# iPPC-IoT Series
# User Manual

V1.0.2 February 2025

## iPPC-4801-IoT/iPPC-6801-IoT/iPPC-6831-IoT

## iPPC-4901-IoT/iPPC-6901-IoT/iPPC-6931-IoT

Written by Jeffery Hong

Edited by Mac Cho

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# 1. Introduction

This chapter provides an overview of the iPPC-IoTand its components, and introduces the fundamental concepts for user familiar with the iPPC-IoT.

The iPPC-IoT series is Windows 10 IoT Enterprise based Panel PC that combine computing, I/O, and operator interface into a single unit, and provide the perfect solution for integrating HMI, data acquisition and control in an individual iPPC. It is equipped with an Intel Atom E3845 or E3950 CPU, three I/O expansion slots option, TFT LCD and a variety of connectives including dual Gigabit Ethernet, USB port, RS-232 and RS-485 interface. The operating system is pre-installed in the built-in mSATA SSD, and the storage can be expanded from a Compact Flash slot. Local I/O slots are available to use our I-8K and I-87K series I/O modules and remote I/O expansion is available to use our Ethernet I/O modules and RS-485 I/O modules.

.

Designed for panel mount installation, the front panel is NEMA 4/IP65 rated and can withstand sprayed water, humidity and extreme dust. Designed to operate over a wide -20°C ~ 60°C ambient temperature range, the fanless design offers the ultimate in reliability with no moving parts.

Since Windows 10 IoT Enterprise has the same Win32 API as Windows 10, most popular applications on desktop can run on Windows 10 IoT Enterprise based controllers.



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# 1.1. Features

The iPPC-IoT offers the most comprehensive configuration and remote system upgrade solutions to meet specific application requirements. The following list shows the software and hardware features designed to simplify installation, configuration and application.

## Software Features

- Windows IoT (Windows 10 IoT Enterprise LTSC 2021)

Windows 10 IoT is a member of the Windows 10 family that brings enterprise-class power, security, and manageability to the Internet of Things. It leverages Windows' embedded experience, ecosystem, and cloud connectivity, allowing organizations to create their Internet of Things with secure devices that can be quickly provisioned, easily managed, and seamlessly connected to an overall cloud strategy.

  - Traditional Windows Shell with Advanced Lockdown Features
  - Full Windows UI support (e.g. UWP, WinForms, etc)

1. Rich Software Solutions
2. Visual Studio .Net and VC solution: SDK as well as demo programs for C#, VB.Net, and VC are provided.
3. eLogger HMI: A free charge and easy-to-use software to implement HMI and data logger, supporting Modbus TCP/RTU/ASCII master and MQTT protocols. (See more...)

**Tips & Warnings**

The Windows 10 IoT Enterprise is like Windows 10. Like PC, please do not power off directly.

## Hardware Features

### Powerful CPU Module

E3845 (1.91 GHz, 64bit quad core) for iPPC-4801-IoT/iPPC-4901-IoT/ iPPC-6801-IoT/iPPC-6831-IoT

E3950 (1.6~2.0 GHz, 64bit quad core) for iPPC-6901-IoT/iPPC-6931-IoT

### VGA Resolution

10.4"(800 x 600) TFT LCD with Touch Panel for iPPC-4801-IoT/iPPC-4901-IoT



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15" (1024 x 768) TFT LCD with Touch Panel for iPPC-6801-IoT/iPPC-6831-IoT/ iPPC-6901-IoT/iPPC-6931-IoT

## Memory Size:

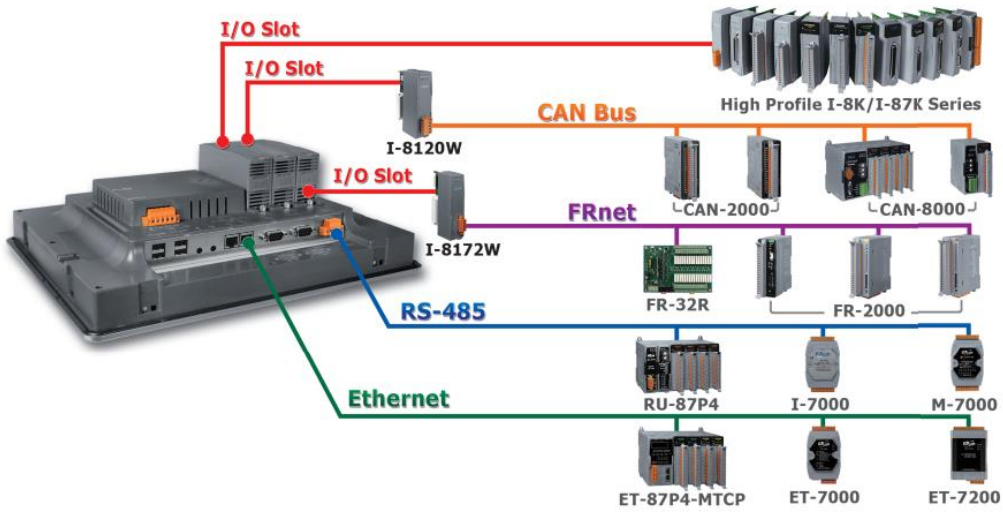
- SDRAM (4 GB DDR3)
- Flash (128 GB SSD)
- CF Card (support up to 32 GB)

## 64-bit Hardware Serial Number

The 64-bit hardware serial number is unique and individual. Every serial number of iPPC-IoT PAC is different. Users can add a checking mechanism to their AP to prevent software from pirating.

## Rich I/O Expansion Ability(connect with serial/USB I/O and Ethernet I/O devices)

- I/O Slots (for iPPC-6831-IoT/iPPC-6931-IoT)
- RS-232/RS-422(for iPPC-4801-IoT, iPPC-6801-IoT)/RS-485
- FRnet(for iPPC-6831-IoT/iPPC-6931-IoT)
- USB
- Ethernet




Besides the local I/O slots, iPPC-IoT also provides several RS-232/RS-485/USB ports and two Ethernet ports to connect with serial/USB I/O and Ethernet I/O devices.



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## Dual Ethernet Ports (for iPPC-6801-IoT/iPPC-6831-IoT/iPPC-6901-IoT/iPPC-6931-IoT)

iPPC-IoT provides two Gigabit Ethernet ports. The two Ethernet ports can be used to implement redundant Ethernet communication and separate Ethernet communication (one for a global Internet, one for private Ethernet).

## Dual Watchdog Timer

A system could be hanged up when the OS or the AP fails. There are two watchdogs (CPU watchdog and Backplane watchdog) designed to automatically reset the CPU/Backplane when the situations happen. The design will increase the reliability of the system.

## Redundant Power Inputs

To prevent the iPPC-IoT from failing by the power loss, the power module is designed with two inputs. The iPPC-IoT can keep working even one power input fails, and meanwhile, there is a relay output for informing the power failure.

## Operating Temperature：

- -20°C to +60°C

## Metal Enclosure

The iPPC-IoT features a durable metal casing to provide high levels of impact resistance and flame resistance and higher protection on EMS or other electromagnetic noises.



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# 1.2. Specifications

The table below summarizes the specifications of iPPC-IoT.

| Models | iPPC-4801-IoT | iPPC-4901-IoT | iPPC-6801-IoT | iPPC-6901-IoT |
|---|---|---|---|---|
| **System Software** | | | | |
| OS | Windows 10 IoT Enterprise (64-bit) | | | |
| Framework Support | .Net Compact Framework 3.5~4.8 | | | |
| SDK Provided | Dll for VC, Dll for Visual Studio.Net | | | |
| Multilanguage Support | English, German, French, Spanish, Portuguese, Russian, Italian, Korean, Japanese, Simplified Chinese, Traditional Chinese | | | |
| **CPU Module** | | | | |
| CPU | E3845 (1.91 GHz, 64-bit quad core) | E3950 (1.6~2.0 GHz, 64bit quad core) | E3845 (1.91 GHz, 64-bit quad core) | E3950 (1.6~2.0 GHz, 64bit quad core) |
| SDRAM | 4 GB DDR3 SDRAM | 8 GB DDR4 SDRAM | 4 GB DDR3 SDRAM | 8 GB DDR4 SDRAM |
| MRAM | 128 KB | | | |
| Flash(SSD) | mSATA slot with one 128 GB SSD | | | |
| EEPROM | 16 KB | | | |
| Memory Expansion | CF socket with one 32GB CF card | | | |
| RTC (Real Time Clock) | Provide second, minute, hour, date, day of week, month, year | | | |
| 64-bit Hardware Serial Number | Yes, for software copy protection | | | |
| Dual Watchdog Timers | Yes | | | |
| Programmable LED Indicator | No | | 2 (L1, L2) | |



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| | | |
|---|---|---|
| Rotary Switch | Yes (0 ~ 9) | |
| **Display** | | |
| Size | 10.4" (4:3) | 15" (4:3) |
| Resolution | 800 x 600 | 1024 x 768 |
| Brightness | 400 cd/m2 | |
| Contrast Ratio | 500:1 | 700:1 |
| Backlight Life | 50,000 hours | |
| Touch Panel | 5-wire, resistive type; light transmission: 80 % | |
| **Communication Ports** | | |
| Ethernet Port | 1 x RJ-45, 10/100/1000M Base-TX | 2 x RJ-45, 10/100/1000M Base-TX |
| USB port | USB 2.0 x 2 | USB 2.0 x 4 |
| COM2 | RS-232/RS-422/RS-485 | |
| COM3 | RS-232/RS-422/RS-485 | |
| Audio | Earphone-out | Microphone-in and Earphone-out |
| **Mechanical** | | |
| Casting | Metal | |
| Dimensions (W x H x D, unit: mm) | 291 x 229 x 53 | 381 x 305 x 63 |
| Panel Cut-Out (W x H, unit: mm) | 274 x 211, ±1 | 364 x 288, ±1 |
| Installation | Panel Mounting, VESA Mounting (75 x 75, 100 x 100) | |
| Ingress Protection Rating | Front panel: NEMA 4/IP65 | |
| Weight | 1.82 kg | 2.975 kg |
| **Environmental** | | |
| Operating Temperature | -20 °C to +60 °C | |



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| | | |
|---|---|---|
| Storage Temperature | -20 °C to +70 °C | |
| Ambient Relative Humidity | 10 % to 90 % RH (non-condensing) | |
| **Power** | | |
| Input Range | +10 $V_{DC}$ to +30 $V_{DC}$ | |
| Isolation | 1.5 kV | |
| Redundant Power Inputs | Yes | |
| Consumption | 22 W | 29W |



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| Models | iPPC-6831-IoT | iPPC-6931-IoT |
|---|---|---|
| **System Software** | | |
| OS | Windows 10 IoT Enterprise (64-bit) | |
| Framework Support | .Net Compact Framework 3.5~4.8 | |
| SDK Provided | Dll for VC, Dll for Visual Studio.Net | |
| Multilanguage Support | English, German, French, Spanish, Portuguese, Russian, Italian, Korean, Japanese, Simplified Chinese, Traditional Chinese | |
| **CPU Module** | | |
| CPU | E3845 (1.91 GHz, 64-bit quad core) | E3950 (1.6~2.0 GHz, 64bit quad core) |
| SDRAM | 4 GB DDR3 SDRAM | 8 GB DDR4 SDRAM |
| MRAM | 128 KB | |
| Flash(SSD) | mSATA slot with one 64 GB SSD | |
| EEPROM | 16 KB | |
| Memory Expansion | CF socket with one 32GB CF card | |
| RTC (Real Time Clock) | Provide second, minute, hour, date, day of week, month, year | |
| 64-bit Hardware Serial Number | Yes, for software copy protection | |
| Dual Watchdog Timers | Yes | |
| Programmable LED Indicator | 2 (L1, L2) | |
| Rotary Switch | Yes (0 ~ 9) | |
| **Display** | | |
| Size | 15" (4:3) | |
| Resolution | 1024 x 768 | |



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| | | |
|---|---|---|
| Brightness | 400 cd/m2 | |
| Contrast Ratio | 700:1 | |
| Backlight Life | 50,000 hours | |
| Touch Panel | 5-wire, resistive type; light transmission: 80 % | |
| **I/O Expansion I-8K, I-87K series** | | |
| Slots | 3 | |
| **Communication Ports** | | |
| Ethernet Port | 2 x RJ-45, 10/100/1000M Base-TX | |
| USB port | USB 2.0 x 3 | |
| COM2 | RS-232 | |
| COM3 | RS-485 | |
| COM4 | RS-232/RS-485 | |
| Audio | Microphone-in and Earphone-out | |
| **Mechanical** | | |
| Casting | Plastic | |
| Dimensions (W x H x D, unit: mm) | 381 x 305 x 88 | |
| Panel Cut-Out (W x H, unit: mm) | 366 x 290, ±1 | |
| Installation | Panel Mounting | |
| Ingress Protection Rating | Front panel: NEMA 4/IP65 | |
| Weight | 3.02 kg | 3.02 kg |
| **Environmental** | | |
| Operating Temperature | -20 °C to +60 °C | |
| Storage Temperature | -20 °C to +70 °C | |



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| | |
|---|---|
| Ambient Relative Humidity | 10 % to 90 % RH (non-condensing) |
| **Power** | |
| Input Range | +10 $V_{DC}$ to +30 $V_{DC}$ |
| Isolation | 1.5 kV |
| Redundant Power Inputs | Yes |
| Consumption | 25 W |



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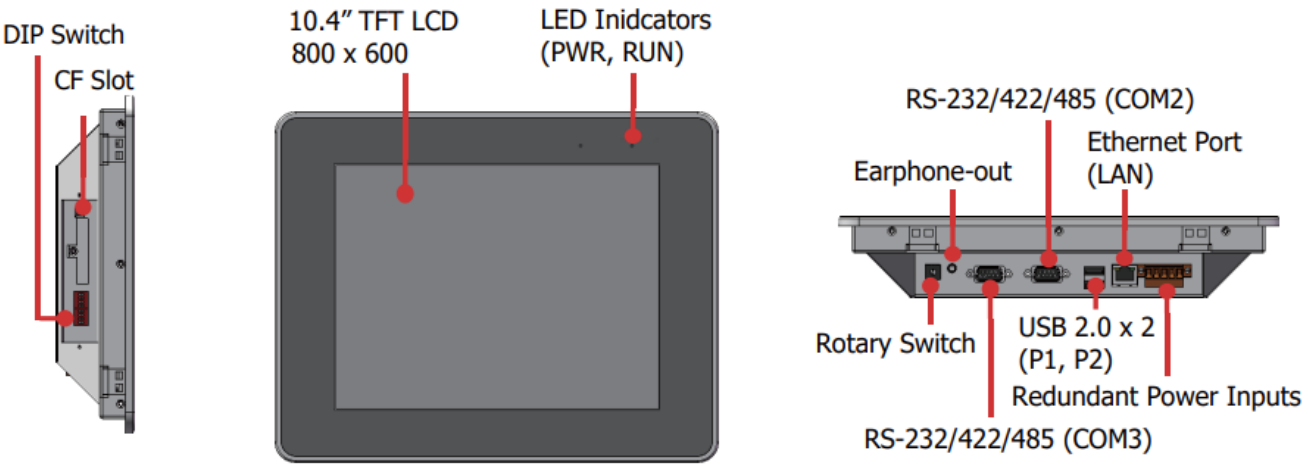
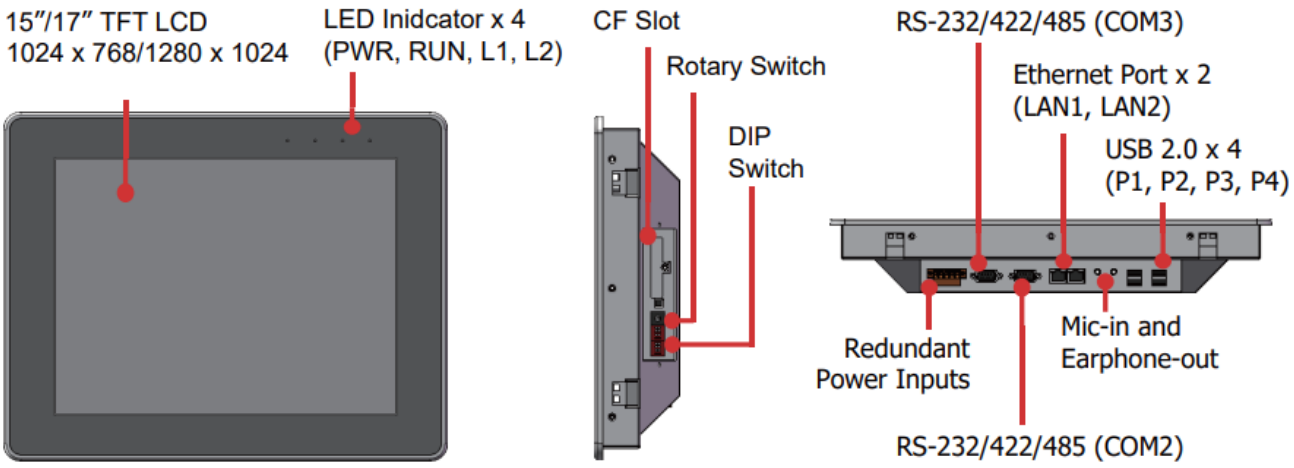
# 1.3. Overview

The iPPC-IoT Series modules are equipped with several interfaces and peripherals that can be integrated with external systems. Here is an overview of the components and its descriptions.

**iPPC-4801-IoT**




**iPPC-6801-IoT**



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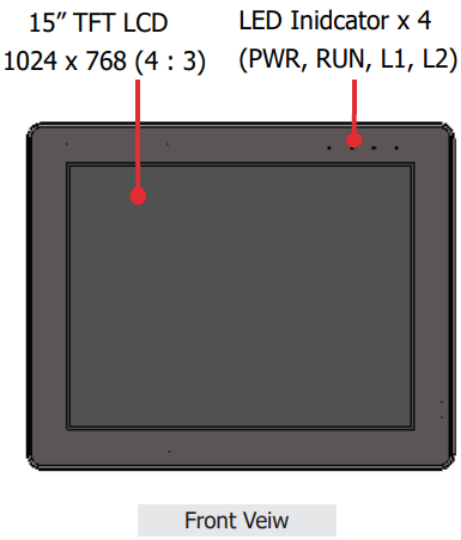
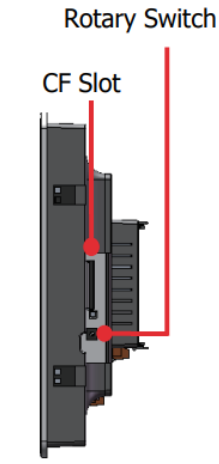
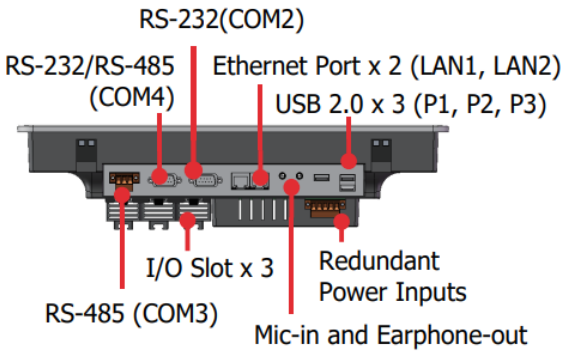
## iPPC-6831-IoT




Front Veiw




Righ Side View




Bottom View

### Tips & Warnings

The iPPC-IoT on the side has a cover to protect the interior components.

Before starting any work with these components, first open the cover.

### LED Indicators

| LED Indicator | Label | State (Color) | Meaning |
|---|---|---|---|
| Programmable LED Indicators | L1 and L2 | - | Programmable LED indicators |
| System LED indicator | RUN | Green | OS is running |
| PWR LED Indicator | PWR | Red | Power is on |
| LAN1 LED indicator | Link/Act | Green | The Link is active |
| | | Blinking | Network activity |
| | 1G | Orange | The network speed is 1 G |
| LAN2 LED indicator | Link/Act | Green | The Link is active |
| | | Blinking | Network activity |
| | 1G | Orange | The network speed is 1 G |



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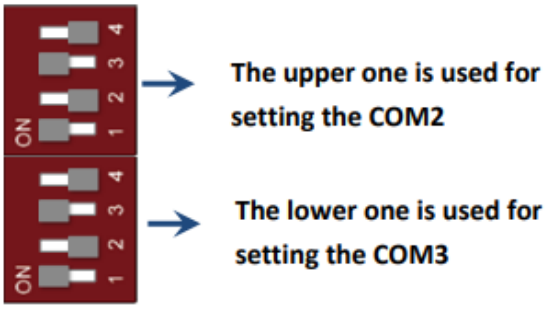
● **DIP Switch**

The iPPC-IoT has 2 COM ports that provide versatile communication types: RS-232, RS-422 and RS-485. The two DIP switches are used for assigning the communication types.

i




➢ **Selecting communication interface (S3, S4)**

| COM2/COM3 | Switch Setting | | Status |
|---|---|---|---|
| **RS-232 (Default)** | **S4** | **Off** | |
| | **S3** | **On** | |
| **RS-422** | S4 | On | |
| | S3 | On | |
| **RS-485** | S4 | On | |
| | S3 | Off | |



➢ **Enable/Disable Pull-high/Pull-low resistors for RS-422/RS-485 (S1)**

| COM2/COM3 | Switch Setting | | Status |
|---|---|---|---|
| **Enable (Default)** | **S1** | **On** | |
| **Disable** | S1 | Off | |



➢ **Enable/Disable 120Ω termination resistors for RS-422/RS-485 (S2)**

| COM2/COM3 | Switch Setting | | Status |
|---|---|---|---|
| **Disable (Default)** | **S2** | **Off** | |
| **Enable** | S2 | On | |





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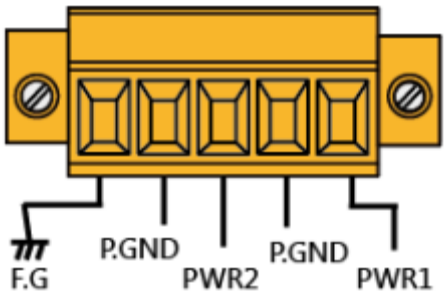
## Redundant Power (PWR1 and PWR2)

The iPPC-IoT has a terminal with 5-wire; there are 4-wire for redundant power input and a wire for frame ground, the details are shown as below.




- **Mic-in & Earphone-out**

The iPPC-IoT has a microphone-in and an earphone-out that can be used to process the input and the output of sound. (The iPPC-4801-IoT and iPPC-4901-IoT supports earphone-out only)

- **Rotary Switch**

Rotary Switch is an operating mode selector.

## Communication Ports

- **CF Socket with a CF Card Inside**

The iPPC-IoT comes with a CF card inside the CF socket. The CF card can be used to restore the iPPC-IoT system and expand the memory up.

- **LAN Ports, LAN1 and LAN2**

The iPPC-IoT has two Ethernet ports that can be used to connect the router to the Internet or to other devices.

- **USB 2.0 Ports**

The iPPC-IoT has 2/3 USB 2.0 ports that can be used to connect the USB devices such as mouse, keyboard or an external USB hard drive.



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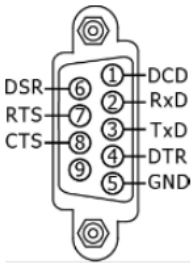
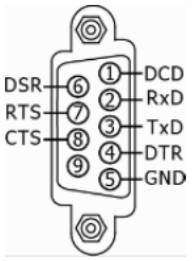
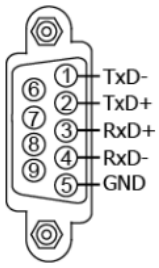
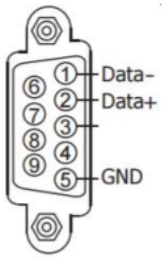
- **COM1, Expansion I/O Slot for iPPC-6831-IoT/iPPC-6931-IoT**

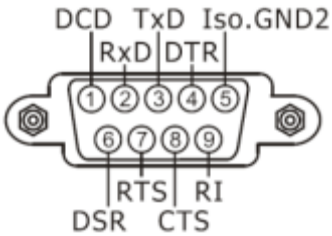
The iPPC-IoT has 1/3/7 I/O slots that can be used to integrate high performance parallel I/O modules (I-8K Series) or serial I/O modules (I-87K series).

- **COM2 /COM3 for iPPC-4801-IoT/iPPC-4901-IoT/iPPC-6801-IoT/iPPC-6901-IoT**

The iPPC has 2 COM ports that provide versatile communication types: RS-232, RS-422 and RS-485. The pin assignments of these two COM port are shown as below:

| COM Port | RS-232 (Default) | | RS-422 | | RS-485 | |
|---|---|---|---|---|---|---|
| | COM2 | COM3 | COM2 | COM3 | COM2 | COM3 |
| Pins |  |  |  | |  | |
| 1 | DCD | DCD | TxD- | | Data- | |
| 2 | RxD | RxD | TxD+ | | Data+ | |
| 3 | TxD | TxD | RxD+ | | - | |
| 4 | DTR | DTR | RxD- | | - | |
| 5 | GND | GND | GND | | GND | |
| 6 | DSR | DSR | - | | - | |
| 7 | RTS | RTS | - | | - | |
| 8 | CTS | CTS | - | | - | |
| 9 | - | - | - | | - | |

- **COM2 (RS-232) for iPPC-6831-IoT/iPPC-6931-IoT**




The COM2 port is a 9-pins RS-232 connector.

The details of the COM2 port specifications are shown to the side.

**Port Type:** Male

**Baud Rate:** 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200 bps

**Data Bits:** 5, 6, 7, 8

**Parity:** None, Even, Odd, Mark (Always 1), Space (Always 0)

**Stop Bits:** 1, 2

**FIFO:** 16 bytes



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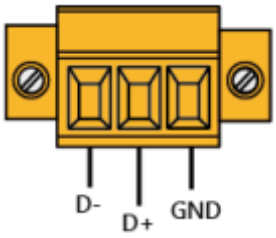
**COM3 (2-wire RS-485) for iPPC-6831-IoT/iPPC-6931-IoT**

The COM3 port is a 3-wire RS-485 connector.

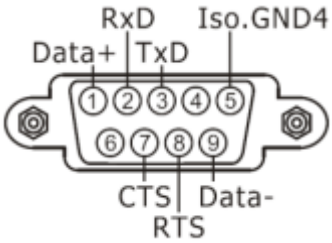
The details of the COM3 specifications are shown to the side.




● **COM4 (RS-232/RS-485) for iPPC-6831-IoT/iPPC-6931-IoT**

The COM4 port is a 9-pins RS-232/RS-485 connector.

The details of the COM4 port specifications are shown to the side




**Port Type:** Male

**Baud Rate:** 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200 bps

**Data Bits:** 5, 6, 7, 8

**Parity:** None, Even, Odd, Mark (Always 1), Space (Always 0)

COM4 can be configured as either RS-232 or RS-485, that only can select one at a time and its configuration depends on the pin connections as follows:

**RS-232** (RXD, TXD, CTS, RTS and GND)

**RS-485** (Data+ and Data-)

No software configuration or hardware jumper needed



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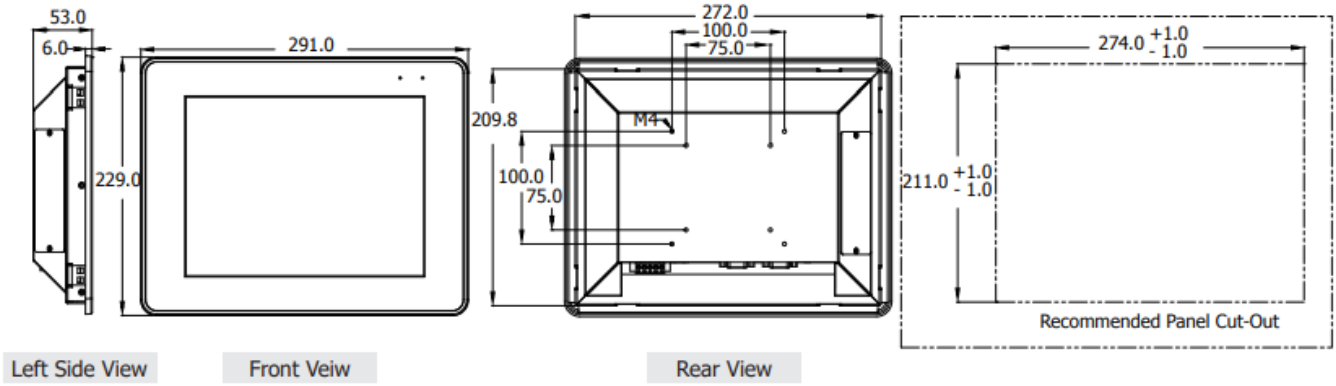
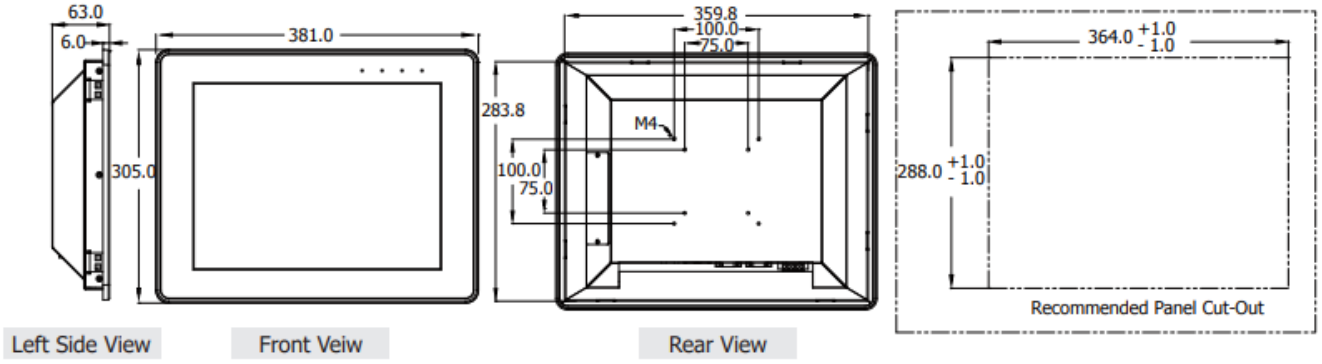
# 1.4. Dimensions

The diagrams below provide the dimensions and the panel cut-out to use in defining your enclosure specifications. Remember to leave room for potential expansion if you are using other components in your system. All dimensions are in millimeters.

### iPPC-4801-IoT/iPPC-4901-IoT




### iPPC-6801-IoT/iPPC-6901-IoT



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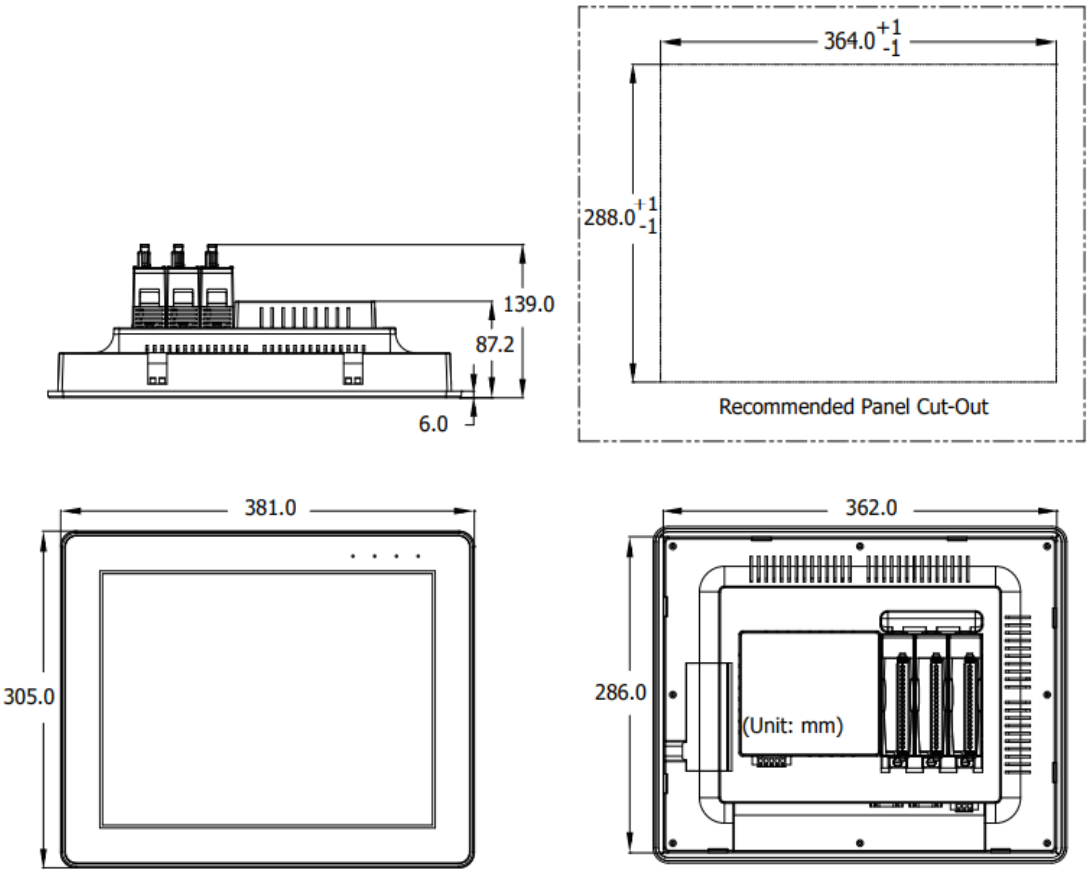




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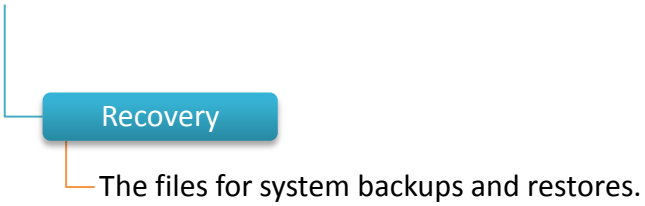
# 1.5. Rescue CF Card

The iPPC-IoT comes with a rescue compact flash card that supports rescue mechanism for the iPPC-IoT. All of them are listed below.

Rescue CF Card



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# 2. Getting Started

This chapter provides a guided tour of the iPPC-IoT installation and configuration that describes the steps needed to download, install, configure, and run the basic procedures for user working with the iPPC-IoT for the first time.

Before starting any task, please check the package contents. If any of the following package contents are missing or damaged, contact your dealer, distributor.

iPPC-IoT series device

I/O Socket *3
for iPPC-6831-IoT/iPPC-6931-IoT

Touch Pen

CF slot with a CF card

Screw Driver

Panel clip * 4

M4 x 30L Screw * 4



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## 2.1. Mounting the Hardware

iPPC-6831-IoT/iPPC-6931-IoT has 3 expansion I/O slots to expand the functions, allowing it to communicate with external I/O devices, and before choosing the right I/O module, you first need to know the I/O expansion capacities in order to choose the best expansion module for achieving maximal efficiency.

There are more than 30 high profile I/O modules available for interfacing many different measurements, including thermocouple, voltage, RTD, current, resistance, strain, digital,…, etc., and these modules have their own manuals, so if you are using them you should supplement this manual with the manual specifically designed for the special module.

For more information about the I/O expansion modules that are compatible with the iPPC-6831-IoT/iPPC-6931-IoT, please refer to
https://www.icpdas.com/en/product/guide+Remote_I_O_Module_and_Unit+PAC_I_O_Modules+I-8K_I-87K_Series_(High_Profile)%23485


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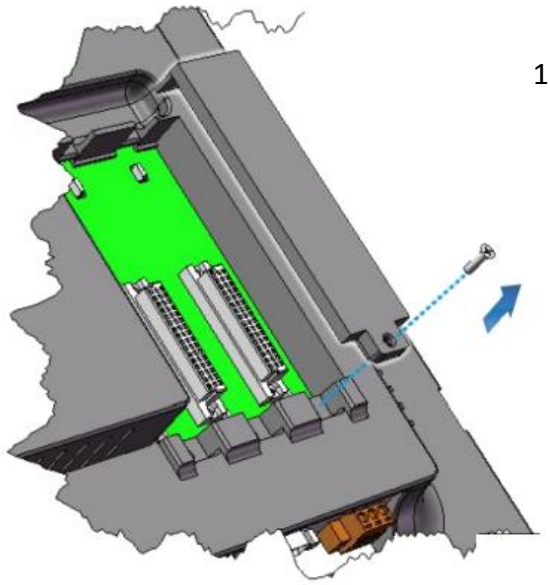
## 2.1.1. Inserting the I/O Modules (for iPPC-6831-IoT/iPPC-6931-IoT)

There is a top case on each I/O socket.

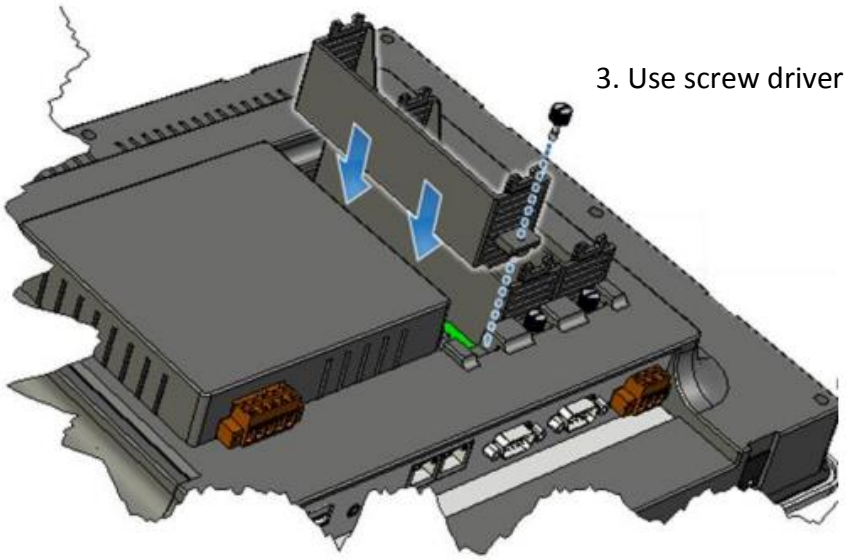
Before inserting the I/O module you first need to remove it

### To insert the I/O module



1. Use the screw driver to remove the screw and then remove the top case.

2. Hold the I/O socket vertically and align the iPPC socket and then carefully press the I/O socket onto the socket



3. Use screw driver to screw tightly the screw.



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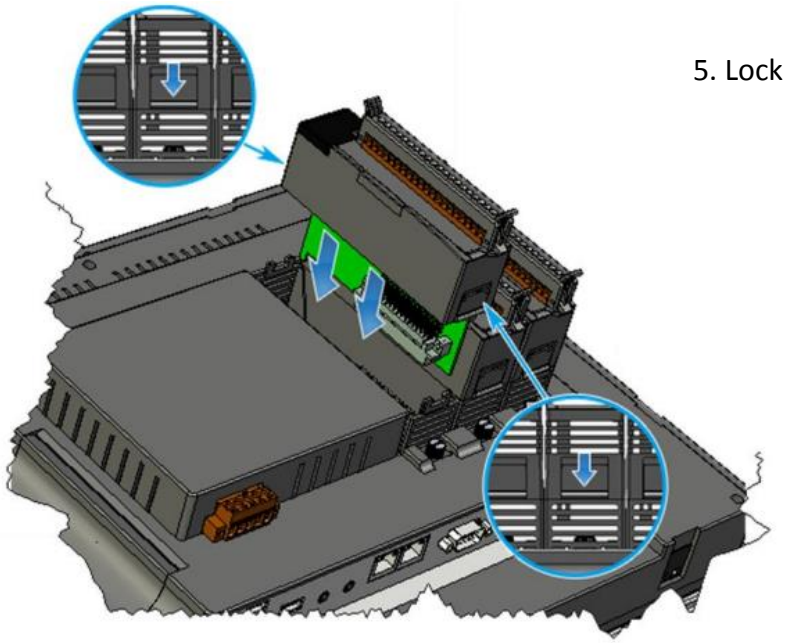
4. Hold the I/O module vertically and align the socket and then carefully press the I/O module onto the socket.



5. Lock the I/O module

**Tips & Warnings**

If you do not expand the I/O module full, please keep the top case of the unused slot to protect the backplane from dirt, dust and damage from foreign objects.



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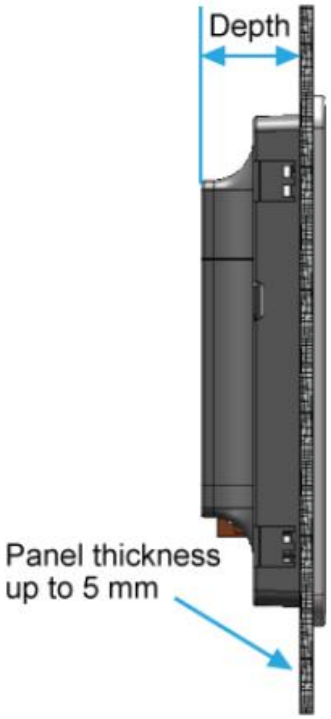
## 2.1.2. Mounting the iPPC

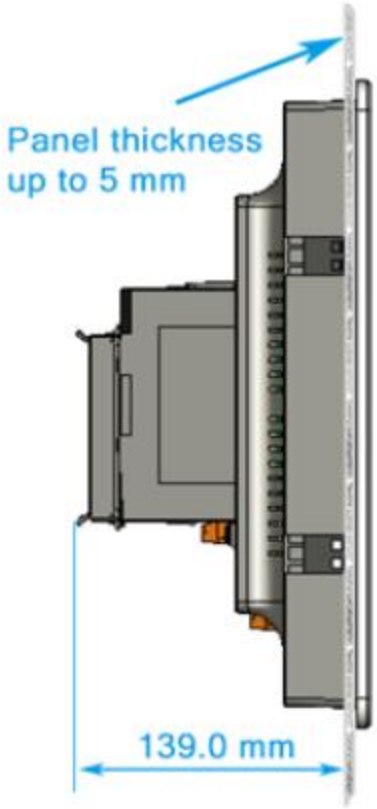
The iPPC can be mounted on a panel of maximum thickness 5 mm.

Adequate access space can be available at the rear of the instrument panel for wiring and servicing purposes.




**iPPC-4801-IoT/iPPC-4901-IoT**

**iPPC-6801-IoT/iPPC-6901-IoT**




**iPPC-6831-IoT/iPPC-6931-IoT**

**Tips & Warnings**

To ensure proper ventilation for the iPPC-IoT, leave a minimum of 50 mm space between the top and bottom edges of the iPPC-IoT and the enclosure panels.



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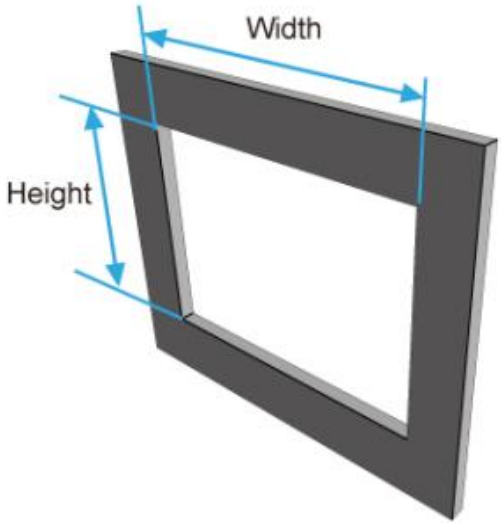
**To mount the iPPC-IoT**

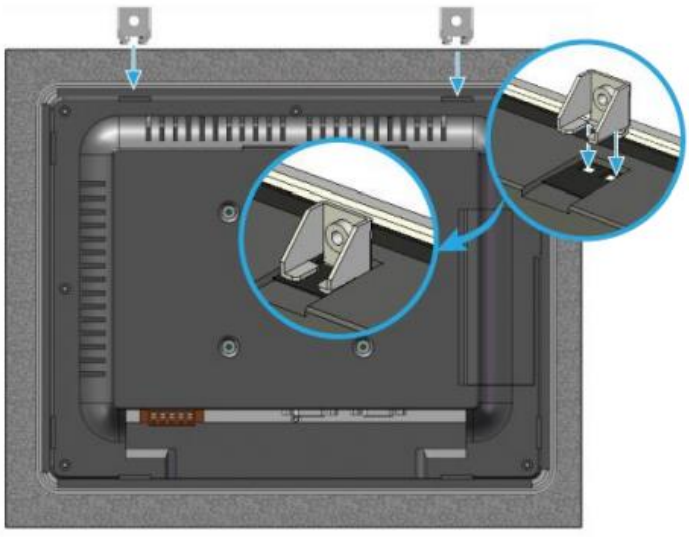
1. Prepare the panel and cut the hole to the specified size

2. Attach the iPPC-IoT to the cut-out hole



| Models | Depth |
|---|---|
| iPPC-4801-IoT/iPPC-4901-IoT | 274 mm x 211 mm, ±1 mm |
| iPPC-6801-IoT/iPPC-6901-IoT | 364 mm x 288 mm, ±1 mm |
| iPPC-6831-IoT/iPPC-6931-IoT | 366 mm x 290 mm, ±1 mm |

3. Insert the panel mounting clips into the upper and lower ventilation holes.





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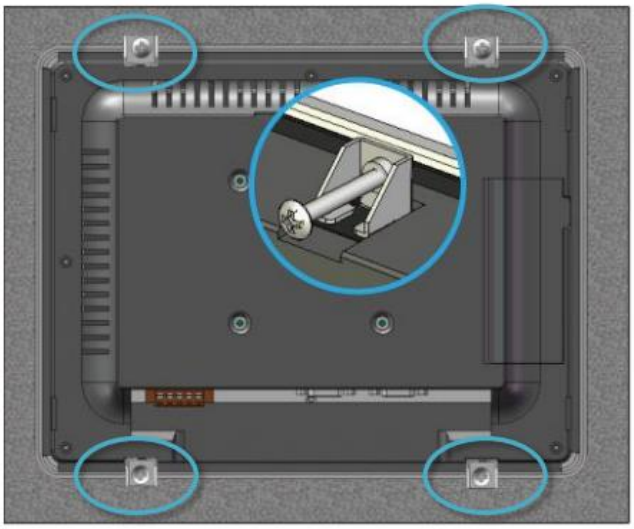
4. Screw the panel mounting clips to the panel.



**Tips & Warnings**

Recommended Screw Torque: 3.4 ~ 4.5 kgf-cm.



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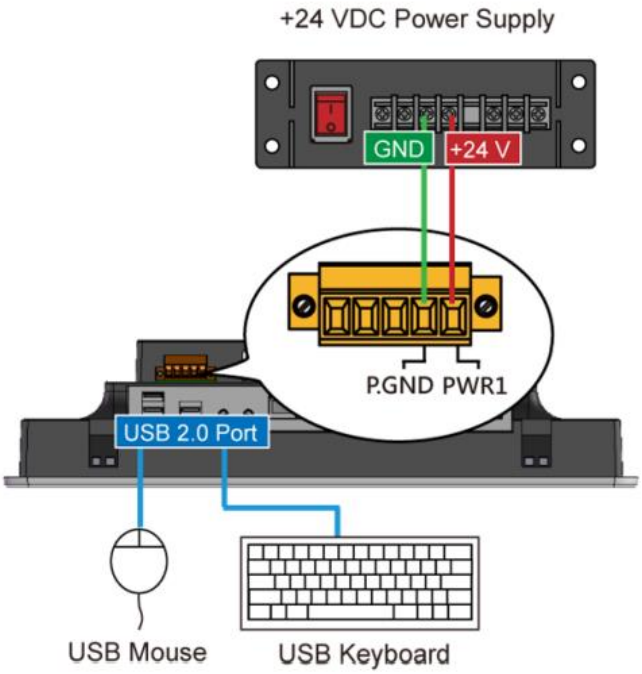
## 2.1.3. Deploying a Basic iPPC-IoT System

The iPPC-IoT provides a variety of interfaces to suit a range of applications.
The following illustration shows a simple application.

**To deploy a basic iPPC-IoT system**




As the above illustration shows, the interfaces of iPPC-IoT can be used to perform the following tasks:

- Connect the positive terminal (+) of the power supply to the terminal PWR and the negative terminal (-) of the power supply to the P.GND.
- Connect to a USB mouse or keyboard



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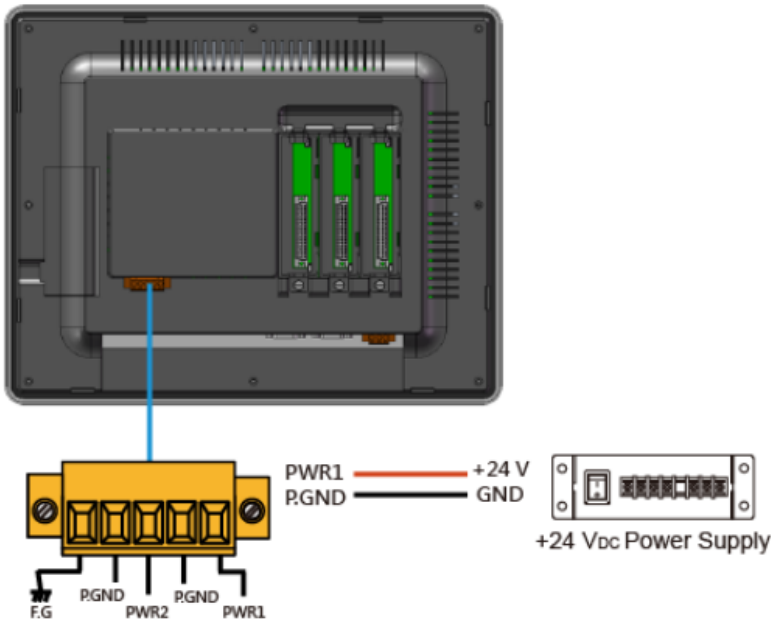
## 2.1.4. Supplying Power to iPPC-IoT

The iPPC-IoT has two power inputs that can be connected simultaneously to live DC power sources.
If one power source fails, the other live source acts as a backup, and automatically supplies all of iPPC-IoT power needs.

For more information about the supported power supply from ICP DAS web site, please refer to
https://www.icpdas.com/en/product/guide+Accessories+Power_Supplies+Power_Supply

**To supply power to iPPC-IoT**
There are two ways to supply power to the iPPC-IoT

**i. Single power supply**





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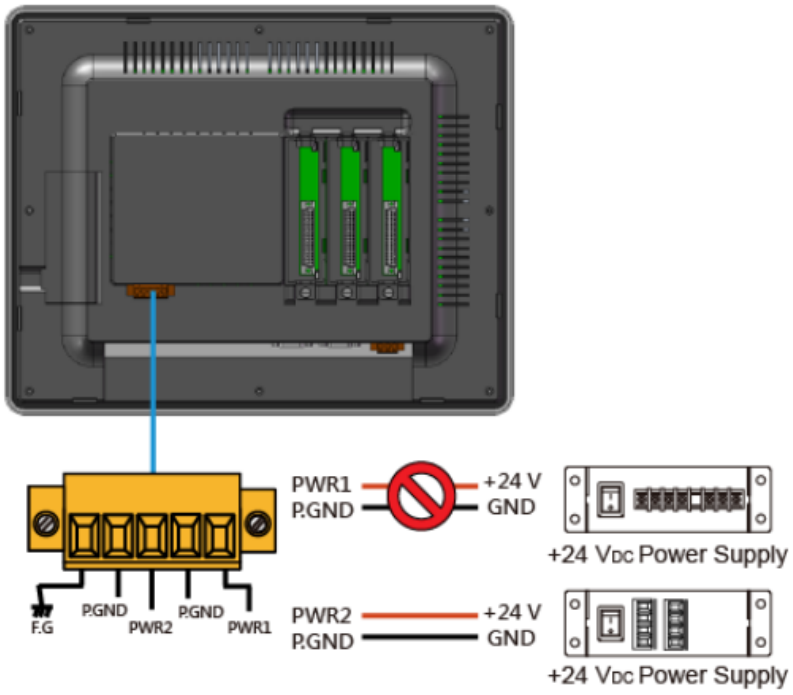
**ii. Redundant power supply**

The redundant power can be used single and used two self-governed power to supply to the system, PWR1 and PWR2 input at the same time, when one power fails, the other power acts as a backup, and automatically supplies power needs.



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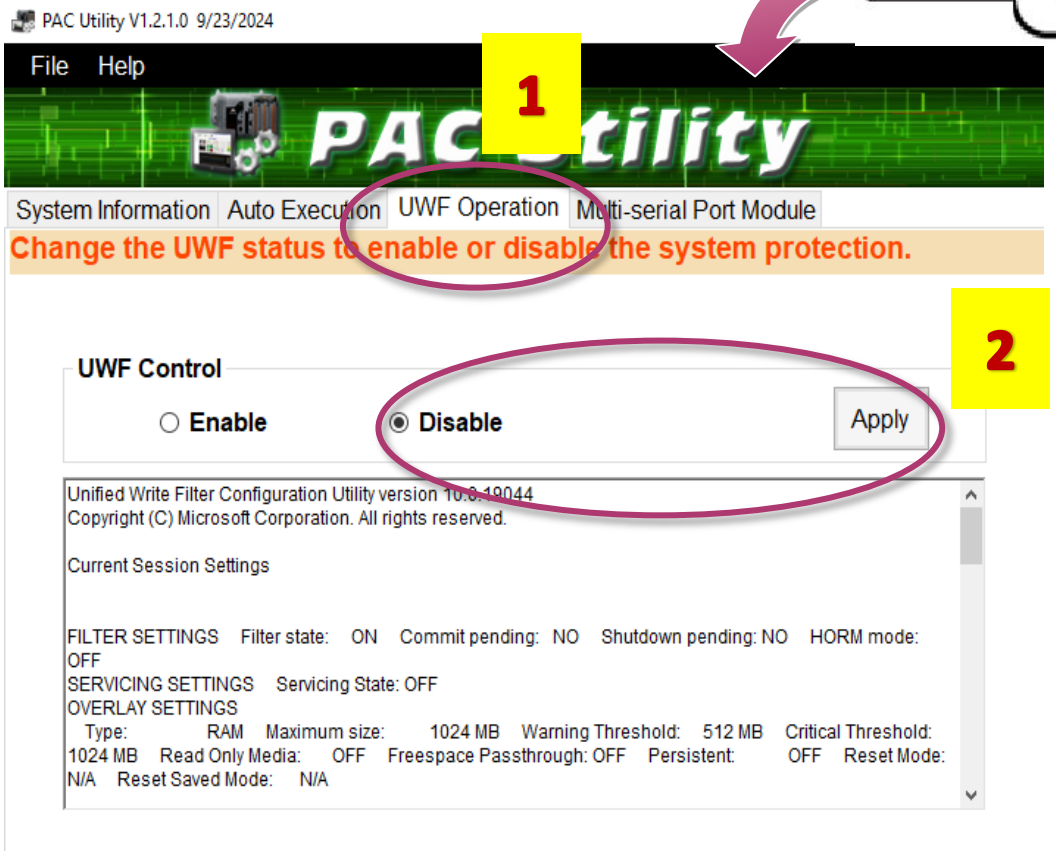
## 2.2. Disable UWF to Allow Settings to Be Saved

The UWF is a safety mechanism that provides the ability to control write protection of the iPPC-IoT system built in C: drive. Any changes made to the system are lost when the start restarts while UWF is enabled, unless they are committed to the system.

For more details about the UWF, please refer to section 3.4. Configuring the UWF Manager.

**1. Click the PAC Utility shortcut on the desktop**

**2. Click the UWF Operation tab, select the Commit check box, and then click Apply button**




**3. Click Yes button In the pop-up dialog box**



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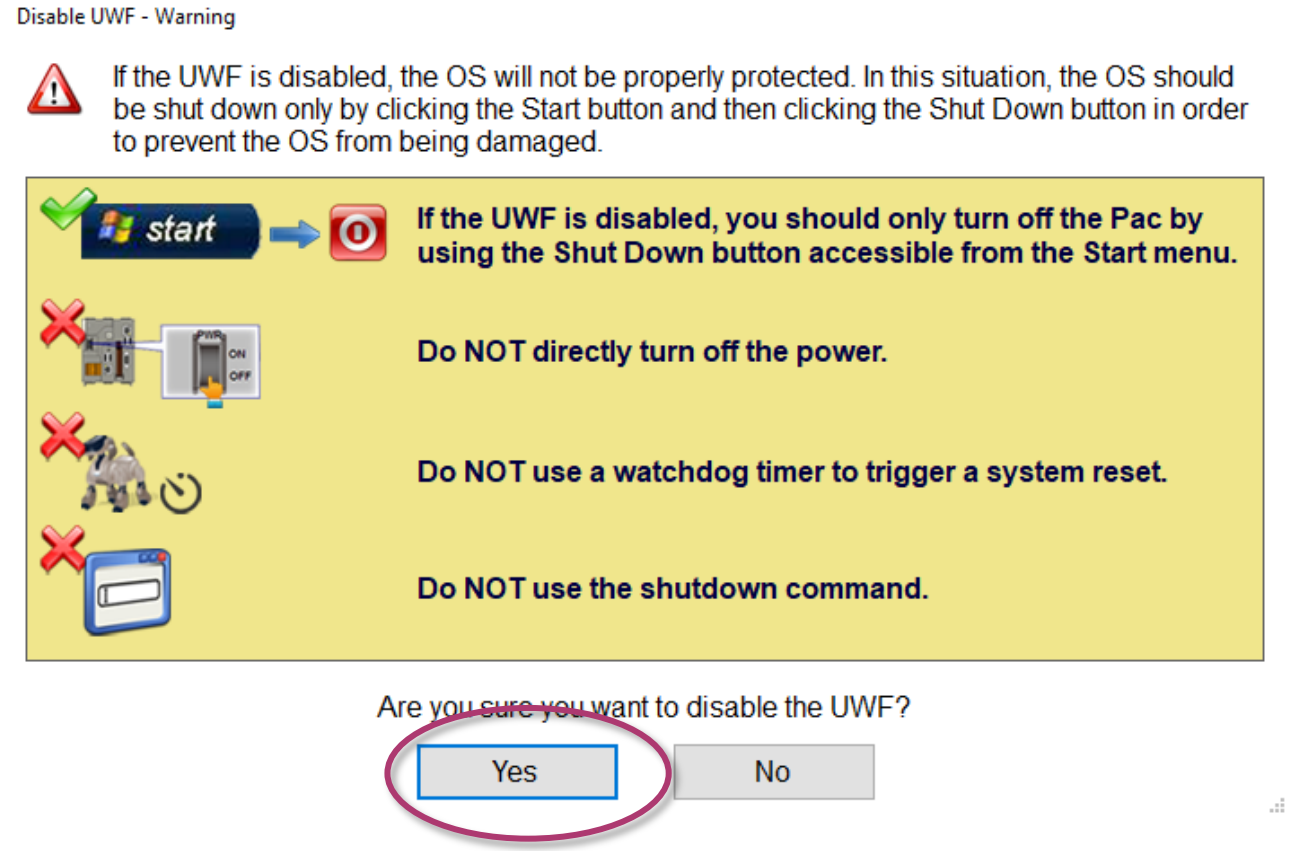
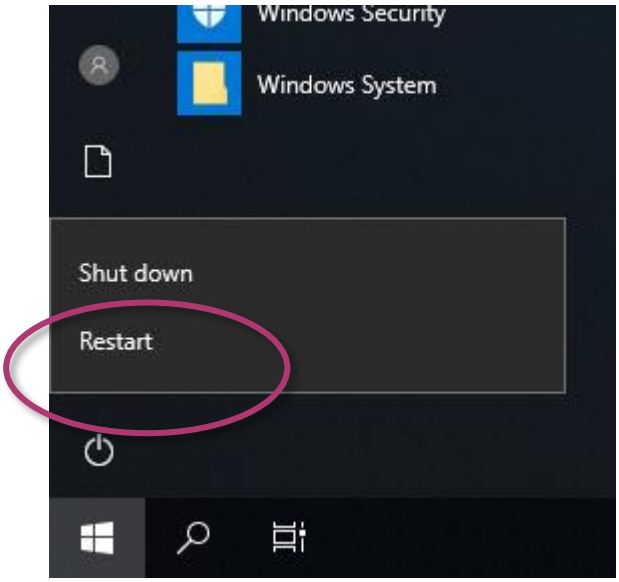



**4. Click the Start button , click the power button , and then click Restart for changes to take effect.**



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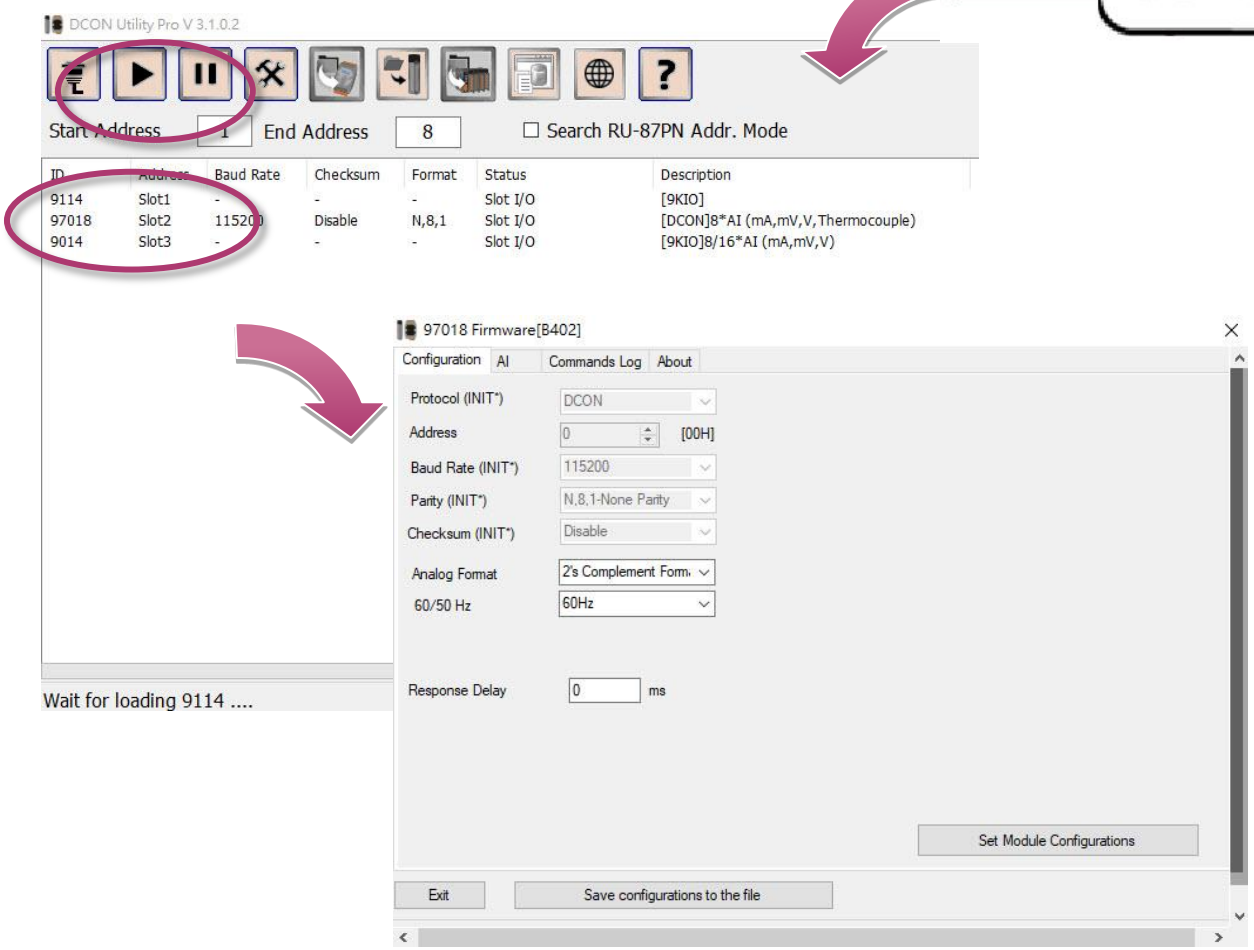
## 2.3. Using DCON Utility Pro to Configure I/O Modules

DCON Utility Pro is a tool kit designed to quickly control and manage I-97K series expansion I/O modules.

**1. Click the DCON Utility Pro shortcut on the desktop**

**2. Click the Search button**

**3. Click the module name to configure the I-97K series module**



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# 3. Security and Risk

This chapter provides information of technological security risks and solutions associated with the iPPC-IoT services.

Security is important for iPPC-IoT. Based on Windows 10 IoT, iPPC-IoT can avoid many security vulnerabilities. The following provides some security policy that you should consider before you develop your iPPC-IoT.

- Windows Firewall
- UWF (Unified Write Filter)

The following table provides the default settings of the iPPC-IoT security policy.

| Security Item | Default Settings | User Name | Password |
|---|---|---|---|
| Firewall | Enable | N/A | N/A |
| UWF | Enable | N/A | N/A |



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## 3.1. Creating and Managing User Accounts

Based on Windows 10 IoT, iPPC-IoT includes several components for managing user account names, groups, and passwords.

- The Administrator Account component allows you to specify the password for the local Administrator account. You can only include one Administrator Account component in your configuration.
- The User Account component allows you to specify the user name, group, and password for a local user account. You must add a separate User Account component for each user in your configuration.
- Additional components are required if you want to provide end-user access to account settings, passwords, and display names in User Accounts in Control Panel.



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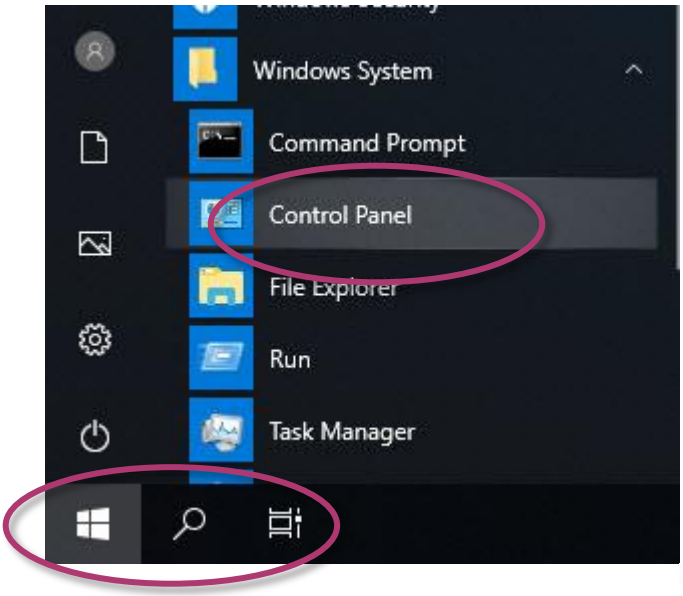
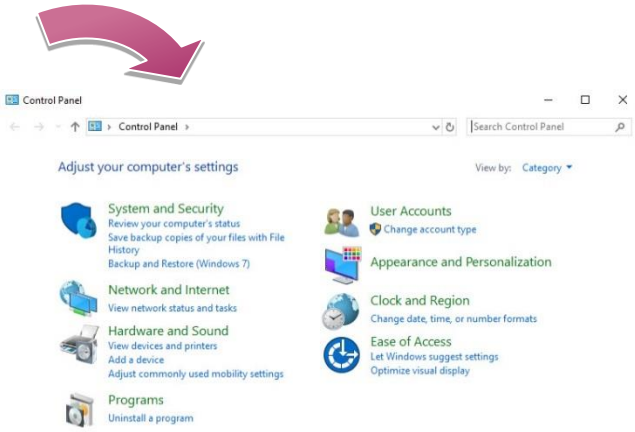
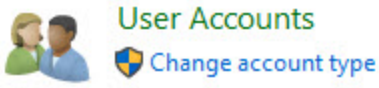
**To open the user accounts tool**

**1. Click the Start button , find Control Panel then click it.**




**2. Click the User Accounts and Family Safety**



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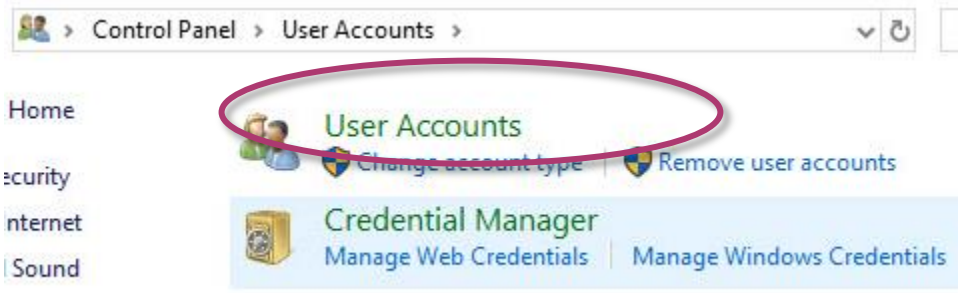
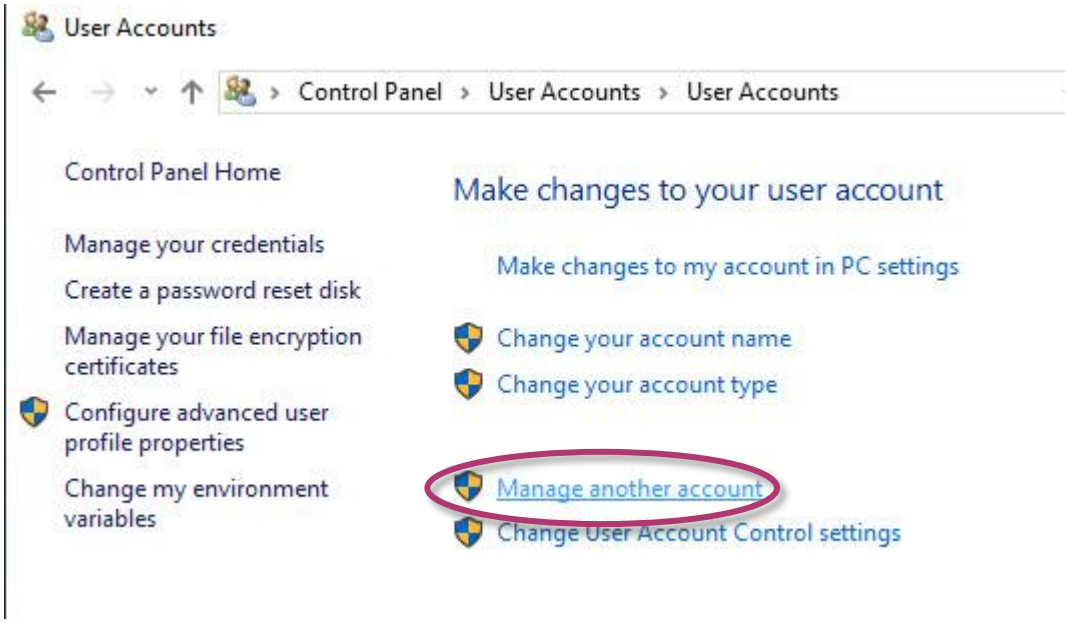
**To create a new use account**

**1. Click user accounts**




**2. Click the Manage another account**



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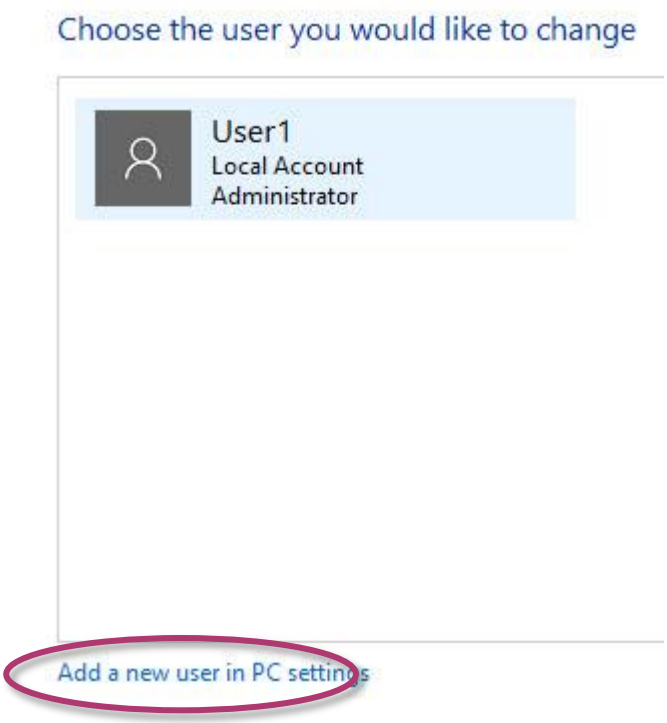
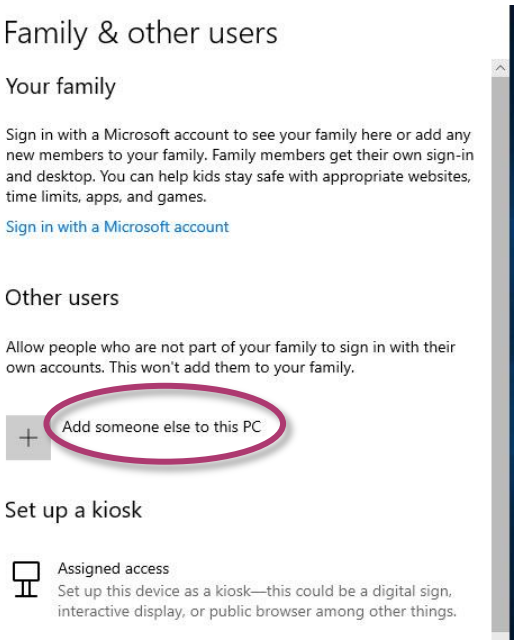
### 3. Click Add a user in PC settings




### 4. Click Add someone else to this PC



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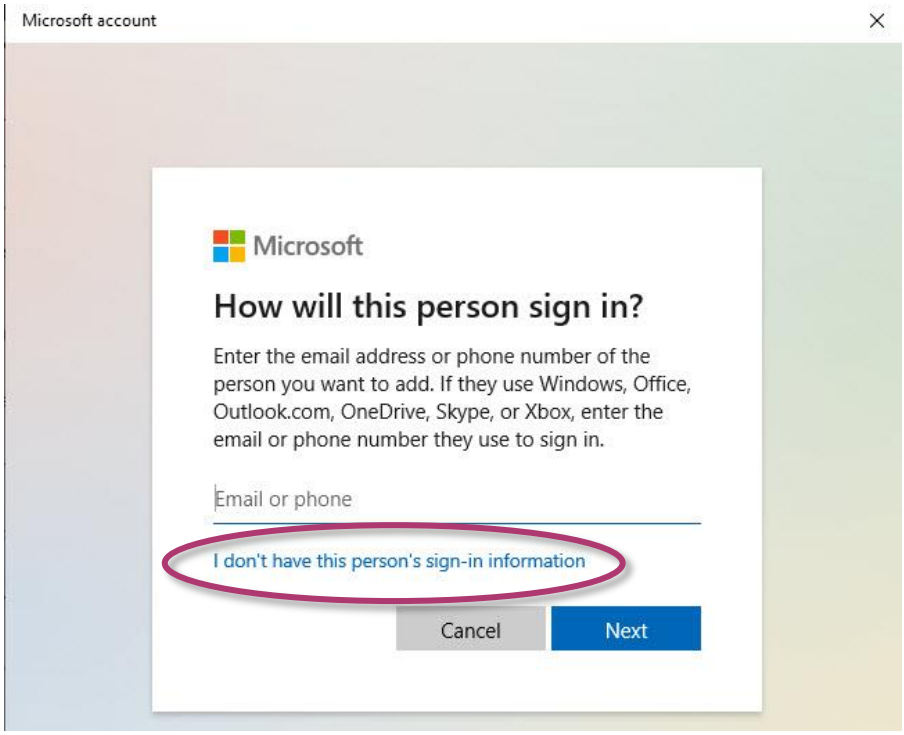
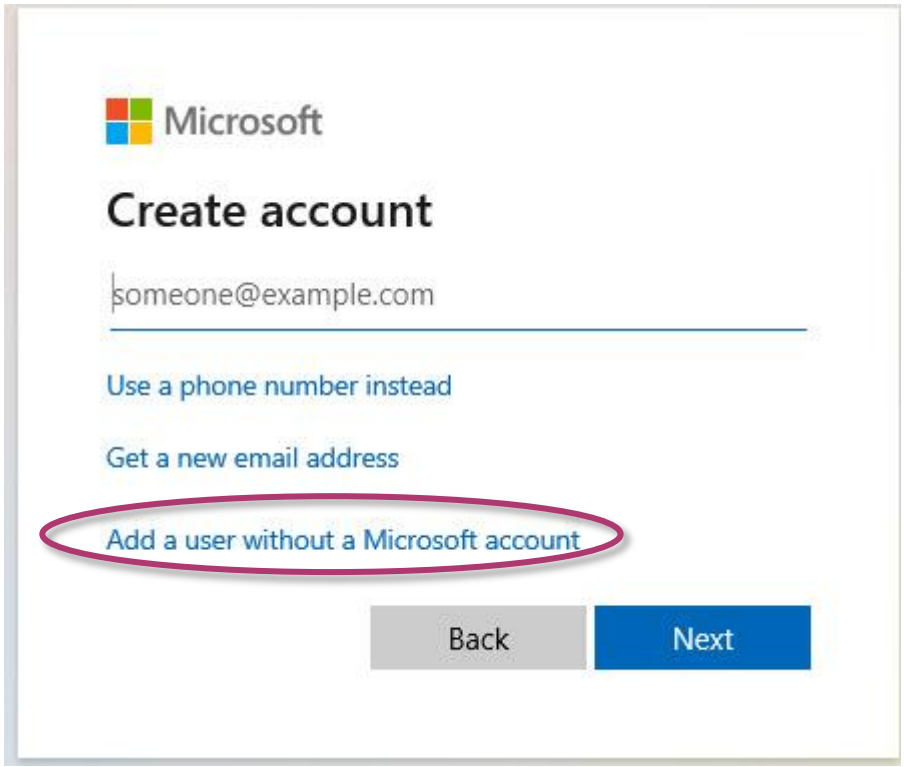
**5. Click I don't have this person's sign-in information**




**6. Click Add a user without a Microsoft account**



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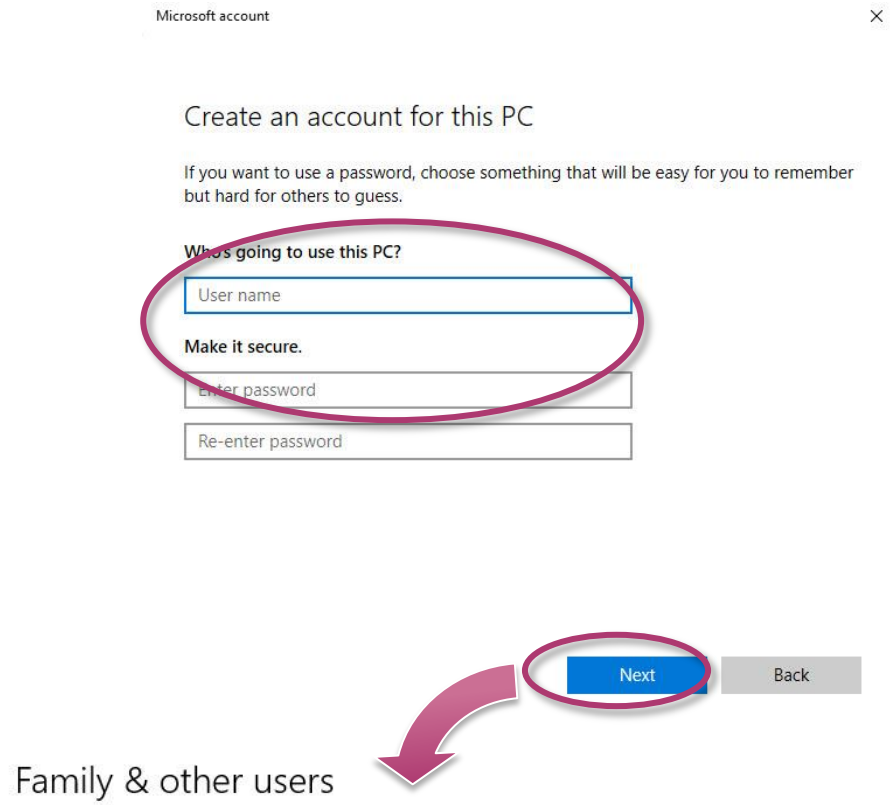
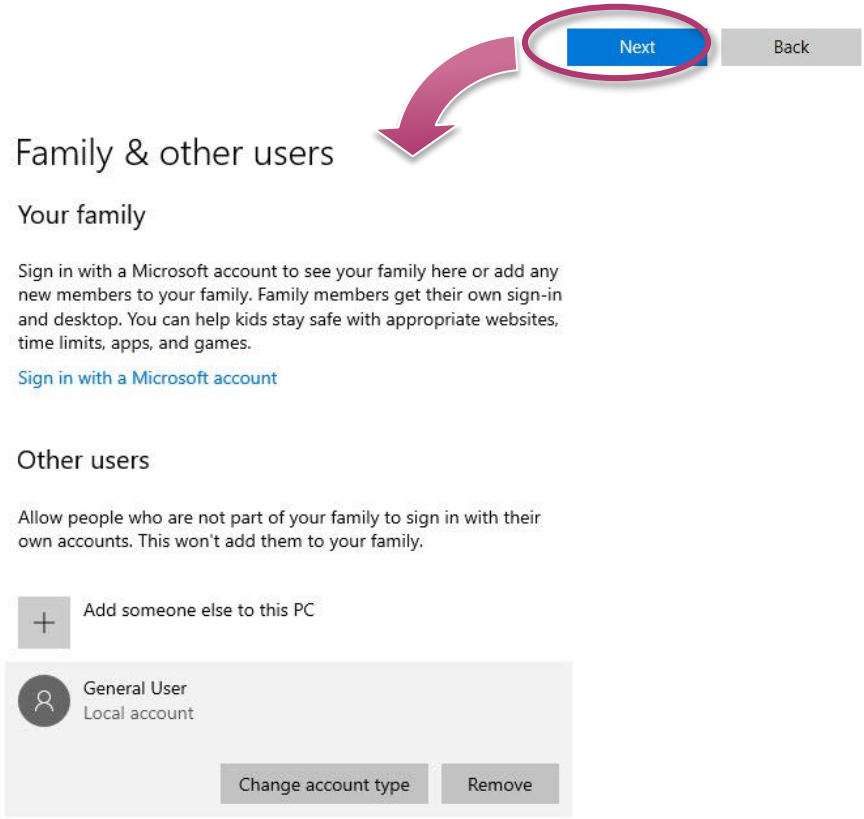
**7. Type the name that you want to use for the account, if you want to set password, please enter it then click next.**



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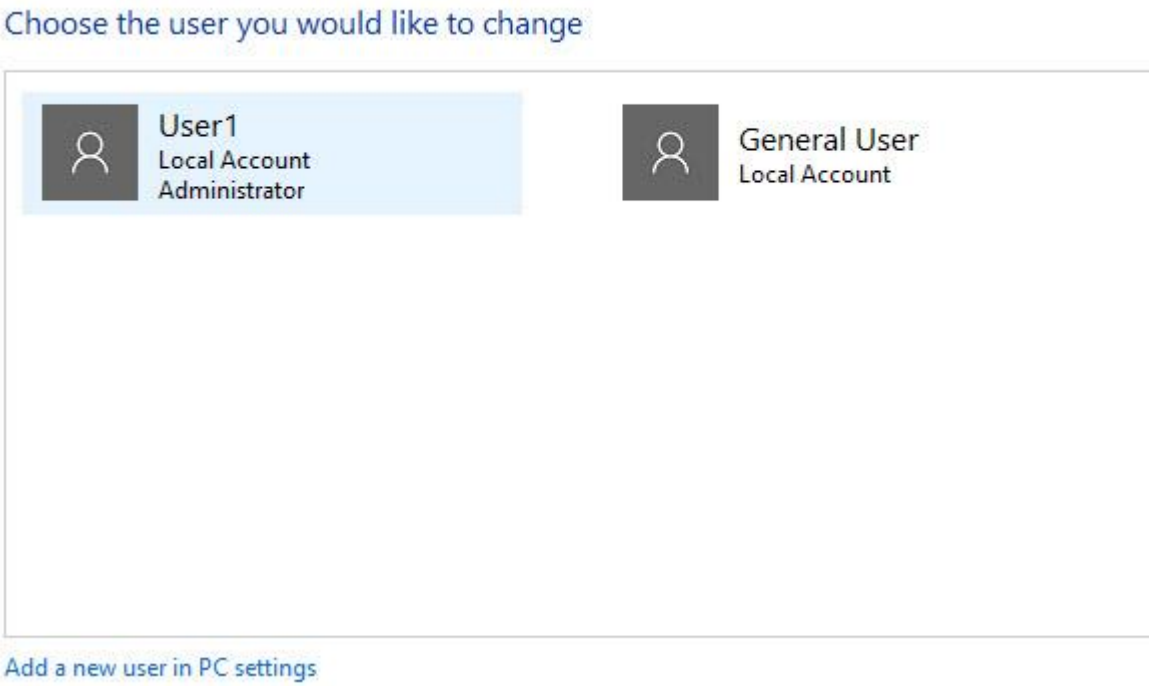
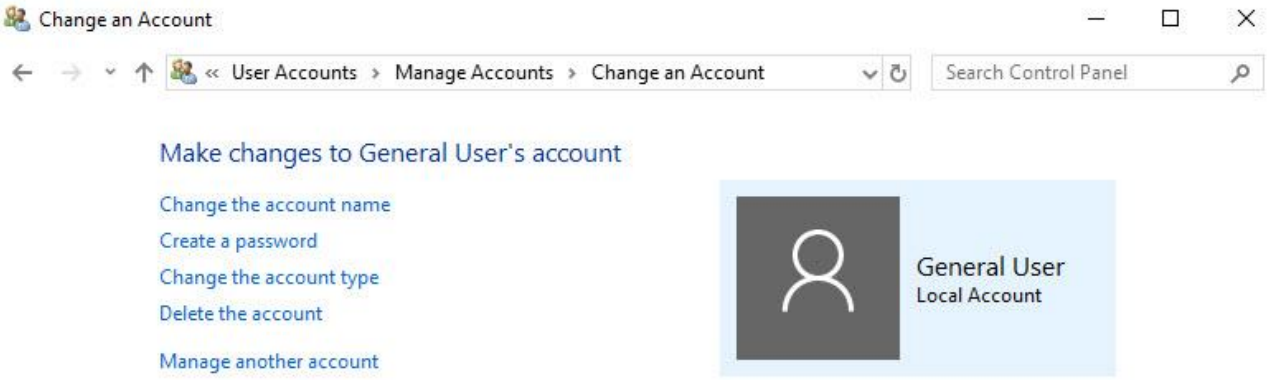
**To Make Changes to an Account**

**1. Back to Manage Accounts, click the account that you want to change.**




**2. Select the item that you would like to change:**



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- Click the **Change the account name** to change the name that appears on the Welcome screen for the account.
- Click the **Create/change a password** to create or change the password for the user and create or change the password hint.
- Click the **Change the account type** to change the account type to increase or decrease the user's rights on the computer.
- Click the **Delete the account** to delete the user account from the computer. When you delete the account, you are given the option to save the user's files on the computer.
- Click the **Manage another account** to manage another account.



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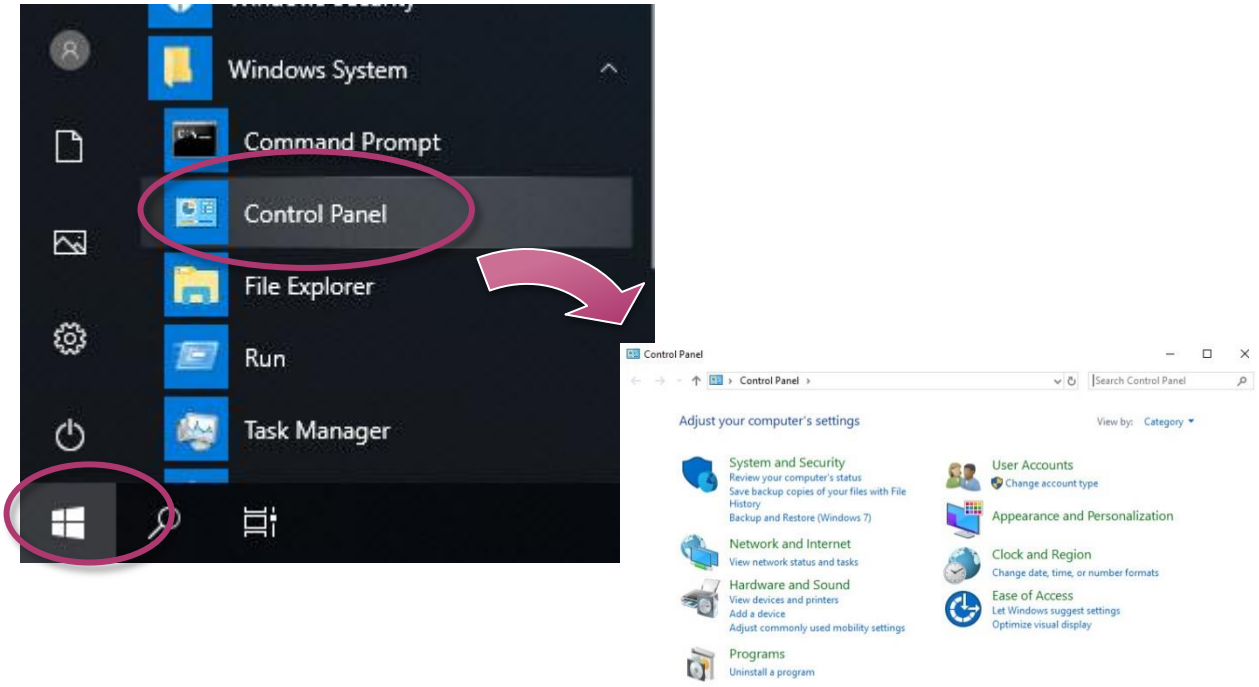
## 3.2. Turning Firewall On or Off

Based on Windows 10 IoT, iPPC-IoT Firewall with Advanced Security and the related firewall technologies documented here enable user to share Internet connections, protect connections using a firewall, and provide Network Address Translation (NAT).

**To open the Windows Firewall tool**

**1. Click the Start button , find Control Panel then click it.**



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**2. Click the System and Security, and then click Windows Defender Firewall**

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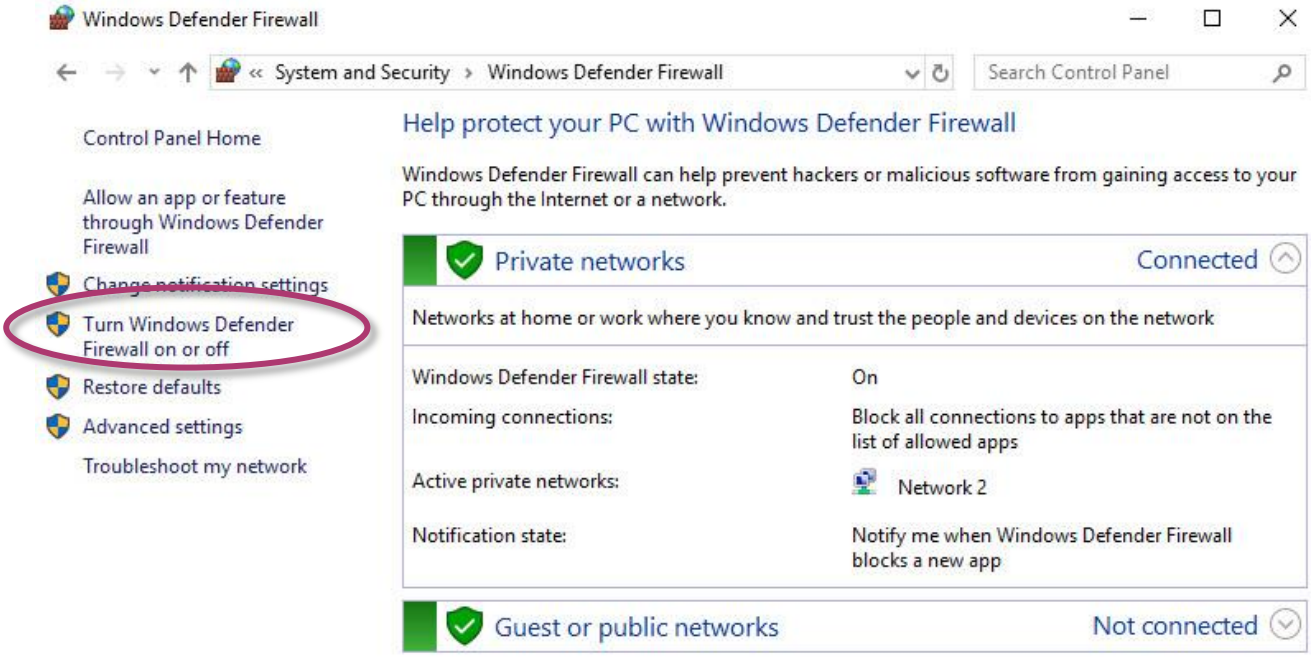
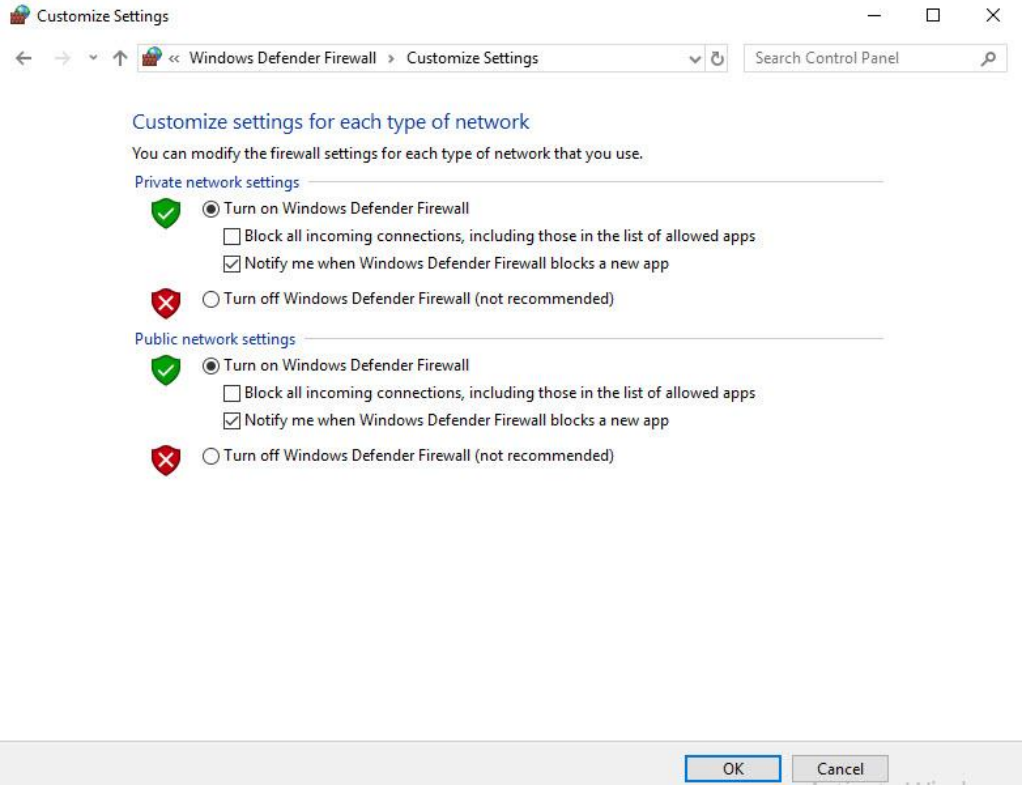
## To turn on/off Windows Firewall

### 1. Click the Turn Windows Firewall on or off in the left panel




### 2. Select the settings for your home/work (private) or public network, and then OK



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## 3.3. Configuring the UWF Manager

UWF provides a means for protecting a volume from writes. All writes to an UWF-protected volume are redirected to an overlay. These writes are stored in the overlay and made available as part of the volume. In this way, it feels like that the volume is writeable. The overlay may exist either on disk or in RAM. If desired, the data stored in the overlay may be committed to the protected volume. The following figure is an overview of UWF.

For more detailed information about Unified Write Filter (UWF), please refer to
https://docs.microsoft.com/en-us/windows-hardware/customize/enterprise/unified-write-filter

On iPPC-IoT, only the C drive that OS resides can be protected.

In cases of maintenance, the disk must be updated to your desired changes.
There is one way to use contains three steps: (1) disabling UWF, (2) updating, and (3) re-enabling UWF.


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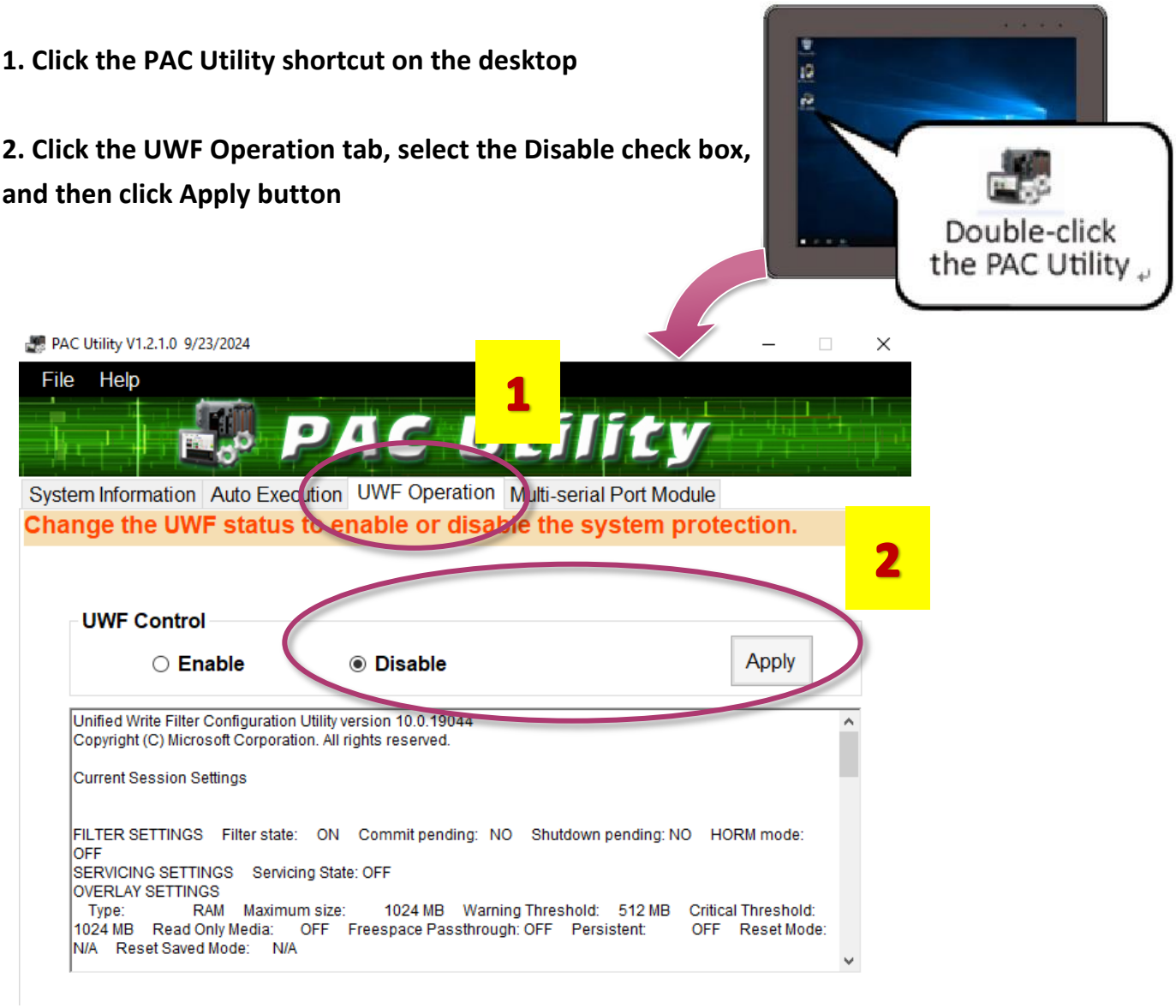
# To disable the UWF

**1. Click the PAC Utility shortcut on the desktop**

**2. Click the UWF Operation tab, select the Disable check box, and then click Apply button**




**Tips & Warnings**

If UWF is disabled and XP-9000-IoT/iPPC-IoT suffers sudden power off, the operating system of XP-9000-IoT/iPPC-IoT may be damaged or incomplete.



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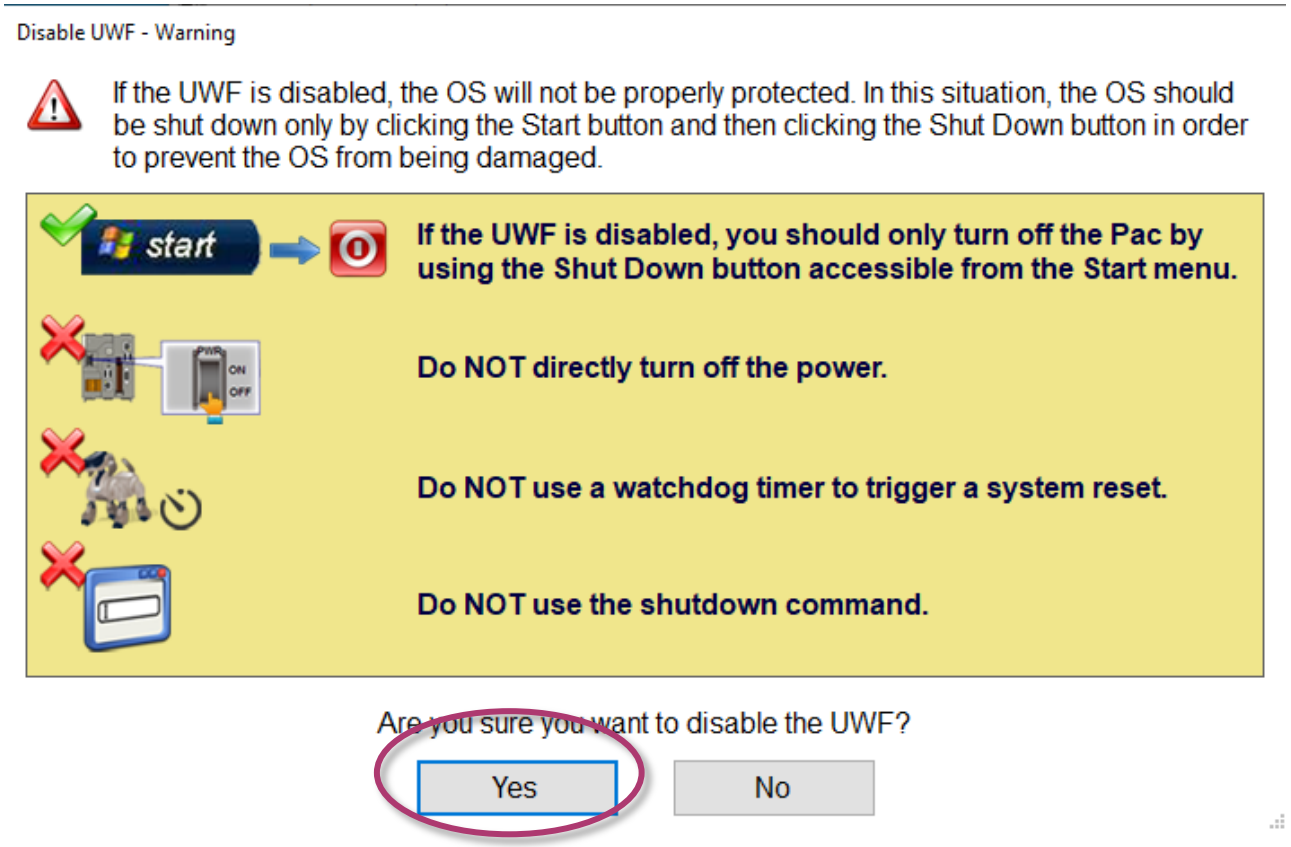
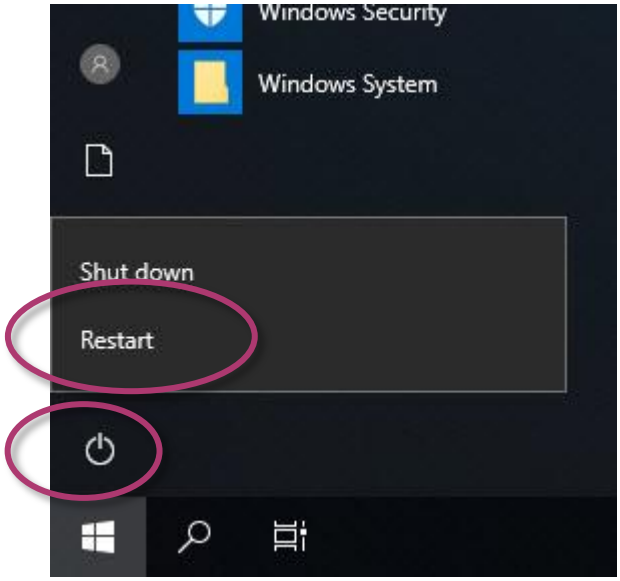
**3. In the pop-up dialog box, click Yes button**




**4. Click the Start button , click the power button , and then click Restart for changes to take effect.**



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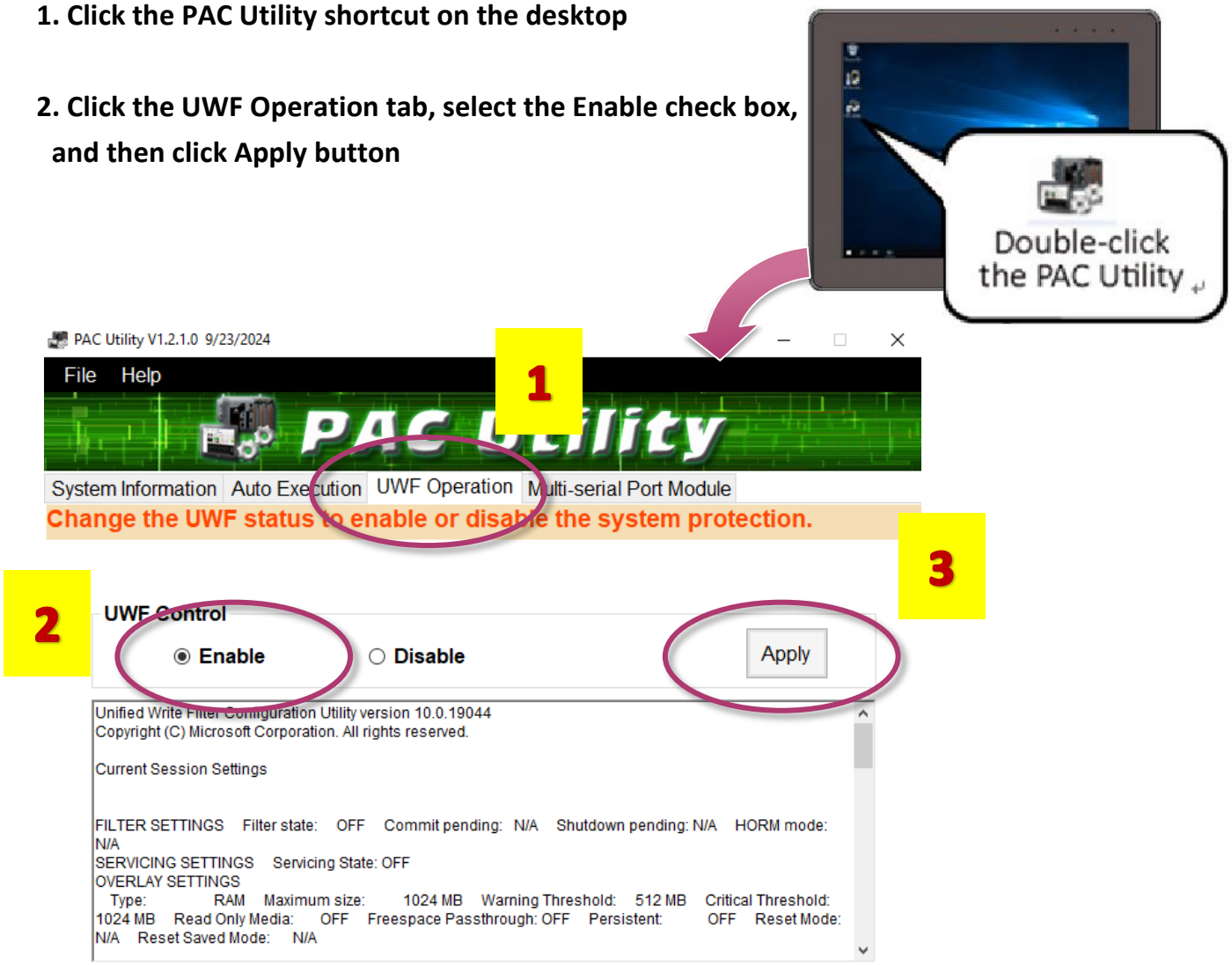
# To enable the UWF

**1. Click the PAC Utility shortcut on the desktop**

**2. Click the UWF Operation tab, select the Enable check box, and then click Apply button**




**Tips & Warnings**

UWF only takes effect on hard drive C (where the operating system resides), it is recommended to download your programs to Compact Flash or USB-HDD. It'll prevent operating system from damages of illegal writing or sudden power off.



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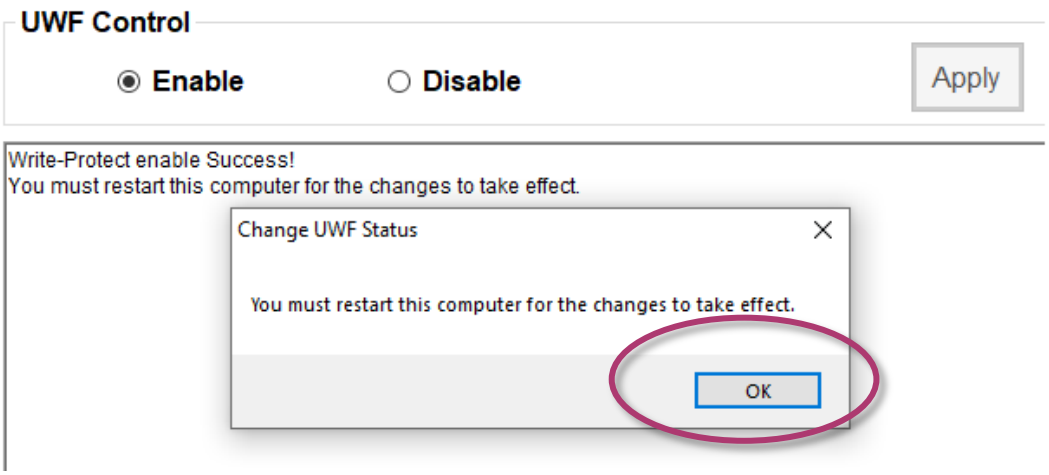
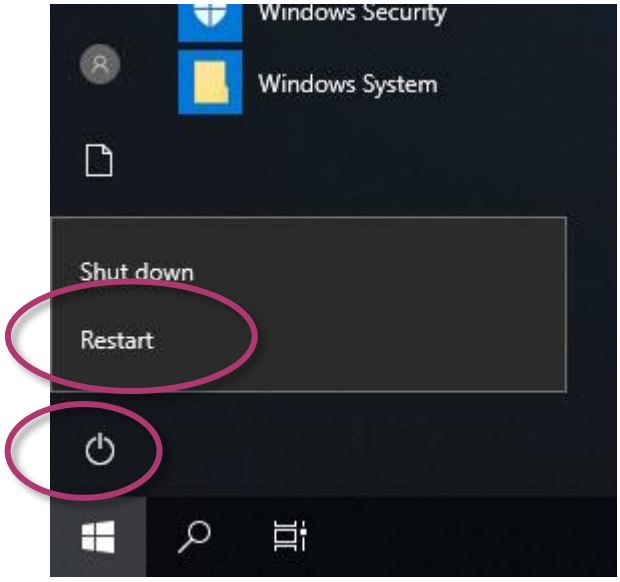
**3. In the pop-up dialog box, click OK button**




**4. Click the Start button , click the power button , and then click Restart for changes to take effect.**



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# How to use the UWF console application command-line tool

**To control the status of UWF, use the UWF Manager Command "UWFMGR".**

Windows 10 IoT includes the Unified Write Filter (UWF) console application command-line tool, Uwfmgr.exe.

- Enable the UWF:
  uwfmgr filter enable (it is effective after rebooting.)
- Disable UWF:
  uwfmgr filter disable

For more information about using UWF Manager Commands, please refer to **Manager Commands**
https://docs.microsoft.com/en-us/windows-hardware/customize/enterprise/uwfmgrexe

**Tips & Warnings**

Only the disk drive (usually, c:\) that OS resides can use the feature of UWF



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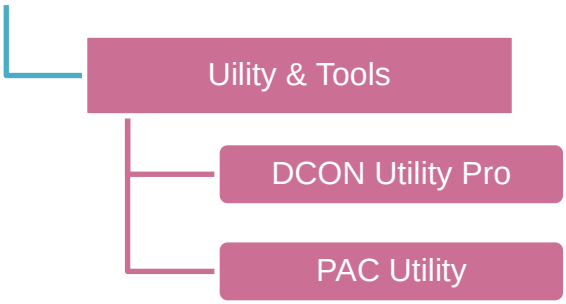
# 4. Tools and Tasks

This chapter provides a brief introduction of the iPPC-IoT service tools and its benefits.

There are several tools and utilities built-in and designed for use with iPPC-IoT. Some of these are pre-installed on iPPC-IoT and can work directly on iPPC-IoT, and some of these are supporting tools and can help you to manage the iPPC-IoT remotely on a PC.

Tools for working with PC can be found separately by downloading the latest version from ICP DAS web site.

https://www.icpdas.com/en/download/index.php?model=AXP-9051-IoT



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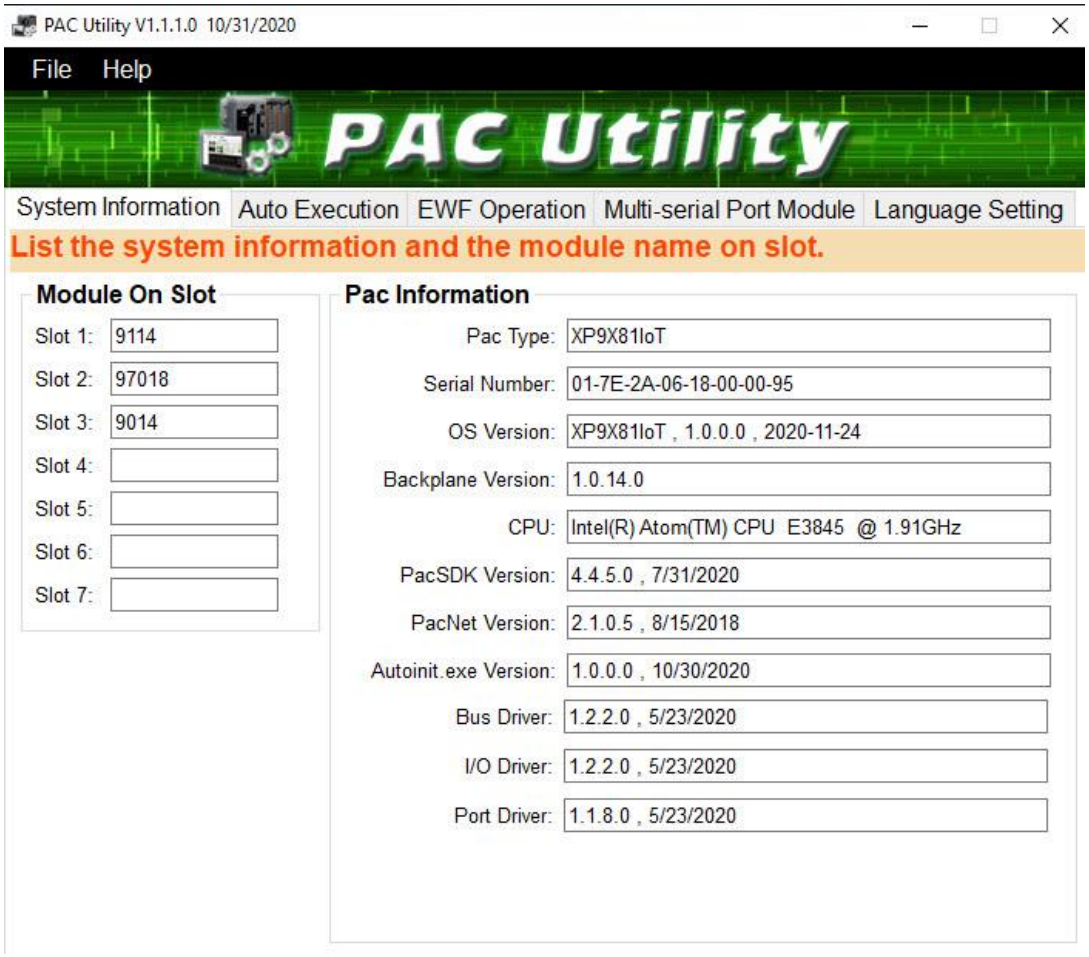
# 4.1. PAC Utility

PAC Utility is a collection of software applications that enable management and configuration of iPPC-IoT system and features.

## 4.1.1. System Information

The System Information tab provides functions to monitor necessary device information of iPPC-IoT. The system information is the most important note of version control for upgrading system.



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## 4.1.2. Auto Execution

The Auto Execution tab provides functions to configure programs running at iPPC-IoT startup, it allows users to configure ten execute files at most.

**Tips & Warnings**

The allowed file types are .exe and .bat, and they are executed in order of program 1, program 2, etc.

| The tab use to | How to use |
|---|---|
| Configure programs running at startup | Click on the Browse button and select the execute file which you want, and then click the **Save All Setting** button. |



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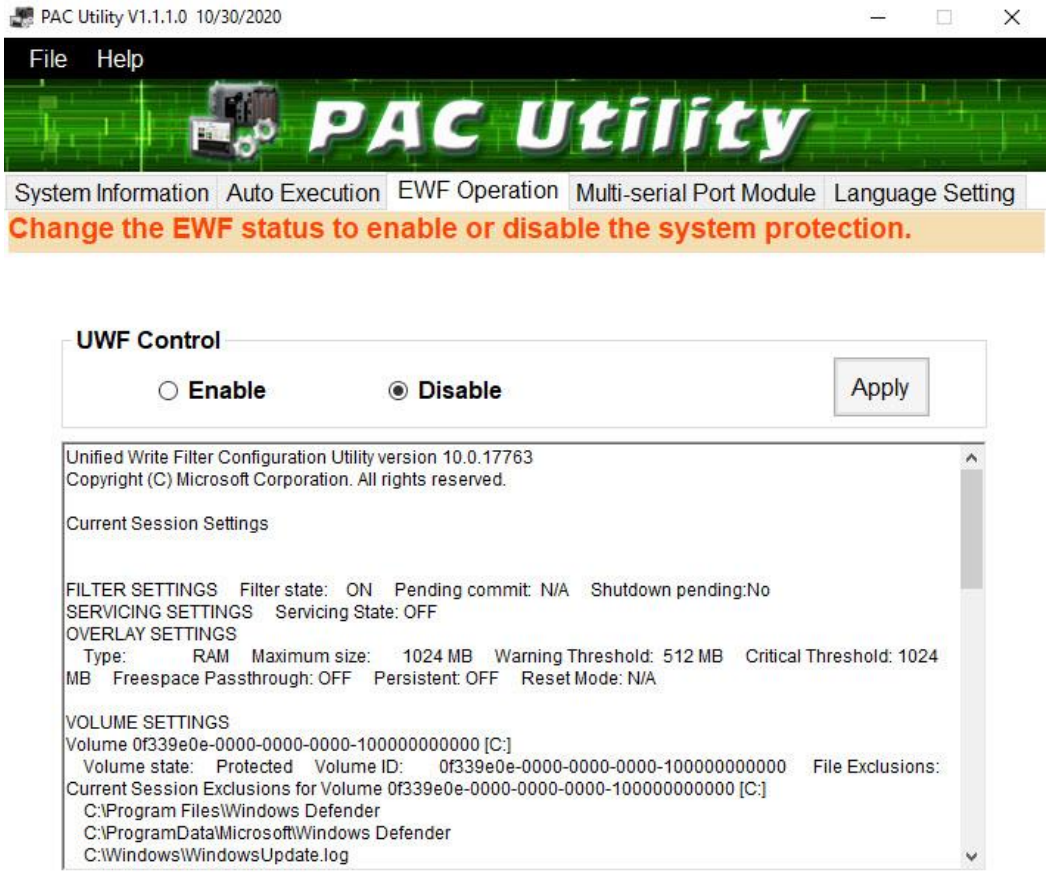
## 4.1.3. UWF Operation

The UWF Operation tab provides functions to configure UWF.




| The tab use to | How to use |
|---|---|
| Enable/disable the UWF function | **Enable the UWF function:**<br>Select the **Enable** option, and then click the **Apply** button.<br>**Disable the UWF function:**<br>Select the **Disable** option, and then click the **Apply** button. |



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## 4.1.4. Multi-serial Port Module

The Multi-serial port provides functions for installation of the RS-232/RS-422/RS-485 communication module driver.

The table below shows the expansion RS-232/RS-422/RS-485 communication modules that are compatible with the iPPC-IoT.

| Item | RS-232 | RS-422/RS-485 | Isolation | Connector |
|---|---|---|---|---|
| I-8112-iW | 2 | - | 2500 Vrms | DB-9 x 2 |
| I-8114W | 2 | - | - | DB-37 x 1 |
| I-8114iW | 4 | - | 2500 Vrms | DB-37 x1 |
| I-8142iW | - | 2 | 2500 Vrms | Terminator block x 1 |
| I-8144iW | - | 4 | 2500 Vrms | Terminator block x 1 |

The iPPC-IoT can be expanded to support up to 16 I/O modules.

For more detailed information about these support modules, please refer to

https://www.icpdas.com/en/product/guide+Remote_I_O_Module_and_Unit+PAC_I_O_Modules+I-8K_I-87K_Series_(High_Profile)

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## 4.2. DCON Utility Pro

The DCON Utility Pro is a toolkit that help user to search the network, easily to configure and test the I/O modules via the serial port (RS-232/485) or Ethernet port (using virtual com port).

For more information on how to use DCON Utility Pro to configure I/O modules, please refer to section 2.3. Using DCON Utility Pro to Configure I/O Modules.



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# 5. Your First iPPC-IoT Program

This chapter provides a guided tour that describes the steps needed to set-up a development environment, download, install, configure for user programming with the iPPC-IoT.

Before writing your first program, ensure that you have the necessary development tool and the corresponding iPPC-IoT SDKs are installed on your system.

### Development Tools

iPPC-IoT is a Windows 10 IoT based unit. Windows 10 IoT is a mature embedded operating system which supports rapid development. Three standard development tools are list as follows which are highly integrated, with comprehensive support for developing applications of Windows 10 IoT based iPPC-IoT.

- Visual Basic.net
- Visual C#
- Visual C++

### iPPC-IoT SDKs

The PAC SDK is a Software Development Kit (SDK) that contains C header files, C libraries and documents.

The XP-9000-IoT SDK are classified by development tools that can be obtained by downloading the latest version from ICP DAS web site.

https://www.icpdas.com/en/download/index.php?model=AXP-9051-IoT

SDK

| | FILE NAME | DESCRIPTION | MODEL |
|---|---|---|---|
| | Windows PACs/iPPCs | SDK | AXP-9051-IoT |



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# 5.1. Your First iPPC-IoT Program in VB.NET

The best way to learn programming with iPPC-IoT is to actually create an iPPC-IoT program.

The example below will guide you through creating this simple program in VB.net and running them on iPPC-IoT.

To create a demo program with VB.NET that includes the following main steps:

1. Create a new project
2. Specify the path of the PAC reference
3. Add the control to the form
4. Add the event handling for the control
5. Upload the application to iPPC-IoT
6. Execute the application on iPPC-IoT

All main steps will be described in the following subsection.



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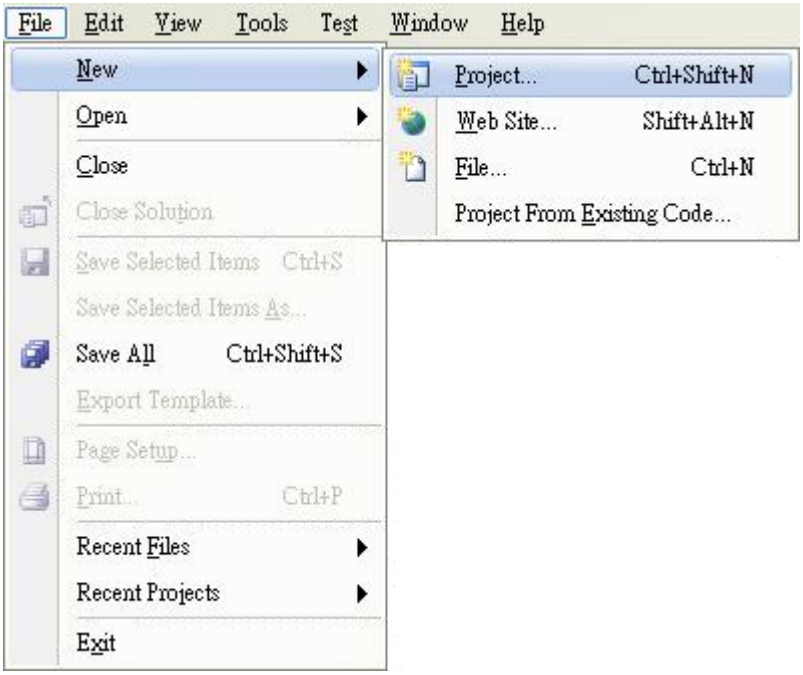
## 5.1.1. Create a New Project

The Visual VB.net project template is a composite control that you use in this example creates a new project with this user control.

### 1. Run the Visual Studio 2008

Visual Studio 2008

### 2. On the File menu, point to New, and then click Project



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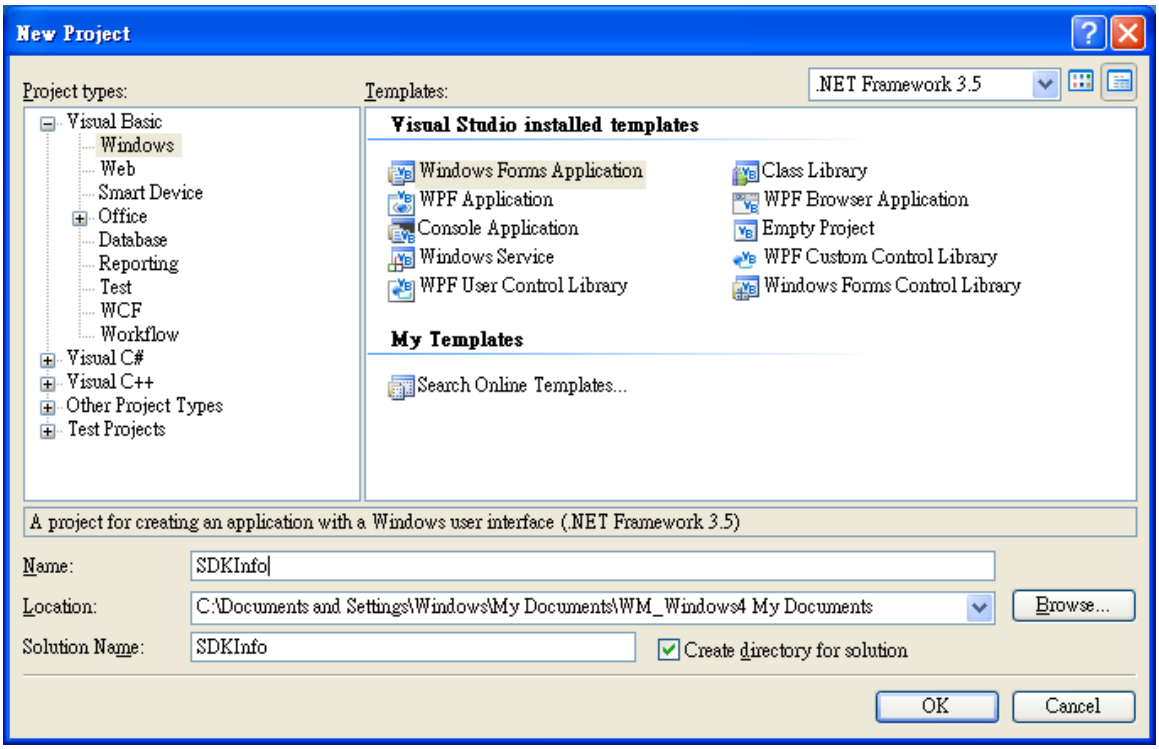
**3. In the Project types pane, expand Visual Basic, and then click Windows**

**4. In the Templates pane, click Windows Forms Application**

**5. Type a name in the Name field, and then click OK button**

Here we will enter the name “SDKInfo” and a different location for the project if you wish



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## 5.1.2. Specify the Path of PAC Reference

The PAC SDK provides a complete solution to integrate with iPPC-IoT and it's compatible with Visual C#, Visual Basic .net and C++. In order to use a component in your application, you must first add a reference to it.

### 1.1 Get the PACNET.dll and copy it to the project folder

The PACNET.dll can be obtained separately by downloading the latest version from ICP DAS web site.

https://www.icpdas.com/en/download/index.php?model=AXP-9051-IoT

### 1.2 Get the UniDAQ.vb and copy it to the project folder (Only uses for e-9K module.)

The UniDAQ.vb can be obtained separately by downloading the latest version from ICP DAS web site.

https://www.icpdas.com/en/download/index.php?model=AXP-9051-IoT

PACSDK_WES7_IoT_Vxxx_YYYYMMDD.zip



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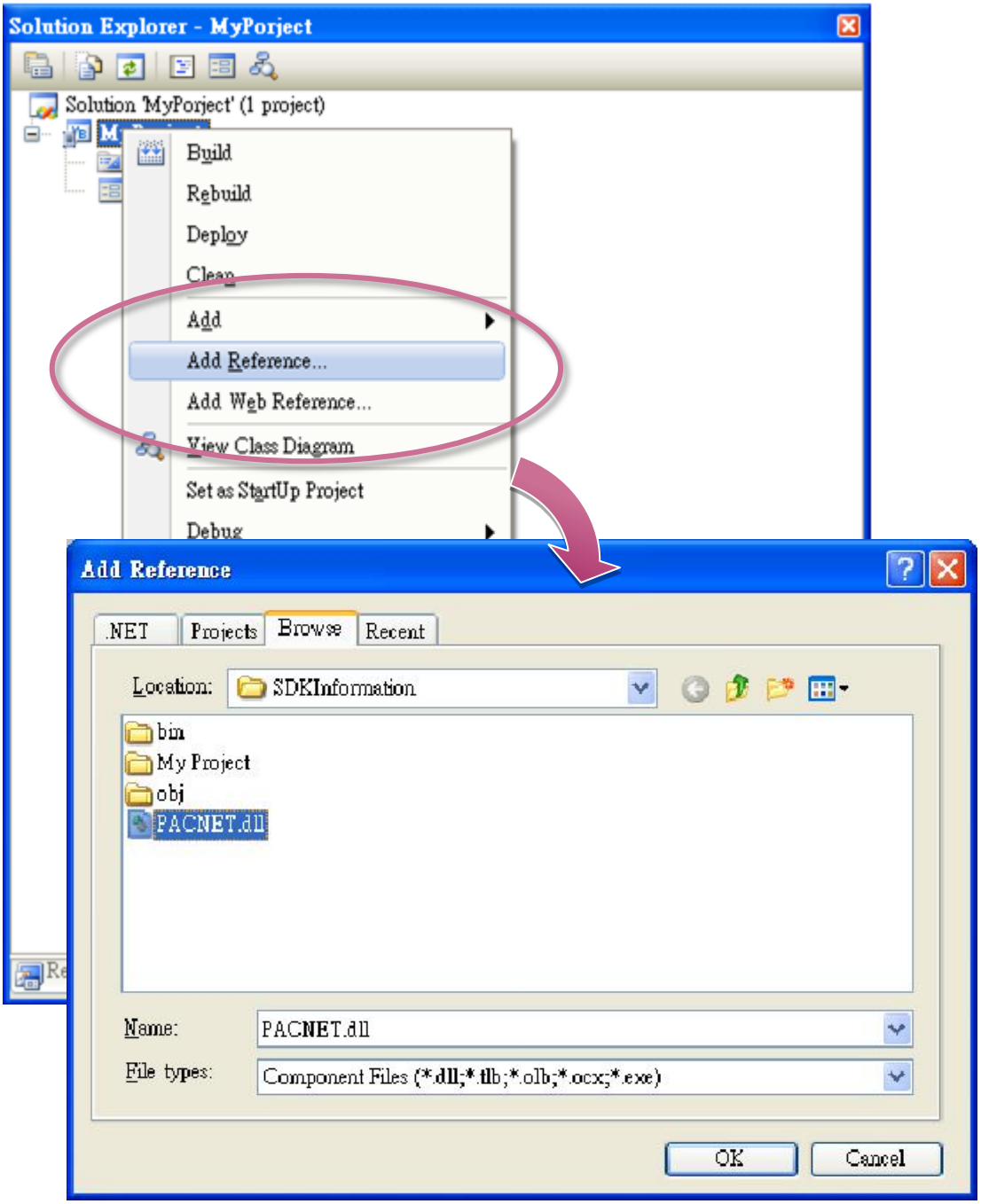
**2. In the Solution Explorer, right-click the References node, and then click Add Reference…**

**3.1. Click the Browse tab, and then select the PACNET.dll**



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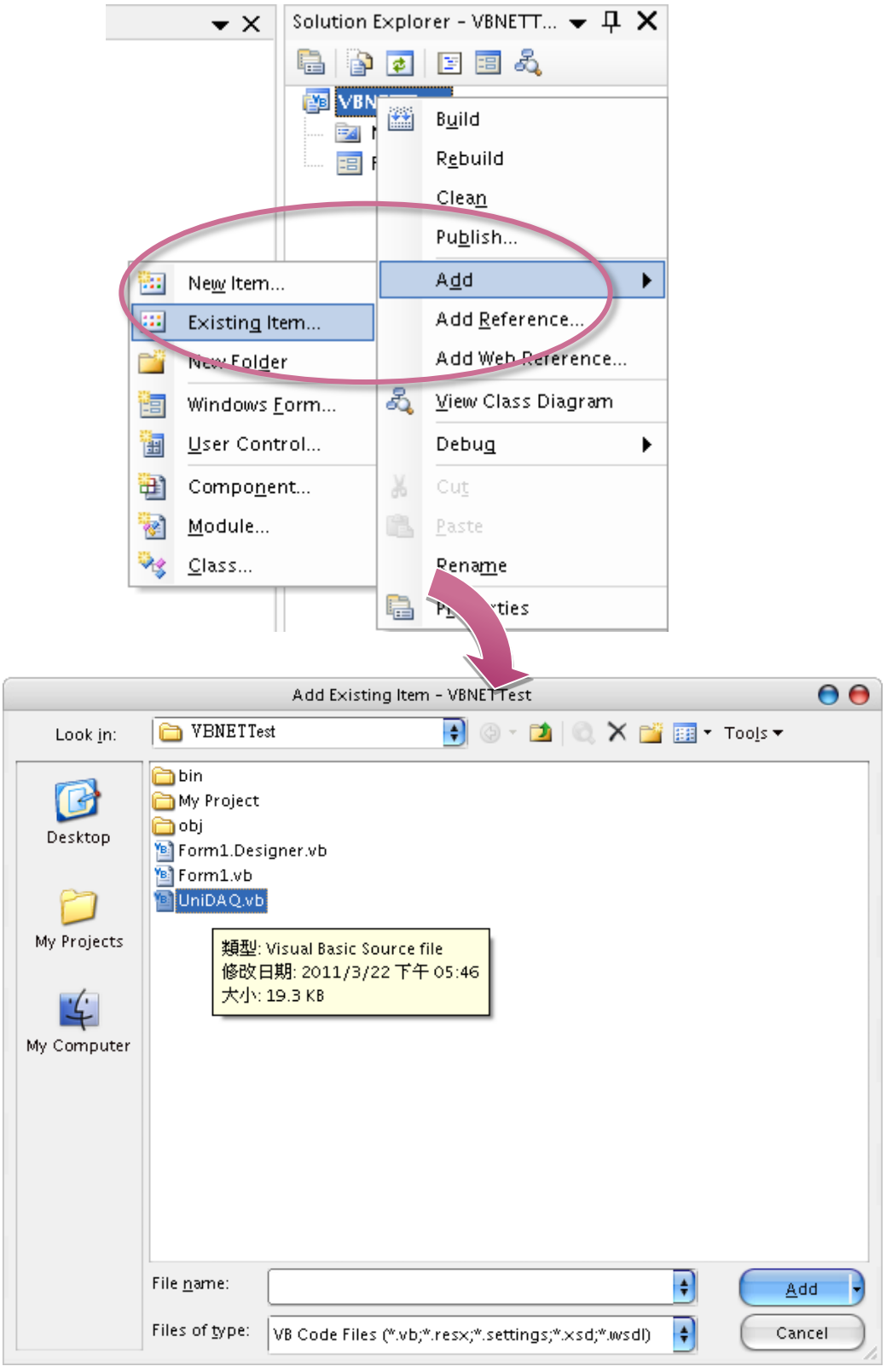
### 3.2. Add the UniDAQ.vb declaration file by clicking the name of the file and then clicking the Add button. (Only uses for e-9K module.)



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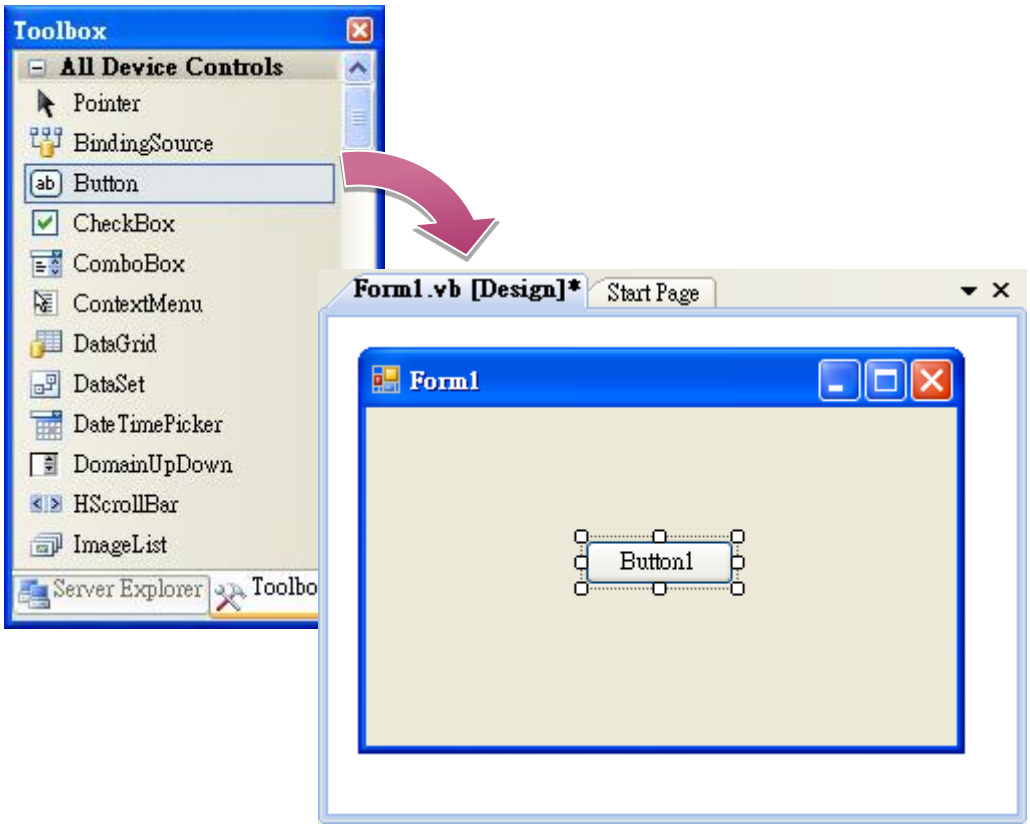
## 5.1.3. Add the Control to the Form

You can drag various controls from the Toolbox onto the form. These controls are not really "live"; they are just images that are convenient to move around on the form into a precise location.

After you add a control to your form, you can use the Properties window to set its properties, such as background color and default text. The values that you specify in the Properties window are the initial values that will be assigned to that property when the control is created at run time.

**1. From the Toolbox, drag a Button control onto the form**



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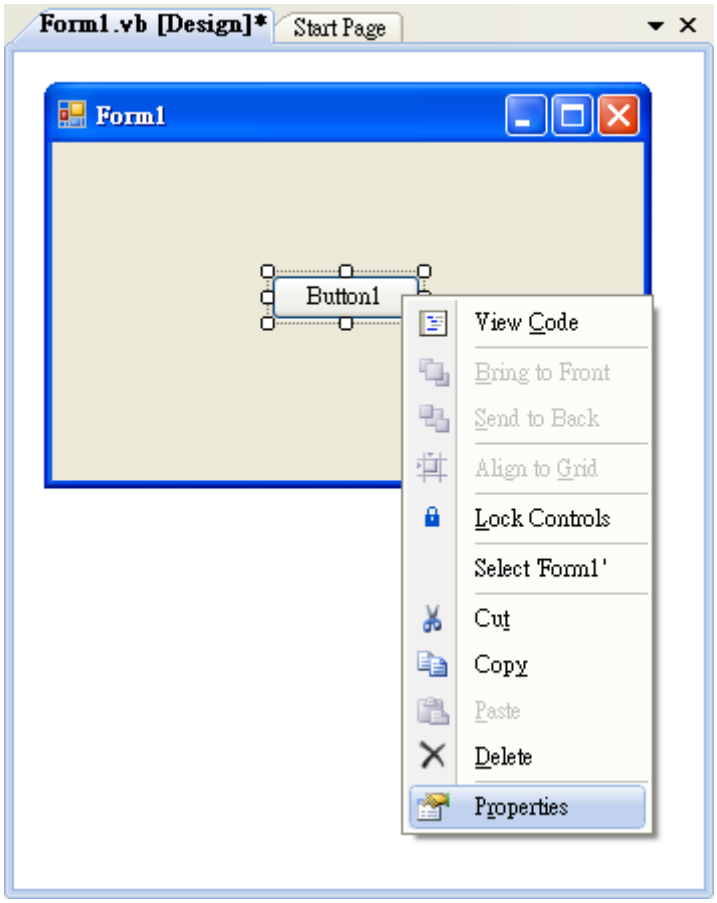
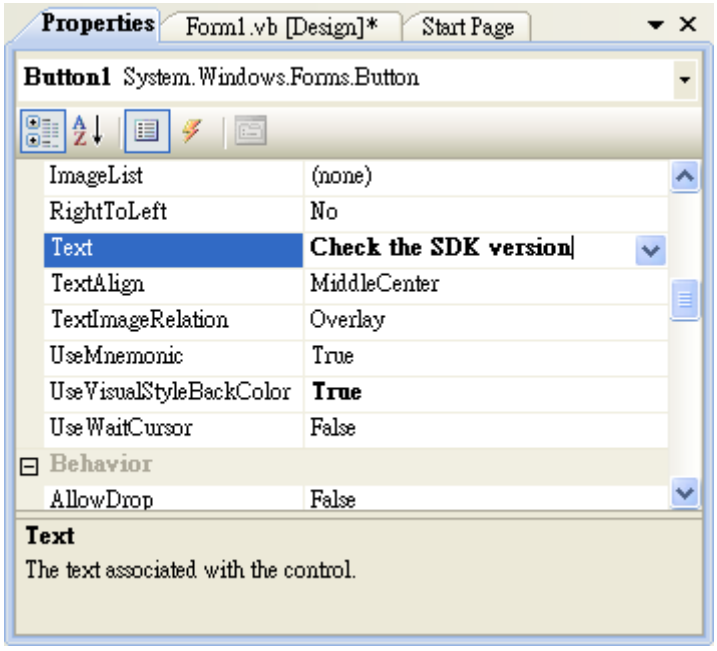
**2. Right-click the Button control, and then click Properties**




**3. In the Properties window, type Check the SDK version in the Text item, and press ENTER**



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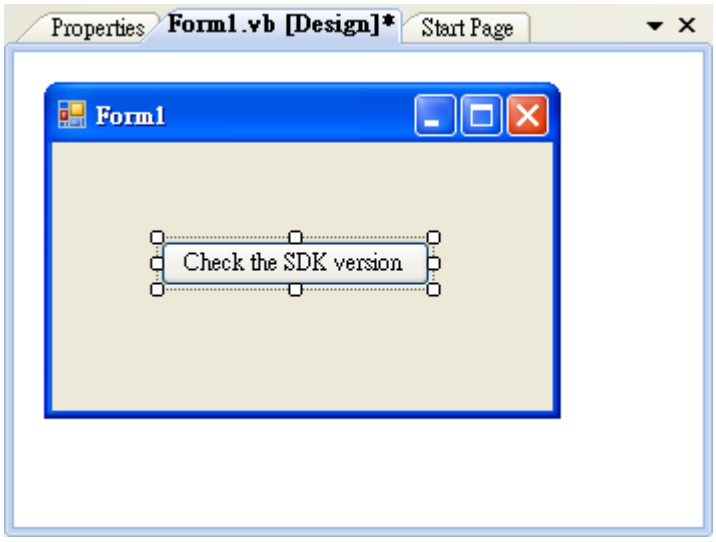
## 5.1.4. Add the Event Handling for the Control

You have finished the design stage of your application and are at the point when you can start adding some code to provide the program's functionality.

### 1. Double-click the button on the form



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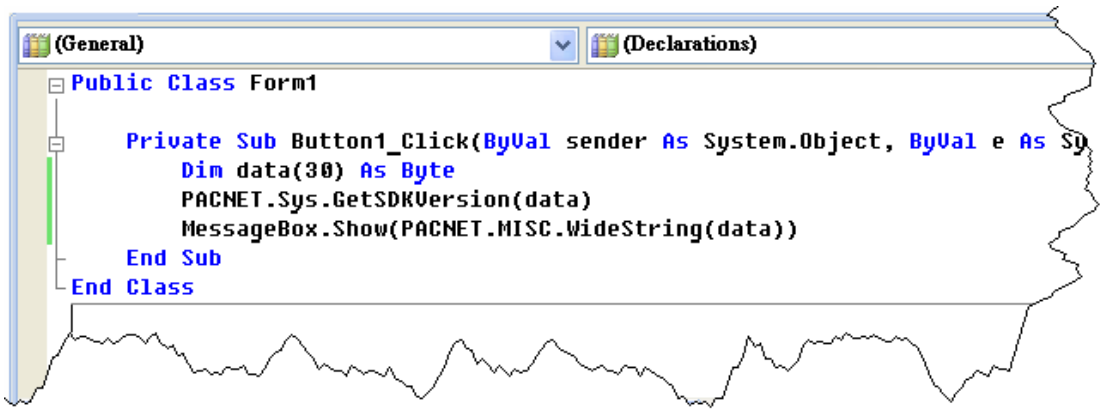
## 2. Inserting the following code

Dim data(30) As Byte
PACNET.Sys.GetSDKVersion(data)
MessageBox.Show(PACNET.MISC.WideString(data))




**Tips & Warnings**

The “PACNET” of “using PACNET” is case- sensitive.



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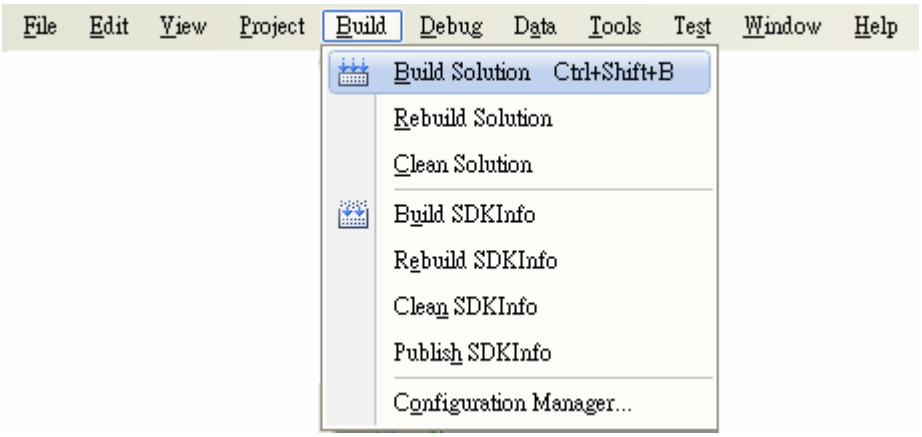
## 5.1.5. Upload the Application to iPPC-IoT

iPPC-IoT supports FTP server service. You can upload files to iPPC-IoT or download files from a public FTP server.

### 1. On the Build menu, click Build Solution




### 2. Open the browser and type the IP address of iPPC-IoT



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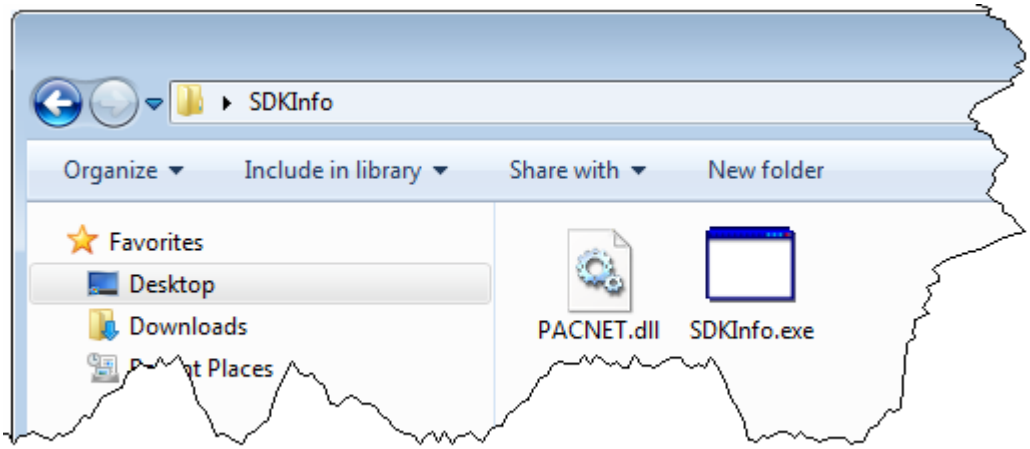
## 3. Upload the SDKInfo.exe application and the corresponding PACNET.dll files to iPPC-IoT

**Tips & Warnings**

For applications programming in C# and VB.net with .net compact framework, when executing these application on iPPC-IoT, the corresponding PACNET.dll must be in the same directory as the .exe file.



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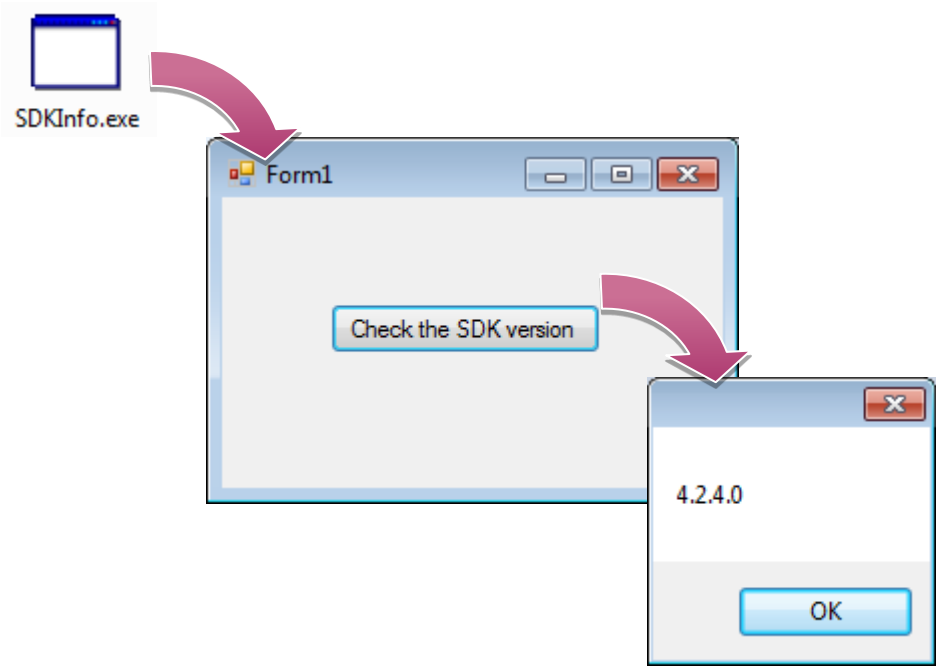
### 5.1.6. Execute the Application on iPPC-IoT

After uploading the application to iPPC-IoT, you can just double-click it to execute it.



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## 5.2. Your First iPPC-IoT Program in C#

The best way to learn programming with iPPC-IoT is to actually create an iPPC-IoT program.

The example below will guide you through creating this simple program in C# and running them on iPPC-IoT.

To create a demo program with C# that includes the following main steps:

1. Create a new project
2. Specify the path of the PAC reference
3. Add the control to the form
4. Add the event handling for the control
5. Upload the application to iPPC-IoT
6. Execute the application on iPPC-IoT

All main steps will be described in the following subsection.



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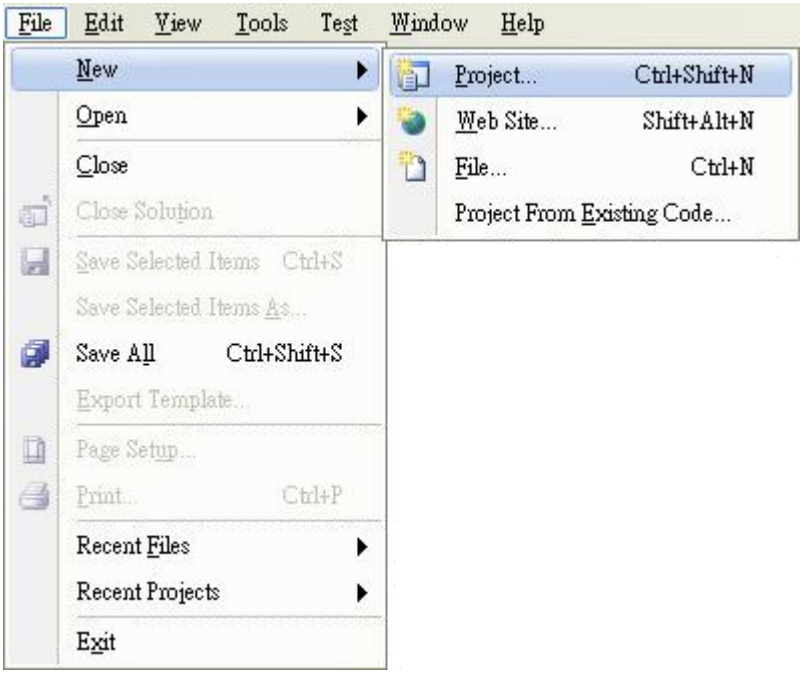
## 5.2.1. Create a New Project

The C# project template is a composite control that you use in this example creates a new project with this user control.

### 1. Run the Visual Studio 2008

Visual Studio 2008

### 2. On the File menu, point to New, and then click Project



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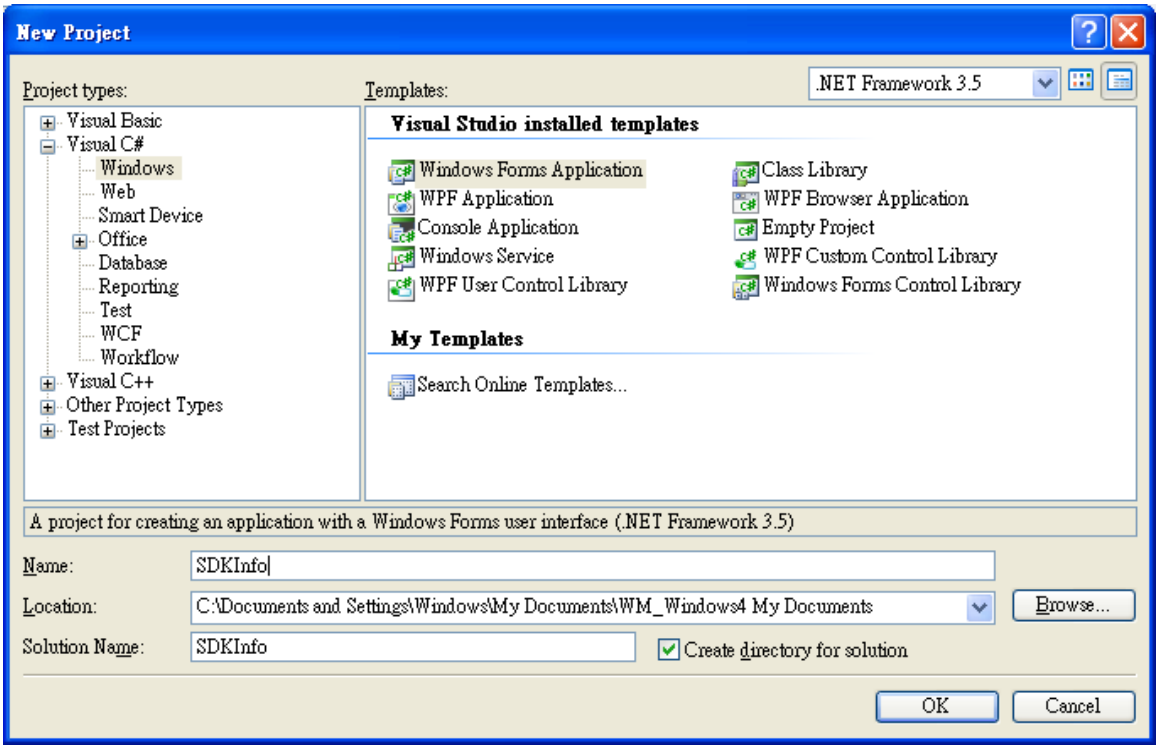
### 3. In the Project types pane, expand Visual C#, and then click Windows

### 4. In the Templates pane, click Windows Forms Application

### 5. Type a name in the Name field, and then click OK button

Here we will enter the name “SDKInfo” and a different location for the project if you wish



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## 5.2.2. Specify the Path of PAC Reference

The PAC SDK provides a complete solution to integrate with iPPC-IoT and it's compatible with Visual C#, Visual Basic .net and C++. In order to use a component in your application, you must first add a reference to it.

### 1.1 Get the PACNET.dll and copy it to the project folder

The PACNET.dll can be obtained separately by downloading the latest version from ICP DAS web site.

https://www.icpdas.com/en/download/index.php?model=AXP-9051-IoT

### 1.2 Get the UniDAQ.cs and copy it to the project folder (Only uses for e-9K module.)

The UniDAQ.vb can be obtained separately by downloading the latest version from ICP DAS web site.

https://www.icpdas.com/en/download/index.php?model=AXP-9051-IoT

PACSDK_WES7_IoT_Vxxx_YYYYMMDD.zip



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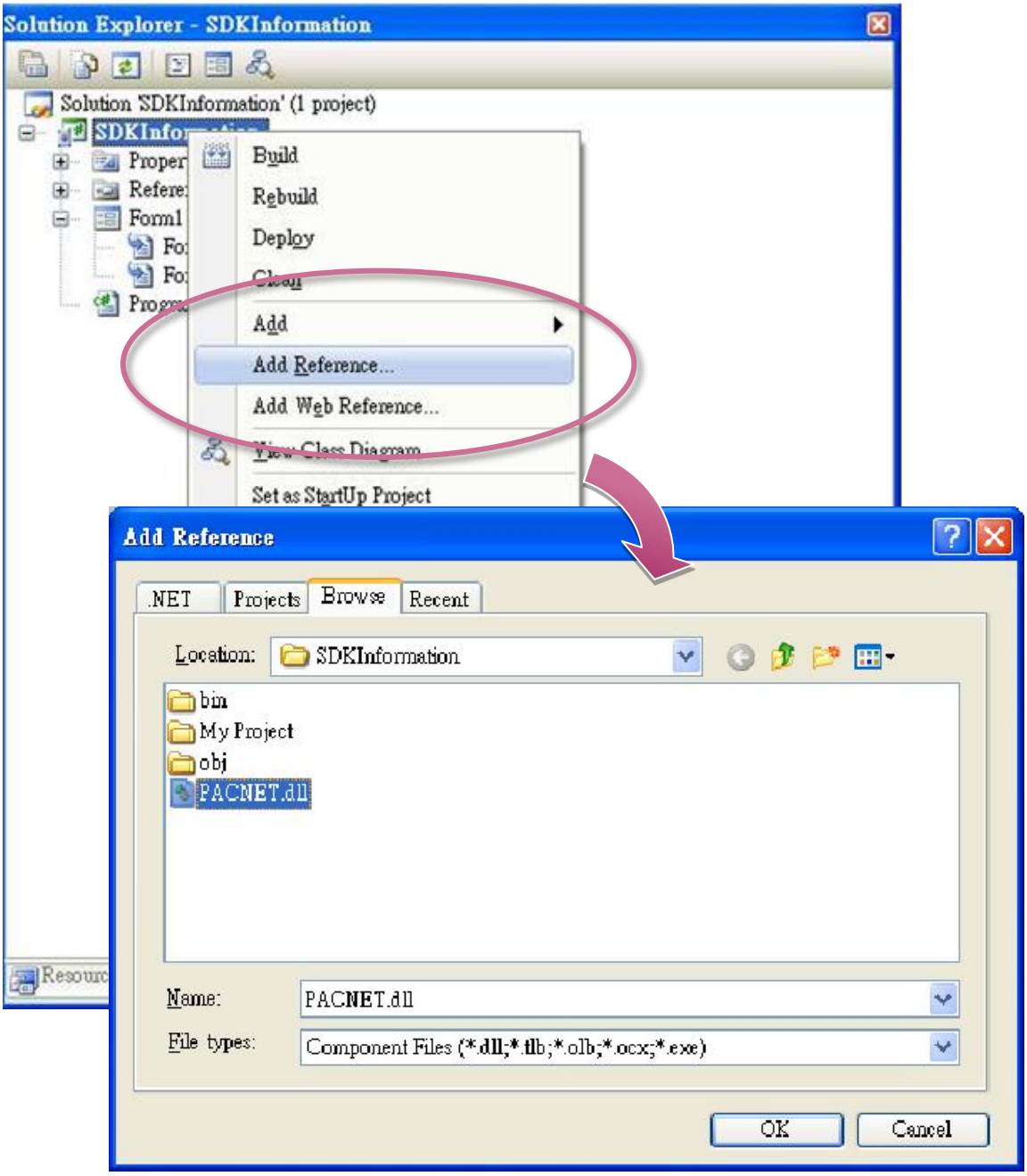
**2. In Solution Explorer, right-click the References node, and then click Add Reference…**

**3.1. Select Browse tab and add the PACNET.dll**



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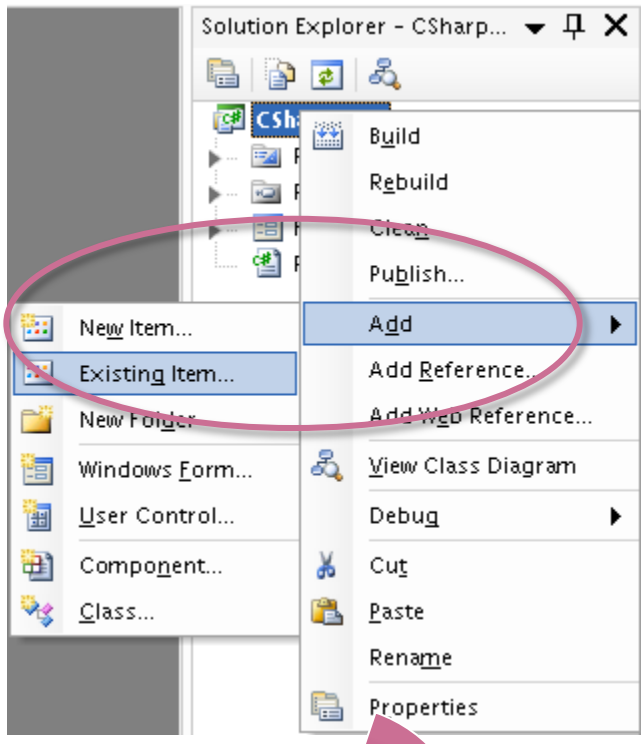
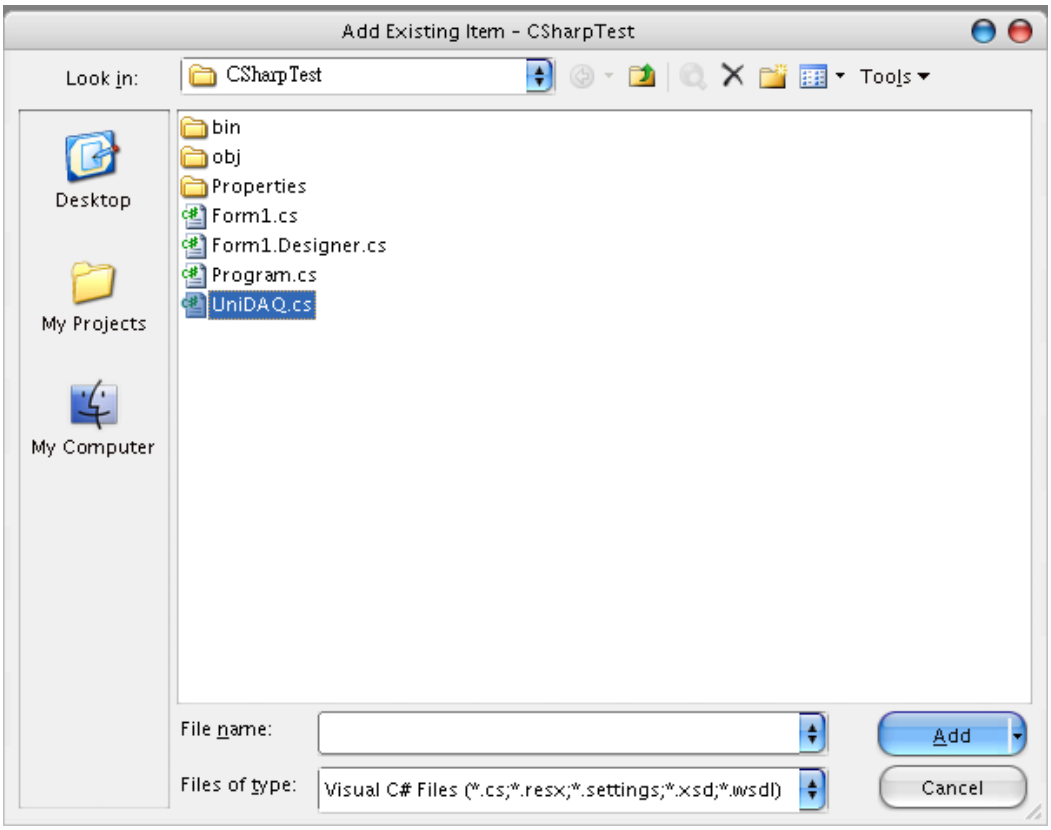
### 3.2. Add the UniDAQ.cs declaration file by clicking the name of the file and then clicking the Add button. (Only uses for e-9K module.)



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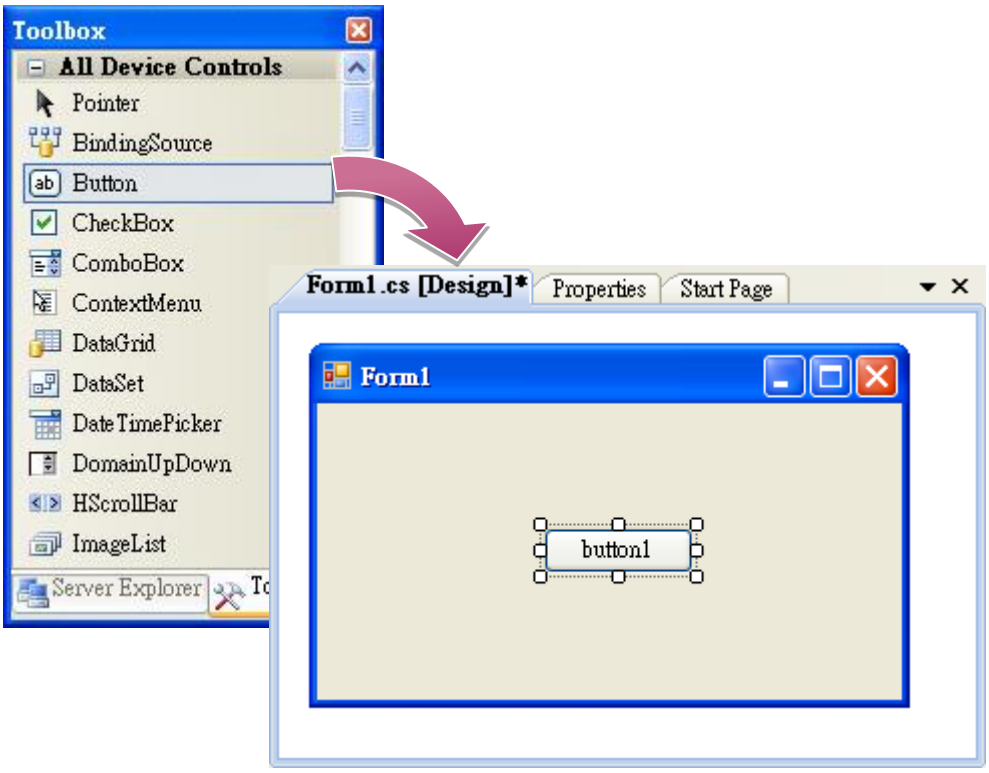
## 5.2.3. Add the Control to the Form

You can drag various controls from the Toolbox onto the form. These controls are not really "live"; they are just images that are convenient to move around on the form into a precise location.

After you add a control to your form, you can use the Properties window to set its properties, such as background color and default text. The values that you specify in the Properties window are the initial values that will be assigned to that property when the control is created at run time.

**1. From the Toolbox, drag a Button control onto the form**



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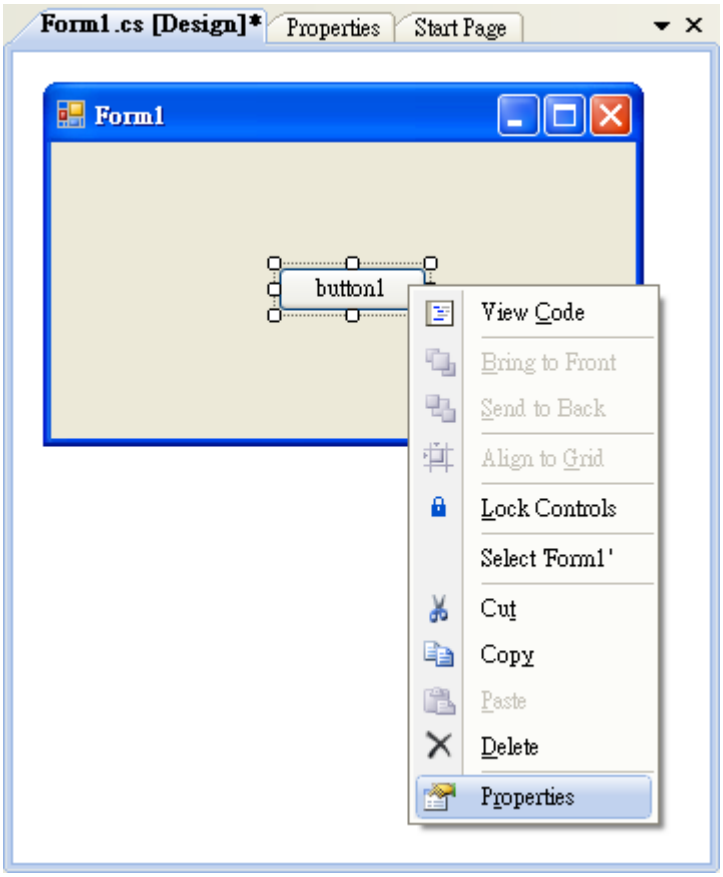
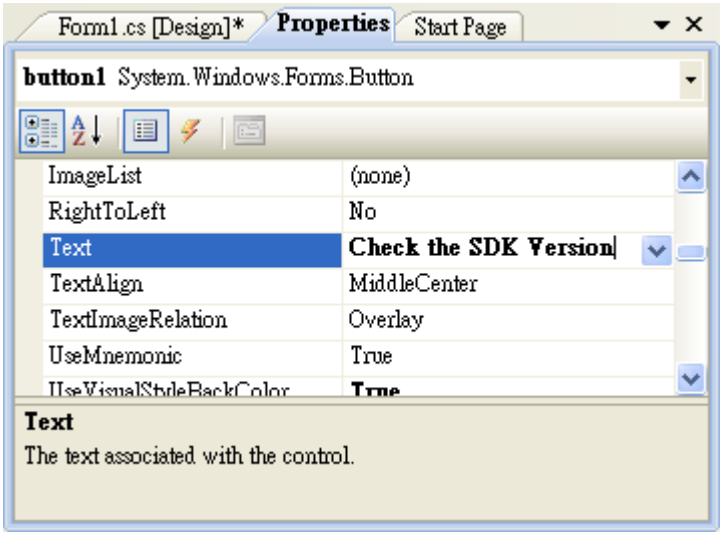
**2. Right-click the Button control, and then click Properties**




**3. In the Properties window, type Check the SDK version in the Text item, and press ENTER**



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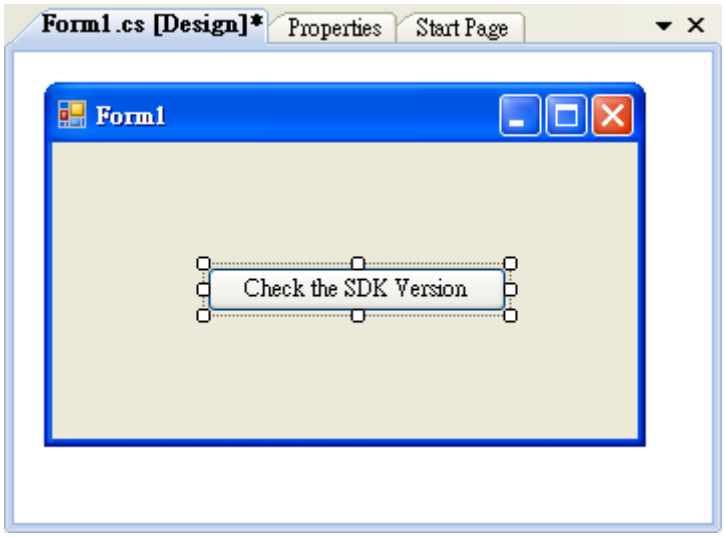
## 5.2.4. Add the Event Handling for the Control

You have finished the design stage of your application and are at the point when you can start adding some code to provide the program's functionality.

### 1. Double-click the button on the form



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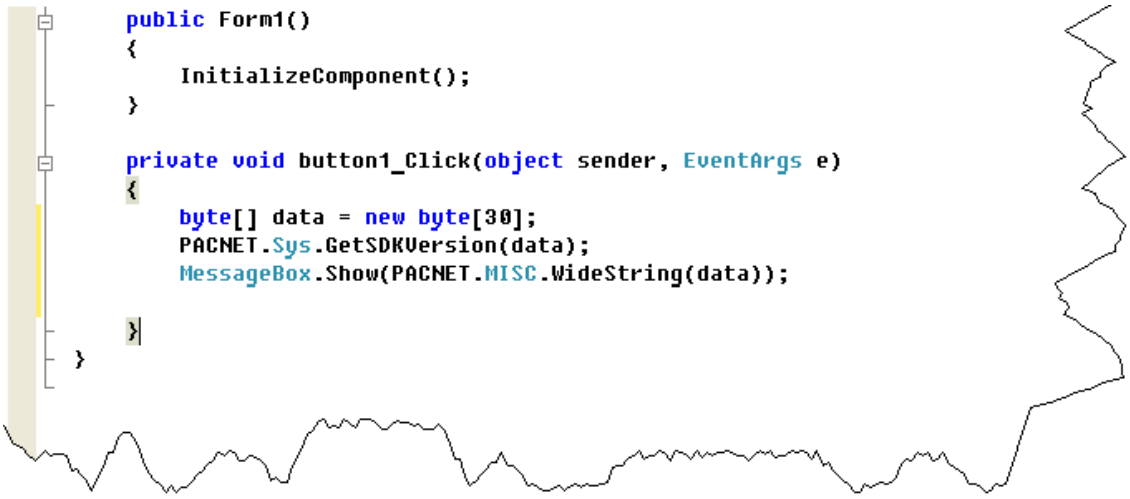
## 2. Inserting the following code

byte []data = new byte[30];
PACNET.Sys.GetSDKVersion(data);
MessageBox.Show(PACNET.MISC.WideString(data));



```
    public Form1()
    {
        InitializeComponent();
    }

    private void button1_Click(object sender, EventArgs e)
    {
        byte[] data = new byte[30];
        PACNET.Sys.GetSDKVersion(data);
        MessageBox.Show(PACNET.MISC.WideString(data));

    }
}
```

**Tips & Warnings**

The “PACNET” of “using PACNET” is case- sensitive.



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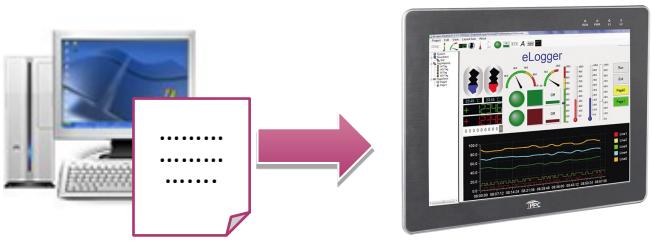
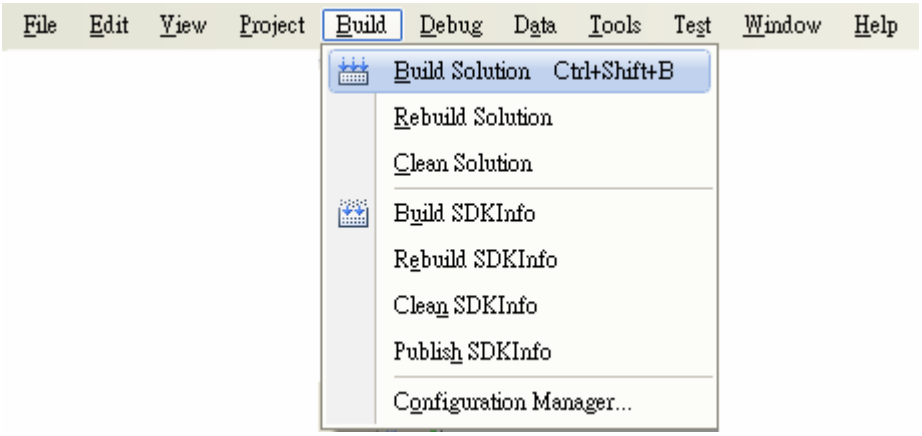
## 5.2.5. Upload the Application to iPPC-IoT

iPPC-IoT supports FTP server service. You can upload files to iPPC-IoT or download files from a public FTP server.




### 1. On the Build menu, click Build Solution




### 2. Open the browser and type the IP address of iPPC-IoT



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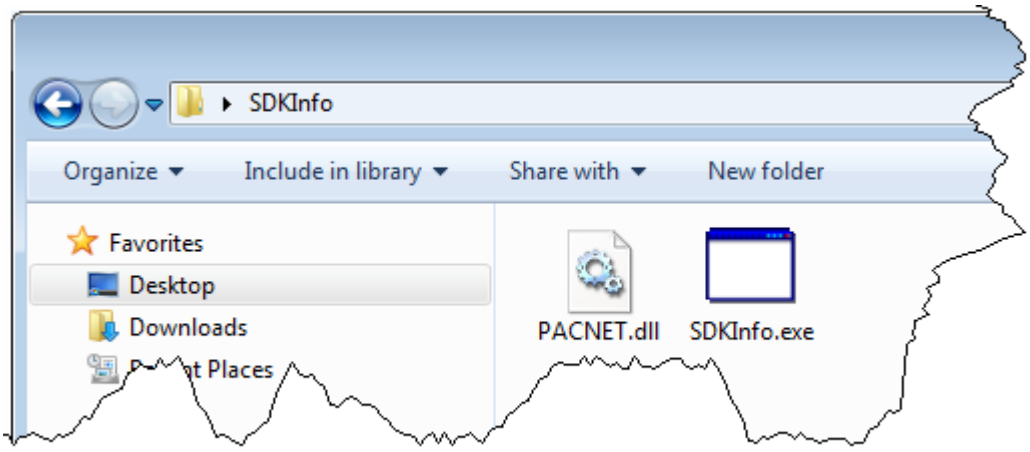
## 3. Upload the SDKInfo.exe application and the corresponding PACNET.dll files to iPPC-IoT

**Tips & Warnings**

For applications programming in C# and VB.net with .net compact framework, when executing these application on iPPC-IoT, the corresponding PACNET.dll must be in the same directory as the .exe file.



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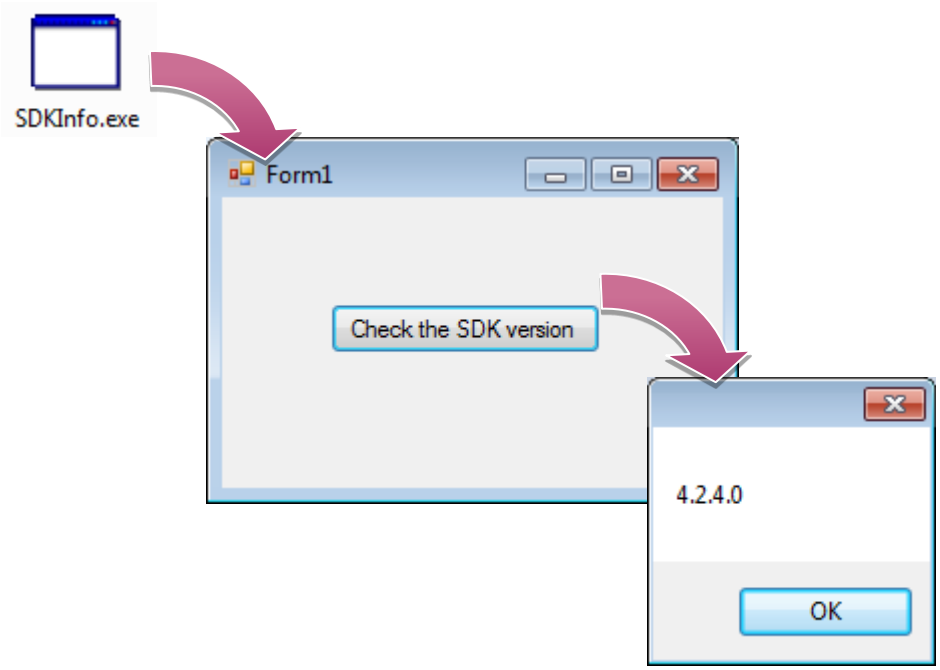
## 5.2.6. Execute the Application on iPPC-IoT

After uploading the application to iPPC-IoT, you can just double-click it to execute it.



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## 5.3. Your First iPPC-IoT Program in Visual C++

The best way to learn programming with iPPC-IoT is to actually create a iPPC-IoT program.

The example below will guide you through creating this simple program in Visual C++ and running them on iPPC-IoT.

To create a demo program with Visual C++ that includes the following main steps:

1. Create a new project
2. Specify the path of the iPPC-IoT reference
3. Add the control to the form
4. Add the event handling for the control
5. Upload the application to iPPC-IoT
6. Execute the application on iPPC-IoT

All main steps will be described in the following subsection.



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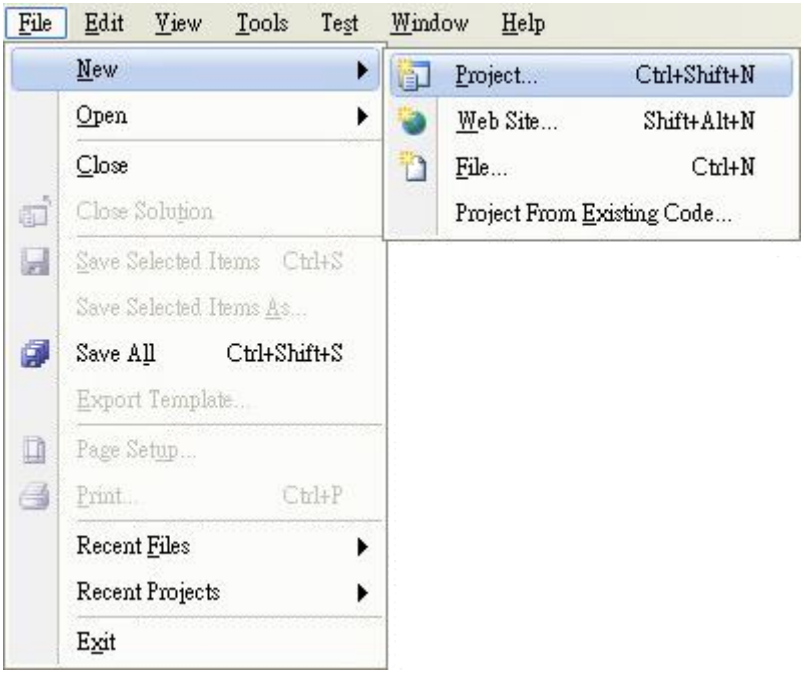
## 5.3.1. Create a New Project

The Visual C++ project template is a composite control that you use in this example creates a new project with this user control.

### 1. Run the Visual Studio 2008

Visual Studio 2008

### 2. On the File menu, point to New, and then click Project



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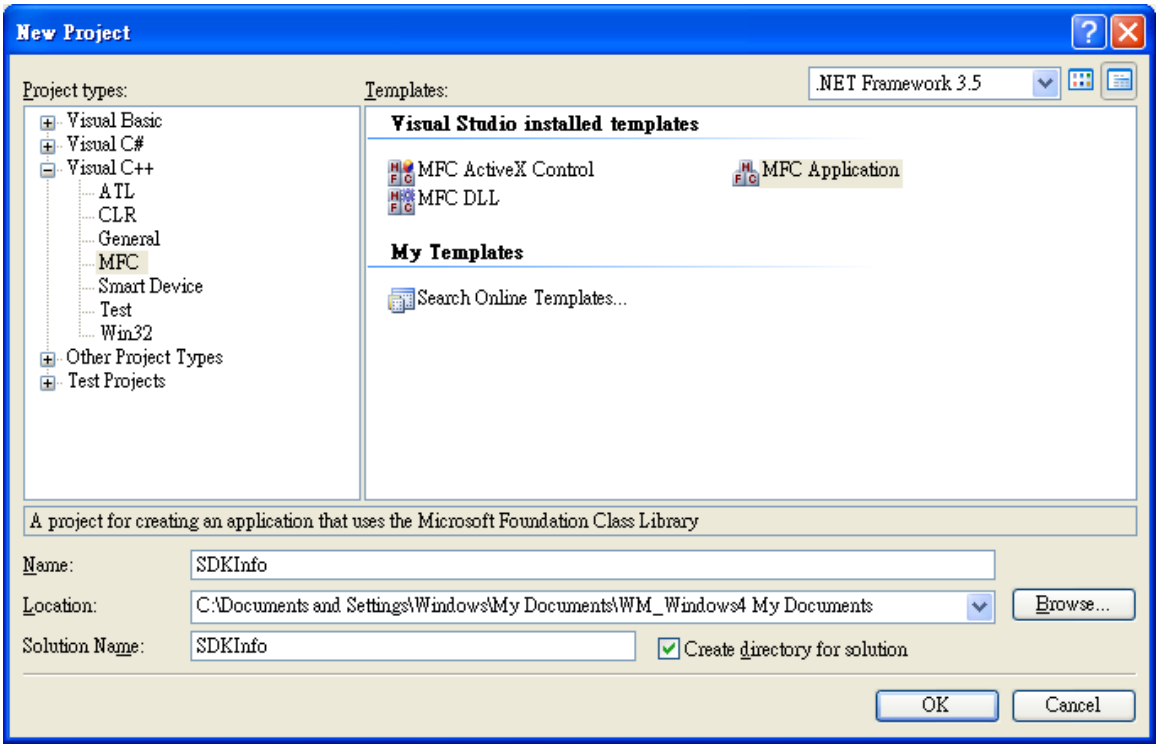
### 3. In the Project types pane, expand Visual C++, and then click MFC

### 4. In the Templates pane, click MFC Application

### 5. Type a name in the Name field, and then click OK

Here we will enter the name “SDKInfo” and a different location for the project if you wish



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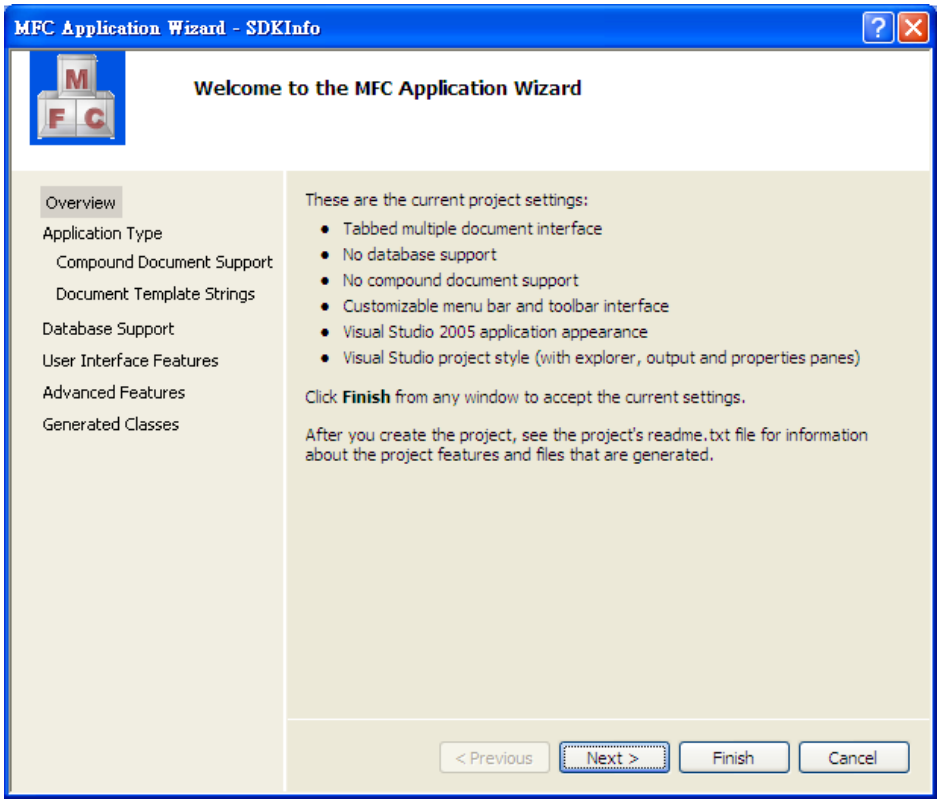
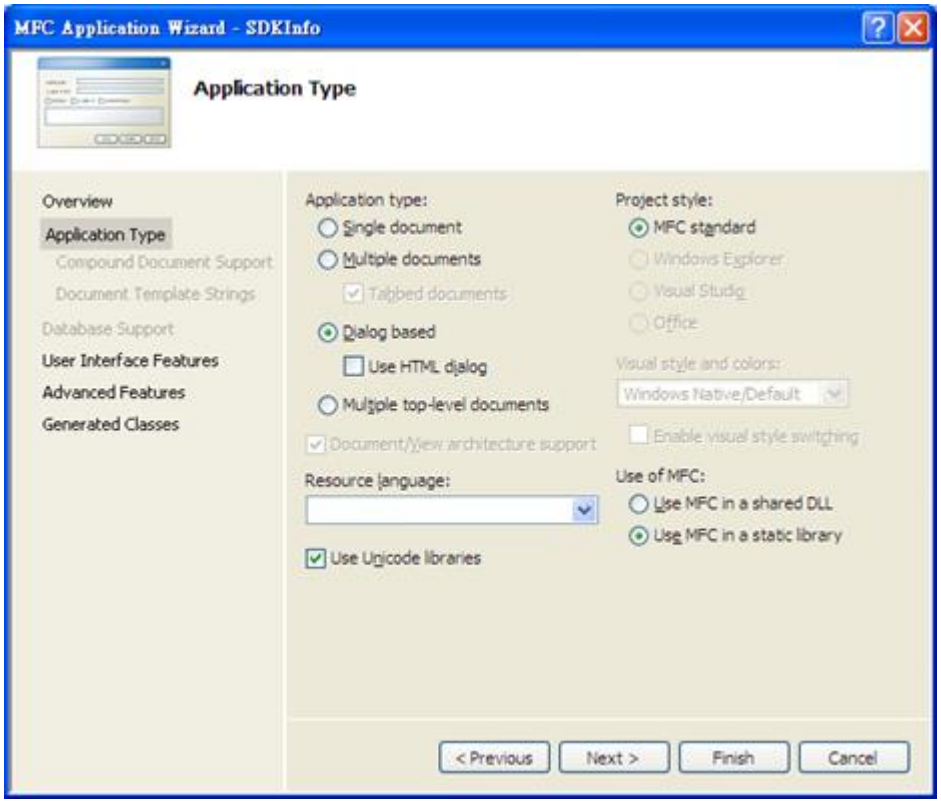
**6. On the first page of the wizard, click Next >**




**7. On the next page of the wizard, select Dialog based, select Use MFC in a static library, and then click Finish**



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## 5.3.2. Specify the Path of the PAC Reference

The PAC SDK provides a complete solution to integrate with iPPC-IoT and it's compatible with Visual C#, Visual Basic .net and C++. In order to use a component in your application, you must first add a reference to it.

### 1.1 Get the PACSDK.H and PACSDK.lib, and copy them to the project folder

The PACSDK.H and PACSDK.lib can be obtained separately by downloading the latest version from ICP DAS web site.

https://www.icpdas.com/en/download/index.php?model=AXP-9051-IoT

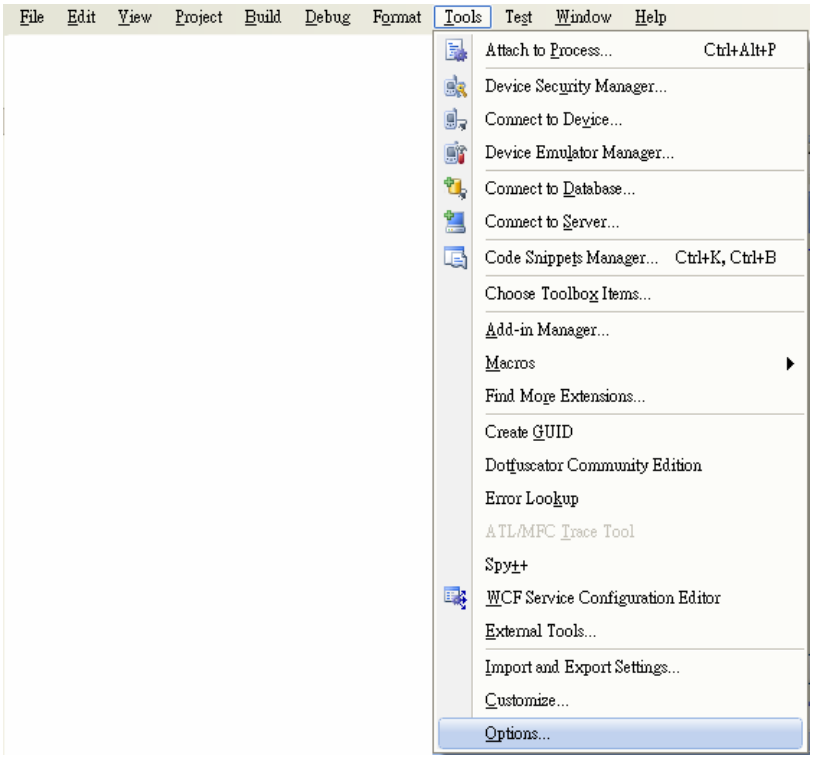
### 1.2 Get the UniDAQ.h and UniDAQ.lib, and copy them to the project folder (Only uses for e-9K module.)

The UniDAQ.h and UniDAQ.lib can be obtained separately by downloading the latest version from ICP DAS web site.

https://www.icpdas.com/en/download/index.php?model=AXP-9051-IoT

PACSDK_WES7_IoT_Vxxx_YYYYMMDD.zip

### 2. On the Tools menu, and then click Options



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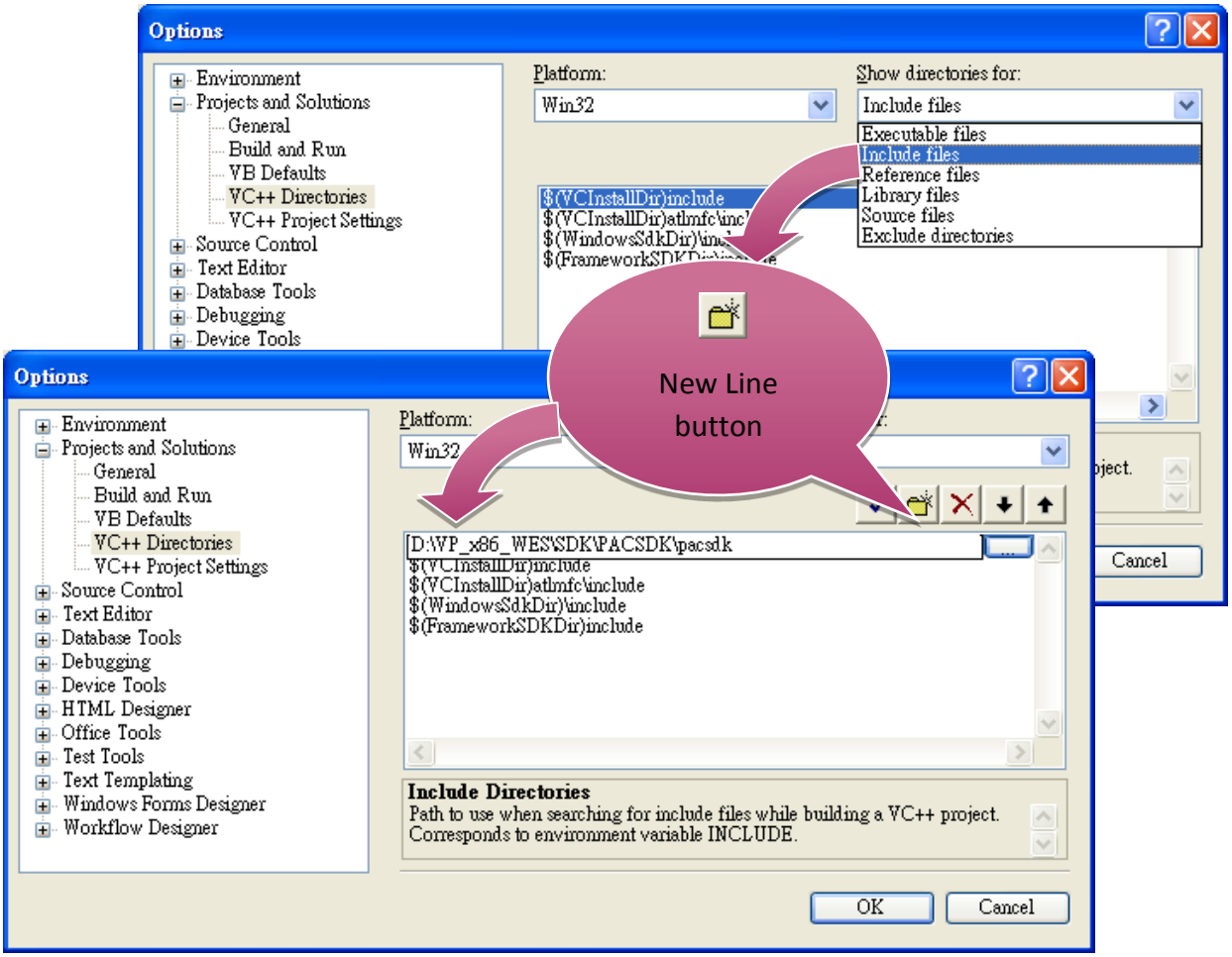
**3. In the left pane, expand Projects and Solutions, and then click the VC++ Directories**

**4. Select Include files in the Show directories for drop down box, and then click the New Line button**

**5. Add a new line to the list of directories. Browse to the directory that contains the PACSDK.H file.**



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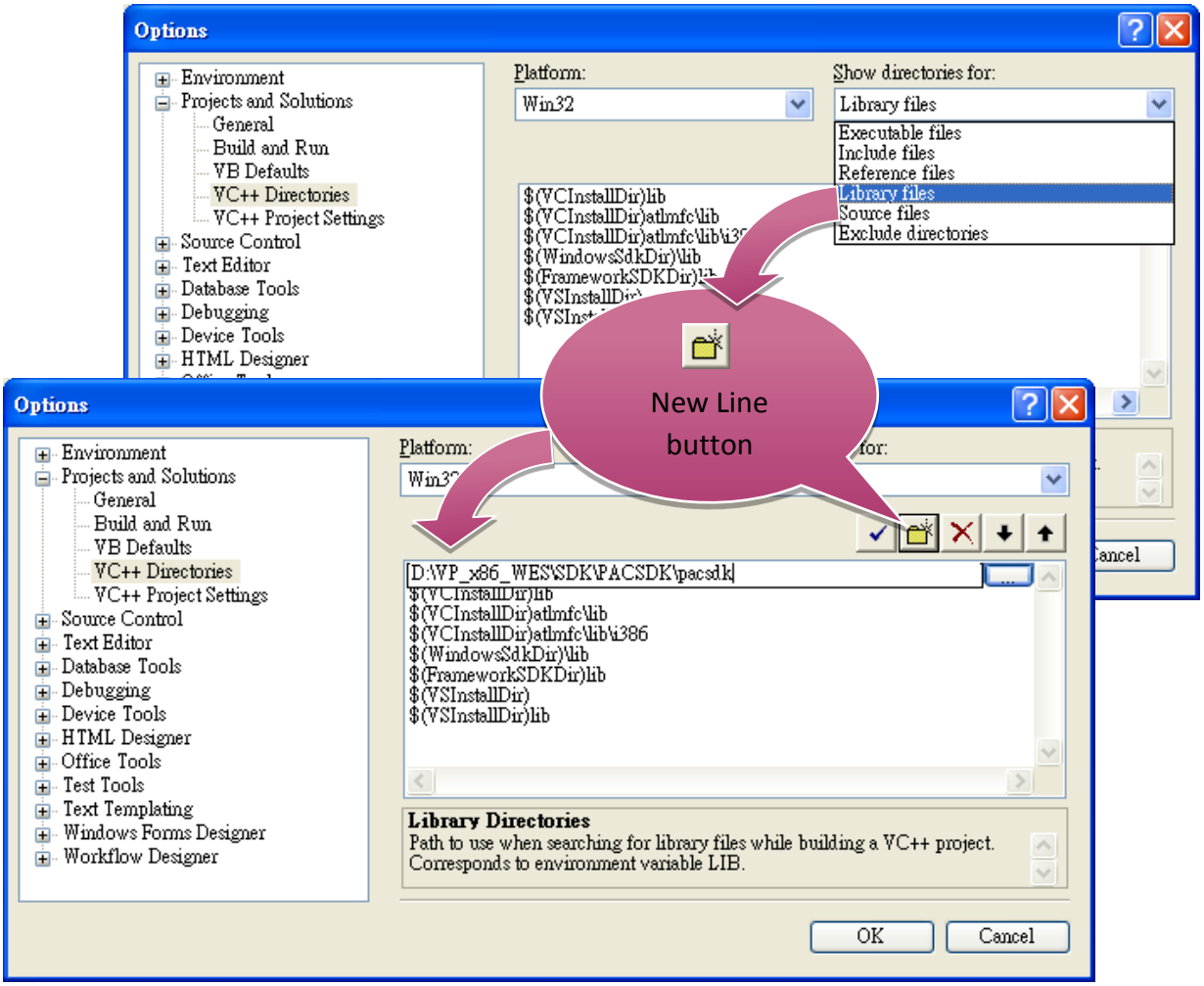
**6. Select Library files in the Show directories for drop down box, and then click the New Line button**

**7. Add a new line to the list of directories. Browse to the directory that contains the PACSDK.lib file, and then click OK button**



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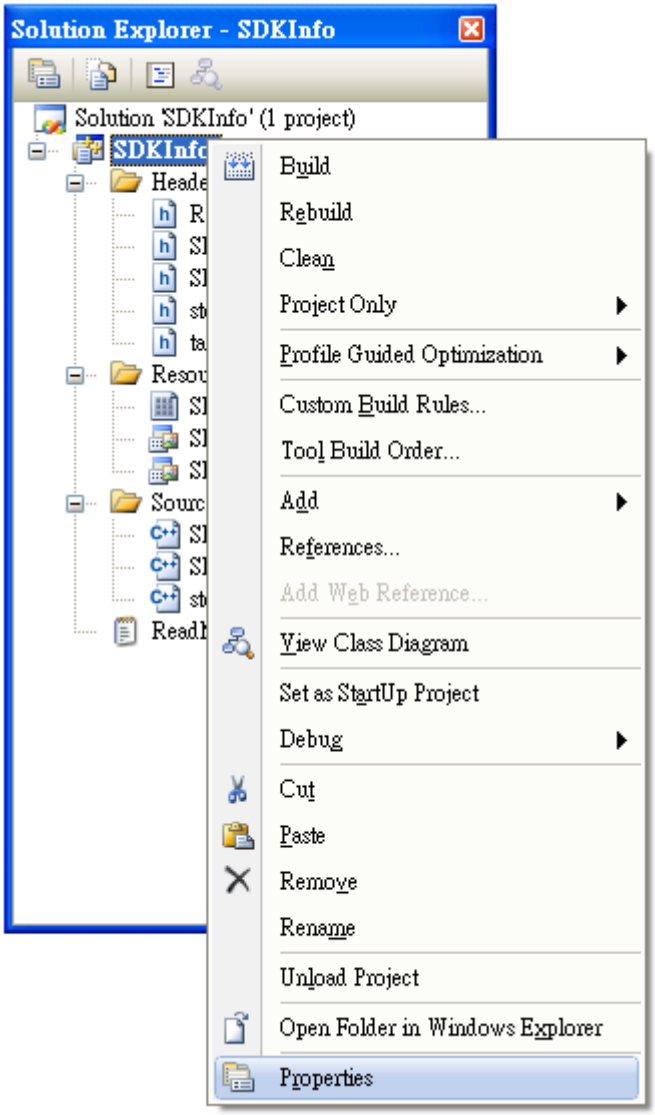
**8. In the Solution Explorer windows, right-click the project name, and then click Properties**



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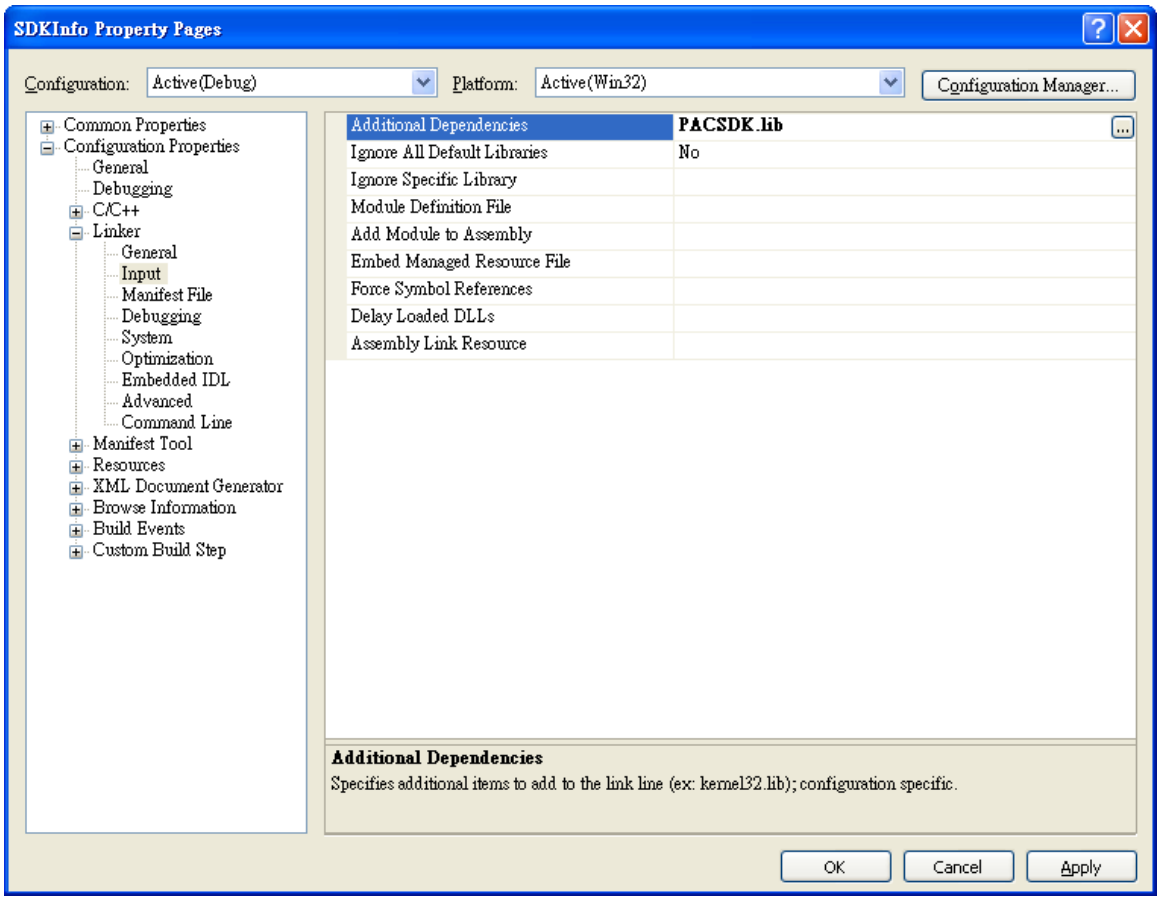
**9. In the left pane, expand Configuration Properties, and then click the Link**

**10. In the right pane, type the PACSDK.lib in the Additional Dependencies item, click Apply button, and then click the OK button**



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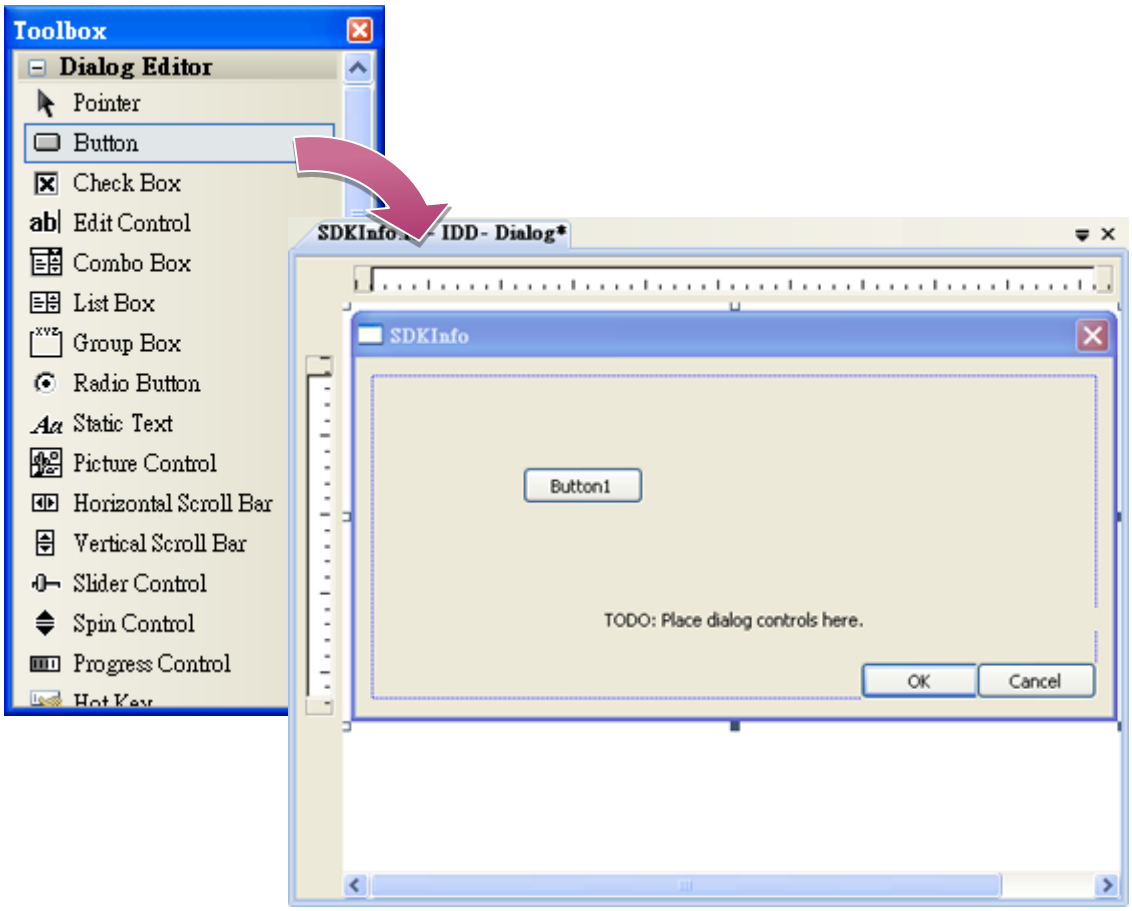
## 5.3.3. Add the Control to the Form

You can drag various controls from the Toolbox onto the form. These controls are not really "live"; they are just images that are convenient to move around on the form into a precise location.

After you add a control to your form, you can use the Properties window to set its properties, such as background color and default text. The values that you specify in the Properties window are the initial values that will be assigned to that property when the control is created at run time.

**1. From the Toolbox, drag a Button control onto the form**



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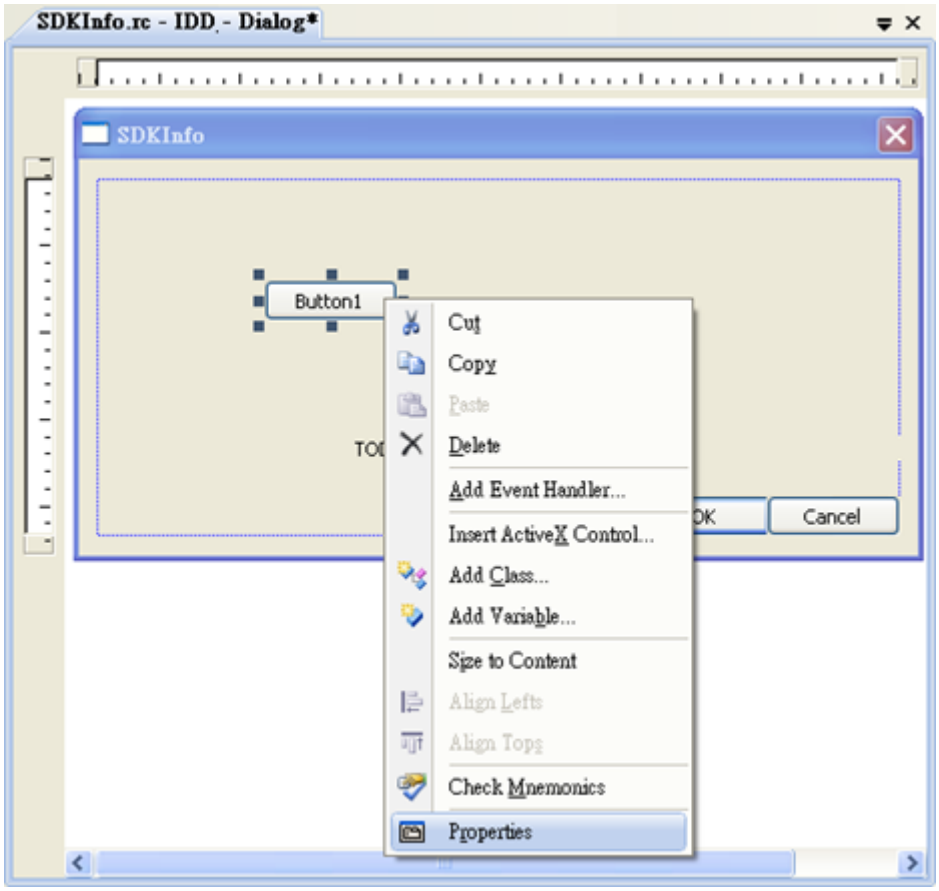
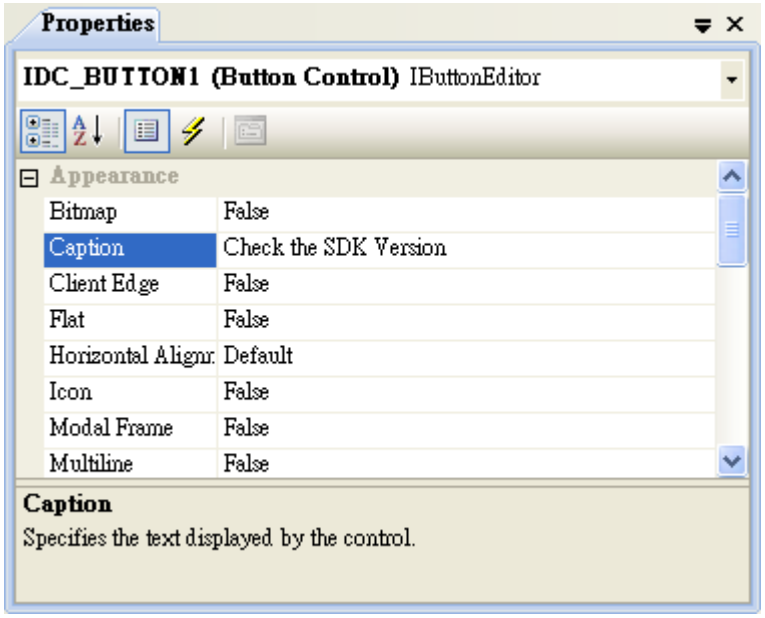
**2. Right-click the Button control, and then click Properties**




**3. In the Properties window, type Check the SDK version in the Caption item, and press ENTER**



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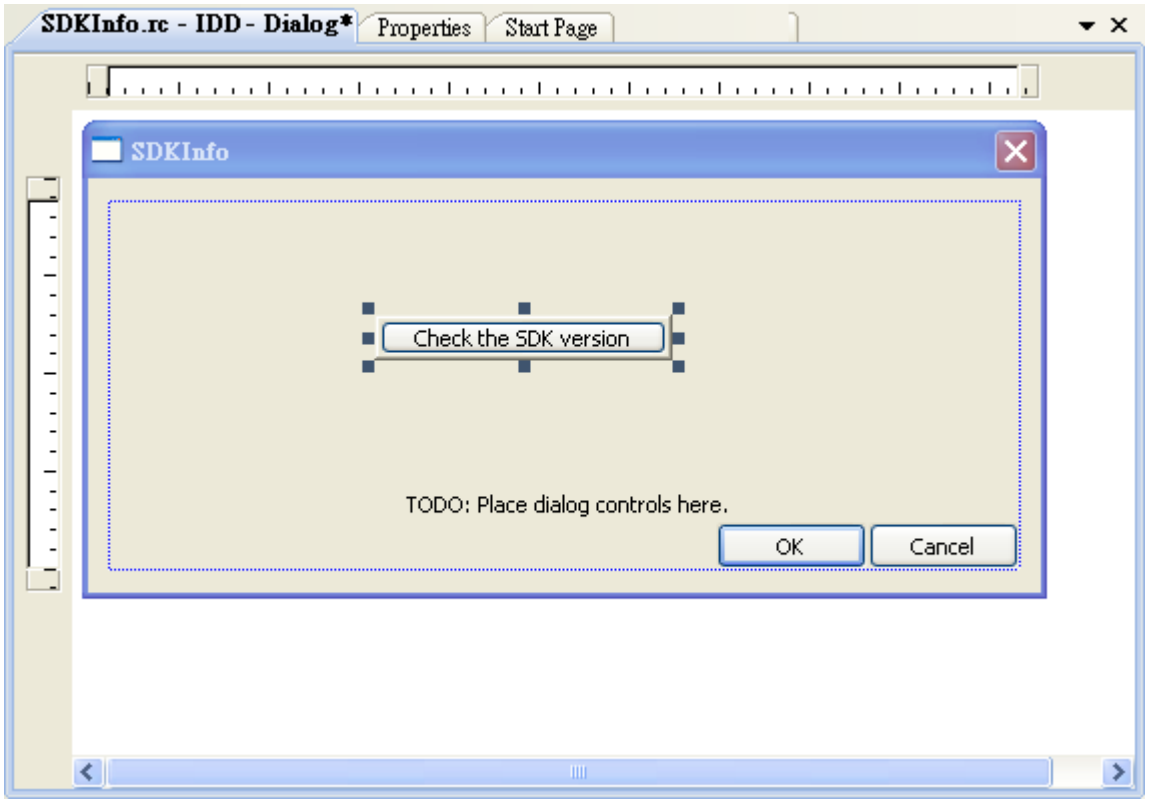
## 5.3.4. Add the Event Handling for the Control

You have finished the design stage of your application and are at the point when you can start adding some code to provide the program's functionality.

### 1. Double-click the button on the form



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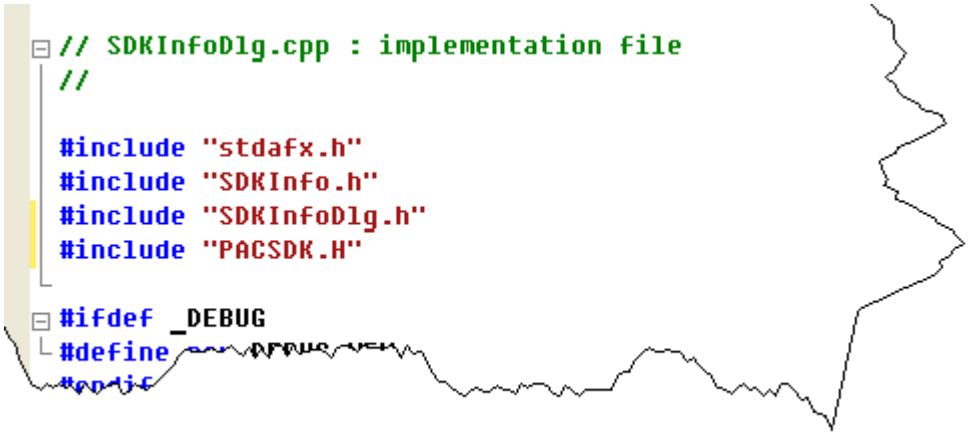
### 2. Inserting the following code

```
char sdk_version[32];
TCHAR buf[32];
pac_GetSDKVersion(sdk_version);
pac_AnsiToWideString(sdk_version, buf);
MessageBox(buf,0,MB_OK);
```

### 3.1. Inserting the following code into the header area

#include “PACSDK.H”




### 3.2. Inserting the following code into the header area (Only uses for e-9K module.)

```
#include "UniDAQ.h"
#pragma comment(lib,"UniDAQ.lib")
```



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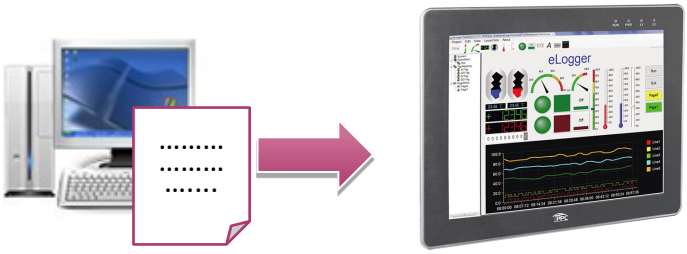
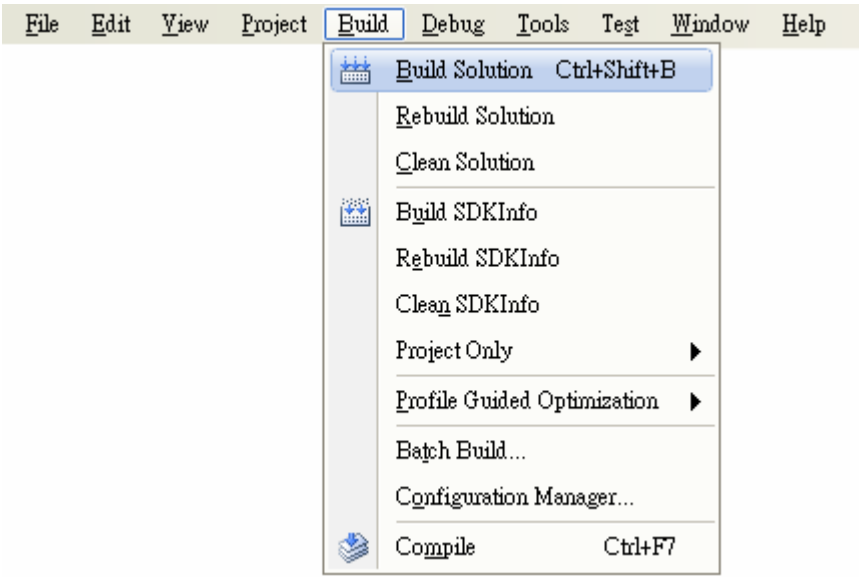
## 5.3.5. Upload the Application to iPPC-IoT

iPPC-IoT supports FTP server service. You can upload files to iPPC-IoT or download files from a public FTP server.




### 1. On the Build menu, click Build Solution




### 2. Open the browser and type the IP address of iPPC-IoT

### 3. Upload the SDKInfo.exe application to iPPC-IoT

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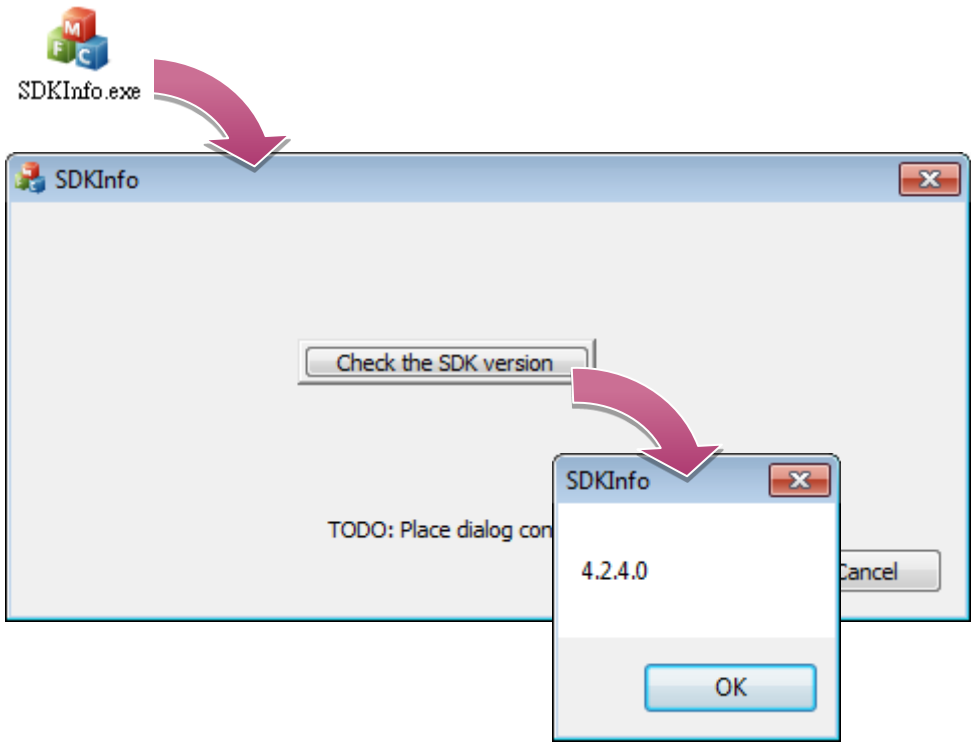
## 5.3.6. Execute the Application on iPPC-IoT

After uploading the application to iPPC-IoT, you can just double-click it to execute it.



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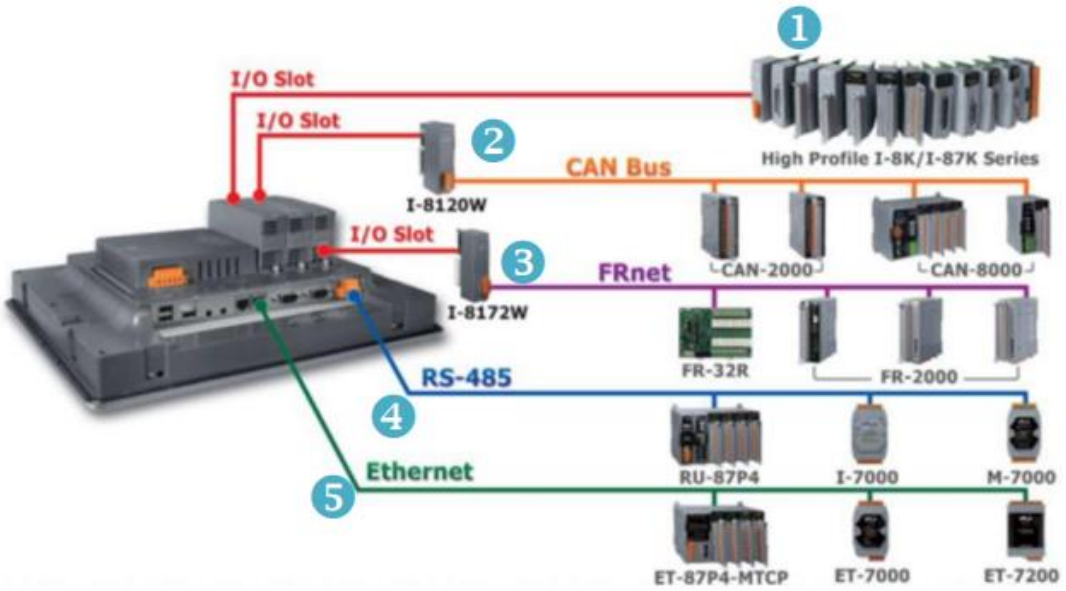
# 6. I/O Modules and SDK Selection

This chapter describes how to select a suitable expansion I/O module and the corresponding SDK library to be used for developing programs on iPPC-IoT.

iPPC-IoT provides the following I/O expansion buses:




### 1. Local I/O Module (I-8K series and I-87K series) for iPPC-6831-IoT/iPPC-6931-IoT

There are two types of I/O modules that can be inserted into local bus of a iPPC-IoT device, Parallel and Serial. Parallel modules (I-8K Series) are high-speed modules and only support an MCU (Main Control Unit). Serial modules (I-87K Series) can support either an MCU or an I/O expansion unit. The following table shows the appropriate SDK library to be used for I/O modules.

➢ **I-8K series I/O modules**

| Module | Native SDK | .NET CF SDK |
|---|---|---|
| I-8K series | PACSDK.dll | PACNET.dll |
| Specified I-8K series | Specified SDK | Specified SDK |

For full details regarding I-8K series I/O modules and its demos, please refer to:
https://www.icpdas.com/web/product/download/pac/wes/software/sdk/xpac_iot_wes7_sdk_demo.zip



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➢ **I-87K series I/O modules**

| Module | Native SDK | .NET CF SDK |
|---|---|---|
| I-87K series | PACSDK.dll | PACNET.dll |
| I-87K series with I-87088W | PACSDK_PWM.dll | Specified SDK |

For full details regarding I-87K series I/O modules and its demos, please refer to:
https://www.icpdas.com/web/product/download/pac/wes/software/sdk/xpac_iot_wes7_sdk_demo.zip

➢ **Specified I-8K series modules**

| Module | Native SDK | .NET CF SDK |
|---|---|---|
| I-8017HW | pac_i8017HW.dll | pac_i8017HWNet.dll |
| I-8014W | pac_i8014W.dll | pac_i8014WNet.dll |
| I-8024W | pac_i8024W.dll | Pac_i8024WNet.dll |
| I-8026W | pac_i8028W.dll | pac_i8026WNet.dll |
| I-8048W | pac_i8048W.dll | pac_i8048WNet.dll |
| I-8050W | pac_i8050W.dll | pac_i8050WNet.dll |
| I-8084W | pac_i8084W.dll | pac_i8084WNet.dll |
| I-8088W | pac_i8088W.dll | pac_i8088WNet.dll |
| I-8093W | pac_i8093W.dll | pac_i8093WNet.dll |
| Others | PACSDK.dll | PACNET.dll |

## 2. CAN bus for iPPC-6831-IoT/iPPC-6931-IoT

The Controller Area Network (CAN) is a serial communication way, which efficiently supports distributed real-time control with a very high level of security. It provides the error-processing mechanisms and concepts of message priority. These features can improve the network reliability and transmission efficiency.

| Module | Native SDK | .NET CF SDK |
|---|---|---|
| I-8120W | I8120.dll | I8120net_pac.dll |

For full details regarding CAN bus series modules and its demos, please refer to:
https://www.icpdas.com/web/product/download/pac/wes/software/sdk/xpac_iot_wes7_sdk_demo.zip


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## 3. FRnet for iPPC-6831-IoT/iPPC-6931-IoT

FRnet is an innovative industrial field bus technology that uses twisted pair cable as the transmission medium. The status of all I/O devices is updated on a fixed cycle, no matter how many FRnet I/O modules are connected to the FRnet network.

| Module | Native SDK | .NET CF SDK |
|---|---|---|
| I-8172W | pac_i8172W.dll | pac8172WNet.dll |

## 4. RS-485 (I-7K series and M-7K series)

I-7000, M-7000, RU-87Pn and high profile I-87K series modules connect to iPPC-IoT series devices via a twisted-pair, multi-drop, 2-wire RS-485 network

➢ **I-7K series I/O modules**

| Module | Native SDK | .NET CF SDK |
|---|---|---|
| I-7K series | PACSDK.dll | PACNET.dll |
| I-7K series with I-7088(D) | PACSDK_PWM.dll | PACNET.dll |

For full details regarding I-7K series I/O modules and its demos, please refer to:

https://www.icpdas.com/web/product/download/pac/wes/software/sdk/xpac_iot_wes7_sdk_demo.zip

➢ **M-7K series I/O modules**

| Module | Native SDK | .NET CF SDK |
|---|---|---|
| M-7K series | Modbus Demo | Modbus Demo |

For more detailed information about M-7K series modules using Modbus protocol and its demos, please refer to:

https://www.icpdas.com/web/product/download/pac/wes/software/sdk/xpac_iot_wes7_sdk_demo.zip



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➢ **RU-87Pn + I-87K series I/O modules**

| Module | Native SDK | .NET CF SDK |
|---|---|---|
| RU-87Pn + I-87K | PACSDK.dll | PACNET.dll |

➢ **Other specified I/O**

| Module | Native SDK | .NET CF SDK |
|---|---|---|
| Others | PACSDK.dll | PACNET.dll |

## 5. Ethernet (ET-7K series and I-8KE4/8-MTCP)

The Ethernet I/O devices available include ET-7000 and I-8KE4/8-MTCP, and support either the DCON or the Modbus/TCP communication protocol

| Module | Native SDK | .NET CF SDK |
|---|---|---|
| ET-7K | Modbus Demo | Modbus Demo |

For more detailed information about ET-7K and I-8KE4/8-MTCP series modules using Modbus protocol and its demos, please refer to:

https://www.icpdas.com/web/product/download/pac/wes/software/sdk/xpac_iot_wes7_sdk_demo.zip



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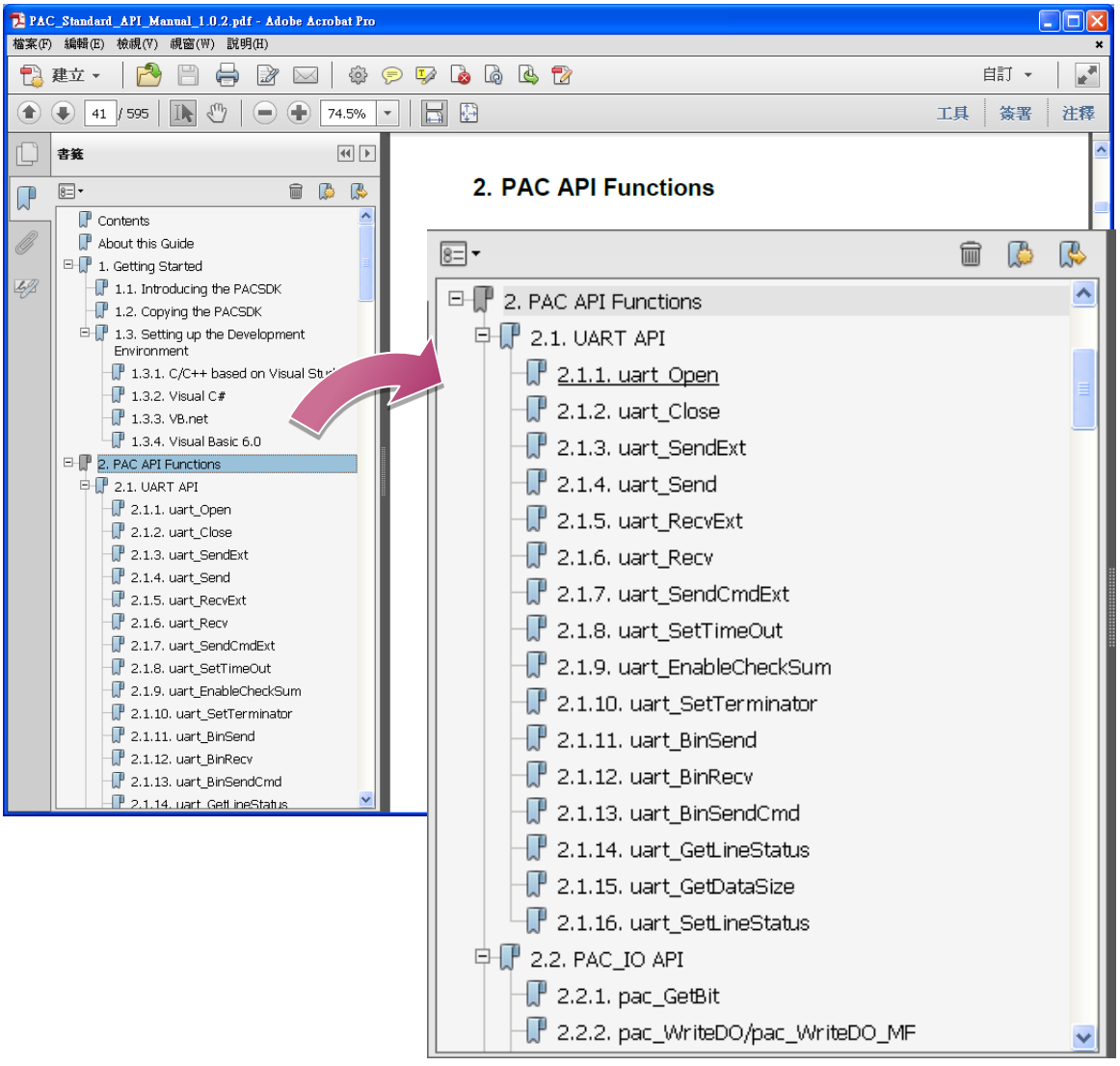
# 7. APIs and Demo Programs

This chapter provides a brief overview of PAC APIs and demo programs that have been designed for iPPC-IoT.

ICP DAS provides a set of demo programs in different programming languages. You can examine the demo codes, which includes numerous comments, to familiarize yourself with the PAC APIs. This will allow developing your own applications quickly by modifying these demo programs.

For full usage information regarding the description, prototype and the arguments of the functions, please refer to the “PAC Standard API Manual”



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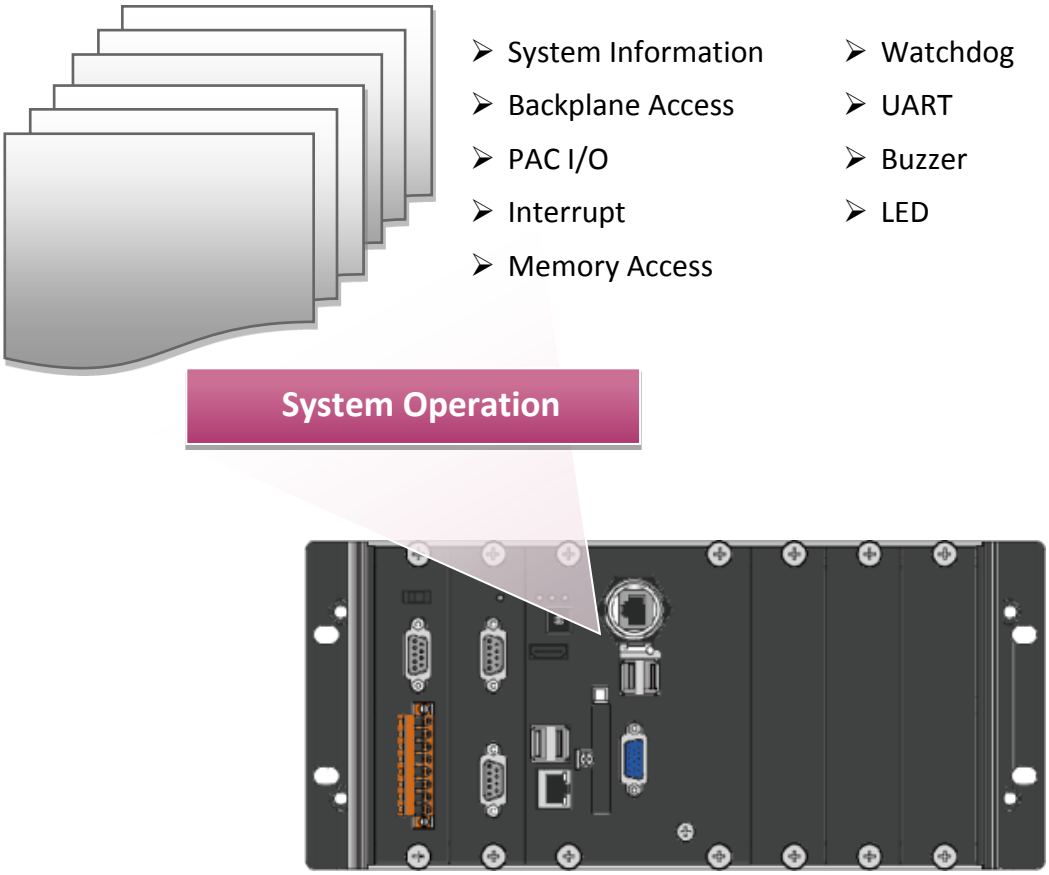
## 7.1. PAC Standard APIs

The diagram below shows the set of each system operation API provided in the PACSDK.




## PAC Standard API Manual (EN)

https://www.icpdas.com/en/download/show.php?num=2527

## VB.NET Demo Programs for PAC Standard APIs

The PAC SDK includes the following demo programs that demonstrate the use of the PAC Standard APIs in a VB.NET language environment. The following demo programs can be found by downloading the latest version from ICP DAS web site.

For VB.NET applications, these demo programs can be obtained from:

https://www.icpdas.com/en/download/show.php?num=2540&model=AXP-9051-IoT#expansion1

xpac_iot_wes7_sdk_demo.zip



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# C# Demo Programs for PAC Standard APIs

The PAC SDK includes the following demo programs that demonstrate the use of the PAC Standard APIs in a C# language environment. The following demo programs can be found by downloading the latest version from ICP DAS web site.

For C# applications, these demo programs can be obtained from:

https://www.icpdas.com/en/download/show.php?num=2540&model=AXP-9051-IoT#expansion1

xpac_iot_wes7_sdk_demo.zip

# Visual C++ Demo Programs for PAC Standard APIs

The PAC SDK includes the following demo programs that demonstrate the use of the PAC Standard APIs in a Visual C++ language environment. The following demo programs can be found by downloading the latest version from ICP DAS web site.

For Visual C++ applications, these demo programs can be obtained from:

https://www.icpdas.com/en/download/show.php?num=2540&model=AXP-9051-IoT#expansion1

xpac_iot_wes7_sdk_demo.zip

| Folder | Demo | Explanation |
|---|---|---|
| diagnostic | diagnostic | Retrieves information about the slot count and the module inserted in the backplane. |
| dip | dip | Retrieves information about the status of the DIP switch. |
| getdeviceinformation | getdeviceinformation | Retrieves information about the OS version, the CPU version and the SDK version, etc. |
| GetRotaryID | GetRotaryID | Retrieves information about the status of the rotary switch. |
| Memory | readmemory | Shows how to read date values from EEPROM. |
| | writememory | Shows how to write date values to EEPROM. |
| uart_sendcmd | uart_sendcmd | Shows how to read the name of local I/O modules via UART |
| WatchDog | WatchDog | Displays information about how to operate the watchdog |



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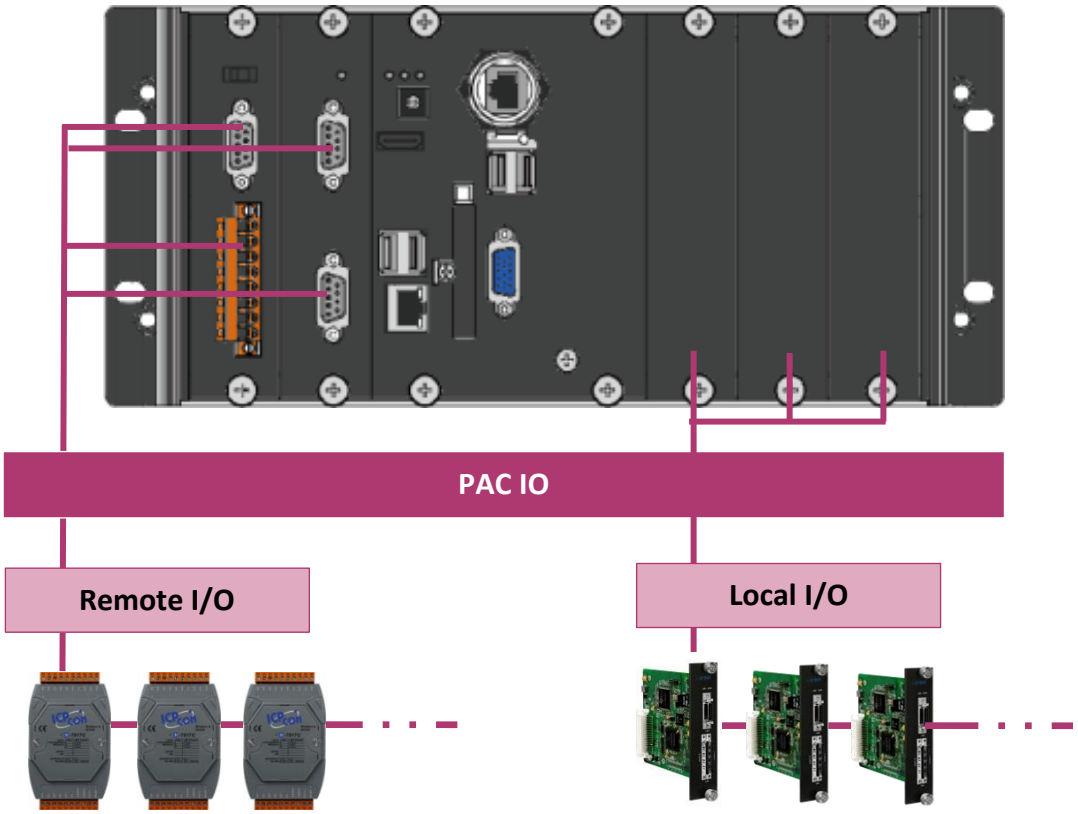
## 7.2. PAC Local IO APIs

The diagram below shows the types of the PAC IO APIs provided in the PACSDK or the specified SDK.

For more information about the APIs and demo programs provided by the expansion I/O modules, please refer to chapter 6. I/O Modules and SDK Selection




## PAC Standard API Manual (EN)

https://www.icpdas.com/en/download/show.php?num=2527

## e-9K API - UniDAQ DLL User Manual

https://www.icpdas.com/en/download/show.php?num=1010



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# VB.NET Demo Programs for PAC Local IO APIs

The PAC SDK includes the following demo programs that demonstrate the use of the PAC IO APIs in a VB.NET language environment. The following demo programs can be found by downloading the latest version from ICP DAS web site.

For VB.NET applications, these demo programs can be obtained from:

https://www.icpdas.com/en/download/show.php?num=2540&model=AXP-9051-IoT#expansion1

xpac_iot_wes7_sdk_demo.zip

# C# Demo Programs for PAC Local IO APIs

The PAC SDK includes the following demo programs that demonstrate the use of the PAC IO APIs in a C# language environment. The following demo programs can be found by downloading the latest version from ICP DAS web site.

For C# applications, these demo programs can be obtained from:

https://www.icpdas.com/en/download/show.php?num=2540&model=AXP-9051-IoT#expansion1

xpac_iot_wes7_sdk_demo.zip

# Visual C++ Demo Programs for PAC Local IO APIs

The PAC SDK includes the following demo programs that demonstrate the use of the PAC IO APIs in a Visual C++ language environment. The following demo programs can be found by downloading the latest version from ICP DAS web site.

For Visual C++ applications, these demo programs can be obtained from:

https://www.icpdas.com/en/download/show.php?num=2540&model=AXP-9051-IoT#expansion1

xpac_iot_wes7_sdk_demo.zip



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| Folder | Demo | Explanation |
|---|---|---|
| Local | 87K_ai | https://www.icpdas.com/en/download/show.php?num=2775&model=I-9014#aio<br><br>**I-97K (PAC I/O) User Manual** |
| | 87K_ao | |
| | 87k_ao_poweron_safe | |
| | 87k_basic | |
| | 87k_count | |
| | 87k_di(mf) | |
| | 87k_di_cnt(mf) | |
| | 87k_di_latch | |
| | 87k_dio(mf) | |
| | 87k_dio_latch | |
| | 87k_do(mf) | |
| | 87k_do_poweron_safe(mf) | |
| | 87k_pwm | |
| | 8k_87k_di(mf) | |
| | 8k_87k_dio(mf) | |
| | 8k_87k_do(mf) | |
| | 8k_di | https://www.icpdas.com/en/download/show.php?num=2775&model=I-9014#aio<br><br>**I-9K (PAC I/O) User Manual** |
| | 8k_dio | |
| | 8k_do | |
| | pac_i8014w_demo | https://www.icpdas.com/en/download/show.php?num=2775&model=I-9014#aio<br>https://www.icpdas.com/en/download/show.php?num=2775&model=I-9014#dio<br>https://www.icpdas.com/en/download/show.php?num=2775&model=I-9014#motion |
| | pac_i8017hwdemo | |
| | pac_i8024wdemo | |
| | pac_i8026w_demo | |
| | pac_i8084wdemo | |
| | pac_i8088wdemo | |
| | pac_i8093demo | |
| | pac_i8172wdemo | |



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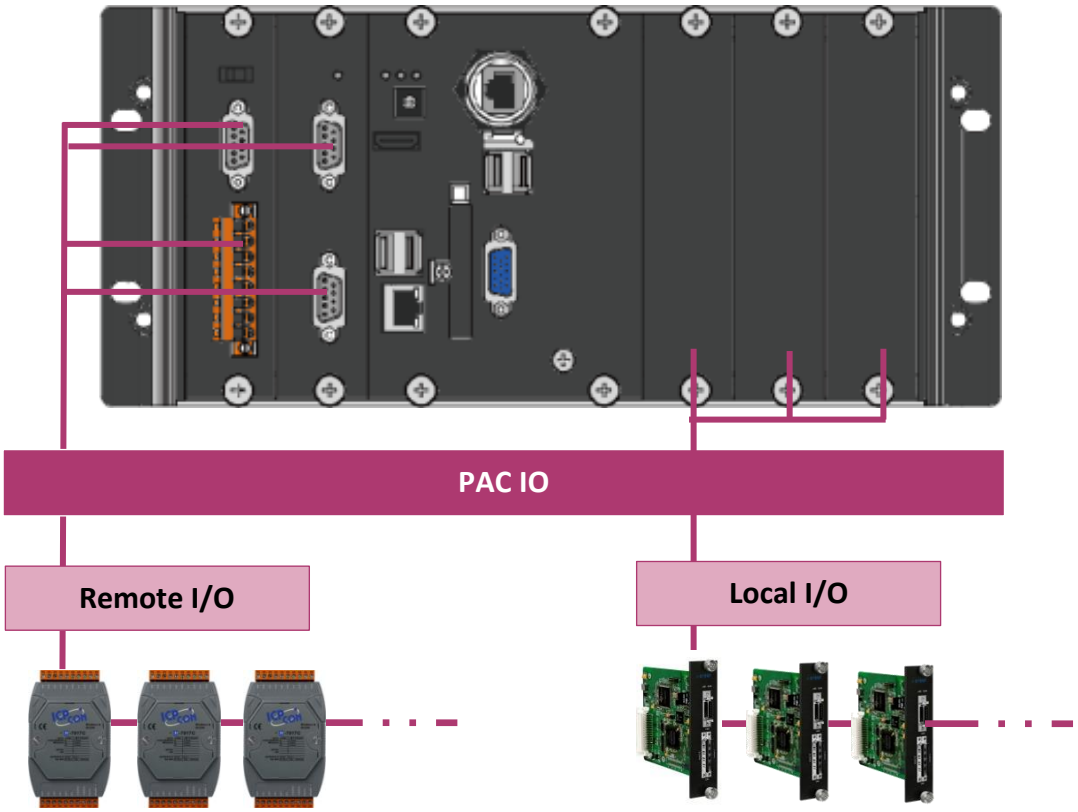
## 7.3. PAC Remote IO APIs

The diagram below shows the types of the PAC IO APIs provided in the PACSDK or the specified SDK.

For more information about the APIs and demo programs provided by the expansion I/O modules, please refer to chapter 6. I/O Modules and SDK Selection




# VB.NET Demo Programs for PAC Remote IO APIs

The PAC SDK includes the following demo programs that demonstrate the use of the PAC IO APIs in a VB.NET language environment. The following demo programs can be found by downloading the latest version from ICP DAS web site.

For VB.NET applications, these demo programs can be obtained from:

https://www.icpdas.com/en/download/show.php?num=2540&model=AXP-9051-IoT#expansion1

xpac_iot_wes7_sdk_demo.zip



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# C# Demo Programs for PAC Remote IO APIs

The PAC SDK includes the following demo programs that demonstrate the use of the PAC IO APIs in a C# language environment. The following demo programs can be found by downloading the latest version from ICP DAS web site.

For C# applications, these demo programs can be obtained from:

https://www.icpdas.com/en/download/show.php?num=2540&model=AXP-9051-IoT#expansion1
xpac_iot_wes7_sdk_demo.zip

# Visual C++ Demo Programs for PAC Remote IO APIs

The PAC SDK includes the following demo programs that demonstrate the use of the PAC IO APIs in a Visual C++ language environment. The following demo programs can be found by downloading the latest version from ICP DAS web site.

For Visual C++ applications, these demo programs can be obtained from:

https://www.icpdas.com/en/download/show.php?num=2540&model=AXP-9051-IoT#expansion1
xpac_iot_wes7_sdk_demo.zip



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| Folder | Demo | Explanation |
|---|---|---|
| Remote | 7k87k_basic | Shows how to send/receive a command/response application.<br>This demo program is used by 7K, 97K series<br>AI modules which connected through a COM port. |
| | 7k87k_ai | Shows how to read the AI values of AI module.<br>This demo program is used by 7K, 97K series<br>AI modules which connected through a COM port. |
| | 7k87k_ao | Shows how to write the AO values to AO module.<br>This demo program is used by 7K, 97K series<br>AI modules which connected through a COM port. |
| | 7k87k_di | Shows how to read the DI values of DI module.<br>This demo program is used by 7K, 97K series<br>AI modules which connected through a COM port. |
| | 7k87k_do | Shows how to write the DO values to DO module.<br>This demo program is used by 7K, 97K series<br>AI modules which connected through a COM port. |
| | 7k87k_dio | Shows how to read the DI and the DO values of the DIO module.<br>This demo program is used by 7K, 97K series<br>AI modules which connected through a COM port. |



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# 8. Restore and Recovery

This chapter provides information of the iPPC-IoT restore and recovery, and a guided tour that describes the steps needed to restore and recovery the iPPC-IoT.

The iPPC-IoT come with a rescue CF card that can be used to not only boot the iPPC-IoT when the OS fails to load, but also recover files.

The recovery file of the rescue CF card can be found separately by downloading the latest version from ICP DAS web site.

AXP-9x51-IoT:
https://www.icpdas.com/en/download/index.php?model=AXP-9051-IoT

AXP-9x91-IoT:
https://www.icpdas.com/en/download/index.php?model=AXP-9191-IoT



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# 8.1. Recovering the iPPC-IoT

The iPPC-IoT comes with a rescue CF card that can be used to restore the iPPC-IoT to factory default settings by reinstalling the iPPC-IoT OS image.

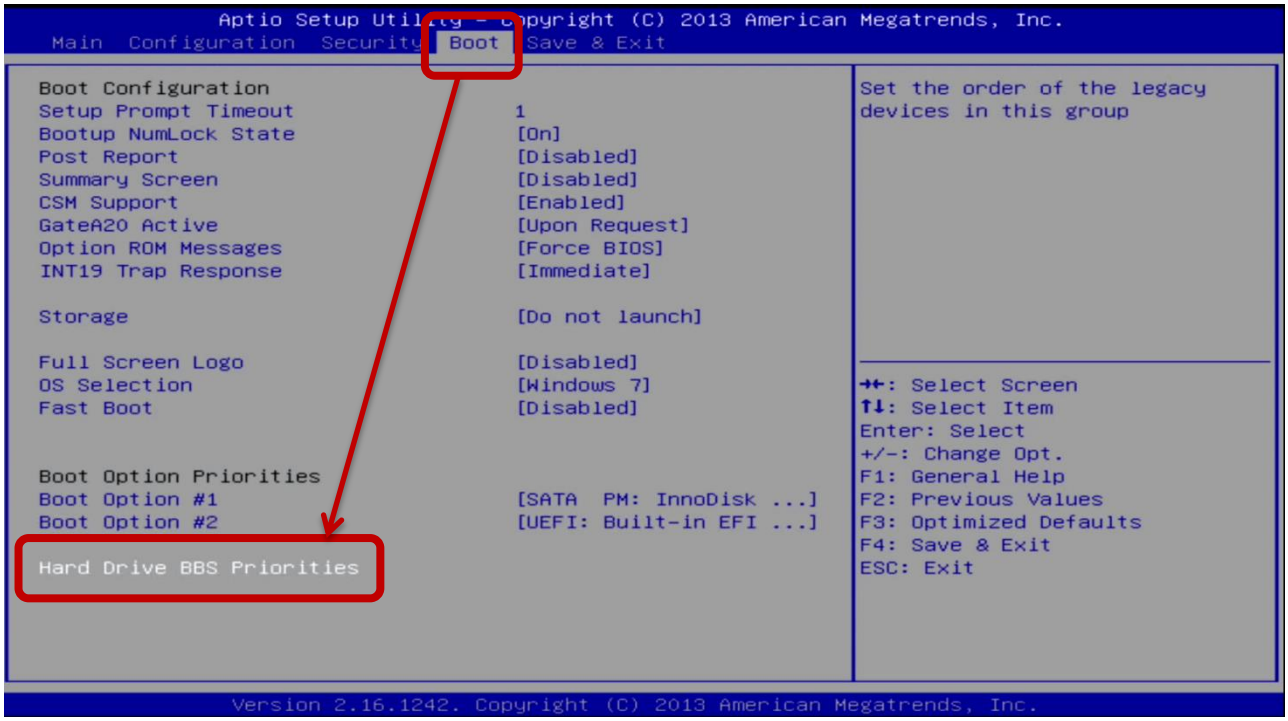
If the iPPC-IoT crashes and won't start up, you can use the rescue CF card to start up the iPPC-IoT and then fix the problem that caused the crash.

**To restore the iPPC-IoT OS**

**1. Plug the Rescue CF card into CF slot (iPPC-IoT)**

**2. Restart the iPPC-IoT, and then enter the BIOS by pressing Delete key**

**3. Press the → key to highlight the Boot tab, and then press ↓ key to select [Hard Drive BBS Priorities]**



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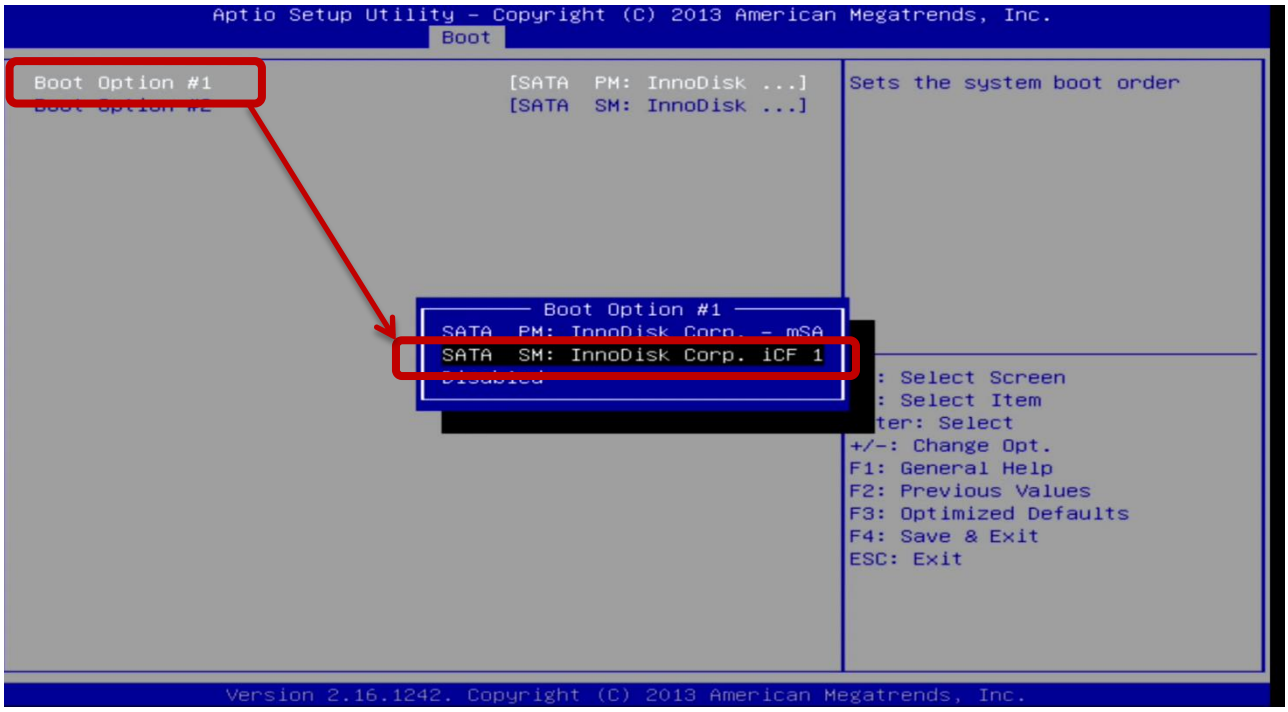
**4. Press Enter on Boot Option #1, and select [CF card name]**




**5. Press the F4 key, and then select Yes to save settings and exit the utility.**

The iPPC-IoT will restart and then enter to the iPPC-IoT PAC Recovery Utility.



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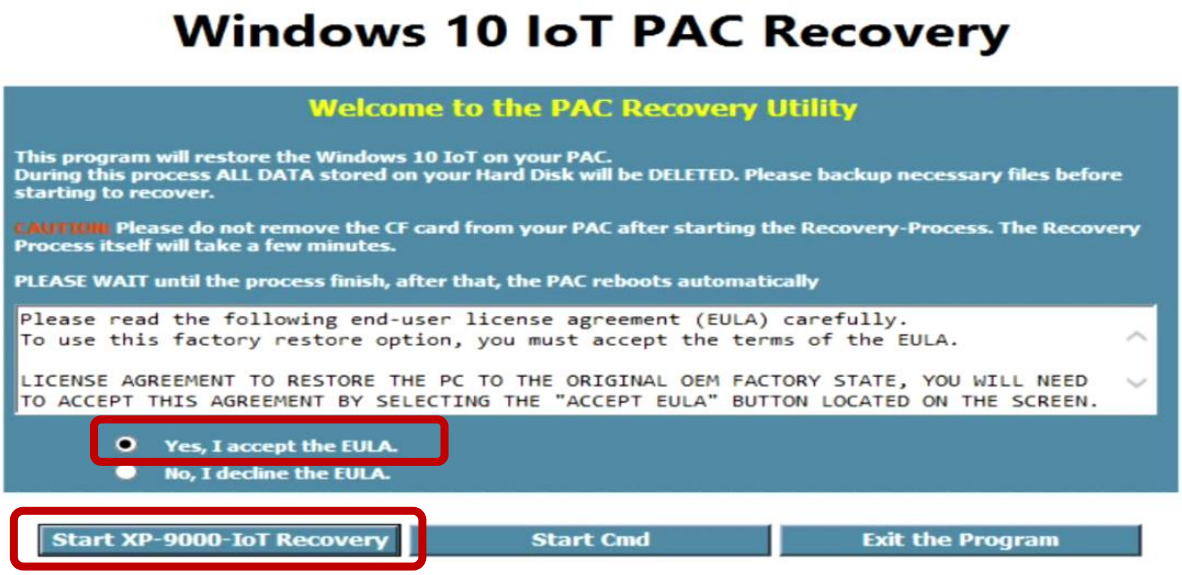
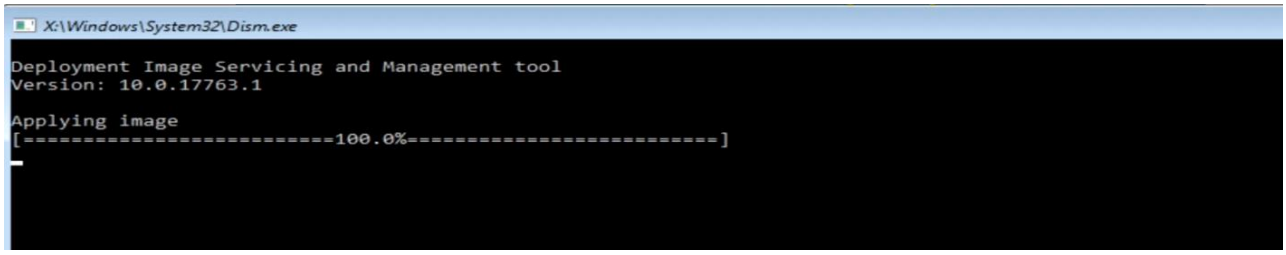
**6. Check Yes and click Start iPPC-IoT Recovery button for start the recovery process.**

The process will take a few minutes until this utility is displayed again.





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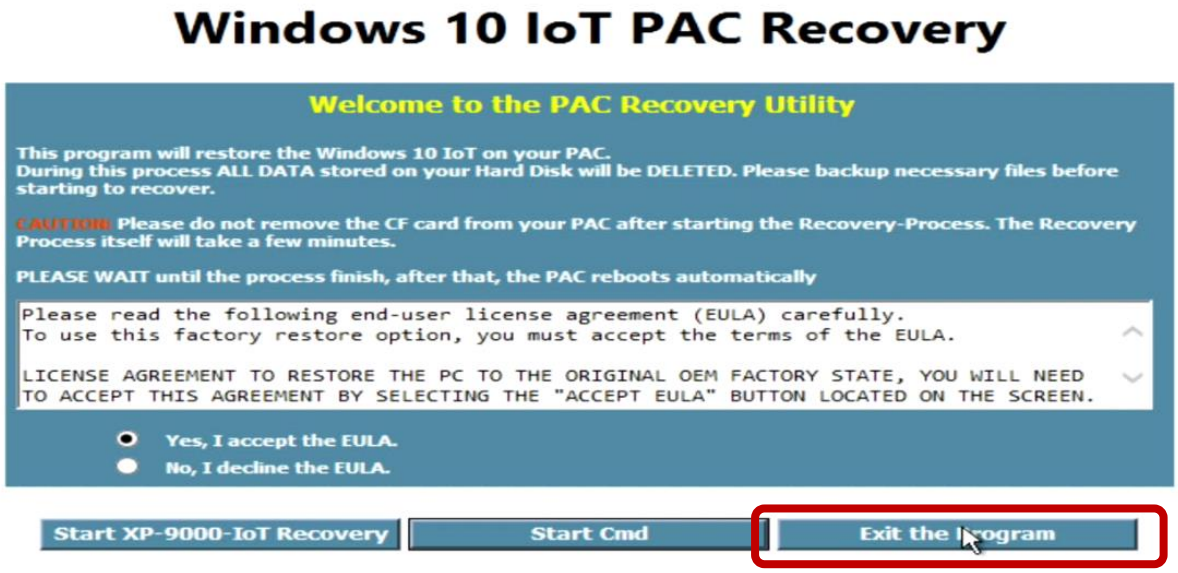
**7. Click the Exit And Restart button, and then repeat the step 2 to step 5. In step 4, the [SATA PM: InnoDisk Corp. –mSA] option need be selected for using the restored disk as a boot drive. After completing the configuration process, restart the iPPC-IoT.**



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# 8.2. Restoring the Rescue CF Card

The rescue CF card is rescue equipment that allows you to perform some maintenance tasks on your system in case of failure.
Once the rescue CF card are partitioned or formatted, you must restore the rescue CF card.

**Requirements**

For restoring the Rescue CF card, you should prepare Clonezilla, which you could obtain by contacting Symantec (http://www.symantec.com)

In this article, we will use Symantec Norton Ghost32 V.11 (The Symantec Norton Ghost V.11 or above version are recommend) to restore the rescue CF card.

**To restore the rescue CF card**

**1. Get the rescue ghost file, rescue.gho**

The rescue.gho file can be found by downloading the latest version from ICP DAS web site.
https://www.icpdas.com/en/download/index.php?model=iPPC-6801-IoT



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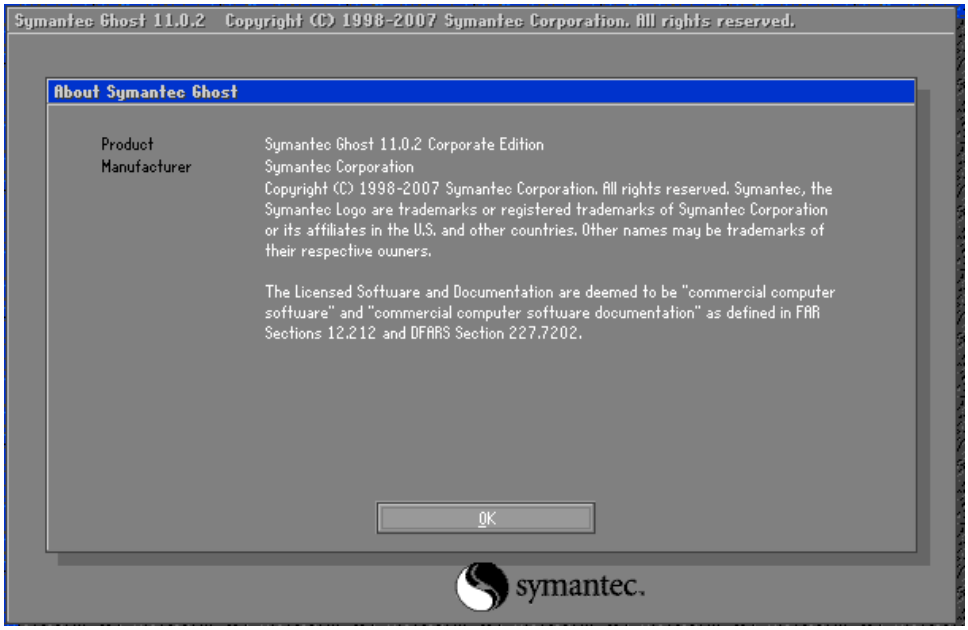
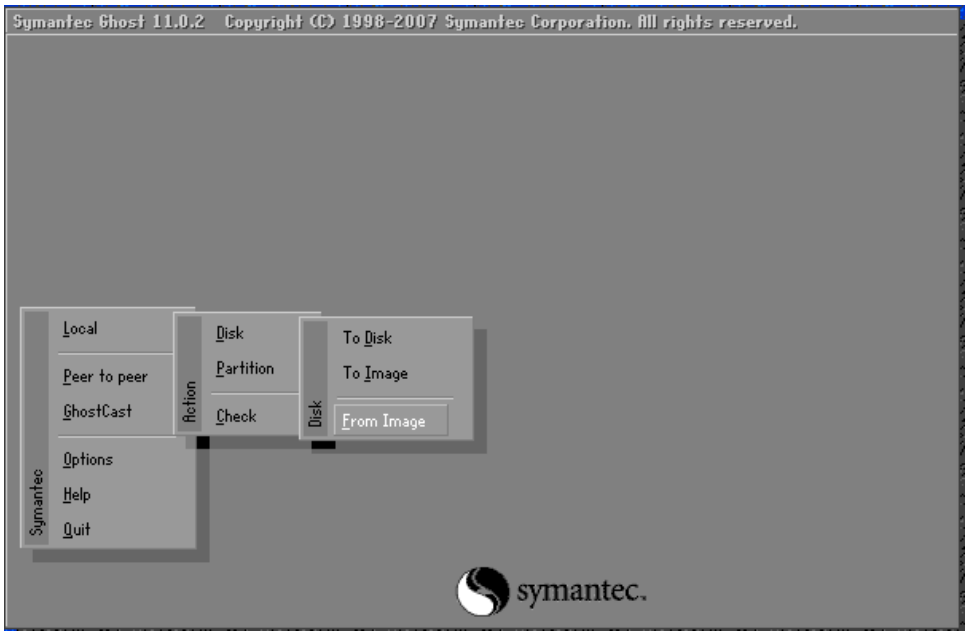
## 2. Run the Symantec Ghost32, and then click OK button




## 3. Click Function Menu, point to Local, point to Disk, and then click From Image



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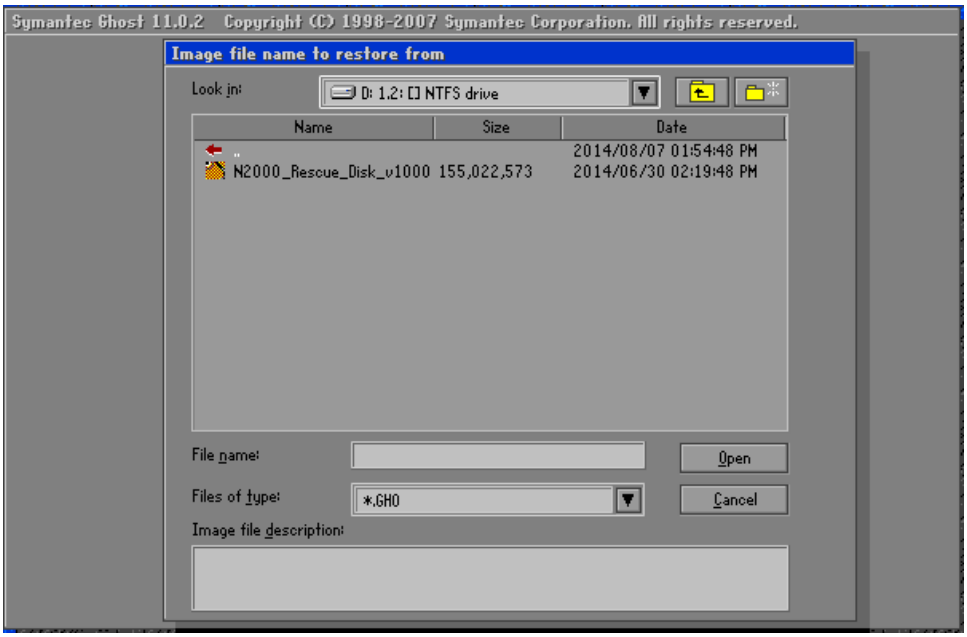
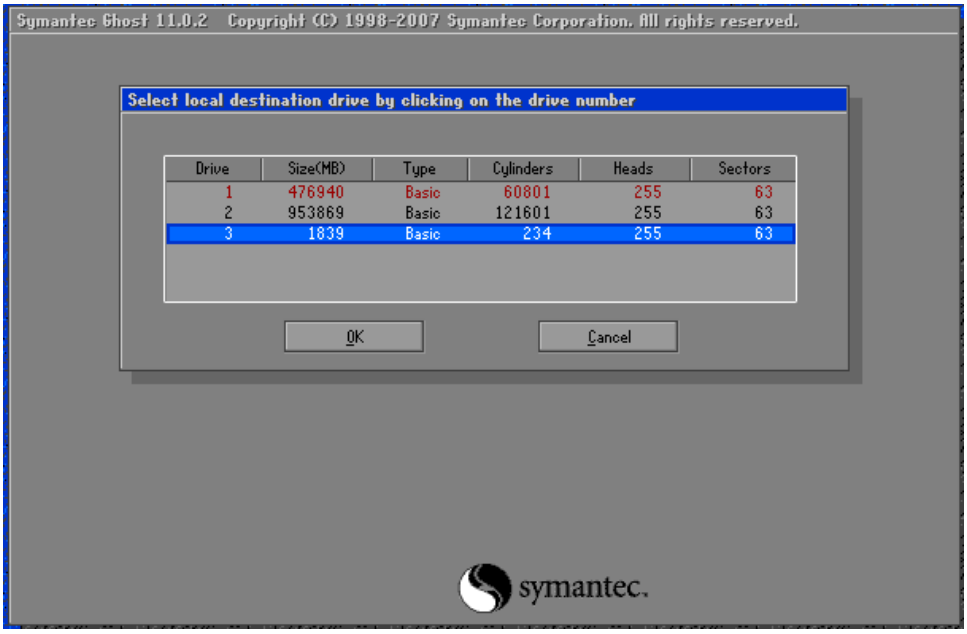
## 4. Select the rescue ghost file, rescue.gho, that you saved and then click Open




## 5. Select the destination to CF card and click then OK



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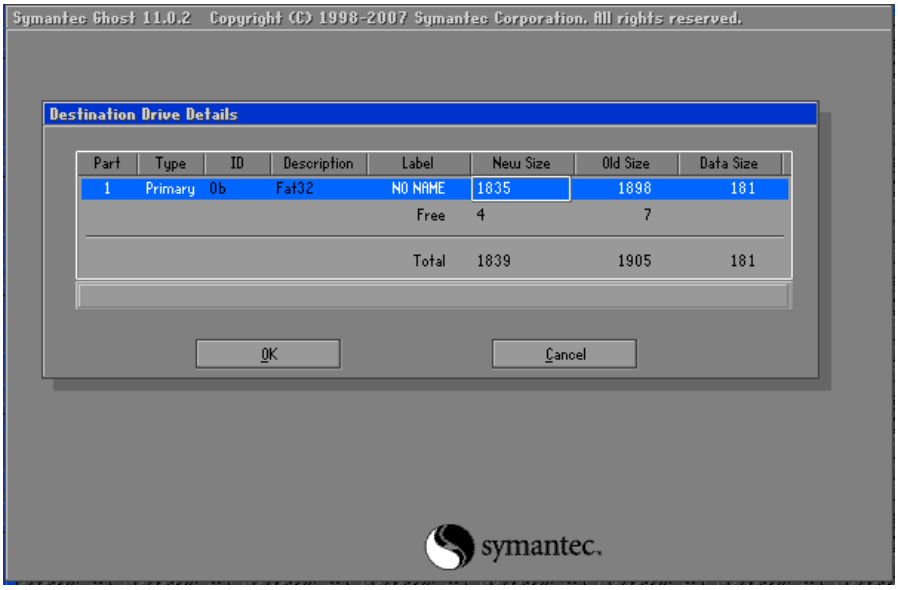
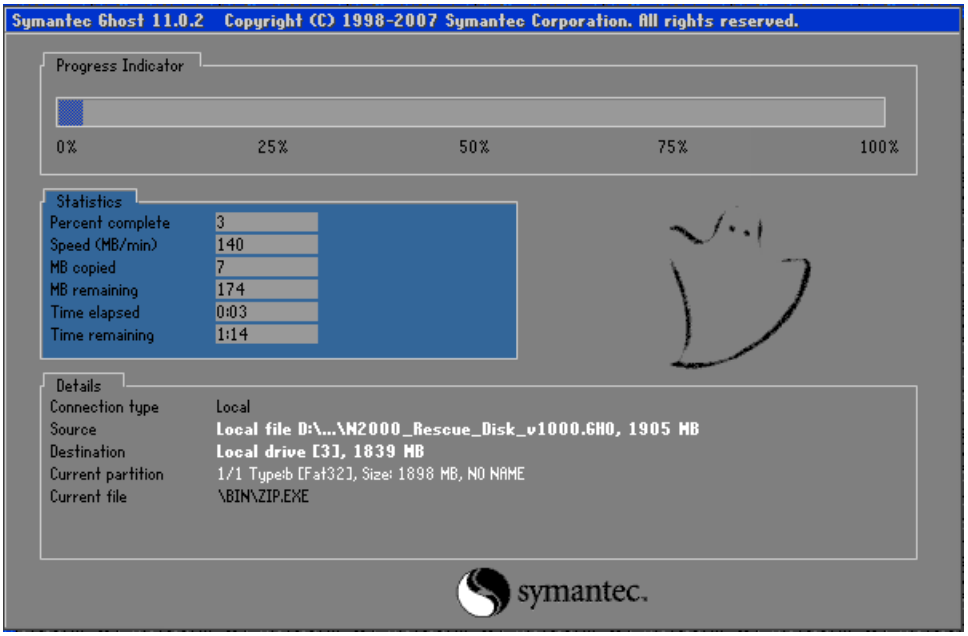
## 6. Recovery the rescue ghost file, rescue.gho, into CF card and then click OK




## 7. The rescue CF card has been done



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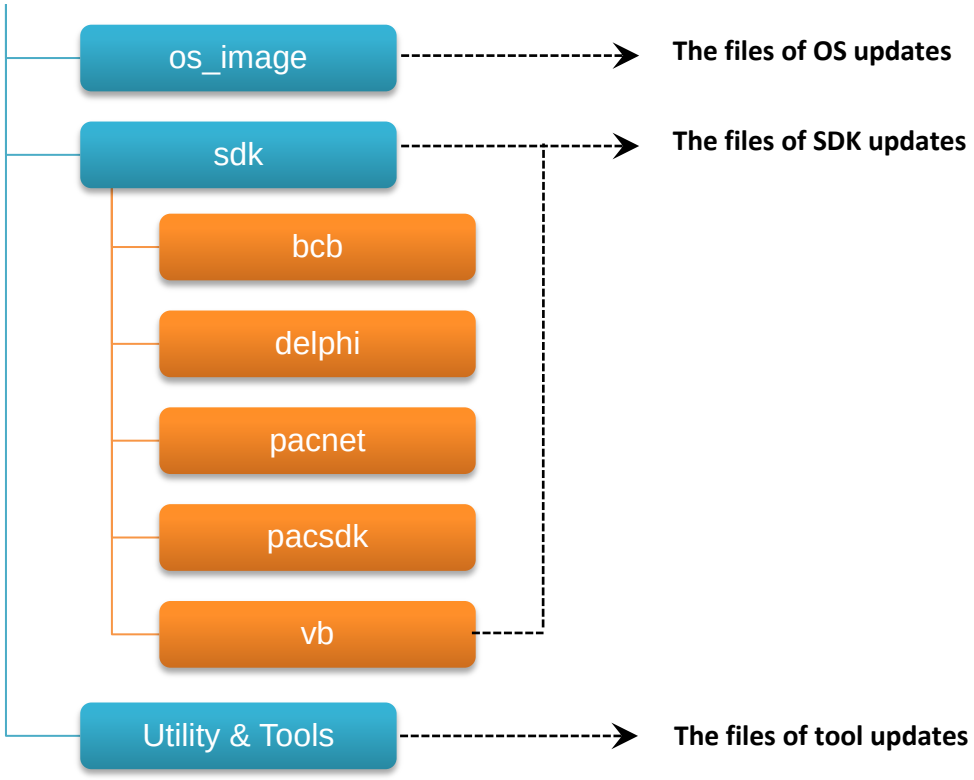
# 9. iPPC-IoT Updates

This chapter provides information of the iPPC-IoT OS, SDKs and tools, and a guided tour that demonstrates the steps needed to update the iPPC-IoT OS, SDKs and tools.

ICP DAS will continue to add additional features to iPPC-IoT OS, SDKs and tools in the future, so we advise you to periodically check the ICP DAS web site for the latest updates.

The files of OS updates, SDK updates and tool updates can be found on the CD that was provided with the package or by downloading the latest version from ICP DAS web site.

https://www.icpdas.com/en/download/index.php?model=iPPC-6801-IoT



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## 9.1. Updating the iPPC-IoT OS

ICP DAS will continue to add additional features and improve performances to iPPC-IoT OS in the future, so we advise you to periodically check the ICP DAS web site for the latest updates.

The information can be obtained from:
https://www.icpdas.com/en/download/index.php?model=iPPC-6801-IoT

Free feel to contact us to get the latest version of OS image.
E-mail: service@icpdas.com



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# 9.2. Updating the iPPC-IoT SDK

ICP DAS will continue to include more functionality and API calls to iPPC-IoT SDK in the future, so we advise you to periodically check the ICP DAS web site for the latest updates.

**To update the iPPC-IoT SDK**

1. **Run the PAC Utility, and then disable the UWF overlay**

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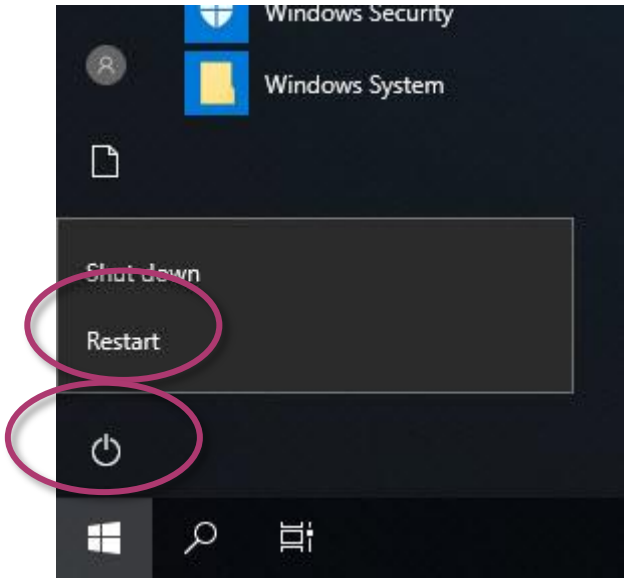
2. **Click the Start button , click the power button , and then click Restart for changes to take effect.**




3. **Download the latest version of the pacsdk.dll file**

The latest version of the pacsdk.dll file can be obtained from ICP DAS web site.
https://www.icpdas.com/en/download/index.php?model=iPPC-6801-IoT

Copy the downloaded file, pacsdk.dll into the C:\Windows\System32\ folder.
This will overwrite the existing pacsdk.dll file



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# 9.3. Updating the iPPC-IoT Tools

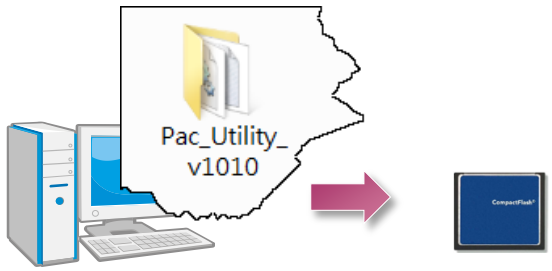
ICP DAS will continue to add more functionality and support to the PAC utility in the future, so we advise you to periodically check the ICP DAS web site for the latest updates.

**To update the PAC Utility**

1. **To update the PAC Utility Download the latest version of the PAC utility file in PC or a laptop**

   The latest version of the PAC utility file can be obtained from ICP DAS web site.
   https://www.icpdas.com/en/download/index.php?model=iPPC-6801-IoT

2. **Extract the downloaded file, and then copy the file folder to the CF card**



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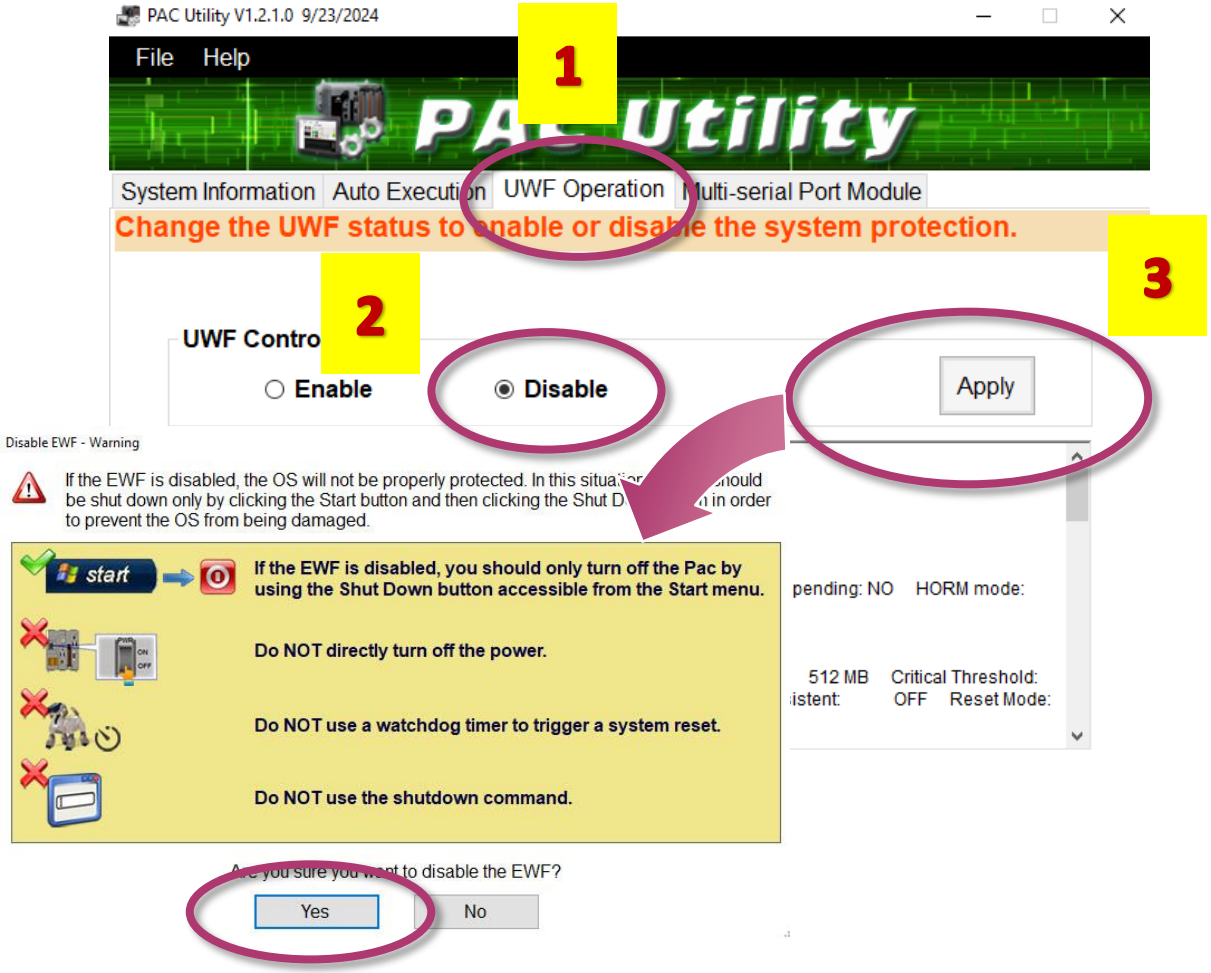
### 3. Plug the Rescue CF card into CF socket of iPPC-IoT

### 4. Run the PAC Utility, and then disable the UWF overlay



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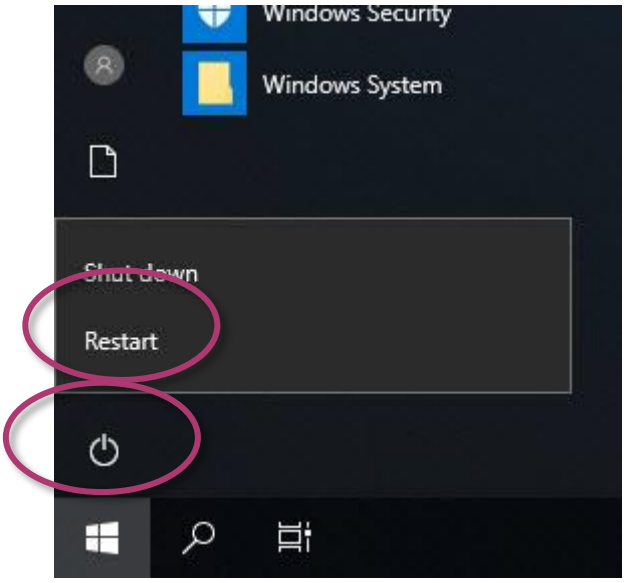
5. **Click the Start button , click the power button , and then click Restart for changes to take effect.**




6. **Copy the file folder into C:\icpdas\, and then delete the older, existing file folder**



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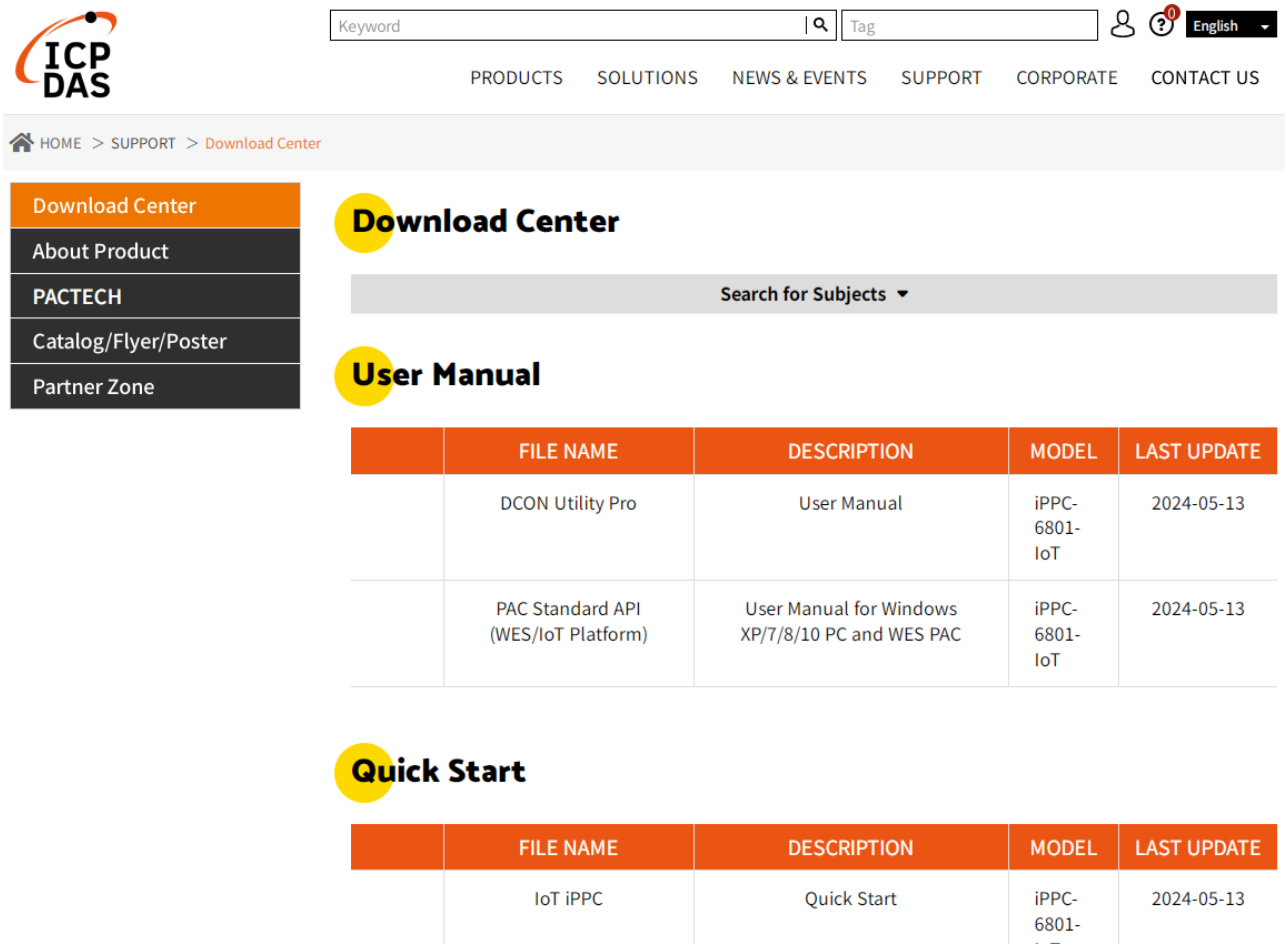
# 10. iPPC-IoT Download Center

This chapter provides a brief introduction of the iPPC-IoT download center.

iPPC-IoT has a download center where you can access the latest version of the software, tools, demo programs, and related information.

The iPPC-IoT Download Center can be found at:
https://www.icpdas.com/en/download/index.php?model=iPPC-6801-IoT



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# Appendix

## A. I-8K Modules and I-87K Modules

This chapter provides a brief overview of the different between the I-8K series modules and I-87K series modules.

I-8K and I-87K modules provide the option to expand the local I/O to expansion I/O slots and the bus type for the modules can be either parallel (high profile I-8K series) or serial (high profile I-87K series).

The differences between the I-8K series modules and I-87K series modules are as follows

| Item | I-8K Series | I-87K Series |
|---|---|---|
| Microprocessor | No | Yes (8051) |
| Communication Interface | Parallel Bus | Serial Bus |
| Protocol | No | DCON |
| Communication Speed | Fast | Slow |
| DI with latched function | No | Yes |
| DI with counter input | No | Yes (100 Hz) |
| Power on value | No | Y |
| Safe Value | No | Y |
| Programmable slew-rate for AO module | No | Y |



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# B. How to change the BIOS CMOS battery

The BIOS is retained by a Li-ion battery, which can supply continuous power for 10 years. The battery design has the added function of preventing data from being lost while replacing the battery. The following figures show the location of the battery installed in the CPU board of iPPC-IoT.

**Checking the current battery power**

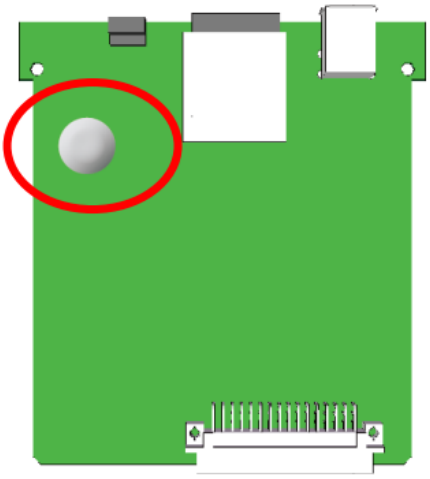
1. Run demo 'deviceinformation' to check whether the battery power is low. When the power of the battery is low, it's recommended that the battery is replaced immediately, otherwise the RTC time will be reset.

(Please go to https://www.icpdas.com/en/download/show.php?num=2540 to download related demos)

2. When programming this, call the pac_GetBatteryLevel() API function in the PACSDK.dll to check whether the battery power is low. When the power of the battery is low, it's recommended that the battery is replaced immediately, otherwise the RTC time will be reset.

**Replacing the battery**

1. Disconnect the power of the iPPC-IoT.
2. Locate your CMOS battery in the CPU board



3. Removing the battery

   Use your fingers to move the clip up and the other hand to pull the battery out.

   Do not use any kind of metal object to pry the battery.

   (Removing the CMOS battery erases the BIOS settings)



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4. Obtain battery information

   Replace the battery with the exact same type of coin cell battery.

   (Use BR2032 coin cell battery)

5. Insert the new battery

   Ensure to replace with a brand new battery. Do not install a used battery.

## Ordering information

Battery type: BR2032

For more detailed information, contact your local sales office or distributor.



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# C. Revision History

This chapter provides revision history information to this document.

The table below shows the revision history.

| Revision | Date | Created By | Description |
|---|---|---|---|
| V1.0.0 | May 2024 | Jeffery | Initial issue |
| V1.0.1 | June 2024 | Jeffery | Edit the CPU and SDRAM of iPPC-4901-IoT |
| V1.0.2 | February 2025 | Jeffery | Modified section 2.2, 3.3, 4.1.2, 9.2 and 9.3<br>Move Appendix B (Revision History) to Appendix C and add Appendix B (How to change the BIOS CMOS battery) |



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