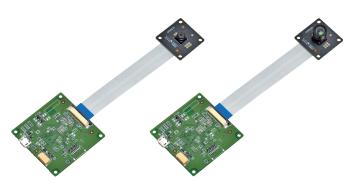
# B<sub>5</sub>T

**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".



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
Approximately 50 deg. (wide-angle type)	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:

Americas https://components.omron.com/us-en/products/sensors/B5T
Asia-Pacific https://components.omron.com/sg-en/products/sensors/B5T
Europe https://components.omron.com/eu-en/products/sensors/B5T
Korea https://components.omron.com/kr-en/products/sensors/B5T

#### **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**

ltem	Specifications		
iteili	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°	

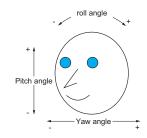
#### **Image Output Specifications**

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			
Age estimation	Face direction ±20°	Face direction ±30°	±45°
Gender estimation			
Blink estimation	1 ace direction 120		
Expression estimation			
Face recognition			
Gaze estimation	Gaze angle ±20° *4 (up to face direction ±10°)	Gaze angle ±30° *4 (up to face direction ±20°)	

- 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.
  "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.
- This indicates all the directions to the left and right of the human body.
- 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

#### **Image Sensing Functions**

Function	Output	Details
	Number of detected objects	Maximum of 35 per object type
Human Body Detection, Face Detection,	Position (center coordinates)	Coordinates on the screen from the top-left corner of the screen (in pixels)
Hand Detection	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
	Yaw angle	Positive to the right (in degrees)
	Pitch angle	Positive upwards (in degrees)
Face Direction Estimation	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)
Gaze Estimation	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	0 to 75 (75 includes higher ages)
Age Estimation	Degree of confidence	Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
	Gender	Male or female
Gender Estimation	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/ verification result	Identify and Displays either the registered User ID, or "non-registered" for non-registered individuals  Verify to compare with registered User ID can be changed through a command  Maximum number of users: 100 / Maximum number of data per use: 10 (Default value)  500 users × 2 data or 1000 users × 1 data (can be change through commands)  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

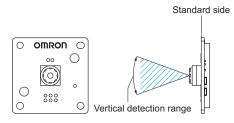
Degrees of confidence are grain size 1. Angles are for when facing the camera.

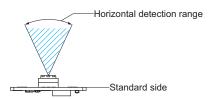
#### **Detection Distance (for reference\*)**

Function	Maximum distance	
FullCuoti	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

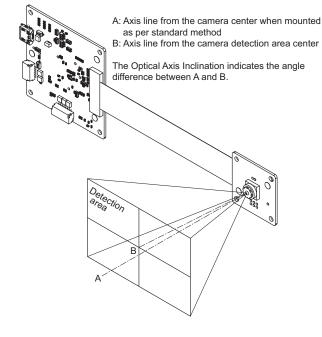
<sup>\*</sup>Caution: Please note that the detection and estimation performance will gradually fall when exceeding the maximum distance indicated for reference. Please note that being within the range indicated above does not always guarantee successful detection.

# ■ Image Input Specification Item Definitions Horizontal and Vertical Detection Range (angles of view) Horizontal angle of view 50° B5T-007001-010

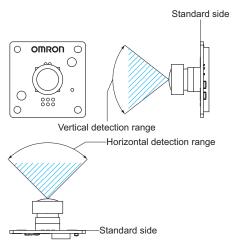




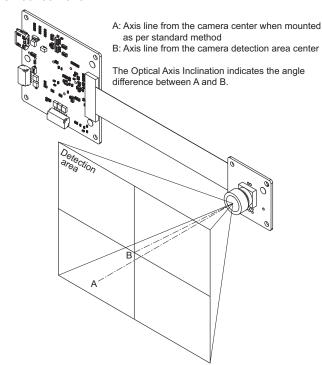
#### Optical Axis Inclination Horizontal angle of view 50° B5T-007001-010



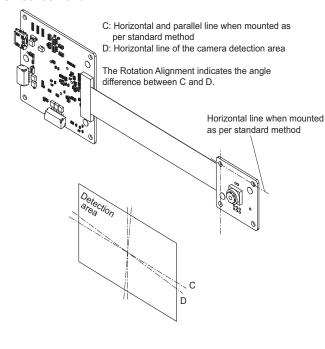
## Horizontal angle of view 90° B5T-007001-020



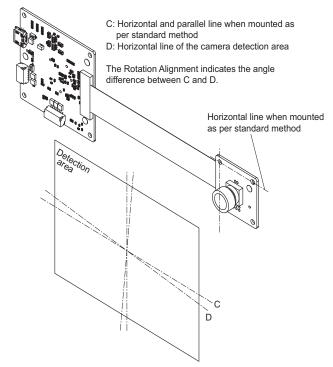
# Horizontal angle of view 90° B5T-007001-020



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

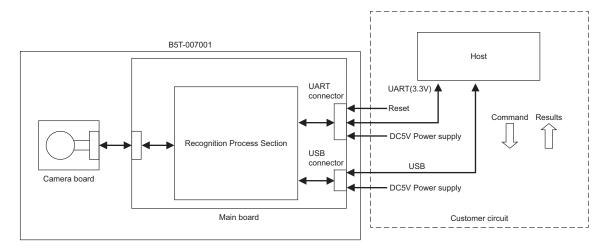


## Horizontal angle of view 90° B5T-007001-020



#### Connection

#### ■ Block Diagram

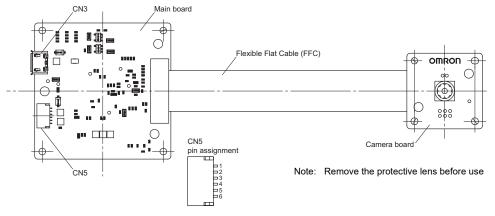


Note: Do not use the USB and UART connection simultaneously.

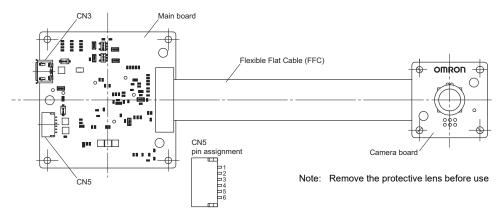
#### **Parts & Functions**

**Front** 

Horizontal angle of view 50° B5T-007001-010



# Horizontal angle of view 90° B5T-007001-020



Symbol	Description	Function
CN3	USB connector (MicroUSB Type B)	USB communication, power supply
CN5	UART connector	UART communication, power supply, reset input

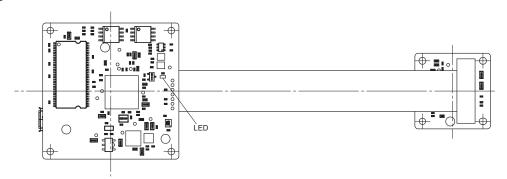
Note: Do not use the USB and UART connection simultaneously.

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



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

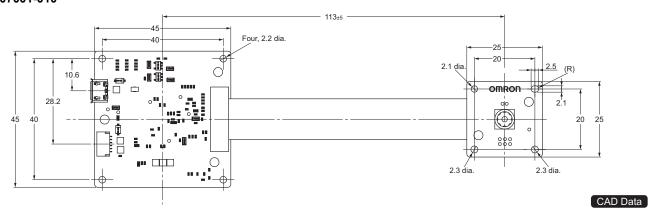
#### **Dimensions**

CAD Data marked products, 2D drawings and 3D CAD models are available. For CAD information, please visit our website, which is noted on the last page.

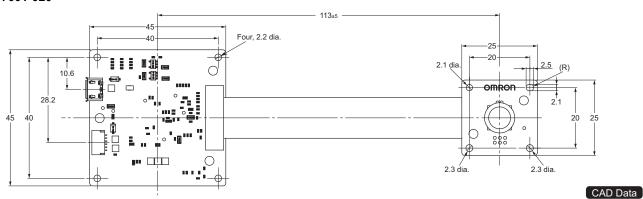
(Units: mm / unspecified dimension tolerance: tolerance class IT16)

**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

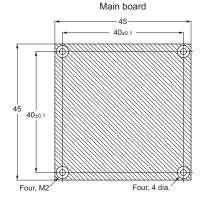


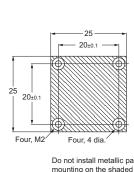
Horizontal angle of view 90° B5T-007001-020



Camera board

#### Dimensions when mounted

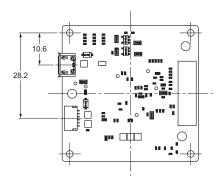




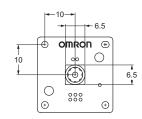
Do not install metallic parts for mounting on the shaded areas.

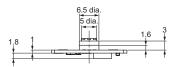
Note: Do not install metallic parts for mounting on the shaded areas

#### **Main Board Front**

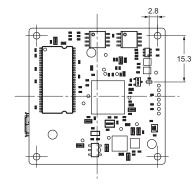


Camera Board Horizontal angle of view 50° B5T-007001-010



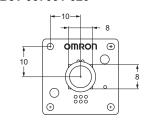


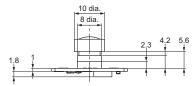
#### **Main Board Back**



CAD Data

# Horizontal angle of view 90° B5T-007001-020





CAD Data

#### **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)

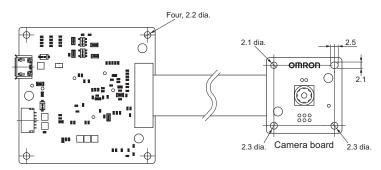
Housing: SHR-06V-S-B or SHR-06V-S (made by J.S.T. Connectors)

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 *	lt	UART [receive] (Device ← Host)
2	OAKTIKA	Input	Logic 0: 0 V Logic 1: 3.3 V
2	3 UART TX	Output	UART [send] (Host ← Device)
3			Logic 0: 0 V Logic 1: 3.3 V
4	GND	-	Ground
			Reset signal (Device ← Host)
5	RESET	Input	Logic 0: 0 V Logic 1: 3.3 V
			Reset is active on logic 0
6	RESERVED	-	Do not connect to this

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

#### **Mounting Method**



Main board

- 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.
- 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



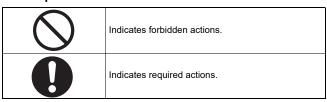
Denotes a potentially hazardous situation which, if not avoided, may result in minor, moderate or serious injury, or death. It may also result in serious damage.



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



#### 

#### 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 the Product 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.

#### 

#### 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 selfpowered hub with an AC adaptor.

Please check each region's Terms & Conditions by region website.

**OMRON Corporation Device & Module Solutions Company** 

#### **Regional Contact**

Americas

https://components.omron.com/us

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https://components.omron.com/jp