

NLV 2001

**Fixed-position Laser
Barcode Scanner**

OPTICON

Specifications Manual



All information subject to change without notice.

Document History

| | | | |
|----------------------|------------|------------------------------|---------|
| Model Number: | NLV 2001 | Specification Number: | SS07077 |
| Edition: | 2 | Original Spec Number: | SS06124 |
| Date: | 2007-08-01 | | |

Copyright 2007 Opticon. All rights reserved.

This manual may not, in whole or in part, be copied, photocopied, reproduced, translated or converted to any electronic or machine readable form without prior written consent of Opticon.

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

Trademarks used are the property of their respective owners.

Opticon Inc. and Opticon Sensors Europe B.V. are wholly owned subsidiaries of OPTOELECTRONICS Co., Ltd., 5-3, Tsukagoshi 5-chome, Warabi-shi, Saitama, Japan 335-0002. TEL +81-(0) 48-446-1183; FAX +81-(0) 48-446-1180

SUPPORT

USA

Phone: 800-636-0090

Email: support@opticonusa.com

Web: www.opticonusa.com

Europe

Email: support@opticon.com

Web: www.opticon.com

Contents

- 1. Abstract..... 7**
- 2. Overview 7**
- 3. Physical Features..... 8**
 - 3.1. Dimensions 8
 - 3.2. Weight..... 8
- 4. Environmental Specifications 8**
 - 4.1. Operating Temperature and Humidity..... 8
 - 4.2. Storage Temperature and Humidity 8
 - 4.3. Ambient Light Immunity 8
- 5. Electrical Specifications 9**
 - 5.1. Absolute Maximum Ratings 9
 - 5.2. Recommended Operating Conditions..... 9
 - 5.3. Electrical Characteristics..... 9
- 6. Optical Specifications..... 10**
 - 6.1. Imager Scanning..... 10
- 7. Technical Specifications 11**
 - 7.1. Print Contrast Signal (PCS) 11
 - 7.2. Scan Area and Resolution 12
 - 7.2.1. Depth of Field..... 13
 - 7.3. Pitch, Skew, and Tilt 14
 - 7.3.1. Pitch Angle 14
 - 7.3.2. Skew Angle and Dead Zone 15
 - 7.3.3. Tilt Angle 15
 - 7.4. Curvature 16
- 8. Interface Specifications 17**
 - 8.1. RS-232C Interface Spec..... 17
 - 8.1.1. Settings and Communication 17
 - 8.1.2. Signal Level..... 17
 - 8.1.3. Interface Circuit..... 18
 - 8.1.4. Character Format..... 18
 - 8.1.5. Communication Format..... 18
 - 8.1.6. Handshaking 19
 - 8.2. USB Interface Specifications 23

| | |
|--|-----------|
| 8.2.1. Settings | 24 |
| 8.2.2. Interface Circuit..... | 24 |
| 8.3. DOS/V Wedge Interface Specification | 24 |
| 9. Cables and Connectors | 25 |
| 9.1. RS-232C Cable..... | 25 |
| 9.1.1. Standard Specification | 25 |
| 9.1.2. DB9 Connector | 25 |
| 9.1.3. Pin Assignment | 26 |
| 9.2. USB Cable | 27 |
| 9.2.1. Standard Specification | 27 |
| 9.2.2. Connector..... | 27 |
| 9.2.3. Pin Assignment | 27 |
| 9.3. Wedge Cable | 28 |
| 9.3.1. Standard Specification | 28 |
| 9.3.2. Wedge Connector | 28 |
| 9.3.3. Pin Assignment..... | 29 |
| 9.4. Connector Specification (Scanner Side)..... | 29 |
| 10. Default Settings | 29 |
| 10.1. Set Default Interface | 29 |
| 10.2. Default Settings 1: Readable Codes..... | 31 |
| 10.3. Default Settings 2: Read Options, Trigger, Buzzer | 33 |
| 10.4. Default Settings 3A: Serial Communication Settings—RS-232C, USB-VCP..... | 34 |
| 11. Serial Number | 35 |
| 12. Packaging Specifications | 36 |
| 12.1. Individual Packaging Specification..... | 36 |
| 12.2. Collective Packaging Specification | 36 |
| 13. Durability | 37 |
| 13.1. Electrical Noise | 37 |
| 13.2. Static Electricity | 37 |
| 13.3. Shock: Drop Test | 37 |
| 13.4. Vibration Strength | 37 |
| 13.5. Dust and Drip Proof | 37 |
| 13.6. Cable Bending | 37 |
| 14. Reliability | 38 |

| | |
|---|-----------|
| 15. Trigger and Read Options | 39 |
| 15.1. Auto Trigger Sensor..... | 39 |
| 15.2. Auto Trigger Settings | 40 |
| 15.2.1. Enable/Disable Settings..... | 40 |
| 16. Regulatory Compliance | 41 |
| 16.1. Laser Safety..... | 41 |
| 16.2. Product Safety | 41 |
| 16.3. EMC..... | 41 |
| 16.4. RoHS | 41 |
| 17. Safety | 42 |
| 17.1. Shock..... | 42 |
| 17.2. Temperature Conditions | 42 |
| 17.3. Foreign Materials | 42 |
| 17.4. Other..... | 42 |
| 18. Mechanical Drawing..... | 43 |

Table of Figures

| | |
|---|----|
| Figure 1: Depth of field and resolution (NLV 2001 I-Type)..... | 12 |
| Figure 2: Pitch (NLV 2001 I-Type) | 14 |
| Figure 3: Skew angle and dead zone (NLV 2001 I-Type)..... | 15 |
| Figure 4: Tilt angle (NLV 2100 I-Type)..... | 15 |
| Figure 5: Curvature (NLV 2001 I-Type)..... | 16 |
| Figure 6: Interface circuit..... | 18 |
| Figure 7:Character format (same for both sending and receiving) | 18 |
| Figure 8: Communication format | 18 |
| Figure 9: No handshaking | 19 |
| Figure 10: Busy/Ready communication | 20 |
| Figure 11: Cannot receive command..... | 20 |
| Figure 12: Signal timing..... | 21 |
| Figure 13: Modem transmit data..... | 21 |
| Figure 14: ACK/NAK..... | 22 |
| Figure 15: ACK/NAK—No response | 23 |
| Figure 16: Interface circuit | 24 |
| Figure 17: RS-232C — cable 1 | 25 |
| Figure 18: DB9 connector..... | 25 |
| Figure 19: USB cable | 27 |
| Figure 20: USB "A" connector | 27 |
| Figure 21: Wedge cable..... | 28 |
| Figure 22: Wedge connector | 28 |
| Figure 23: Serial number diagram | 35 |

Figure 24: Collective packaging..... 36
Figure 25: Auto trigger option (NLV 2001 I-Type) 39
Figure 26: Mechanical drawing (NLV 2001 I-Type)..... 43

1. Abstract

This manual provides specifications for the NLV 2001 fixed-position laser barcode scanner.

2. Overview

The NLV 2001 is a fixed-position laser barcode scanner.

- The scannable width at the minimum scan distance is 44 millimeters and the scan angle is 44° degrees.
- A short-wavelength red laser improves the visibility of the scan line.
- The NLV 2001 outputs scanned and decoded data via RS-232C, USB, or Wedge interfaces.
- The NLV 2001 complies with RoHS.

Supported symbologies:

Linear (1D)

JAN/UPC/EAN (WPC), incl. add-on
Chinese Post
Codabar/NW-7
Code 11
Code 39
Code 93
Code 128: EAN-128
IATA
Industrial 2of5
Interleaved 2of5
Matrix 2of5
MSI/Plessey–UK/Plessey
RSS; RSS-14/RSS-Limited/ RSS-Expanded
S-Code
Telepen
Tri-Optic

2D

MicroPDF417
PDF417

3. Physical Features

3.1. Dimensions

W 46.0 x D 58.0 x H 24.5 mm

3.2. Weight

120 g (max.) excluding the cable

4. Environmental Specifications

4.1. Operating Temperature and Humidity

Temperature: -10 to 45° C

Humidity: 20 to 85% RH

4.2. Storage Temperature and Humidity

Temperature: -20 to 60° C

Humidity: 20 to 90% 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 | 50,000 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: | 100 mm |
| Angle (see note below): | $\alpha = 0^\circ \beta = 15^\circ \gamma = 0^\circ$ |
| Curvature: | $R = \infty$ |
| Power Supply Voltage: | 5.0 V |

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

Note: α , β and γ respectively represent pitch, skew and tilt. Please see section 7.3 for how these values are defined.

5. Electrical Specifications

5.1. Absolute Maximum Ratings

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

5.2. Recommended Operating Conditions

| Item | Symbol | Min | Typ | Max | Unit | Conditions |
|-----------------------|-----------|-----|-----|----------|------|---------------|
| Power supply voltage | V_{DD} | 4.5 | 5.0 | 5.5 | V | |
| Operating temperature | T_a | -10 | – | 45 | °C | No condensing |
| Input voltage | V_{in} | 0 | – | V_{DD} | V | |
| Output voltage | V_{out} | 0 | – | V_{DD} | V | |

5.3. Electrical Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit |
|-------------------|------------|-----|-----|------|------|
| Operating current | I_{OP} | – | 85 | 150 | mA |
| Rush current peak | I_{PEAK} | – | 400 | 1500 | mA |
| Stand-by current | I_{PRE} | – | 35 | 70 | mA |
| Startup time | T_D | – | 100 | – | ms |

Conditions

- 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. Optical Specifications

6.1. Imager Scanning

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

7. Technical Specifications

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

Conditions

| | |
|----------------------------------|---|
| Ambient temperature and humidity | 21° C/70° F, 60% RH |
| Ambient light | 500 to 900 lx |
| Background | Barcode = black Space = white Margin = white Background of label = black |
| Power supply voltage | 5.0 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.) |

7.1. Print Contrast Signal (PCS)

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

7.2. Scan Area and Resolution

The depth of field is measured from the front edge of the scanner.

The scan area is a circular area centered around the beam, which appears at various resolutions.

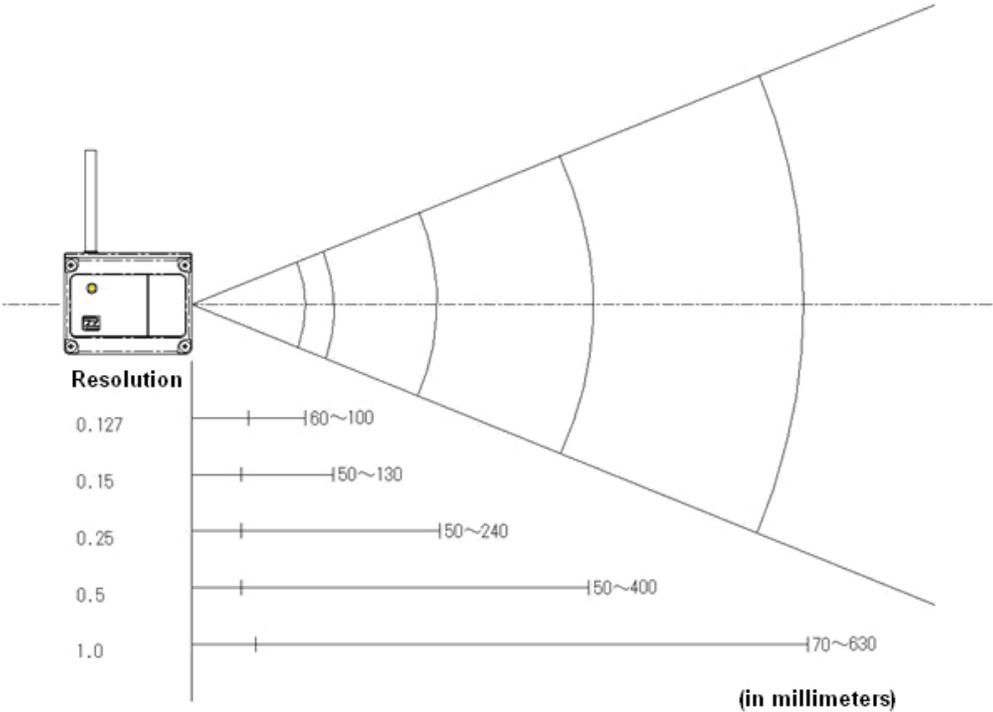


Figure 1: Depth of field and resolution (NLV 2001 I-Type)

7.2.1. Depth of Field

| PCS | Resolution (mm) | Decode Depth (mm) |
|-----|-----------------|-------------------|
| 0.9 | 1.0 | 70–630 |
| | 0.5 | 50–400 |
| | 0.25 | 50–240 |
| | 0.15 | 50–130 |
| | 0.127 | 60–100 |

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 |

7.3. Pitch, Skew, and Tilt

7.3.1. Pitch Angle

$\alpha \leq \pm 35^\circ$

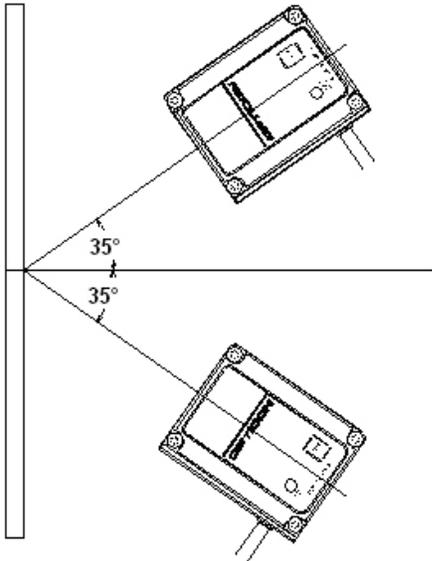


Figure 2: Pitch (NLV 2001 I-Type)

7.3.2. Skew Angle and Dead Zone

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

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

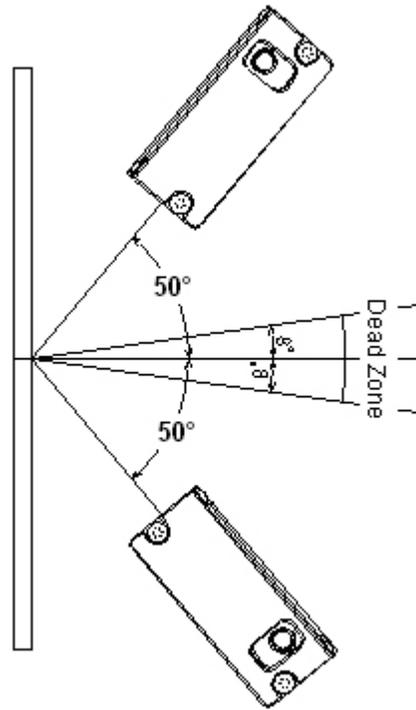


Figure 3: Skew angle and dead zone (NLV 2001 I-Type)

7.3.3. Tilt Angle

$\gamma \leq \pm 20^\circ$

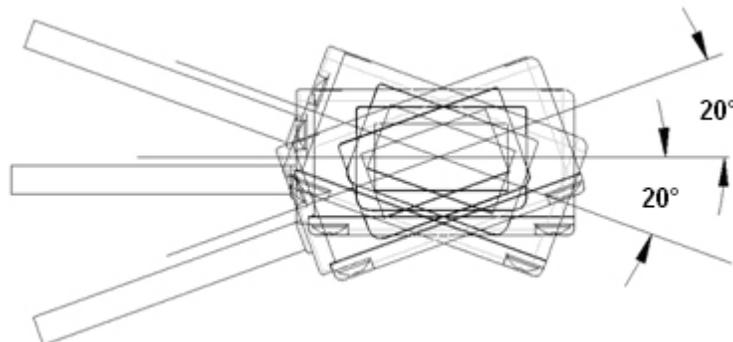


Figure 4: Tilt angle (NLV 2100 I-Type)

Conditions

Barcode Sample: OPTOELECTRONICS Test Sample

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

7.4. 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 (NLV 2001 I-Type)

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 scanner |
| Angle | Skew Angle $\beta = +15^\circ$ |

8. Interface Specifications

8.1. RS-232C Interface Spec

8.1.1. Settings and Communication

Reading the menu barcodes in section 10.1 can set the RS-232C interface default.

| Item | [U2] setting |
|-----------------------|--------------|
| Baud rate | 9600 bps |
| Start/stop bits | 1 bit |
| Data bits | 8 bits |
| Parity bits | No parity |
| Handshaking | No handshake |
| Flow control time out | Indefinitely |

You can change the communication condition using the menu barcode.

8.1.2. Signal Level

| Signal Name | I/O | RS-232C Level (V) | |
|-------------|-----|-------------------|-----------|
| | | Bars/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 |

8.1.3. Interface Circuit

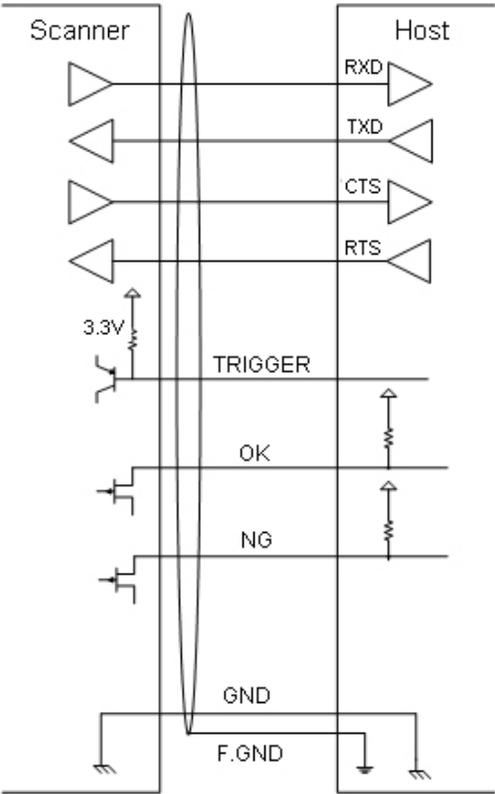


Figure 6: Interface circuit

8.1.4. Character Format

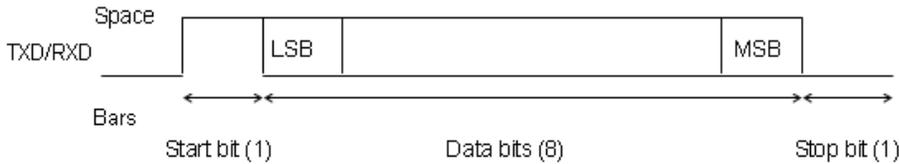


Figure 7: Character format (same for both sending and receiving)

8.1.5. Communication Format

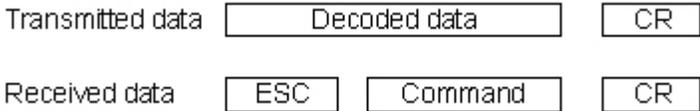


Figure 8: Communication format

8.1.6. 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.

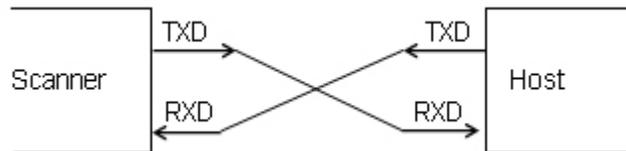


Figure 9: No handshaking

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.

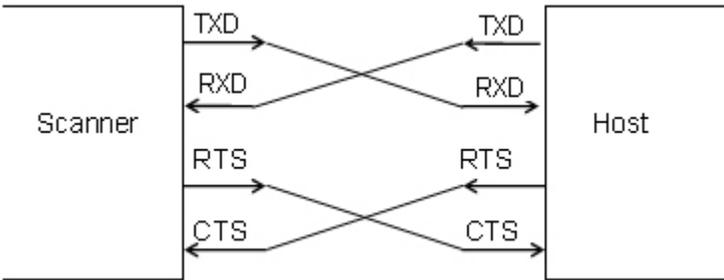


Figure 10: Busy/Ready communication

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 |

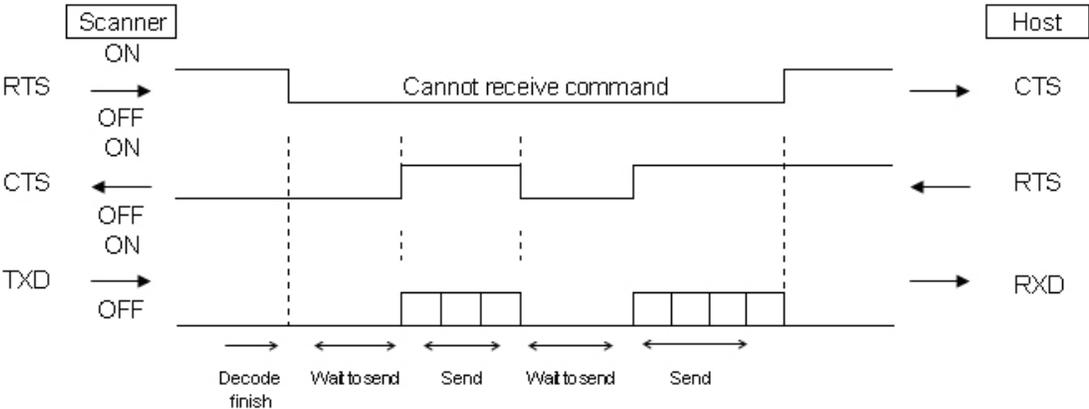


Figure 11: Cannot receive command

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.

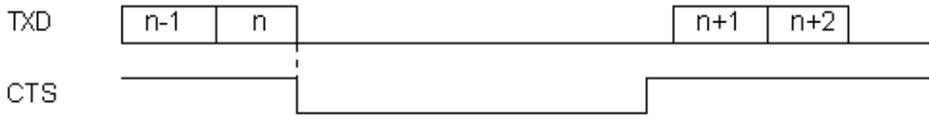


Figure 12: Signal timing

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 CTS line ON before transmitting data. Other processes are the same as BUSY/READY.

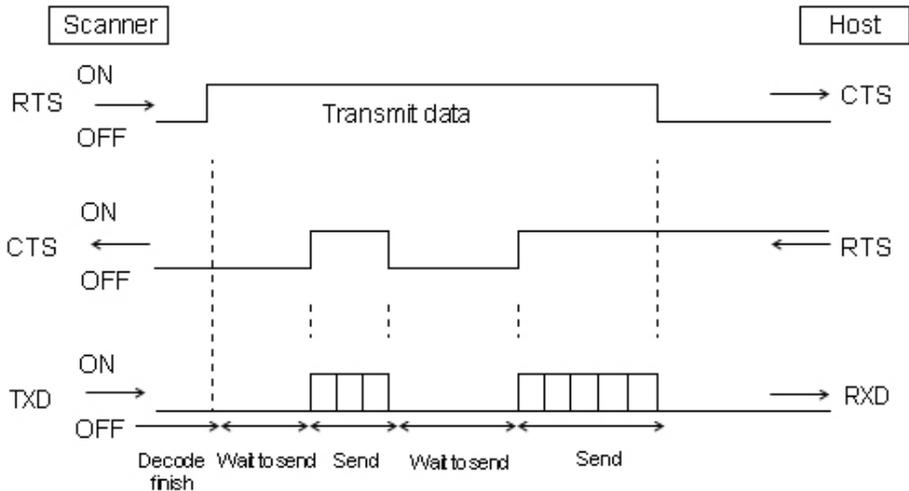


Figure 13: Modem transmit data

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.

ACK/NAK timeout can be set as follows using the menu or commands.

| ACK/NAK timeout | Menu / Command |
|------------------------|----------------|
| Indefinitely (default) | X14 |
| 100 ms | X15 |
| 500 ms | X16 |
| 1000 ms | X17 |

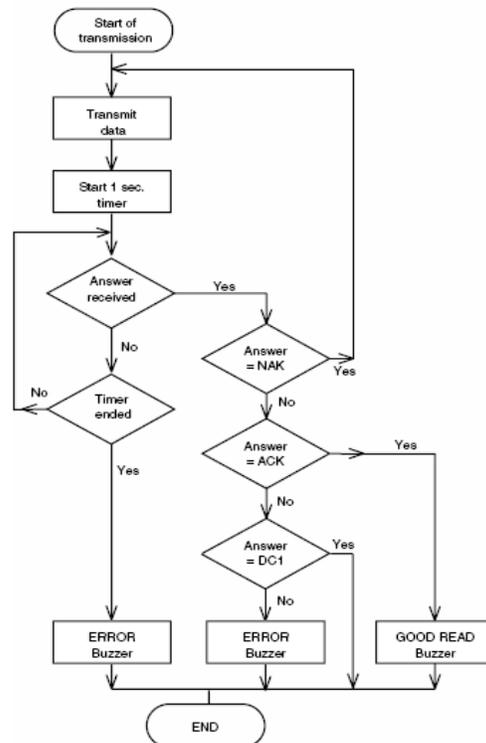


Figure 14: ACK/NAK

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.

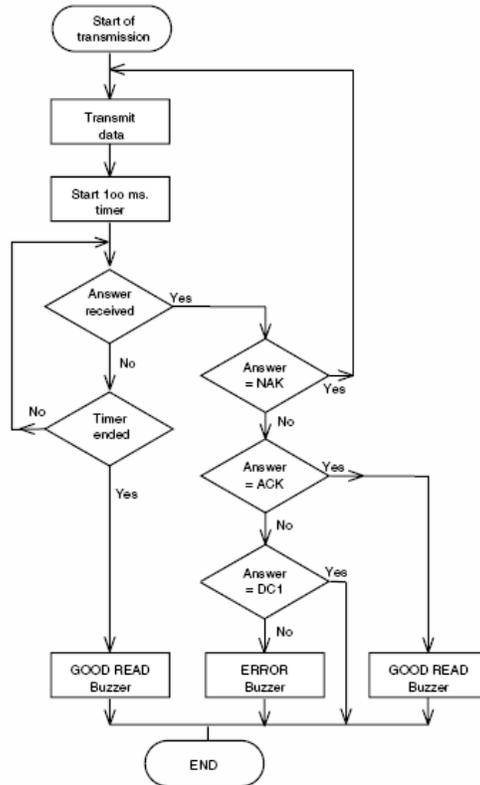


Figure 15: ACK/NAK—No response

8.2. USB Interface Specifications

The interface is full-speed USB version 1.1.

Set the language for the scanner and PC keyboard to the same language before use; otherwise, the output may not be correct.

Using the keyboard while the scanner is transmitting the data to the host may cause failure in data transactions.

8.2.1. Settings

Reading the menu barcodes in section 10.1 can set the USB interface default.

8.2.2. Interface Circuit

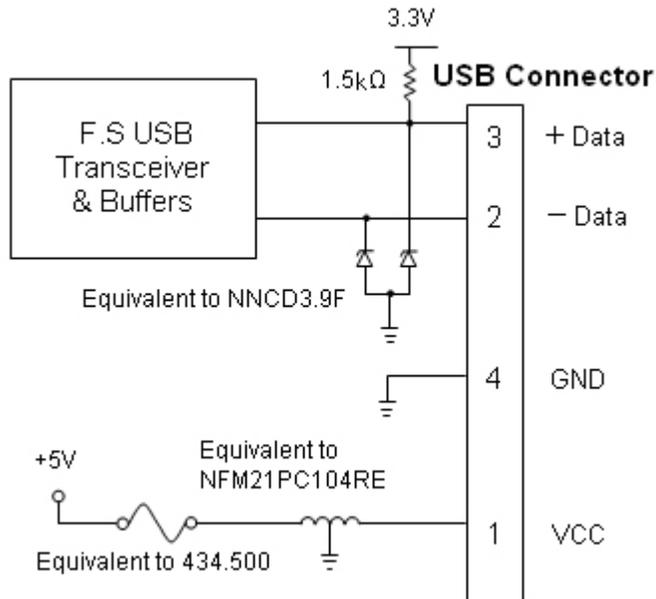


Figure 16: Interface circuit

8.3. DOS/V Wedge Interface Specification

Reading the menu barcodes in section 10.1 can set the DOS/V Wedge interface default.

Set the language for the scanner and PC keyboard to the same language before use; otherwise, the output may not be correct.

Using the keyboard while the scanner is transmitting the data to the host may cause failure in data transactions.

9. Cables and Connectors

9.1. RS-232C Cable

9.1.1. Standard Specification



Figure 17: RS-232C — cable 1

| | |
|-----------|--------------------------------------|
| Type: | Straight |
| Diameter: | $\phi 3.8 \pm 0.5$ mm |
| Length: | 1500 \pm 50 mm or 500 \pm 50 mm |
| Cores: | 8 insulated wires, 1 conductive wire |
| Weight: | Approximately 45 g |

9.1.2. DB9 Connector

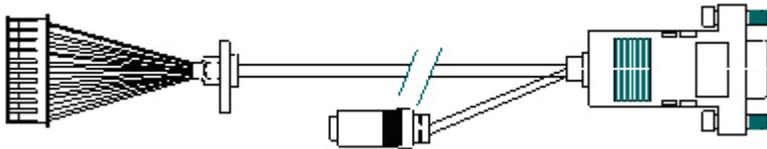


Figure 18: DB9 connector

| | |
|-----------|--------------------------------------|
| Type: | Straight |
| Diameter: | $\phi 3.8 \pm 0.5$ mm |
| Length: | 1500 \pm 50 mm or 500 \pm 50 mm |
| Cores: | 8 insulated wires, 1 conductive wire |
| Weight: | Approximately 65 g |

9.1.3. Pin Assignment

a) Standard Specification

| Wire Color | Signal | Remarks |
|----------------|---------|--|
| Shield (Black) | F.GND | Cover the shield wire with the heat shrink tube. |
| Black | GND | |
| Red | VCC | |
| Green | TxD | |
| White | RxD | |
| Grey | RTS | |
| Blue | CTS | |
| Orange | NG | |
| Yellow | OK | |
| Brown | TRIGGER | |

b) D-sub Specification

| Pin | Signal | Remarks |
|-----|--------|--|
| 1 | F.GND | Cover the shield wire with the heat shrink tube. |
| 2 | TXD | |
| 3 | RXD | |
| 4 | NC | Connected to pin 6 with jumper cable. |
| 5 | GND | |
| 6 | NC | Connected to pin 4 with jumper cable. |
| 7 | CTS | |
| 8 | RTS | |
| 9 | NC | |

c) DC Jack Specification

| Pin | Signal | Remarks |
|-----|--------|---------|
| 1 | VCC | Inside |
| 2 | GND | Outside |

9.2. USB Cable

9.2.1. Standard Specification



Figure 19: USB cable

| | |
|-----------|--------------------------------------|
| Type: | Straight |
| Diameter: | $\phi 3.8 \pm 0.5$ mm |
| Length: | 1500 \pm 50 mm |
| Cores: | 4 insulated wires, 1 conductive wire |
| Weight: | Approximately 50 g |

9.2.2. Connector

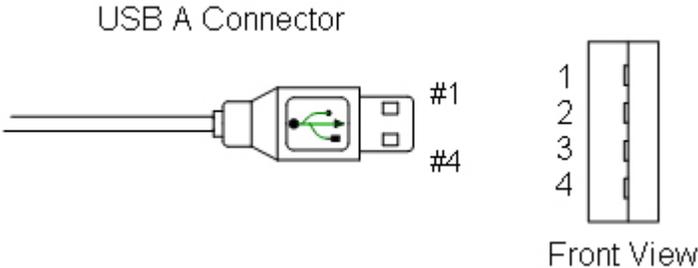


Figure 20: USB "A" connector

9.2.3. Pin Assignment

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

9.3. Wedge Cable

9.3.1. Standard Specification

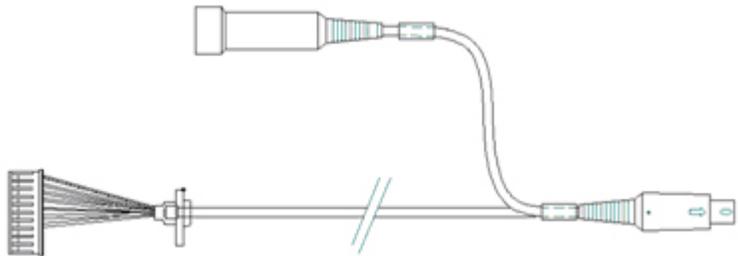


Figure 21: Wedge cable

| | |
|-----------|--------------------------------------|
| Type: | Y cable |
| Diameter: | $\phi 3.8 \pm 0.5$ mm |
| Length: | 1500 \pm 50 mm |
| Cores: | 6 insulated wires, 1 conductive wire |
| Weight: | Approximately 60 g |

9.3.2. Wedge Connector

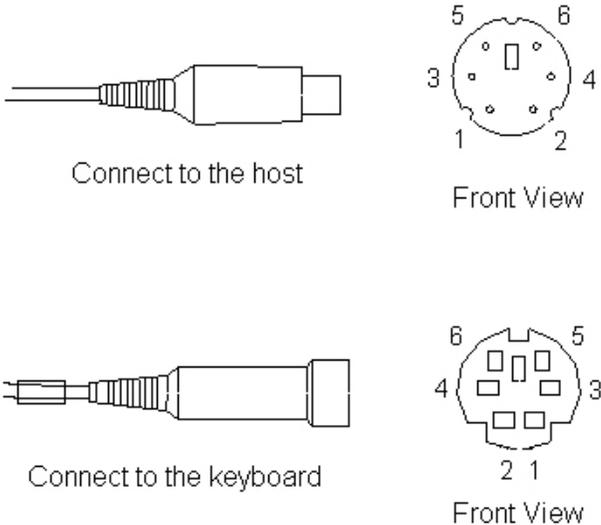


Figure 22: Wedge connector

9.3.3. Pin Assignment

| Pin | Host Connector | Keyboard Connector |
|-----|----------------|--------------------|
| 1 | CPU DATA | KEY DATA |
| 2 | OPEN | OPEN |
| 3 | GND | GND |
| 4 | VCC | VCC |
| 5 | CPU CLOCK | KEY CLK |
| 6 | OPEN | OPEN |

9.4. Connector Specification (Scanner Side)

CN 1 (10-pin)

| Pin | Signal per Interface | | |
|-----|----------------------|--------|-----------|
| | RS-232C | USB | Wedge |
| 1 | TRIGGER | NC | NC |
| 2 | OK | NC | NC |
| 3 | NG | NC | NC |
| 4 | CTS | NC | KEY DATA |
| 5 | RTS | NC | KEY CLOCK |
| 6 | R×D | USB- | CPU DATA |
| 7 | T×D | USB+ | CPU CLOCK |
| 8 | VCC | VCC | VCC |
| 9 | GND | GND | GND |
| 10 | SHIELD | SHIELD | SHIELD |

Connector used: BM10B –SRSS–TB–LFSN (or equivalent product)

10. Default Settings

10.1. 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 |
| 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 |
| Without keyboard |  k l | KL |
| END |  z z | ZZ |

10.2. Default Settings 1: Readable Codes

| Symbology | Read | 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 | |
| Chinese Post | X | X | ■ | X | — | CR | |
| Codabar / NW-7 | ■ | X | ■ | X | — | CR | Not transmit ST/SP |
| Code 11 | X | X | X | ■ | — | CR | |
| Code 39 | ■ | X | ■ | X | — | CR | Not transmit ST/SP |
| Code 93 | ■ | X | X | ■ | — | CR | |
| Code 128 | ■ | X | X | ■ | — | CR | |
| EAN-128 | X | X | X | ■ | — | CR | |
| IATA | ■ | X | ■ | X | — | CR | |
| Industrial2of5 | ■ | X | ■ | X | — | CR | |
| Interleaved2of5 | ■ | X | ■ | X | — | CR | |
| Matrix2of5 | X | X | ■ | X | — | CR | |
| MicroPDF417 | X | X | — | — | — | CR | |
| PDF417 | X | X | — | — | — | CR | |
| MSI/Plessey | ■ | X | ■CD1 | ■CD1 | — | CR | |
| UK/Plessey | ■ | X | ■ | ■ | — | CR | |
| RSS-14 | X | X | ■ | ■ | — | CR | |

| Symbology | Read | Transmit Code Length | Transmit CD | Calculate CD | Set Prefix | Set Suffix | Other |
|--------------|------|----------------------|-------------|--------------|------------|------------|--------------------|
| RSS-limited | X | X | ■ | ■ | — | CR | |
| RSS-expanded | X | X | ■ | ■ | — | CR | |
| S-Code | ■ | X | ■ | X | — | CR | |
| Telepen | ■ | X | X | ■ | — | CR | |
| Trioptic | ■ | X | ■ | 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.”

10.3. Default Settings 2: Read Options, Trigger, Buzzer

| Item | | Default Setting |
|----------------------------------|---|--|
| Setting the number of characters | | Fixed length OFF all codes |
| Read mode | | Multiple read |
| Multiple read reset time | | 500 ms |
| Add-on wait mode | | 500 ms |
| Multiple label read | | Disable |
| Multiple column read | | Disable |
| Redundancy | Default option ([X0] setting) | Read 1 times, redundancy = 0 |
| | Other options ([X1 .. X3] setting) ([BS .. BW] setting) | Read n times, redundancy = n+1 for the following symbologies and lengths: <ul style="list-style-type: none"> • Code 11 with length <= 5 • Code 39 with length <= 5 • IATA, Industrial 2of5, Interleaved 2of5 with length <= 8 • Matrix 2of5 (& Chinese Post), Scode with length <= 8 • MSI/Plessey with length <= 4 • Codabar (NW-7) with all lengths |
| Trigger switch | | Enable |
| Trigger repeat | | Disable |
| Auto trigger | | Disable |
| Read time | | 2 seconds |
| Margin check | | Normal |
| Buzzer duration | | 50 ms |
| Buzzer tone | | Single tone (3 kHz) |
| Buzzer loudness | | Maximum |
| Buzzer transmission | | Before transmission |
| Startup buzzer | | Enable |
| Good read LED | | Indicator duration 200 ms |

10.4. Default Settings 3A: Serial Communication Settings—RS-232C, USB-VCP

| Parameter | “U2” and “C01” Default Setting |
|---------------------------|--------------------------------|
| ACK/NAK | No handshaking |
| Flow control time out | Indefinitely |
| Flow control | Disabled |
| Command header | ESC/STX |
| Command terminator | CR/ETX |
| ACK/NAK for RS-232C comm. | Disabled |

11. Serial Number

The serial number shown below is affixed to the scanner.

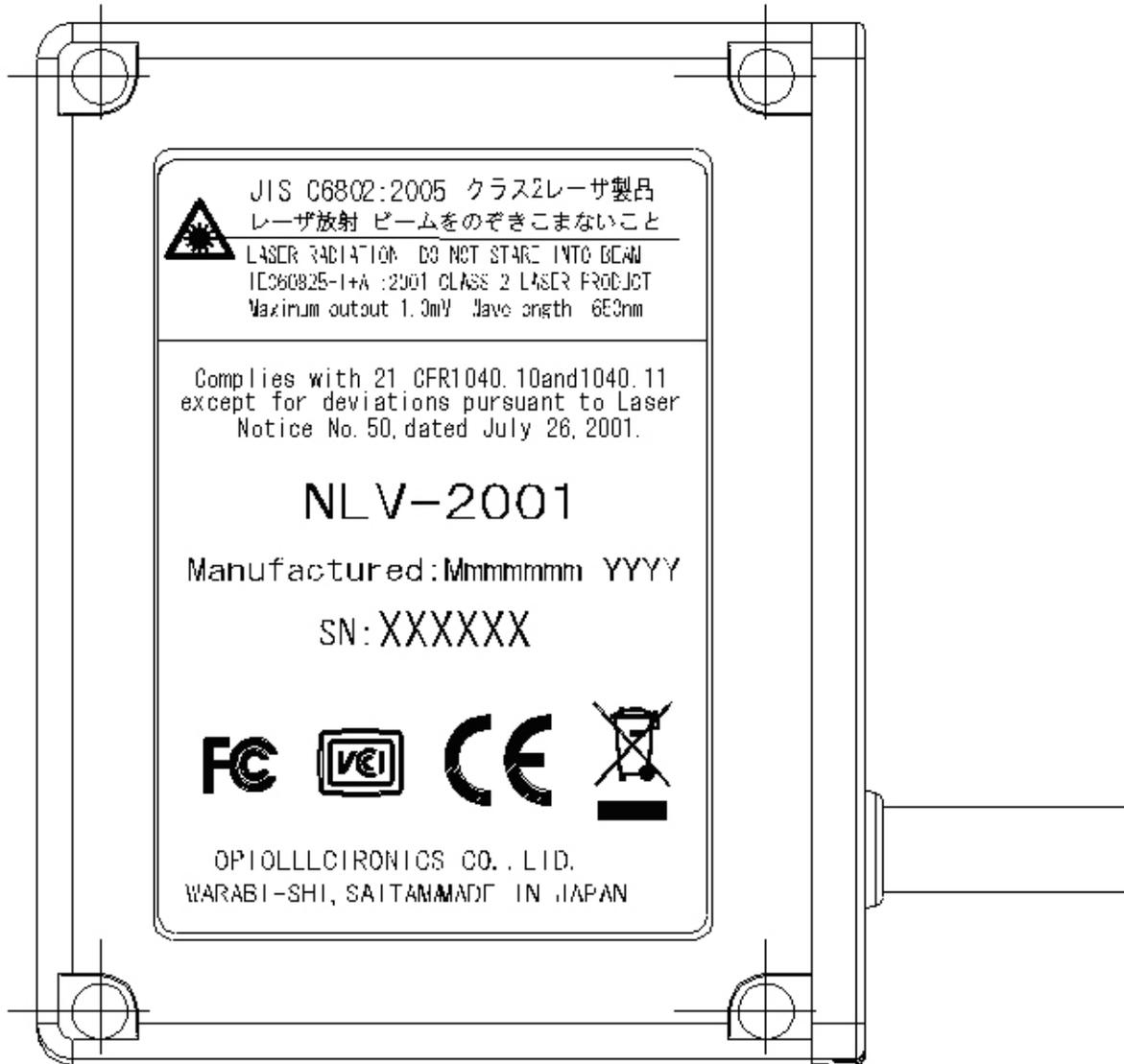


Figure 23: Serial number diagram

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: (W) 245 mm x (D) 110 mm x (H) 38 mm

12.2. Collective Packaging Specification

Put 50 individually packaged scanners in a collective packaging box.

Size of the package (after assembly: (W) 560 mm x (D) 490 mm x (H) 195 mm

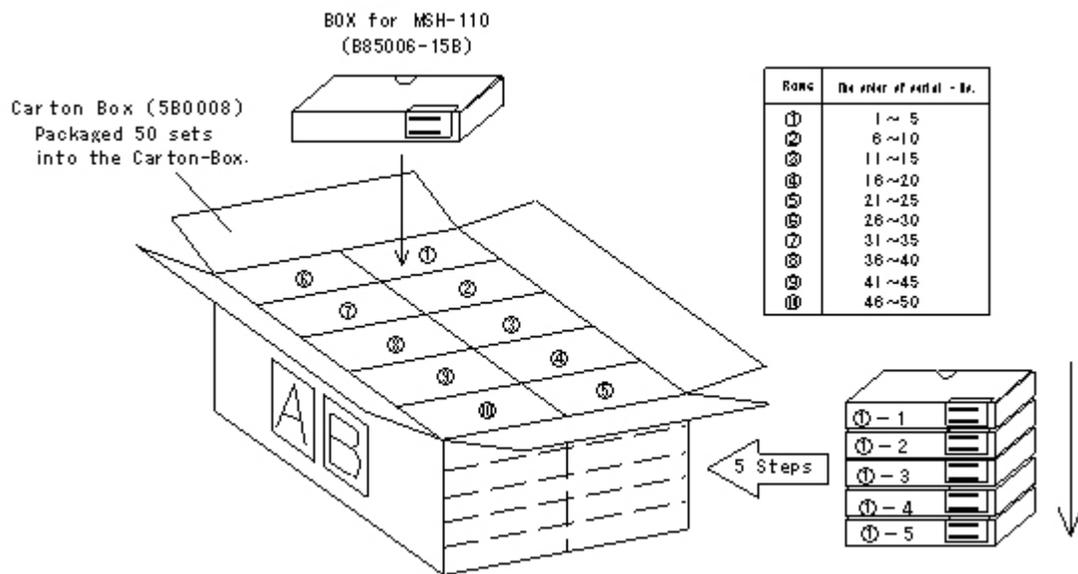


Figure 24: Collective packaging

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. Electrical Noise

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

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 | $\alpha = 0^\circ \beta = 15^\circ \gamma = 0^\circ$ |
| Curvature | $R = \infty$ |
| Power Supply Voltage | 5.0 V |

13.2. Static Electricity

| | |
|-------------------------|---|
| Air discharge | 8 kV MAX (No malfunction) 10 kV MAX (No destruction) |
| Measurement environment | Use electrostatic testing device compliant with IEC 61000-4-2 |
| Discharge resistance | 330 Ω |
| Capacitor charging | 150 pF |

13.3. Shock: Drop Test

No malfunction occurred after the following drop test.

Drop Test: Drop the scanner from a height of 75 cm onto a concrete floor (three times in each of 6 angles).

13.4. Vibration Strength

No malfunction occurred after the following vibration test.

Vibration test: Increase the frequency of the vibration from 10 Hz to 100 Hz with accelerated velocity 19.6m/s^2 (2G) for 60 minutes in non-operating state. Repeat this routine in each X, Y, Z direction once for 60 minutes each.

13.5. Dust and Drip Proof

IEC IP67

13.6. Cable Bending

Defects occurring due to bending the cable are not covered under warranty.

14. Reliability

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

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.

15. Trigger and Read Options

The NLV 2001 has an optional auto trigger setting, which starts barcode reading automatically by using sensor detection. When enabling auto trigger, a laser beam is emitted and points to the auto trigger area. The scanner starts barcode reading after detecting reflection from the surface when the auto trigger is used.

15.1. Auto Trigger Sensor

When auto trigger is used, the scanner starts barcode reading after detecting a change in reflection in the detection area. The scanner will be triggered if the sensors detect changes in brightness in the detection area.

Auto trigger distance: 50 ±10 mm from the edge of the scanner.

Conditions

| | |
|--|--|
| Moving speed | 100 ±10 mm/s |
| Angle | Vertical to the front edge of the scanner |
| Environmental temperature and humidity | Room temperature and humidity |
| Environmental illuminance | 500 to 900 lx |
| Conditions for the auto trigger | <ol style="list-style-type: none"> 1. Barcode sheet: OPTOELECTRONICS Test Sheet (white) Background: OPTOELECTRONICS Test Sheet (black) 2. Barcode sheet: OPTOELECTRONICS Test Sheet (black) Background: OPTOELECTRONICS Test Sheet (white) |

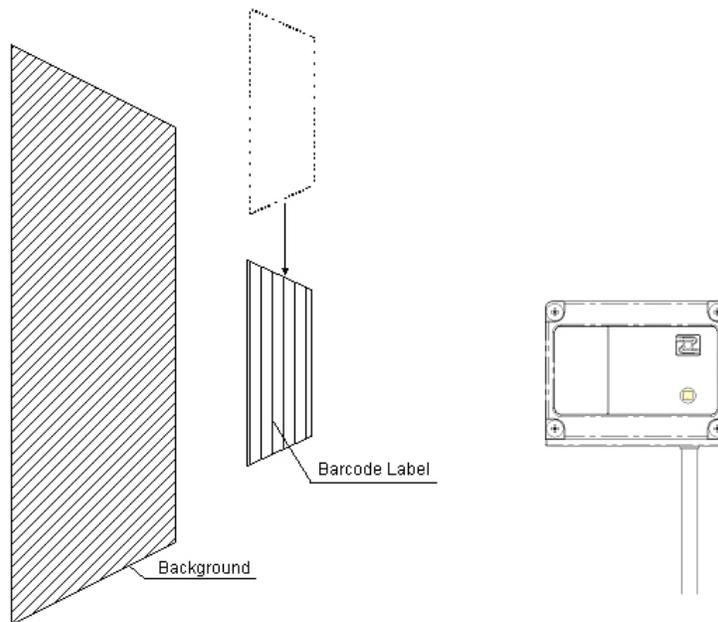


Figure 25: Auto trigger option (NLV 2001 I-Type)

15.2. Auto Trigger Settings

15.2.1. 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.
- To disable auto trigger, scan “ZZ”, “+F” and “ZZ” in that order.

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

Note: Please configure the following **after** enabling the auto trigger.

16. Regulatory Compliance

16.1. 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.

16.2. Product Safety

EN60950-1: 2001

IEC60950-1: 2001

16.3. 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.

16.4. RoHS

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

17. Safety

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

17.1. Shock

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

17.2. 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.

17.3. Foreign Materials

- Do not immerse the scanner in liquids.
- Do not subject the scanner to chemicals.

17.4. Other

- Do not plug/unplug the connectors before disconnecting the power.
- Do not disassemble this product.
- Do not use the scanner near a radio or a TV receiver. It 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.

18. Mechanical Drawing

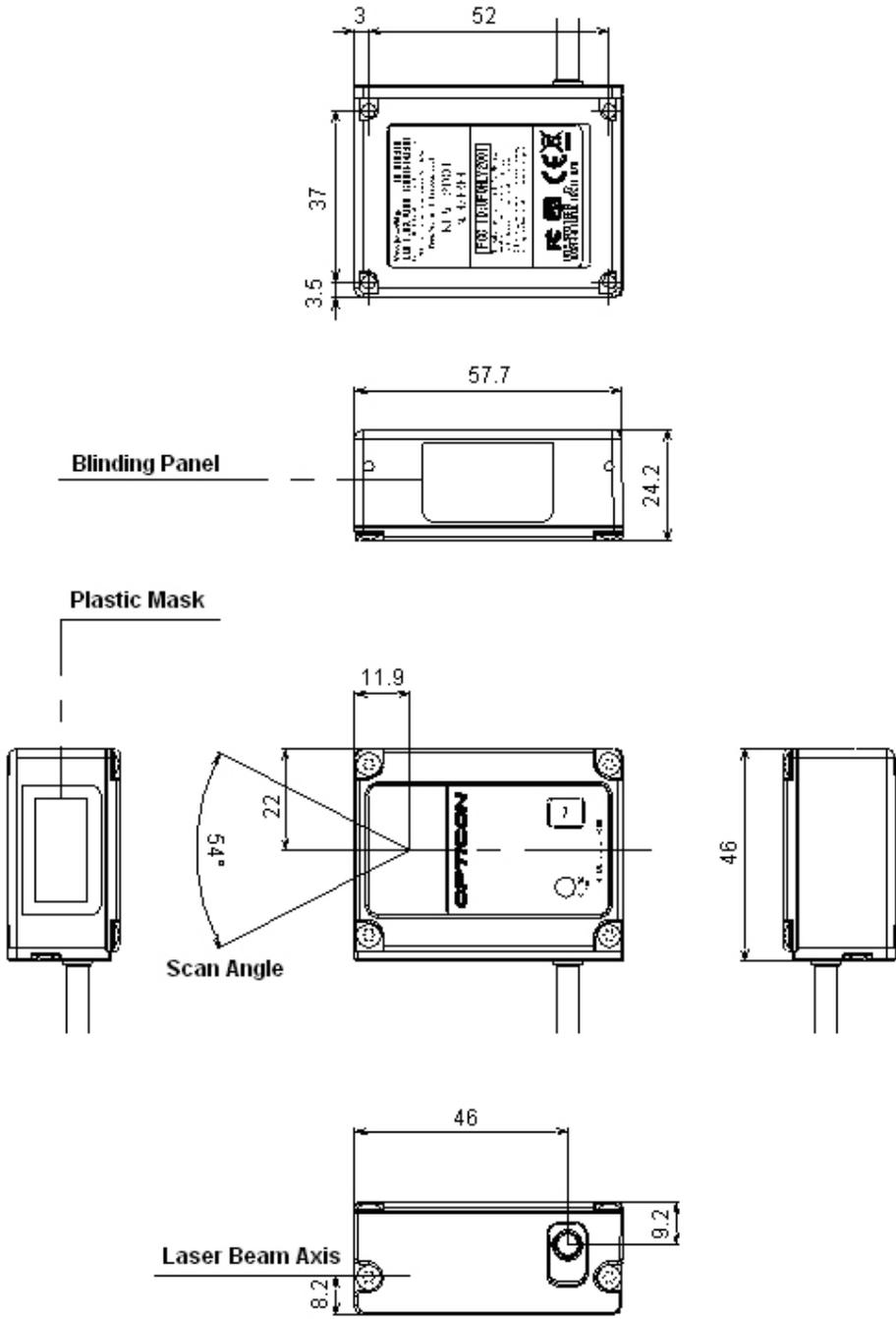


Figure 26: Mechanical drawing (NLV 2001 I-Type)