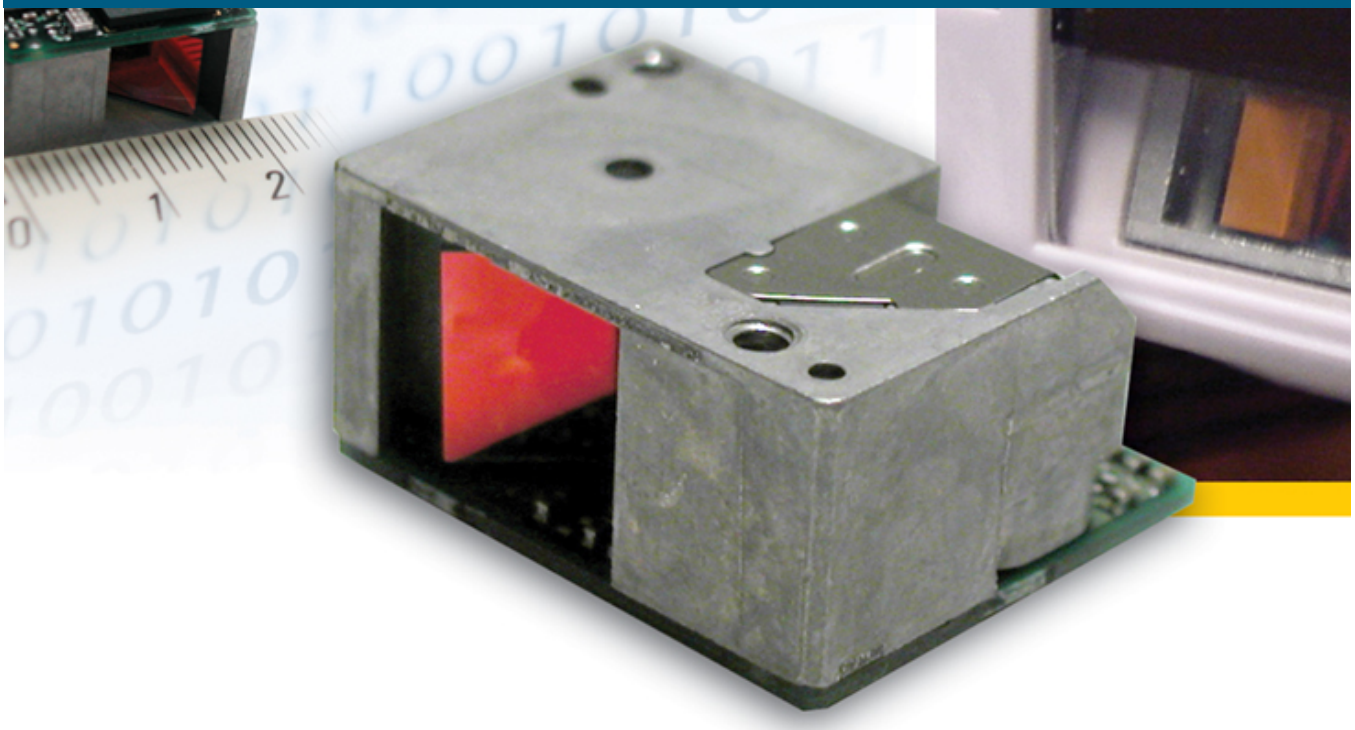
Specification Manual

MDL 2000

OPTICON



Decoded Laser Scan Engine

Document：MDL-2000 Standard Specification
Admin No.：DM-0510005, Doc. Control No. SS06024, Original SS05046
Manufacturer: OPTOELECTRONICS Co., Ltd., Warabi-shi, Saitama
Distributed: Opticon, Inc., Orangeburg, NY

CAUTION: This information is subject to change without prior notice.

Limited warranty and disclaimers

UNDER ALL CIRCUMSTANCES THIS MANUAL SHOULD BE READ ATTENTIVELY, BEFORE INSTALLING AND OR USING THE PRODUCT.

Serial number
A serial number appears on all Opticon products. This official registration number is strictly related to the device purchased. Make sure that the serial number appearing on your Opticon device has not been removed. Removing the serial number might affect the warranty conditions and liability disadvantageously, so please be strict at maintaining the label with serial number on the Opticon product.

Warranty / Warranty period / Liability
Unless otherwise agreed in a contract, all Opticon products are warranted for the period of two years after purchase, covering defects in material and workmanship. Opticon will repair or, at its opinion, replace products that prove to be defective in material or workmanship under proper use during the warranty period. Opticon will not be liable in cases where modifications are made by the customer. In such case the standard repair charge will be applicable. The standard charge for repair will also be applicable in cases where no defect is found at all. These rules also apply for products that are still under warranty. Under no circumstance will Opticon Sensors Europe, be liable 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 not harmful for the environment. We recommend that you save all packing material, as it should be used whenever you need to transport your scanner (eg. for service). Damage caused by improper repacking is not covered by the warranty.

Trademark
Trademarks used are property of their respective owners.

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Table of Contents

1 Abstract

This document provides specifications on the MDL 2000 laser scan engine.

2 Overview

The MDL-2000 is a compact laser barcode scan engine which can be installed in various handheld products such as portable terminals. When scanning a target from the closest point, it has the ability to scan up to 44 mm wide at an angle of 44°. The use of a short wave-length red laser beam enhances the visibility when scanning lines.
A decoder is built into the MDL-2000 which enables the scan engine to decode the barcodes after scanning and output the information in serial communication.
MDL-2000 is compliant with the Restriction of Hazardous Substances (hereinafter called as “RoHS”).

3 Physical Features

3.1 Dimensions

W20.4×D18×H11.2 (mm)

3.2 Weight

4.7g (maximum)

4 Electrical Specifications

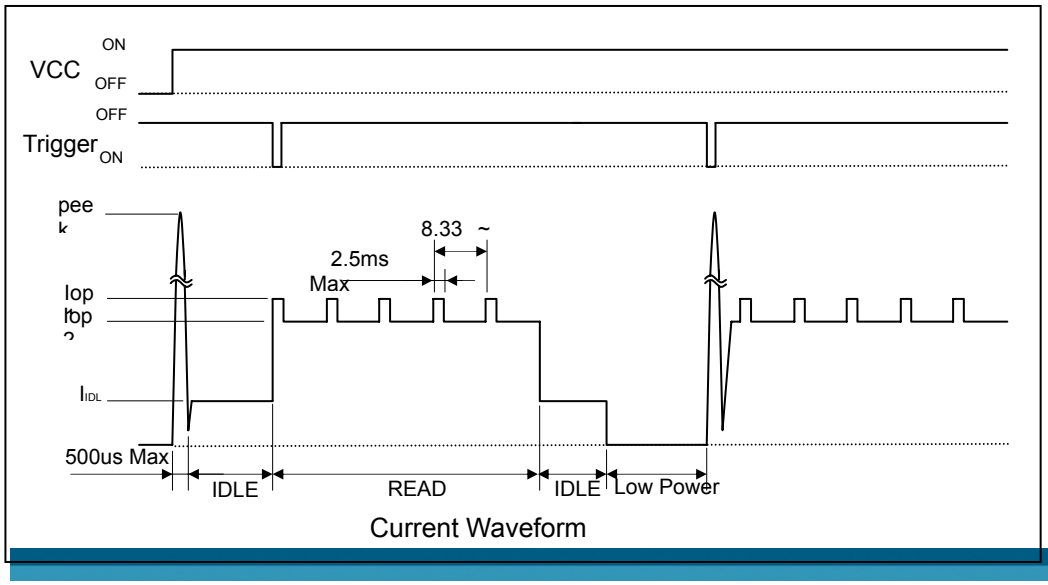
Absolute Maximum Ratings

Items	Symbol	Value	Unit
Power Supply Voltage (V_{CC} to GND)	V_{cc}	3.9	V
Input Voltage	V_I	-0.3 to V_{CC}+0.3	V
Output Current	I_O	±4	mA

Electrical Characteristics

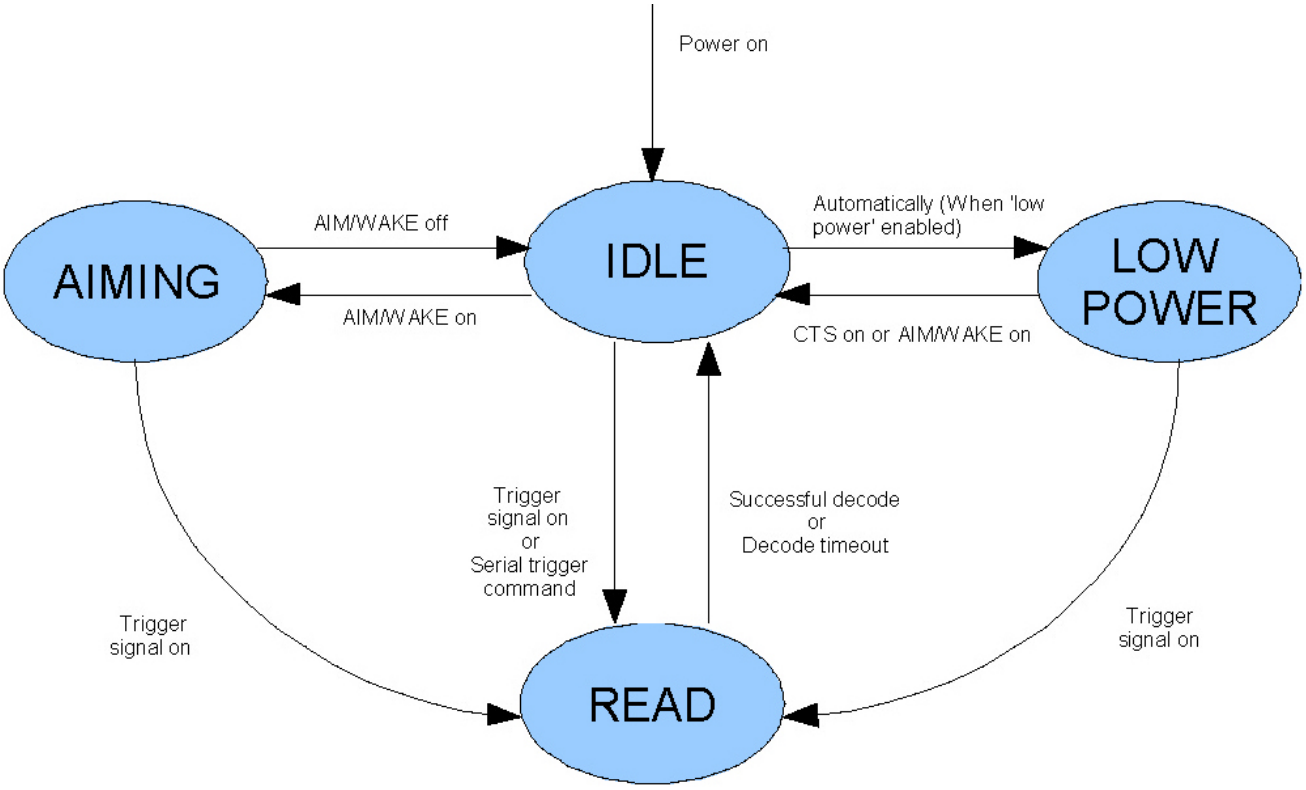
Vcc = 3.3V, Ta = 25° C

Items		Marks	Conditions	Min	Typ	Max	Unit
Operating Voltage		V_{CC}		3.0	-	3.6	V
Operating Current 1		I_{OP1}	READ State	-	110	125	mA
Operating Current 2		I_{OP2}	READ State		95	110	mA
Idle Current		I_{IDL}	IDLE State	-	30	40	mA
Aiming Current		I_{AIM}	AIMING State	-	50	65	mA
Low Power Current		I_{LOW}	Low Power State	-	-	1400	uA
Rush Current Peak		I_{PEEK}		-	500	1000	mA
Input Voltage	High	V_{IH}		V_{CC} x 0.8	-	-	V
	Low	V_{IL}		-	-	V_{CC} x 0.2	V
Output Voltage (Decode LED)	High	V_{OH}	I_{OH} < 8mA	V_{CC}-0.6	-	-	V
	High (Low Power State)	V_{OH}	I_{OH} < 5uA	V_{CC}-0.6	-	-	V
	Low	V_{OL}	I_{OL} < 8mA	-	-	0.4	V
Output Voltage (Txd、RTS)	High	V_{OH}	I_{OH} < 4mA	V_{CC}-0.6	-	-	V
	High (Low Power State)	V_{OH}	I_{OH} < 5uA	V_{CC}-0.6	-	-	V
	Low	V_{OL}	I_{OL} < 4mA	-	-	0.4	V
Output Voltage (Power Down)	High (Low Power State)	V_{OH}	I_{OH} < 5uA	V_{CC} -0.6	-	-	V
	Low	V_{OL}	I_{OL} < 4mA	-	-	0.4	V
Input Current		I_{IN}	V_{IN} = 3.3V	-	-	-10	μA
			V_{IN} = 0V	-	-	50	μA



Current Waveform

5 Interface Specifications



- When the unit is configured for “Low Power”, it automatically switches from IDLE to LOW POWER state. If “Low Power” is not enabled, the unit stays in IDLE state unless an event occurs as indicated above.

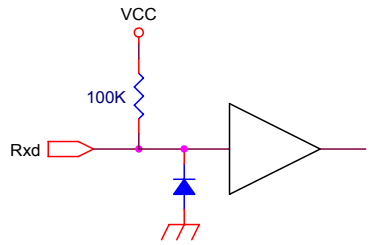
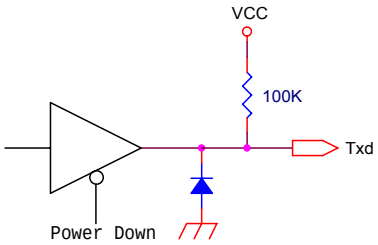
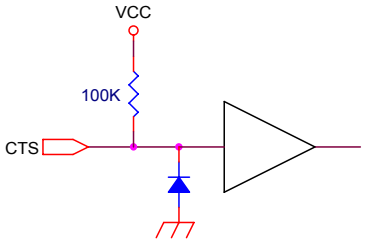
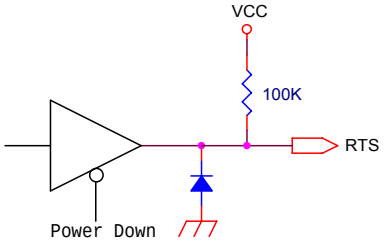
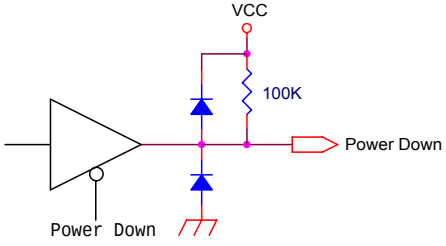
6 Interface Specifications

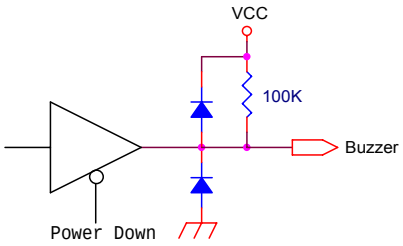
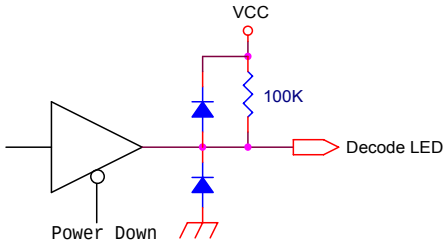
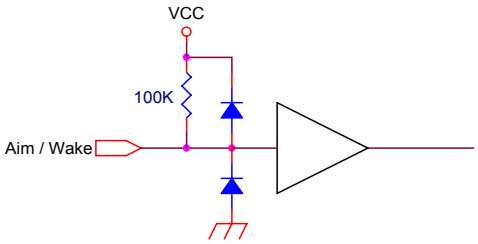
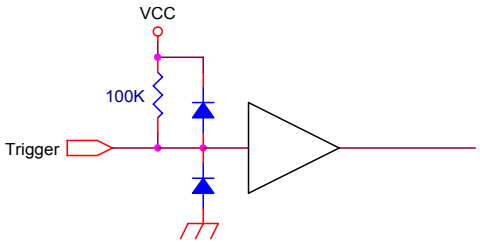
6.1 Interface Connector

Signals	Pin No.	I/O	Features	
TEST	1	I	Input for the Test: High or Open State	
VCC	2	-	Power Supply: DC 3.0V to 3.6V	
GND	3	-	Ground	
Rxd	4	I	Input Serial Data, CMOS Logic Level	
Txd	5	O	Output Serial Data, CMOS Logic Level	
CTS	6	I	Clear to Send, CMOS Logic Level	
RTS	7	O	Request to Send, CMOS Logic Level	
Power Down	8	O	Power Down Output, CMOS Logic Level	High = Low Power State
Buzzer	9	O	Buzzer Control Pulse Output, CMOS Logic Level	Low = Buzzer On
Decode LED	10	O	LED Output, CMOS Logic Level	Low = LED On
Aim/Wake	11	I	Aiming / Wakeup Input, CMOS Logic Level	Low = Aim/Wake
Trigger	12	I	Trigger Input, CMOS Logic Level	Low = Trigger

Connector type: KYOCERA ELCO Corporation. No. 04 6238 012 0 1 0 883+
12 Pin 0.5mm Pitch FFC Connector (Bottom Contact)

6.2 Interface Circuit

Pin No.	Signal	Circuitry
1	Test Terminal (Open or Vcc)	-
2	VCC	-
3	GND	-
4	Rxd Input	
5	Txd Output	
6	CTS Input	
7	RTS Output	
8	Power Down Output High = Low Power State	

9	Buzzer Output High = OFF Low = ON	
10	Decode LED Output High = OFF Low = ON	
11	Aim/Wake Input Low = Aim / Wake	
12	Trigger Input Low = Trigger	

7 Optical Specifications

7.1 Laser Scan Specifications

Items		Specification	Unit
Light Source		Red Laser Diode	-
Wave Length		650±10 (25°C)	nm
Output Power		< 1.0	mW
Scanning Method		Bi-directional Scanning	-
Scanning Speed		100±20	scan/sec
Scan Angle	Scanning Angle	54±5	Deg
	Range of Scanning Angle	44 (Min)	Deg

8 Technical Specifications

Except as otherwise noted in each section, the conditions for technical specifications are as follows:

Conditions:

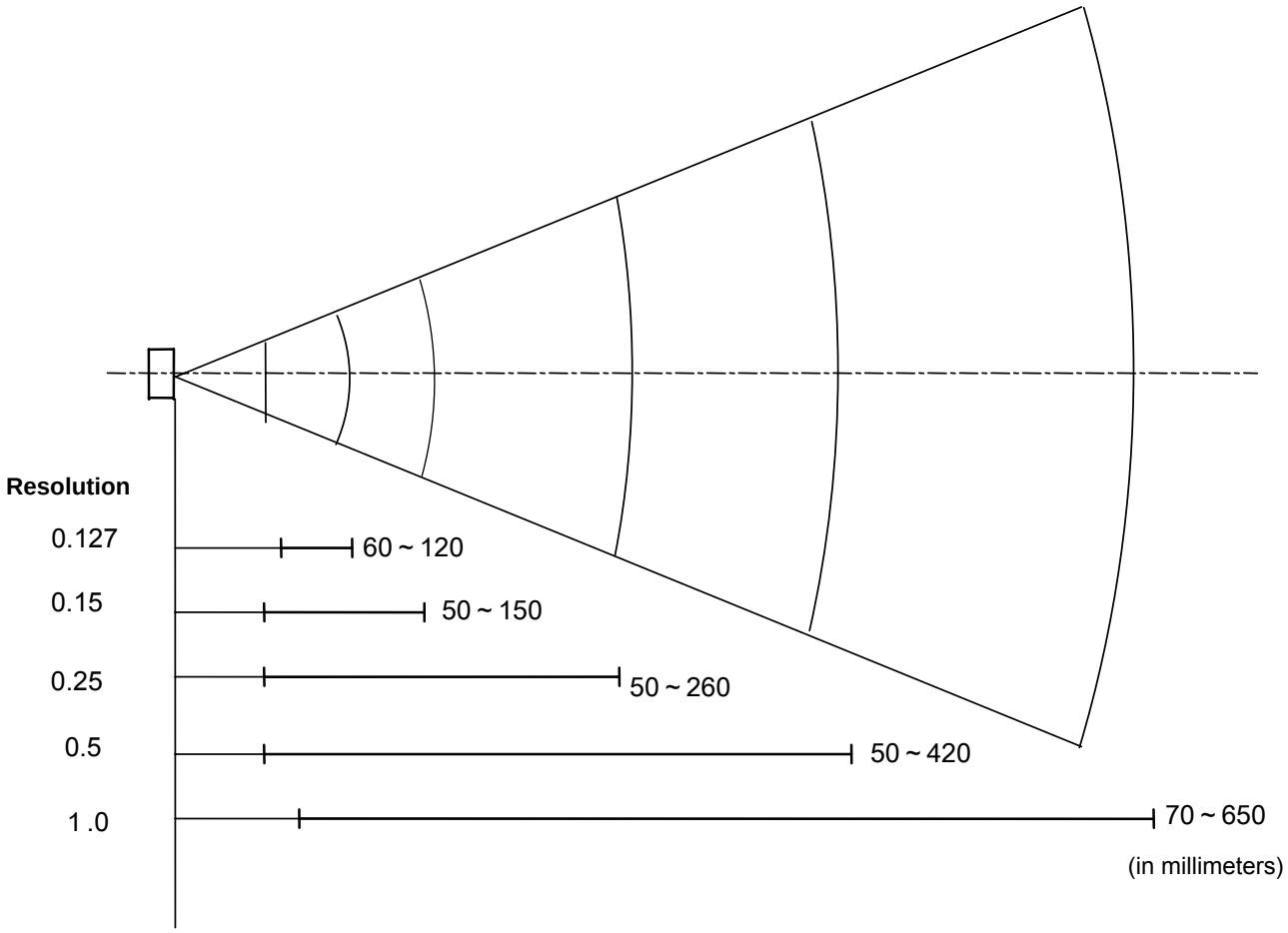
Ambient Temperature and Humidity:	Room temperature and room humidity
Ambient Light:	500 lux to 900 lux
Background:	Black
Power Supply Voltage:	3.3 V

Decoding Test:
Approve the performance when decoding is successful in all ten tests.
(Decoding is deemed successful when completed in 0.5 second or less.)

8.1 Print Contrast Signal

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

8.2 Decode Area and Resolution



Details:

The depth of field is measured from the edge of the exit window.
The decode area is rectilinear near the exit window and expands in an arc centered on a virtual reference point in the distance.

Conditions:

Barcode Sample: OPTOELECTRONICS Test Sample (N/W ratio = 1 : 2.5)
Angle: α = 0°, β = 15° γ = 0°
Curvature: R = ∞

Resolutions	Symbology	PCS	Quiet Zone	No. of Digits
1.0 mm	CODE-39	0.9	25 mm	1
0.5 mm	CODE-39	0.9	18 mm	3
0.25 mm	CODE-39	0.9	10 mm	8
0.15 mm	CODE-39	0.9	7 mm	10
0.127 mm	CODE-39	0.9	5 mm	4

8.3 Pitch, Skew and Tilt

Pitch Angle: α = ±35°
Skew Angle: β = ±50° (Exclude the dead zone.)
Dead Zone: β = ±8°
(There is an area in which decoding fails due to specular reflection)
Tilt Angle: γ = ±20°

Conditions:

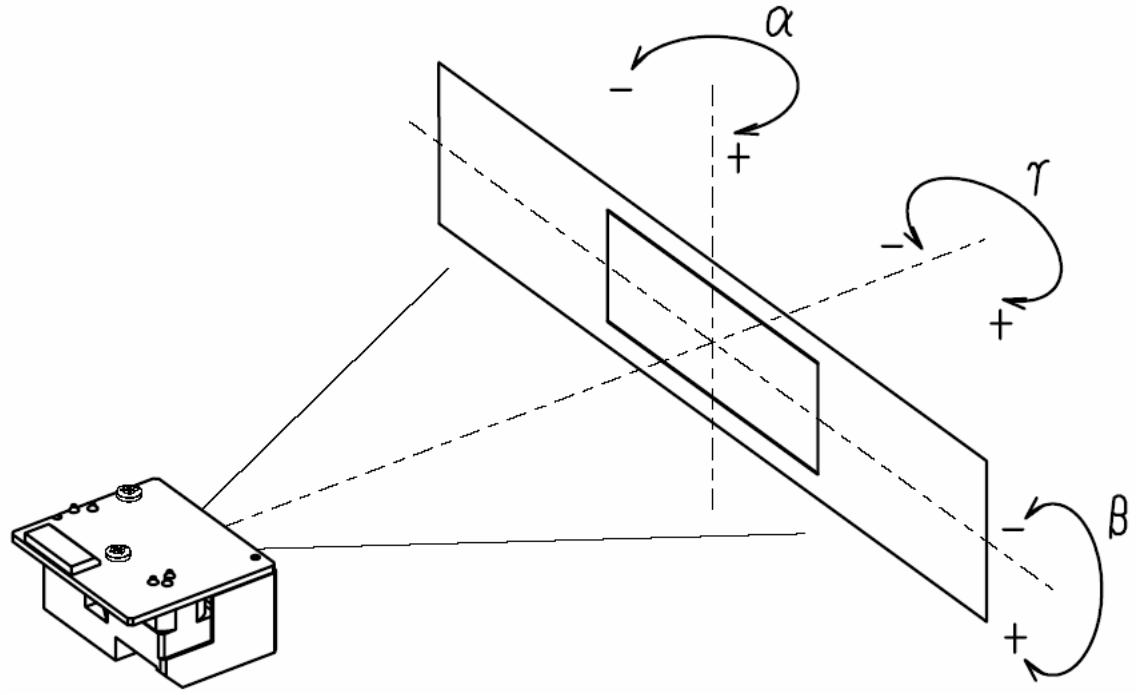
Barcode Sample: OPTOELECTRONICS Test Sample
Distance: Measured from the point 110 mm from the exit window.
Pitch Angle, Skew Angle and Dead Zone:
PCS = 0.9, Resolution = 0.25 mm, 9 digit barcode, Symbology = Code 39,
Quiet Zone = 10 mm

N/W ratio = 1 : 2.5

Tilt Angle:
PCS=0.9, Resolution = 0.26mm, 13 digit barcode, Symbology = JAN,
Quiet Zone = 10 mm

Curvature: R=∞

(The calculation of pitch angle and tilt angle is made based on the formula of skew angle being β = +15°.)



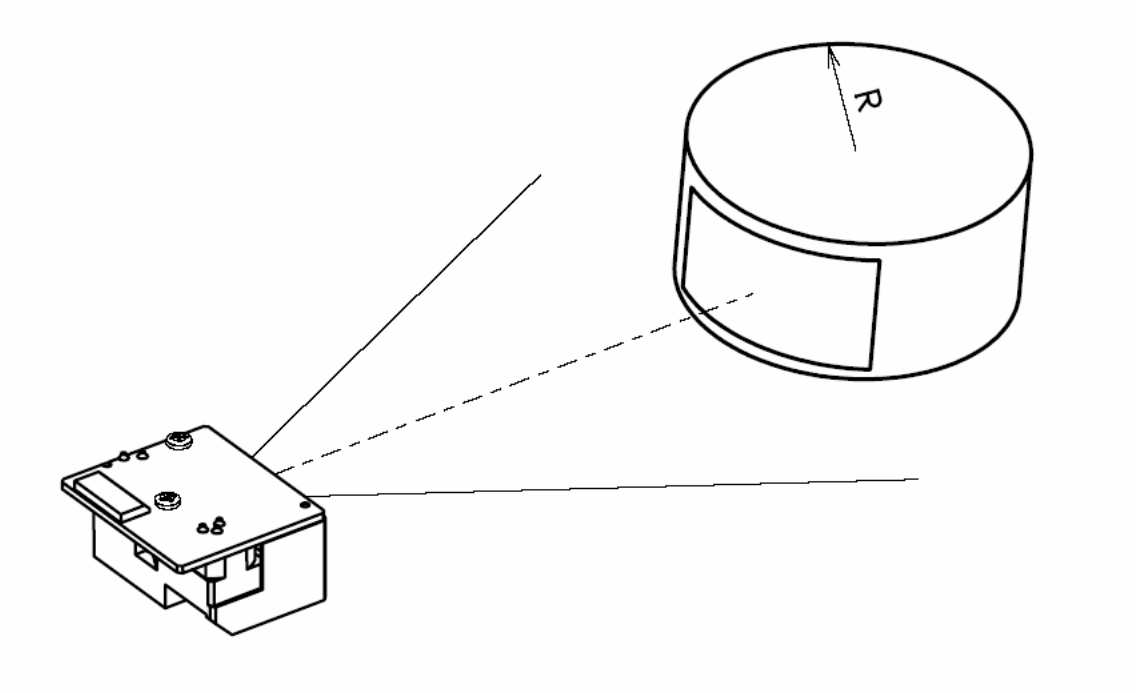
8.4 Curvature

With 8-digit JAN barcodes, decoding performance is guaranteed when R≧15mm.

With 13-digit JAN barcodes, decoding performance is guaranteed when R≧20mm.

Conditions:

Barcode Sample: OPTOELECTRONICS Test Sample
PCS = 0.9, Resolution = 0.26 mm, Quiet Zone = 10mm
Distance: Measured from the point 110 mm away from the exit window.
Angle: Skew Angle β= +15°



9. Environmental Specifications:

9.1 Temperature

Operating Temperature: -20° to 65° C
Storage Temperature: -30° to 70° C

9.2 Humidity

Operating Humidity: 5 to 90% RH (without dew condensation or gelation)
Storage Humidity: 5 to 90% RH (without dew condensation or gelation)

9.3 Ambient Light Immunity

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

Incandescent Light: 4000 lux
Fluorescent Light: 4000 lux
Sunlight: 80000 lux

Conditions:

Barcode Sample: OPTOELECTRONICS Test Sample
PCS = 0.9, Resolution = 0.25 mm, Symbology = Code 39, 9 digit barcode,
Quiet Zone = 10 mm
N/W Ratio = 1:2.5
Distance: Measured from the point 150 mm away from the exit window
Pitch Angle: α=0°,
Skew Angle: β=15°
Tilt Angle: γ=0°
Curvature: R=∞
Power Supply Voltage: 3.3 V

Performance is guaranteed unless the direct light or direct reflection from the light source falls within the MDL-2000's light-sensing area.

9.4 Electrical Noise

There was no sign of defects in output signals when sinusoidal electrical noise (50Hz to 100kHz, smaller than 0.1Vp-p) was added to the power supply line.

Conditions:

Barcode Sample: OPTOELECTRONICS Test Sample
PCS = 0.9, Resolution = 0.25 mm, Symbology = Code 39, 9 digit barcode,
Quiet Zone = 10 mm
N/W Ratio = 1:2.5
Distance: Measured from the point 150 mm away from the exit window
Pitch Angle: α=0°,
Skew Angle: β=15°
Tilt Angle: γ=0°
Curvature: R=∞
Power Supply Voltage: 3.3 V

9.5 Vibration

There was no sign of any malfunction after the following vibration test.

Vibration Test:

Increased the frequency of the vibration from 12Hz to 200Hz with accelerated velocity of 3.3G for over ten minutes. Repeated this routine for 2 hours to X-direction, 2 hours to Y-direction and 4 hours to Z-direction.

9.6 Shock

There was no sign of any malfunctions of the MDL-2000 after the following shock test.

Shock Test:

Fixed a MDL-2000 inside a dummy case and dropped it on its top, bottom, front, back, left, right, top-left, top-right, bottom-left and bottom-right sides from 1.8 meters above the concrete floor. Repeated this test procedure 10 times.

Conditions:

Barcode Sample: OPTOELECTRONICS Test Sample
PCS = 0.9, Resolution = 0.25 mm, Symbology = Code 39, 9 digit barcode,
Quiet Zone = 10 mm
N/W Ratio = 1:2.5
Distance: Measured from the point 50 mm to150 mm away from the exit window
Pitch Angle: α=0°,
Skew Angle: β=15°
Tilt Angle: γ=0°
Curvature: R=∞
Power Supply Voltage: 3.3 V

10 Compliance to Law and Standards

- Laser Safety Standard: Compliant with JIS-C-6802 Class 1
- Compliant with RoHS

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

11 Reliabilities

- MTBF (mean time between failures) of this product except for the laser diode and the scan unit is 30,000 hours.
- The life cycle of the laser diode is 10,000 hours and that of the mirror scan unit is 10,000 hours.

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

12 Caution

12.1 Cautions on the Laser Beam

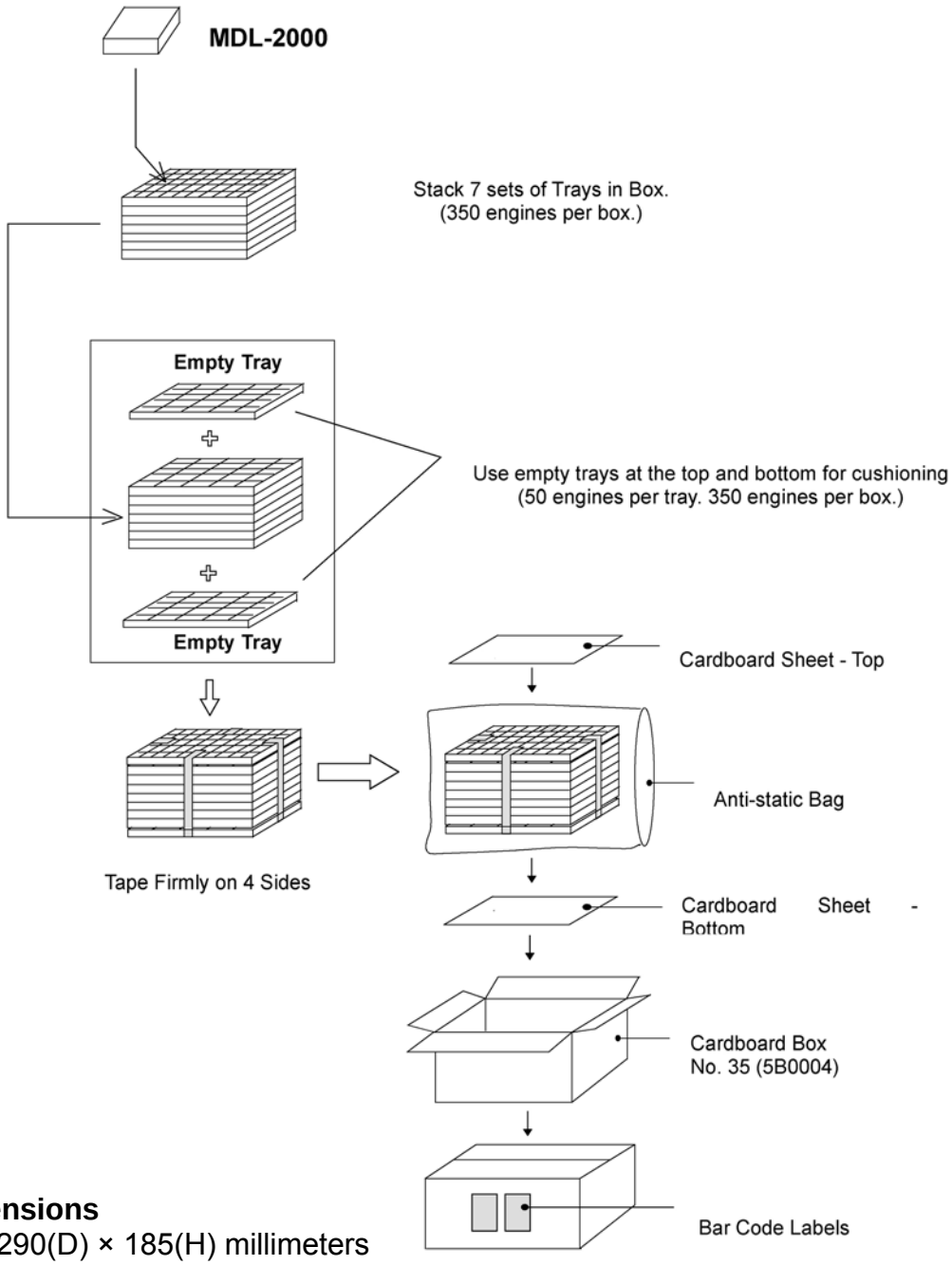
- Do not stare into the laser beam. It may cause damage to your eyes.
- The MDL-2000 emits a JIS-C-6802 Class-1 laser light.
  Class 1 laser devices are not considered to be hazardous when used for their intended purpose. Avoid staring into the laser beam.
-

12.2 Handling Instructions

- All work-benches, tools, measuring instruments and any part of the human body which comes into contact with the MDL-2000 must undergo preliminary anti-static procedures.
- Do not touch optical or electronic components. Hold it by its metal case when necessary.
- Avoid handling the MDL-2000 in dusty places. If dust gets on the component, gently blow off the dust with dry air. Direct contact of swabs and the like on the optics may cause deterioration of performance.
- Do not drop the MDL-2000.

13 Packing Specifications

13.1 Packing



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13.2 Box Dimensions

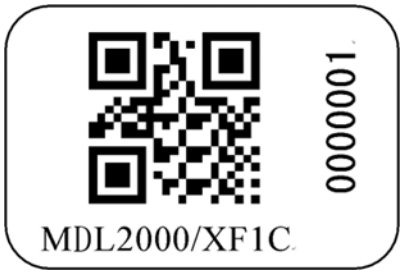
355(W) × 290(D) × 185(H) millimeters

Note:

The “Ro” mark labeled on the tray or box guarantees that the product has passed OPTOELECTRONICS RoHS testing and meets RoHS compliance (the restriction of the use of certain hazardous substances in electrical and electronic equipment, 2002/95EC). However, this mark does not have any legal weight in the EU.

14 Serial Number

Serial number is displayed on a label shown below which is affixed to the MDL-2000.



Management Quick Response Code (QR Code)

Model name and serial number are displayed.

*Serial number starts from 0000001 and is in order regardless of the lot number.

15 Mechanical drawing