# B5T

Human Vision Components (HVC-P2)

HVC incorporates ten different image sensing functions like Face recognition in an easy-to-mount and compact format to provide image sensing capability to various devices.

- **Choice of wide-angle type and long-distance type depending of detection distance or range needs.**
- **Incorporates ten different image sensing functions used to recognize people's conditions.**
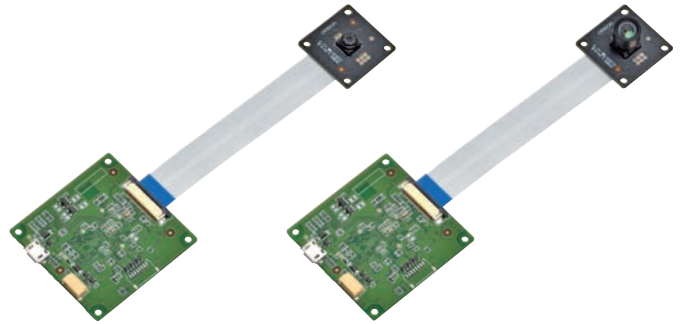
Make sure to read the Terms of Use before using the Product.
Omron will see any use of the Product as an indication that you agree and will comply with the contents of these Terms of Use.

"HVC" stands for "Human Vison Components".

RoHS compliant

⚠ Refer to Safety Precautions on page 10.

Model

Lens angle	Model	Packaging	Minimum contents per box
Approximately 50 deg. (long-distance type)	B5T-007001-010	Individual box	1 unit
	B5T-007001-010-H	Large box	50 units
Approximately 90 deg. (wide-angle type)	B5T-007001-020	Individual box	1 unit
	B5T-007001-020-H	Large box	50 units

For detailed interface specifications for the Product, refer to the Command Specifications document (provided separately).

Information concerning the following items related to the Product:

- Datasheet
- Command Specifications document
- USB drivers
- Evaluation software
- Sample codes
- Other development related documentation

can be downloaded from the website below:

https://www.components.omron.com/mobile/hvc_p2

Term Definitions

- The "Product" indicates the BT5-007001-010 models. It consists of the "Device" and the "SDK". In this instruction sheet, the word "Product" refers to the whole or a part of them.
- The "Device" indicates the hardware component that consist of the main board, the camera board and the flexible flat cable (FFC).
- The "SDK" consists of the evaluation software, the command specifications, sample codes and other documentations concerning the "Device" or the "SDK."

Ratings / Specifications / Functions

■ Ratings

Item	Rated values (standards)
Supply voltage	5 VDC ±10%
Consumption current	Below 0.25 A
Operating temperature	0 to +50°C (no condensation or freezing)
Operating humidity	Below 90% RH (no condensation or freezing)
Storage temperature	-30 to +70°C (no condensation or freezing)
Storage humidity	Below 90% RH (no condensation or freezing)

■ Specifications & Functions

Image Input Specifications

Item	Specifications	
	B5T-007001-010 model	B5T-007001-020 model
Detection resolution	1600 × 1200 pixels	1600 × 1200 pixels
Horizontal detection range (angle of view)	54°±3°	94°±5°
Vertical detection range (angle of view)	41°±3°	76°±5°
Optical axis inclination	±4°	±7°
Rotation alignment	±2°	±2°

Image Output Specifications

Item	Specifications
Output image	No output / 160 × 120 pixels / 320 × 240 pixels (choose one)
Image format	RAW (8-bit, Y data)

Angle Range *1

Function	Pitch angle (up-down)	Yaw angle (left-right)	Roll angle
Human body detection	Up 15° *2 Down -30° *2	360° *3	±10°
Hand detection	±20°	±30°	
Face detection	±30°	±90°	
Face direction estimation			±45°
Age estimation			
Gender estimation	Face direction ±20°	Face direction ±30°	
Blink estimation			
Expression estimation			
Face recognition			
Gaze estimation	Gaze angle ±20° *4 (up to face direction ±10°)	Gaze angle ±30° *4 (up to face direction ±20°)	

*1. The detection and estimation accuracy will fall when outside the specified angle range.
Note that being within range indicated above does not always guarantee successful detection.
*2. "Up direction 15°" indicates that the camera is looking up to the target from a 15° downward angle and "Down direction -30°" indicates that the camera is looking down to the target from a 30° upward angle.
*3. This indicates all the directions to the left and right of the human body.
*4. This is the angle when facing the camera, regardless of the face direction angle.
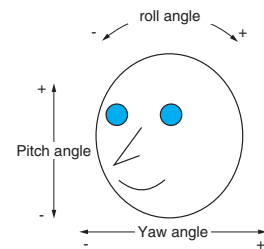
Host Communication Specifications

UART

Item	Specifications
Feature	Receives the command controlling the module from the host and sends back the detection result info
System	Full duplex bidirectional system
Protocol	Non-procedural
Sync	Asynchronous method
Data format	Start: 1 bit, Data: 8 bit, Stop: 1 bit, no parity
Transmission code	NRZ method, Logic low: 0V & logic high: 3.3 V
Transmission rate	9600 (Default value)/38400/115200/230400/460800/921600 bps, can be changed through commands

USB

Item	Specifications
Feature	Receives the command controlling the module from the host and sends back the detection result info
System	USB 2.0 (CDC class used)
Protocol	Non-procedural
Data format	Start: 1 bit, Data: 8 bit, Stop: 1 bit, no parity
Supported OS	Windows 7, 32 bit (refer to website for other versions) https://www.components.omron.com/mobile/hvc_p2

Image Sensing Functions

Function	Output	Details
Human Body Detection, Face Detection, Hand Detection	Number of detected objects	Maximum of 35 per object type
	Position (center coordinates)	Coordinates on the screen from the top-left corner of the screen (in pixels)
	Size	Pixel size on the input image
	Degree of confidence	Confidence in the detection result (0 to 1000), a higher value indicates a higher confidence
Face Direction Estimation	Yaw angle	Positive to the right (in degrees)
	Pitch angle	Positive upwards (in degrees)
	Roll angle	Positive clockwise (in degrees)
	Degree of confidence	Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
Gaze Estimation	Yaw angle	Positive to the right (in degrees)
	Pitch angle	Positive upwards (in degrees)
Blink Estimation	Blink degree	Output for both eyes (1 to 1000), a higher value indicates the eye is closer to being fully shut
Age Estimation	Age	0 to 75 (75 includes higher ages)
	Degree of confidence	Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
Gender Estimation	Gender	Male or female
	Degree of confidence	Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
Expression Estimation	Score for 5 expressions	0 to 100 The score will be output for each expression ("neutral", "happiness", "surprise", "anger" and "sadness"). The score indicates the likeliness of a face displaying the estimated expression, where a higher score indicates a higher likeliness of being that expression.
	Expression degree (positive or negative)	+100 to -100 A degree closer to +100 indicates a high degree of "happiness" while a degree closer to -100 indicates a high degree of "surprise", "anger" or "sadness".
Face Recognition	Individual identification result	Displays either the registered User ID, or "non-registered" for non-registered individuals Maximum number of users: 100 Maximum number of data per use: 10 Registration is done with the Product.
	Score	Matching degree (0 to 1000) The result of the user with the highest matching degree is output. A degree closer to 1000 indicates a higher likeliness of being that user

Degrees of confidence are grain size 1. Angles are for when facing the camera.

Detection Distance (for reference*)

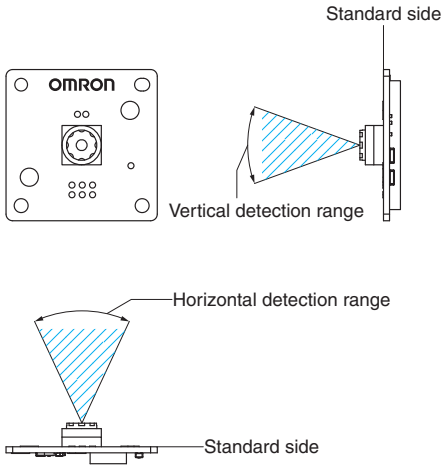| Function	Maximum distance	
	B5T-007001-010	B5T-007001-020
Human Body Detection	17 meters	8 meters
Hand Detection	6 meters	3 meters
Face Detection	10 meters	5 meters
Face Direction Estimation, Gaze Estimation, Blink Estimation, Age Estimation, Gender Estimation, Expression Estimation, Fac Recognition	3 meters	1.5 meters

* Caution: Please note that the detection and estimation performance will gradually fall when exceeding the maximum distance indicated for reference.
  Please note that being within the range indicated above does not always guarantee successful detection.

■ Image Input Specification Item Definitions

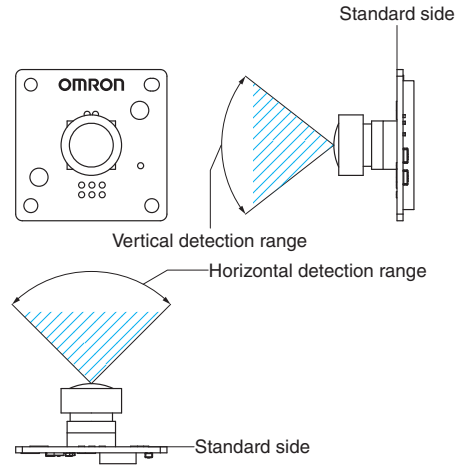**Horizontal and Vertical Detection Range (angles of view)**
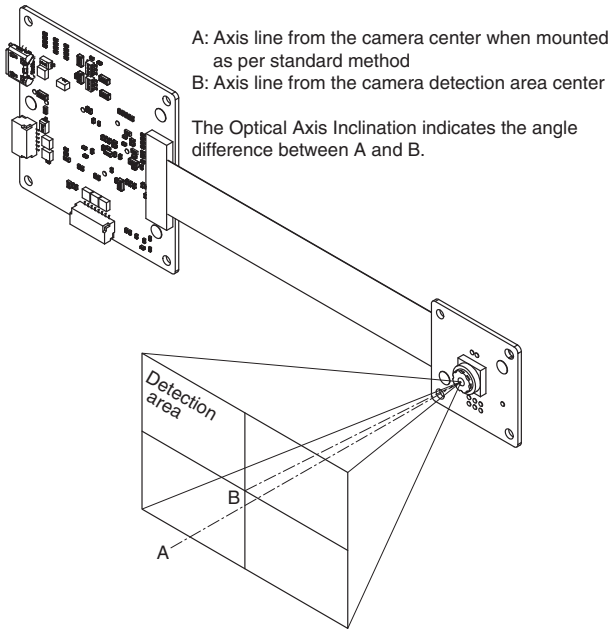
Horizontal angle of view 50°
B5T-007001-010

Standard side

Vertical detection range

Horizontal detection range

Standard side

Horizontal angle of view 90°
B5T-007001-020

Standard side

Vertical detection range

Horizontal detection range

Standard side

Optical Axis Inclination

Horizontal angle of view 50°
B5T-007001-010

A: Axis line from the camera center when mounted
   as per standard method
B: Axis line from the camera detection area center

The Optical Axis Inclination indicates the angle
difference between A and B.

Detection
area

B

A

Horizontal angle of view 90°
B5T-007001-020

A: Axis line from the camera center when mounted
   as per standard method
B: Axis line from the camera detection area center

The Optical Axis Inclination indicates the angle
difference between A and B.

Detection
area

B

A
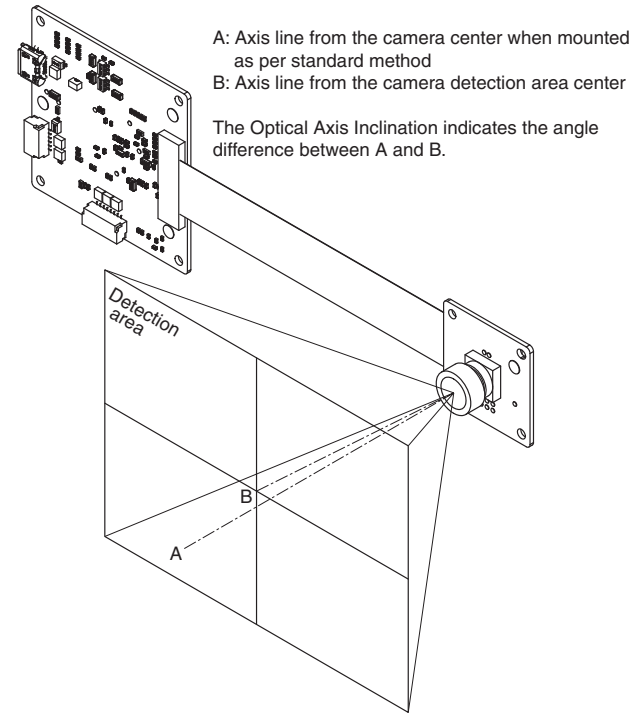
Rotation Alignment
Horizontal angle of view 50°
B5T-007001-010

C: Horizontal and parallel line when mounted as
per standard method
D: Horizontal line of the camera detection area

The Rotation Alignment indicates the angle
difference between C and D.

Horizontal line when mounted
as per standard method

Detection area

C
D

Horizontal angle of view 90°
B5T-007001-020

C: Horizontal and parallel line when mounted as
per standard method
D: Horizontal line of the camera detection area

The Rotation Alignment indicates the angle
difference between C and D.

Horizontal line when mounted
as per standard method

Detection area

C
D

Connection

■ Block Diagram

B5T-007001

Host

UART connector

UART(3.3V)

Reset

DC5V Power supply

Recognition Process Section

Command   Results

Camera board

USB connector

USB

DC5V Power supply

Main board

Customer circuit
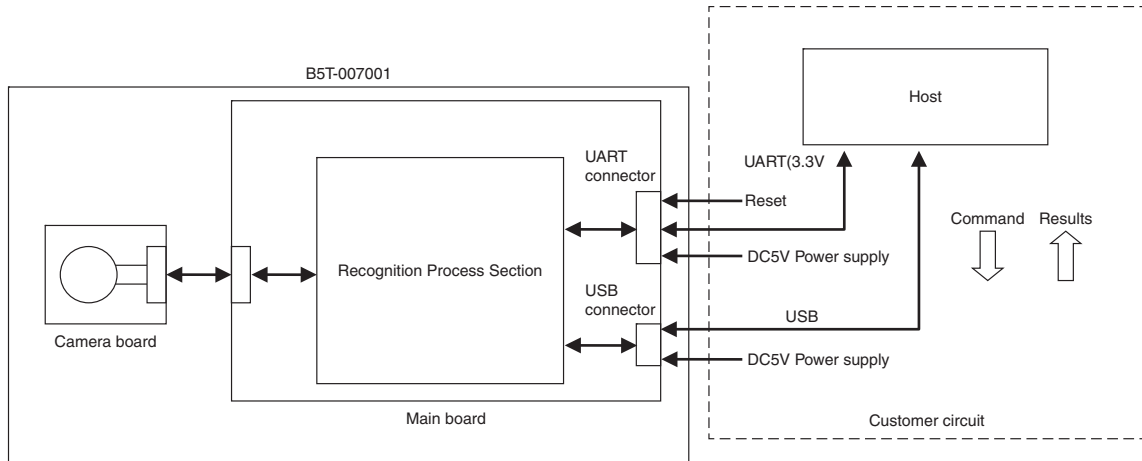
Note: Do not use the USB and UART connection simultaneously.

Parts & Functions

Front
Horizontal angle of view 50°
B5T-007001-010

CN3
Main board
Flexible Flat Cable (FFC)
OMRON
Camera board
CN5
pin assignment
2
3
4
5
6
CN5

Note: Remove the protective lens before use

Horizontal angle of view 90°
B5T-007001-020

CN3
Main board
Flexible Flat Cable (FFC)
OMRON
Camera board
CN5
pin assignment
2
3
4
5
6
CN5

Note: Remove the protective lens before use
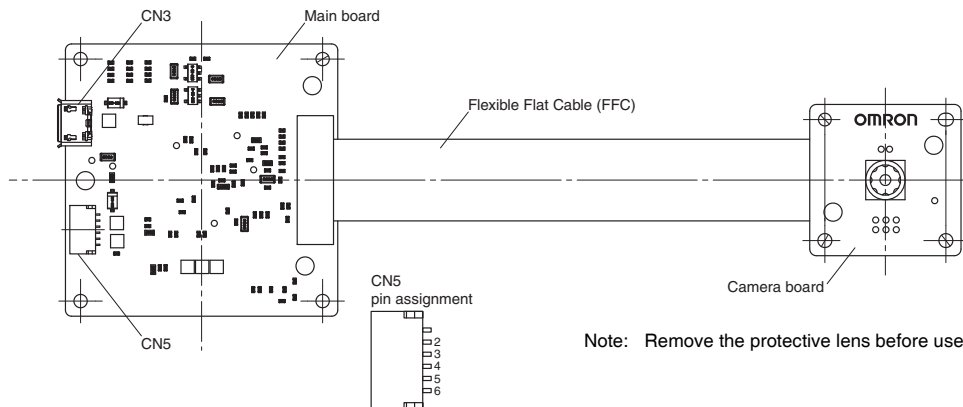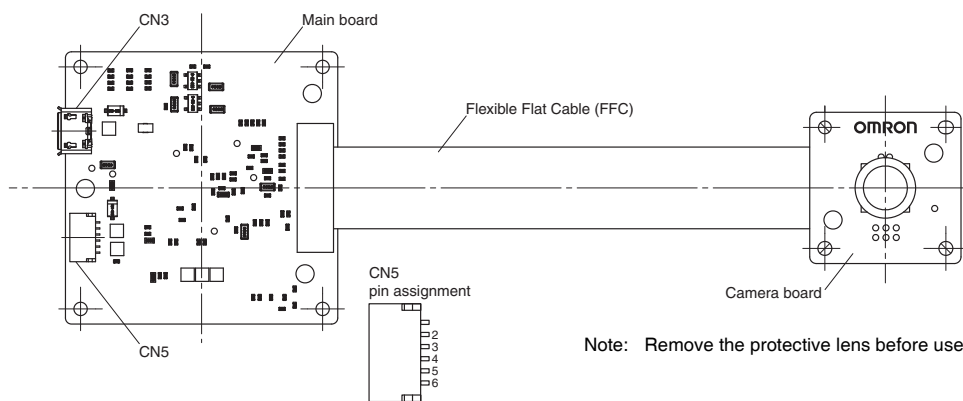
Symbol	Description	Function
CN3	USB connector (MicroUSB Type B)	USB communication, power supply
CN5	UART connector	UART communication, power supply, reset input

Note: Do not use the USB and UART connection simultaneously.
Do not change the main board and camera board configuration.
Try to limit the number of times CN3 and CN5 are connected/disconnected below 10.

Back
Horizontal angle of view 50°
B5T-007001-010
Horizontal angle of view 90°
B5T-007001-020

LED
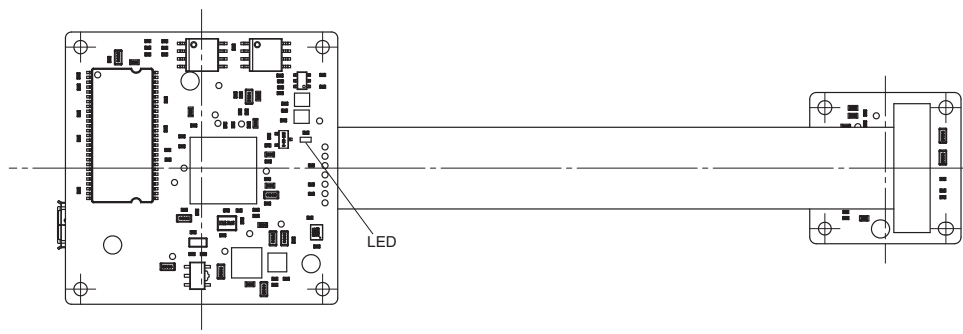
Symbol	Description	Function
LED	LED display light	Lit when power is ON Off when proceeding commands from Host

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Dimensions (Unit: mm)

(Units: mm / unspecified dimension tolerance: tolerance class IT16)

Front
Horizontal angle of view 50°
B5T-007001-010
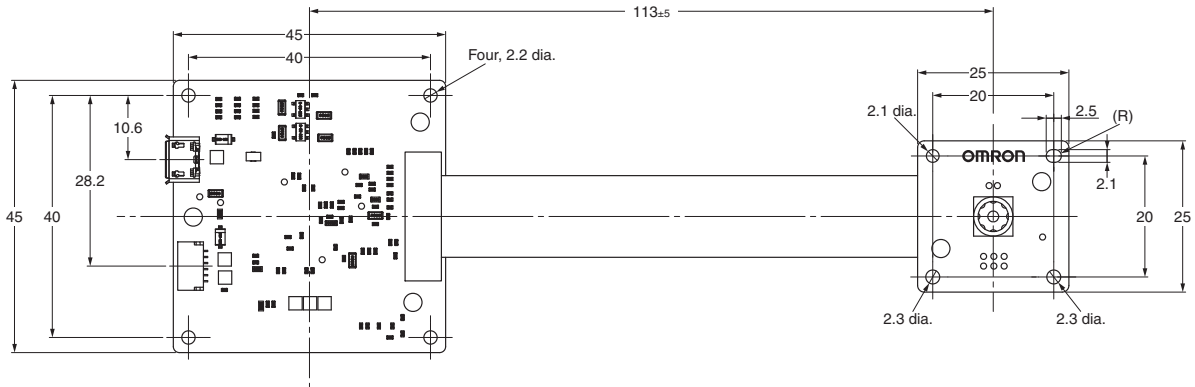
Horizontal angle of view 90°
B5T-007001-020
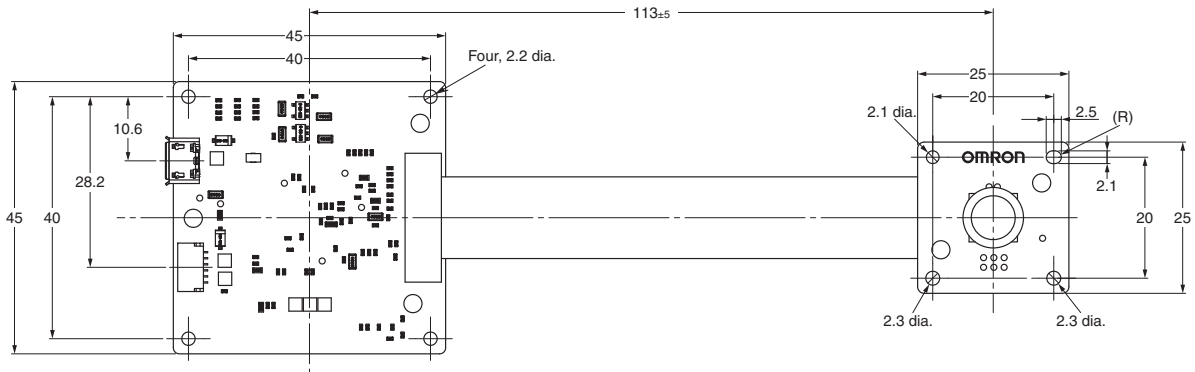
Back
Horizontal angle of view 50°
B5T-007001-010

Horizontal angle of view 90°
B5T-007001-020

Dimensions when mounted

Main board

Camera board

Do not install metallic parts for mounting on the shaded areas.
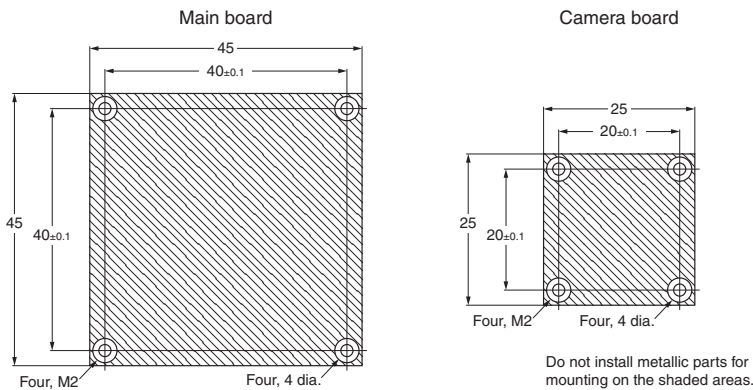
Note: Do not install metallic parts for mounting on the shaded areas

7

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Main Board Front
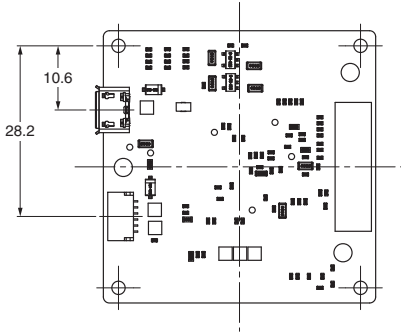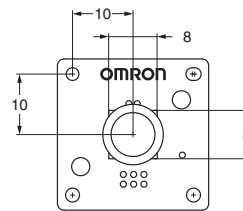
Main Board Back
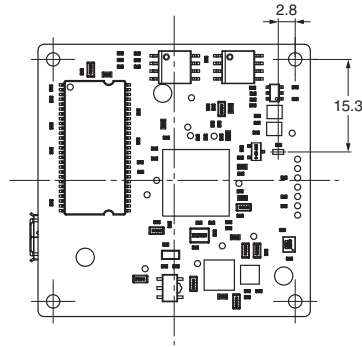
Camera Board
Horizontal angle of view 50°
B5T-007001-010
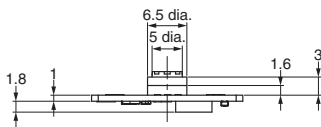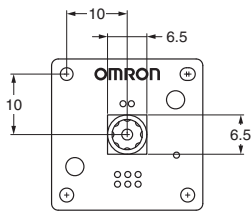
Horizontal angle of view 90°
B5T-007001-020
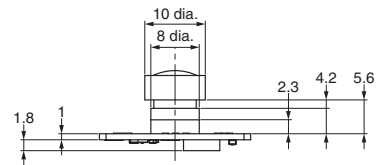
Connector Pin Assignment

CN5: Provides power and the UART communication interface.

Board-side connector: SM06B-SRSS-G-TB (made by J.S.T. Connectors, recommended for use)

Housing: SHR-06V-S-B or SHR-06V-S (made by J.S.T. Connectors)

Contact: SSH-003GA-P0.2 (made by J.S.T. Connectors)

Pin number	Signal	I/O	Description
1	Vcc	-	Power supply 5.0 V ±10%
2	UART RX *	Input	UART [receive] (Device ← Host)
			Logic 0: 0 V Logic 1: 3.3 V
3	UART TX	Output	UART [send] (Host ← Device)
			Logic 0: 0 V Logic 1: 3.3 V
4	GND	-	Ground
5	RESET	Input	Reset signal (Device ← Host)
			Logic 0: 0 V Logic 1: 3.3 V
			Reset is active on logic 0
6	RESERVED	-	Do not connect to this

* Do not make the RX terminal floating when applying power to the Device.
Note: Do not use CN3 and CN5 simultaneously.

Mounting Method
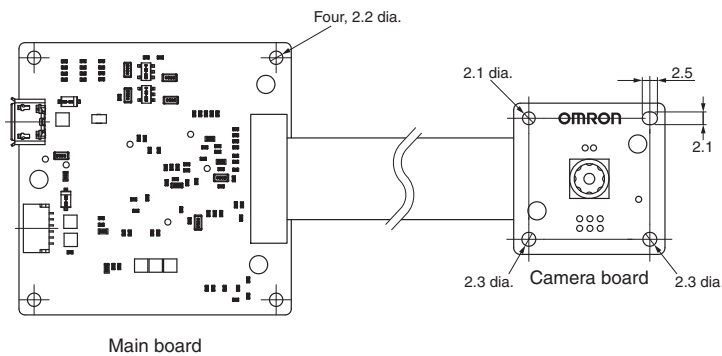
Note 1:   This figure is for a frontal mounting direction (0°) of the module.
Settings need to be changed through commands when mounting the Device at a clockwise rotation angle of 90°, 180° or 270° from the front.
Note 2:   Fix each board with the M2 screws in the four board corner holes.
Make sure not to bend or break the board when fastening the screws.
Apply torque appropriately for the screws used.
Note 3:   Make sure to fix the board so that it is not warped, bent or any under unreasonable stress.
Note 4:   Make sure that the board is sufficiently distanced from any electrically-conductive part.
Note 5:   Take proper measures against static electricity.

Safety Precautions

Make sure to read these precautions for a safe use of the Product.

- The contents included is to ensure proper use of the Product and prevent harm and/or property damage to the user or other people.
- Warnings and cautions are defined as follows.

● **Definition of Warning and Caution**

⚠ **Warning**	Denotes a potentially hazardous situation which, if not avoided, may result in minor, moderate or serious injury, or death. It may also result in serious damage.
⚠ **Caution**	Denotes a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or damage.

"Damage" indicates property damage to a building, production line, household goods, other products, livestock, pets, etc.

● **Examples of indications**

🚫	Indicates forbidden actions.
❗	Indicates required actions.

⚠ Warning

Regarding use:

Do not use the Product for safety of life or crime prevention purposes.
Do not use the Device on automobiles or other vehicles, including bikes as it may result in accidents. 🚫

The following will result in fire, electric shock, injury or damage if ignored.

Do not touch the Device or any connected cable during a lightning storm.
Do not use the Device if it is cracked or damaged.
Do not insert foreign objects in the connector or in the holes on the various parts of the Device.
Do not use the Device in bathrooms or any other place where it may get in contact with water.
Do not touch the Device or any connected cable with wet hands.
Do not install the Device in a location subjected to animal or human body fluids.
Do not disassemble, repair, or modify the Device. 🚫

Turn the power off and stop using theProduct if you notice any anomaly, including foul odor, distortion or discoloration to the Device during use.
Install the cables in a way that would not put strong force on them, including making sure they are not crushed in a door. ❗

The following will result in accident or injury if ignored.

Install the Device and the cables out of reach of infants.
Store the Device out of reach of infants when not using it.
Contact emergency services at once if small parts are ingested.
Do not touch sharp parts or the exposed interior of the Device that was damaged. ❗

⚠ Caution

Regarding the use or handling of the Product:

Make sure to follow the warnings and cautions indicated in this
document when using the Product. ❗

The following will result in accident, injury or damage if ignored.

Do not install the Device in an unstable location, where it could fall down, or where it can be subject to vibrations.
Install the cables in a safe way, out of the way of hands or feet. ❗

The following will result in burns or damage due to heating if ignored.

Do not wrap the Device in a blanket or sheets, etc. when it is powered on.
Do not use or store the Device next to fire, heating equipment, in direct sunlight, in cars or in any other location subject to high temperature. 🚫

The Device may produce heat. Do not touch it when transmitting or shortly after powering it off. ❗

Precautions for Safe Use

Check the Product for physical damage upon opening its package. It is recommended to wear gloves when opening the package.

Follow the indications listed below for a safe use of the Product.

(1) Installation Environment

- There is potential internal deterioration and damage of internal parts of the Device. Do not use the Product in conditions exceeding the ratings for temperature and humidity.
- Do not use the Product in an environment where condensation occurs.
- Do not use the Product in an environment subjected to water, oil or chemicals spills.
- Do not use the Product in an environment subjected to corrosive, combustible or explosive gas.
- Do not use the Product in an environment where dust, salt or iron powder are present.

(2) Power Supply and Wiring

- Make sure there is no faulty wiring of I/O terminals, etc. as this may result in fire.
- Do not connect the DC power supply terminal to AC power.
- Do not connect the Product to DC voltage above the rated capacity.
- Do not reverse-connect the DC power supply.
- Make sure to turn the Device off before removing cables.
- Do not connect the UART connector (CN5) to asynchronous method non-compliant devices.
- Make sure to check the Device and the connector pins for distortion or physical damage before connecting or removing cables.
- Connect a commercially available Micro USB Cable (TypeB) cable to the USB connector (CN3). Make sure the cable is not damaged and do not modify it.

(3) Others

- Do not disassemble, repair or otherwise remodel the Device.
- Treat the Product as industrial waste when disposing of it.
- Use the M2 screws on the fixing holes on the Device when fixing it. Make sure not to bend or break the board when fastening the screws. Apply torque appropriately for the screws used.
- Do not apply stress on the Device, e.g. twists, deflections or impacts, as it may result in causing defects or degradation.
- Do not apply stress on the connector or display implementation parts when installing the Device, as it may result in causing defects or degradation.

Precautions for Safe Use

Observe the following precautions to prevent failure to operate and malfunctions, and to prevent adversely affecting the performance and function of the Product.

- Store the Device at a temperature between -30 and +70°C and a humidity level below 90%.
- Do not touch the board mounted parts with bare hands. Discharge any static electricity from the user before use.
- Take proper measures against static electricity by using an antistatic wrist strap, etc. before handling the Product.
- Make sure to properly ground the connector's earth terminal in order to prevent malfunction due to noise.
- Do not use the Product in places where the surrounding temperature goes above the rating range.

- Do not use the Product in a location where it would be subjected to direct sunlight.
- Do not use the Product in a location subject to excessive inductive or power supply noise, such as in strong magnetic or electric fields.
- Do not use the Product in a location where it would be subjected to strong UV light.
- Do not use the Product in a location where it would be subjected to radiation.
- Sufficiently evaluate the electrical characteristics of any connection to the Device.
- Make sure to properly align the connectors when connecting them.
- Avoid desorption of power supplied connectors as it will result in accidents.
- Refer to the B5T-007001 Command Specifications document separately provided by OMRON for details on the interface specifications.
- Never use benzene, paint thinner, or any other volatile cleaning solution, detergent, bleach or chemical washcloth for cleaning the Device.
- Take in consideration heat dissipation from the Device when installing it in order to improve its long term reliability.
- Install the Device sufficiently far away from any other surrounding charged parts.
- Install the Device making sure not to obstruct the camera detection range.
- Use transparent materials to cover and protect the front of the lens should it be in contact with hands or objects.
- Remove the lens protective seal before use (B5T-007001-010).
- Remove the lens protective cover before use (B5T-007001-020).
- Do not touch the camera module.
- The Product performs detection on images. As such, note that it may sometimes detect objects other than living bodies, such as photographs or posters.
- Note that since the Product uses a camera for detection, successful detection may not be possible due to light orientation, brightness or exposure issues.
- Make sure to reset the Product before using it again following a power interruption or failure.
- Restart or reset the Device if data is received improperly.
- Cutting or losing power to the Device while saving the Album on the flash ROM may destroy the Album data saved on it. As such, make sure to take a backup of the Album data on the Host device. Refer to the B5T-007001 Command Specifications document for details.
- Do not use the USB and UART connection method simultaneously.
- Do not remove the FFC connection between the main board and the camera board, and do not alter the configuration of the combination.
- When using the USB connector, note that the bus power may not be properly powering the Device depending on the computer USB port used. In such case, use a device like a self-powered hub with an AC adaptor.

B5T

Terms of Use and Disclaimer

Omron will see any use of the Product as an indication that you agree and will comply with the contents of these Terms of Use.

(1) Definitions:

In addition to the definition in "Term Definitions" section above, the terms in this section have the following meaning.

1) Software: (i) Omron's OKAO™ software, as embedded in the Device, and (ii) software included in the SDK.

2) Customer: Distributor and/or the end Customer who introduces or uses the Product in the Customer Application.

3) Customer Application: Any kind from application,integration or use of the Product in connection with the Customer's end product.

(2) CAUTION ON DESCRIPTIONS

Attention is required to the following points:

1) Rated values and performance values are the product of tests performed for separate individual conditions, including but not limited to temperature and humidity. Omron does NOT warrant the rated and performance values indicated for multiple combined conditions.

2) Reference data is provided for reference only. Omron does NOT warrant that the Product works properly at all times in the range of the reference data.

3) Application examples are provided for reference only. Omron does NOT warrant the fitness of the Product in a Customer Application.

4) Omron may discontinue the production of the Product or change its specifications for the purpose of improving it, or any other reasons, at Omron's sole discretion and at any time.

(3) The Product has face detection function. As such, the Customer shall take proper care of privacy, portrait right, copyright or any other rights of people.

(4) PRECAUTIONS AND CONDITIONS OF USE

The Customer accepts the following precautions and conditions when the Customer introduces or uses the Product in a Customer Application:

1) The Customer shall use the Product in compliance with the instructions noted in the instruction sheet, including but not limited to, ratings and performance.

2) The Product is composed of (i) hardware and (ii) the Software. The Software is an inseparable part of the Product and the use and application of this Software is strictly limited to the use and application of the Product as a whole, to be used in a Customer Application. It is strictly forbidden to extract, copy, amend or reproduce the Software and/or to otherwise infringe Omron's intellectual property rights on the Product and/or the Software, and doing or attempting to do so may be punishable by law.

3) THE PRODUCT SHALL NOT BE USED IN THE FOLLOWING APPLICATIONS:

(a) Applications with stringent safety requirements, including but not limited to nuclear power control equipment, combustion equipment, aerospace equipment, railway equipment, elevator/lift equipment, amusement park equipment, medical equipment, safety devices or any other applications that could cause danger/harm to people's body and life.

(b) Applications that require high reliability, including but not limited to supply systems for gas, water and electricity, etc., 24 hour continuous operating systems, financial settlement systems and other applications that handle rights and property.

(c) Applications for use under severe conditions or in severe environments, including but not limited to outdoor equipment, equipment exposed to chemical contamination, equipment exposed to electromagnetic interference and equipment exposed to vibration and shocks.

(d) Applications under any conditions or environments not specifically described in the specifications.

(e) Automotive applications (including automotive applications relating to two wheel vehicles).

(f) Applications which aim to cause danger/harm to people's life, body or property, including but not limited to weapons and criminal activities

IF THE CUSTOMER INTRODUCES, USES, OR INTEGRATES THE PRODUCT IN THE APPLICATIONS DESCRIBED IN SECTION (4)3)(a) to (4)3)(f), OMRON SHALL NOT PROVIDE ANY WARRANTY FOR THE PRODUCT.

(5) CUSTOMER APPLICATION

The precautions and conditions of use written above also apply equally to end-Customers. DISTRIBUTORS shall ensure that such conditions of use are being made clear to end-Customers.

(6) LIMITED WARRANTY AND LIMITATION OF LIABILITY

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