

OPTICON



The F70-L 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

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1. Abstract

The following specification manual is for the F-70-L-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	Code39: 0.15mm	
	Scan Curvature	Radius \geq 20mm (JAN-8) Radius \geq 30mm (JAN-13)	

No Specification PCS = 0.9

Item		Specifications	Notes	
Common Specifications	Scan Angle	Pitch: \pm to 30°	(Excluding dead zone)	
		Skew: \pm 60°		
		Tilt: \pm 10°		
	Minimum PCS	more than 0.45		
Power Source	Active Voltage Range		5.0 V \pm 5%	
	Consumption Current	Scanning	200mA (max)	
		Standby	100mA (max)	
Environmental Specifications	Temperature	Active	0-40°C	
		Storage	-10-60°C	
	Humidity	Active	Anti-freezing, condensation (20-85%)	
		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
		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

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	Domestic, 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
		No malfunctions	Contact Discharge (direct/indirect) : ± 5 kV	
	Radio Frequency Electromagnetic Field Amplitude Modulation	Frequency	80 - 1000 MHz	Measuring Condition: IEC61000-4-3 compliant
		Level	3 V/m	
		Modulation Depth	80 % (AM)	
	First Transient	Voltage	Alternator Input Cable: ± 1 kV	Measuring Condition: IEC61000-4-4 compliant
		Pulse	5 / 50 ns (Tr / Tw)	
		Frequency	5 kHz	
	Surge	Pulse	1.2 / 50 ns (Tr / Th)	Measuring Condition: IEC61000-4-5 compliant
		Voltage	L-P gap : ± 2 kV(closed circuit voltage) L-L gap : ± 1 kV(closed circuit voltage)	
	Power Frequency Magnetic Field	Frequency	50, 60 Hz	Measuring Condition: IEC61000-4-8 compliant
		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
Dip (2)		less than 60 %, 5 cycles		
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		

4. Detailed View

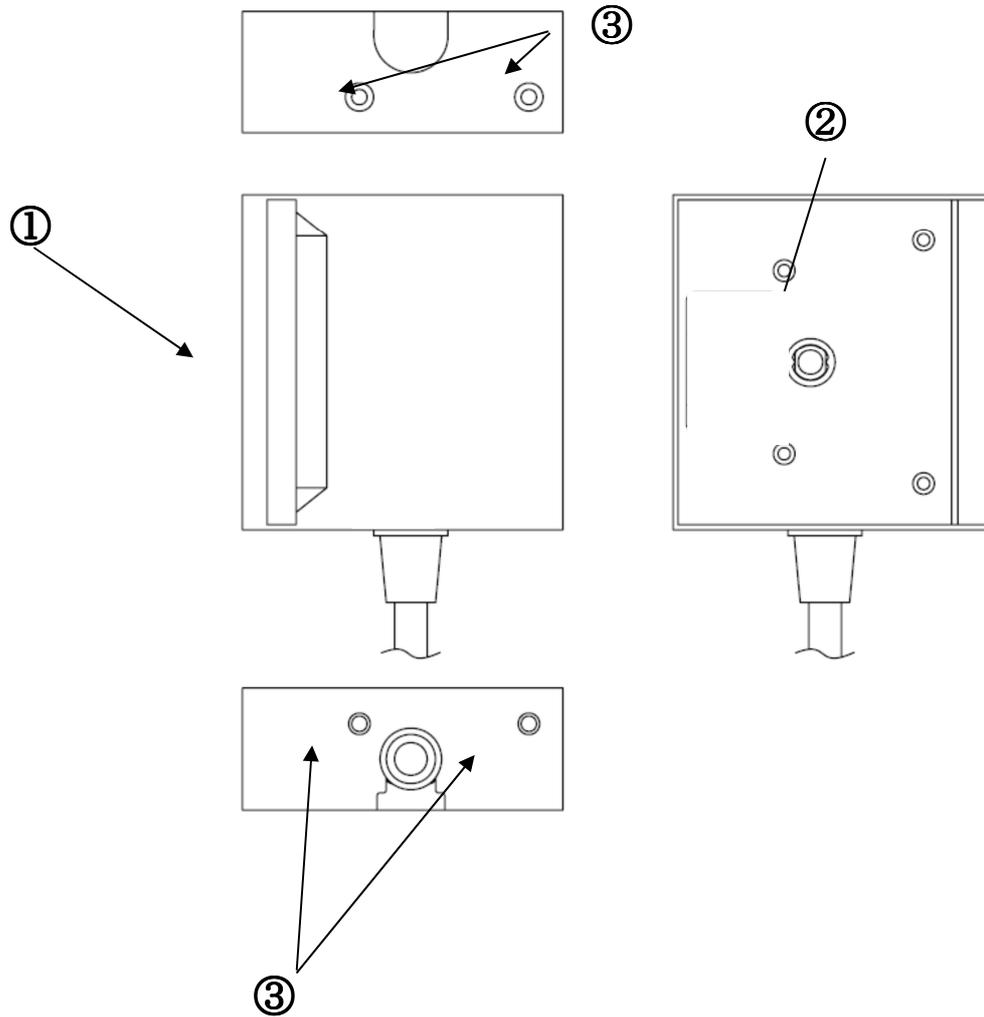


Figure 1: Detailed Explanation

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.

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

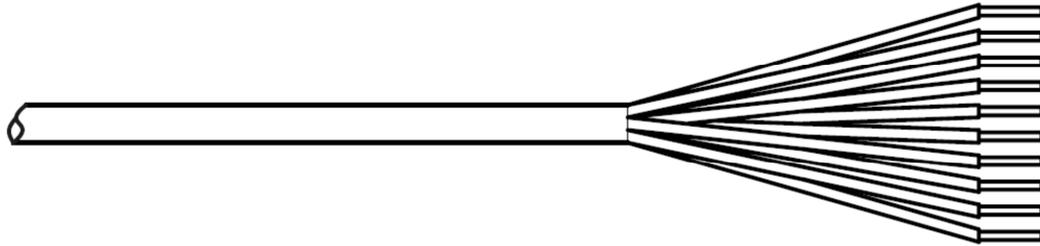


Figure 2 : Host Connection Wiring

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

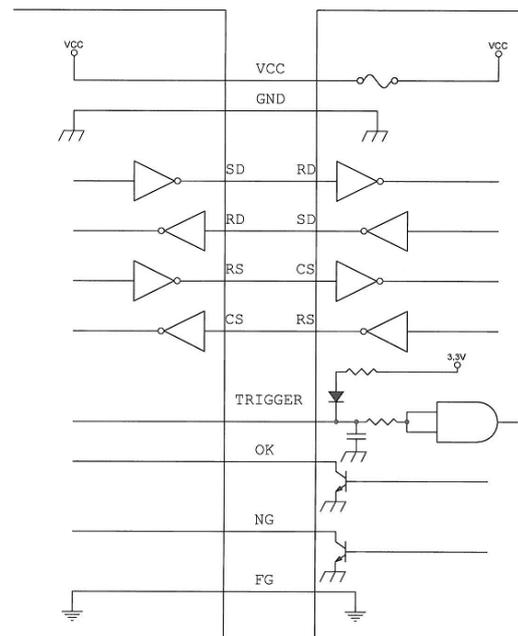
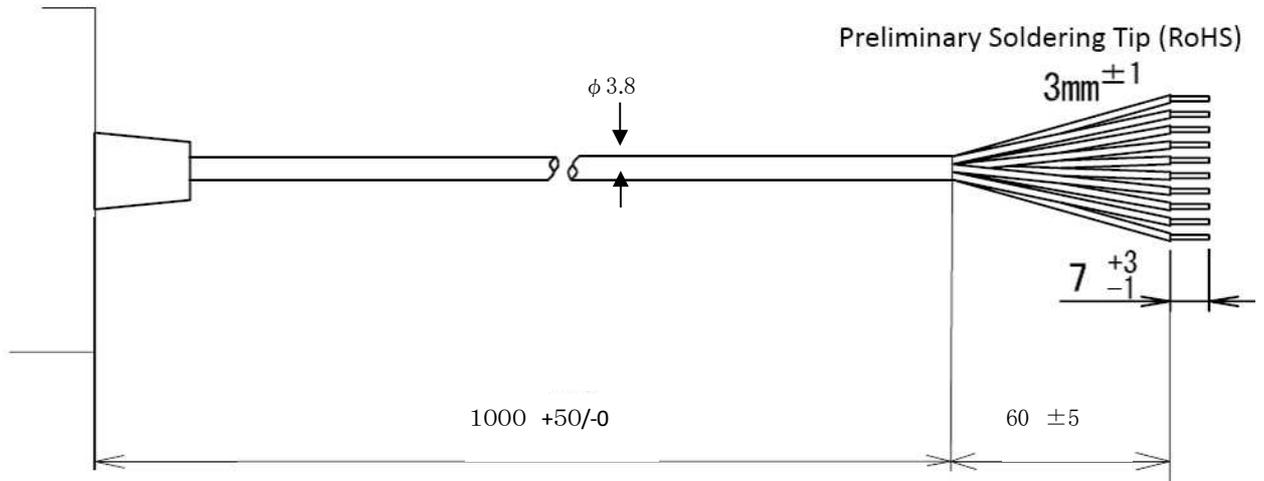


Figure 3: RS-232C Interface Circuit

6.4. Interface Cable

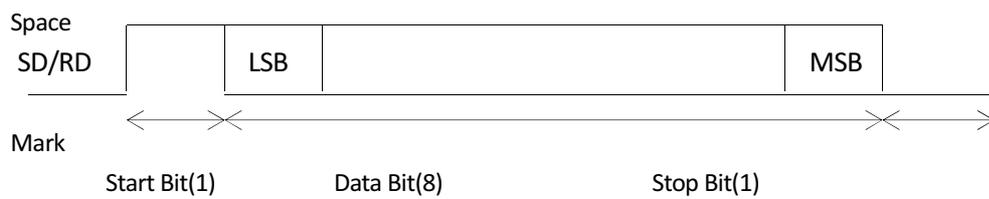


Total Weight: 90g

Figure 4: Cable

6.5. RS232C Transmission Format

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



6.5.2. Transmission Format

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

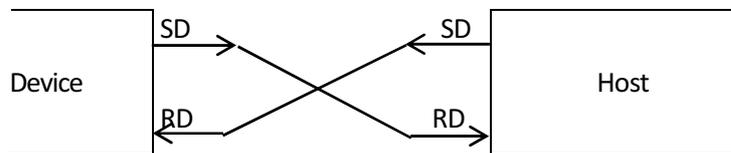
6.5. 3. Transmission Controls

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)

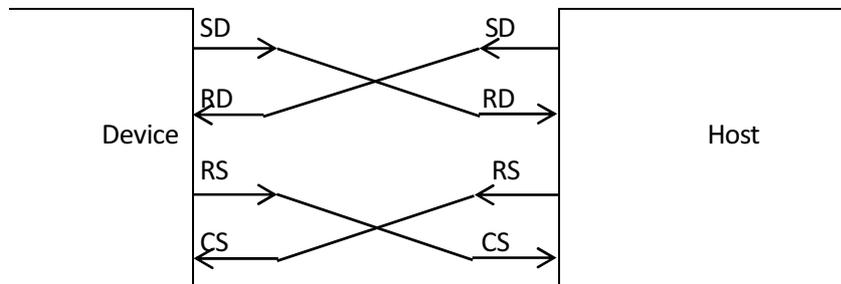
With this setting, the device will transmit without any knowledge of the Host's current status.



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.

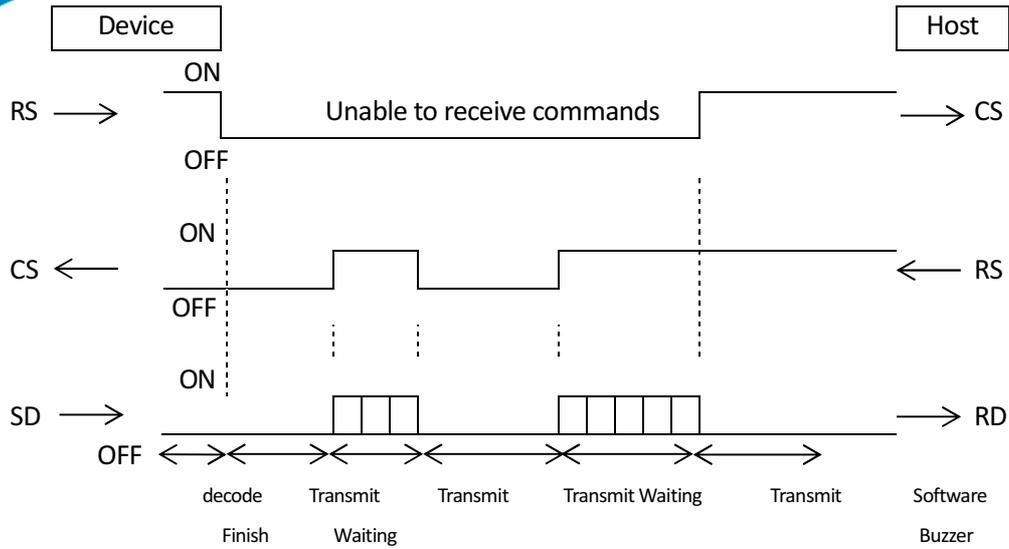
Before transmitting data, the Scanner will check the CS Line.

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)

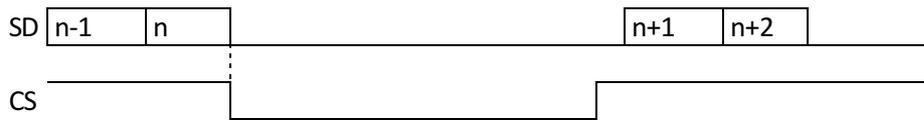
CS Wait Time	Menu or Command
Unlimited	I0
100msec	I1
200msec	I2
400msec	I3



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.

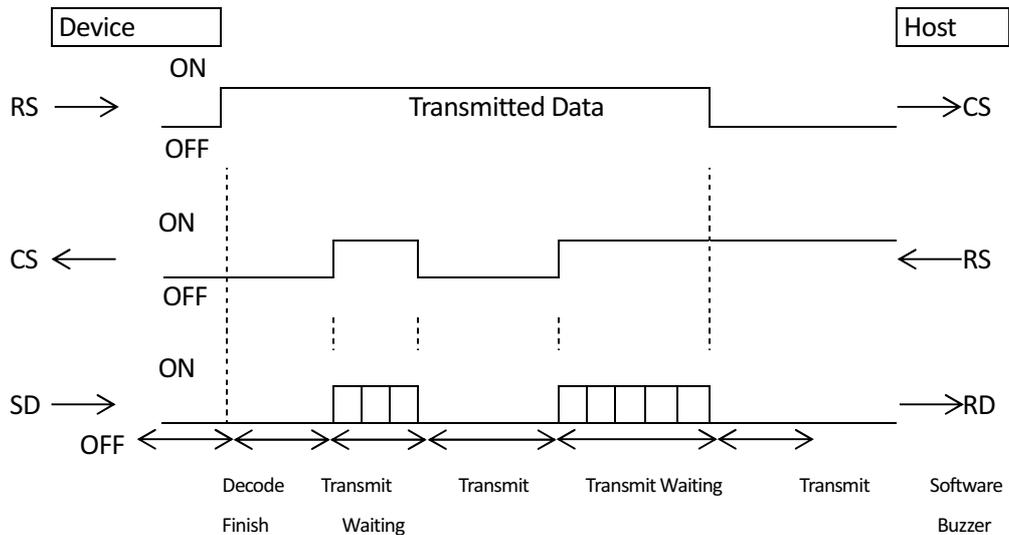


Caution: When setting a loop-back for this device's RS/CS line with the above setting, No Handshaking (no controls) will not be implemented.

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.



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.

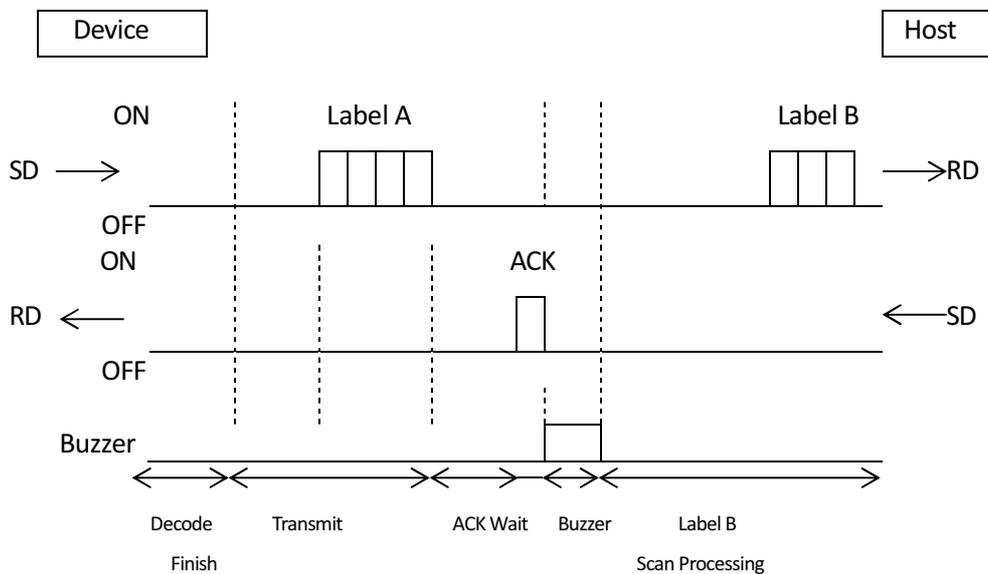
NAK Receive response → After retransmitting data returns to Response Wait.

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.

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	31.4mm
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 31.4mm 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:

Utilizing a Tilt Angle of 77°, the light axis is approximately 14.5±1mm from the edge of the device.

The light axis will produce individual variations within this range (1±1.5mm), so be certain to set as such that the barcode receives the full quantity of light.

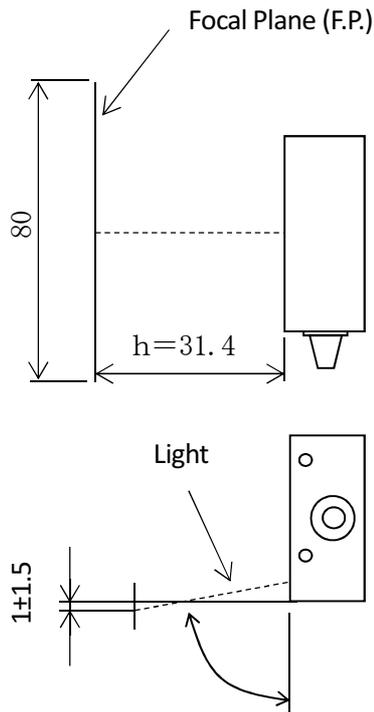


Figure 5: Scanning Position

8.3. Scan Performance

Item Number	Item	Notation	Specification Standards	X(mm)	α	β	θ	R
1	Scanning Width	-	80mm (with margins)	0	$\alpha 2=10^\circ$	0°	0°	∞
2	Scanning Width + low PCS	-	60mm (with margins)	0	$\alpha 2=10^\circ$	0°	0°	∞
3	High Resolution	-	Resolution (0.15)	0	$\alpha 2=10^\circ$	0°	0°	∞
4	Scan depth	X	$-5\text{mm} \leq X \leq 7\text{mm}$		$\alpha 2=10^\circ$	0°	0°	∞
5	Before/After Tilt Angle (Skew Angle)	α	$\alpha 1$ $10^\circ \leq \alpha 1 \leq 25^\circ$	0		0°	0°	∞
			$\alpha 2$ $10^\circ \leq \alpha 2 \leq 25^\circ$	0		0°	0°	∞
6	Left/Right Tilt Angle (Pitch Angle)	β	$\beta = 0^\circ - 6^\circ$	0	$\alpha 2=10^\circ$		0°	∞
7	Rotation (Tilt Angle)	θ	$\theta = \pm 10^\circ$	0	$\alpha 2=10^\circ$	0°		∞
8	Curvature	R	$R \geq 30\text{mm}(\text{JAN-13})$	0	$\alpha 2=10^\circ$	0°	0°	
			$R \geq 20\text{mm}(\text{JAN-8})$	0	$\alpha 2=10^\circ$	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.

* Scanning Width, Low PCS, High Resolution, Scan Depth, and Curvature:

Setting the FP (h = 31.4mm) 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.

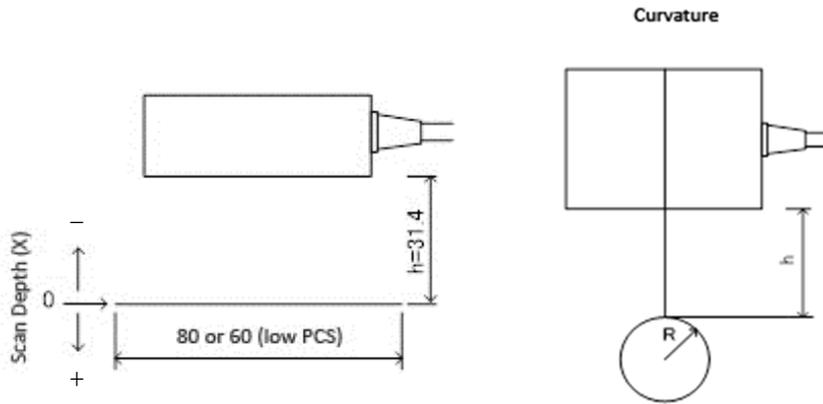


Figure 6: Scanning Width/Curvature

* 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 $\alpha_1 < 10^\circ$ and $\alpha_2 < 10^\circ$ due to it becoming the LED specular reflectance region.

Be sure to not set at this angle. $10^\circ \leq \alpha_1 * \alpha_2 \leq 15^\circ$ is recommended instead.

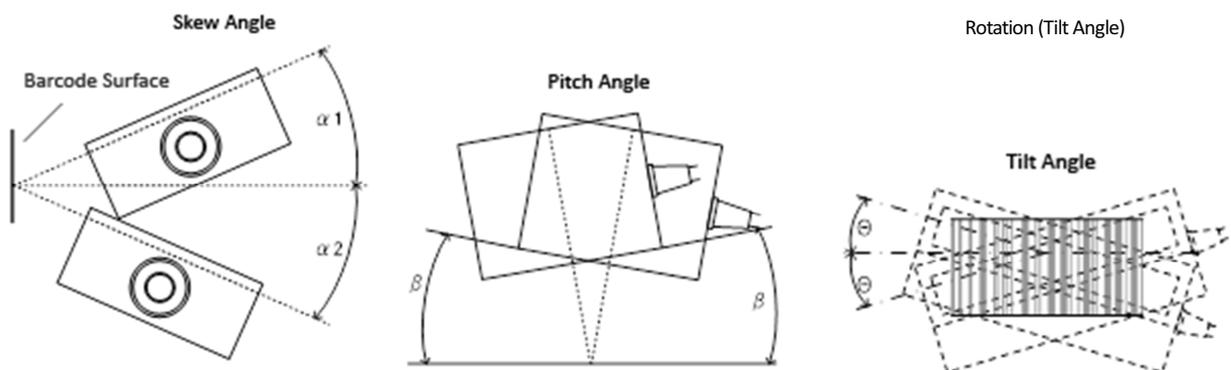


Figure 7: Angle Reading

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'.

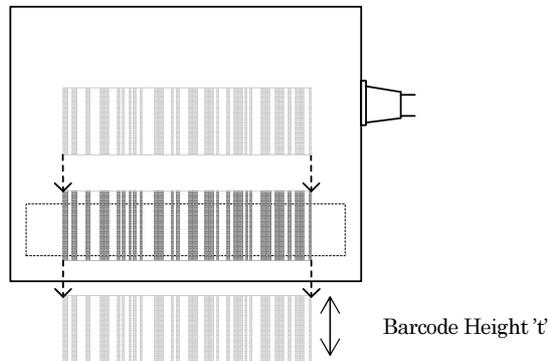


Figure 8: Moving Barcode/Vertical Movement

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.

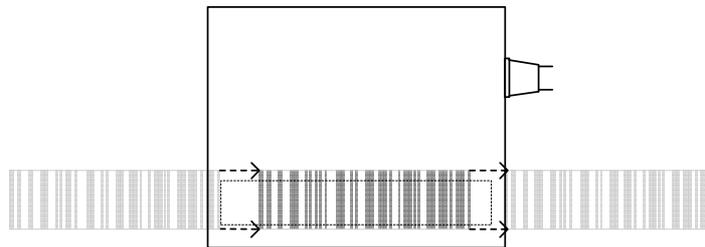


Figure 9: Moving Barcode/Horizontal Movement

* 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 °C

Storage Temperature: -10 - 60 °C

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 01x 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 $\alpha=10^\circ$, Pitch $\beta=0^\circ$, Tilt $\theta=0^\circ$

Curvature: $R=\infty$

Power Voltage: 5.0V

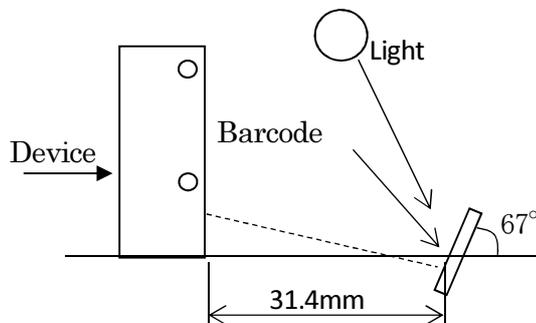


Figure10: Environmental Lighting

9.4. Anti-Dust/Moisture Structure

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.

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): ± 5 kV

- * 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:

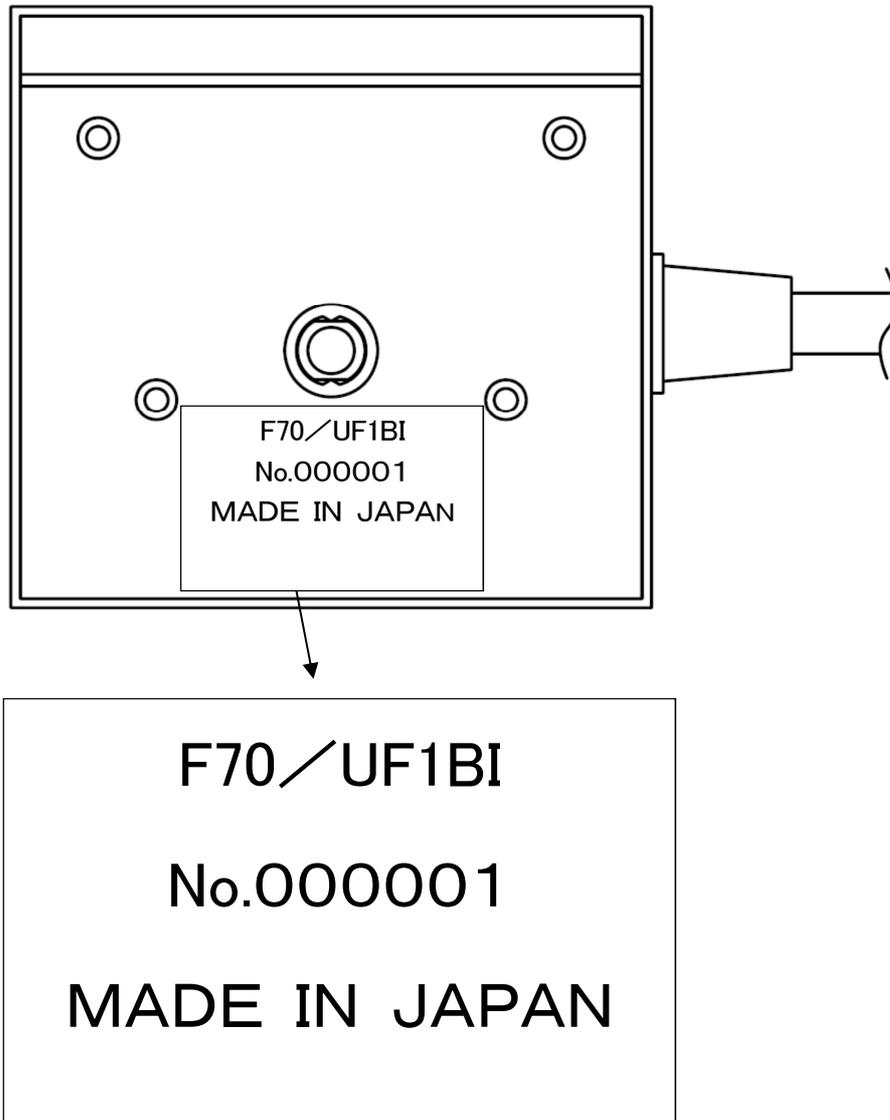
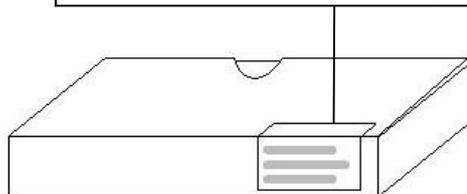
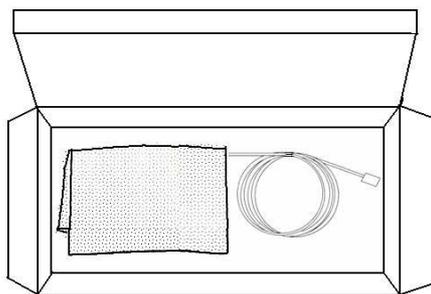
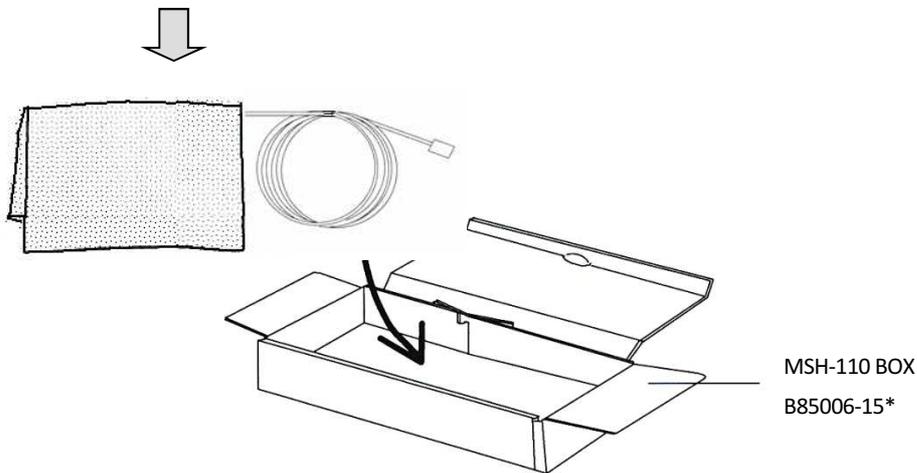
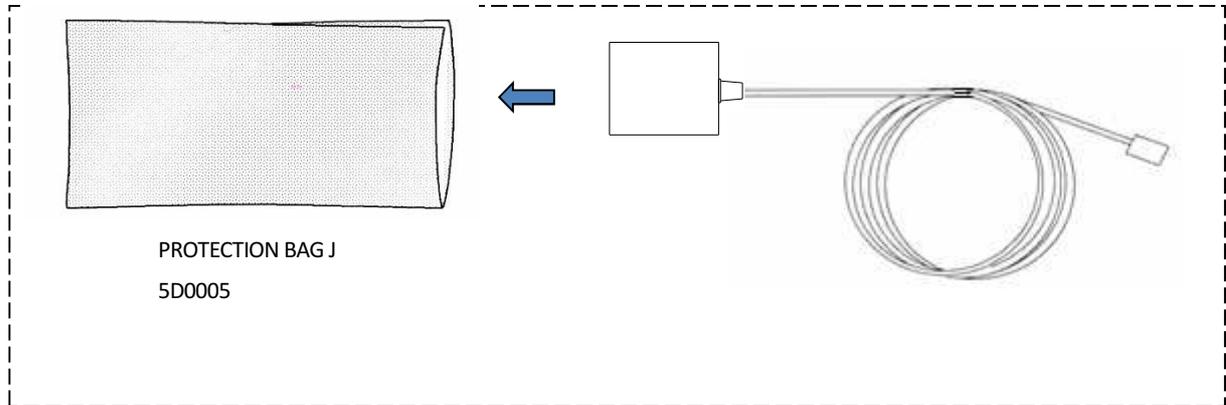


Figure 11: Model name label placement

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

15. Packing Specifications

15.1. Individual Packaging



Do not fold on the Bar Code.

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)

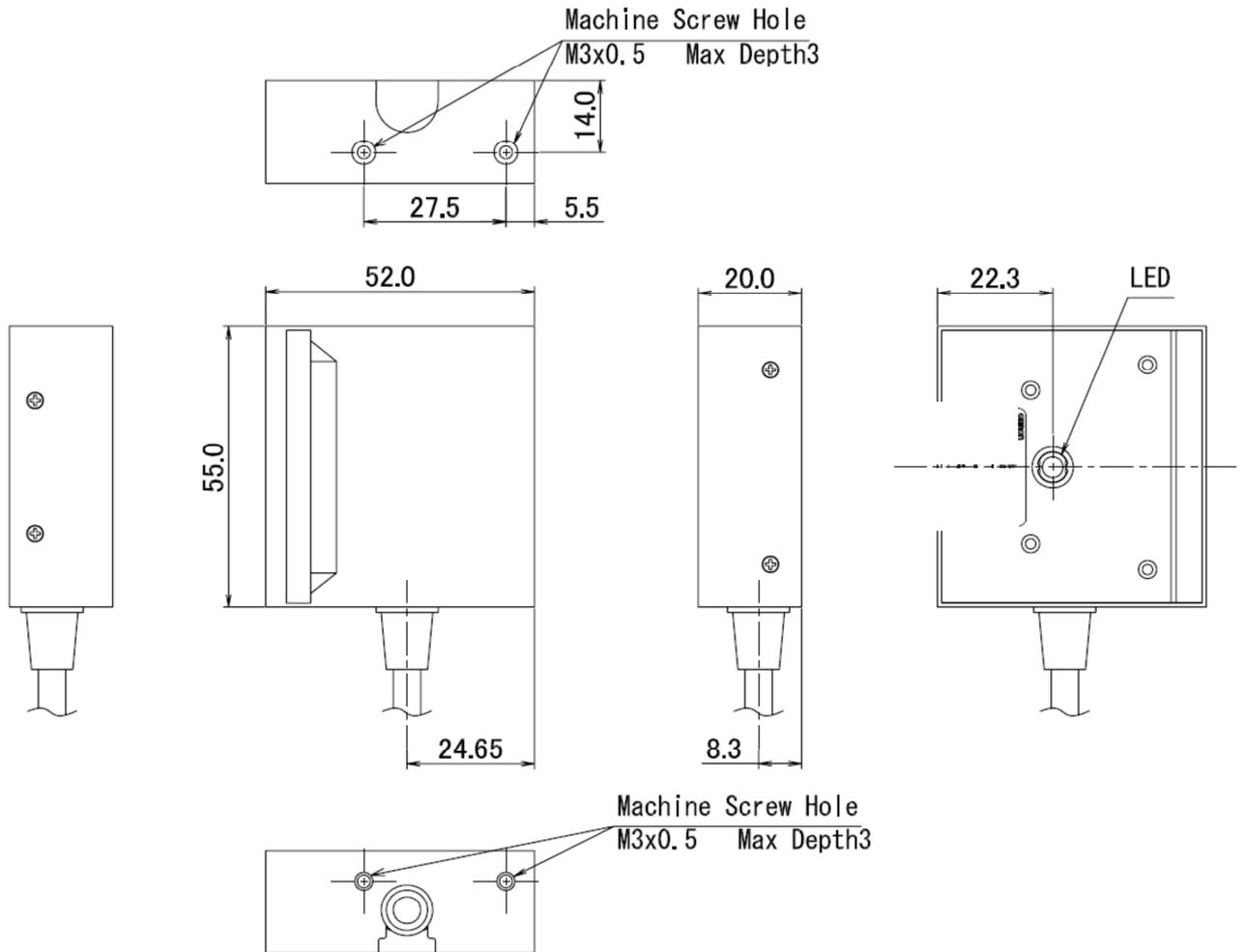


Figure 12: Mechanical Drawing