Raspberry Pi Expansion Card
RAS / RTC function card

# CPI-RAS

This product is an expansion card that adds RAS functionality, RTC functionality, and 8 - 28VDC power supply input functionality to the Raspberry Pi.

*The contents in this document are subject to change without notice.
*Visit the CONTEC website to check the latest details in the document.
*The information in the data sheets is as of July, 2022.

* Specifications, color and design of the products are subject to change without notice.

## Features

**RAS functionality for improved reliability, availability, and serviceability**
This expansion card improves the reliability of Raspberry Pi devices by supplying clean power via the high-output, high-efficiency 5VDC 5A power supply and a noise filter for removing external noise.
To improve availability, the expansion card automatically shuts down and restarts to minimize system downtime if the dedicated software or hardware detects a problem.
The dedicated software also monitors various statuses for improved serviceability.

**Real-time clock (RTC) with temperature compensation**
RTCs without temperature compensation will usually be accurate in an environment of about 25°C. In low- or high-temperature environments, however, accuracy is likely to decrease due to the internal crystal characteristics. The RTC internal temperature compensation feature in this product improves the accuracy of time tracking in any temperature environment.

**Support for a wide range of power supplies**
This product supports external power supplies ranging from 8 - 28VDC (6 - 30V).

**Power switch functionality**
Add power switch functionality available in most PCs to the Raspberry Pi. The power switch can also be long-pressed to forcibly turn off the power. Operation is possible from the push switch on the product itself or from digital input via the interface connectors.

**Timer interrupt for intermittent operation**
Setting a start date and time using the RTC makes it possible to start the Raspberry Pi at a specific date and time.
The included low power consumption power supply circuit also minimizes current consumption during shutdown.

**External power supply function**
Output connectors are available for outputting 8 - 28VDC power or 5VDC power, allowing external devices to be turned on or off according to the Raspberry Pi operation status.

**Adaptable to a wide range of temperature between -20 and +60°C**
The product is capable of operating in the temperature between -20 and + 60°C. It can be installed in the various environments.

## Specifications

### Function specification

| Item | | Description |
|---|---|---|
| Digital Input | | |
| Input type | | Non-isolated opto-coupler input (supports current sink output [negative logic] *1) |
| Number of input signal channels | | 2 |
| Isolation | | Non-isolated |
| Voltage Resistance | | Non-isolated |
| Internal power supply | | 3.3V±5% |
| Input Resistance | | Current-limiting : 220Ω, Shunt resistance : 1kΩ |
| Input ON current | | 6.4mA (Typ) |
| Input OFF current | | 0.16mA or less |
| Input signal voltage | | 3.3 - 28VDC |
| Digital Output | | |
| Output type | | Solid State Relay output |
| Number of output signal channels | | 1 |
| Isolation | | Solid State Relay isolation |
| Voltage Resistance | | AC1000Vrms |
| Output rating | Output Voltage | 28VAC/DC (Max.) |
| | Output Current | 200mA (Max.) |
| ON resistance | | 2Ω or less (25°C) |
| OFF leak current | | 1μA or less (25°C) |
| External power supply output | | |
| 8 - 28VDC power supply output | | Max. 2A (Output voltage varies according to DC power supply input voltage) |
| 5VDC power supply output | | 5V±5% Max. 2A *2 |
| Interface Connector | | 2 pieces 3.81mm pitch 10-pin terminal |
| Applicable wire | | AWG26 - 16 |
| LED | | 2-color LED (Green, Red) |
| Push switch | | 1 |
| Hardware Monitor | | 8 - 28VDC input voltage, CPI-RAS board temperature |
| Bus specification | | |
| Power supply output | | 5V±5% Max. 5A *2 |
| Power supply input | | 3.3V±5% Max. 30mA |
| I2C bus (I2C1) | | Used for 0x2c address and 0x32 address |
| Interrupt notification | | |
| Function | | Open collector output (Pull-up: 15kΩ) |
| Notification destination | | Select from GPIO 4, 5, 6, or 22 (using DIP switch) |
| Power supply | | |
| Rated input voltage | | 8 - 28VDC |
| Input voltage range | | 6 - 30VDC |
| Consumption power *3 | | <Product only> |



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| Item | | Description |
|---|---|---|
| | | Without load :<br>8VDC 8.9mA (Typ.), 12mA (Max.)<br>28VDC 4.5mA (Typ.), 5.9mA (Max.)<br>Shutdown :<br>8VDC 10uA (Typ.)<br>28VDC 13uA (Typ.)<br><Expanded interface><br>When Raspberry Pi + Expansion card + 5V external power supply output = 5A, and 8 - 28V external power supply output = 0A :<br>8VDC 3.6A (Typ.), 4.0A (Max.)<br>28VDC 1.0A (Typ.), 1.1A (Max.) |
| | Connector | 2 pieces 3.5mm pitch 3-pin terminal (V+, V-, FG) |
| | Applicable wire | AWG22 - 16 |
| Physical dimensions (mm) | | 65.0(W) x 56.5(D) (No protrusions)<br>Spacer height : 12.5mm |
| Weight | | 50g |

*1 Data "0" and "1" correspond to the High and Low levels, respectively.
*2 The total current of the external power supply 5V output and GPIO 40-pin connector 5V output should be 5A or less.
*3 The product is equipped with a fuse (rated current: 5A) for preventing overcurrent in the power supply input. Use a power supply that has overcurrent protection or that has a current capacity capable of blowing the fuse (9.5A or more is recommended).

### Installation Environment Requirements

| Item | | Description |
|---|---|---|
| Operating Temperature *4 | | -20 - +60℃ |
| Storage Temperature | | -20 - +60℃ |
| Humidity | | 10 - 90%RH (No condensation) |
| Floating dust particles | | Not to be excessive |
| Corrosive gases | | None |
| Line-noise resistance *5 | Line noise | Signal Line /±1kV (IEC61000-4-4 Level 3, EN61000-4-4 Level 3) |
| | Static electricity resistance | Indirect discharge /±4kV (IEC61000-4-2 Level 2, EN61000-4-2 Level 2) |
| Vibration resistance | Sweep resistance | 10 - 57Hz/semi-amplitude vibration 0.15mm, 57 - 150Hz/2.0G<br>40minutes each in X, Y, and Z directions (JIS C60068-2-6-compliant, IEC60068-2-6-compliant) |
| Shock resistance | | 15G half-sine shock for 11ms in X, Y, and Z directions<br>(JIS C 60068-2-27 -compliant, IEC 60068-2-27 -compliant) |
| Standard | | VCCI Class A, FCC Class A,<br>CE Marking (EMC Directive Class A, RoHS Directive), UKCA |

*4 The 5V output current may be limited depending on the ambient temperature. Refer to the derating graph and make sure the current does not exceed the limit.
*5 When using an optional power supply: 10 - 55Hz (For details, refer to the optional power supply manual.)

## Packing List

Product [CPI-RAS] ...1
10-pin Connector ...1 (Attached to the product)
3-pin Pin-header...1 (Attached to the product)
40-pin Pin-header...1
Plastic Spacer for CPU Card...1
Hexagonal Spacers...4 (Height 12.5mm)
Three-point Sems Screw...4
Nuts...4
Product Guide & Warranty Certificate...1
Serial Number Label ...1

* This product is verified in conformity with our recommended power supply. In case you use other power supplies, thus, it may not be able to fulfil certification requirements. Please see the CONTEC website regarding power supply recommendation (https://www.contec.com/).

## Support Software

You can use CONTEC support software according to your purpose and development environment. For more details on the supported OS, applicable languages, or to download the latest version of software, visit the CONTEC Web site.

| Name | Contents | How to get |
|---|---|---|
| ARM Linux RAS driver | This is the Linux version driver software for providing RAS functionality in API function formats. The software includes various sample programs. | Download from the CONTEC website |
| ARM Linux RTC driver | This is the Linux version driver software for controlling RTC devices equipped in CPI-RAS products. | Download from the CONTEC website |

Download the files from the following URL. https://www.contec.com/download/

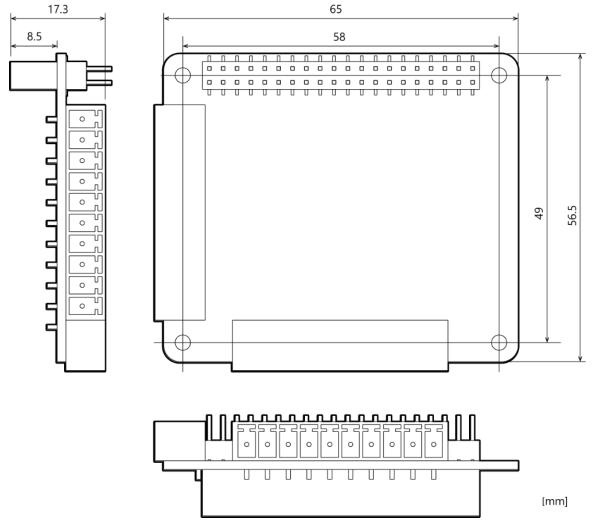
## List of Option

| Product Name | Model type | Description |
|---|---|---|
| AC adapter | PWA-65AWD9 | Switching AC adapter 65W<br>(Input: 100 - 240VDC, Output: 19VDC 3.42A) |
| DIN rail fitting power supply | CPS-PWD-30AW24-01 | Fitting power supply 30W (Input: 100 - 240VDC, Output: 24VDC 1.3A) |
| | CPS-PWD-90AW24-01 | Fitting power supply 90W (Input: 100 - 240VDC, Output: 24VDC 3.8A) |
| Expansion Card | CPI-DI-16L | Isolated Digital Input<br>(Input 16 points, supporting sink/source output) |
| | CPI-DO-16L | Isolated Digital Output<br>(Output 16 points, sink output) |
| | CPI-DO-16RL | Isolated Digital Output<br>(Output 16 points, source output) |
| | CPI-DIO-0808L | Isolated Digital Input/Output<br>(Input 8 points, Output 8 points, sink output) |
| | CPI-DIO-0808RL | Isolated Digital Input/Output<br>(Input 8 points, Output 8 points, source output) |
| | CPI-RRY-16 | Solid State Relay Output<br>(Output 16 points) |

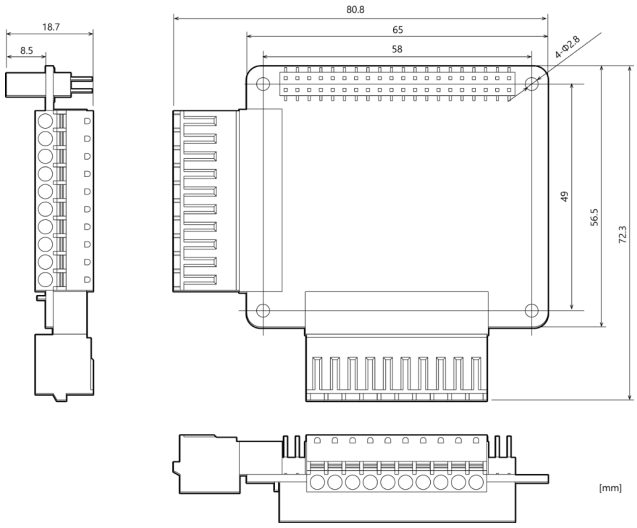
* Information about the option products, see the Contec's website.

## Physical Dimensions

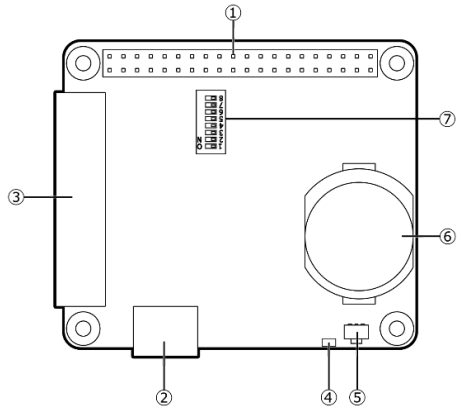
Main body only




With connector attached



## Component Name

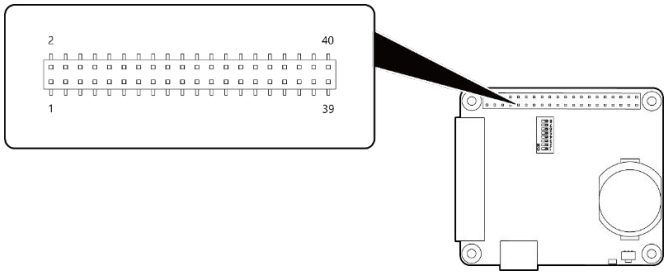



| No. | Name | Function |
|---|---|---|
| 1 | GPIO 40 pin connector | This connector is used to connect to a Raspberry Pi or an expansion card. |
| 2 | DC power connector | This connector is used for power input. It uses the included 3-pin connector. |
| 3 | Interface connector | This connector is used for power supply output and digital input/output. It uses the included 10-pin connector. |
| 4 | LED Indicator | This indicator is used to display the operation status of the product. |
| 5 | Push switch | This switch is used to turn on/off the Raspberry Pi. |
| 6 | RTC battery | This is the primary RTC battery connector. The connector accepts a CR2032 battery. |
| 7 | DIP switch | This switch sets the GPIO pins to use for outputting the interrupt notification signal. |

## Connection to external devicese

### GPIO 40 pin connector

This connector is used to connect to a Raspberry Pi or an expansion card.

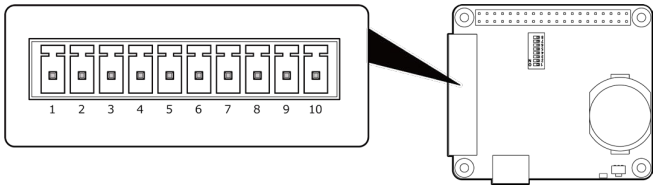



### Pin Assignment

| Pin No. | Signal Name | Description | Pin No. | Signal Name | Description |
|---|---|---|---|---|---|
| 1 | 3.3V Power | 3.3V power input | 2 | 5V Power | 5V±5% power output |
| 3 | GPIO 2(I2C1 SDA) | I2C1 SDA | 4 | 5V Power | 5V±5% power output |
| 5 | GPIO 3(I2C1 SCL) | I2C1 SCL | 6 | Ground | GND |
| 7 | GPIO 4(GPCLK0) | INT_1 | 8 | GPIO 14(UART TX) | (Don't use) |
| 9 | Ground | GND | 10 | GPIO 15(UART RX) | (Don't use) |
| 11 | GPIO 17 | (Don't use) | 12 | GPIO 18(PCM CLK) | (Don't use) |
| 13 | GPIO 27 | (Don't use) | 14 | Ground | GND |
| 15 | GPIO 22 | INT_2 | 16 | GPIO 23 | (Don't use) |
| 17 | 3.3V Power | 3.3V power input | 18 | GPIO 24 | (Don't use) |
| 19 | GPIO 10(SPI0 MOSI) | (Don't use) | 20 | Ground | GND |
| 21 | GPIO 9(SPI0 MISO) | (Don't use) | 22 | GPIO 25 | (Don't use) |
| 23 | GPIO 11(SPI0 SCLK) | (Don't use) | 24 | GPIO 8(SPI0 CE0) | (Don't use) |
| 25 | Ground | GND | 26 | GPIO 7(SPI0 CE1) | (Don't use) |
| 27 | GPIO 0(EEPROM SDA) | (Don't use) | 28 | GPIO 1(EEPROM SCL) | (Don't use) |
| 29 | GPIO 5 | INT_3 | 30 | Ground | GND |
| 31 | GPIO 6 | INT_4 | 32 | GPIO 12(PWM0) | (Don't use) |
| 33 | GPIO 13(PWM1) | (Don't use) | 34 | Ground | GND |
| 35 | GPIO 19(PCM FS) | (Don't use) | 36 | GPIO 16 | (Don't use) |
| 37 | GPIO 26 | (Don't use) | 38 | GPIO 20(PCM DIN) | (Don't use) |
| 39 | Ground | GND | 40 | GPIO 21(PCM DOUT) | (Don't use) |

### Interface connector

The interface connector includes an external power supply output, two digital inputs, and one digital output. It uses the included 10-pin connector.
Connector type: DEGSON 15EDGKD-3.81-10P-13-00A(H)
PHOENIX CONTACT FK-MCP 1.5/10-ST-3.81 (or equivalent)

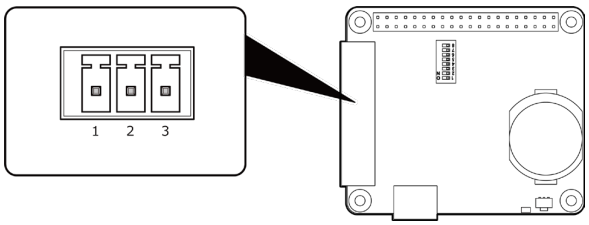



### Pin Assignment

| Pin No. | Signal Name | Description |
|---|---|---|
| 1 | DO- | This indicates the output signals. This contact is connected to the negative (-) side of the input signals of other devices. |
| 2 | DO+ | This indicates the output signals. This contact is connected to the positive (+) side of the input signals of other devices. |
| 3 | DI1- | This indicates the input signals. This contact is connected to the negative (-) side of the output signals of other devices. |
| 4 | DI1+ | This indicates the input signals. This contact is connected to the positive (+) side of the output signals of other devices. |
| 5 | DI0- | This indicates the input signals. This contact is connected to the negative (-) side of the output signals of other devices. |
| 6 | DI0+ | This indicates the input signals. This contact is connected to the positive (+) side of the output signals of other devices. |
| 7 | 5V external power supply - | This contact outputs voltage at 5V ±5% on the software setting. (Power ON : 0V) |
| 8 | 5V external power supply + | This contact outputs voltage at 5V ±5% on the software setting. (Power ON : 0V) |
| 9 | 8 - 28V external power supply - | This contact outputs the input voltage from the DC power supply connector on the software setting. (Power ON : 0V) |
| 10 | 8 - 28V external power supply + | This contact outputs the input voltage from the DC power supply connector on the software setting. (Power ON : 0V) |

### DC power connector

The included 3-pin power connector is used for connecting an external power supply.
Connector type: DEGSON 15EDGKD-3.5-03P-13-00A(H)
PHOENIX CONTACT FK-MCP1,5/3-ST-3,5 (or equivalent)

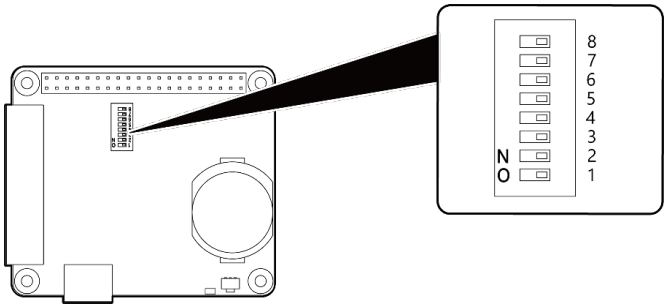



### Pin Assignment

| Pin No. | Signal Name | Description |
|---|---|---|
| 1 | FG | Frame ground |
| 2 | V- | GND |
| 3 | V+ | 8 - 28VDC |

### DIP switch

This switch sets the GPIO pins to use for outputting the interrupt notification signal.




| Pin No. | Signal Name | Operation | Description |
|---|---|---|---|
| 1 | INT_1 | OFF | Interrupt notification signal not connected to GPIO4 (Pin 7) (Factory setting) |
| | | ON | Interrupt notification signal connected to GPIO4 (Pin 7) |
| 2 | INT_2 | OFF | Interrupt notification signal not connected to GPIO22 (Pin 15) (Factory setting) |
| | | ON | Interrupt notification signal connected to GPIO22 (Pin 15) |
| 3 | INT_3 | OFF | Interrupt notification signal not connected to GPIO5 (Pin 29) (Factory setting) |
| | | ON | Interrupt notification signal connected to GPIO5 (Pin 29) |
| 4 | INT_4 | OFF | Interrupt notification signal not connected to GPIO6 (Pin 31) |
| | | ON | Interrupt notification signal connected to GPIO6 (Pin 31) |
| 5 | Reserved | OFF | Reserved for system; Leave to OFF. |
| 6 | Reserved | OFF | Reserved for system; Leave to OFF. |
| 7 | Reserved | OFF | Reserved for system; Leave to OFF. |
| 8 | Reserved | OFF | Reserved for system; Leave to OFF. |

## Block Diagram