

Overview



P4S-342 is an industrial programmable I/O board. You can build various network communication systems connecting P4S-342 to many devices such as sensors and actuators. We provide a self-development programming language, which is called PHPoC, for programming P4S-342. This language is easy to use and compatible with PHP which is widely used script language.

※ PHPoC is basically compatible with PHP but those languages are not the same because of restrictions about embedded system. Refer to the [PHPoC Language Reference](#) and [PHPoC vs PHP](#) for detailed information.

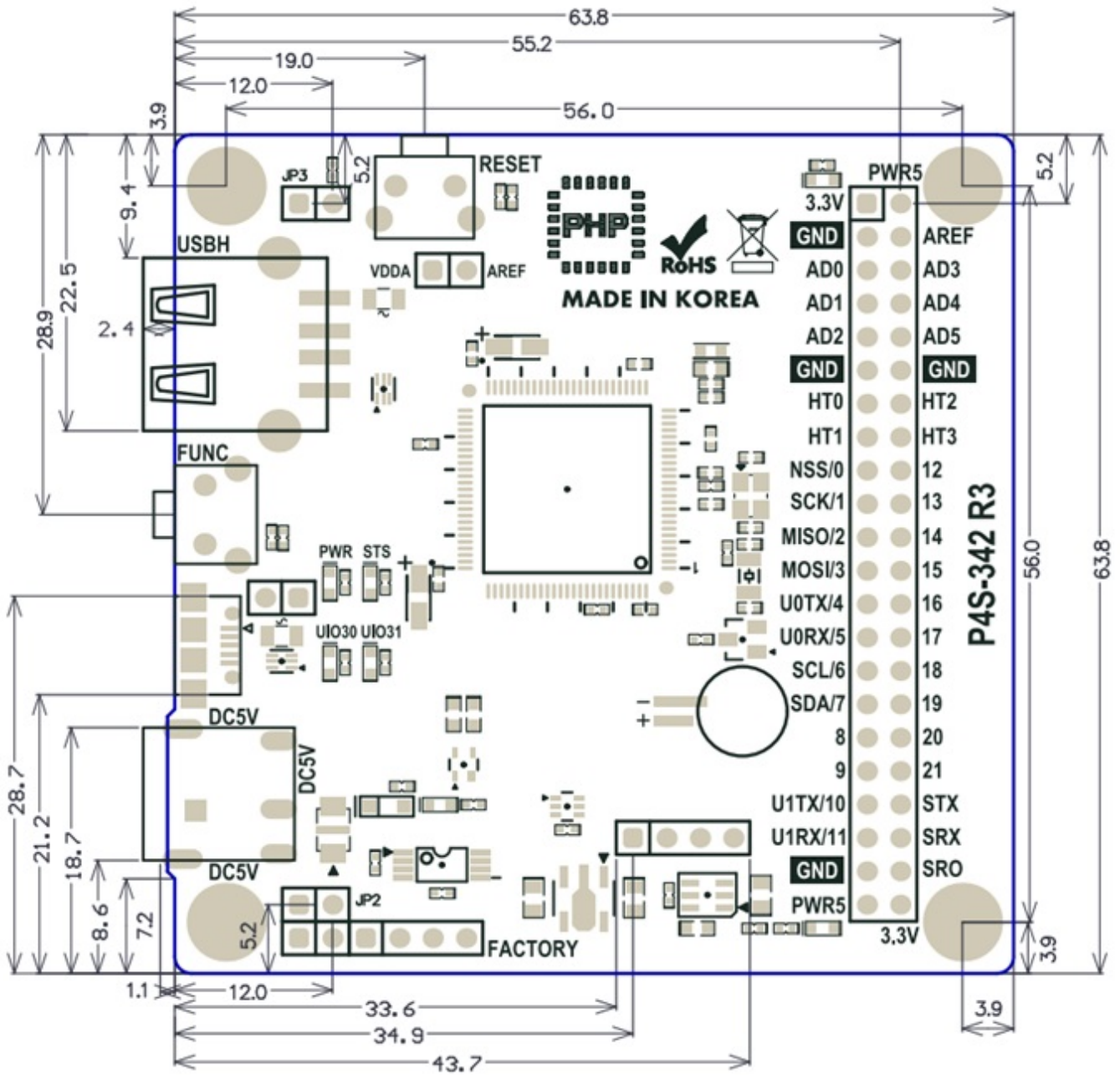
Features

- Provides self-developed PHPoC Interpreter
- Provides simple development environment via USB
- Provides IEEE802.11b/g Wireless LAN
- Provides 22 digital i/o and 6 analog input ports
- Provides 2 UART ports
- Provides 4 hardware timer
- Provides I2C and SPI interfaces
- Provides self-developed TCP/IP stacks
- Provides a Web Server
- Support Websocket, Telnet, SSH, SSL
- Provides the various libraries such as Email, DNS, MySQL and so on
- Provides PHPoC Debugger - a development tool for Windows

H/W Specification

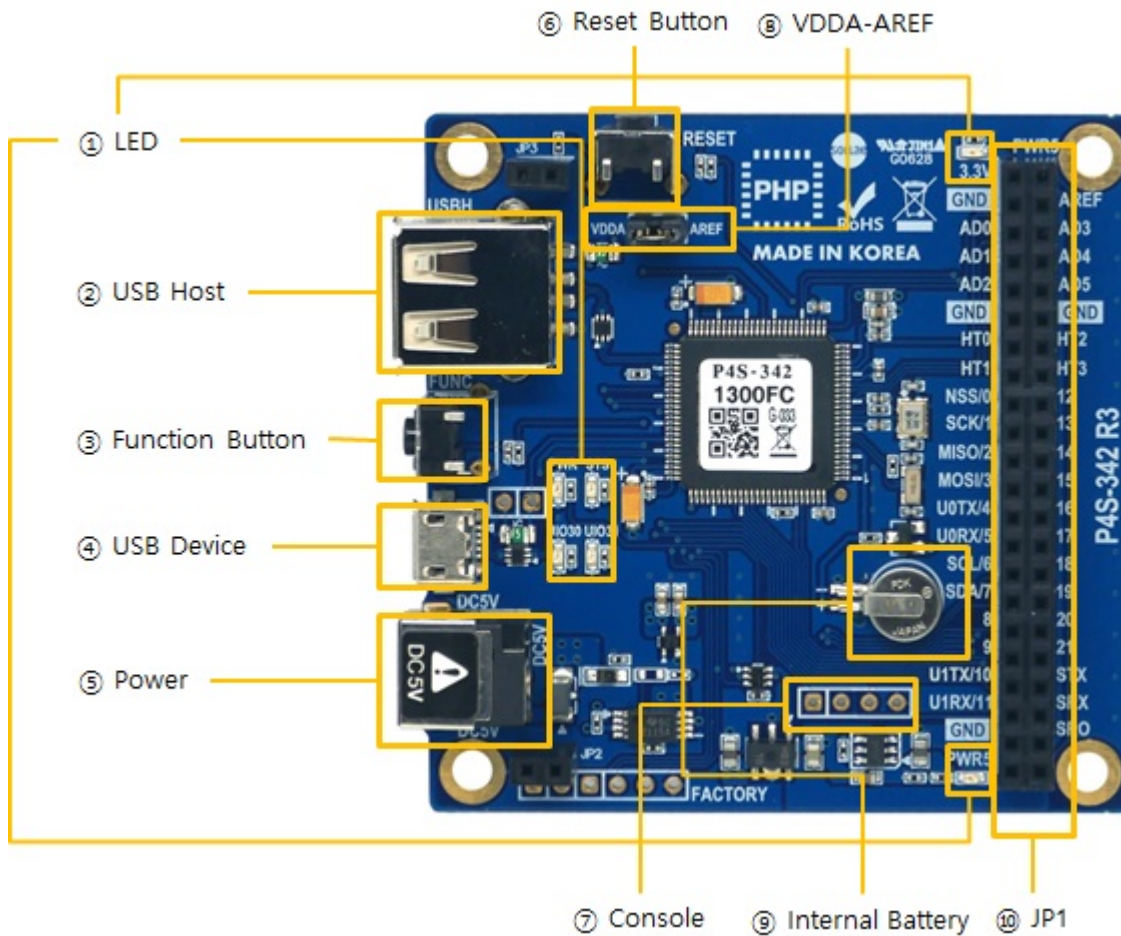
| | | |
|-----------------------|---------------------|---------------------------------------------------------------------------------------|
| Power | Input 1 | DC 5V ($\pm 0.5V$) |
| | Input 2 | DC 5V ($\pm 0.5V$) - USB Device Port |
| | Current Consumption | Typical - about 85mA(※ without USB WLAN adapter) Power Down mode - less than 200uA |
| Dimension | | 66.5mm x 63.8mm x 13mm |
| Weight | | about 27g (without USB WLAN adapter) |
| Interface | UART | 2 X UART Ports(UART0 ~ 1), Baudrate: 1,200 bps ~ 230,400 bps |
| | Network | IEEE802.11b/g Wireless LAN (require Ralink RT3070/5370 chipset Wireless LAN Adapter) |
| | USB | USB Host - for WLAN adapter USB Device - for PC |
| | Digital I/O | UIO0: pin #0 ~ #21, #30(LED), #31(LED) |
| | Analog Input | ADC_CH0 ~ 5, AREF, 12-bit resolution |
| | Hardware Timer (HT) | HT0 ~ 3, toggle/pulse/pwm output and capture mode |
| | SPI | NSS, SCK, MISO, MOSI |
| | I2C | SCL, SDA |
| SPC | | STX, SRX, SRO |
| Internal Battery | | 3V(rechargeable) |
| Wireless LAN Security | | WPA-PSK / WPA2-PSK, WPA-Enterprise(TLS/TTLS/PEAP) |
| Temperature | Storage /Operating | -20°C ~ 60°C |
| Environment | | RoHS Compliant |

Dimension



※ Dimensions(unit : mm) may vary according to a method of measurement.

Layout



1. LED

There are six LEDs on the P4S-342 board.

| LED | Action |
|-------------------|------------------------------------------------------------------------------------------------------|
| PWR / 3.3V / PWR5 | supplying power > ON |
| STS | running PHP > repeat On and Off in every second not running PHP > briefly blinks 1 time at a time |
| UIO30 | on board LED: connected with 30th pin of UIO0 |
| UIO31 | on board LED: connected with 31th pin of UIO0 |

※ PWR, STS, UIO30 and UIO31 are also located on the opposite side.

2. USB Host Port for Connection with WLAN adapter

P4S-342 provides a USB host port for an USB WLAN adapter. You can connect P4S-342 to Wireless LAN by connecting an WLAN adapter to this port.

※ Caution: Only adapters using Ralink RT3070/5370 chipsets are available.

3. Function Button (Func)

The function button is used for changing mode to the Button setup mode.

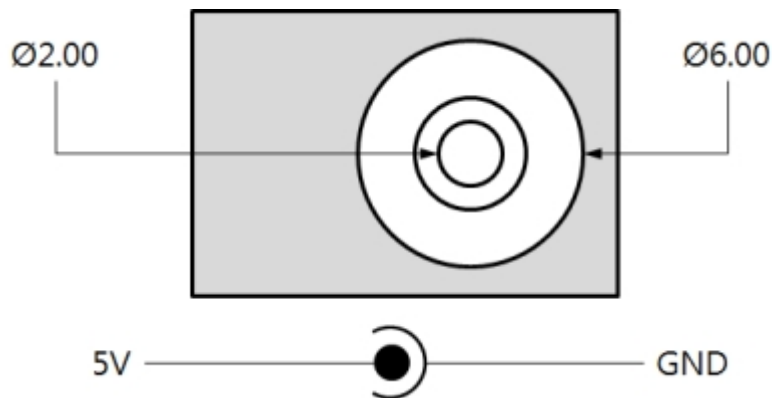
4. USB Device Port for connection with PC

The USB device port is to connect with PC. You can access to P4S-342 via development tool by connecting USB cable to this port. You can supply DC 5V power through this port. However, P4S-342 may not work properly in case of supplying power via this port only due to insufficient current.

5. Supplying Power

- DC 5V Input

This port is the main input port for supplying power. Specification is as follows:



- USB Device port (Micro USB)

This port can be a sub input port for supplying power.

6. Reset Button (RESET)

This button is used for hardware reset.

7. Console Port

This port is console port for management.

| Division | Value |
|----------------|--------------------------------------------------|
| Signal Level | 3.3V |
| Configuration | 115,200bps / 8 Data bit / 1 Stop bit / No parity |
| Pin Assignment | #1 - 3.3V, #2 - RX, #3 - TX, #4 - GND |

8. JP1

| Label | Description | Label | Description |
|---------|--------------------------------------|-------|---------------------------------------|
| 3.3V | 3.3V Output | PWR5 | Output Supplied Power (5V±0.5V) |
| GND | Ground | AREF | ADC reference input port |
| AD0 | ADC channel 0 | AD3 | ADC channel 3 |
| AD1 | ADC channel 1 | AD4 | ADC channel 4 |
| AD2 | ADC channel 2 | AD5 | ADC channel 5 |
| GND | Ground | GND | Ground |
| HT0 | Hardware Timer 0 | HT2 | Hardware Timer 2 |
| HT1 | Hardware Timer 1 | HT3 | Hardware Timer 3 |
| NSS/0 | SPI - NSS / UIO0 #0 | 12 | UART #1 RTS / UART #1 TxDE / UIO0 #12 |
| SCK/1 | SPI - SCK / UIO0 #1 | 13 | UART #1 CTS / UIO0 #13 |
| MISO/2 | SPI - MISO / UIO0 #2 | 14 | UIO0 #14 |
| MOSI/3 | SPI - MOSI / UIO0 #3 | 15 | UIO0 #15 |
| U0TX/4 | UART #0 TX / UIO0 #4 | 16 | UIO0 #16 |
| U0RX/5 | UART #0 RX / UIO0 #5 | 17 | UIO0 #17 |
| SCL/6 | I2C - SCL / UIO0 #6 | 18 | UIO0 #18 |
| SDA/7 | I2C - SDA / UIO0 #7 | 19 | UIO0 #19 |
| 8 | UART #0 RTS / UART #0 TxDE / UIO0 #8 | 20/DM | UIO0 #20 |
| 9 | UART #0 CTS / UIO0 #9 | 21 | UIO0 #21 |
| U1TX/10 | UART #1 TX/ UIO0 #10 | STX | SPC TX |
| U1RX/11 | UART #1 RX/ UIO0 #11 | SRX | SPC RX |
| GND | Ground | SRO | SPC Reset |
| PWR5 | Output Supplied Power (5V±0.5V) | 3.3V | 3.3V Output |

9. VDDA-AREF

If you connect this port, 3.3V is supplied to the analog input reference port (AREF).

10. Internal Battery

Internal battery is for saving log messages and operating RTC. Specification of this battery is as follows:

| Parameter | Value |
|-----------------|----------------|
| Capacity | 5.8mAh |
| Nominal Voltage | DC 3V |
| Charge Voltage | DC 2.8V ~ 3.1V |

※ Refer to the [datasheet](#) for more information about the battery

Peripherals (JP1)

Analog Input: ADC

P4S-342 provides 6 ADC input channels.

To use the ADC, the reference voltage input is required. When VDDA-AREF jumper is connected, 3.3V is connected to the reference voltage input pin.

※ VDD-AREF jumper is connected on the P4S-342 when shipped from the factory.

When directly inputting the reference voltage without using JP4, input it with the AREF pin.

※ Caution: Inputting a voltage to the AREF pin while the VDDA-AREF jumper is connected may cause the product to malfunction. Therefore, before connecting the voltage to the AREF pin, make sure that the jumper is NOT connected.

Specification of an ADC port is as follows:

| Parameter | Value |
|----------------------|------------------------|
| Resolution | 12 bits (0 ~ 4095) |
| Input Type | DC Voltage (Max. 3.3V) |
| Number of Channel | 6 channels |
| Interfaced Pin Label | AREF, AD0 ~ 5 |

Hardware Timer: HT

P4S-342 provides 4 hardware timers called HT.

Specification of HT is as follows:

| Parameter | Value |
|----------------------|-----------------------------------------------|
| Mode | Output mode(toggle, pulse, PWM), Capture mode |
| Unit | ms(millisecond) or us(microsecond) |
| Number of Channel | 4 channels |
| Interfaced Pin Label | HT0 ~ 3 |

Digital Inputs/Outputs: UIO

P4S-342 provides 24 digital I/O ports including 22 universal I/O ports (numbered 0 to 21) and 2 LED ports (numbered 30 and 31). Two LEDs on board are assigned to number 30 and 31. The pins numbered 0 to 21 can be available to be set digital input or output but note that pins which are shared with serial interfaces (numbered 0 to 13) cannot be available to use a digital input or output while they are being used by the serial communication (UART, SPI and I2C).

- Electrical Characteristics of Digital I/O

| Parameter | Description | Min.[V] | Max.[V] | Current |
|-----------------|-------------------|---------|---------|----------------|
| V _{IH} | HIGH level input | 2.31 | - | - |
| V _{IL} | LOW level input | 0 | 0.99 | - |
| V _{OH} | HIGH level output | 2.9 | - | ±8mA(CMOS) |
| V _{OH} | HIGH level output | 2.4 | - | ±8mA(TTL) |
| V _{OL} | LOW level output | - | 0.4 | ±8mA(CMOS/TTL) |

※ Note: Each UIO port is 5V tolerant in input mode and the maximum driving current is $\pm 8\text{mA}$ in output mode.

- Pin Assignment of Digital I/O

DIO LED Not Assigned

| | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|
| #7 | #6 | #5 | #4 | #3 | #2 | #1 | #0 |
| #15 | #14 | #13 | #12 | #11 | #10 | #9 | #8 |
| #23 | #22 | #21 | #20 | #19 | #18 | #17 | #16 |
| #31 | #30 | #29 | #28 | #27 | #26 | #25 | #24 |

"/mmap/uio0"

Serial: UART

P4S-342 provides 2 UART ports.
Specification of UART is as follows:

| Division | Value |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Number of Port | 2 |
| Interfaced Pin Label | UART0: Required(U0TX/4, U0RX/5, GND), Optional(U0RTS/8, U0CTS/9) UART1: Required(U1TX/10, U1RX/11, GND), Optional(U1RTS/12, U1CTS/13) |
| Signal Level | 3.3V |
| Baud Rate | 1,200 ~ 230,400 [bps] |
| Parity | NONE / EVEN / ODD / MARK / SPACE |
| Data bit | 8 / 7(Parity is required to use 7 data bit mode) |
| Stop bit | 1 / 2 |
| Flow Control | NONE, RTS/CTS |
| TxDE Pin | UART0 - UIO0.8(UART0 RTS), UART1 - UIO0.12(UART1 RTS) |

Serial: SPI

P4S-342 provides a SPI interface.
Specification of SPI is as follows:

| Parameter | Value |
|----------------------|--------------------------------------|
| Number of Port | 1 |
| Signal Level | 3.3V |
| Interfaced Pin Label | NSS/0, SCLK/1, MOSI/2, MISO/3 |
| SPI mode | mode 0 ~ 3 |
| Bit Order | LSB > MSB or MSB > LSB |
| Transmission Unit | 8bit or 16bit |
| Basic Clock Speed | 42MHz |
| Frequency | 2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 |

Serial: I2C

P4S-342 provides an I2C interface.
Specification of I2C is as follows:

| Parameter | Value |
|----------------------|----------------------------------------------|
| Number of Port | 1 |
| Signal level | 3.3V |
| Interfaced Pin Label | SCL, SDA |
| Data Rate | Standard mode(100Kbps) or Fast mode(400Kbps) |
| Address Type | 7bits |

Smart expansion Procedure Call: SPC

P4S-342 provides an SPC interface for communication with smart expansion boards.
Specification of SPC is as follows:

| Parameter | Value |
|----------------------|---------------|
| Number of Port | 1 |
| Signal level | 3.3V |
| Interfaced Pin Lable | STX, SRX, SRO |

※ Refer to the [PHPoC Device Programming Guide for p40](#) for detailed information about peripherals.

Software (IDE)

PHPoC Debugger

PHPoC Debugger is a software used for developing and setting PHPoC products. You need to install this program on your PC for using PHPoC.

- [PHPoC Debugger Download Page](#)
- [PHPoC Debugger Manual](#)

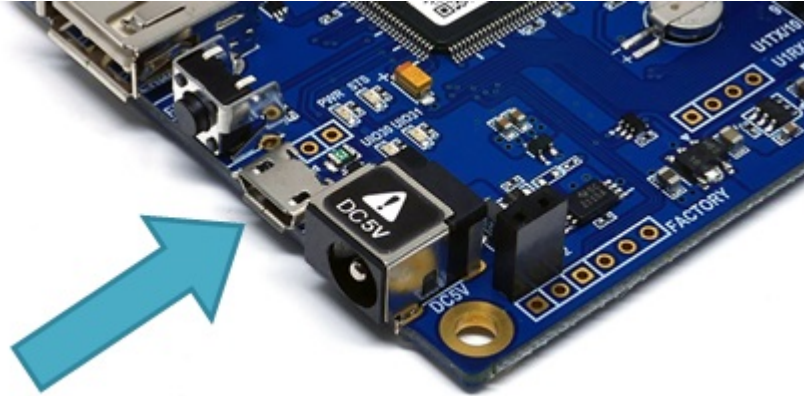
Functions and Features of PHPoC Debugger

- Upload files from local PC to PHPoC
- Download files in PHPoC to local PC
- Edit files stored in PHPoC
- Debug PHPoC scripts
- Monitor resources of PHPoC
- Configure parameters PHPoC
- Upgrade Firmware of PHPoC
- Support MS Windows O/S


Connecting Product


USB Connection

1. Connect the USB device port of P4S-342 to your PC via a USB cable.



2. Run PHPoC Debugger

3. Select connected COM PORT and press connect () button.

4. If USB is successfully connected, connect button will be inactivated and disconnect button () will be activated

Remote Connection

Starting with firmware version 1.4.0, the remote connection is provided. Please refer to [the PHPoC Debugger manual page](#) for details.

Reset

Settings Reset

Settings Reset makes all settings of your PHPoC products to factory default. A certificate in PHPoC is also deleted.

- Settings Reset Procedure

| Step | Action | Product State | STS LED |
|------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------|
| 1 | Press function button shortly (less than 1 second) | Button setup mode | On |
| 2 | Keep pressing the function button over 5 seconds | Preparing initialization | Blink very rapidly |
| 3 | Check if the STS LED is turned OFF | Initialization ready | Off |
| 4 | Release the function button right after the STS is OFF.(※ If you don't release the button within 2 seconds, the state go back to the step 3) | Progressing initialization | On |
| 5 | Rebooting automatically | Initial state | Off |

Factory Reset

Factory Reset makes all settings of your PHPoC products to factory default including a password. Futhermore, all files stored in flash memory are deleted as well as certificate. Because of this, you have to backup your files before doing Factory Reset.

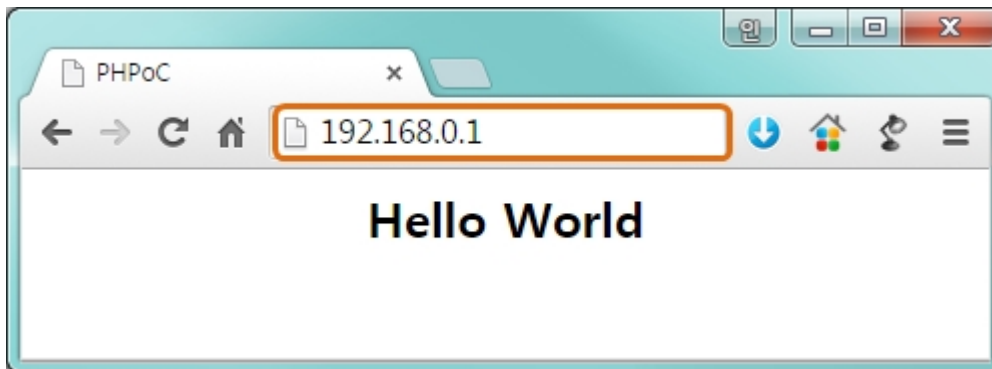
- [Factory Reset Procedure](#)

Web Interface

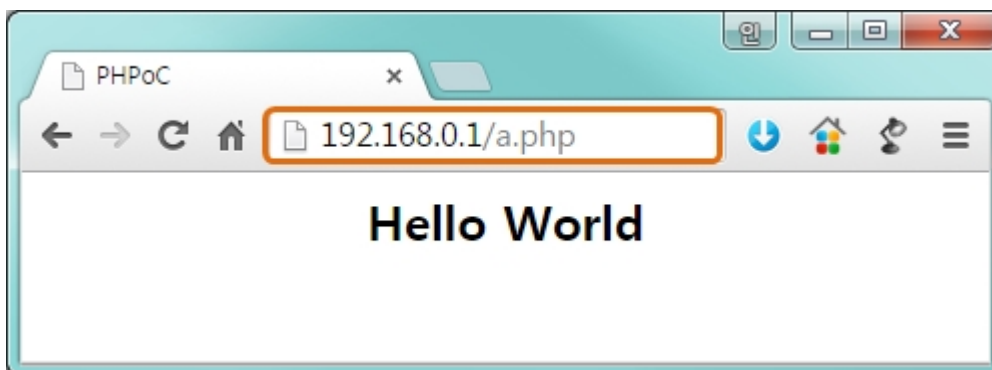
PHPoC itself has a webserver to provide a web interface. When receiving a HTTP request, it executes the php script in the requested file (if there) and respond to the client. Webserver is independent of PHPoC main script. TCP 80 is used for web server and you can use the interface via Internet Explorer, Chrome or any other web browsers.

How to use web interface

To use the web interface, "index.php" file should be in the file system of P4S-342. Connect to this page by entering device IP address after connecting it to network.



If the name of file is not "index.php", just specify the name of file after the IP address with slash mark.



Practical Use of Web Interface

Since the web server executes the php script in the requested file, user can put php code in the in the requested file to interact with peripherals such as I/O port, I2C, SPI, UART, ADC and so on. It is worth noting that there is other way to interact with the peripherals in real-time from web interface. This can be done by using websocket.

A web interface is very useful because it runs even a state which is activating [Simple WLAN Connection](#) function. If you upload web pages for specific functions, you can easily use them through wireless LAN.

Simple WLAN Connection

P4S-342 enters into Button Setup Mode when you push function button in normal state. In this mode, Simple WLAN Connection function is activated if a USB WLAN adapter is connected so you can access to P4S-342 by smartphone or laptop by WLAN.

- ※ Only the task for not basic task but [web interface](#) runs in the Button Setup Mode.
- ※ Simple WLAN Connection function is available by connecting a USB WLAN adapter.

SSID

Once WLAN Easy Connect function is activated in the Button setup mode, P4S-342 uses SSID including its own MAC address like an AP. SSID is contained the second half of the P4S-342's MAC address after "phpoc_" which is a prefix.

For example, if the MAC address is "0030f9060101", the SSID is "phpoc_060101".

WLAN Connection

Find the SSID of P4S-342 via a smartphone or laptop.



DHCP

While using WLAN Easy Connect function, a mobile automatically gets a dynamic IP address from your P4S-342. The IP address of P4S-342 is fixed to 192.168.0.1 and mobile obtains an IP address in 192.168.X.X range.

Access to Product

After uploading a setting page to P4S-342, you can access to it by web browser.



Setting Passwords

If you set a password for the product, you must enter the password when connecting the product via USB or network.

Please refer to [the PHPoC Debugger manual page](#) for details.

Escape Infinite Reset

PHPoC basically runs scripts when it boots up. Therefore, it is possible that a P4S-342 cannot be escaped from infinite reboot when script contains system command such as "reboot". To solve this problem, it is required to stop the running script.

Refer to the following.

1. Entering ISP mode

Make P4S-342 to enter ISP mode by supplying power while pressing FUNC button. In the ISP mode, you can access to PHPoC by PHPoC Debugger without running a script.

2. Connect to PHPoC

Connect a PC to PHPoC via a USB cable and connect to the port via PHPoC Debugger. A message window related with ISP mode will be popped up.

3. Reboot PHPoC

Reboot PHPoC by using "Reboot a product" menu in PHPoC Debugger. After rebooting, PHPoC stops running script even it is not in the ISP mode.

4. Correct source code

Correct the source code to prevent infinite reboot state.

Device Information

| Device | Channel | Path | Note |
|-------------|---------|---------------|------------------------|
| UART | 2 | /mmap/uart0~1 | - |
| NET | 1 | /mmap/net1 | - |
| TCP | 5 | /mmap/tcp0~4 | - |
| UDP | 5 | /mmap/udp0~4 | - |
| Digital I/O | 1 | /mmap/uio0 | pin #0 ~ #21, #30, #31 |
| ADC | 2 | /mmap/adc0~1 | - |
| ST | 8 | /mmap/st0~7 | - |
| HT | 4 | /mmap/ht0~3 | - |
| SPI | 1 | /mmap/spi0 | - |
| I2C | 1 | /mmap/i2c0 | - |
| RTC | 1 | /mmap/rtc0 | - |
| UM | 4 | /mmap/um0~3 | - |
| NM | 1 | /mmap/nm0 | - |
| SPC | 1 | /mmap/spc0 | - |

※ Refer to the [PHPoC Device Programming Guide for p40](#) for detailed information about using devices.