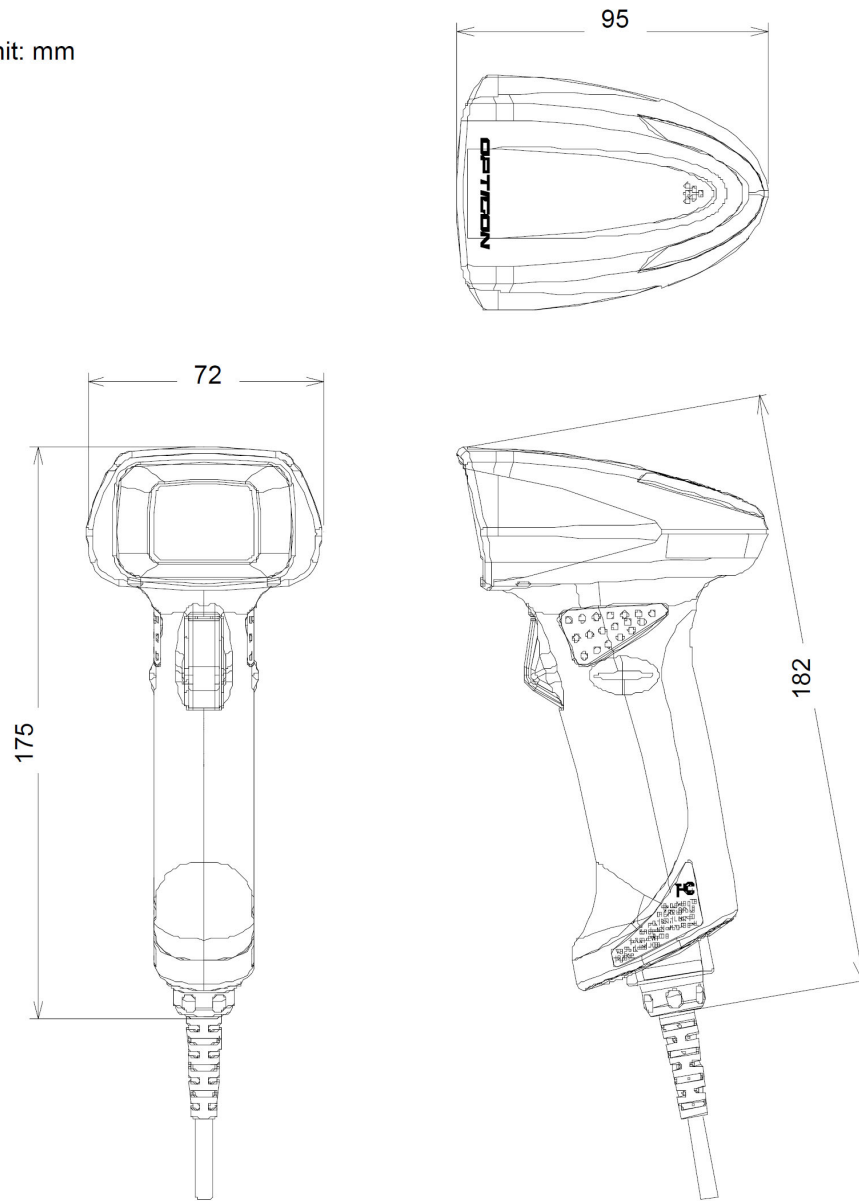


Figure 34: Mechanical drawing

## 21. Detailed View of the AC Adapter

SFP0602000P-PSE

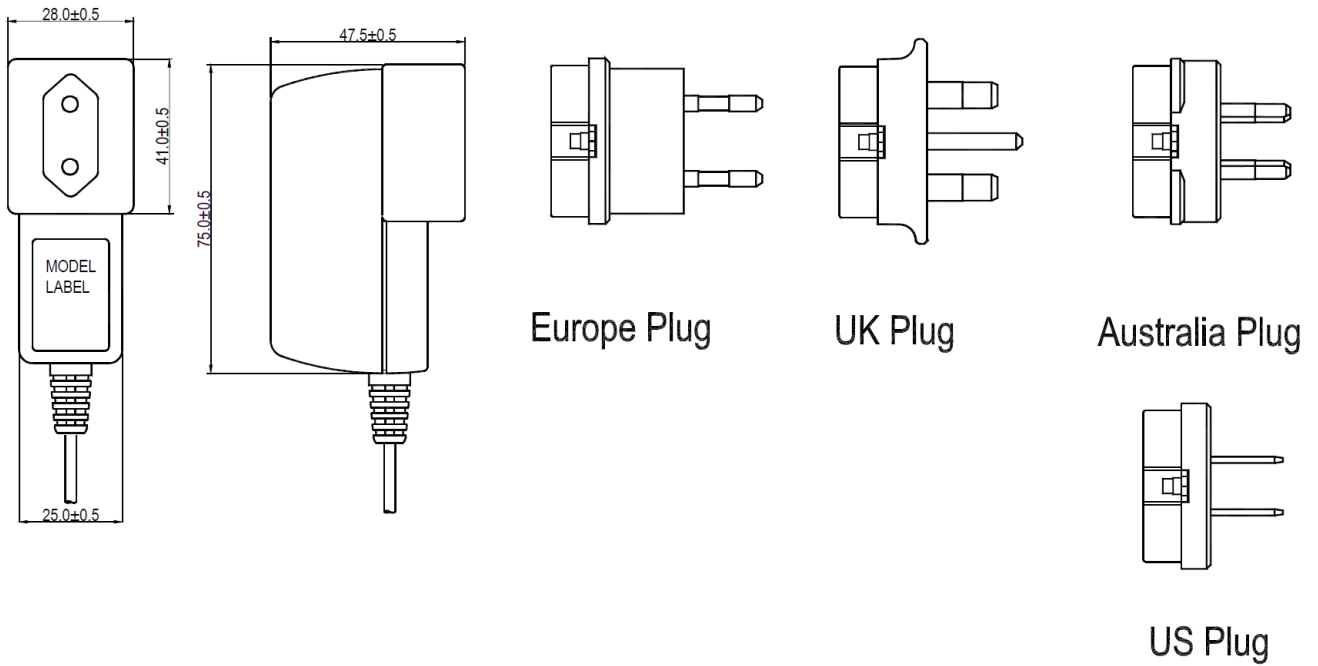


Figure 35: AC adapter (for input side)

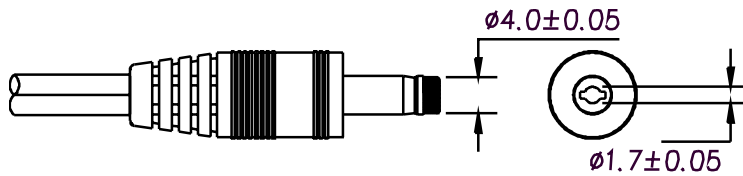


Figure 36: AC adapter (for output side: DC jack)

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