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The F70-I fixed position scanner is a small, 700 scans per second CCD barcode reader designed to be easily integrated into host equipment.

Specifications Manual

All Information is subject to change without notice.

Document History

Model Number:	F-70-I-RS232C	**Specification Number:**	
Edition:	1.2	**Original Spec Number:**	
Date:	24-11-2013		

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Limited Warranty and Disclaimers

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

Serial Number

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

Warranty

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

Packaging

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

Trademarks

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Table of Contents

1. Abstract

The following specification manual is for the F-70-I-RS-232C Stationary CCD Barcode Scanner.

2. Overview

* This product reads the barcode without direct contact.

* Supported Symbologies:

UPC (EAN-13) / EAN-8, JAN-13 / JAN-8,UPC-A / (UPC-E) / Industrial 2 of 5 / IATA /

Interleaved 2 of 5 / NW-7 (CODABAR) / Code 39 / Code 93 / Code 128 / MSI / Plessey /

& Book Codes (JAN-13＋Add on 5) / Code 11 / Korean Postal　Authority　Code (Code　3 of 5) UK /

Plessey / GS1　DataBar (RSS) / S-Code / Telepen / Tri-Optic.

* It is possible to change the settings of functions via menu barcodes or commands.

* Scanned barcode images are then outputted via the RS-232C Interface.

* This product is RoHS compliant.

3. Basic Product Specifications

	Item	Specifications	Notes
Controller	CPU	32bit CISC	
	SDRAM	96KB	
	Flash ROM	512Kbits	
	RS-232C	600bps-38400bps	Default Setting: 9600 bps
Optical Component	Scanning Method	2048 pixel CCD	
	Scanning Light Source	Red LED Diode	Wavelength: 626nm
	Scan Rate	700 scan/sec	
1D Barcode	Symbology	UPC (EAN-13) / EAN-8, JAN-13 / JAN-8,UPC-A / (UPC-E) / Industrial 2 of 5 / IATA / Interleaved 2 of 5 / NW-7 (CODABAR) / Code 39 / Code 93 / Code 128 / MSI / Plessey / & Book Codes (JAN-13＋Add on 5) / Code 11 / Korean Postal　Authority　Code(Code　3 of 5) UK / Plessey / GS1 DataBar (RSS) / S-Code / Telepen / Tri-Optic	
	Minimum Resolution	Code 39: 0.15mm	
	Scan Curvature	Radius ≧ 20mm (JAN-8) Radius ≧ 30mm (JAN-13)	

No Specification PCS = 0.9

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Item		Specifications	Notes
Common Specifications	Scan Angle	Pitch: ± to 30°	(Excluding dead zone)
		Skew: ± 60°	
		Tilt: ± 10°	
	Minimum PCS	more than 0.45	
Power Source	Active Voltage Range	5.0 V ±5%	
	Consumption Current — Scanning	200mA (max)	
	Consumption Current — Standby	100mA (max)	
Environmental Specifications	Temperature — Active	0-40℃	
	Temperature — Storage	-10-60℃	
	Humidity — Active	Anti-freezing, condensation (20-85%)	
	Humidity — Storage	Anti-freezing, condensation (20-90%)	
	Surrounding Light Illumination Intensity — Fluorescent Light	Less than 5,000 1x	Jan-13 Resolution = 0.33mm Light Axis Angle 80° Distance: 35.4mm
	Surrounding Light Illumination Intensity — Incandescent Light	Less than 5,000 1x	
	Vibration	10Hz - 100Hz, acceleration rate 19.6m/s^2, At 60 minutes per cycle, X, Y, and Z in each direction 1 cycle implemented	
	Drop Resistance Test	Survives 3 times from 60 cm onto concrete surface (4 surface 1 cycle) natural drop, with no abnormalities.	Setting is 1 cycle to 4 surfaces. No case deformation.
	Protective Structure	IP42	

No Specification PCS = 0.9

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Item		Specifications	Notes
Specification Standards	LED Safety Standards	IEC 62471-1:2006 Risk License Group	Peak Wavelength : 626 nm
	EMI/RFI	VCCI/EN55022/FCC Class-B	Domestic, Commercial, and Industrial environments
	Certification Standards	CE Marking	
	Immunity Specification Standards	EN55024 (EN61000-6-1) Class-B	Home, Commercial, and Industrial environments
Immunity Test Items	Electrostatic Discharge Resistance — No breakage	15 kV (applied 50 times to device's outer surface)	Measuring Condition: IEC: 61000-4-2 compliant
	Electrostatic Discharge Resistance — No malfunctions	Contact Discharge (direct/indirect) : ± 5 kV	
	Radio Frequency Electromagnetic Field Amplitude Modulation — Frequency	80 - 1000 MHz	Measuring Condition: IEC61000-4-3 compliant
	Radio Frequency Electromagnetic Field Amplitude Modulation — Level	3 V/m	
	Radio Frequency Electromagnetic Field Amplitude Modulation — Modulation Depth	80 % (AM)	
	First Transient — Voltage	Alternator Input Cable: ± 1 kV	Measuring Condition: IEC61000-4-4 compliant
	First Transient — Pulse	5 / 50 ns (Tr / Tw)	
	First Transient — Frequency	5 kHz	
	Surge — Pulse	1.2 / 50 ns (Tr / Th)	Measuring Condition: IEC61000-4-5 compliant
	Surge — Voltage	L-P gap : ± 2 kV (closed circuit voltage)	
	Surge — Voltage	L-L gap : ± 1 kV (closed circuit voltage)	
	Power Frequency Magnetic Field — Frequency	50、60 Hz	Measuring Condition: IEC61000-4-8 compliant
	Power Frequency Magnetic Field — Level	3 A/m	
	Voltage Dip, Instant Stop and Voltage Variation — Dip (1)	less than 30%, 0.5 cycles	Measuring Condition: IEC61000-4-11 compliant
	Voltage Dip, Instant Stop and Voltage Variation — Dip (2)	less than 60 %, 5 cycles	
	Voltage Dip, Instant Stop and Voltage Variation — Instant Stop	less than 95 %, 250 cycles	
Dimensions	Mechanical Drawing	55.0 mm(W) x 52.0mm (D) x 20.0mm (H)	
	Total Weight	125g	Without cable

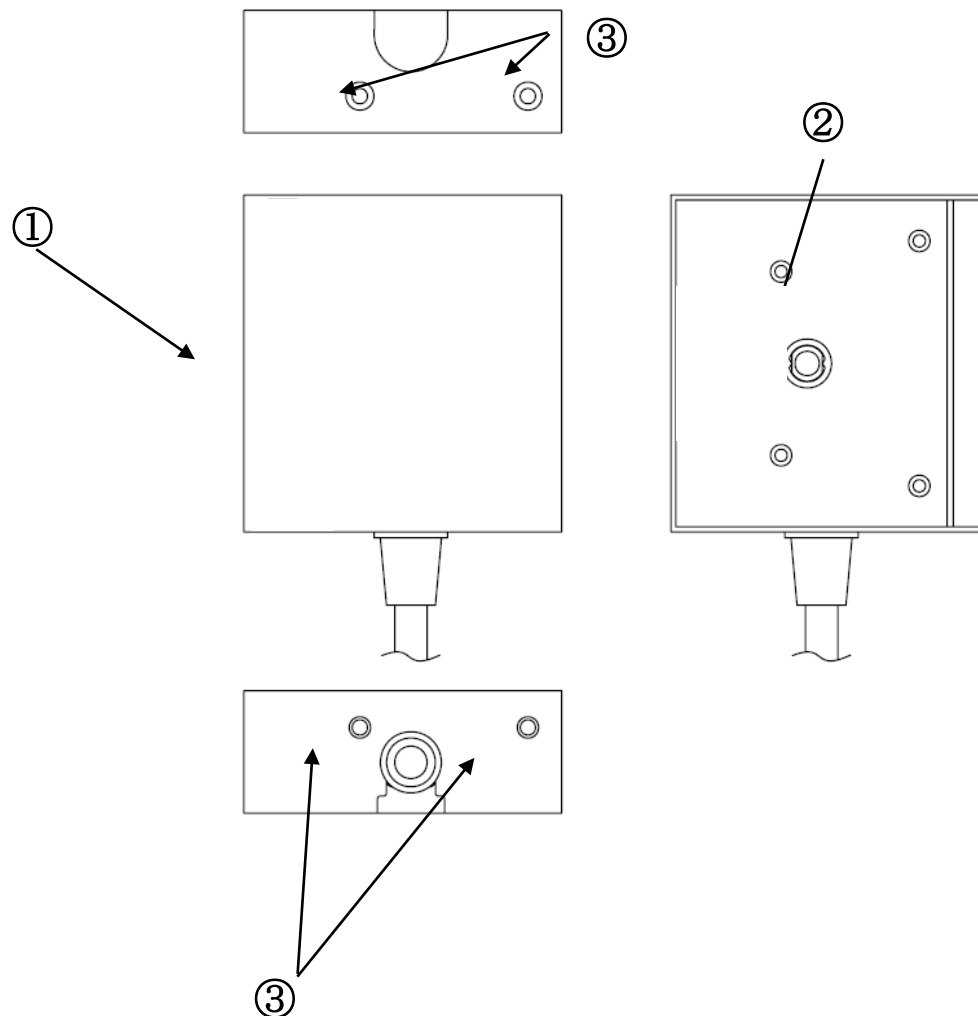4. Detailed View

Figure 1: Detailed Explanation

1. Scan Window

    Also used as output for the LED illumination. Make sure to keep the lens is clean.

2. Status LED

    Status is shown with a bi-color LED.

3. Mounting Holes

    Screw holes for device installation. Consult the mechanical drawing for the installation process.

    Dimensions: M3 x 0.5, maximum depth of 3mm. Any deeper than 3mm may cause damage to the inner structure. Please fill up any unused holes with screws or seals to prevent dust from entering the scanner enclosure.

5. Electrical Specifications

* Input Power Voltage： DC 5.0V
* Usable Voltage Range： 4.75 - 5.25V
* Power Supply Ripple： 100mVp-p max (10 - 100kHz、Power Voltage 5.0V)
* Current consumption: 100mA (max) / When Scanning: 200mA (max)

Notes

* Currents/voltages are measured at 25°C.
* The current consumption is determined by measuring the voltage across a 1Ω resistance in the Power Line.
* The supply current may change depending on the connected host's type.

6. Interface Specifications

The RS-232C Interface does not come with a connector.

6.1. Communication Specifications

Baud Rate: 600-38400 bps
Data Length: 7 / 8 bit
Parity Bit: None/Even/Odd
Stop Bit: 1 / 2 bit

Signal Level: the signal name refers to acceptable levels on the device side (DCE).

Signal Name	IN/OUT	Voltage Level (V)	
		Mark	Space
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

Signal Level: Sequencer Signal

Signal Name	IN/OUT	Voltage Level (V)	
		L Level	Space /ON
External Trigger	IN	-0.3V - 1.5V	2.5V - 5.5V
OK	OUT	0.3V/5mA	OC Output / 24V(max)
NG	OUT	0.3V/5mA	OC Output / 24V(max)

6.2. Host Connection Specifications
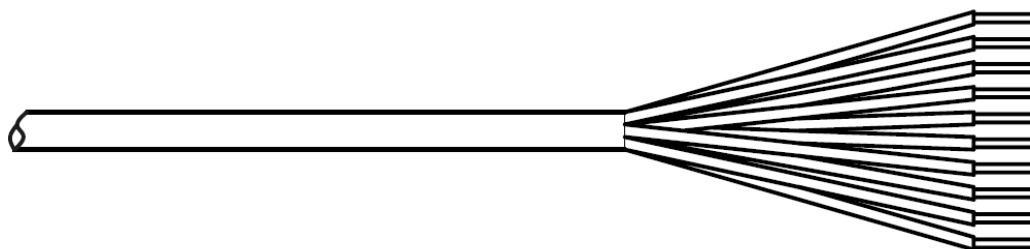
Figure 2 : Host Connection Wiring

Pin Assignment

Cable Color	Signal Name	Notes
Green	TxD	RS-232C Transmit Line
White	RxD	RS-232C Transmit Line
Gray	RTS	RS-232C Transmit Line
Blue	CTS	RS-232C Transmit Line
Brown	Trigger	External Trigger Input Terminal
Black	S-GND	Signal Line GND
Red	VCC	Power Voltage 4.5-5.5V (Typ.5V)
Orange	NG	External NG Output Terminal
Yellow	OK	External OK Output Terminal
Cable shield	F-GND	Frame GND

6.3. RS-232C Interface Circuit
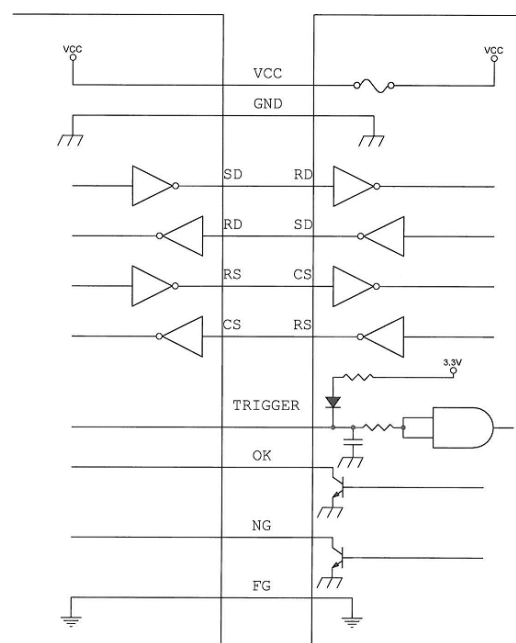
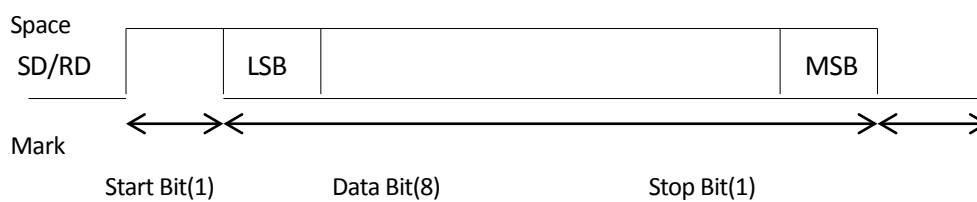*Figure 3: RS-232C Interface Circuit*

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6.4. Interface Cable

Preliminary Soldering Tip (RoHS)

φ3.8

3mm±1

7 +3/−1

1000 +50/-0   60 ±5
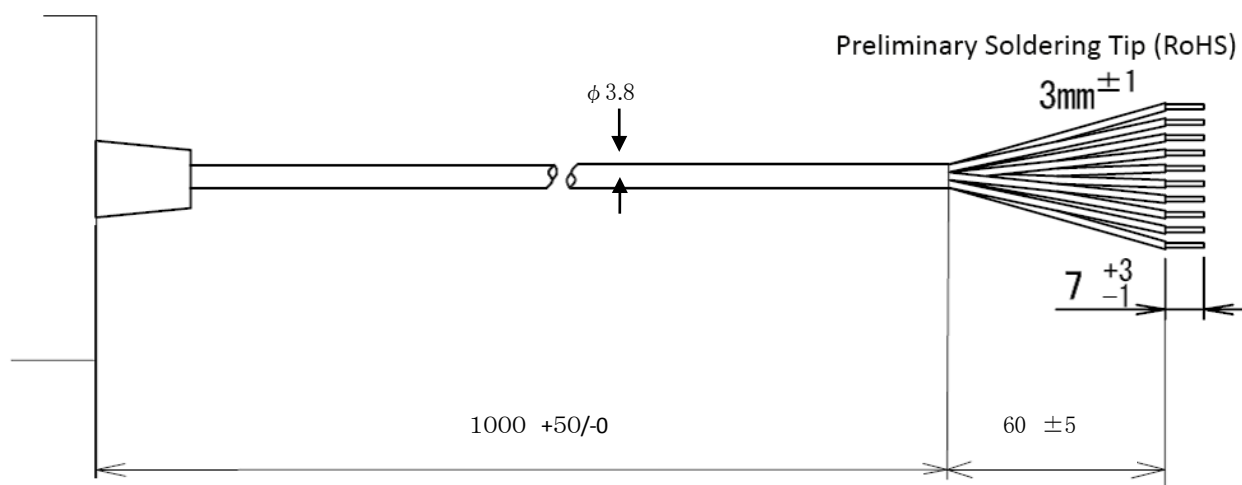
Total Weight: 90g

Figure 4: Cable

6.5. RS232C Transmission Format

6.5.1. Character Format (send/receive are the same)

Space
SD/RD | LSB | MSB

Mark

Start Bit(1)   Data Bit(8)   Stop Bit(1)

6.5.2. Transmission Format

Transmitted Data	Decoded Data		CR
Recieved Data	ESC	Command	CR
Otherwise	STX	Command	ETX

6.5. 3. Transmission Controls

The transmission control method may be chosen either via the menu below or commands:

| Transmission Control Method	Menu or Command
No Controls (No Handshaking)	P0
BUSY/READY	P1
MODEM	P2
ACK/NAK	P3
ACK/NAK NO ERROR	P4

A) No Control (No Handshaking)

Within this setting, the device will transmit without any knowledge of the Host's current status.
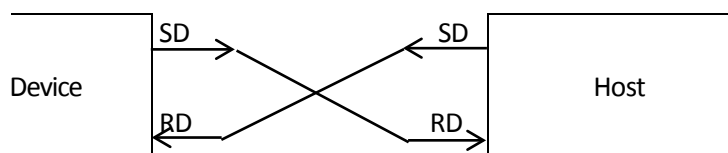
B) BUSY/READY

With this setting, both the Host System and Scanner may utilize the RS Line to relay to each other its BUSY/READY status.
By connecting the Scanner and Host System as shown in the drawing below, both devices can catch the others' status via the CS Line.
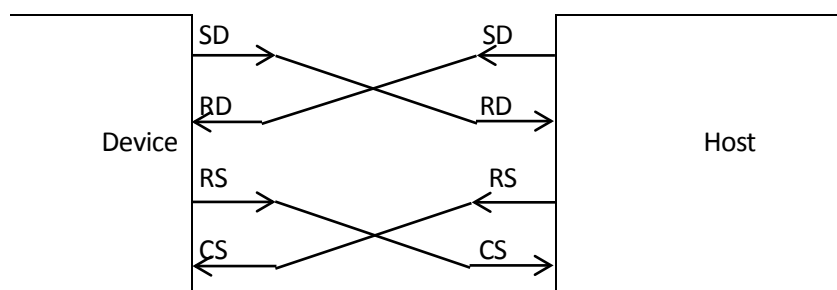
During a receiving process (such as a buzzer command execution), the device is always in an 'ON' (able to received data) state, except during a transmit or menu process.

Before transmitting data, the Scanner will check the CS Line.
If set to ON, transmitting will commence.   If OFF, waits until the specified time when it returns to ON.
If the CS Line is still set to OFF at the specified time, an error buzzer will sound off and the action will end automatically due to an abnormality.

The CS Wait Time is displayed below, with (I0) unlimited standard setting. (I0)

CS Wait Time	Menu or Command
Unlimited	I0
100msec	I1
200msec	I2
400msec	I3
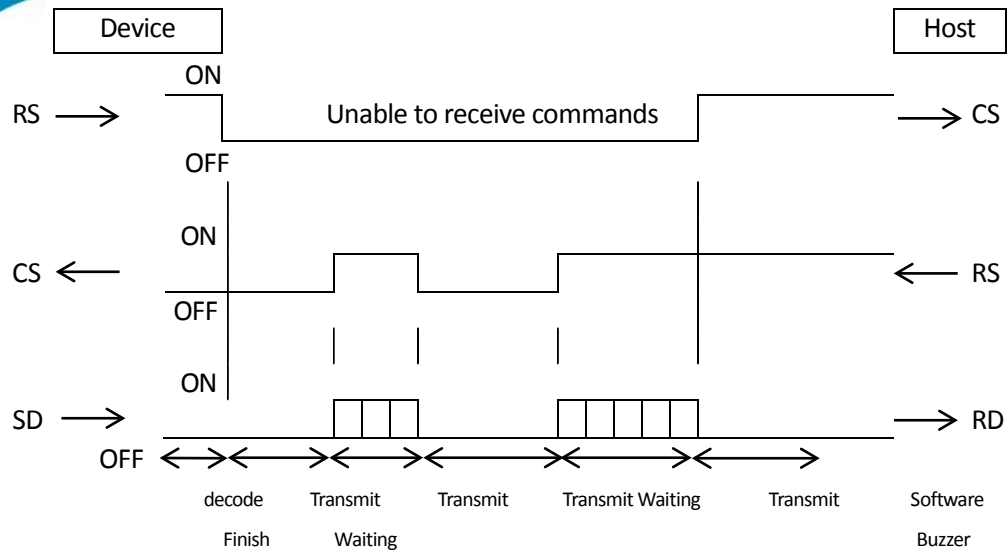
CS, SD Signal Timing

* During an SD Signal transmission, the CS Line (host-side RS signal) is switched to OFF, one character's worth
  is transmitted and then changes to standby.
 In addition, characters are transmitted once the CT signal catches said characters.
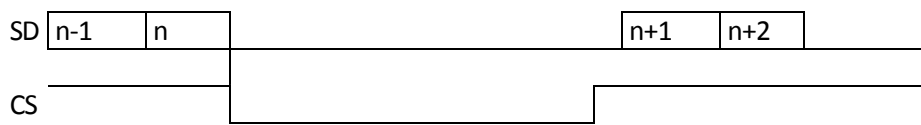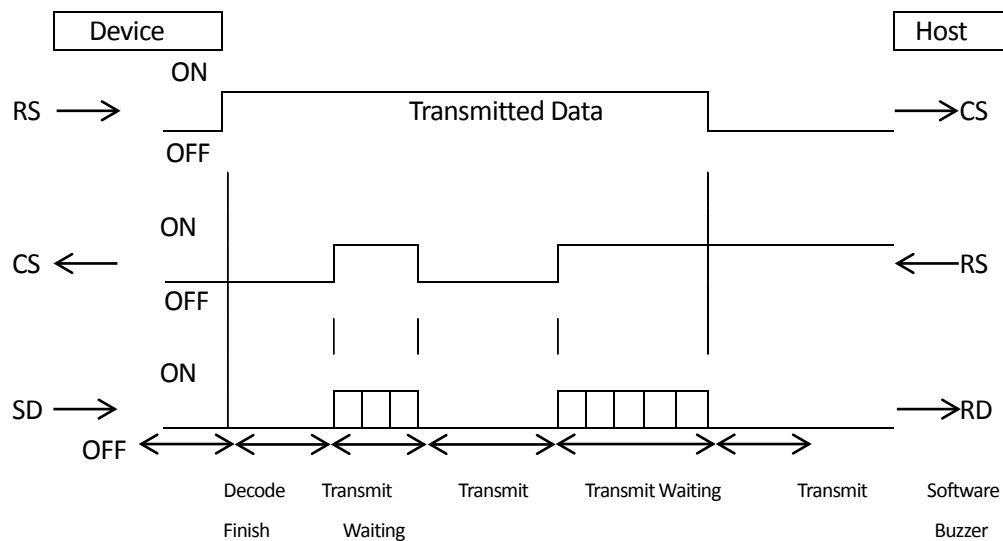

Caution: When setting a loop-back for this device's RS/CS line with the above setting,
No Handshaking (no controls) will not be implemented.

C) MODEM
 Within this setting, the device will switch RS line to 'ON' before transmitting data.
 All other processes are treated the same as BUSY/READY.

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D) ACK/NAK

After completing a data transmission, the scanner will wait for the host's response.

The host will respond with the following actions:

ACK Receive response → Standard Completion, the Good Read buzzer is sounded and returns to default status.

NAK Receive response → After retransmitting data returns to Response Wait.

DC1 Receive response → When trigger is present returns to awaiting trigger (default status).

Time Out→ Error buzzer is sounded and returns to default status.
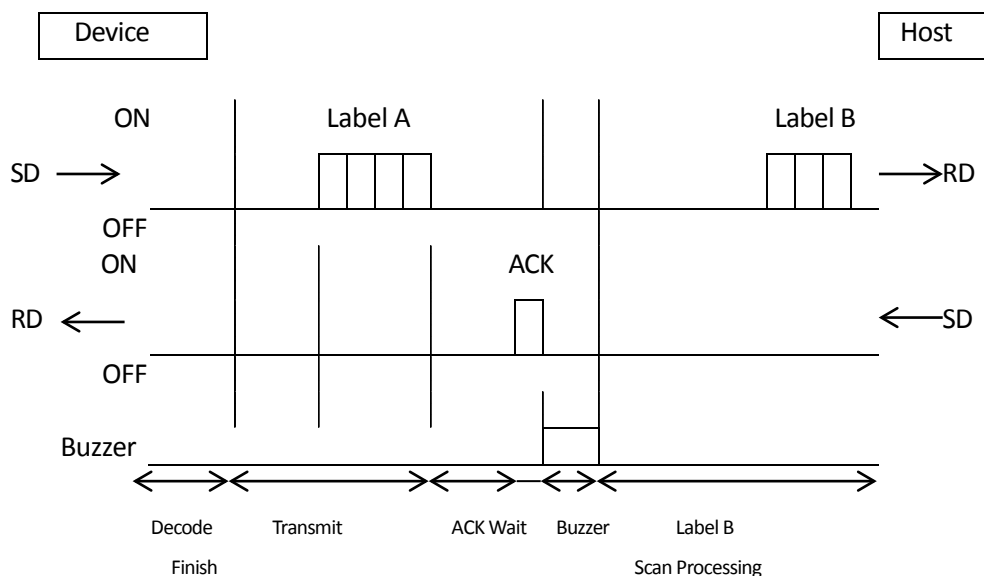
The Response Wait Time may be set with the below menu/commands:

I4: Unlimited (default settings)

I5: 100msec

I6: 500msec

I7: 1000msec

E) ACK/NAK No Error

When timing out the device assumes a positive response (ACK), wherein no error buzzer is sounded and returns to default status.

All other situations are handled the same as ACK/NAK.

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7. Optical Specifications

Item		Characteristics
Scanning Method	Linear CCD Sensor	—
Number of Active Pixels	2048 pixels	—
Image Capture Rate (*1)	Scanning Speed	700±10%
Focal Point (F.P)	Distance from front of Scanner	35.4mm
Scanning Light Source (LED×2)	Red LED Diode	—
	Wavelength	626 nm
	Directivity Angle 2θ1/2 (*2)	40°

＊ 1. Maximum Pixel Capture Rate

＊ 2. 40°is the reference value from the LED data sheet, with a spread angle of half-value of the Light Axis.

8. Scanning Characteristics

The conditions for the device's scanning characteristics are as shown below.

Conditions:

Environmental Temperature: regular temp/humidity

Environmental Lighting: 500-1,000 lx

Barcode Background: white

Power Voltage: 5.0V

Scan Rate: over 70% (according to Opticon standards)

8.1. Scan PCS (Print Contrast Signal)

Must be over 0.45 PCS; however, the spaces and margins must be over 70% reflectivity.

8.2. Scanning Position

Focal Plane (F.P):

The focal plane is approximately 35.4mm from the edge of the scanner.   This optimal position for optical performance is highly recommended for scanning barcodes; particularly high resolution or low PCS symbologies (barcodes with a width of up to 80mm may be scanned from this distance).

Light Axis:

The light axis is approximately 14.5±1mm from the device's underside.

The light axis will produce individual variations within this range (13.5-15.5mm), so be certain to set as such that the barcode receives the full quantity of light.
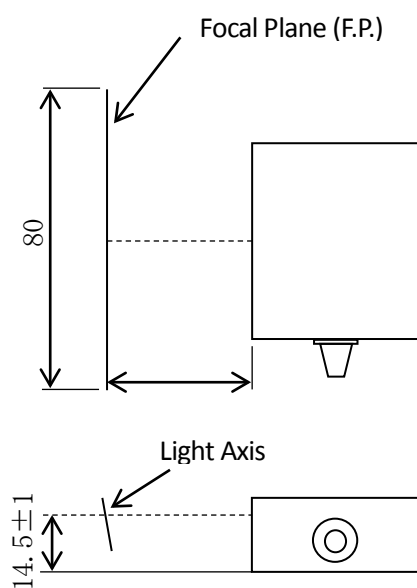
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Focal Plane (F.P.)

80

Light Axis

14.5±1

Figure 5: Scanning Position

8.3. Scan Performance

Item Number	Item	Notation	Specification Standards		X(mm)	α	β	θ	R
1	Scanning Width	-	80mm (with margins)		0	α2=10°	0°	0°	∞
2	Scanning Width + low PCS	-	60mm (with margins)		0	α2=10°	0°	0°	∞
3	High Resolution	-	Resolution (0.15)		0	α2=10°	0°	0°	∞
4	Scan depth	X	-5mm≦ X ≦7mm			α2=10°	0°	0°	∞
5	Before/After Tilt Angle (Skew Angle)	α	α1	10°≦α1≦25°	0		0°	0°	∞
			α2	10°≦α2≦25°	0		0°	0°	∞
6	Left/Right Tilt Angle (Pitch Angle)	β	β =	0°- 6°	0	α2=10°		0°	∞
7	Rotation (Tilt Angle)	θ	θ =	±10°	0	α2=10°	0°		∞
8	Curvature	R	R ≧	30mm(JAN-13)	0	α2=10°	0°	0°	
			R ≧	20mm(JAN-8)	0	α2=10°	0°	0°	

Barcode: Opticon test chart

    Item 1:   PCS=0.9, resolution 0.2, Code 39

    Item 2:   PCS=0.45, resolution 0.2, Code 39

    Item 3:   PCS=0.9, resolution 0.15, Code 39

    Item 4- 8:   PCS=0.9, resolution 0.26, Code 39

Barcode Position: the barcode is placed within the center of the device's scan window.

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* Scanning Width, Low PCS, High Resolution, Scan Depth, and Curvature:
   Setting the FP (h =35.4mm) position at 0, the specified range may be read when moving to either the + or - side.

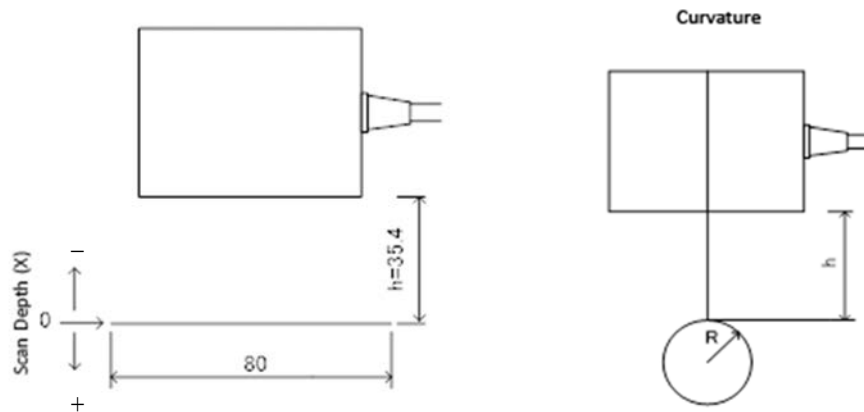   Only the F.P. will be scanned in regards to Scanning Width 80/60mm, High Resolution, and Curvature.

Figure 6: Scanning Width/Curvature

* The range (below) of specified criteria may be scanned in regards to multi directional tilt angle and rotations.
(Caution) With skew angle α, scanning is impossible when α1<10° and α2<10°due to it becoming the LED specular reflectance region.
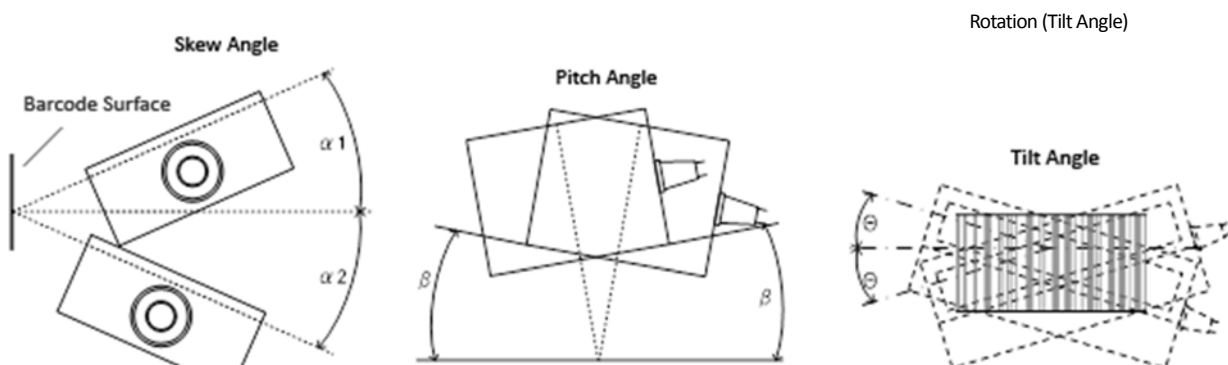Be sure to not set at this angle. 10°≦α1 * α2 ≦15° is recommended instead.

Figure 7: Angle Reading

8.4. Scanning Moving Barcodes

As shown in Figure 8 below, though the range of speed may vary, when scanning a barcode moving vertically it is important to capture the full barcode height 't'.
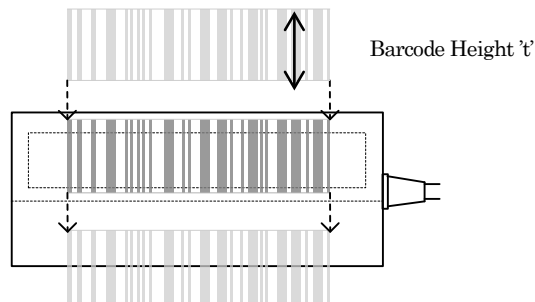

Barcode Height 't'

Figure 8 : Moving Barcode/Vertical Movement

As shown in Figure 9, when the barcode moves horizontally, the scanning performance drops substantially.
When operating in this manner, set such that when the barcode reaches the center of the device, it stops for duration of 200 msec before continuing.
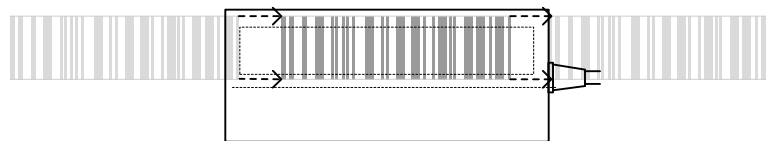

Figure 9 : Moving Barcode/Horizontal Movement

* Caution: As displayed in the above examples, depending on the conditions, the scan performance may vary when reading mobile barcodes.

9. Environmental Specifications

9.1. Temperature
Scanning is possible within the following temperature ranges:
Active Temperature: 0 - 40 ℃
Storage Temperature: -10 - 60 ℃

9.2. Humidity
Scanning is possible within the following humidity ranges:
Active Humidity: 25 - 85%RH (anti-freezing, anti-condensation)
Storage Humidity: 25 - 90%RH (anti-freezing, anti-condensation)

9.3. Ambient Light Immunity

Scanning is possible when the Barcode's Surface Illumination is 0lx greater than the following parameters:

Florescent Light: 5,000 lx

Incandescent Light: 5,000 lx

Conditions:

Barcode: Opticon test chart

                  PCS 0.9, Resolution 0.33, JAN-13

Distance: F.P 31.4mm from device front

Angle: Skew α2=10°、Pitch β=0°、Tilt θ=0°
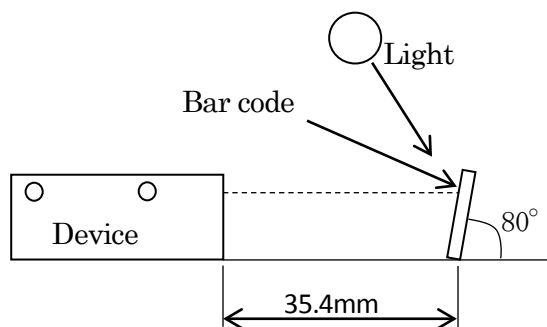
Curvature: R=∞

Power Voltage: 5.0V

Figure10: Environmental Lighting

9.4. Dust/Moisture

IP42

9.5. Vibration Strength (without packaging)

No malfunctions after the following vibration test:
Increase the frequency of the vibration from 10 to 100 Hz with accelerated velocity 19.6m/s^2 (2G) and sweep for 30 minutes (60 min. in one cycle) in non-operating state.   Repeat this routine in each X, Y, and Z direction.

9.6. Vibration Strength (with packaging)

No malfunctions after the following vibration test:
Contained in packaging, increase the frequency of the vibration from 10 to 100 Hz with accelerated velocity 19.6m/s^2 (2G) and sweep for 30 minutes (60 min. in one cycle).   Repeat this routine in each X, Y, and Z direction.

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9.7. Drop Impact Strength (without packaging)

Survives drop from 60cm onto concrete surface.
4 in each direction every 3 times, average 12 drops.

9.8. Drop Impact Strength (with packaging)

Averages 10 drops onto concrete surface from height of 150cm.

9.9. Electrical Characteristics

* No destruction: 15kV (applied 50 times to device exterior)
* No malfunction: Contact Discharge (direct/indirect):±5kV

* Follows test method (IEC61000-4-2 compliant) 150pF, 330 Ω

10. Compliance Standards

10.1. LED Safety Standards
IEC 62471-1:2006 Risk License Group

10.2. EMC
* EN55022
* EN55024
* FCC Part15 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.

* Class B VCCI

This product is a Class B Information Technology Device based on and complying with
the Voluntary Control Council for Interference (VCCI).
If this is used near a radio or television receiver in a domestic environment, it may cause
radio interference. Please use the device following guidelines as shown in the User's
Manual.

11. Regulatory and Safety Standards

RoHS compliant

* RoHS: The restriction of use of certain hazardous substance in electrical and electronic equipment,2011/65/EU.

12. Authentication

MTBF: 100,000 hours

LED authentication is described as shown below in A - C:

A. LED maker's guaranteed value- within 50% power down 1,000 hours continuous lighting at the rated current.

B. Using the above 'A' specifications as the scanner's light source, the actual-use LED current value for Opticon is set within 50% of the standard amount.

C. Using the above 'B' as company standard, the LED from scanners distributed via Opticon are guaranteed for approximately 10,000 hours.

13. Precautionary Items

Handling in the following ways may cause damage to the device:

(1) Impact

* Drops from longer distances than the specified maximum.

* Swinging the cable around.

* Setting heavy objects onto and/or stepping onto the cable.

(2) Heat Stress

* Usage/storage outside of recommended temperature ranges.

* Exposure to hot water.

* Exposure to fire.

* Bending the cable under temperatures that cause the cable to harden.

(3) Foreign Materials

* Contact with corrosive chemical substances.

(4) Other

* Do not unplug the connector while charging the AC adapter.

* Do not disassemble the device.

* Usage of the device in proximity to radio and/or TV systems may cause poor reception.

* The device may malfunction due to sudden drops or spikes in voltage, such as those caused by lightning, etc.

14. Product Nameplate

The label shown below is attached to the scanner via the shown figure:
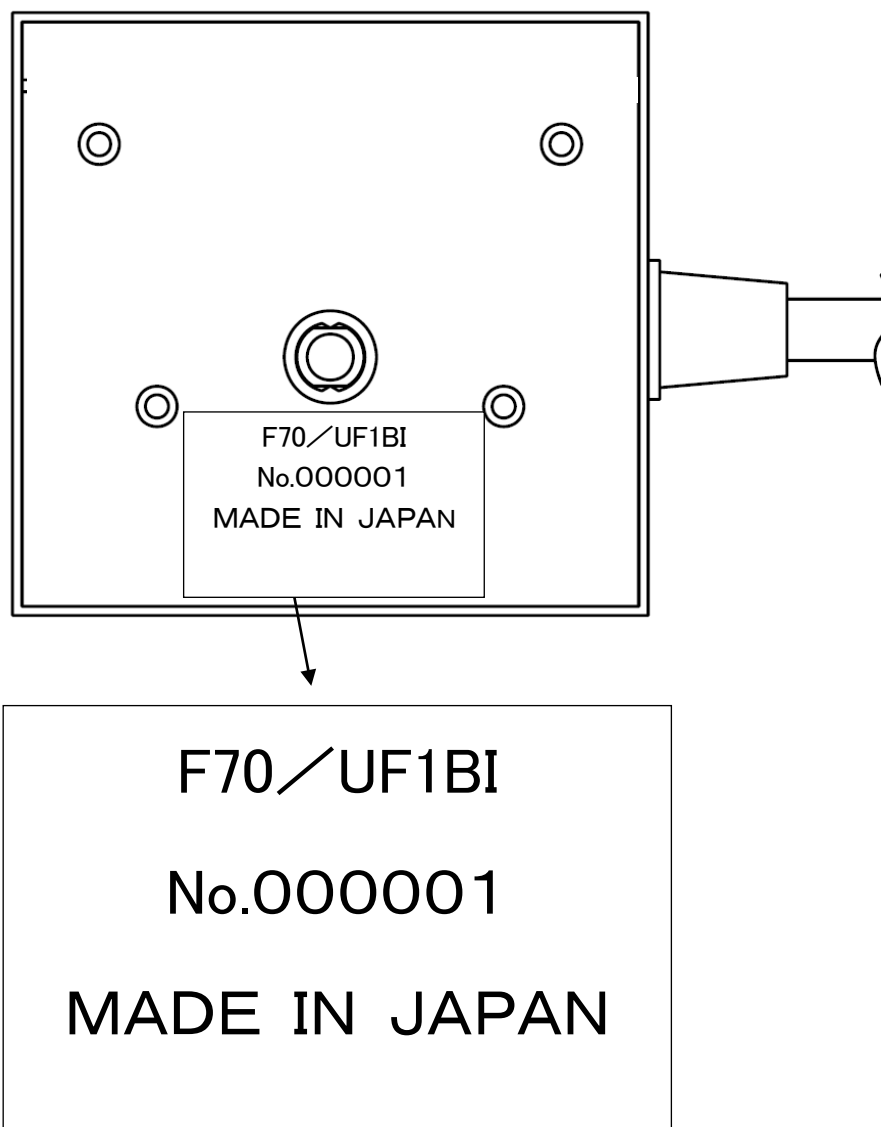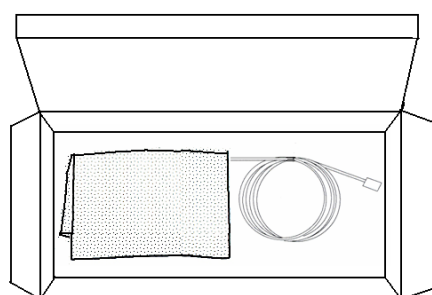

F70／UF1BI
No.000001
MADE IN JAPAN

F70／UF1BI
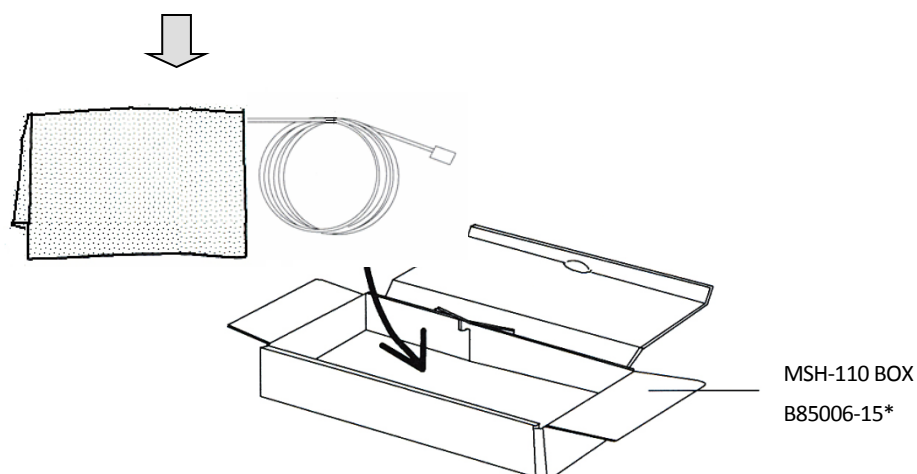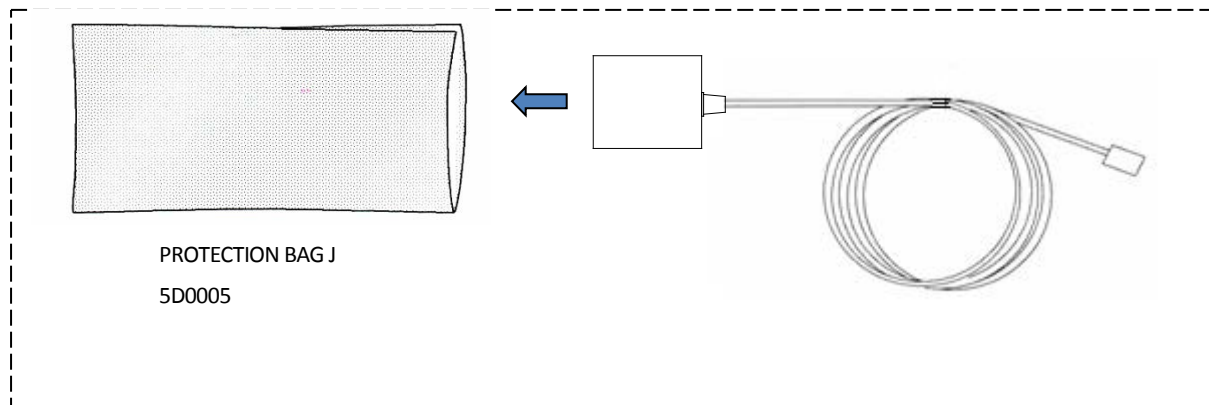
No.000001

MADE IN JAPAN

Figure 11: Model name label placement

The serial number is 6 digits from a sequence starting at 000001 and upward.

15. Packing Specifications

15.1. Individual Packaging

PROTECTION BAG J

5D0005

MSH-110 BOX

B85006-15*
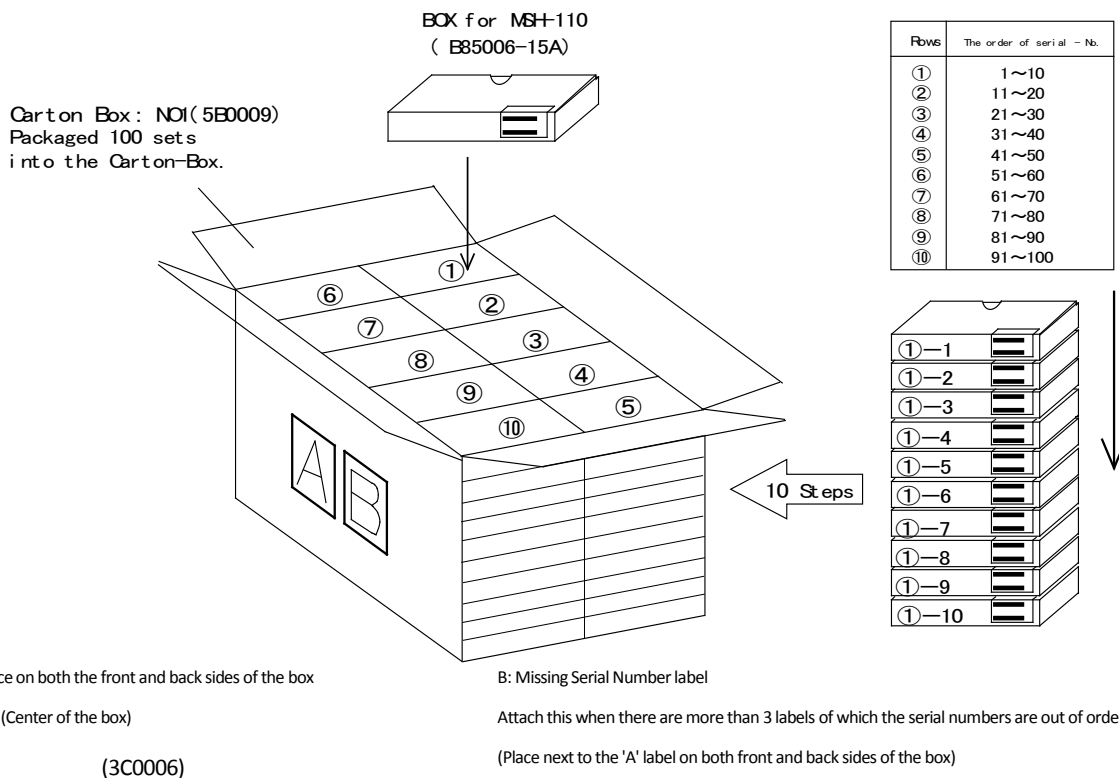
SERIAL LABEL/3A0002

Model No.   MADE IN JAPAN
  F-70-I-RS232C

Spec No.

 UF1F70BI

                                              Quantity 1

Serial No.
 * 0 0 0 0 0 1 *   (Ro)

Do not fold on the Bar Code.

15.2. External Packaging

BOX for MSH-110
（B85006-15A）

Carton Box: NOI(5B0009)
Packaged 100 sets
into the Carton-Box.

Rows	The order of serial - No.
①	1～10
②	11～20
③	21～30
④	31～40
⑤	41～50
⑥	51～60
⑦	61～70
⑧	71～80
⑨	81～90
⑩	91～100

10 Steps

①—1
①—2
①—3
①—4
①—5
①—6
①—7
①—8
①—9
①—10

A: Place on both the front and back sides of the box

  (Center of the box)

    (3C0006)

B: Missing Serial Number label

Attach this when there are more than 3 labels of which the serial numbers are out of order (not in sequence)

(Place next to the 'A' label on both front and back sides of the box)

C/No. △ △
MADE IN JAPAN

Product F-70-I-RS232C

SPec # *UF1F70BI*

' Qty   △△/△△△
    △△

S/N(from)
      △△△△△△

S/N(to)
      △△△△△△

Missing Serial Number Missing Q'ty △
  1
      △△△△△△
  2
      △△△△△△

ROM-Ver   TC03J△△

Shipping Date   20△△/△△/△△   Ro

OPTO ELECTRONICS Co., Ltd.

C/No. △ △
MADE IN JAPAN

Missing Serial Number   Missing Q'ty 10

  3
      △△△△△△
  4
      △△△△△△
  5
      △△△△△△
  6
      △△△△△△
  7
      △△△△△△
  8
      △△△△△△
  9
      △△△△△△
  1 0
      △△△△△△
  1 1
      △△△△△△
  1 2
      △△△△△△

OPTO ELECTRONICS Co., Ltd.

16. Mechanical Drawing

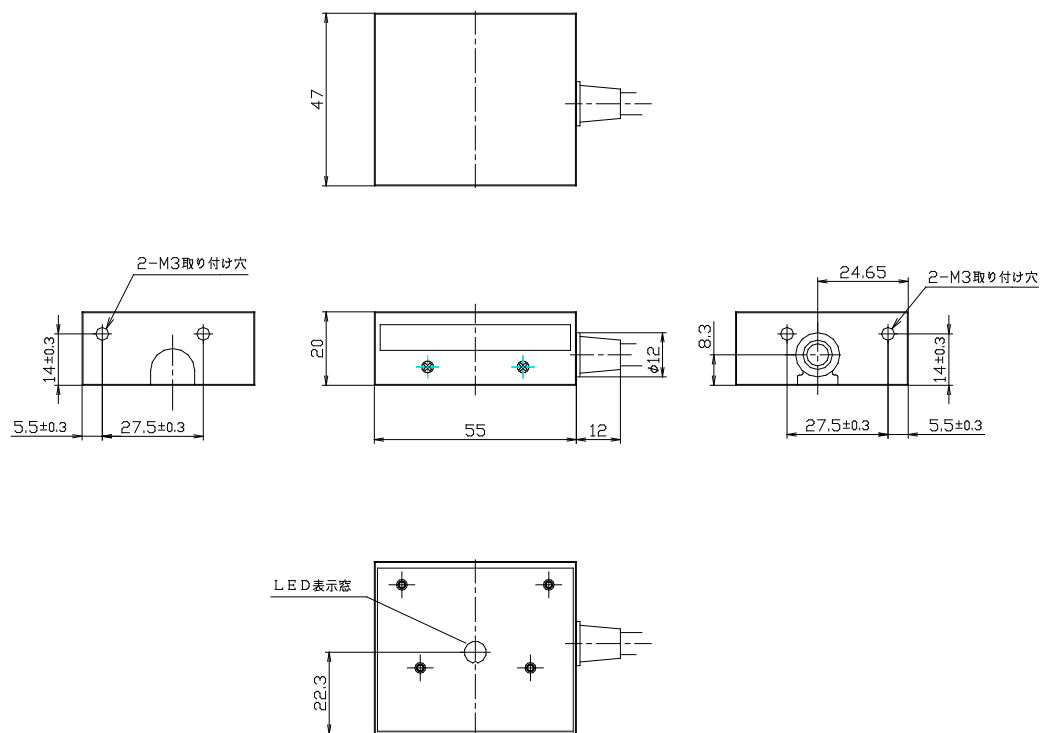Device Dimensions : 55.0 mm (W) x 52.0 mm (D) x 20.0 mm (H)

Total Weight:　　　110 grams (cables not included)

Figure 12: Mechanical Drawing