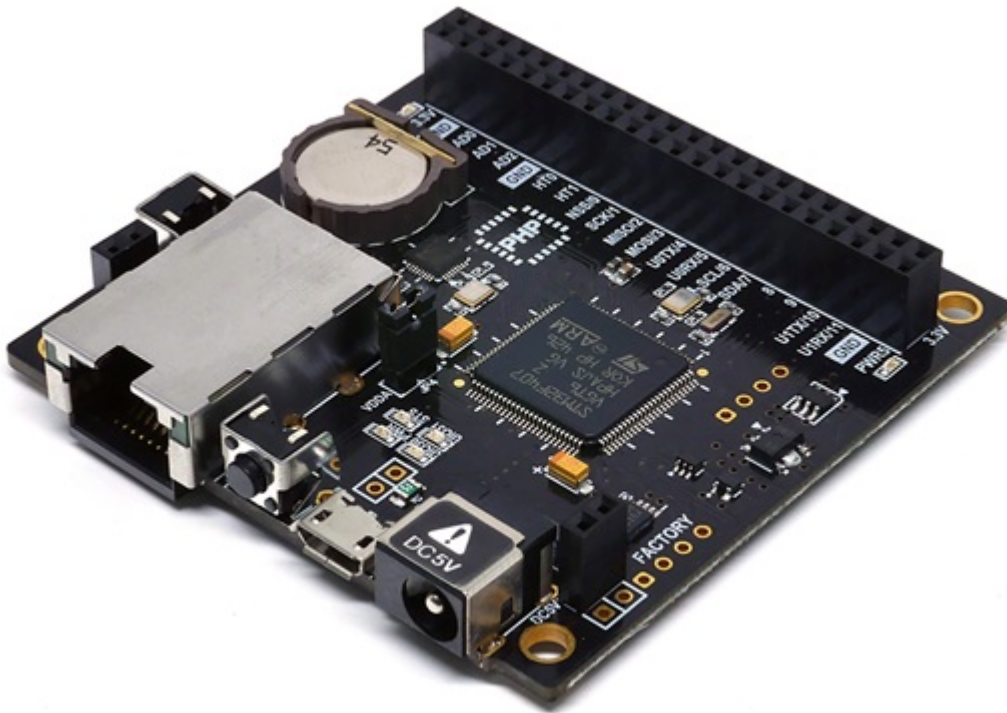


Overview



P4S-341 is an industrial programmable I/O board. You can build various network communication systems connecting P4S-341 to many devices such as sensors and actuators. We provide a self-development programming language, which is called PHPoC, for programming P4S-341. 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.

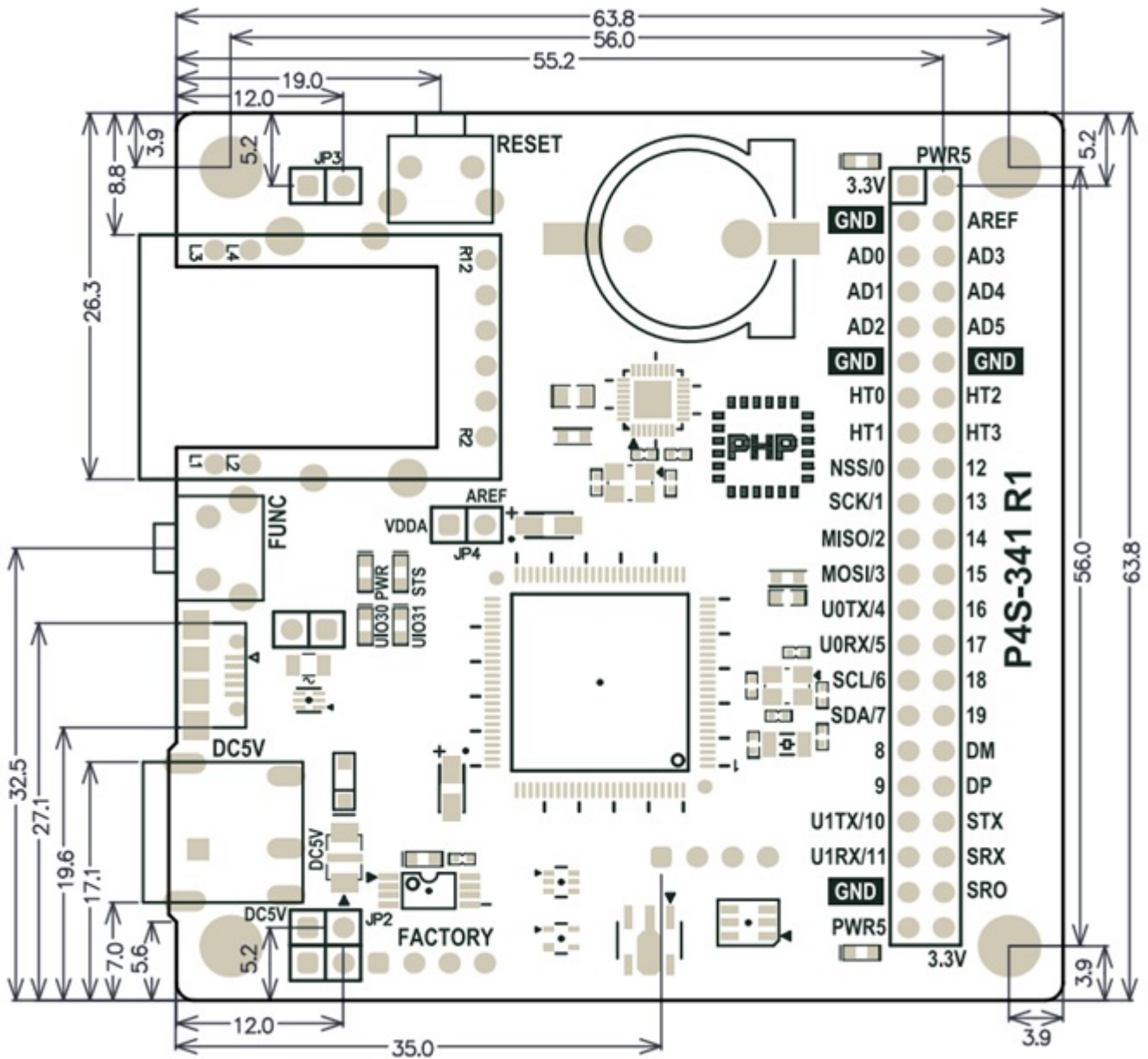
Features

- Provides self-developed PHPoC Interpreter
- Provides simple development environment via USB
- Provides 10/100Mbit Ethernet
- 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

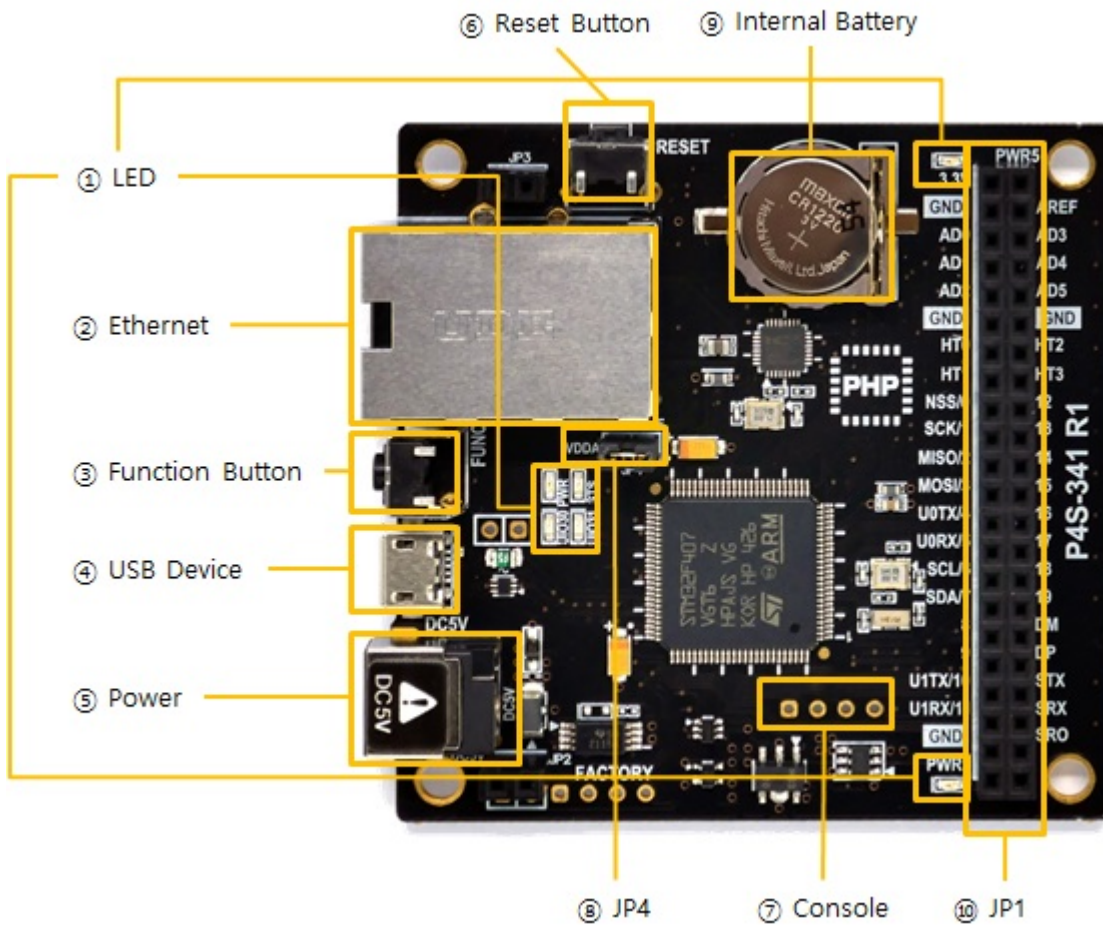
Power	Input 1	DC 5V ($\pm 0.5V$)
	Input 2	DC 5V ($\pm 0.5V$) - USB Device Port
	Current Consumption	Typical - about 110mA Power Down mode - less than 200uA
Dimension		66.5mm x 63.8mm x 13mm
Weight		about 30g
Interface	UART	2 X UART Ports(UART0 ~ 1), Baudrate: 1,200 bps ~ 230,400 bps
	Network	10/100Mbps Ethernet
	USB	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
Temperature	Storage /Operating	-40°C ~ 85°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-341 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. Ethernet

P4S-341 provides 10/100Mbps Ethernet.

3. Function Button (Func)

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

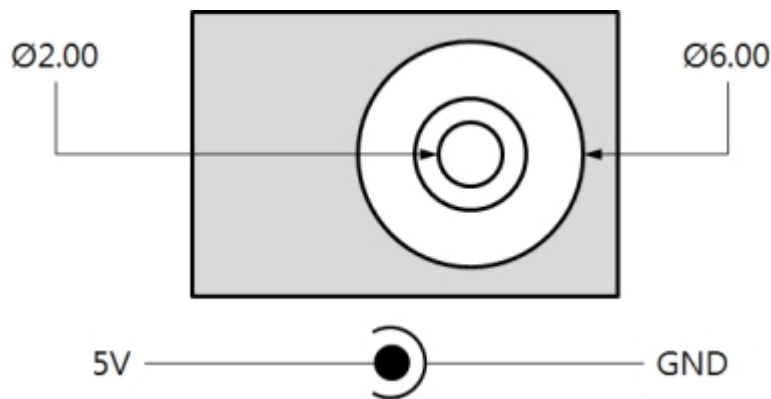
4. USB Device Port for connection with PC

The USB device port is to connect with PC. You can access to P4S-341 via development tool by connecting USB cable to this port. You can supply DC 5V power through this port. However, P4S-341 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

Label	Description	Label	Description
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/DP	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. JP4(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	48mAh
Nominal Voltage	DC 3V

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

Peripherals (JP1)

Analog Input: ADC

P4S-341 provides 6 ADC input channels.

To use the ADC, the reference voltage input is required. When JP4 (VDDA-AREF) jumper is connected, 3.3V is connected to the reference voltage input pin.

※ VDD-AREF jumper is connected on the P4S-341 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 JP4 (VDDA-AREF) jumper is connected may cause the product to malfunction. Therefore, before connecting the voltage to the AREF pin, make sure that the JP4 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-341 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-341 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-341 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-341 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-341 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-341 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](#)

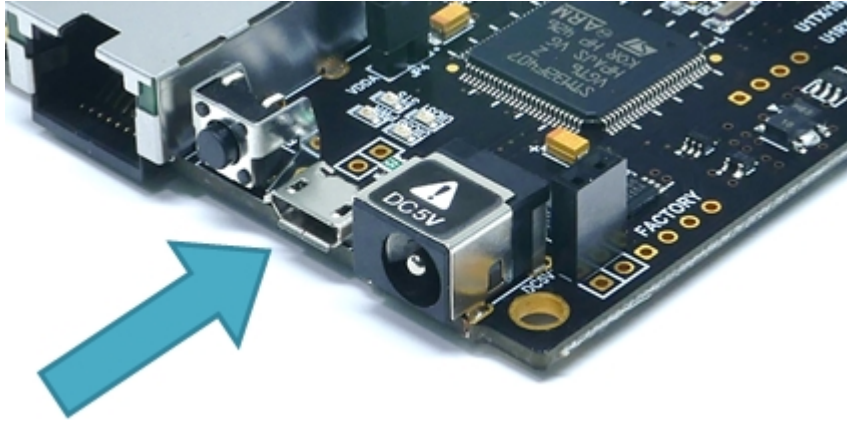
Functions and Features of PHPoC Debugger

- 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-341 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.

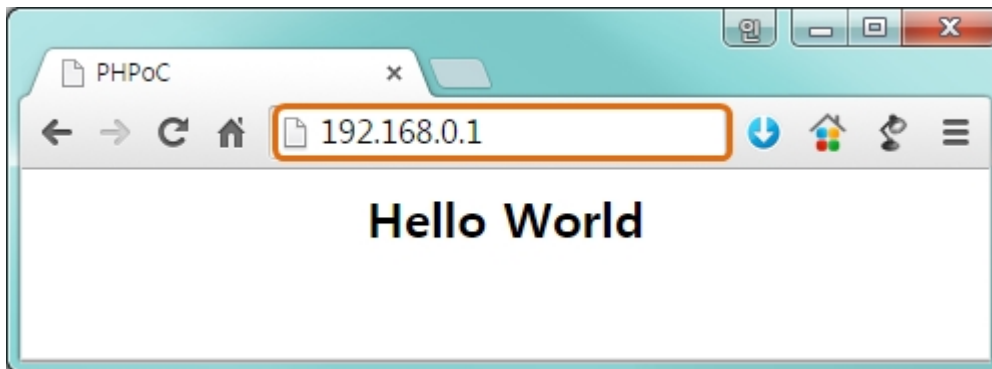
- [Factory Reset Procedure](#)

Web Interface

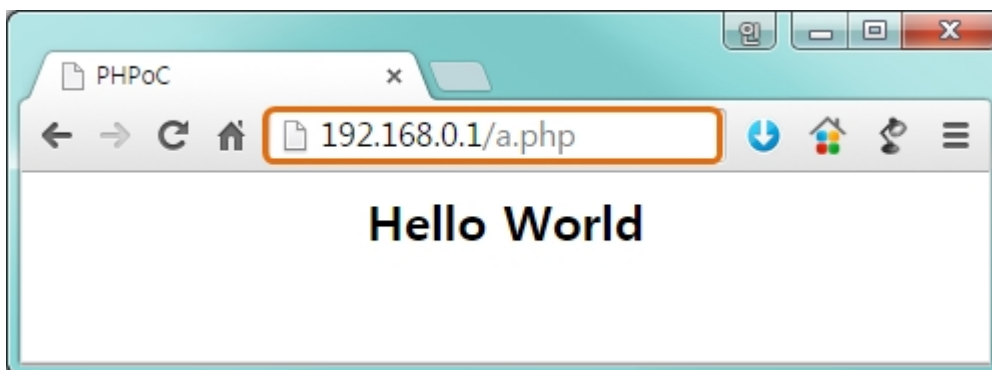
PHPoC itself has a webserver to provide a web interface. When receiving a HTTP request, it executes the php script in the requested file (if there) and respond to the client. Webserver is independent of PHPoC main script. TCP 80 is used for web server and you can use the interface via Internet Explorer, 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-341. 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.

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.

Escaping Infinite Reset

PHPoC basically runs scripts when it boots up. Therefore, it is possible that a P4S-341 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-341 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/net0	-
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.