PAC SDK

Standard API User Manual

(Windows Based (VC & .NET))

Version 1.0.2, November 2013

Service and usage information for

XPAC-8000 XPAC-8000-Atom PC

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Edited by Amber

Contact US

If you have any problem, please feel free to contact us.
You can count on us for quick response.

Email: service@icpdas.com

Contents

About this Guide

This manual is intended for software developers who want to integrate XPAC/PC functionality into their applications.

What Models and PC OS are covered in this Manual?

The following PAC models and PC OS are covered in this manual:

XPAC family for x86 platform series

XP-8000 series	
XP-8041	Windows Embedded Standard 2009 XPAC with 0 I/O slot
XP-8341	Windows Embedded Standard 2009 XPAC with 3 I/O slots
XP-8741	Windows Embedded Standard 2009 XPAC with 7 I/O slots
XP-8000-Atom series	
XP-8141-Atom	Windows Embedded Standard 2009 XPAC with 1 I/O slot
XP-8341-Atom	Windows Embedded Standard 2009 XPAC with 3 I/O slots
XP-8741-Atom	Windows Embedded Standard 2009 XPAC with 7 I/O slots

Supported Windows OS for PC

Operation System
Windows XP
Windows 7
Windows 8

Related Information

For additional information about your PAC that can be obtained from CD or by downloading the latest version from ICP DAS web site.

XPAC family for x86 series

XP-8000 Series:
CD:\XP-8000\Document\
http://www.icpdas.com/products/PAC/xpac/download/xpac_wes/download_documents.htm
XP-8000-Atom Series:
CD:\XPAC-ATOM\Document\
http://www.icpdas.com//products/PAC/xpac/download/atom_wes/download_documents.htm

How to contact us?

For support for this or any ICP DAS product, you can contact ICP DAS Customer Support in one of the following ways:

- Visit the ICP DAS Storage Manager technical support Web site at:
  http://www.icpdas.com/faq/faq.htm
- Submit a problem management record (PMR) electronically from our Web site at:
  http://www.icpdas.com/sevices/contact_customerservice.htm
- Send e-mail to:
  service@icpdas.com

Revision History

The table below shows the revision history.

Revision	Date	Description
1.0.2	November 2013	Initial issue

1. Getting Started

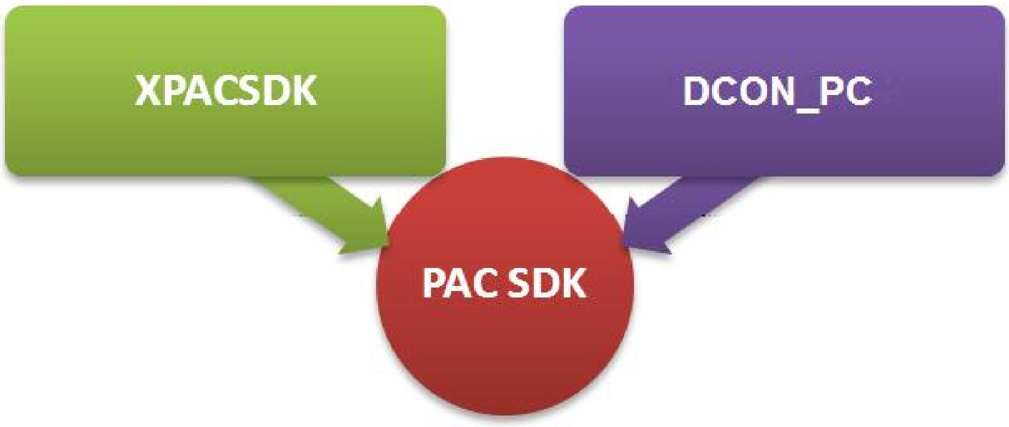
This chapter provides a guided tour that describes the steps needed to know, download, copy and configure of the basic procedures for user working with the PACSDK for the first time.

1.1. Introducing the PACSDK

PACSDK are software development kits that contain header files, libraries, documentation and tools required to develop applications for XPAC series and PC.

PACSDK has replaced XPACSDK and DCON_PC

ICP DAS has released a new SDK (PACSDK), which merged and replaced the XPACSDK and DCON_PC.



The XPACSDK and DCON_PC have been unified and renamed PACSDK. The new PACSDK.dll provides support x86 platforms for the XPAC series and PC.

PACSDK.dll (x86) is linked to C programs for the XPAC series to replace the previous SDK, XPACSDK.dll, and for the PC to replace the previous SDK, DCON_PC.dll.

The PACNET.dll is used for .Net CF programs (C#, VB) for both the XPAC series and PC to replace the previous SDKs (XPacNet.dll and DCON_PC_DotNet.dll).

New/Previous SDK files comparison

Items	XPACSDK Library	DCON_PC Library	PACSDKLibrary
Development header files	XPacSDK.h	DCON_Fun.h	PACSDK.h
Development library files	XPacSDK.lib	DCON_PC.lib	PACSDK.lib
Target device Native DLL files	XPacSDK.dll	DCON_PC.dll	PACSDK.dll
Target device .NET CF DLL files	XpacNet.dll	DCON_PC_DotNet.dll	PACNET.dll

Benefits of the unified SDK include:

Easily migrates custom PC programs to the XPAC series

Easily migrates custom XPAC programs to the PC

A suite of PACSDK APIs is almost same as the previous SDK, (XPACSDK.dll) but there are some modifications and updates. Refer to the **Appendix C** for more details.

1.2. Copying the PACSDK

Users just need through a simple action that copies the PACSDK.dll to a specified folder, and then they can use the PACSDK library to develop the applications for the XPAC series and PC.

To download and copy the new PACSDK to a specified folder

1. Get the latest version of PACSDK library.

   The latest version of the installation package from FTP site listed as following FTP:

   http://ftp.icpdas.com/pub/cd/xp-8000/sdk/pacsdk/

   http://ftp.icpdas.com/pub/cd/xpac-atom/sdk/pacsdk/

2. Copy the PACSDK.dll to the Windows system directory and copy the corresponding PACSDK library to the application folder for reference.

   The default location of Windows system directory for XPAC and PC is listed as below:

XPAC series	C:\WINDOWS\
PC	On 32-bit Windows the path is C:\WINDOWS\System32\
	On 64-bit Windows the path is C:\WINDOWS\SysWow64\

To Update the XPACSDK to PACSDK

In XPAC series：

Please download and install the software **XP-8000_Toolkit_Setup.exe** to update.

The latest version of the installation package from FTP site listed as following FTP:

http://ftp.icpdas.com/pub/cd/xp-8000/sdk/install/

http://ftp.icpdas.com/pub/cd/xpac-atom/sdk/install/

In PC：

Directly download and copy the new PACSDK library to replace XPacSDK library on users' program.

1.3. Setting up the Development Environment

Both the XPAC series an PC support Visual Studio 2005/2008/2010 and Visual Studio 6.0.

1.3.1. C/C++ based on Visual Studio

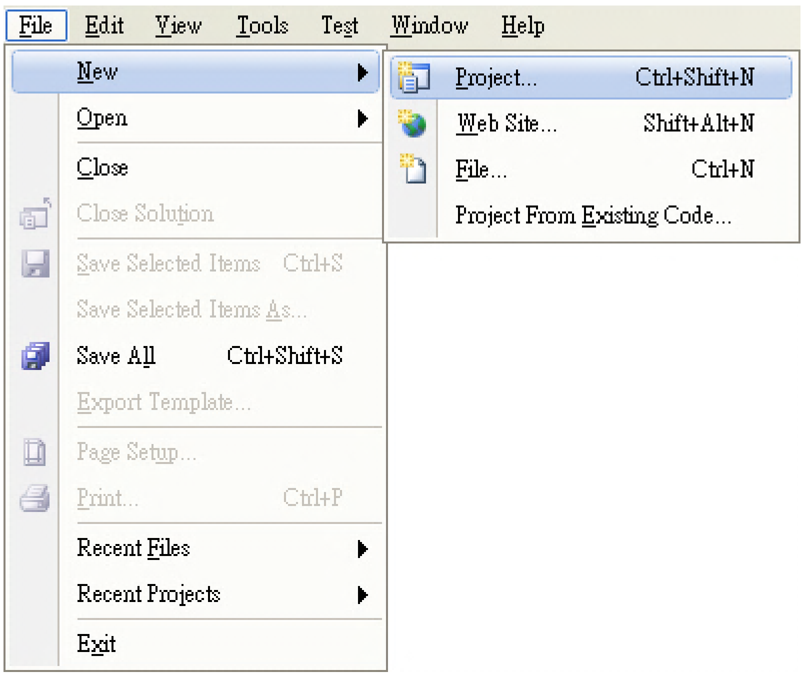
Required header and library files

The following list lists the libraries, header files or DLL files you will need to include to develop a XPAC/PC application or plug-in.

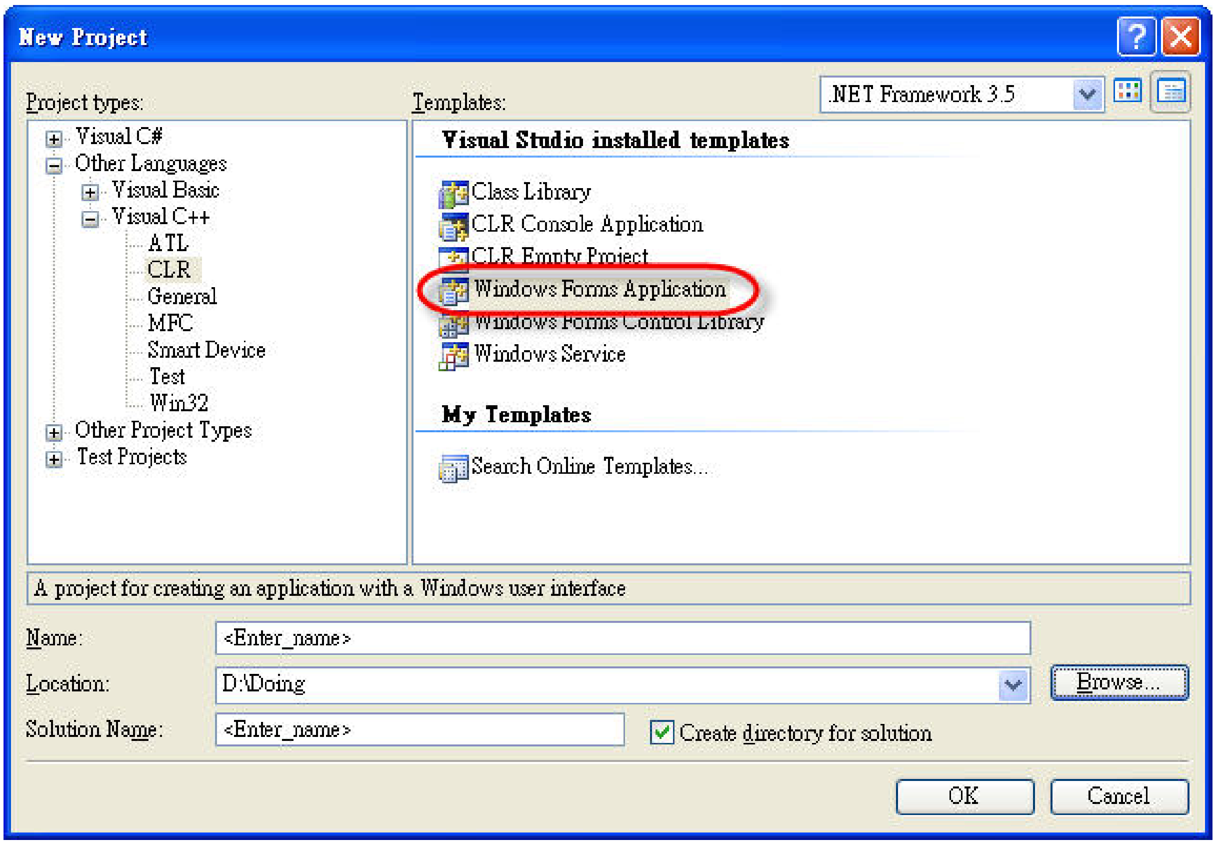
- PACSDK.h
- PACSDK.lib

How to create a program with new SDK using Visual Studio 2005/2008 (VS2005/VS2008)

Step 1: Create a new project by using Visual Studio 2005/2008



Step 2: Select "Windows Forms Application"



A project for creating an application with a Windows user interface

Name: <Enter_name>

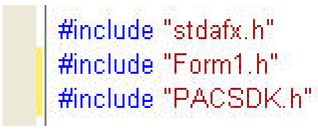
Location: D:\Doing

Solution Name: <Enter_name>

Create directory for solution: ✓

Step 3: Copy PACSDK.h to the application folder and include it

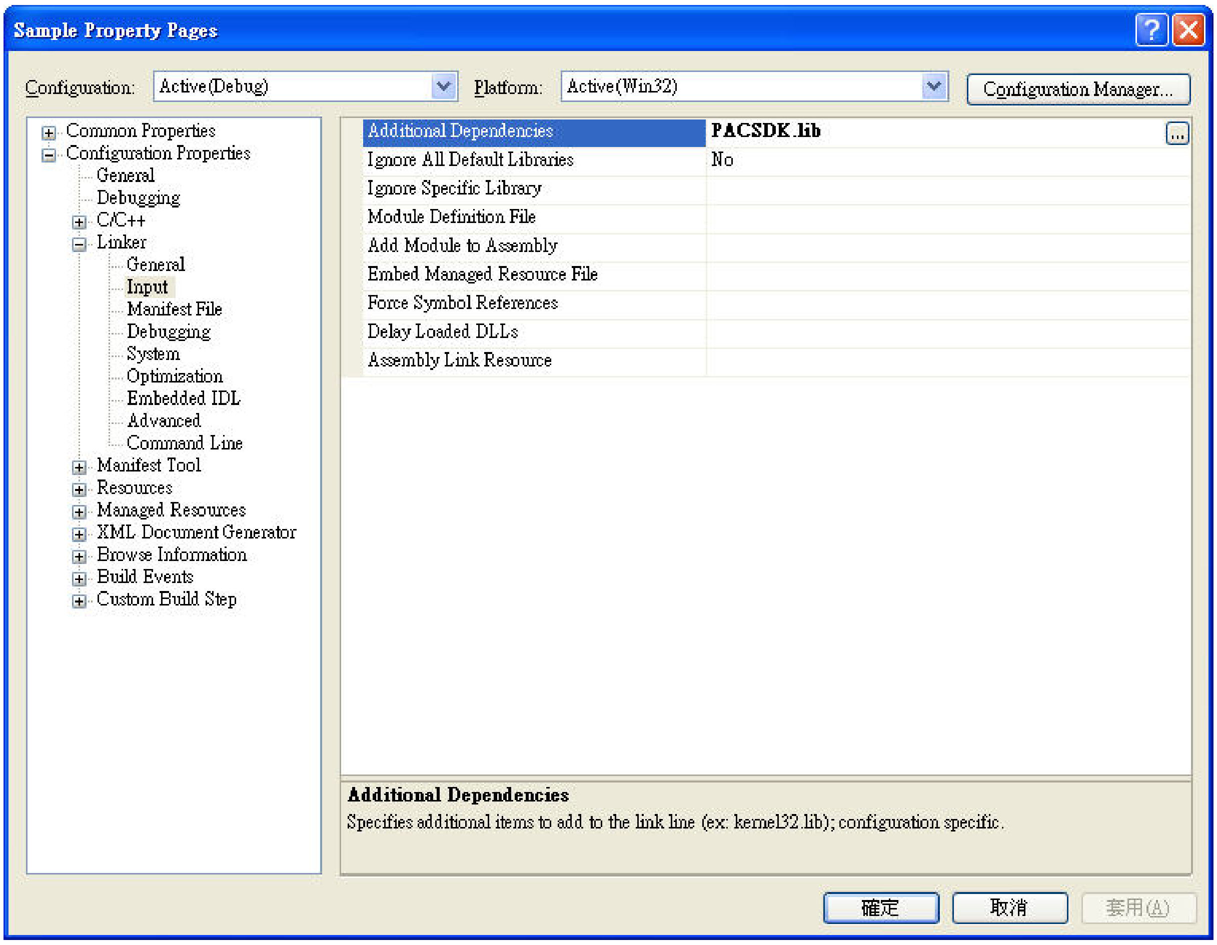
1. Copy **PACSDK.h** to the application folder.
2. Add **#include "PACSDK.h"**.



```
#include "stdafx.h"
#include "Form1.h"
#include "PACSDK.h"
```

Step 4: Copy PACSDK.lib to the application folder and Include it

1. Copy **PACSDK.lib** to the application folder.
2. Open the project's **Property Page** dialog box.
3. Click the **Linker** folder.
4. Click the **Input** property page.
5. In the right pane, type the **PACSDK.lib** in the Additional Dependencies item.



Additional Dependencies	PACSDK.lib
Ignore All Default Libraries	No
Ignore Specific Library	
Module Definition File	
Add Module to Assembly	
Embed Managed Resource File	
Force Symbol References	
Delay Loaded DLLs	
Assembly Link Resource	

Additional Dependencies
Specifies additional items to add to the link line (ex: kernel32.lib); configuration specific.

1.3.2. Visual C#

Required library files

The following DLL files are needed to include for developing a XPAC/PC application or plug-in.

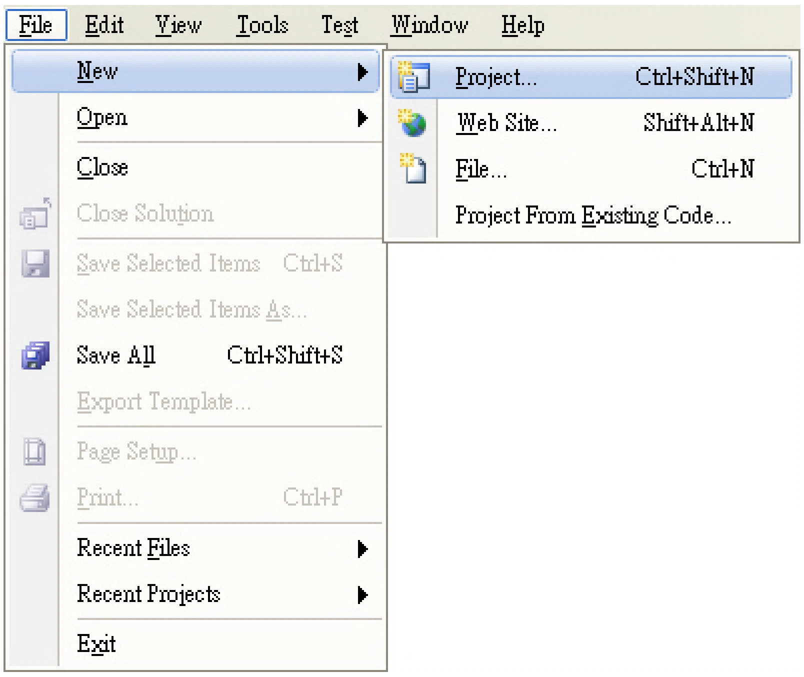
- PACSDK.dll

How to create a program with new SDK using Visual Studio 2005/2008 (VS2005/VS2008)

1. Using Dll Import:

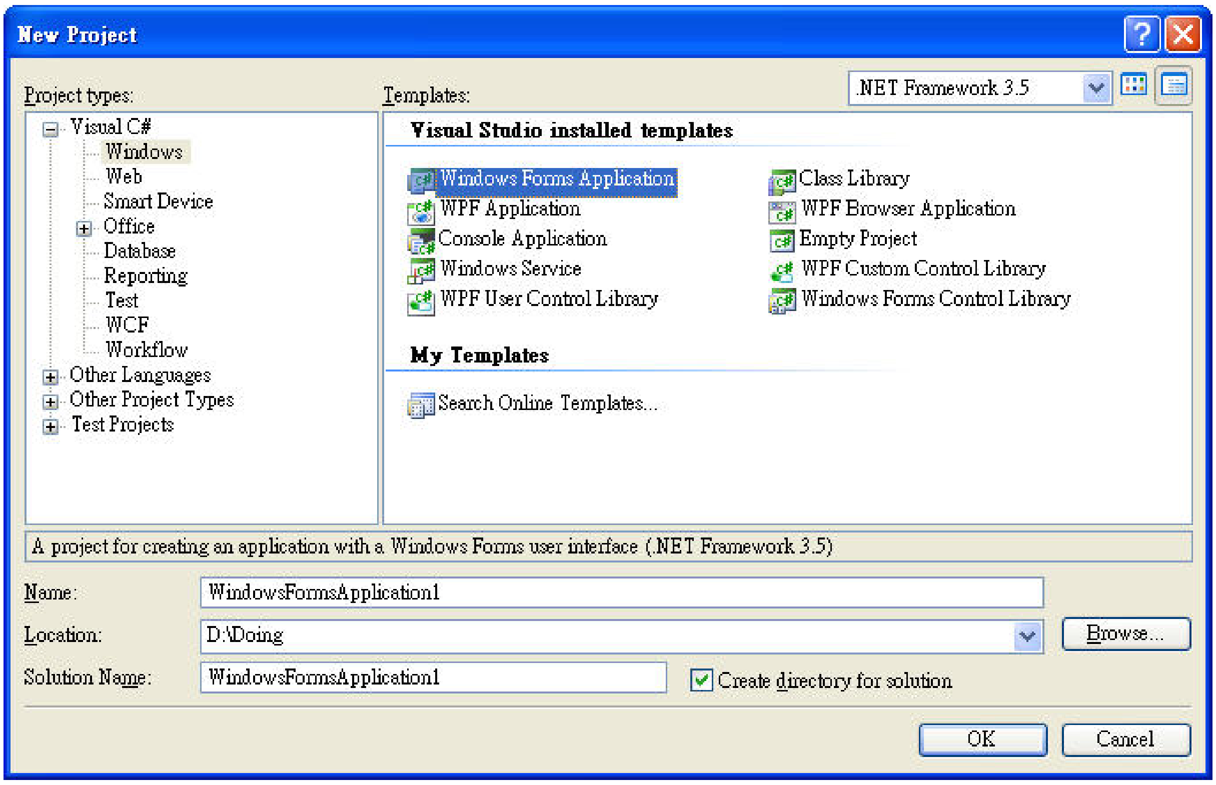
Step 1: Create a new project by using Visual Studio 2005/2008

1. Start Visual Studio .NET.
2. Click >**File** >**New** >**Project**.



Step 2: Select Windows Forms Application and name the project

1. In the **Project Type** column, choose **Visual C#** >**Windows**.
2. In the **Template** column, choose **Windows Forms Application**.
3. Name your project.
4. Click **OK** to create your new project.



A project for creating an application with a Windows Forms user interface (.NET Framework 3.5)

Name: WindowsFormsApplication1

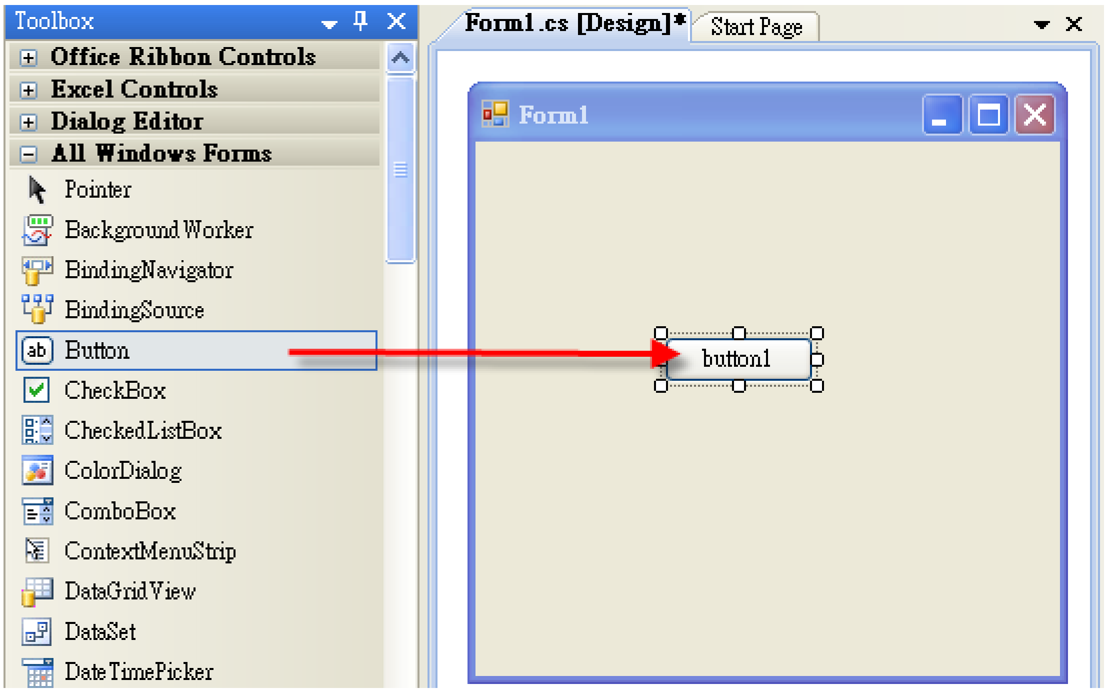
Location: D:\Doing

Solution Name: WindowsFormsApplication1

[✓] Create directory for solution

Step 3: Add a button control to the Windows form

1. Open the form.
2. In the **Toolbox**, click the **Button** control and drag it to your form.
3. Double-click the button on the form to create a **Click** event.



Step 4: In order to use "DllImport", you should add the namespace using Statement: System.Runtime.InteropServices, and then implement the function which you want to call.

Demonstrate an example of using "pac_writeDO" in .NET project.

[The function defined in PACSDK.h file]

```
PAC_API BOOL pac_WriteDO(HANDLE hPort, int slot, int iDO_TotalCh, DWORD
lDO_Value);
```

[How to use in your .NET project]

1. Added this line in your project:

```
using System.Runtime.InteropServices;
```

2. Declare this function as following:

```
[DllImport("PACSDK.dll", EntryPoint = "pac_WriteDO")]
public extern static bool pac_WriteDO(IntPtr hPort, int slot, int iDO_TotalCh,
uint lDO_Value);
```

3. Then you can use this function, pac_WriteDO, in your .NET project.

[Code Snippet]

```
using System.Windows.Forms;
using System.Runtime.InteropServices;
namespace
{
        public partial class Form1 : Form
        {
                [DllImport("PACSDK.dll", EntryPoint = "pac_WriteDO")]
                public extern static bool pac_WriteDO(IntPtr hPort, int slot, int
                iDO_TotalCh, uint lDO_Value);

                public Form1()
                {
                        InitializeComponent();
                }
                private void button1_Click(object sender, EventArgs e)
                {
                        pac_WriteDO((IntPtr)1, 1, 16, 0xff);
                }
        }
}
```

2. Using PACNET.dll:

PACNET.dll is a .net Compact framework SDK and PACNET.dll is not only used for C# program but also used for VB.net program.

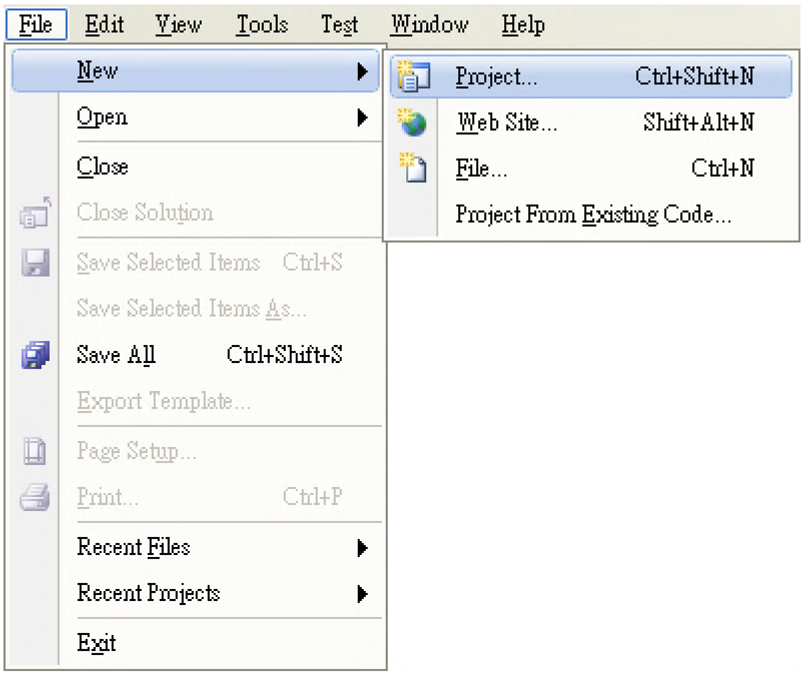
- PACNET.dll (the execution file should be put in the same directory of the PACNET.dll)

The latest version of this library is located at:

CD root\Xpac-Atom\SDK\PACSDK\Driver\DOTNET (in the companion CD)

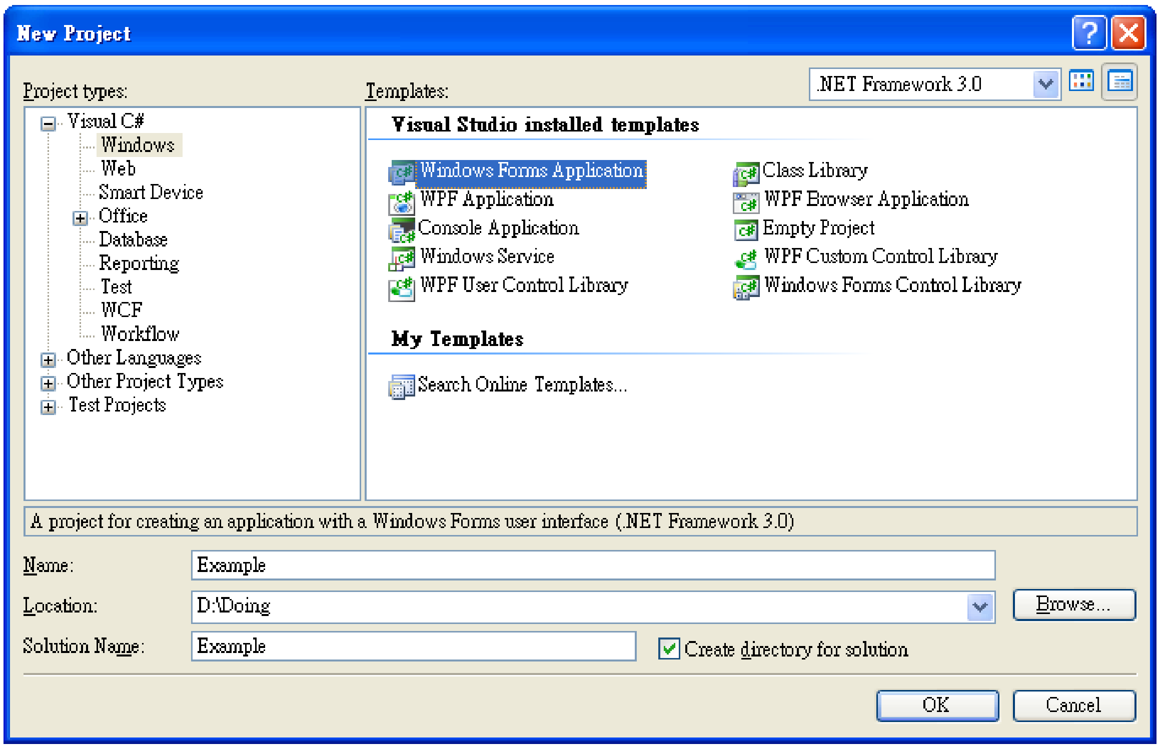
http://ftp.icpdas.com/pub/cd/xp-8000/sdk/pacsdk/pacnet/pacnet.dll

Step 1: Create a new project by using Visual Studio 2005/2008



Step 2: Select Windows Forms Application and name the project

1. In the **Project Type** column, choose **Visual C#** >**Windows**.
2. In the **Template** column, choose **Windows Forms Application**.
3. Name your project.
4. Click **OK** to create your new project.



A project for creating an application with a Windows Forms user interface (.NET Framework 3.0)

Name: Example

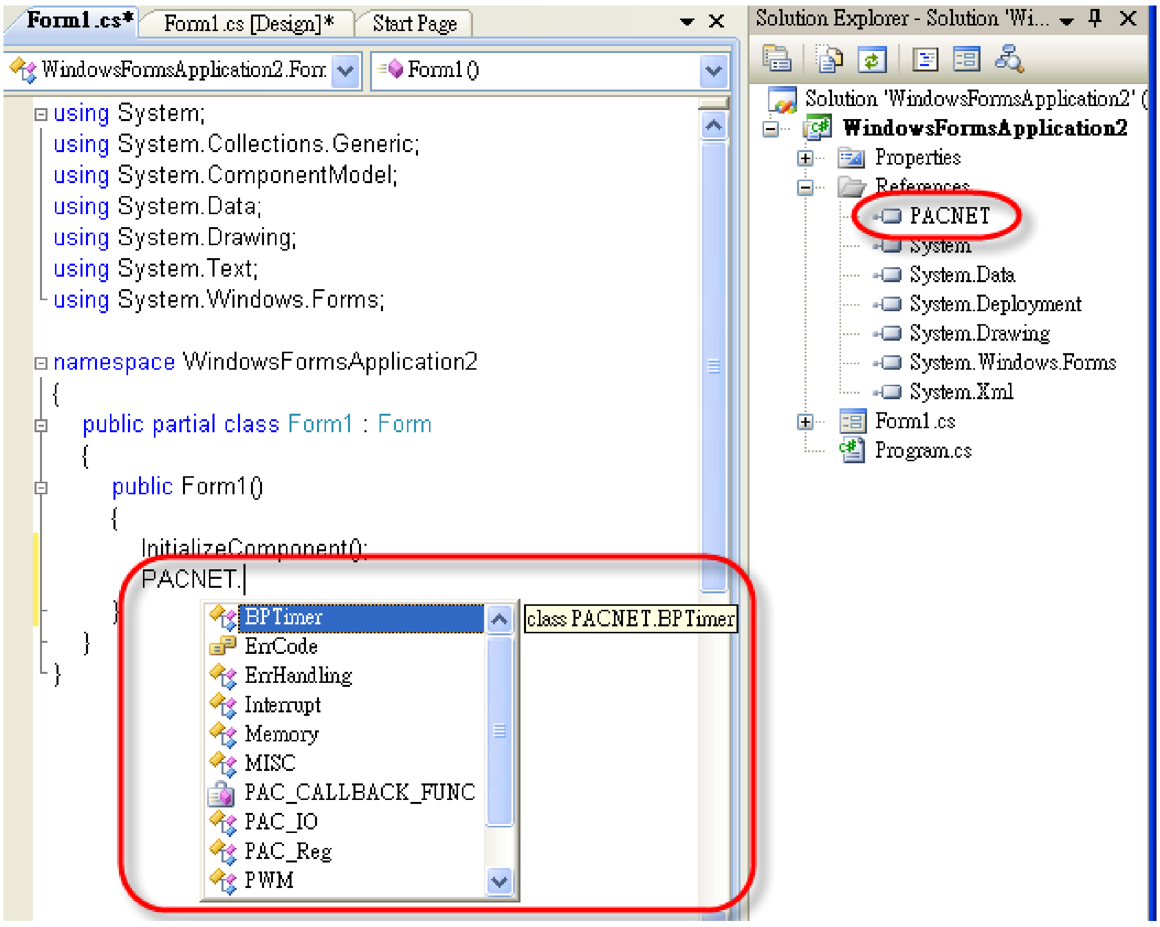
Location: D:\Doing

Solution Name: Example

[✓] Create directory for solution

Step 3: Add the PACNET.dll into the references of the project, and then insert the code to complete your project.

1. Click **Project** >**Add Reference**.
2. Choose **PACNET.dll** from the list.
3. Click **OK** to add the reference.
4. Use the intelliSense feature to quickly select the function which you want to call.



```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Text;
using System.Windows.Forms;

namespace WindowsFormsApplication2
{
    public partial class Form1 : Form
    {
        public Form1()
        {
            InitializeComponent();
            PACNET.
        }
    }
}
```

Tip

You can add the the namespace, **using PACNET**, to your code, and it can simplify object names. Such as **PAC_IO.GetBit** instead of **PACNET.PAC_IO.GetBit**.

1.3.3. VB.net

Required library files

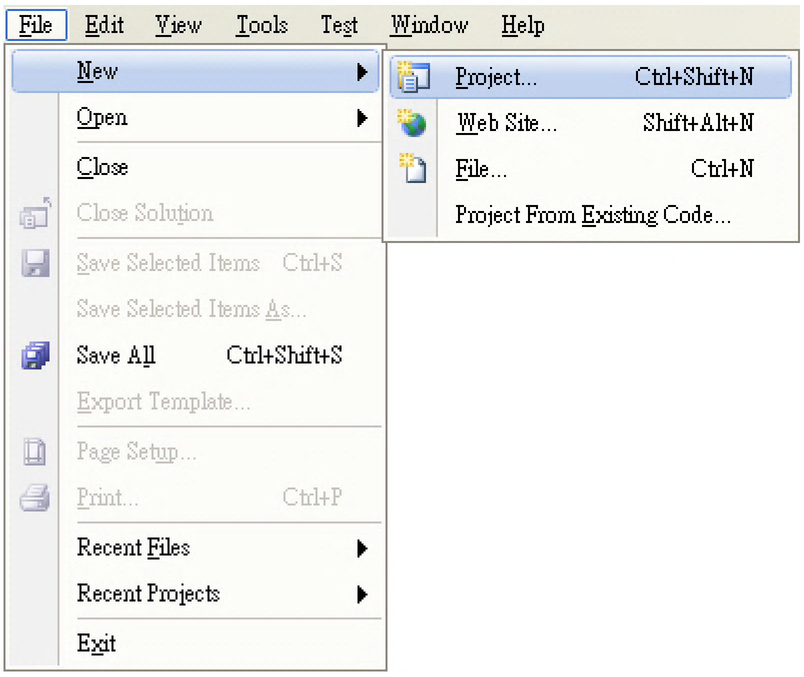
The following DLL files are needed to include for developing a XPAC/PC application or plug-in.

- PACSDK.dll

How to create a program with new SDK using Visual Studio 2005/2008 (VS2005/VS2008)

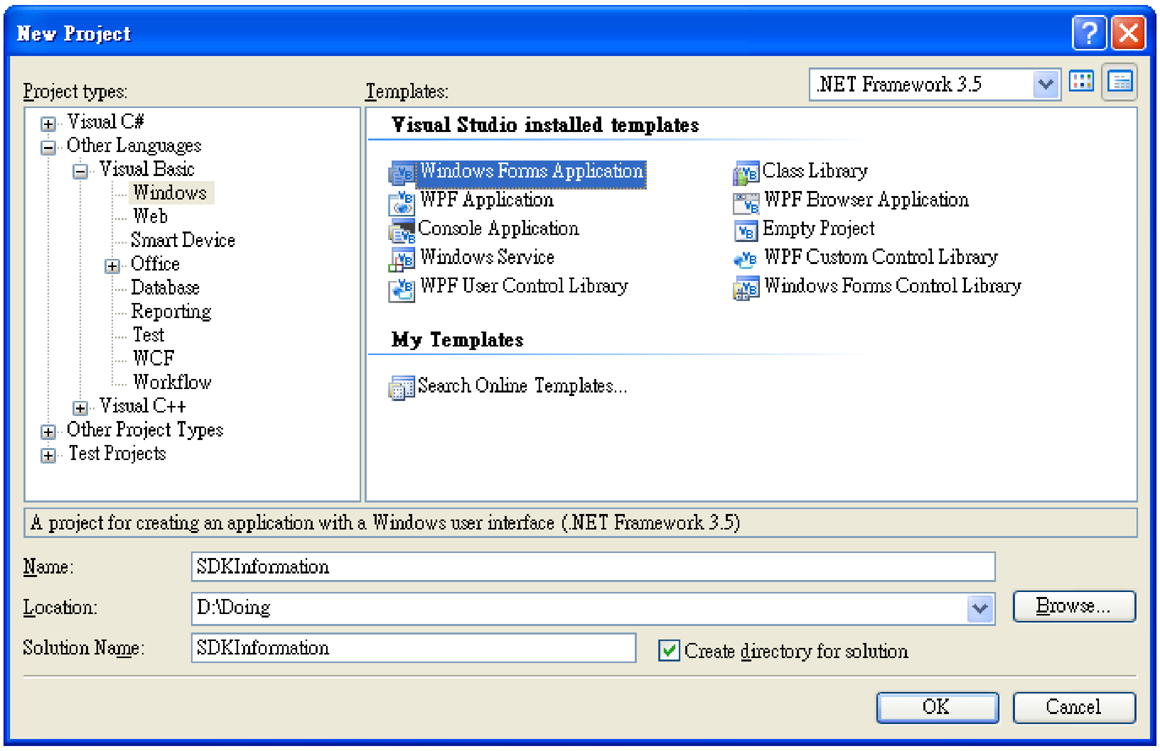
1. Using Dll Import:

Step 1: Create a new project by using Visual Studio 2005/2008



Step 2: Select Windows Forms Application and name the project

1. In the **Project Type** column, choose **Other Languages** >**Visual Basic** >**Windows**.
2. In the **Template** column, choose **Windows Forms Application**.
3. Name your project.
4. Click **OK** to create your new project.

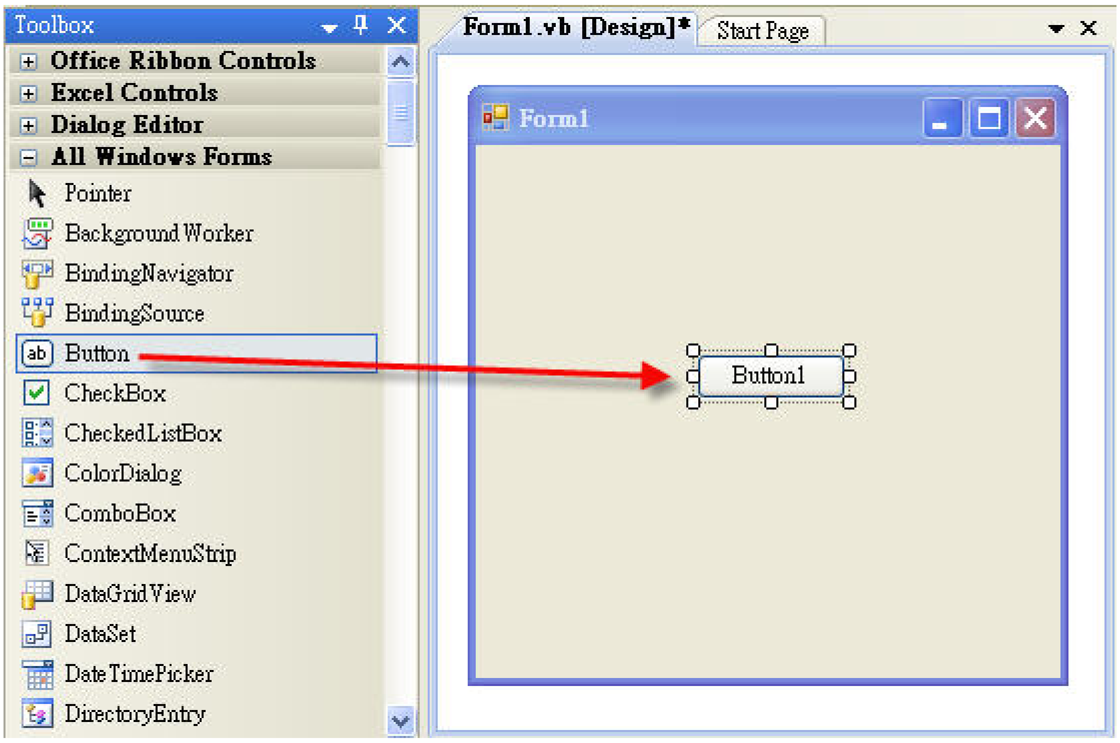


A project for creating an application with a Windows user interface (.NET Framework 3.5)

Name: SDKInformation
Location: D:\Doing
Solution Name: SDKInformation
✓ Create directory for solution

Step 3: Add a button control to the Windows form

1. Open the form.
2. In the **Toolbox**, click the **Button** control and drag it to your form.
3. Double-click the button on the form to create a **Click** event.



Step 4: In order to use “DllImport”, you should add the namespace using Statement: System.Runtime.InteropServices, and then implement the function which you want to call.

Demonstrate an example of using “pac_writeDO” in .NET project.

[The function defined in PACSDK.h file]

```
PAC_API BOOL pac_WriteDO(HANDLE hPort, int slot, int iDO_TotalCh, DWORD
lDO_Value);
```

[How to use in your .NET project]

1. Added this line in your project:

```
Imports System.Runtime.InteropServices
```

2. Declare this function as following:

```
<DllImport("PACSDK.dll", EntryPoint:="pac_WriteDO")> _
Public Shared Function pac_WriteDO(ByVal hPort As IntPtr, ByVal slot As Integer, ByVal
iDO_TotalCh As Integer, ByVal lDO_Value As UInteger) As Boolean
End Function
```

3. Then you can use this function, pac_WriteDO, in your .NET project.

[Code Snippet]

```
Imports System.Runtime.InteropServices

Public Class Form1
    Inherits Form

    <DllImport("PACSDK.dll", EntryPoint:="pac_WriteDO")> _
    Public Shared Function pac_WriteDO(ByVal hPort As IntPtr, ByVal slot As Integer,
    ByVal iDO_TotalCh As Integer, ByVal lDO_Value As UInteger) As Boolean
    End Function

    Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As
    System.EventArgs) Handles Button1.Click

        pac_WriteDO(CType(1, IntPtr), 1, 16, &Hff)

    End Sub
End Class
```

2. Using PACNET.dll:

PACNET.dll is a .net Compact framework SDK and PACNET.dll is not only used for C# program but also used for VB.net program.

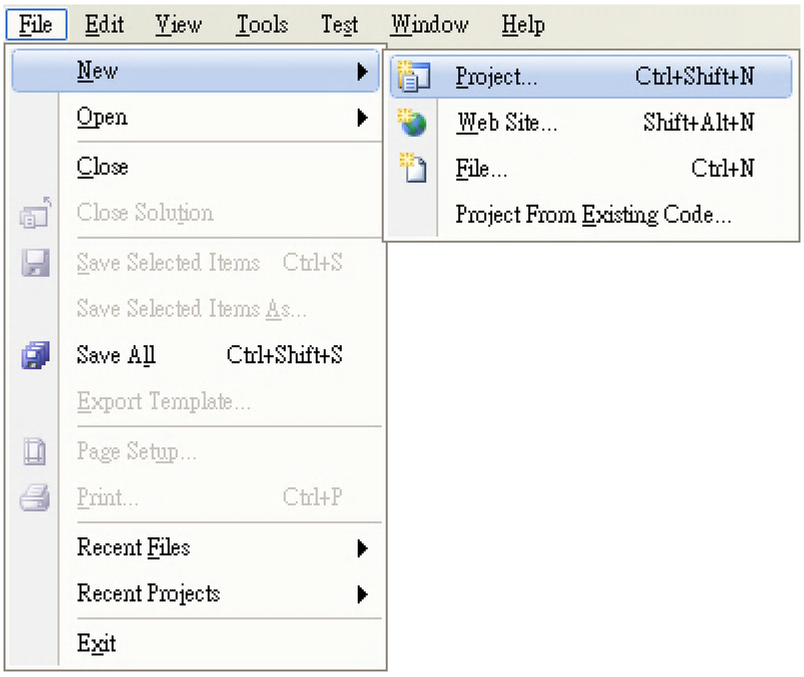
- PACNET.dll (the execution file should be put in the same directory of the PACNET.dll)

The latest version of this library is located at:

CD root\Xpac-Atom\SDK\PACSDK\Driver\DOTNET (in the companion CD)

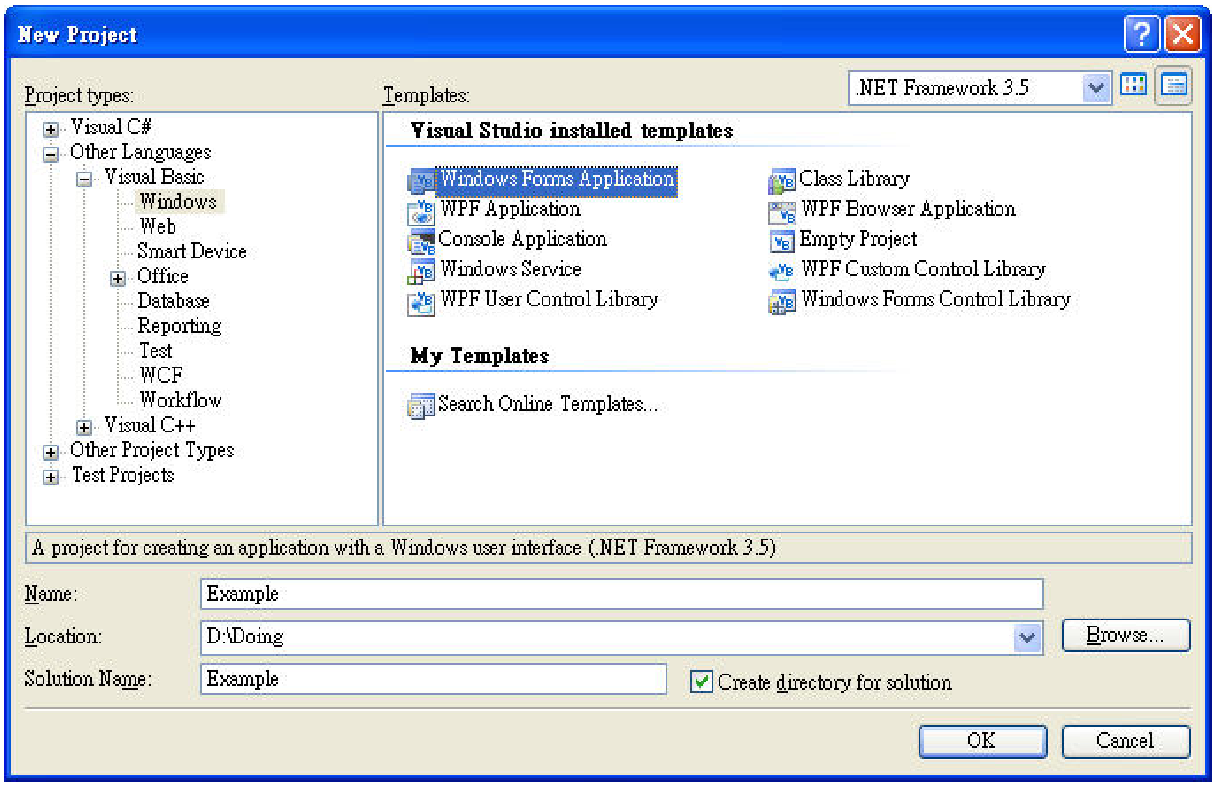
http://ftp.icpdas.com/pub/cd/xpac-atom/sdk/pacsdk/driver/dotnet

Step 1: Create a new project by using Visual Studio 2005/2008



Step 2: Select Windows Forms Application and name the project

1. In the **Project Type** column, choose **Other Languages** >**Visual Basic** >**Windows**.
2. In the **Template** column, choose **Windows Forms Application**.
3. Name your project.
4. Click **OK** to create your new project.

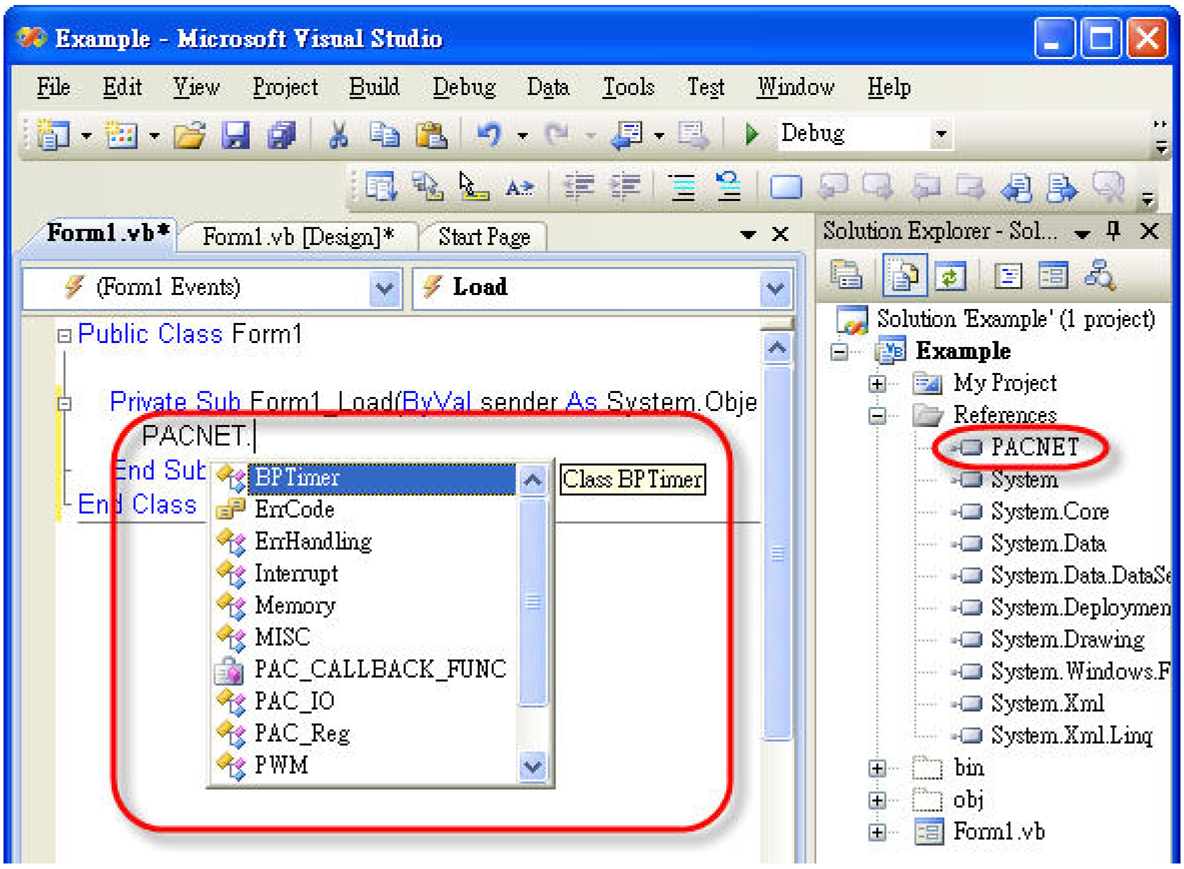


A project for creating an application with a Windows user interface (.NET Framework 3.5)

Name: Example
Location: D:\Doing
Solution Name: Example
☑ Create directory for solution

Step 3: Add the PACNET.dll into the references of the project, and then insert the code to complete your project.

1. Click **Project** >**Add Reference**.
2. Choose **PACNET.dll** from the list.
3. Click **OK** to add the reference.
4. Use the intelliSense feature to quickly select the function which you want to call.



```
Public Class Form1

    Private Sub Form1_Load(ByVal sender As System.Obje
        PACNET.
    End Sub
End Class
```

Tip

You can add the the namespace, **Imports PACNET**, to your code, and it can simplify object names. Such as **PAC_IO.GetBit** instead of **PACNET.PAC_IO.GetBit**.

1.3.4. Visual Basic 6.0

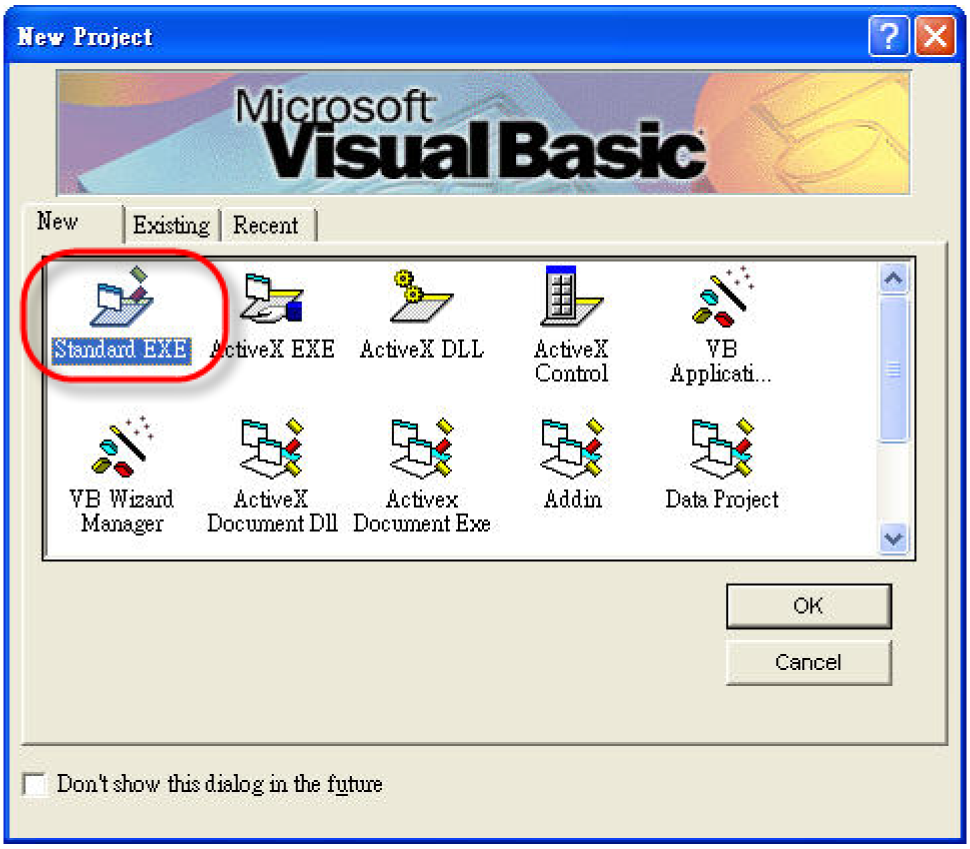
Required header and library files

The following list lists the libraries or DLL files you will need to include to develop a XPAC/PC application or plug-in.

- PACSDK_vb.dll
- pacsdk.bas

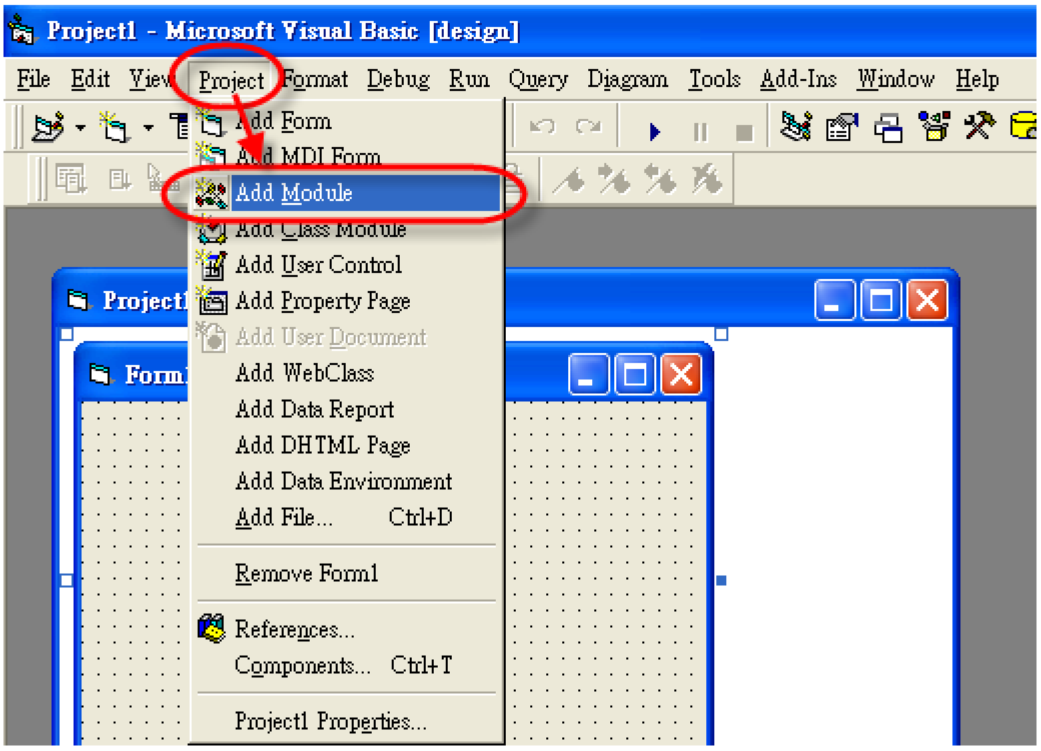
How to create a program with new SDK using Visual Basic 6.0

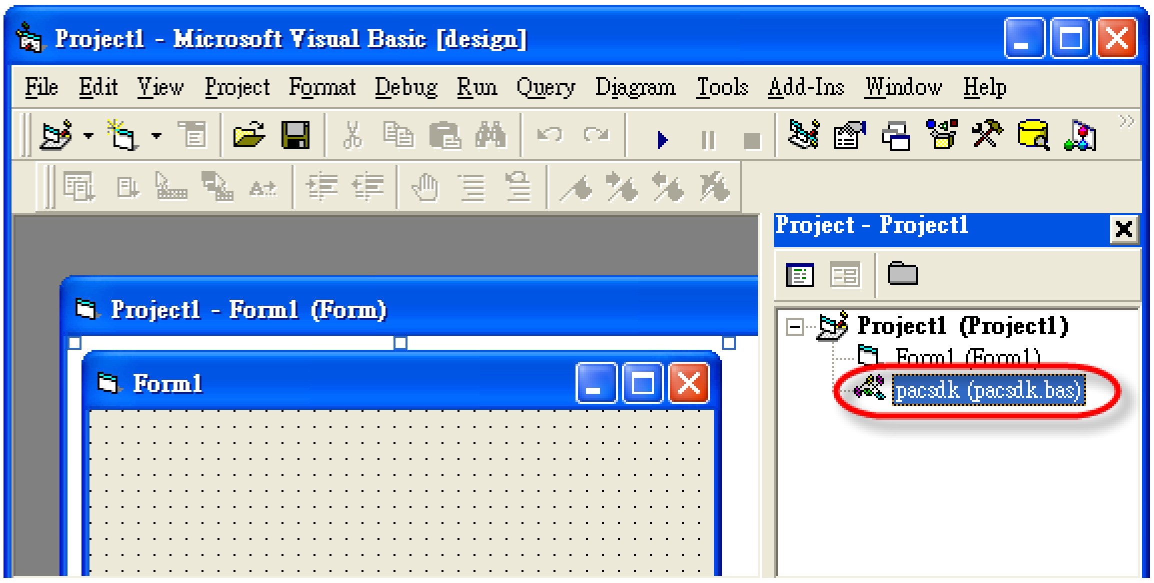
Step 1: Create a new project by using Visual Basic 6.0



Step 2: Copy pacsdk.bas and PACSDK_vb.dll to the application folder and Include pacsdk.bas

1. Copy **PACSDK.bas** and **PACSDK_vb.dll** to the application folder.
2. Click **Project** >**Add Module**.
3. Choose **PACSDK.bas** from the list.
4. Click **OK** to add the reference.




Project1 - Microsoft Visual Basic [design]
File Edit View Project Format Debug Run Query Diagram Tools Add-Ins Window Help
Project1 - Form1 (Form)
Form1
Project - Project1
Project1 (Project1)
Form1 (Form1)
pacsdk (pacsdk.bas)

The following references illustrate how to develop the programs for XP-8000 and XP-8000-Atom step by step.

XP-8000

Refer to the chapter 4 on xp-8000 user manual for more details

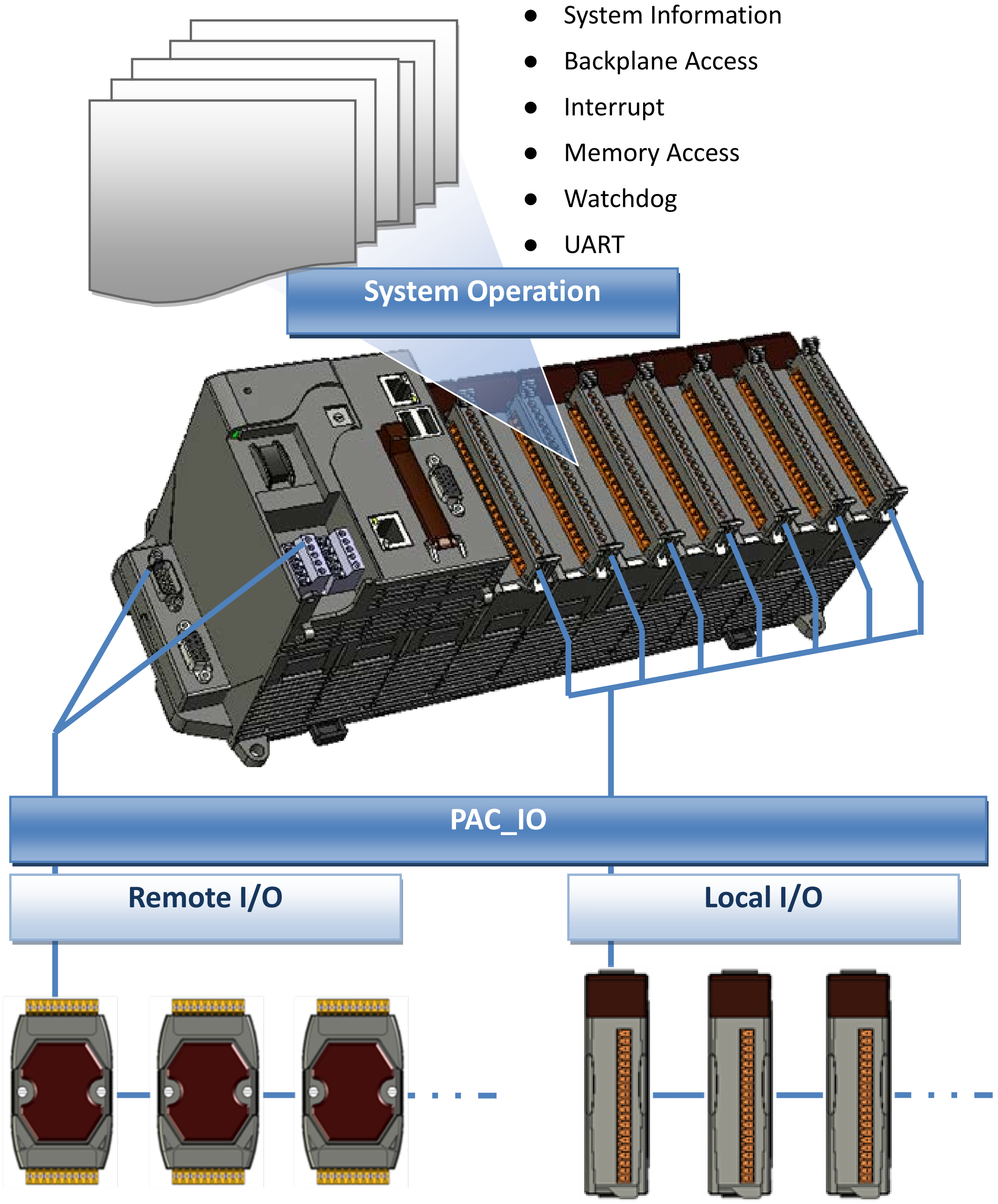
http://ftp.icpdas.com/pub/cd/xp-8000/document/user_manual/

XP-8000-Atom

Refer to the chapter 5 on xp-8000-Atom user manual for more details
http://ftp.icpdas.com/pub/cd/xpac-atom/document/user_manual/

2. PAC API Functions

The PACSDK API consists of the following APIs and functional categories



2.1. System Information API

The system information functions and messages describe or change the system configuration, settings, and attributes.

Supported PACs

The following list shows the supported PACs for each of the system information functions.

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_GetModuleName	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetRotaryID	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetSerialNumber	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetSDKVersion	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ChangeSlot	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_CheckSDKVersion	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ModuleExists	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetOSVersion	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
Pac_GetCPUVersion	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
Pac_EnableLEDs	-	Y	-	-	Y	-	-	-	-	-	-
pac_GetModuleType	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_BuzzerBeep	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetBuzzerFreqDuty	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetBuzzerFreqDuty	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_StopBuzzer	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetDIPSwitch	Y	Y	-	Y	Y	Y	Y	Y	-	-	-
pac_GetSlotCount	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_GetBackplaneID	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_GetBatteryLevel	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_EnableRetrigger	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_GetMacAddress	-	-	-	Y	Y	Y	Y	Y	Y	Y	Y

pac_ReBoot	-	-	-	Y	Y	Y	Y	Y	Y	Y	Y
Pac_EnableLED	-	-	-	-	-	Y	Y	Y	Y	Y	Y
pac_BackwardCompatible	-	-	-	-	-	Y	Y	Y	-	-	-
pac_GetEbootVersion	-	-	-	-	-	Y	Y	Y	Y	Y	Y
pac_GetComMapping	-	-	-	-	-	Y	Y	Y	Y	-	-
pac_RegistryHotPlug (Beta testing)	-	-	-	-	-	-	-	-	-	-	-
pac_UnregistryHotPlug (Beta testing)	-	-	-	-	-	-	-	-	-	-	-

System Information Functions

The following functions are used to retrieve or set system information.

PACSDK Functions	PACNET Functions	Description
pac_GetModuleName	Sys.GetModuleName	retrieves the name of the specified I/O module plugged into the XPAC series devices.
pac_GetRotaryID	Sys.GetRotaryID	retrieves the position number of the rotary switch.
pac_GetSerialNumber	Sys.GetSerialNumber	retrieves the serial number of the XPAC hardware ID.
pac_GetSDKVersion	Sys.GetPacSDKVersion	retrieves the version number of the current PACSDK.dll.
pac_ChangeSlot	Sys.ChangeSlot	handles the slot of the XPAC from one to another.
pac_CheckSDKVersion	Sys.CheckSDKVersion	is used to compare the version number of the currently used PACSDK.dll with the specified version number.
pac_ModuleExists	Sys.ModuleExists	specifies whether the local IO module exist in the XPAC or not..
pac_GetOSVersion	Sys.GetOSVersion	retrieves the version number of the XPAC current operating system (OS).
Pac_GetCPUVersion	Sys.GetCPUVersion	retrieves the version number of the XPAC CPU board.
Pac_EnableLEDs	Sys.EnableLEDs	sets the state of the specified LED .
pac_GetModuleType	Sys.GetModuleType	retrieves the type of I/O modules
pac_BuzzerBeep	Sys.Buzzer.BuzzerBeep	generates simple tones on the speaker.
pac_GetBuzzerFreqDuty	Sys.Buzzer.GetBuzzerFreqDuty	retrieves the frequency value and duty cycle value of the buzzer.
pac_SetBuzzerFreqDuty	Sys.Buzzer.SetBuzzerFreqDuty	sets the frequency value and duty cycle value of the buzzer.
pac_StopBuzzer	Sys.Buzzer.StopBuzzer	stops the buzzer.

pac_GetDIPSwitch	Sys.GetDIPSwitch	retrieves the dip switch on the XPAC.
pac_GetSlotCount	Sys.GetSlotCount	retrieves the total number of the IO slot on the XPAC.
pac_GetBackplaneID	Sys.GetBackplaneID	retrieves the backplane ID of the XPAC.
pac_GetBatteryLevel	Sys.GetBatteryLevel	retrieves the battery status of the backplane and the RTC battery status of the CPU board.
pac_EnableRetrigger	Sys.EnableRetrigger	determines the retrigger status.

2.1.1. pac_GetModuleName

This function retrieves the name of the specified I/O module plugged into the XPAC series devices.

Syntax

C++

```
int pac_GetModuleName(
          BYTE slot,
          LPSTR strName
);
```

Parameters

Slot

[in] Specifies the slot number to which I/O module is plugged to XPAC series devices.

strName

[out] A pointer to a buffer that receives the name of the specified I/O module.

Return Value

If the 8K I/O module is undefined, the return value is some other value.

Examples

[C]

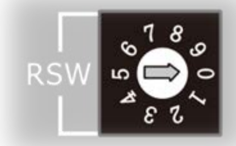
```
byte slot = 1;
char strName[10];
pac_GetModuleName(slot, strName);
```

[C#]

```
// For this API, there are two ways to get the module name.
// First is called by reference, and you should add key word, ref,
// The return value is "Module type", not "Module name".
byte slot = 1;
string strName = "";
int ModuleType = 0;
ModuleType = PACNET.Sys.GetModuleName(slot, ref strName);
Console.WriteLine("The Module Name on slot 1 is : " + strName);

// Another directly returns the module name.
slot = 2;
strName = PACNET.Sys.GetModuleName(slot);
Console.WriteLine("The Module Name on slot 2 is : " + strName);
Console.ReadLine();

// The example displays the following output to the console:
//          The Module Name on slot 1 is : 87061
//          The Module Name on slot 2 is : 8017H
```

2.1.2. pac_GetRotaryID

This function retrieves the position number of the rotary switch.



Syntax

C++

```
int pac_GetRotaryID();
```

Parameters

This function has no parameters

Return Value

If the function succeeds, the return value is the position number of the rotary switch. If the function fails, the return value is invalid value. To get extended error information, call pac_GetLastError.

Examples

[C]

```
int RotaryID;
RotaryID = pac_GetRotaryID();
```

[C#]

```
int RotaryID;
RotaryID = PACNET.Sys.GetRotaryID();
Console.WriteLine("The Rotary ID is : " + RotaryID.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The Rotary ID is : 0
```

2.1.3. pac_GetSerialNumber

This function retrieves the serial number of the XPAC hardware ID.

Syntax

C++

```
void pac_GetSerialNumber(
        LPSTR SerialNumber
);
```

Parameters

SerialNumber

[out] The serial number of the XPAC hardware ID.

Return Value

This function does not return a value.

Examples

[C]

```
char SN[32];
pac_GetSerialNumber(SN);
```

[C#]

```
string SN;
SN = PACNET.Sys.GetSerialNumber();
Console.WriteLine("The Serial Number is : " + SN);
Console.ReadLine();

// The example displays the following output to the console:
//            The Serial Number is : 01-38-11-79-14-00-00-2F
```

Remarks

If the retrieved value is null, means the function executes failure or the device is not valid product.

2.1.4. pac_GetSDKVersion

This function retrieves the version number of the current PACSDK.dll.

Syntax

C++

```
void pac_GetSDKVersion(
        LPSTR sdk_version
);
```

Parameters

sdk_version

[out] The version number of the PACSDK.

Return Value

This function does not return a value.

Examples

[C]

```
char SDK[32];
pac_GetSDKVersion(SDK);
```

[C#]

```
//In .net, ths API is different with VC.
//And there are two API, pac_GetPacSDKVersion and pac_GetPacNetVersion.
string PacSDK;
string PacNET;
PacSDK = PACNET.Sys.GetPacSDKVersion(); //retrieving PacSDK version
PacNET = PACNET.Sys.GetPacNetVersion(); //retrieving PacNET version
Console.WriteLine("The PacSDK.dll version is : " + PacSDK);
Console.WriteLine("The PacNET.dll version is : " + PacNET);
Console.ReadLine();

// The example displays the following output to the console:
//          The PacSDK.dll version is :    4.2.3.6
//          The PacNET.dll version is :    2.1.0.3
```

2.1.5. pac_ChangeSlot

This function handles the slot of the XPAC from one to another.

Syntax

C++

```
void pac_ChangeSlot(
        BYTE slotNo
);
```

Parameters

slotNo

[in] Specifies the slot number which the 87K module plug in.

Return Value

This function does not return a value.

Examples

[C]

```
BYTE slot;
HANDLE hPort;
BOOL ret;
char buf[Length];
hPort = uart_Open("");
pac_ChangeSlot(slot);
// Change to the slot which the 87k modules plug in
ret = uart_SendCmd(hPort,"$00M", buf);
// $00M: ask the device name
```

[C#]

```
// This example demonstrates how to change slot if you want to use the uart API.
byte slot;
IntPtr hPort;
bool ret;
byte[] buf= new byte[10];
hPort = PACNET.UART.Open("");
// Assign the slot number and change to the slot which the 87k modules plug in.
slot = 1;
PACNET.Sys.ChangeSlot(slot);
// Send "$00M" DCON command by uart API to get the module name
ret = PACNET.UART.SendCmd(hPort, PACNET.MISC.AnsiString("$00M"), buf);

Console.WriteLine("The Module on slot 1 is : " + PACNET.MISC.WideString(buf));
Console.ReadLine();

// The example displays the following output to the console:
//          The Module Name on slot 1 is : 87061
```

Remarks

When you use uart APIs and the IO modules are located as slots, you have to call pac_ChangeSlot to the specified slot for communicating with the module.

Besides, other low level operations may use pac_ChangeSlot to change the slot.

If you just use PAC_IO APIs, you needn’t care about this.

2.1.6. pac_CheckSDKVersion

This function is used to compare the version number of the currently used PACSDK.dll with the specified version number.

This function does not support all versions of XPACSDK.

Syntax

C++

```
BOOL pac_CheckSDKVersion(
        DWORD version
);
```

Parameters

version

[in] The version number of the PACSDK.

If the version number is 1.0.0.1. or previous, this parameter must be **0x01000001**

Return Value

If the specified version number is eailer than the currently used PACSDK.dll, the return value is TRUE.

If the specified version number is later than the currently used PACSDK.dll, the return value is FALSE.

Examples

[C]

```
//……
//Added this API in the begin of your application
BOOL bVersion;
bVersion = pac_CheckSDKVersion( 0x01000001);
//if your application should use newer than version 1.0.0.1
if(!bVersion)
{
    MessageBox("The XPacSDK.dll version is wrong");
    // display some warning and close the application
}
```

[C#]

```
// Added this API in the begin of your application
bool bVersion;
bVersion = PACNET.Sys.CheckSDKVersion( 0x01000001);

//if your application should use newer than version 1.0.0.1
if(!bVersion)
{
    Console.WriteLine("The PACSDK.dll version is wrong.");
    // display some warning and close the application
}
Console.ReadLine();

// If the version of the currently used PACSDK.dll is not 1.0.0.1 or earlier,
// the output to the console is as below:
//              The PACSDK.dll version is wrong
```

2.1.7. pac_ModuleExists

This functions specifies whether the local IO module exist in the XPAC or not.

Syntax

C++

```
BOOL pac_ModuleExists(
        HANDLE hPort,
        int slot
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open().

Because the API only uses for local modules, this parameter must be **0**.

Slot

[in] The slot in which module is to check exists or not.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE. To get extended error information, call pac_GetLastError.

Examples

[C]

```
//……
//if you want to check a module which is in the slot 5
BOOL bExist;
bExist = pac_ModuleExists(0, 5);
if(bExist)
{
    MessageBox(“The module exist !”);
}
    else
{
    MessageBox(“The module unexist !”);
}
```

[C#]

```
//Check if a module exists in the slot 5 of the XPAC.
bool bExist;
IntPtr hPort = PACNET.UART.Open("0");
bExist = PACNET.Sys.ModuleExists(hPort, 5);

if (bExist)
    Console.WriteLine("A module exists in the slot 5 of the XPAC.");
else
    Console.WriteLine("No module exists in the slot 5 of the XPAC.");
Console.ReadLine();

// If there is a local module in the slot 5 of a XPAC, the output to the console is as below:
//          A module exists in the slot 5 of the XPAC.
// Else the output to the console is as below:
//          No module exists in the slot 5 of the XPAC.
```

Remarks

When you have ever sended a command to a local module on the slot and an error happened, you can add the “Pac_ModuleExists” function into your program before sending command to the module. By this way You can quickly check whether a module correctly exists in the slot, and save the waiting time for the timeout if a module does not exist. The API does not apply to a remote module.

2.1.8. pac_GetOSVersion

This function retrieves the version number of the XPAC current operating system (OS).

Syntax

C++

```
void pac_GetOSVersion(
          LPSTR os_version
);
```

Parameters

os_version

[out] The version number of the XPAC OS.

Return Value

This function does not return any value.

Examples

[C]

```
char OS[32];
pac_GetOSVersion(OS);
```

[C#]

```
string OS;
OS = PACNET.Sys.GetOSVersion();
Console.WriteLine("The XPAC OS version is v"+OS);
Console.ReadLine();

// The example displays the following output to the console:
//              The XPAC OS version is v1.0.3.0
```

2.1.9. Pac_GetCPUVersion

This function retrieves the version number of the XPAC CPU board.

Syntax

C++

```
void pac_GetCPUVersion(
          LPSTR cpu_version
);
```

Parameters

cpu_version

[out] The version number of the XPAC CPU board.

Return Value

This function does not return any value.

Examples

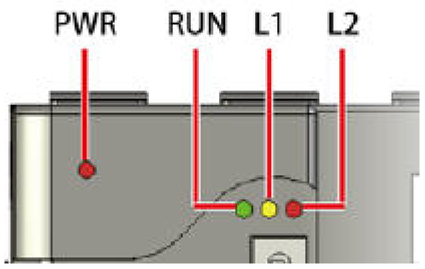
[C]

```
char CPU[32];
pac_GetCPUVersion(CPU);
```

[C#]

```
string CPU = PACNET.Sys.GetCPUVersion();
Console.WriteLine("The XPAC CPU board version is v" + CPU);
Console.ReadLine();

// The example displays the following output to the console:
//            The XPAC CPU board version is v1.0.15.0
```

2.1.10. Pac_EnableLEDs



This function sets the state of the specified LED .

Syntax

C++

```
void pac_EnableLEDs(
        INT pin,
        BOOL bFlag
);
```

Parameters

pin

Specifies the user programmable LED.

0: L1 LED

1: L2 LED

bFlag

Specifies the mode of the LED.

True: Turn on the LED

False: Turn off the LED

Return Value

This function does not return any value.

Remark

The function is only applied to the XP-8000-Atom series.

Examples

[C]

```
pac_EnableLEDs(0,TRUE);
```

[C#]

```
// Turn on the L1 LED.
PACNET.Sys.EnableLEDs(0, true);

// Turn off the L2 LED.
PACNET.Sys.EnableLEDs(1, false);
```

2.1.11. pac_GetModuleType

This function retrieves the type of I/O modules which plugged into the XPAC series devices.

Syntax

C++

```
int pac_GetModuleType(
    BYTE slot
);
```

Parameters

slot

[in] Specifies the slot number where the I/O module is plugged into.

Return Value

For XPAC Series

The following table shows the defined values.

Value	Description
0	No module existed
0x80	Genernal I-8000W module
0x81	I-8000RW module (R version: Provide PowerOn and Safe value)
0xE3	I-8000W module with 32 DI channels
0xE0	I-8000W module with 32 DO channels
0xE2	I-8000W module with 16 DI channels and 16 DO channels
0xC3	I-8000W module with 16 DI channels
0xC0	I-8000W module with 16 DO channels
0xC2	I-8000W module with 8 DI channels and 8 DO channels
0x40	No module defined

Examples

[C]

```
int iDIO_Slot = 1;
int Type = 0;
Type=pac_GetModuleType(iDIO_Slot);
if(Type==0xe2 || Type==0xc2){
//The module is DIO module
...
}
```

[C#]

```
byte slot = 1;
int ModuleType = 0;
ModuleType = PACNET.Sys.GetModuleType(slot);

if (ModuleType == 0xC0)
    Console.WriteLine("The module is an I-8000W module with 16 DO channels.");
else
    Console.WriteLine("The module type value is "+Convert.ToString(ModuleType,16));
Console.ReadLine();

// If an I-8000W module with 16 DO channels plugged into slot 1,
// the output to the console is as below:
//          The module is an I-8000W module with 16 DO channels.
// Else output the module type to the console as below:
//          The module type value is 40
```

2.1.12. pac_BuzzerBeep

This function generates simple tones on the speaker.

Syntax

C++

```
void pac_BuzzerBeep(
    WORD count,
    DWORD milliseconds
);
```

Parameters

count

[in] Specifies the number of beeps.

milliseconds

[in] Specifies the duration of the sound measured in milliseconds.

Return Value

This function does not return any value.

Examples

[C]

```
pac_BuzzerBeep(1, 100);
```

[C#]

```
// Beep 1 time for 1 second.
PACNET.Sys.Buzzer.BuzzerBeep(1, 1000);
```

2.1.13. pac_GetBuzzerFreqDuty

This function retrieves the frequency value and duty cycle value of the buzzer.

Syntax

C++

```
void pac_GetBuzzerFreqDuty(
          int *freq,
          int *duty
);
```

Parameters

freq

[out] The frequency of the sound, ranging from 37 to 32767 hertz.

duty

[out] The duty cycle of the sound.

Return Value

This function does not return any value.

Examples

[C]

```
int fq =0;
int du = 0;
pac_GetBuzzerFreqDuty(&fq, &du);
```

[C#]

```
int fq = 0;
int du = 0;
PACNET.Sys.Buzzer.GetBuzzerFreqDuty(ref fq, ref du);
Console.WriteLine("The frequency : " + fq.ToString() + "; The duration : "+du.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The frequency : 2000 ; The duration : 50
```

2.1.14. pac_SetBuzzerFreqDuty

This function sets the frequency value and duty cycle value of the buzzer.

Syntax

C++

```
void pac_SetBuzzerFreqDuty(
          int freq,
          int duty
);
```

Parameters

freq

[out] The frequency of the sound.

duty

[out] The duty cycle of the sound.

Return Value

This function does not return any value.

Examples

[C]

```
int fq = 500;
int du = 20;
pac_SetBuzzerFreqDuty(fq, du);
```

[C#]

```
// Set Frequency = 100 and Duty Cycle = 20.
int fq = 100;
int du = 20;
PACNET.Sys.Buzzer.SetBuzzerFreqDuty(fq, du);
```

Remark

The default frequency value is 2000 and the default duty cycle value is 50 in PACSDK.dll. You can use the pac_SetBuzzerFreqDuty function to change the two parameters and the two values you changed will take effect until the end of the program.

2.1.15. pac_StopBuzzer

This function stops the buzzer.

Syntax

C++

```
void pac_StopBuzzer();
```

Parameters

This function has no parameters.

Return Value

This function does not return any value.

Examples

[C]

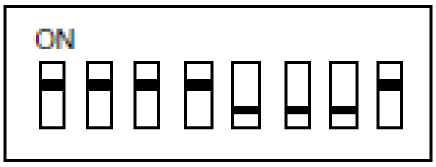
```
pac_StopBuzzer();
```

[C#]

```
// Demonstrate how to stop the buzzer.
PACNET.Sys.Buzzer.BuzzerBeep(1, 10000);
Console.ReadLine(); //Press any key to stop the buzzer.
PACNET.Sys.Buzzer.StopBuzzer();
```

2.1.16. pac_GetDIPSwitch

This function retrieves the dip switch on the XPAC.



Syntax

C++

```
int pac_GetDIPSwitch();
```

Parameters

This function has no parameters.

Return Value

The return value specifies the dip switch.

Examples

[C]

```
int iDipSwitch;
iDipSwitch = pac_GetDIPSwitch();
```

[C#]

```
int iDipSwitch;
iDipSwitch = PACNET.Sys.GetDIPSwitch();
Console.WriteLine("The DIP Switch value is " + iDipSwitch.ToString());
Console.ReadLine();
```

2.1.17. pac_GetSlotCount

This function retrieves the total number of the IO slot on the XPAC.

Syntax

C++

```
int pac_GetSlotCount();
```

Parameters

This function has no parameters.

Return Value

The return value is the number of the IO slot.

Examples

[C]

```
int wSlot;
wSlot = pac_GetSlotCount();
```

[C#]

```
int iSlot;
iSlot = PACNET.Sys.GetSlotCount();
Console.WriteLine("The number of the IO slot is " + iSlot.ToString());
Console.ReadLine();
```

2.1.18. pac_GetBackplaneID

This function retrieves the backplane ID of the XPAC.

Syntax

C++

```
void pac_GetBackplaneID(
         LPSTR backplane_version
);
```

Parameters

backplane_version

[out] Retrieves the backplane ID.

Return Value

This function has does not return any value.

Examples

[C]

```
char Backplane[32];
pac_GetBackplaneID(Backplane);
```

[C#]

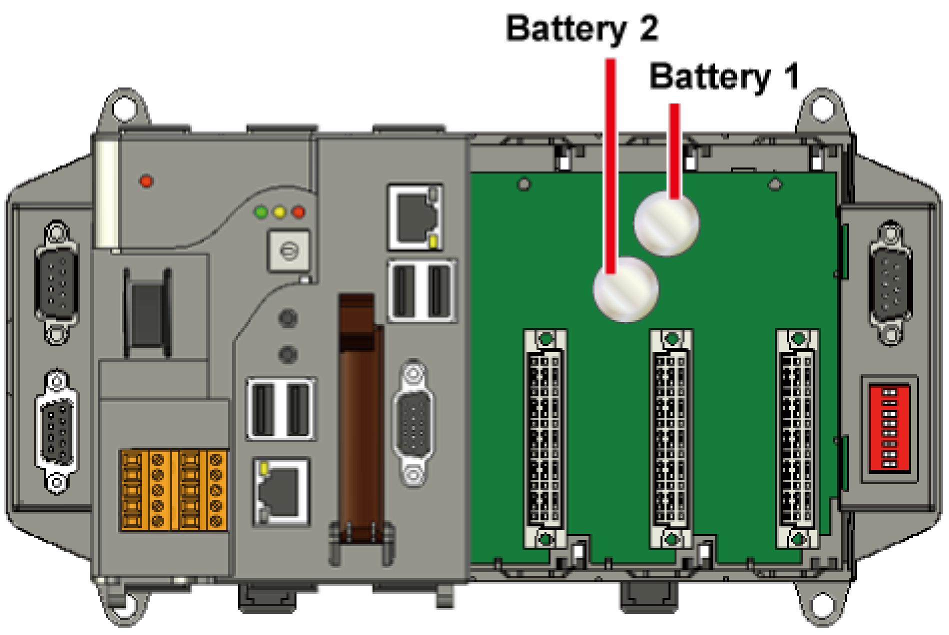
```
string Backplane;
Backplane = PACNET.Sys.GetBackplaneID();
Console.WriteLine("The Backplane ID is " + Backplane);
Console.ReadLine();

// The example displays the following output to the console:
//            The Backplane ID is 1.0.10.0
```

2.1.19. pac_GetBatteryLevel

This function retrieves the battery status of the backplane and the RTC battery status of the CPU board.

This function supports the following series models.

XPAC



Syntax

C++

```
int pac_ GetBatteryLevel(
        int nBattery
);
```

Parameters

nBattery

[in] Specifies the index of battery.

1 means first battery.

2 means second battery.

3 means RTC battery. (For XPAC_Atom series only)

Return Value

1 means high voltage.

0 means low voltage. (for XPAC series only)

Examples

[C]

```
int nBattery;
int index = 1;
nBattery = pac_GetBatteryLevel(index);
```

[C#]

```
int nBattery;
int index = 1;
nBattery = PACNET.Sys.GetBatteryLevel(index);
Console.WriteLine("The First battery level is " + nBattery.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//          The First battery level is 1
```

2.1.20. pac_EnableRetrigger

This function determines the retrigger status.

Syntax

C++

```
void pac_EnableRetrigger(
          BYTE iValues
);
```

Parameters

iValues

[in] Specifies the retrigger value, 0~255, unit= 10 microsecond. (0 means disable retrigger function)

Return Value

This function has does not return any value.

Examples

This function has no examples.

Remarks

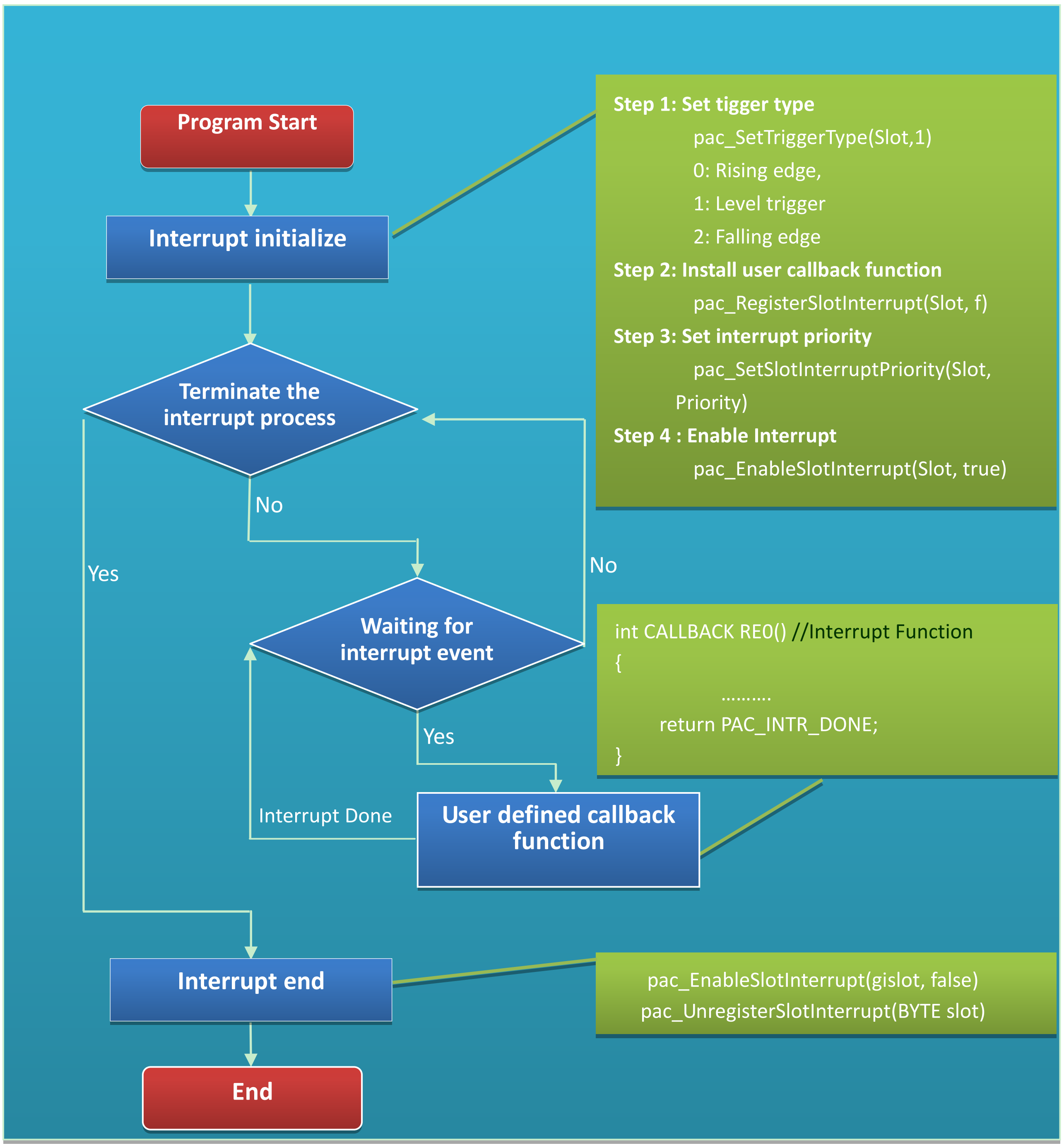
The retrigger mechanism is used when the below situation occurred.

If an interrupt is sent but not be serviced, the retrigger function will send an interrupt again. This operation will continue until the interrupt has been serviced.

2.2. Interrupt API

The Interrupt functions provide the slot interrupt that may be used for counting, timing, detecting external events, and sending and receiving data using the serial interface.

Interrupt Flow



Program Start
Interrupt initialize
Terminate the interrupt process
No
Yes
Waiting for interrupt event
No
Yes
Interrupt Done
User defined callback function
Interrupt end
End

Step 1: Set tigger type
pac_SetTriggerType(Slot,1)
0: Rising edge,
1: Level trigger
2: Falling edge
Step 2: Install user callback function
pac_RegisterSlotInterrupt(Slot, f)
Step 3: Set interrupt priority
pac_SetSlotInterruptPriority(Slot, Priority)
Step 4 : Enable Interrupt
pac_EnableSlotInterrupt(Slot, true)

```
int CALLBACK RE0() //Interrupt Function
{
            ……….
    return PAC_INTR_DONE;
}
```

pac_EnableSlotInterrupt(gislot, false)
pac_UnregisterSlotInterrupt(BYTE slot)

Supported PACs

The following list shows the supported PACs for each of the interrupt functions.

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_RegisterSlotInterrupt	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_UnregisterSlotInterrupt	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_EnableSlotInterrupt	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetSlotInterruptPriority	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_InterruptInitialize	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetSlotInterruptEvent	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetSlotInterruptEvent	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetTriggerType	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetSlotInterruptID	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_InterruptDone	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y

Interrupt Functions

The following functions are used to retrieve or set the slot interrupt.

PACSDK Functions	PACNET Functions	Description
pac_RegisterSlotInterrupt	Interrupt.RegisterSlotInterrupt	registers the slot interrupt service route after turning on the slot interrupt.
pac_UnregisterSlotInterrupt	Interrupt.UnregisterSlotInterrupt	unregisters slot interrupt service route and disables a hardware interrupt as specified by its interrupt identifier.
pac_EnableSlotInterrupt	Interrupt.EnableSlotInterrupt	performs hardware operations necessary to enable the specified hardware interrupt.
pac_SetSlotInterruptPriority	Interrupt.SetSlotInterruptPriority	sets the priority for a real-time thread on a thread by thread basis.
pac_InterruptInitialize	Interrupt.InterruptInitialize	initializes a slot interrupt with the kernel. This initialization allows the slot to register an event and enable the interrupt.
pac_GetSlotInterruptEvent	Interrupt.GetSlotInterruptEvent	retrieves the slot event handle which registered by pac_InterruptInitialize.
pac_SetSlotInterruptEvent	Interrupt.SetSlotInterruptEvent	sets the priority for a real-time thread on a thread by thread basis.
pac_SetTriggerType	Interrupt.SetTriggerType	assigns the pulse trigger type for separate slot.
pac_GetSlotInterruptID	Interrupt.GetSlotInterruptID	retrieves the ID of the slot interrupt.
pac_InterruptDone	Interrupt.InterruptDone	signals to the kernel that interrupt processing has been completed.

2.2.1. pac_RegisterSlotInterrupt

This function registers the slot interrupt service route after turning on the slot interrupt.

Syntax

C++

```
BOOL pac_RegisterSlotInterrupt(
        BYTE slot,
        PAC_CALLBACK_FUNC f
);
```

Parameters

slot

[in] Specifies the index of slot. On the XPAC, the index of slot starts from 1.

f

A call back function.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE. To get extended error information, call pac_GetLastError.

Examples

[C]

```
int slot = 3; // if slot is 3
int CALLBACK slot_callback_proc()
{
// do something
    return true;
// if return true, SDK will do pac_InterruptDone automatically
// else, users should do pac_InterruptDone by themselves if needed.
// if interrupt type is level trigger, no matter return true or false,
// needn't add pac_InterruptDone and it will work correctly.
}
void CIntrDlg::OnButton1()
{
    pac_RegisterSlotInterrupt(slot, slot_callback_proc);
    pac_EnableSlotInterrupt(slot, true);      // enable slot interrupt
}

void CIntrDlg::OnButton2()
{
    pac_EnableSlotInterrupt(slot, false);      // disable slot interrupt
    pac_UnregisterSlotInterrupt(slot);      // unregister slot interrupt
}
```

Remarks (for XPAC series only)

Default trigger type is level trigger.

For XPAC series, only support level trigger type.

2.2.2. pac_UnregisterSlotInterrupt

This function unregisters slot interrupt service route and disables a hardware interrupt as specified by its interrupt identifier.

Syntax

C++

```
BOOL pac_UnregisterSlotInterrupt(
        BYTE slot
);
```

Parameters

slot

[in] Specifies the index of slot. On the XPAC, the index of slot starts from 1.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE. To get extended error information, call pac_GetLastError.

Examples

[C]

```
int slot = 3; // if slot is 3
int CALLBACK slot_callback_proc()
{
// do something
pac_InterruptDone(slot);
return false;
// if return true, SDK will do pac_InterruptDone automatically
//else, users should do pac_InterruptDone by themselves if needed
// if interrupt type is level trigger, no matter return true or false,
// needn't add pac_InterruptDone and it will work correctly.
}
void CIntrDlg::OnButton1()
{
  pac_RegisterSlotInterrupt(slot, slot_callback_proc);
  pac_EnableSlotInterrupt(slot, true);      // enable slot interrupt
}
void CIntrDlg::OnButton2()
{
  pac_EnableSlotInterrupt(slot, false);    // disable slot interrupt
  pac_UnregisterSlotInterrupt(slot);       // unregister slot interrupt
}
```

2.2.3. pac_EnableSlotInterrupt

This function performs hardware operations necessary to enable the specified hardware interrupt.

Syntax

C++

```
void pac_EnableSlotInterrupt(
          BYTE slot,
          BOOL bEnable
);
```

Parameters

slot

[in] Specifies the index of slot to enable interrupt or disable.

bEnable

[in] Specifies the Slot interrupt turning on or not.

Return Value

This function does not return any value.

Examples

[C]

```
int slot = 3; // if slot is 3
int CALLBACK slot_callback_proc()
{
// do something
pac_InterruptDone(slot);
return true;
// if return true, SDK will do pac_InterruptDone automatically
//else, users should do pac_InterruptDone by themselves if needed
// if interrupt type is level trigger, no matter return true or false,
// needn't add pac_InterruptDone and it will work correctly.
}
void CIntrDlg::OnButton1()
{
   pac_RegisterSlotInterrupt(slot, slot_callback_proc);
   pac_EnableSlotInterrupt(slot, true);     // enable slot interrupt
}

void CIntrDlg::OnButton2()
{
   pac_EnableSlotInterrupt(slot, false);     // disable slot interrupt
pac_UnregisterSlotInterrupt(slot);    // unregister slot interrupt
}
```

Remarks

Default trigger type is level trigger.

For XP-8000 series, only support level trigger type.

2.2.4. pac_SetSlotInterruptPriority

This function sets the priority for a real-time thread on a thread by thread basis.

Syntax

C++

```
BOOL pac_SetSlotInterruptPriority(
        BYTE slot,
        int nPriority
);
```

Parameters

slot

[in] Specifies the index of slot to set priority.

nPriority

[in] Specifies the priority to set for the thread.

This value can range from 0 through 255, with 0 as the highest priority.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE. To get extended error information, call pac_GetLastError.

Examples

This function has no examples.

2.2.5. pac_InterruptInitialize

This function initializes a slot interrupt with the kernel. This initialization allows the slot to register an event and enable the interrupt.

Syntax

C++

```
BOOL pac_InterruptInitialize(
        BYTE slot
);
```

Parameters

slot

[in] Specify the index of slot to initialize.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE. To get extended error information, call pac_GetLastError.

Examples

This function has no examples.

Remarks

Default trigger type is level trigger.

For XP-8000 series, only support level trigger type.

If you want to get the registered event handle, please call this API, pac_GetSlotInterruptEvent.

2.2.6. pac_GetSlotInterruptEvent

This function retrieves the slot event handle which registered by pac_InterruptInitialize.

Syntax

C++

```
HANDLE pac_GetSlotInterruptEvent(
        BYTE slot
);
```

Parameters

slot

[in] Specifies the index of slot to retrieve the event handle.

Return Value

If the function succeeds, return the event handles.

If the function fails, the return value is NULL. To get extended error information, call pac_GetLastError.

Examples

This function has no examples.

2.2.7. pac_SetSlotInterruptEvent

This function allows a device driver to assign the slot event handle.

Syntax

C++

```
void pac_SetSlotInterruptEvent(
          BYTE slot,
          HANDLE hEvent
);
```

Parameters

slot

[in] Specifies the index of slot to assign the event handle.

hEvent

[in] Event to be signaled.

Return Value

This function does not return any value.

Examples

This function has no examples.

2.2.8. pac_SetTriggerType

This function assigns the pulse trigger type for separate slot.

Syntax

C++

```
void pac_SetTriggerType(
          BYTE slot,
          int iType
);
```

Parameters

iType

[in] Specifies the pulse trigger type.

0: Rising edge trigger(default)

1: Level trigger

2: Falling edge trigger

Return Value

This function does not return any value.

Examples

This function has no examples.

Remarks

For XP-8000 series, only support level trigger type.

2.2.9. pac_GetSlotInterruptID

This function retrieves the ID of the slot interrupt.

Syntax

C++

```
DWORD pac_GetSlotInterruptID(
        BYTE Slot
);
```

Parameters

slot

[in] Specifies the slot.

Return Value

If the function succeeds, the return value is the ID of the slot interrupt.

If the function fails, the return value is FALSE. To get extended error information, call pac_GetLastError.

Examples

This function has no examples.

2.2.10. pac_InterruptDone

This function signals to the kernel that interrupt processing has been completed.

Syntax

C++

```
void pac_InterruptDone(
        BYTE slot
);
```

Parameters

slot

[in] Specifies the slot to clear trigger.

Return Value

This function does not return any value.

Examples

[C]

```
HANDLE hIntr;
BOOL bExit = false;
BYTE slot=0;

DWORD INTP_Thread(PVOID pContext)
{
    while (bExit)
    {
            WaitForSingleObject(hIntr, INFINITE);

            // do something
            pac_InterruptDone(slot);
    }
    pac_EnableSlotInterrupt(slot, false);
    pac_SetSlotInterruptEvent( slot, NULL);
    CloseHandle(pac_GetSlotInterruptEvent(slot));
    return 0;
}

void CInterruptDlg::OnButton1()
{
    bExit = true;
    pac_InterruptInitialize(slot);
    pac_EnableSlotInterrupt(slot, true);
    hIntr = pac_GetSlotInterruptEvent(slot);
    CreateThread(NULL, 0, INTP_Thread, &slot, 0, NULL);
}
```

2.3. Memory Access API

The memory access functions provide the memory management that may be used for reading, writing EEPROM or SRAM, or mounting, ummounting MicroSD.

Supported PACs

The following list shows the supported PACs for each of the memory access functions.

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_GetMemorySize	Y	Y	-	Y	Y	Y	Y	Y	Y▲	Y	Y
pac_ReadMemory	Y	Y	-	Y	Y	Y	Y	Y	Y▲	Y	Y
pac_WriteMemory	Y	Y	-	Y	Y	Y	Y	Y	Y▲	Y	Y
pac_EnableEEPROM	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SDExists	-	-	-	-	-	Y	Y	-	Y	Y	Y
pac_SDMount	-	-	-	-	-	Y	Y	-	Y	Y	Y
pac_SDOnside	-	-	-	-	-	Y	Y	-	Y	Y	Y
pac_SDUnmount	-	-	-	-	-	Y	Y	-	Y	Y	Y

▲ WP-5xxx only supports the memory type 1 (EEPROM), not type 0 (SRAM).

Memory Access Functions

The following functions are used to retrieve or set the memory

PACSDK Functions	PACNET Functions	Description
pac_GetMemorySize	Memory.GetMemorySize	retrieves the size of the specified memory.
pac_GetRotaryID	Memory.ReadMemory	retrieves the position number of the rotary switch.
pac_WriteMemory	Memory.WriteMemory	stores data in the specified memory.
pac_EnableEEPROM	Memory.EnableEEPROM	retrieves the version number of the current PACSDK.dll.

2.3.1. pac_GetMemorySize

This function retrieves the size of the specified memory.

Syntax

C++

```
DWORD pac_GetMemorySize(
        int mem_type
);
```

Parameters

mem_type

[in] Handle to a currently type memory.

0:	PAC_MEM_SRAM
1:	PAC_MEM_EEPROM

Return Value

The return value specifies the memory size.

Examples

[C]

```
DWORD mem_size;
mem_size = pac_GetMemorySize(PAC_MEM_SRAM);
```

[C#]

```
uint mem_size;
int PAC_MEM_SRAM = 0;
int PAC_MEM_EEPROM = 1;
mem_size = PACNET.Memory.GetMemorySize(PAC_MEM_SRAM);
Console.WriteLine("The SRAM size is : " +mem_size.ToString() );

mem_size = PACNET.Memory.GetMemorySize(PAC_MEM_EEPROM);
Console.WriteLine("The EEPROM size is : "+mem_size.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//          The SRAM size is : 524288
//          The EEPROM size is : 16384
```

2.3.2. pac_ReadMemory

This function retrieves data from the specified memory.

Syntax

C++

```
BOOL pac_ReadMemory(
        DWORD address,
        LPBYTE lpBuffer,
        DWORD dwLength,
        int mem_type
);
```

Parameters

address

[in] Specifies the memory address where read from.

EEPROM

0 ~0x1FFF (8KB) for users

0x2000~0x3FFF (8KB) is reserved for the system

SRAM

The size of the input range for the SRAM is only 0 ~0x6FFFF (448KB), with another 64KB of SRAM is reserved for use by the system.

lpBuffer

[out] Receives the memory data.

dwLength

[in] Number of characters to be read.

mem_type

[in] Handle to a currently type memory.

0: PAC_MEM_SRAM

1: PAC_MEM_EEPROM

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE. To get extended error information, call pac_GetLastError.

Examples

[C]

```
#define LENGTH 2
bool ret;
DWORD address = 0;
BYTE Buffer[LENGTH];
ret = pac_ReadMemory(address, Buffer, LENGTH, PAC_MEM_SRAM);
```

[C#]

```
uint address = 0;    // the memory address where read from
byte[] Buffer = new byte[2];
PACNET.Memory.ReadMemory(address, Buffer, 2, 0);
Console.WriteLine("Buffer[0] = "+Buffer[0]+" , Buffer[1] = "+Buffer[1]);
Console.ReadLine();

// The example displays the following output to the console:
//            Buffer[0] = 37, Buffer[1] = 38
```

Remarks

If an older program is coded to write data to the 0x2000 ~ 0x3FFF address of the EEPROM, or to the last segment of the SRAM using the SDK version 2.0.1.0 or earlier, the program may fail to write the data to the EEPROM or the SRAM using the PACSDK.dll or PACNET.dll.

There are two ways to fix the problem

1. Modify the program so that the data is written to the 0~0x1FFF address of the EEPROM or the 0 ~ 0x6FFFF address of the SRAM.

2. Ask for the previous SDK from ICPDAS.

2.3.3. pac_WriteMemory

This function stores data in the specified memory.

Syntax

C++

```
BOOL pac_WriteMemory(
        DWORD address,
        LPBYTE lpBuffer,
        DWORD dwLength,
        int mem_type
);
```

Parameters

Address

[in] Specifies the memory address where write from.

EEPROM

0 ~0x1FFF (8KB) for users

0x2000~0x3FFF (8KB) is reserved for the system

SRAM

The size of the input range for the SRAM is only 0 ~0x6FFFF (448KB), with another 64KB of SRAM is reserved for use by the system.

lpBuffer

[in] A pointer to the buffer containing the data to be written to the memory.

dwLength

[in] Number of characters to be written.

mem_type

[in] Handle to a currently type memory.

0:	PAC_MEM_SRAM
1:	PAC_MEM_EEPROM

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE. To get extended error information, call pac_GetLastError.

Examples

[C]

```
#define LENGTH 2
bool ret;
DWORD address = 0;
BYTE Buffer[LENGTH];
Buffer[0] = 10;
Buffer[1] = 20;
ret = pac_WriteMemory(address, Buffer, LENGTH, PAC_MEM_SRAM);
```

[C#]

```
// Demonstrate how to store data(10 and 20) in the address 0~1 of SRAM.
uint address = 0;
byte[] Buffer = new byte[2] { 10, 20 };
int PAC_MEM_SRAM = 0;
PACNET.Memory.WriteMemory(address, Buffer, 2, PAC_MEM_SRAM);
```

Remarks

If an older program is coded to write data to the 0x2000 ~ 0x3FFF address of the EEPROM, or to the last segment of the SRAM using the SDK version 2.0.1.0 or earlier, the program may fail to write the data to the EEPROM or the SRAM using the PACSDK.dll or PACNET.dll.

There are two ways to fix the problem

1. Modify the program so that the data is writhen to the 0~0x1FFF address of the EEPROM or the 0 ~ 0x6FFFF address of the SRAM.

2. Ask for the previous SDK from ICPDAS.

2.3.4. pac_EnableEEPROM

This function sets the states of the EEPROM.

Syntax

C++

```
void pac_EnableEEPROM(
            BOOL bEnable
);
```

Parameters

bEnable

[in] Specifies the mode of the EEPROM.

True: To enable the writing for the EEPROM.

False: To disable the writing for the EEPROM.

Return Value

This function does not return any value.

Examples

[C]

```
#define LENGTH 2
int ret;
DWORD address = 0;
BYTE Buffer[LENGTH];
Buffer[0] =0xAB;
Buffer[1] =0xCD;
Int PAC_MEM_EEPROM = 1;
pac_EnableEEPROM(true);
ret = pac_WriteMemory(address, Buffer, LENGTH, PAC_MEM_EEPROM);
pac_EnableEEPROM(false) ;
```

[C#]

```
// Demonstrate how to store the data in the EEPROM.
uint address = 0;
byte[] Buffer = new byte[2] { 0xAB, 0xCD };
int PAC_MEM_EEPROM = 1;
PACNET.Memory.EnableEEPROM(true);
PACNET.Memory.WriteMemory(address, Buffer, (uint)Buffer.Length, PAC_MEM_EEPROM);
PACNET.Memory.EnableEEPROM(false);
```

Remarks

Before writing EEPROM, need turn on the EEPROM; after writing EEPROM, need turn off the EEPROM.

2.4. Watchdog API

Watchdog operations include basic management operations, such as turning on and refreshing. The following topics describe how you can operate watchdog programmatically by using the watchdog functions.

Supported PACs

The following list shows the supported PACs for each of the Watchdog functions.

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_EnableWatchDog	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_DisableWatchDog	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_RefreshWatchDog	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetWatchDogState	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetWatchDogTime	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetWatchDogTime	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y

Watchdog Functions

The following functions are used to retrieve or set the Watchdog.

PACSDK Functions	PACNET Functions	Description
pac_EnableWatchDog	Sys.WDT.EnableWatchDog	starts a watchdog operation.
pac_DisableWatchDog	Sys.WDT. DisableWatchDog	stops a watchdog operation.
pac_RefreshWatchDog	Sys.WDT. RefreshWatchDog	refreshes the watchdog.
pac_GetWatchDogState	Sys.WDT. GetWatchDogState	retrieves the watchdog state.
pac_GetWatchDogTime	Sys.WDT. GetWatchDogTime	retrieves the watchdog time.
pac_SetWatchDogTime	Sys.WDT. SetWatchDogTime	starts a watchdog operation.

2.4.1. pac_EnableWatchDog

This function starts a watchdog operation. Before you run the program which enabled watchdog, you have to enable EWF for protecting the system disk.

Syntax

C++

```
BOOL pac_EnableWatchDog(
        int wdt,
        DWORD value
);
```

Parameters

wdt

[in] Specifies the name of watchdog:

0 : Hardware watchdog(PAC_WDT_HW).

1 : OS watchdog(PAC_WDT_OS).

value

[in] Specifies the watchdog time.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE. To get extended error information, call pac_GetLastError.

Examples

[C]

```
DWORD second = 10;
bool ret;
ret = pac_EnableWatchDog(PAC_WDT_OS, second);
```

[C#]

```
// Enable the OS watchdog and set the reset time = 10 seconds.
int PAC_WDT_OS = 1;
uint second = 10;
bool ret_err;
ret_err = PACNET.Sys.WDT.EnableWatchDog(PAC_WDT_OS, second);
```

Remarks

The unit of the parameter: *value* for OS watchdog is second. In addition, the value cannot be zero.

(for XPAC series only)

The value of the parameter: *value* for hardware watchdog is limited to the range of 0~63 unit.

A unit is about 0.5 seconds. 0 means the shortest timeout, otherwise 63 is longest and it takes about 30 seconds.

2.4.2. pac_DisableWatchDog

This function stops a watchdog operation.

Syntax

C++

```
void pac_DisableWatchDog(
        int wdt
);
```

Parameters

wdt

[in] Specifies the Watchdog type:

0 : Hardware watchdog(PAC_WDT_HW).

1 : OS watchdog(PAC_WDT_OS).

Return Value

This function does not return any value.

Examples

[C]

```
pac_DisableWatchDog(PAC_WDT_OS);
```

[C#]

```
// Demonstrate how to disable the watchdog.
PACNET.Sys.WDT.EnableWatchDog(1, 10); // First enable the OS watchdog.
Console.WriteLine("Press any key to disable the watchdog in 10 Seconds.");
Console.ReadLine();
PACNET.Sys.WDT.DisableWatchDog(1);
```

2.4.3. pac_RefreshWatchDog

This function refreshes the watchdog.

Syntax

C++

```
void pac_RefreshWatchDog(
            int wdt
);
```

Parameters

wdt

[in] Specifies the Watchdog type:

0 : Hardware watchdog(PAC_WDT_HW).

1 : OS watchdog(PAC_WDT_OS).

Return Value

This function does not return any value.

Examples

[C]

```
pac_RefreshWatchDog(PAC_WDT_OS);
```

[C#]

```
// Demonstrate how to refresh the watchdog.
PACNET.Sys.WDT.EnableWatchDog(1, 10); // First enable the OS watchdog.
while (true)
{
        Console.WriteLine("Press any key to refresh the watchdog in 10 Seconds.");
        Console.ReadLine();
        PACNET.Sys.WDT.RefreshWatchDog(1);
}
```

2.4.4. pac_GetWatchDogState

This function retrieves the watchdog state.

Syntax

C++

```
BOOL pac_GetWatchDogState(
          int wdt
);
```

Parameters

wdt

[in] Specifies the Watchdog type:

0 : Hardware watchdog(PAC_WDT_HW).

1 : OS watchdog(PAC_WDT_OS).

Return Value

If the watchdog is turning on and the return value is TRUE. Otherwise, the return value is FALSE.

Examples

[C]

```
BOOL bState;
bState = pac_GetWatchDogState(PAC_WDT_OS);
```

[C#]

```
bool bState;
bState = PACNET.Sys.WDT.GetWatchDogState(1);
Console.WriteLine("The state of the watchdog is "+bState.ToString());
Console.ReadLine();

// If the watchdog is enabled, the output to the console is as below:
//              The state of the watchdog is true
// If the watchdog is disabled, the output to the console is as below:
//              The state of the watchdog is false
```

2.4.5. pac_GetWatchDogTime

This function retrieves the watchdog time.

Syntax

C++

```
DWORD pac_GetWatchDogTime(
          int wdt
);
```

Parameters

wdt

[in] Specifies the Watchdog type:

0 : Hardware watchdog(PAC_WDT_HW).

1 : OS watchdog(PAC_WDT_OS).

Return Value

The return value is the watchdog time which has been assigned by pac_EnableWatchDog or pac_SetWatchDogTime.

For OS watchdog, the unit of the return value is second, and for hardware watchdog, the return value is between 0~63.

Examples

[C]

```
DWORD dwTime;
dwTime = pac_GetWatchDogTime(PAC_WDT_OS);
```

[C#]

```
uint uTime;
uTime = PACNET.Sys.WDT.GetWatchDogTime(1);
Console.WriteLine("The watchdog time is " + uTime.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//              The watchdog time is 10
```

2.4.6. pac_SetWatchDogTime

This function starts a watchdog operation.

The unit of the parameter: *value* for OS watchdog is second. In addition, the value cannot be zero.

The value of the parameter: *value* for hardware watchdog is limited to the range of 0~63 unit. A unit is about 0.5 seconds. 0 means the shortest timeout, otherwise 63 is longest and it takes about 30 seconds.

Syntax

C++

```
BOOL pac_SetWatchDogTime(
        int wdt,
        DWORD value
);
```

Parameters

wdt

[in] Specifies the Watchdog type:

0 : Hardware watchdog(PAC_WDT_HW).

1 : OS watchdog(PAC_WDT_OS).

value

[in] Specifies the watchdog time.

Return Value

This function does not return any value.

Examples

[C]

```
DWORD dwTime = 1000;
pac_SetWatchDogTime(PAC_WDT_OS, dwTime);
```

[C#]

```
// Set the OS watchdog time = 10 seconds.
uint uTime = 10;
int PAC_WDT_OS = 1;
PACNET.Sys.WDT.SetWatchDogTime(PAC_WDT_OS, uTime);
```

Remarks

The same as the pac_EnableWatchDog function.

The unit of the parameter: *value* for OS watchdog is second. In addition, the value cannot be zero.

(for XPAC series only)

The value of the parameter: *value* for hardware watchdog is limited to the range of 0~63 unit. A unit is about 0.5 seconds. 0 means the shortest timeout, otherwise 63 is longest and it takes about 30 second.

2.5. UART API

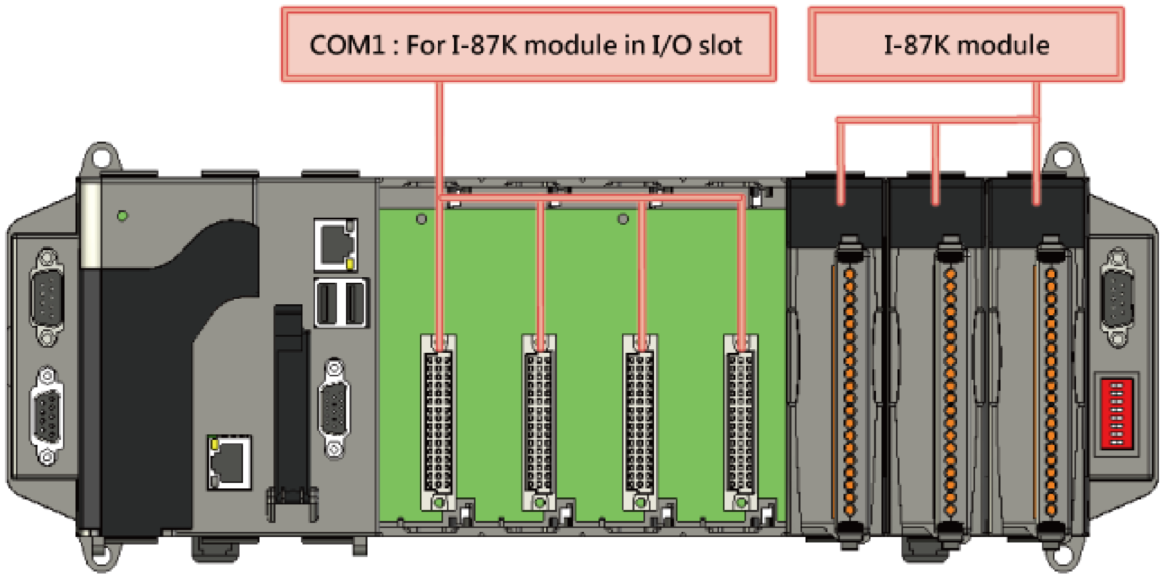
Uart operations include basic management operations, such as opening, sending, receiving, and closing. The following topics describe how you can operate uart programmatically using the uart functions.

Remarks

We provide several COM port functions (uart_Send/uart_Recv…) to communicate with ICPDAS modules (High profile I-87K series, I-811xW/I-814xW series, I-7000 series). All the functions are based on standard COM port API functions in C++ (CreateFile/CloseHandle/WriteFile/ReadFile /GetCommModemStatus…..).

Use these functions of this section to communicate with I-87K.

XPAC



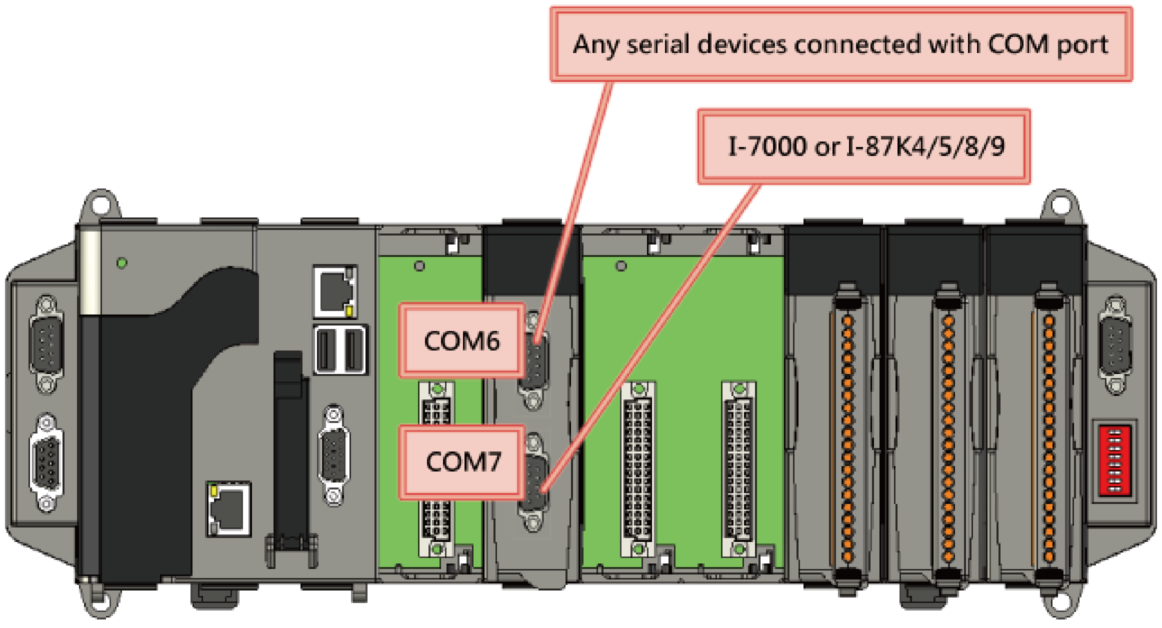
When a high profile I-87K is plugged in slot, please call the function, pac_ChangeSlot, to change to the specific slot before doing other operations. Please refer to demo "87k_Basic".

About I-87K commands (DCON protocol), please refer
http://ftp.icpdas.com/pub/cd/8000cd/napdos/dcon/io_module/87k_high_profile_modules.htm

Although user can use UART API to set and read values for high profile I-87K series modules, we provide a more convenient API to do it. Please refer to Section 6 PAC_IO API

Use these functions of this section to communicate with external devices by I-811xW/I-814xW serises modules.

XPAC



PC

The PC has no slots for plugging the high profile I-8K and I-87K series, but the UART API on this section can also be used for the COM ports of PC.
To see more information, please reference user manual - Chapter 5 API and Demo Reference.

Supported PACs

The following list shows the supported PACs for each of the UART functions.

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
uart_Open	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_Close	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_SendExt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_Send	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_RecvExt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_Recv	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_SendCmdExt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_SetTimeOut	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_EnableCheckSum	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_SetTerminator	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_BinSend	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_BinRecv	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_BinSendCmd	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_GetLineStatus	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
uart_GetDataSize	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_SetLineStatus	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y

UART Functions

The following functions are used to retrieve or set the UART.

PACSDK Functions	PACNET Functions	Description
uart_Open	UART.Open	opens the COM port and specifies the baud rate, parity bits, data bits, and stop bits.
uart_Close	UART.Close	closes the COM port which has been opened.
uart_SendExt	UART.SendExt	sends data as a string through the COM port which has been opened.
uart_Send	UART.Send	sends data through the COM port which have been opened.
uart_RecvExt	UART.RecvExt	receives a string+0x0D. A [0x0D] character is assigned to terminate the string.
uart_Recv	UART.Recv	retrieves data through the COM port which has been opened.
uart_SendCmdExt	UART.SendCmdExt	sends commands through the COM port which has been opened.
uart_SetTimeOut	UART.SetTimeOut	sets the time out timer.
uart_EnableCheckSum	UART.EnableCheckSum	turns on the check sum or not.
uart_SetTerminator	UART.SetTerminator	sets the terminate characters.
uart_BinSend	UART.BinSend	sends out command string with or without null character under the consideration of the command length.
uart_BinRecv	UART.BinRecv	receives the response string data with or without null character under the consideration of receiving length.
uart_BinSendCmd	UART.BinSendCmd	sends binary command and receive binary data with the fixed length.
uart_GetLineStatus	UART.GetLineStatus	retrieves the modem control-register values.

uart_GetDataSize	UART.GetDataSize	retrieves the number of bytes received by the serial provider but not yet read by a uart_Recv operation, or of user data remaining to transmitted for write operations.
uart_SetLineStatus	UART.SetLineStatus	sets the status of modem line.

2.5.1. uart_Open

This function opens the COM port and specifies the baud rate, parity bits, data bits, and stop bits.

Syntax

C++

```
HANDLE uart_Open(
        LPCSTR ConnectionString
);
```

Parameters

connectionString

[in] Specifies the COM port, baud rate, parity bits, data bits, and stop bits.

The default setting is COM1,115200,N,8,1.

The format of ConnectionString is as follows:

“com_port, baud_rate, parity_bits, data_bits, stop_bits”

Warning: there is no blank space between each parameter.

Com_port:

XPAC: COM1, COM2……

WinPAC: COM0, COM1……

baud_rate:

1200/2400/4800/9600/19200/38400/57600/115200

parity_bits:

'N' = NOPARITY

'O' = ODDPARITY

'E' = EVENPARITY

'M' = MARKPARITY

'S' = SPACEPARITY

Data_bits:

5/6/7/8

Stop_bits:

"1" = ONESTOPBIT

"2" = TWOSTOPBITS

"1.5" = ONE5STOPBITS

Return Values

A handle to the open COM port.

Nonzero indicates success.

If the function fails, the return value is INVALID_HANDLE_VALUE. (INVALID_HANDLE_VALUE should be 0xffffffff in C/C++/MFC. INVALID_HANDLE_VALUE should be -1 in .NET.)

To get extended error information, call pac_GetLastError. To get a generic description of the error, call pac_GetErrorMessage. The message resource is optional; therefore, if you call pac_GetErrorMessage it could fail.

Examples

[C]

```
HANDLE hOpen;
hOpen = uart_Open("COM1,9600,N,8,1");
```

[C#]

```
IntPtr hOpen;
hOpen = PACNET.UART.Open("COM1,9600,N,8,1");
if (hOpen.ToString() != "-1")
    Console.WriteLine("Open COM1 success!");
else
    Console.WriteLine("Open COM1 fail!");
Console.ReadLine();

// The example displays the following output to the console if open successfully:
//          Open COM1 success!
// Otherwise:
//          Open COM1 fail!
```

Remarks

The uart_Open function does not open the specified COM port if the COM port has been opened.

[Use I-811xW/I-814xW series modules]

The COM port name is COM6/COM7/.

For example:

uart_Open("COM6,9600,N,8,1");

About how to set I-811xW/I-814xW series modules, Please refer to the manual below: wes2-011-03_how_to_set_up_multi_port_modules_tc.pdf

[Use I-87K series modules]

Only use COM1 to communicate with I-87K series modules. Please refer to Sec.5 UART API.

2.5.2. uart_Close

This function closes the COM port which has been opened.

Syntax

C++

```
BOOL uart_Close(
        HANDLE hPort
);
```

Parameters

hPort

[in] The handle to the opened COM port to close.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
BOOL ret;
HANDLE hOpen;
hOpen = uart_Open("COM1,9600,N,8,1");
ret = uart_Close(hOpen);
```

[C#]

```
bool ret;
IntPtr hOpen;
hOpen = PACNET.UART.Open("COM1,9600,N,8,1");
ret = PACNET.UART.Close(hOpen);

if (ret)
    Console.WriteLine("Close COM1 success!");
else
    Console.WriteLine("Close COM1 fail!");
Console.ReadLine();

// The example displays the following output to the console if close successfully:
//            Close COM1 success!
// Otherwise:
//            Close COM1 fail!
```

Remarks

The function for a specified COM port should not be used after it has been closed.

2.5.3. uart_SendExt

This function sends data as a string through the COM port which has been opened.

When the checksum is enabled by using uart_EnableCheckSum function, the two bytes of the checksum is automatically added to the string, and the character [0x0D] is added to the end of the string to terminate the string (buf).

This function replaces the uart_Send function.

Syntax

C++

```
BOOL uart_SendExt(
        HANDLE hPort,
        LPCSTR buf,
        DWORD out_Len
);
```

Parameters

hPort

[in] Handle to the opened COM port.

buf

[in] A point to a buffer containing the data to be transmitted.

out_Len

[in] A pointer to a variable that specifies the size, in bytes, of the data in buffer pointed to by the *buf* parameter.

Return Value

If the function succeeds, the return value is TRUE, otherwise FALSE

Examples

[C]

```
BOOL ret;
HANDLE hOpen;
char buf[Length];
sprintf(buf,"abcd");
hOpen = uart_Open("COM1,9600,N,8,1");
ret = uart_SendExt(hOpen, buf, Length);
uart_Close(hPort);
```

[C#]

```
bool ret;
IntPtr hPort;
string buf;
buf = "abcd";
hPort = PACNET.UART.Open("COM1,9600,N,8,1");
ret = PACNET.UART.SendExt(hPort, PACNET.MISC.AnsiString(buf), (uint)buf.Length);
PACNET.UART.Close(hPort);
```

Remarks

The terminate characters is 0x0D. (Refer to uart_SetTerminator function to change.)

This function will call PurgeComm() to clear serial COM port output buffer.

This function sends data with a terminate character 0x0D. For example:

Check sum is disabled. The “buf” are five bytes (ABCD+0x0). This function will send five bytes (ABCD+0x0D).

2.5.4. uart_Send

This function sends data through the COM port which have been opened.

This function will send a string. If the checksum is enabled by the uart_EnableCheckSum function, this function automatically adds the two checksum bytes to the string. And then the end of sending string is further added [0x0D] to mean the termination of the string(buf).

Syntax

C++

```
BOOL uart_Send(
        HANDLE hPort,
        LPCSTR buf
);
```

Parameters

hPort

[in] Handle to the opened COM port.

buf

[in] A point to a buffer containing the data to be transmitted.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FLASE.

Examples

[C]

```
BOOL ret;
HANDLE hPort;
char buf[4];
sprintf(buf,"abcd");
hPort = uart_Open("COM2,9600,N,8,1");
ret = uart_Send(hPort, buf);
uart_Close(hPort);
```

[C#]

```
bool ret;
IntPtr hPort;
string buf;
buf = "abcd";
hPort = PACNET.UART.Open("COM1,9600,N,8,1");
ret = PACNET.UART.Send(hPort, PACNET.MISC.AnsiString(buf));
PACNET.UART.Close(hPort);
```

Remarks

The terminate characters is 0x0D. (Refer to uart_SetTerminator function to change.)

This function will call PurgeComm() to clear serial COM port output buffer.

This function sends data with a terminate character 0x0D. For example:

Check sum is disabled. The “buf” are five bytes (ABCD+0x0). This function will send five bytes (ABCD+0x0D).

2.5.5. uart_RecvExt

This function receives a string+0x0D. A [0x0D] character is assigned to terminate the string.

This function is not called when the checksum is enabled by using uart_EnableCheckSum function which includes the terminate character [0x0D].

This function replaces uart_Recv. The uart_Recv can cause the buffer overflow in some situation.

Syntax

C++

```
BOOL uart_RecvExt(
        HANDLE hPort,
        LPSTR buf,
        DWORD in_Len
);
```

Parameters

hPort

[in] Handle to the opened COM port.

buf

[out] A pointer to a buffer that receives data.

in_Len

[in] A pointer to a variable that specifies the size, in bytes, of the data in buffer pointed to by the *buf* parameter.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

If the function doesn’t receive a character 0x0D, the other data still store to “buf” but the return value is FALSE. Calling pac_GetLastError function will get an error code (PAC_ERR_UART_READ_TIMEOUT)

If this function to receive the actual data size is larger than the buffer length of buf, it will return FALSE. Calling pac_GetLastError function will get an error code (PAC_ERR_UART_INTERNAL_BUFFER_OVERFLOW)

Examples

[C]

```
BOOL ret;
HANDLE hOpen;
char buf[Length];
hOpen = uart_Open("COM1,9600,N,8,1");
ret = uart_RecvExt(hOpen, buf, Length);
```

[C#]

```
bool ret;
IntPtr hOpen;
byte[] result = new byte[64];
hOpen = PACNET.UART.Open("COM3,9600,N,8,1");
ret = PACNET.UART.RecvExt(hOpen, result, 64);
if (ret)
    Console.WriteLine(PACNET.MISC.WideString(result));
Console.ReadLine();
```

Remarks

The terminate characters is 0x0D. (Refer to uart_SetTerminator function to change.)

For example:

a. Check sum is disabled. This function receives five bytes (ABCD+0x0D). The “buf” will be five bytes (ABCD+0x0).

b. Check sum is enable. This function receives four bytes (ABCD). The “buf” will be four bytes (ABCD). But the reurn value is 0.

2.5.6. uart_Recv

This function retrieves data through the COM port which has been opened.

This function will receive a string+0x0D. Wait a character [0x0D] to mean the termination of a string. And then if the checksum is enabled by the uart_EnableCheckSum function, this function automatically checks the two checksum bytes to the string. This function will provide a string without the last byte[0x0D].

Syntax

C++

```
BOOL uart_Recv(
        HANDLE hPort,
        LPSTR buf
);
```

Parameters

hPort

[in] Handle to the open COM port.

buf

[out] A pointer to a buffer that receives data.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

If this function doesn't receive a character0x0D, the other data still store to "buf" but the return value is 0. Calling pac_GetLastError function will get an error code (pac_ERR_uart_READ_TIMEOUT).

Examples

[C]

```
BOOL ret;
HANDLE hPort;
char buf[10];
hPort = uart_Open("COM2,9600,N,8,1");
ret = uart_Recv(hPort, buf);
uart_Close(hPort);
```

[C#]

```
bool ret;
IntPtr hPort;
byte[] result = new byte[64];
hPort = PACNET.UART.Open("COM3,9600,N,8,1");
ret = PACNET.UART.Recv(hPort, result);
if (ret)
    Console.WriteLine(PACNET.MISC.WideString(result));
Console.ReadLine();
PACNET.UART.Close(hPort);
```

Remarks

The terminate characters is 0x0D. (Refer to uart_SetTerminator function to change.)

For example:

a. Check sum is disabled. This function receives five bytes (ABCD+0x0D). The “buf” will be five bytes (ABCD+0x0).

b. Check sum is enabled. This function receives four bytes (ABCD). The “buf” will be four bytes (ABCD). But the reurn value is 0.

2.5.7. uart_SendCmdExt

This function sends commands through the COM port which has been opened.

This function is a combination of uart_SendExt and uart_RecvExt.

The operation for sending a command is the same as uart_SendExt.

The operation for receiving a response is the same as uart_RecvExt.

This function replaces uart_SendCmd. The uart_SendCmd can cause the buffer overflow in some situation.

Syntax

C++

```
BOOL uart_SendCmdExt(
        HANDLE hPort,
        LPCSTR cmd,
        DWORD out_Len,
        LPSTR szResult,
        DWORD in_Len
);
```

Parameters

hPort

[in] Handle to the opened COM port.

cmd

[in] A pointer to a command.

out_Len

[in] A pointer to a variable that specifies the size, in bytes, of the data pointed to by the *cmd* parameter.

szResult

[out] A pointer to a buffer that receives data.

in_Len

[in] A pointer to a variable that specifies the size, in bytes, of the data in buffer pointed to by the *szResult* parameter.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
BOOL ret;
HANDLE hOpen;
char buf[Length];
hOpen = uart_Open("COM1,9600,N,8,1");
ret = uart_SendCmdExt(hOpen,"$00M", 4, buf, Length);      // $00M: ask the device name
uart_Close(hPort);
```

[C#]

```
bool ret;
IntPtr hOpen;
string buf= "$00M"; // read module name
byte[] cmd = new byte[64];
byte[] result = new byte[64];
hOpen = PACNET.UART.Open("COM1,115200,N,8,1");
cmd= PACNET.MISC.AnsiString(buf);
ret = PACNET.UART.SendCmdExt(hOpen,cmd, 64, result, 64);
if (ret)
    Console.WriteLine();
Console.ReadLine();
```

Remarks

This function calls PurgeComm() to clear serial COM port input and output buffer.

Refer to Remarks of uart_SendExt/uart_RecvExt for more details.

2.5.8. uart_SetTimeOut

This function sets the time out timer.

Syntax

C++

```
void uart_SetTimeOut(
          HANDLE hPort,
          DWORD msec,
          int ctoType
);
```

Parameters

hPort

[in] Handle to the opened COM port.

msec

[in] Millisecond to the timer.

ctoType

[in] Specifies the timer type of time out as following:

0 : CTO_TIMEOUT_ALL

1 : CTO_READ_RETRY_TIMEOUT

2 : CTO_READ_TOTAL_TIMEOUT

3 : CTO_WRITE_TOTAL_TIMEOUT

Return Value

This function has does not return a value.

Examples

[C]

```
HANDLE hOpen;
DWORD mes;
hOpen = uart_Open("COM1,9600,N,8,1");
mes = 300;
uart_SetTimeOut(hOpen, mes, CTO_TIMEOUT_ALL);
uart_Close(hOpen);
```

[C#]

```
IntPtr hOpen;
uint msc;
hOpen = PACNET.UART.Open("COM1,9600,N,8,1");
msc = 300;
PACNET.UART.SetTimeOut(hOpen, msc, 0);
PACNET.UART.Close(hOpen);
```

Remarks

CTO_READ_TOTAL_TIMEOUT:

A constant used to calculate the total time-out period for read operations, in milliseconds.

A value of zero for the CTO_READ_TOTAL_TIMEOUT indicates that total time-outs are not used for read operations.

CTO_WRITE_TOTAL_TIMEOUT:

A constant used to calculate the total time-out period for write operations, in milliseconds.

A value of zero for the CTO_WRITE_TOTAL_TIMEOUT indicates that total time-outs are not used for write operations.

CTO_READ_RETRY_TIMEOUT:

A constant used to calculate the time-out period for read operations, in system tick count.

CTO_TIMEOUT_ALL:

A constant used to calculate the total time-out period for write and read operations, in milliseconds.

A value of zero for the CTO_TIMEOUT_ALL indicates that total time-outs are not used for write and read operations.

2.5.9. uart_EnableCheckSum

This function turns on the check sum or not.

Add two checksum bytes to the end of the data which is used to produce checksum.

Syntax

C++

```
void uart_EnableCheckSum(
        HANDLE hPort,
        BOOL bEnable
);
```

Parameters

hPort

[in] Handle to the opened COM port.

bEnable

[in] Decide the check sum turning on or not.

Default is disabled.

Return Value

This function does not return any value.

Examples

[C]

```
HANDLE hUart;
char result[32];
hUart = uart_Open("");
uart_EnableCheckSum(hUart , true);
pac_ChangeSlot(1);
uart_SendCmd(hUart, "$00M", result);
```

[C#]

```
byte[] result = new byte[32];
IntPtr hPort = PACNET.UART.Open("COM1,115200,N,8,1");
PACNET.UART.EnableCheckSum(hPort, true);
PACNET.Sys.ChangeSlot(1);
PACNET.UART.SendCmd(hPort, PACNET.MISC.AnsiString("$00M"), result);
Console.WriteLine(PACNET.MISC.WideString(result));
Console.ReadLine();
```

2.5.10. uart_SetTerminator

This function sets the terminate characters.

Syntax

C++

```
void uart_SetTerminator(
        HANDLE hPort,
        LPCSTR szTerm
);
```

Parameters

hPort

[in] Handle to the opened COM port.

szTerm

[in] Pointer the terminate characters.

Default is CR.

Return Value

This function does not return any value.

Examples

[C]

```
HANDLE hPort;
char result[32];
hPort = uart_Open("");      // Open COM1, data format: 115200,N,8,1
uart_SetTerminator(hPort, "\r");
pac_ChangeSlot(1); //An I-87K module is in slot 1.
uart_SendCmd(hPort, "$00M", result); // $00M: ask the device name,DCON
uart_Close(hPort);
```

[C#]

```
byte[] result = new byte[32];
IntPtr hPort = PACNET.UART.Open("");      // Open COM1, data format: 115200,N,8,1
PACNET.UART.SetTerminator(hPort, PACNET.MISC.AnsiString("\r"));
PACNET.Sys.ChangeSlot(1); // An I-87K module is in slot 1.
// $00M: ask the device name, DCON
PACNET.UART.SendCmd(hPort, PACNET.MISC.AnsiString("$00M"), result);
Console.WriteLine( PACNET.MISC.WideString(result));
Console.ReadLine();
PACNET.UART.Close(hPort);
```

Remarks

This function relates to uart_Send/uart_Recv/uart_SendCmd.

2.5.11. uart_BinSend

Send out the command string by fix length, which is controlled by the Parameter “in_Len”. The difference between this function and uart_Send is that uart_BinSend terminates the sending process by the string length “in_Len” instead of the character "CR"(Carry return). Therefore, this function sends out command string with or without null character under the consideration of the command length. Besides, because of this function without any error checking mechanism (Checksum, CRC, LRC... etc.), users have to add the error checking information to the raw data by themselves if communication checking system is required.

Syntax

C++

```
BOOL uart_BinSend(
    HANDLE hPort,
    LPCSTR buf,
    DWORD in_Len
);
```

Parameters

hPort

[in] Handle to the opened COM port.

buf

[in] A point to a buffer containing the data to be transmitted.

in_Len

[in] The length of result string.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
bool ret;
HANDLE hPort;
char buf[2];
buf[0] = 0x41;
buf[1] = 0x42;
hPort = uart_Open("COM4,9600,N,8,1");
ret = uart_BinSend(hPort, buf, 2);
uart_Close(hPort);
```

[C#]

```
bool ret;
IntPtr hPort;
string buf = "AB";
hPort = PACNET.UART.Open("COM3,9600,N,8,1");
ret = PACNET.UART.BinSend(hPort, PACNET.MISC.AnsiString(buf), 2);
PACNET.UART.Close(hPort);
```

Remarks

Note that this function is usually applied to communicate with the other device, but not for ICPDAS DCON (I-7000/8000/87K) series modules.

This function will call PurgeComm() to clear serial COM port output buffer.

2.5.12. uart_BinRecv

This function is applied to receive the fix length response. The length of the receiving response is controlled by the Parameter “in_Len”. The difference between this function and uart_Recv is that uart_BinRecv terminates the receiving process by the string length “in_Len” instead of the character "CR"(Carry return). Therefore, this function receives the response string data with or without null character under the consideration of receiving length. Besides, because of this function without any error checking mechanism (checksum, CRC, LRC... etc.), users have to remove the error checking information from the raw data by themselves if communication checking system is used.

Syntax

C++

```
bool uart_BinRecv(
    HANDLE hPort,
    LPSTR buf,
    DWORD in_Len
);
```

Parameters

hPort

[in] Handle to the open COM port.

buf

[out] A pointer to a buffer that receives the data.

in_Len

[in] The length of result string.

Return Value

If the function succeeds, the return value is True.

If the function fails, the return value is False.

Examples

[C]

```
bool ret;
    HANDLE hPort;
    char buf[2];
    hPort = uart_Open("COM4,9600,N,8,1");
    ret = uart_BinSend(hPort, "AB", 2);
    ret = uart_BinRecv(hPort, buf, 2);
uart_Close(hPort);
```

[C#]

```
bool ret;
IntPtr hPort;
byte[] buf = new byte[100];
hPort = PACNET.UART.Open("COM4,9600,N,8,1");
ret = PACNET.UART.BinSend(hPort, PACNET.MISC.AnsiString("AB"), 2);
ret = PACNET.UART.BinRecv(hPort, buf,2);
PACNET.UART.Close(hPort);
Console.WriteLine(PACNET.MISC.WideString(buf));
Console.ReadLine();
```

Remarks

Note that this function is usually applied to communicate with the other device, but not for ICPDAS DCON (I-7000/8000/87K) series modules.

2.5.13. uart_BinSendCmd

This function sends binary command and receive binary data with the fixed length.

This function is a combination of uart_BinSend and uart_BinRecv.

The operation for sending a command is the same as uart_BinSend.

The operation for receiving a response is the same as uart_BinRecv.

Syntax

C++

```
bool uart_BinSendCmd(
    HANDLE hPort,
    LPCSTR ByteCmd,
    DWORD in_Len,
    LPSTR ByteResult,
    DWORD out_Len
);
```

Parameters

hPort

[in] Handle to the opened COM port.

ByteCmd

[in] A pointer to a command.

in_Len

[in] The length of the command string.

ByteResult

[out] A pointer to a buffer that receives the data.

out_Len

[in] The length of the result string.

Return Value

If the function succeeds, the return value is True.

If the function fails, the return value is False.

Examples

[C]

```
bool ret;
HANDLE hPort;
char buf[2];
char cmd[2];
hPort = uart_Open("COM4,9600,N,8,1");
cmd[0] = 0x41;
cmd[1] = 0x42;
ret = uart_BinSendCmd( hPort, cmd, 2, buf, 2);
uart_Close(hPort);
```

[C#]

```
bool ret;
byte[] cmd = new byte[2];
IntPtr hPort;
byte[] buf = new byte[2];
cmd[0] = 0x41;
cmd[1] = 0x42;
hPort = PACNET.UART.Open("COM4,9600,N,8,1");
ret = PACNET.UART.BinSendCmd(hPort, cmd, 2, buf, 2);
PACNET.UART.Close(hPort);
```

Remarks

This function will call PurgeComm() to clear serial COM port output and input buffer.

2.5.14. uart_GetLineStatus

This function retrieves the modem control-register values.

Syntax

C++

```
BOOL uart_GetLineStatus(
    HANDLE hPort,
    int pin
);
```

Parameters

hPort

[in] Handle to the opened COM port.

pin

[in] A variable specifies state of a pin of the COM port.

This parameter can be following values:

0: #define CTS

1: #define DSR

2: #define RI

3: #define CD

Return Value

TRUE indicates the state of the pin is ON.

False indicates OFF.

Examples

[C]

```
HANDLE hPort = uart_Open(“COM5,115200,N,8,1”);
BOOL ret = uart_GetLineStatus(hPort, DSR);      //the pin, DSR, for example
if(ret)
printf(“The status of DSR is ON\n”);
else
printf(“The status of DSR is OFF\n”);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort = PACNET.UART.Open("COM4,115200,N,8,1");
//the pin, DSR, for example
uint ret = PACNET.UART.GetLineStatus(hPort, PACNET.UART.DSR);
if(ret == 1)
        Console.WriteLine("The status of DSR is ON");
else
        Console.WriteLine("The status of DSR is OFF");
Console.ReadLine();
PACNET.UART.Close(hPort);
```

2.5.15. uart_GetDataSize

This function retrieves the number of bytes received by the serial provider but not yet read by a uart_Recv operation, or of user data remaining to transmitted for write operations.

Syntax

C++

```
BOOL uart_GetDataSize(
    HANDLE hPort,
    int data_type
);
```

Parameters

hPort

[in] Handle to the opened COM port.

data_type

[in] A value specifies to retrieve in or out buffer.

This parameter can be following values:

0: #define IN_DATA

1: #define OUT_DATA

Return Value

The number of bytes in/out buffer but not yet read/write.

2.5.16. uart_SetLineStatus

This function sets the status of modem line.

Syntax

C++

```
DWORD uart_SetLineStatus(
    HANDLE hPort,
    int pin,
    int mode
);
```

Parameters

hPort

[in] Handle to the open COM port.

pin

[in] A variable specifies state of a pin of the COM port.

This parameter can be following values:

1: #define DTR

2: #define RTS

3: #define DTR + RTS

mode

[in] 0: Disable, Set the pin signal to be OFF.

1: Enable, Set the pin signal to be ON.

Return Value

If the function succeeds, the return value is nonzero.

If the function fails, the return value is zero.

To get an error code, call pac_GetLastError.

Examples

[C]

```
HANDLE hPort = uart_Open("COM5,9600,N,8,1"); //DTR pin on COM5 of XPAC
//HANDLE hPort = uart_Open("COM4,9600,N,8,1"); // DTR pin on COM4 of WinPAC
uart_SetLineStatus(hPort, 1, 1); // set DTR to ON
uart_Close(hPort);
```

[C#]

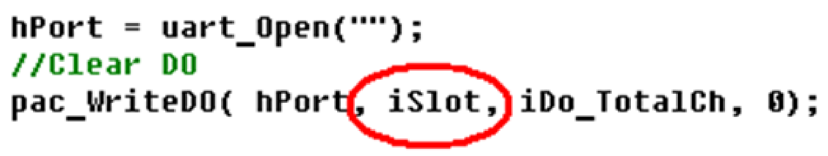
```
IntPtr hPort = PACNET.UART.Open("COM5,9600,N,8,1");//DTR pin on COM5 of XPAC
//IntPtr hPort = PACNET.UART.Open("COM4,9600,N,8,1"); // DTR pin on COM4 of WinPAC
PACNET.UART.SetLineStatus(hPort, 1, 1);     // set DTR to ON
PACNET.UART.Close(hPort);
```

2.6. PAC_IO API

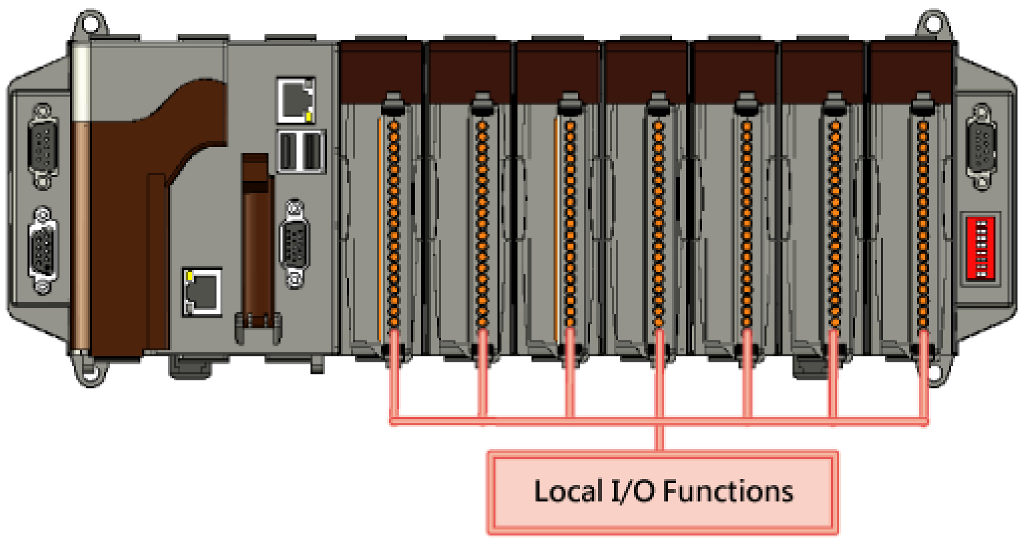
PAC_IO API supports to operate IO modules, which can be divided into the following parts:

Local (IO in slot)

In the local mode, the slot range is from 1 to 7, and it's the same as the iSlot as follow.

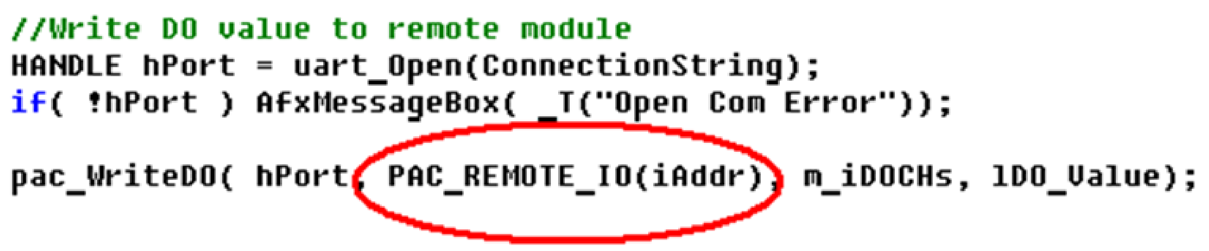


```
hPort = uart_Open("");
//Clear DO
pac_WriteDO( hPort, iSlot, iDo_TotalCh, 0);
```

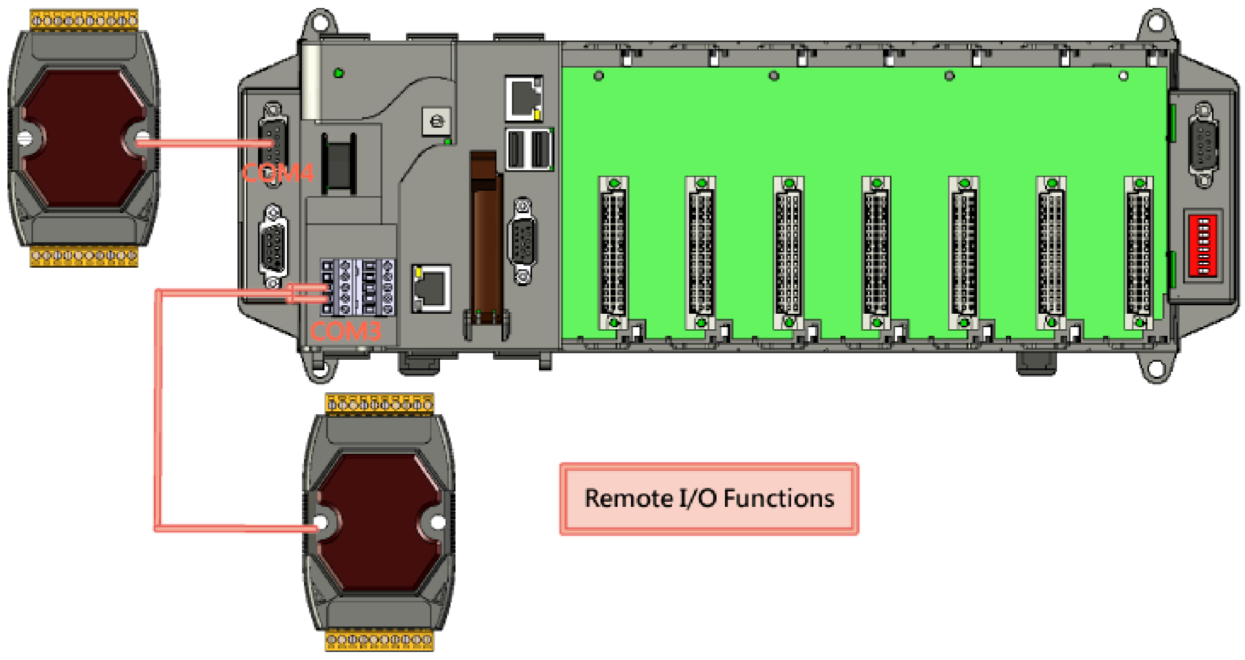


Remote

If the module is in the remote mode, the address need call a macro, PAC_REMOTE_IO. And its range is from 0 to 255. For example as follow:



```
//Write DO value to remote module
HANDLE hPort = uart_Open(ConnectionString);
if( !hPort ) AfxMessageBox( _T("Open Com Error"));

pac_WriteDO( hPort, PAC_REMOTE_IO(iAddr), m_iDOCHs, lDO_Value);
```



In PACSDK.dll, modify the processing to send the DCON commands without determining the module name, the new PAC_IO API functions can support to access the I-87K/I-8K(High profile and Low profile), I-7K, I-8000 units, tM series, and etc DCON modules.

You also need to know the expansion capacities in order to choose the best expansion module for achieving maximal efficiency.
For more information about expansion modules that are compatible with the XPAC/WinPAC series, please refer to

I-8K/I-87K series
http://www.icpdas.com/products/PAC/i-8000/8000_IO_modules.htm

I-7K series
http://www.icpdas.com.tw/product/solutions/remote_io/rs-485/i-7000&m-7000/i-7000_introduction.html

I-8K units
http://www.icpdas.com.tw/product/solutions/pac/ipac/ipac_introduction.html

tM series
http://www.icpdas.com/products/Remote_IO/tm-series/introduction.htm

API functions for theMulti-function DCON modules

PAC_IO API has provided 2 types functions. One type which includes pac_WriteDO, pac_ReadDIO, pac_ReadDI, pac_ReadDO, pac_ReadDIO_DIBit, pac_ReadDIO_DOBit, pac_ReadDIBit, pac_ReadDOBit, pac_ReadDICNT and pac_ClearDICNT functions is used to access the pure DIO DCON modules, which are defeind as modules that only has DI/DO or DIO channels.
The other type which includes pac_WriteDO_MF, pac_ReadDIO_MF and pac_ReadDI_MF, etc functions is used to access the Multi-function DCON modules, which are defined as modules that mainly act as AIO or Counters but are equipped with DIO channels. Such as the I-87005W/I-87016W/I-87082W/I-7016/I-7088, etc.)

The instructions of two fucntions (i.e. pac_WriteDO and pac_WriteDO_MF) are placed on the same section because of the definition of the parameters and Return Value of this pair of functions are the same..

The functions used to access the pure DIO DCON modules cannot be used to access Multi-function DCON modules. The function will return 0x14003 meaning of “Uart response error “ if use the function to acccess Multi-function DCON modules and vice versa.

Supported PACs

The following list shows the supported PACs for each of the PAC_IO functions.

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_GetBit	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteDO/pac_WriteDO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteDOBit	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadDO/pac_ReadDO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadDI/pac_ReadDI_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadDIO/pac_ReadDIO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadDILatch	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ClearDILatch	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadDIOLatch	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ClearDIOLatch	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadDICNT/pac_ReadDICNT_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ClearDICNT/pac_ClearDICNT_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteAO/pac_WriteAO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAO/pac_ReadAO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAI	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAIHex	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAIAllExt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAIAll	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

pac_ReadAIAllHexExt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAIAllHex	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadCNT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ClearCNT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadCNTOverflow	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteModuleSafeValueDO/pac_WriteModuleSafeValueDO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadModuleSafeValueDO/pac_ReadModuleSafeValueDO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteModulePowerOnValueDO/pac_WriteModulePowerOnValueDO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadModulePowerOnValueDO/pac_ReadModulePowerOnValueDO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteModuleSafeValueAO/pac_WriteModuleSafeValueAO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadModuleSafeValueAO/pac_ReadModuleSafeValueAO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteModulePowerOnValueAO/pac_WriteModulePowerOnValueAO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadModulePowerOnValueAO/pac_ReadModulePowerOnValueAO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetModuleWDTStatus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetModuleWDTConfig	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetModuleWDTConfig	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ResetModuleWDT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

pac_RefreshModuleWDT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_InitModuleWDTInterrupt	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetModuleWDTInterruptStatus	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetModuleWDTInterruptStatus	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetModuleLastOutputSource	-	-	-	Y	Y	Y	Y	Y	Y	Y	Y

PAC_IO Functions

The following functions are used to retrieve or set the IO modules.

PACSDK Functions	PACNET Functions	Description
pac_GetBit	PAC_IO.GetBit	retrieves the value which is in specific bit.
pac_WriteDO/pac_WriteDO_MF	PAC_IO.WriteDO PAC_IO.WriteDO_MF	writes the DO values to DO modules.
pac_WriteDOBit	PAC_IO.WriteDOBit	writes a single bit of value to the DO module, that is, only the channel corresponding to the bit is changed.
pac_ReadDO/pac_ReadDO_MF	PAC_IO.ReadDO PAC_IO.ReadDO_MF	reads the DO value of the DO module.
pac_ReadDI/pac_ReadDI_MF	PAC_IO.ReadDI PAC_IO.ReadDI_MF	reads the DI value of the DI module.
pac_ReadDIO/pac_ReadDIO_MF	PAC_IO.ReadDIO PAC_IO.ReadDIO_MF	reads the DI and the DO values of the DIO module.
pac_ReadDILatch	PAC_IO.ReadDILatch	reads the DI latch value of the DI module.
pac_ClearDILatch	PAC_IO.ClearDILatch	clears the latch value of the DI module.
pac_ReadDIOLatch	PAC_IO.ReadDIOLatch	reads the latch values of the DI and DO channels of the DIO module.
pac_ClearDIOLatch	PAC_IO.ClearDIOLatch	clears the latch values of DI and DO channels of the DIO module.
pac_ReadDICNT/pac_ReadDICNT_MF	PAC_IO.ReadDICNT PAC_IO.ReadDICNT_MF	reads the counts of the DI channels of the DI module.

pac_ClearDICNT/pac_ClearDICNT_MF	PAC_IO.ClearDICNT PAC_IO.ClearDICNT_MF	clears the counter value of the DI channel of the DI module.
pac_WriteAO/pac_WriteAO_MF	PAC_IO.WriteAO PAC_IO.WriteAO_MF	writes the AO value to the AO modules.
pac_ReadAO/pac_ReadAO_MF	PAC_IO.ReadAO	reads the AO value of the AO module
pac_ReadAI	PAC_IO.ReadAI	reads the engineering-mode AI value of the AI module.
pac_ReadAIHex	PAC_IO.ReadAIHex	reads the 2's complement-mode AI value of the AI module.
pac_ReadAIAllExt	PAC_IO.ReadAIAllExt	reads all the AI values of all channels in engineering-mode of the AI module
pac_ReadAIAll	PAC_IO.ReadAIAll	reads all the AI values of all channels in engineering-mode of the AI module.
pac_ReadAIAllHexExt	PAC_IO.ReadAIAllHexExt	reads all the AI values of all channels in 2's complement-mode of the AI module
pac_ReadAIAllHex	PAC_IO.ReadAIAllHex	reads all the AI values of all channels in 2's complement-mode of the AI module.
pac_ReadCNT	PAC_IO.ReadCNT	reads the counter values of the counter/frequency modules.
pac_ClearCNT	PAC_IO.ClearCNT	clears the counter values of the counter/frequency modules.
pac_ReadCNTOverflow	PAC_IO.ReadCNTOverflow	reads the counter overflow value of the counter/frequency modules.
pac_WriteModuleSafeValueDO/pac_WriteModuleSafeValueDO_MF	PAC_IO.WriteModuleSafeValueDO PAC_IO.WriteModuleSafeValueDO_MF	writes the DO safe values to DO modules.
pac_ReadModuleSafeValueDO/pac_ReadModuleSafeValueDO_MF	PAC_IO.ReadModuleSafeValueDO PAC_IO.ReadModuleSafeValueDO_MF	reads the safe value of the DO modules.

pac_WriteModulePowerOnValueDO/ pac_WriteModulePowerOnValueDO_MF	PAC_IO.WriteModulePowerOnValueDO PAC_IO.WriteModulePowerOnValueDO_MF	writes the DO power on values to DO modules.
pac_ReadModulePowerOnValueDO/pac_ReadModulePowerOnValueDO_MF	PAC_IO.ReadModulePowerOnValueDO PAC_IO.ReadModulePowerOnValueDO_MF	reads the power on value of the DO modules.
pac_WriteModuleSafeValueAO/pac_WriteModuleSafeValueAO_MF	PAC_IO.WriteModuleSafeValueAO	writes the AO safe value to the AO modules.
pac_ReadModuleSafeValueAO/pac_ReadModuleSafeValueAO_MF	PAC_IO.ReadModuleSafeValueAO	reads the AO safe value of the AO module.
pac_WriteModulePowerOnValueAO/pac_WriteModulePowerOnValueAO_MF	PAC_IO.WriteModulePowerOnValueAO	writes the AO power on value to the AO modules.
pac_ReadModulePowerOnValueAO/pac_ReadModulePowerOnValueAO_MF	PAC_IO.ReadModulePowerOnValueAO	reads the AO power on value of the AO module.
pac_GetModuleWDTStatus	PAC_IO.GetModuleWDTStatus	reads the host watchdog status of a module.
pac_GetModuleWDTConfig	PAC_IO.GetModuleWDTConfig	reads the host watchdog status of a module.
pac_SetModuleWDTConfig	PAC_IO.SetModuleWDTConfig	enables/disables the host watchdog and sets the host watchdog timeout value of a module.
pac_ResetModuleWDT	PAC_IO.ResetModuleWDT	resets the host watchdog status of a module.
pac_RefreshModuleWDT	PAC_IO.RefreshModuleWDT	refreshes the watchdog.

pac_InitModuleWDTInterrupt	PAC_IO.InitModuleWDTInterrupt	initializes and enables interrupt of a module watchdog.
pac_GetModuleWDTInterruptStatus	PAC_IO.GetModuleWDTInterruptStatus	reads interrupt status of a module watchdog.
pac_SetModuleWDTInterruptStatus	PAC_IO.SetModuleWDTInterruptStatus	enables/disables interrupt of a module watchdog.

2.6.1. pac_GetBit

The function retrieves the value which is in specific bit.

Syntax

C++

```
BOOL pac_GetBit(
        int v,
        int ndx
);
```

Parameters

v

Which IO result wants to get bit.

ndx

Specific bit to retrieve.

Return Value

The value of the specific index.

Examples

[C]

```
BYTE bit3;
BYTE iSlot = 2;
int iDI_TotalCh = 8;
DWORD lDI_Value;
HANDLE hPort;
hPort = uart_Open("");
BOOL iRet = pac_ReadDI(hPort, iSlot,iDI_TotalCh, &lDI_Value);
bit3 = pac_GetBit(lDI_Value, 3);
uart_Close(hPort);
```

[C#]

```
bool bit;
int index = 3;
byte iSlot = 2;
int iDI_TotalCh = 8;
uint lDI_Value = 0;
IntPtr hPort;
hPort = PACNET.UART.Open(""); // Open COM1, data format: 115200,N,8,1
bool iRet = PACNET.PAC_IO.ReadDI(hPort, iSlot,iDI_TotalCh, ref lDI_Value);
bit = PACNET.PAC_IO.GetBit((int)lDI_Value, index);
PACNET.UART.Close(hPort);
Console.ReadLine();
```

Remarks

The function is used the same as v & (1<<index).

2.6.2. pac_WriteDO/pac_WriteDO_MF

This function writes the DO values to DO modules.

Syntax

C++ for pac_WriteDO

```
BOOL pac_WriteDO(
        HANDLE hPort,
        int slot,
        int iDO_TotalCh,
        DWORD lDO_Value
);
```

C++ for pac_WriteDO_MF

```
BOOL pac_WriteDO_MF(
        HANDLE hPort,
        int iAddrSlot,
        int iDO_TotalCh,
        DWORD lDO_Value
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot / iAddrSlot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iDO_TotalCh

[in] The total number of DO channels of the DO modules.

iDO_Value

[in] A 8-digit hexadecimal value, where bit 0 corresponds to DO0, bit 31 corresponds to DO31, etc. When the bit is 1, it denotes that the digital output channel is on, and 0 denotes that the digital output channel is off.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Remarks

The definition of the parameters and Return Value of pac_WriteDO and pac_WriteDO_MF functions are the same. The different is that pac_WriteDO is applied to the pure DIO DCON modules and pac_WriteDO_MF is applied to the Multi-function DCON modules.

Examples

[C] pac_WriteDO

```
Example 1:
// If the module is remote
HANDLE hPort;
hPort = uart_Open("COM2,9600,N,8,1");
int total_channel = 8;
DWORD do_value = 4; // turn on the channel two
BOOL ret = pac_WriteDO(hPort, PAC_REMOTE_IO(1) , total_channel , do_value );
uart_Close(hPort);

Example 2:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
int total_channel = 8;
DWORD do_value = 4;      // turn on the channel two
BOOL ret = pac_WriteDO(hPort, 1 , total_channel , do_value );
uart_Close(hPort);

Example 3:
// If the module is 8k remote
int total_channel = 8;
DWORD do_value = 4;      // turn on the channel two
BOOL ret = pac_WriteDO(0, 1 , total_channel , do_value );
```

[C] pac_WriteDO_MF

```
Example 1:
// If the module is remote
HANDLE hPort;
hPort = uart_Open("COM2,9600,N,8,1");
int total_channel = 8;
DWORD do_value = 4; // turn on the channel two
BOOL ret = pac_WriteDO_MF(hPort, PAC_REMOTE_IO(1) , total_channel , do_value );
uart_Close(hPort);

Example 2:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
int total_channel = 8;
DWORD do_value = 4;      // turn on the channel two
BOOL ret = pac_WriteDO_MF(hPort, 1 , total_channel , do_value );
uart_Close(hPort);
```

[C#] pac_WriteDO

```
//Example 1:
// If the module is remote
IntPtr hPort;
hPort = PACNET.UART.Open("COM1,9600,N,8,1");
int total_channel = 8;
uint do_value = 4;      // turn on the channel2
int iRemoteAddr = PACNET.PAC_IO.PAC_REMOTE_IO(1);
bool ret = PACNET.PAC_IO.WriteDO(hPort, iRemoteAddr, total_channel , do_value );
PACNET.UART.Close(hPort);

//Example 2:
// If the module is 87k in local
IntPtr hPort2;
hPort2 = PACNET.UART.Open(""); // Open COM1, data format: 115200,N,8,1
int total_channel2 = 8;
uint do_value2 = 4;      // turn on the channel2
bool ret2 = PACNET.PAC_IO.WriteDO(hPort2, 2 , total_channel2 , do_value2 );
PACNET.UART.Close(hPort2);

//Example 3:
// If the module is 8k local
int total_channel3 = 8;
uint do_value3 = 4;      // turn on the channel2
bool ret3 = PACNET.PAC_IO.WriteDO((IntPtr)0, 3, total_channel3, do_value3);
```

[C#] pac_WriteDO_MF

```
//Example 1:
// If the module is remote
IntPtr hPort;
hPort = PACNET.UART.Open("COM1,9600,N,8,1");
int total_channel = 8;
uint do_value = 2;      // turn on the channel1
int iRemoteAddr = PACNET.PAC_IO.PAC_REMOTE_IO(1);
bool ret = PACNET.PAC_IO. WriteDO_MF (hPort, iRemoteAddr, total_channel , do_value );
PACNET.UART.Close(hPort);

//Example 2:
// If the module is 87k local
IntPtr hPort2;
hPort2 = PACNET.UART.Open(""); // Open COM1, data format: 115200,N,8,1
int total_channel2 = 2;
uint do_value2 = 2;      // turn on the channel1
bool ret2 = PACNET.PAC_IO.WriteDO_MF(hPort2, 1 , total_channel2 , do_value2);
PACNET.UART.Close(hPort2);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If it is in remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.3. pac_WriteDOBit

This function writes a single bit of value to the DO module, that is, only the channel corresponding to the bit is changed.

Syntax

C++

```
BOOL pac_WriteDOBit(
        HANDLE hPort,
        int slot,
        int iDO_TotalCh,
        int iChannel,
        int iBitValue
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in]The DO channel to be change.

iDO_TotalCh

[in] The total number of DO channels of the DO modules.

iBitValue

[in] 1 is to turn on the DO channel; 0 is off.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot = 1;
int iChannel = 2;
int iDO_TotalCh = 8;
int iBitValue = 1;
BOOL ret = pac_WriteDOBit(hPort, iSlot , iDO_TotalCh, iChannel , iBitValue );
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot = 1;
int iChannel = 2;
int iDO_TotalCh = 8;
int iBitValue = 1;
BOOL ret = pac_WriteDOBit(0, iSlot , iDO_TotalCh, iChannel , iBitValue );
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot = 2;
int iChannel = 2;
int iDO_TotalCh = 16;
int iBitValue = 1;
bool ret = PACNET.PAC_IO.WriteDOBit(hPort, iSlot, iDO_TotalCh, iChannel, iBitValue);
PACNET.UART.Close(hPort);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.4. pac_ReadDO/pac_ReadDO_MF

This function reads the DO value of the DO module.

Syntax

C++ for pac_ReadDO

```
BOOL pac_ReadDO(
        HANDLE hPort,
        int slot,
        int iDO_TotalCh,
        DWORD *lDO_Value
);
```

C++ for pac_ReadDO_MF

```
BOOL pac_ReadDO_MF(
        HANDLE hPort,
        int iSlot,
        int iDO_TotalCh,
        DWORD *lDO_Value
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot / iSlot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iDO_TotalCh

[in] The total number of DO channels of the DO modules.

lDO_Value

[out] The pointer of the DO value to read from the DO module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_ReadDO

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE slot = 1;
int total_channel = 8;
DWORD do_value;
BOOL ret = pac_ReadDO(hPort, slot , total_channel , &do_value );
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE slot = 1;
int total_channel = 8;
DWORD do_value;
BOOL ret = pac_ReadDO(0, slot , total_channel , &do_value );
```

[C] pac_ReadDO_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE slot = 1;
int total_channel = 8;
DWORD do_value;
BOOL ret = pac_ReadDO_MF(hPort, slot , total_channel , &do_value );
uart_Close(hPort);
```

[C#] pac_ReadDO

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot = 2;
int total_channel = 16;
uint do_value =0;
bool ret = PACNET.PAC_IO.ReadDO(hPort, slot, total_channel, ref do_value);
PACNET.UART.Close(hPort);
Console.WriteLine("The DO value is : " + do_value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//          The DO value is : 4
```

[C#] pac_ReadDO_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot = 1;
int total_channel = 2;
uint do_value =0;
bool ret = PACNET.PAC_IO.ReadDO_MF(hPort, slot , total_channel , ref do_value );
PACNET.UART.Close(hPort);
Console.WriteLine("The DO value is : " + do_value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//          The DO value is : 1
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.5. pac_ReadDI/pac_ReadDI_MF

This function reads the DI value of the DI module.

Syntax

C++ for pac_ReadDI

```
BOOL pac_ReadDI(
        HANDLE hPort,
        int slot,
        int iDI_TotalCh,
        DWORD *lDI_Value
);
```

C++ for pac_ReadDI_MF

```
BOOL pac_ReadDI_MF(
        HANDLE hPort,
        int iSlot,
        int iDI_TotalCh,
        DWORD *lDI_Value
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot / iSlot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iDI_TotalCh

[in] The total channels of the DI module.

lDI_Value

[out] The pointer to DI value to read back.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_ReadDI

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot = 2;
int iDI_TotalCh = 8;
DWORD lDI_Value;
BOOL iRet = pac_ReadDI(hPort, iSlot,iDI_TotalCh, &lDI_Value);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot = 2;
int iDI_TotalCh = 8;
DWORD lDI_Value;
BOOL iRet = pac_ReadDI(0, iSlot,iDI_TotalCh, &lDI_Value);
```

[C] pac_ReadDI_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot = 2;
int iDI_TotalCh = 8;
DWORD lDI_Value;
BOOL iRet = pac_ReadDI_MF(hPort, iSlot,iDI_TotalCh, &lDI_Value);
uart_Close(hPort);
```

[C#] pac_ReadDI

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot = 3;
int iDI_TotalCh = 8;
uint lDI_Value = 0;
bool iRet = PACNET.PAC_IO.ReadDI(hPort, iSlot, iDI_TotalCh, ref lDI_Value);
PACNET.UART.Close(hPort);
Console.WriteLine("The DI value is : " + lDI_Value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//          The DI value is : 5
```

[C#] pac_ReadDI_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot = 1;
int iDI_TotalCh = 2;
uint lDI_Value =0;
bool iRet = PACNET.PAC_IO.ReadDI_MF(hPort, iSlot,iDI_TotalCh, ref lDI_Value);
PACNET.UART.Close(hPort);
Console.WriteLine("The DI value is : " + lDI_Value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//          The DI value is : 1
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.6. pac_ReadDIO/pac_ReadDIO_MF

This function reads the DI and the DO values of the DIO module.

Syntax

C++ for pac_ReadDIO

```
BOOL pac_ReadDIO(
        HANDLE hPort,
        int slot,
        int iDI_TotalCh,
        int iDO_TotalCh,
        DWORD* lDI_Value,
        DWORD* lDO_Value
);
```

C++ for pac_ReadDIO_MF

```
BOOL pac_ReadDIO_MF(
        HANDLE hPort,
        int iAddrSlot,
        int iDI_TotalCh,
        int iDO_TotalCh,
        DWORD* lDI_Value,
        DWORD* lDO_Value
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

Slot / iAddrSlot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iDI_TotalCh

[in] The total number of DI channels of the DIO module.

iDO_TotalCh

[in] The total number of DO channels of the DIO module.

lDI_Value

[out] The pointer to the value of DI read back.

lDO_Value

[out] The pointers to the value of DO read back.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_ReadDIO

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iDI_TotalCh=8;
int iDO_TotalCh=8;
DWORD lDI_Value;
DWORD lDO_Value;
BOOL iRet = pac_ReadDIO(hPort, iSlot,iDI_TotalCh, iDO_TotalCh, &lDI_Value, &lDO_Value);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iDI_TotalCh=8;
int iDO_TotalCh=8;
DWORD lDI_Value;
DWORD lDO_Value;
BOOL iRet = pac_ReadDIO(0, iSlot,iDI_TotalCh, iDO_TotalCh, &lDI_Value, &lDO_Value);
```

[C] pac_ReadDIO_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iDI_TotalCh=8;
int iDO_TotalCh=8;
DWORD lDI_Value;
DWORD lDO_Value;
BOOL iRet = pac_ReadDIO(hPort, iSlot,iDI_TotalCh, iDO_TotalCh, &lDI_Value, &lDO_Value);
uart_Close(hPort);
```

[C#] pac_ReadDIO

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=3;
int iDI_TotalCh=8;
int iDO_TotalCh=8;
uint lDI_Value = 0;
uint lDO_Value= 0;
bool iRet = PACNET.PAC_IO.ReadDIO(hPort, iSlot,iDI_TotalCh, iDO_TotalCh, ref lDI_Value,
ref lDO_Value);
PACNET.UART.Close(hPort);
Console.WriteLine("The DI value is : " + lDI_Value.ToString() + "; The DO value is : " +
lDO_Value.ToString());
Console.ReadLine();


// The example displays the following output to the console:
//           The DI value is : 5; The DO value is : 5
```

[C#] pac_ReadDIO_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=1;
int iDI_TotalCh=2;
int iDO_TotalCh=2;
uint lDI_Value = 0;
uint lDO_Value = 0;
bool iRet = PACNET.PAC_IO.ReadDIO_MF(hPort, iSlot,iDI_TotalCh, iDO_TotalCh, ref
lDI_Value, ref lDO_Value);
PACNET.UART.Close(hPort);
Console.WriteLine("The DI value is : " + lDI_Value.ToString() + "; The DO value is : " +
lDO_Value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The DI value is : 2; The DO value is : 1
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second Parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.7. pac_ReadDILatch

This function reads the DI latch value of the DI module.

Syntax

C++

```
BOOL pac_ReadDILatch(
            HANDLE hPort,
            int slot,
            int iDI_TotalCh,
            int iLatchType,
            DWORD *lDI_Latch_Value
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro,PAC_REMOTE_IO(0...255).

iDI_TotalCh

[in] The total number of the DI channels of the DI module.

iLatchType

[in] Specify the latch type to read latch value back.

1 = latched high status

0 = latched low status

lDI_Latch_Value

[out] The pointer to the latch value read back from the DI module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iDI_TotalCh=8;
int iLatchType=0;
DWORD lDI_Latch_Value;
BOOL iRet = pac_ReadDILatch(hPort, iSlot, iDI_TotalCh, iLatchType, &lDI_Latch_Value);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iDI_TotalCh=8;
int iLatchType=0;
DWORD lDI_Latch_Value;
BOOL iRet = pac_ReadDILatch(0, iSlot, iDI_TotalCh, iLatchType, &lDI_Latch_Value);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=3;
int iDI_TotalCh=8;
int iLatchType=0;
uint lDI_Latch_Value=0;
bool iRet = PACNET.PAC_IO.ReadDILatch(hPort, iSlot, iDI_TotalCh, iLatchType, ref
lDI_Latch_Value);
PACNET.UART.Close(hPort);
Console.WriteLine("The DI latch value is : " + lDI_Latch_Value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//              The DI latch value is : 255
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.8. pac_ClearDILatch

This function clears the latch value of the DI module.

Syntax

C++

```
BOOL pac_ClearDILatch(
        HANDLE hPort,
        int slot
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
BOOL iRet = pac_ClearDILatch(hPort, iSlot);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
BOOL iRet = pac_ClearDILatch(0, iSlot);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=3;
bool iRet = PACNET.PAC_IO.ClearDILatch(hPort, iSlot);
PACNET.UART.Close(hPort);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.9. pac_ReadDIOLatch

This function reads the latch values of the DI and DO channels of the DIO module.

Syntax

C++

```
BOOL pac_ReadDIOLatch(
        HANDLE hPort,
        int slot,
        int iDI_TotalCh,
        int iDO_TotalCh,
        int iLatchType,
        DWORD *lDI_Latch_Value,
        DWORD *lDO_Latch_Value
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iDI_TotalCh

[in] The total number of the DI channels of the DIO module.

iDO_TotalCh

[in] The total number of the DO channels of the DIO module.

iLatchType

[in] The type of the latch value read back.

1 = latched high status

0 = latched low status

lDI_Latch_Value

[out] The pointer to the DI latch value read back.

lDO_Latch_Value

[out] The pointer to the DO latch value read back.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
int iDI_TotalCh=8;
int iDO_TotalCh=8;
int iLatchType=0;
DWORD lDI_Latch_Value;
DWORD lDO_Latch_Value;
BOOL iRet = pac_ReadDIOLatch(hPort, iSlot,iDI_TotalCh,iDO_TotalCh,iLatchType,
&lDI_Latch_Value,&lDO_Latch_Value);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iDI_TotalCh=8;
int iDO_TotalCh=8;
int iLatchType=0;
DWORD lDI_Latch_Value;
DWORD lDO_Latch_Value;
BOOL iRet = pac_ReadDIOLatch(0, iSlot,iDI_TotalCh,iDO_TotalCh,iLatchType,
&lDI_Latch_Value,&lDO_Latch_Value);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=1;
int iDI_TotalCh=8;
int iDO_TotalCh=8;
int iLatchType=0;
uint lDI_Latch_Value =0;
uint lDO_Latch_Value =0;
bool iRet = PACNET.PAC_IO.ReadDIOLatch(hPort, iSlot,iDI_TotalCh,iDO_TotalCh,iLatchType,
ref lDI_Latch_Value, ref lDO_Latch_Value);
PACNET.UART.Close(hPort);
Console.WriteLine("DI Latch : "+lDI_Latch_Value.ToString()+"; DO Latch :
"+lDO_Latch_Value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            DI Latch : 240; DO Latch : 240
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.10. pac_ClearDIOLatch

This function clears the latch values of DI and DO channels of the DIO module.

Syntax

C++

```
BOOL pac_ClearDIOLatch(
        HANDLE hPort,
        int slot
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO (0...255).

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
BOOL iRet = pac_ClearDIOLatch(hPort, iSlot);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
BOOL iRet = pac_ClearDIOLatch(0, iSlot);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=1;
bool iRet = PACNET.PAC_IO.ClearDIOLatch(hPort, iSlot);
PACNET.UART.Close(hPort);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.11. pac_ReadDICNT/pac_ReadDICNT_MF

This function reads the counts of the DI channels of the DI module.

Syntax

C++ for pac_ReadDICNT

```
BOOL pac_ReadDICNT(
        HANDLE hPort,
        int slot,
        int iChannel,
        int iDI_TotalCh,
        DWORD *lCounter_Value
);
```

C++ for pac_ReadDICNT_MF

```
BOOL pac_ReadDICNT_MF(
        HANDLE hPort,
        int iAddrSlot,
        int iChannel,
        int iDI_TotalCh,
        DWORD *lCounter_Value
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

Slot / iAddrSlot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in] The channel that the counter value belongs.

iDI_TotalCh

[in] Total number of the DI channels of the DI module.

lCounter_Value

[out] The pointer to the counter value.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_ReadDICNT

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
int iChannel =2;
int iDI_TotalCh=8;
DWORD lCounter_Value;
BOOL iRet = pac_ReadDICNT(hPort, iSlot,iChannel,iDI_TotalCh, &lCounter_Value);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iChannel =2;
int iDI_TotalCh=8;
DWORD lCounter_Value;
BOOL iRet = pac_ReadDICNT(0, iSlot,iChannel,iDI_TotalCh, &lCounter_Value);
```

[C] pac_ReadDICNT_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
int iChannel =2;
int iDI_TotalCh=8;
DWORD lCounter_Value;
BOOL iRet = pac_ReadDICNT_MF(hPort, iSlot,iChannel,iDI_TotalCh, &lCounter_Value);
uart_Close(hPort);
```

[C#] pac_ReadDICNT

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=1;
int iChannel =2;
int iDI_TotalCh=8;
uint lCounter_Value = 0;
bool iRet = PACNET.PAC_IO.ReadDICNT(hPort, iSlot,iChannel,iDI_TotalCh, ref
lCounter_Value);
PACNET.UART.Close(hPort);
Console.WriteLine("The counter value is : " + lCounter_Value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
  //           The counter value is : 10
```

[C#] pac_ReadDICNT_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=1;
int iChannel =0;
int iDI_TotalCh=2;
uint lCounter_Value = 0;
bool iRet = PACNET.PAC_IO.ReadDICNT_MF(hPort, iSlot,iChannel,iDI_TotalCh, ref
lCounter_Value);
PACNET.UART.Close(hPort);
Console.WriteLine("The counter value is : " + lCounter_Value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The counter value is : 13
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.12. pac_ClearDICNT/pac_ClearDICNT_MF

This function clears the counter value of the DI channel of the DI module.

Syntax

C++ for pac_ClearDICNT

```
BOOL pac_ClearDICNT(
        HANDLE hPort,
        int slot,
        int iChannel,
        int iDI_TotalCh
);
```

C++ for pac_ClearDICNT_MF

```
BOOL pac_ClearDICNT_MF(
        HANDLE hPort,
        int iAddrSlot,
        int iChannel,
        int iDI_TotalCh
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot / iAddrSlot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in] The channel that the counter value belongs.

iDI_TotalCh

[in] Total number of the DI channels of the DI module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_ClearDICNT

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
int iChannel=2;
int iDI_TotalCh=8;
BOOL iRet = pac_ClearDICNT(hPort, iSlot,iChannel,iDI_TotalCh);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iChannel=2;
int iDI_TotalCh=8;
BOOL iRet = pac_ClearDICNT(0, iSlot,iChannel,iDI_TotalCh);
```

[C] pac_ClearDICNT_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
int iChannel=2;
int iDI_TotalCh=8;
BOOL iRet = pac_ClearDICNT_MF(hPort, iSlot,iChannel,iDI_TotalCh);
uart_Close(hPort);
```

[C#] pac_ClearDICNT

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=3;
int iChannel=2;
int iDI_TotalCh=8;
bool iRet = PACNET.PAC_IO.ClearDICNT(hPort, iSlot,iChannel,iDI_TotalCh);
PACNET.UART.Close(hPort);
```

[C#] pac_ClearDICNT_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=1;
int iChannel=0;
int iDI_TotalCh=2;
bool iRet = PACNET.PAC_IO.ClearDICNT_MF(hPort, iSlot,iChannel,iDI_TotalCh);
PACNET.UART.Close(hPort);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.13. pac_WriteAO/pac_WriteAO_MF

This function writes the AO value to the AO modules.

Syntax

C++ for pac_WriteAO

```
BOOL pac_WriteAO(
        HANDLE hPort,
        int slot,
        int iChannel,
        int iAO_TotalCh,
        float fValue
);
```

C++ for pac_WriteAO_MF

```
BOOL pac_WriteAO_MF(
        HANDLE hPort,
        int iAddrSlot,
        int iChannel,
        int iAO_TotalCh,
        float fValue
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot / iAddrSlot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in] The channel that is written the AO value to.

iAO_TotalCh

[in] The total number of the AO channels of the AO module.

float fValue

[in] The AO value to write to the AO module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_WriteAO

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue=5;
BOOL iRet = pac_WriteAO(hPort, iSlot,iChannel,iAO_TotalCh,fValue);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue=5;
BOOL iRet = pac_WriteAO(0, iSlot,iChannel,iAO_TotalCh,fValue);
```

[C] pac_WriteAO_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue=5;
BOOL iRet = pac_WriteAO_MF(hPort, iSlot,iChannel,iAO_TotalCh,fValue);
uart_Close(hPort);
```

[C#] pac_WriteAO

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=2;
int iChannel=2;
int iAO_TotalCh=4;
float fValue=5;
bool iRet = PACNET.PAC_IO.WriteAO(hPort, iSlot,iChannel,iAO_TotalCh,fValue);
PACNET.UART.Close(hPort);
```

[C#] pac_WriteAO_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue=5;
bool iRet = PACNET.PAC_IO.WriteAO_MF(hPort, iSlot,iChannel,iAO_TotalCh,fValue);
PACNET.UART.Close(hPort);
```

Remarks

1. The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.
2. The comparison table of pac_WriteAO / pac_WriteAO_MF Functions and available modules are as following:

Since November 1, 2012

pac_Write AO	**pac_WriteAO_MF**
I-87024W/CW/DW/RW, I-87024	I-87026PW
I-87028CW/UW	
I-87022	
I-87026	
I-7021,I -7021P	
I-7022	
I-7024, I-8024R	

2.6.14. pac_ReadAO/pac_ReadAO_MF

This function reads the AO value of the AO module.

Syntax

C++

```
BOOL pac_ReadAO(
        HANDLE hPort,
        int slot,
        int iChannel,
        int iAO_TotalCh,
        float *fValue
);
```

C++

```
BOOL pac_ReadAO_MF(
        HANDLE hPort,
        int slot,
        int iChannel,
        int iAO_TotalCh,
        float *fValue
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in] Read the AO value from the channel.

iAO_TotalCh

[in] The total number of the AO channels of the AO module.

float fValue

[out] The pointer to the AO value that is read back from the AO module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_ReadAO

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue;
BOOL iRet = pac_ReadAO(hPort, iSlot,iChannel,iAO_TotalCh, &fValue);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue;
BOOL iRet = pac_ReadAO(0, iSlot,iChannel,iAO_TotalCh, &fValue);
```

[C] pac_ReadAO_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue;
BOOL iRet = pac_ReadAO_MF(hPort, iSlot,iChannel,iAO_TotalCh, &fValue);
uart_Close(hPort);
```

[C#] pac_ReadAO

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=2;
int iChannel=2;
int iAO_TotalCh=4;
float fValue = 0;
bool iRet = PACNET.PAC_IO.ReadAO(hPort, iSlot,iChannel,iAO_TotalCh,ref fValue);
PACNET.UART.Close(hPort);
Console.WriteLine("The AO value is " + fValue.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//          The AO value is 5
```

[C#] pac_ReadAO_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=1;
int iChannel=0;
int iAO_TotalCh=2;
float fValue = 0;
bool iRet = PACNET.PAC_IO.ReadAO(hPort, iSlot,iChannel,iAO_TotalCh,ref fValue);
PACNET.UART.Close(hPort);
Console.WriteLine("The AO value is " + fValue.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//              The AO value is 5
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.15. pac_ReadAI

This function reads the engineering-mode AI value of the AI module.

Syntax

C++

```
BOOL pac_ReadAI(
        HANDLE hPort,
        int slot,
        int iChannel,
        int iAI_TotalCh,
        float *fValue
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in] Read the AI value from the channel.

iAI_TotalCh

[in] The total number of the AI channels of the AI module.

fValue

[out] The pointer to the AI value that is read back from the AI module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=2;
int iAI_TotalCh=8;
float fValue;
BOOL iRet = pac_ReadAI(hPort, iSlot,iChannel,iAI_TotalCh, &fValue);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iChannel=2;
int iAI_TotalCh=8;
float fValue;
BOOL iRet = pac_ReadAI(0, iSlot,iChannel,iAI_TotalCh, &fValue);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=3;
int iChannel=0;
int iAI_TotalCh=8;
float fValue=0;
bool iRet = PACNET.PAC_IO.ReadAI(hPort, iSlot,iChannel,iAI_TotalCh, ref fValue);
PACNET.UART.Close(hPort);
Console.WriteLine("The AI value is " + fValue.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//              The AI value is 1.008
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.16. pac_ReadAIHex

This function reads the 2's complement-mode AI value of the AI module.

Syntax

C++

```
BOOL pac_ReadAIHex(
        HANDLE hPort,
        int slot,
        int iChannel,
        int iAI_TotalCh,
        int *iValue
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in] Read the AI value from the channel.

iAI_TotalCh

[in] The total number of the AI channels of the AI module.

iValue

[out] The pointer to the AI value that is read back from the AI module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
int iChannel=2;
int iAI_TotalCh=8;
int iValue;
BOOL iRet = pac_ReadAIHex(hPort, iSlot,iChannel,iAI_TotalCh, &iValue);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iChannel=2;
int iAI_TotalCh=8;
int iValue;
BOOL iRet = pac_ReadAIHex(0, iSlot,iChannel,iAI_TotalCh, &iValue);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=3;
int iChannel=0;
int iAI_TotalCh=8;
int iValue=0;
bool iRet = PACNET.PAC_IO.ReadAIHex(hPort, iSlot,iChannel,iAI_TotalCh, ref iValue);
PACNET.UART.Close(hPort);

Console.WriteLine("The AI value is " + iValue.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The AI value is 3319
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.17. pac_ReadAIAllExt

This function reads all the AI values of all channels in engineering-mode of the AI module.

This function replaces pac_ReadAIAll.

Syntax

C++

```
BOOL pac_ReadAIAllExt(
        HANDLE hPort,
        int slot,
        float fValue[],
        DWORD Buff_Len,
        DWORD *Channel
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

fValue[]

[out] The array contains the AI values that read back from the AI module.

Buff_Len

[in] A pointer to a variable that specifies the size of the buffer pointed to by the fvalue.

Channel

[out] The pointer to a variable that specifies the total available channel numberer of AI module. This channel number is only valid if the return value is TRUE.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
int ichannelnumber=0;
hPort = uart_Open("");
BYTE iSlot=1;
float fValue[8];
BOOL iRet = pac_ReadAIAllExt(hPort, iSlot, fValue,8,&ichannelnumber);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int ichannelnumber=0;
float fValue[8];
BOOL iRet = pac_ ReadAIAllExt (0, iSlot, fValue,8, &ichannelnumber);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
int channelnumber=0;
hPort = PACNET.UART.Open("");
byte iSlot=3;
float[] fValue = new float[8];
bool iRet = PACNET.PAC_IO.ReadAIAllExt(hPort, iSlot, fValue, 8, ref channelnumber);
PACNET.UART.Close(hPort);
for (int i = 0; i < 8; i++)
        Console.WriteLine("The AI[" + i.ToString() + "] : " + fValue[i].ToString());
Console.ReadLine();

// The example displays the following output to the console:
//              The AI[0] : 1.023
//              The AI[1] : 0.001
//              .......
//              The AI[7] : 0
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.18. pac_ReadAIAll

This function reads all the AI values of all channels in engineering-mode of the AI module.

The function maybe causes the buffer overflow in some situation.

Syntax

C++

```
BOOL pac_ReadAIAll(
            HANDLE hPort,
            int slot,
            float fValue[]
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

fValue[]

[out] The array contains the AI values that read back from the AI module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
float fValue[8];
BOOL iRet = pac_ReadAIAll(hPort, iSlot, fValue);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
float fValue[8];
BOOL iRet = pac_ReadAIAll(0, iSlot, fValue);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=3;
float[] fValue = new float[8];
bool iRet = PACNET.PAC_IO.ReadAIAll(hPort, iSlot, fValue);
PACNET.UART.Close(hPort);
for (int i = 0; i < 8; i++)
        Console.WriteLine("The AI[" + i.ToString() + "] : " + fValue[i].ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The AI[0] : 1.015
//            The AI[1] : 0.001
//            .......
//            The AI[7] : 0
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.19. pac_ReadAIAllHexExt

This function reads all the AI values of all channels in 2's complement-mode of the AI module.

This function replaces pac_ReadAIAllHex.

Syntax

C++

```
BOOL pac_ReadAIAllHex(
            HANDLE hPort,
            int slot,
            int iValue[],
            DWORD Buff_Len,
            DWORD *Channel
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO (0...255).

iValue[]

[out] The array contains the AI values that read back from the AI module.

Buff_Len

[in] A pointer to a variable that specifies the size of the buffer pointed to by the iValue.

Channel

[out] The pointer to a variable that specifies the total available channel numberer of AI module. This channel number is only valid if the return value is TRUE.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
int iValue[8];
int ichannelnumber=0;
BOOL iRet = pac_ReadAIAllHexExt(hPort, iSlot, iValue, 8, &ichannelnumber);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int ichannelnumber=0;
int iValue[8];
BOOL iRet = pac_ReadAIAllHexExt(0, iSlot, iValue, 8, &ichannelnumber);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=3;
int ichannelnumber=0;
int[] iValue = new int[8];
bool iRet = PACNET.PAC_IO.ReadAIAllHexExt(hPort, iSlot, iValue, 8, ref ichannelnumber);
PACNET.UART.Close(hPort);
for (int i = 0; i < 8; i++)
        Console.WriteLine("The AI[" + i.ToString() + "] : " + iValue[i].ToString());
Console.ReadLine();

// The example displays the following output to the console:
//              The AI[0] : 3316
//              The AI[1] : 3
//              .......
//              The AI[7] : 0
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.20. pac_ReadAIAllHex

This function reads all the AI values of all channels in 2's complement-mode of the AI module.

The function maybe causes the buffer overflow in some situation.

Syntax

C++

```
BOOL pac_ReadAIAllHex(
         HANDLE hPort,
         int slot,
         int iValue[]
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO (0...255).

iValue[]

[out] The array contains the AI values that read back from the AI module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iValue[8];
BOOL iRet = pac_ReadAIAllHex(hPort, iSlot, iValue);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iValue[8];
BOOL iRet = pac_ReadAIAllHex(0, iSlot, iValue);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=3;
int[] iValue = new int[8];
bool iRet = PACNET.PAC_IO.ReadAIAllHex(hPort, iSlot, iValue);
PACNET.UART.Close(hPort);
for (int i = 0; i < 8; i++)
        Console.WriteLine("The AI[" + i.ToString() + "] : " + iValue[i].ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The AI[0] : 3316
//            The AI[1] : 3
//            .......
//            The AI[7] : 0
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.21. pac_ReadCNT

This function reads the counter values of the counter/frequency modules.

Syntax

C++

```
BOOL pac_ReadCNT(
        HANDLE hPort,
        int slot,
        int iChannel,
        DWORD *lCounter_Value
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in] The channel that reads the counter value back from the counter/frequency module.

lCounter_Value

[out] The pointer to the counter value that reads back from the counter/frequency module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=0;
DWORD lCounter_Value;
BOOL iRet = pac_ReadCNT(hPort, iSlot,iChannel,&lCounter_Value);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iChannel=0;
DWORD lCounter_Value;
BOOL iRet = pac_ReadCNT(0, iSlot,iChannel,&lCounter_Value);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=1;
int iChannel=0;
uint lCounter_Value=0;
bool iRet = PACNET.PAC_IO.ReadCNT(hPort, iSlot,iChannel,ref lCounter_Value);
PACNET.UART.Close(hPort);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.22. pac_ClearCNT

This function clears the counter values of the counter/frequency modules.

Syntax

C++

```
BOOL pac_ClearCNT(
          HANDLE hPort,
          int slot,
          int iChannel
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

iSlot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in] The channel that clears the counter value back from the counter/frequency modules.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
int iChannel=0;
BOOL iRet = pac_ClearCNT(hPort, iSlot, iChannel);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iChannel=0;
BOOL iRet = pac_ClearCNT(0, iSlot, iChannel);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=1;
int iChannel=0;
bool iRet = PACNET.PAC_IO.ClearCNT(hPort, iSlot, iChannel);
PACNET.UART.Close(hPort);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.23. pac_ReadCNTOverflow

This function reads the counter overflow value of the counter/frequency modules.

Syntax

C++

```
BOOL pac_ReadCNTOverflow(
          HANDLE hPort,
          int slot,
          int iChannel,
          int *iOverflow
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO (0...255).

iChannel

[in] The channel that reads the counter overflows value back from the counter/frequency module.

iOverflow

[out] The pointer to the counter overflow that is read back from the counter/frequency module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=0;
int iOverflow;
BOOL iRet = pac_ReadCNT_Overflow(hPort, iSlot,iChannel,&iOverflow);
uart_Close(hPort);

Example 2:
// If the module is 8k local
BYTE iSlot=1;
int iChannel=0;
int iOverflow;
BOOL iRet = pac_ReadCNT_Overflow(0, iSlot,iChannel,&iOverflow);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte iSlot=1;
int iChannel=0;
int iOverflow = 0;
bool iRet = PACNET.PAC_IO.ReadCNTOverflow(hPort, iSlot,iChannel,ref iOverflow);
PACNET.UART.Close(hPort);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.24. pac_WriteModuleSafeValueDO/pac_WriteModuleSafeValueDO_MF

This function writes the DO safe values to DO modules.

Syntax

C++ for pac_WriteModuleSafeValueDO

```
BOOL pac_WriteModuleSafeValueDO(
        HANDLE hPort,
        int slot,
        int iDO_TotalCh,
        unsigned long lValue
);
```

C++ for pac_WriteModuleSafeValueDO_MF

```
BOOL pac_WriteModuleSafeValueDO_MF(
        HANDLE hPort,
        int slot,
        int iDO_TotalCh,
        unsigned long lData
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iDO_TotalCh

[in] The total number of DO channels of the DO modules.

lValue / lData

[in] A 8-digit hexadecimal value, where bit 0 corresponds to DO0, bit 31 corresponds to DO31, etc. When the bit is 1, it denotes that the digital output channel is on, and 0 denotes that the digital output channel is off.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_WriteModuleSafeValueDO

```
Example 1:
// If the module is remote
HANDLE hPort;
hPort = uart_Open("COM2,9600,N,8,1");
int total_channel = 8;
DWORD do_value = 4; // turn on the channel two
BOOL ret = pac_WriteModuleSafeValueDO(hPort, PAC_REMOTE_IO(1) , total_channel ,
do_value ); uart_Close(hPort);

Example 2:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
int total_channel = 8;
DWORD do_value = 4;      // turn on the channel two
BOOL ret = pac_WriteModuleSafeValueDO(hPort, 1 , total_channel , do_value );
uart_Close(hPort);
```

[C] pac_WriteModuleSafeValueDO_MF

```
Example 1:
// If the module is remote
HANDLE hPort;
hPort = uart_Open("COM2,9600,N,8,1");
int total_channel = 8;
DWORD do_value = 4; // turn on the channel two
BOOL ret = pac_WriteModuleSafeValueDO_MF(hPort, PAC_REMOTE_IO(1) ,
total_channel , do_value ); uart_Close(hPort);

Example 2:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
int total_channel = 8;
DWORD do_value = 4;      // turn on the channel two
BOOL ret = pac_WriteModuleSafeValueDO_MF(hPort, 1 , total_channel , do_value );
uart_Close(hPort);
```

[C#] pac_WriteModuleSafeValueDO

```
//Example 1:
// If the module is remote
IntPtr hPort; hPort = PACNET.UART.Open("COM1,9600,N,8,1");
int total_channel = 8;
uint do_value = 4;      // turn on the channel 2
int iRemoteAddr = PACNET.PAC_IO.PAC_REMOTE_IO(1);
bool ret = PACNET.PAC_IO.WriteModuleSafeValueDO(hPort, iRemoteAddr, total_channel,
do_value);
PACNET.UART.Close(hPort);

//Example 2:
// If the module is 87k local
IntPtr hPort1;
hPort1 = PACNET.UART.Open("");
int total_channel1 = 8;
uint do_value1 = 4;      // turn on the channel 2
bool ret1 = PACNET.PAC_IO.WriteModuleSafeValueDO(hPort1, 3 , total_channel1 ,
do_value1 );
PACNET.UART.Close(hPort1);
```

[C#] pac_WriteModuleSafeValueDO_MF

```
//Example 1:
// If the module is remote
IntPtr hPort; hPort = PACNET.UART.Open("COM1,9600,N,8,1");
int total_channel = 8;
uint do_value = 4;      // turn on the channel 2
int iRemoteAddr = PACNET.PAC_IO.PAC_REMOTE_IO(1);
bool ret = PACNET.PAC_IO.WriteModuleSafeValueDO_MF(hPort, iRemoteAddr,
total_channel, do_value);
PACNET.UART.Close(hPort);

//Example 2:
// If the module is 87k local
IntPtr hPort1;
hPort1 = PACNET.UART.Open("");
int total_channel1 = 8;
uint do_value1 = 4;      // turn on the channel 2
bool ret1 = PACNET.PAC_IO.WriteModuleSafeValueDO_MF(hPort1, 3 , total_channel1 ,
do_value1 );
PACNET.UART.Close(hPort1);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.25. pac_ReadModuleSafeValueDO/pac_ReadModuleSafeValueDO_MF

This function reads the safe value of the DO modules.

Syntax

C++ for pac_ReadModuleSafeValueDO

```
BOOL pac_ReadModuleSafeValueDO(
        HANDLE hPort,
        int slot,
        int iDO_TotalCh,
        unsigned long *lValue
);
```

C++ for pac_ReadModuleSafeValueDO_MF

```
BOOL pac_ReadModuleSafeValueDO_MF(
        HANDLE hPort,
        int slot,
        int iDO_TotalCh,
        unsigned long *lValue
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO (0...255).

iDO_TotalCh

[in] The total number of DO channels of the DO modules.

lValue

[out] The pointer of the DO safe value to read from the DO module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_ReadModuleSafeValueDO

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE slot = 1;
int total_channel = 8;
DWORD do_value;
BOOL ret = pac_ReadModuleSafeValueDO(hPort, slot , total_channel , &do_value );
uart_Close(hPort);
```

[C] pac_ReadModuleSafeValueDO_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE slot = 1;
int total_channel = 8;
DWORD do_value;
BOOL ret = pac_ReadModuleSafeValueDO_MF(hPort, slot , total_channel , &do_value );
uart_Close(hPort);
```

[C#] pac_ReadModuleSafeValueDO

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot = 1;
int total_channel = 8;
uint do_value=0;
bool ret = PACNET.PAC_IO.ReadModuleSafeValueDO(hPort, slot , total_channel , ref
do_value );
PACNET.UART.Close(hPort);
Console.WriteLine("The DO safe value is " + do_value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The DO safe value is 4
```

[C#] pac_ReadModuleSafeValueDO_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot = 1;
int total_channel = 8;
uint do_value = 0;
bool ret = PACNET.PAC_IO.ReadModuleSafeValueDO_MF(hPort, slot, total_channel, ref
do_value);
PACNET.UART.Close(hPort);
Console.WriteLine("The DO safe value is " + do_value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The DO safe value is 1
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.26. pac_WriteModulePowerOnValueDO/pac_WriteModulePowerOnValueDO_MF

This function writes the DO power on values to DO modules.

Syntax

C++ for pac_WriteModulePowerOnValueDO

```
BOOL pac_WriteModulePowerOnValueDO(
        HANDLE hPort,
        int slot,
        int iDO_TotalCh,
        unsigned long lValue
);
```

C++ for pac_WriteModulePowerOnValueDO_MF

```
BOOL pac_WriteModulePowerOnValueDO_MF(
        HANDLE hPort,
        int slot,
        int iDO_TotalCh,
        unsigned long lValue
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iDO_TotalCh

[in] The total number of DO channels of the DO modules.

lValue

[in] A 8-digit hexadecimal value, where bit 0 corresponds to DO0, bit 31 corresponds to DO31, etc. When the bit is 1, it denotes that the digital output channel is on, and 0 denotes that the digital output channel is off.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_WriteModulePowerOnValueDO

```
Example 1:
// If the module is remote
HANDLE hPort;
hPort = uart_Open("COM1,9600,N,8,1");
int total_channel = 8;
DWORD do_value = 4; // turn on the channel two
BOOL ret = pac_WriteModulePowerOnValueDO(hPort, PAC_REMOTE_IO(1) ,
total_channel , do_value ); uart_Close(hPort);

Example 2:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
int total_channel = 8;
DWORD do_value = 4;      // turn on the channel two
BOOL ret = pac_WriteModulePowerOnValueDO(hPort, 1 , total_channel , do_value );
uart_Close(hPort);
```

[C] pac_WriteModulePowerOnValueDO_MF

```
Example 1:
// If the module is remote
HANDLE hPort;
hPort = uart_Open(“COM1,9600,N,8,1”);
int total_channel = 8;
DWORD do_value = 4; // turn on the channel two
BOOL ret = pac_WriteModulePowerOnValueDO_MF(hPort, PAC_REMOTE_IO(1) ,
total_channel , do_value ); uart_Close(hPort);

Example 2:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
int total_channel = 8;
DWORD do_value = 4;      // turn on the channel two
BOOL ret = pac_WriteModulePowerOnValueDO_MF(hPort, 1 , total_channel , do_value );
uart_Close(hPort);
```

[C#] pac_WriteModulePowerOnValueDO

```
//Example 1:
// If the module is remote
IntPtr hPort;
hPort = PACNET.UART.Open("COM1,9600,N,8,1");
int total_channel = 8;
uint do_value = 4; // turn on the channel 2
int iRemoteAddr = PACNET.PAC_IO.PAC_REMOTE_IO(1);
bool ret = PACNET.PAC_IO.WriteModulePowerOnValueDO(hPort, iRemoteAddr,
total_channel , do_value );
PACNET.UART.Close(hPort);

//Example 2:
// If the module is 87k local
IntPtr hPort1;
hPort1 = PACNET.UART.Open("");
int total_channel1 = 8;
uint do_value1 = 4;     // turn on the channel 2
bool ret1 = PACNET.PAC_IO.WriteModulePowerOnValueDO(hPort1, 1 , total_channel1 ,
do_value1 );
PACNET.UART.Close(hPort1);
```

[C#] pac_WriteModulePowerOnValueDO_MF

```
//Example 1:
// If the module is remote
IntPtr hPort;
hPort = PACNET.UART.Open("COM1,9600,N,8,1");
int total_channel = 8;
uint do_value = 1; // turn on the channel 0
int iRemoteAddr = PACNET.PAC_IO.PAC_REMOTE_IO(1);
bool ret = PACNET.PAC_IO.WriteModulePowerOnValueDO_MF(hPort, iRemoteAddr,
total_channel, do_value);
PACNET.UART.Close(hPort);

//Example 2:
// If the module is 87k local
IntPtr hPort1;
hPort1 = PACNET.UART.Open("");
int total_channel1 = 8;
uint do_value1 = 1;      // turn on the channel 0
bool ret1 = PACNET.PAC_IO.WriteModulePowerOnValueDO_MF(hPort1, 1, total_channel1,
do_value1);
PACNET.UART.Close(hPort1);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.27. pac_ReadModulePowerOnValueDO/pac_ReadModulePowerOnValueDO_MF

This function reads the power on value of the DO modules.

Syntax

C++ for pac_ReadModulePowerOnValueDO

```
BOOL pac_ReadModulePowerOnValueDO(
        HANDLE hPort,
        int slot,
        int iDO_TotalCh,
        unsigned long *lValue
);
```

C++ for pac_ReadModulePowerOnValueDO_MF

```
BOOL pac_ReadModulePowerOnValueDO_MF(
        HANDLE hPort,
        int slot,
        int iDO_TotalCh,
        unsigned long *lValue
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO (0...255).

iDO_TotalCh

[in] The total number of DO channels of the DO modules.

lValue

[out] The pointer of the DO power on value to read from the DO module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_ReadModulePowerOnValueDO

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE slot = 1;
int total_channel = 8;
DWORD do_value;
BOOL ret = pac_ReadModulePowerOnValueDO(hPort, slot , total_channel , &do_value );
uart_Close(hPort);
```

[C] pac_ReadModulePowerOnValueDO_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE slot = 1;
int total_channel = 8;
DWORD do_value;
BOOL ret = pac_ReadModulePowerOnValueDO_MF(hPort, slot , total_channel ,
&do_value );
uart_Close(hPort);
```

[C#] pac_ReadModulePowerOnValueDO

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot = 1;
int total_channel = 8;
uint do_value =0;
bool ret = PACNET.PAC_IO.ReadModulePowerOnValueDO(hPort, slot , total_channel , ref
do_value);
PACNET.UART.Close(hPort);
Console.WriteLine("The DO power on value is " + do_value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//              The DO power on value is 4
```

[C#] pac_ReadModulePowerOnValueDO_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot = 1;
int total_channel = 8;
uint do_value =0;
bool ret = PACNET.PAC_IO.ReadModulePowerOnValueDO_MF(hPort, slot , total_channel ,
ref do_value);
PACNET.UART.Close(hPort);
Console.WriteLine("The DO power on value is " + do_value.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//              The DO power on value is 4
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO(0...255), which range is from 0 to 255.

2.6.28. pac_WriteModuleSafeValueAO/pac_WriteModuleSafeValueAO_MF

This function writes the AO safe value to the AO modules.

Syntax

C++

```
BOOL pac_WriteModuleSafeValueAO(
            HANDLE hPort,
            int slot,
            int iChannel,
            int iAO_TotalCh,
            float fValue
);
```

C++

```
BOOL pac_WriteModuleSafeValueAO_MF(
            HANDLE hPort,
            int iAddrSlot,
            int iChannel,
            int iAO_TotalCh,
            float fValue
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot / iAddrSlot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in] The channel that is written the AO value to.

iAO_TotalCh

[in] The total number of the AO channels of the AO module.

fValue

[in] The AO value to write to the AO module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_WriteModuleSafeValueAO

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue=5;
BOOL iRet = pac_WriteModuleSafeValueAO(hPort, iSlot,iChannel,iAO_TotalCh,fValue);
uart_Close(hPort);
```

[C] pac_WriteModuleSafeValueAO_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue=5;
BOOL iRet = pac_WriteModuleSafeValueAO_MF(hPort, iSlot,iChannel,iAO_TotalCh,fValue);
uart_Close(hPort);
```

[C#] pac_WriteModuleSafeValueAO

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue=5;
bool iRet = PACNET.PAC_IO.WriteModuleSafeValueAO(hPort, slot, iChannel, iAO_TotalCh,
fValue);
PACNET.UART.Close(hPort);
```

[C#] pac_WriteModuleSafeValueAO_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue=5;
bool iRet = PACNET.PAC_IO.WriteModuleSafeValueAO_MF(hPort, slot, iChannel,
iAO_TotalCh, fValue);
PACNET.UART.Close(hPort);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.29. pac_ReadModuleSafeValueAO/pac_ReadModuleSafeValueAO_MF

This function reads the AO safe value of the AO module.

Syntax

C++

```
BOOL pac_ReadModuleSafeValueAO(
        HANDLE hPort,
        int slot,
        int iChannel,
        int iAO_TotalCh,
        float *fValue
);
```

C++

```
BOOL pac_ReadModuleSafeValueAO_MF(
        HANDLE hPort,
        int slot,
        int iChannel,
        int iAO_TotalCh,
        float *fValue
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in] Read the AO value from the channel of the AO module.

iAO_TotalCh

[in] The total number of the AO channels of the AO module.

float fValue

[out] The pointer to the AO safe value that is read back from the AO module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_ReadModuleSafeValueAO

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue;
BOOL iRet = pac_ReadModuleSafeValueAO(hPort, iSlot,iChannel,iAO_TotalCh, &fValue);
uart_Close(hPort);
```

[C] pac_ReadModuleSafeValueAO_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue;
BOOL iRet = pac_ReadModuleSafeValueAO_MF(hPort, iSlot,iChannel,iAO_TotalCh,
&fValue);
uart_Close(hPort);
```

[C#] pac_ReadModuleSafeValueAO

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue = 0;
bool iRet = PACNET.PAC_IO.ReadModuleSafeValueAO(hPort, slot,iChannel,iAO_TotalCh,ref
fValue);
PACNET.UART.Close(hPort);
Console.WriteLine("The AO safe value is " + fValue.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//              The AO safe value is 5
```

[C#] pac_ReadModuleSafeValueAO_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue = 0;
bool iRet = PACNET.PAC_IO.ReadModuleSafeValueAO_MF(hPort,
slot,iChannel,iAO_TotalCh,ref fValue);
PACNET.UART.Close(hPort);
Console.WriteLine("The AO safe value is " + fValue.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//              The AO safe value is 5
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.30. pac_WriteModulePowerOnValueAO/pac_WriteModulePowerOnValueAO_MF

This function writes the AO power on value to the AO modules.

Syntax

C++

```
BOOL pac_WriteModulePowerOnValueAO(
        HANDLE hPort,
        int slot,
        int iChannel,
        int iAO_TotalCh,
        float fValue
);
```

C++

```
BOOL pac_WriteModulePowerOnValueAO_MF(
        HANDLE hPort,
        int iAddrSlot,
        int iChannel,
        int iAO_TotalCh,
        float fValue
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot / iAddrSlot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in] The channel that is written the AO value to.

iAO_TotalCh

[in] The total number of the AO channels of the AO module.

float fValue

[in] Contain the AO value to write to the AO module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_WriteModulePowerOnValueAO

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue=5;
BOOL iRet = pac_WriteModulePowerOnValueAO(hPort, iSlot,iChannel,iAO_TotalCh,fValue);
uart_Close(hPort);
```

[C] pac_WriteModulePowerOnValueAO_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue=5;
BOOL iRet = pac_WriteModulePowerOnValueAO_MF(hPort,
iSlot,iChannel,iAO_TotalCh,fValue);
uart_Close(hPort);
```

[C#] pac_WriteModulePowerOnValueAO

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue=5;
bool iRet = PACNET.PAC_IO.WriteModulePowerOnValueAO(hPort,
slot,iChannel,iAO_TotalCh,fValue);
PACNET.UART.Close(hPort);
```

[C#] pac_WriteModulePowerOnValueAO_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue=5;
bool iRet = PACNET.PAC_IO.WriteModulePowerOnValueAO_MF(hPort,
slot,iChannel,iAO_TotalCh,fValue);
PACNET.UART.Close(hPort);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.31. pac_ReadModulePowerOnValueAO/pac_ReadModulePowerOnValueAO_MF

This function reads the AO power on value of the AO module.

Syntax

C++

```
BOOL pac_ReadModulePowerOnValueAO(
        HANDLE hPort,
        int slot,
        int iChannel,
        int iAO_TotalCh,
        float *fValue
);
```

C++

```
BOOL pac_ReadModulePowerOnValueAO_MF(
        HANDLE hPort,
        int slot,
        int iChannel,
        int iAO_TotalCh,
        float *fValue
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

iChannel

[in] Read the AO value from the channel of the AO module.

iAO_TotalCh

[in] The total number of the AO channels of the AO module.

float fValue

[out] The pointer to the AO power on value that is read back from the AO module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C] pac_ReadModulePowerOnValueAO

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue;
BOOL iRet = pac_ReadModulePowerOnValueAO(hPort, iSlot,iChannel,iAO_TotalCh,
&fValue);
uart_Close(hPort);
```

[C] pac_ReadModulePowerOnValueAO_MF

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue;
BOOL iRet = pac_ReadModulePowerOnValueAO_MF(hPort, iSlot,iChannel,iAO_TotalCh,
&fValue);
uart_Close(hPort);
```

[C#] pac_ReadModulePowerOnValueAO

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue = 0;
bool iRet = PACNET.PAC_IO.ReadModulePowerOnValueAO(hPort,
slot,iChannel,iAO_TotalCh,ref fValue);
PACNET.UART.Close(hPort);
Console.WriteLine("The AO power on value is " + fValue.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//              The AO power on value is 5
```

[C#] pac_ReadModulePowerOnValueAO_MF

```
// If the module is 87k local
IntPtr hPort;
hPort = PACNET.UART.Open("");
byte slot=1;
int iChannel=2;
int iAO_TotalCh=8;
float fValue = 0;
bool iRet = PACNET.PAC_IO.ReadModulePowerOnValueAO_MF(hPort,
slot,iChannel,iAO_TotalCh,ref fValue);
PACNET.UART.Close(hPort);
Console.WriteLine("The AO power on value is " + fValue.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//              The AO power on value is 5
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.32. pac_GetModuleWDTStatus

This function reads the host watchdog status of a module.

Syntax

C++

```
BOOL pac_GetModuleWDTStatus (
        HANDLE hPort,
        int slot
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

Return Value

If the function succeeds and the host watchdog is enabled, the return value is TRUE.

If the function fails or the host watchdog is disabled, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
int iSlot =0;
bool bStatus=0;
hPort = uart_Open("");
bStatus = pac_GetModuleWDTStatus (hPort , iSlot);
uart_Close(hPort);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
int iSlot =1;
hPort = PACNET.UART.Open("");
bool bStatus= PACNET.PAC_IO.GetModuleWDTStatus(hPort , iSlot);
PACNET.UART.Close(hPort);
Console.WriteLine("The return value is " + bStatus.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The return value is True
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.33. pac_GetModuleWDTConfig

This function reads the host watchdog status of a module.

Syntax

C++

```
BOOL pac_GetModuleWDTConfig (
        HANDLE hPort,
        int slot,
        short* enStatus,
        unsigned long *wdtTimeout,
        int *ifWDT_Overwrite
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

enStatus

[out] 1: the host watchdog is enabled

0: the host watchdog is disabled

wdtTimeout

[out] The unit of return value is 100ms.

ifWDT_Overwrite (only for i-8k)

[out] 1: the host watchdog does overwrite

0: the host watchdog does not overwrite

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
int iSlot =1;
short sStatus=0;
unsigned long ulWDTtime=0;
int iOverwrite= 0;
hPort = uart_Open(“”);
pac_GetModuleWDTConfig (hPort, iSlot, &sStatus, &ulWDTtime, &iOverwrite);
uart_Close(hPort);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
int iSlot =1;
short sStatus=0;
int ulWDTtime=0;
int iOverwrite= 0;
hPort = PACNET.UART.Open("");
PACNET.PAC_IO.GetModuleWDTConfig(hPort , iSlot, ref sStatus, ref ulWDTtime, ref
iOverwrite);
PACNET.UART.Close(hPort);
Console.WriteLine("Status : " + sStatus.ToString() + ", WDTTime : " + ulWDTtime.ToString()
+ ", Overwrite : " + iOverwrite.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//          Status : 1, WDTTime : 100, Overwrite : 0
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.34. pac_SetModuleWDTConfig

This function enables/disables the host watchdog and sets the host watchdog timeout value of a module.

Syntax

C++

```
BOOL pac_SetModuleWDTStatus(
        HANDLE hPort,
        int slot,
        short enStatus,
        unsigned long wdtTimeout,
        int ifWDT_Overwrite
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

enStatus

[in] 1: the host watchdog is enabled

0: the host watchdog is disabled

wdtTimeout

[in] The unit of return value is 100ms.

ifWDT_Overwrite (only for i-8k)

[in] 1: the host watchdog does overwrite

0: the host watchdog does not overwrite

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
int iSlot =1;
short sStatus=0;
unsigned long ulWDTtime=0;
int iOverwrite= 0;
hPort = uart_Open(“”);
pac_SetModuleWDTConfig (hPort, iSlot, sStatus, ulWDTtime, iOverwrite);
uart_Close(hPort);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
int iSlot =1;
short sStatus=0;
int ulWDTtime=0;
int iOverwrite= 0;
hPort = PACNET.UART.Open("");
PACNET.PAC_IO.SetModuleWDTConfig (hPort , iSlot, sStatus, ulWDTtime, iOverwrite);
PACNET.UART.Close(hPort);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.35. pac_ResetModuleWDT

This function resets the host watchdog status of a module.

Syntax

C++

```
BOOL pac_ResetModuleWDT(
        HANDLE hPort,
        int slot
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
int iSlot =1;
hPort = uart_Open(“”);
pac_ResetModuleWDT(hPort, iSlot);
uart_Close(hPort);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
int iSlot =1;
hPort = PACNET.UART.Open("");
PACNET.PAC_IO.ResetModuleWDT(hPort , iSlot);
PACNET.UART.Close(hPort);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.36. pac_RefreshModuleWDT

This function refresh the host watchdog of a module.

Syntax

C++

```
BOOL pac_RefreshModuleWDT(
          HANDLE hPort,
          int slot
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

0, if the module is 8k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
int iSlot =1;
hPort = uart_Open("");
pac_RefreshModuleWDT(hPort, iSlot);
uart_Close(hPort);
```

[C#]

```
// If the module is 87k local
IntPtr hPort;
int iSlot =1;
hPort = PACNET.UART.Open("");
PACNET.PAC_IO.RefreshModuleWDT(hPort , iSlot);
PACNET.UART.Close(hPort);
```

Remarks

The function can support for Local or Remote. When the module is local, the second Parameter's range is from 1 to 7 for XPAC series. If remote, the second parameter need use the macro, PAC_REMOTE_IO (0...255), which range is from 0 to 255.

2.6.37. pac_InitModuleWDTInterrupt

This function initializes and enables interrupt of a module watchdog. This function only supports for 8KRW modules(I-80xxRW).

Syntax

C++

```
BOOL pac_RefreshModuleWDT(
          int slot,
          PAC_CALLBACK_FUNC f
);
```

Parameters

slot

[in] The slot in which module is to receive the command. Default is local.

ft

[in] A call back function..

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
int CALLBACK slot_callback_proc()
{
// do something
   return true;
}

int iSlot =1;
pac_InitModuleWDTInterrupt (iSlot, slot_callback_proc);
```

[C#]

```
static public int slot_callback_proc()
{
        // do something
        return 0;
}
static void Main(string[] args)
{
        int iSlot =1;
        PACNET.PAC_IO.InitModuleWDTInterrupt(iSlot, slot_callback_proc);
}
```

2.6.38. pac_GetModuleWDTInterruptStatus

This function reads interrupt status of a module watchdog. This function only supports for 8KRW modules(I-80xxRW).

Syntax

C++

```
short pac_GetModuleWDTInterruptStatus (
        int slot
);
```

Parameters

slot

[in] The slot in which module is to receive the command. Default is local.

Return Value

Interrupt status.

1:	Enabled.
0:	Disabled.

Examples

[C]

```
Example 1:
int iSlot =1;
short sStatus = 0;
sStatus = pac_GetModuleWDTInterruptStatus (iSlot);
```

[C#]

```
int iSlot = 1;
short sStatus = 0;
sStatus = PACNET.PAC_IO.GetModuleWDTInterruptStatus(iSlot);
Console.WriteLine("The return value is " + sStatus.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//          The return value is 0
```

2.6.39. pac_SetModuleWDTInterruptStatus

This function enables/disables interrupt of a module watchdog.

Syntax

C++

```
BOOL pac_SetModuleWDTInterruptStatus (
        int slot,
        short enStatus
);
```

Parameters

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

enStatus

[in] Interrupt status.

1:	Enabled.
0:	Disabled.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
int iSlot =1;
short sStatus = 0;
pac_SetModuleWDTInterruptStatus (iSlot, sStatus);
```

[C#]

```
int iSlot = 1;
short sStatus = 0; // disabled
PACNET.PAC_IO.SetModuleWDTInterruptStatus(iSlot, sStatus);
```

2.7. PWM API

PWM API only supports to operate I-7K/I-87K PWM modules.
Before using the PWM API functions, refer to the previous chapter, PAC_IO Reference first for more details regarding of the slot definition in local and how to use remote I/O module.

In developing C/C++ program for I-7K/I-87K PWM modules connected or plugged to/on the the WinPAC/XPAC series device, in addition to link PACSDK.lib and it needs to link PACSDK_PWM.lib to the user's project. Besides, the built executable file placed in the WinPAC/XPAC series device must work with PACSDK.dll and PACSDK_PWM.dll.
In developing .net CF program, the project only refer to PACNET.dll and the built executable file placed in the WinPAC/XPAC series device only works with PACNET.dll and PACSDK.dll.

For more information about I-7K/I-87K PWM modules that are compatible with the XPAC/WinPAC series, please refer to

I-87K series
http://www.icpdas.com/products/PAC/i-8000/8000_IO_modules.htm#i87k PWM module (such as I-87088W module)

I-7K series
http://www.icpdas.com/root/product/solutions/remote_io/rs-485/i-7000_m-7000/i-7000_m-7000_selection.html
(such as I-7088)

The suit of the PWM API functions isn't applied to the I-8K PWM module.

Supported PACs

The following list shows the supported PACs for each of the PWM functions.

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_SetPWMDuty	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMDuty	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetPWMFrequency	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMFrequency	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetPWMMode	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMMode	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetPWMDITriggerConfig	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMDITriggerConfig	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetPWMStart	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetPWMSynChannel	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMSynChannel	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SyncPWMStart	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SavePWMConfig	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMDIOStatus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetPWMPulseCount	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMPulseCount	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

PWM Functions

The following functions are used to retrieve or set the PWM.

PACSDK Functions	PACNET Functions	Description
pac_SetPWMDuty	PWM.SetPWMDuty	sets the duty cycle value for a specified channel.
pac_GetPWMDuty	PWM.GetPWMDuty	reads the duty cycle value for a specific channel.
pac_SetPWMFrequency	PWM.SetPWMFrequency	sets the frequency value for a specific channel.
pac_GetPWMFrequency	PWM.GetPWMFrequency	reads the frequency value for a specific channel.
pac_SetPWMMode	PWM.SetPWMMode	sets the continuous mode for a specific channel.
pac_GetPWMMode	PWM.GetPWMMode	reads the continuous mode from a specific channel.
pac_SetPWMDITriggerConfig	PWM.SetPWMDITriggerConfig	sets the hardware trigger for a specific channel.
pac_GetPWMDITriggerConfig	PWM.GetPWMDITriggerConfig	reads the hardware trigger from a specific port.
pac_SetPWMStart	PWM.SetPWMStart	sets the status of the PWM output port.
pac_SetPWMSynChannel	PWM.SetPWMSynChannel	sets the PWM synchronization status for a specific channel.
pac_GetPWMSynChannel	PWM.GetPWMSynChannel	reads the PWM synchronization status ffom a specific channel.
pac_SyncPWMStart	PWM.SyncPWMStart	starts the PWM synchronization.
pac_SavePWMConfig	PWM.SavePWMConfig	saves the PWM configuration.
pac_GetPWMDIOStatus	PWM.GetPWMDIOStatus	reads the status of the PWM output port and the digital input port.
pac_SetPWMPulseCount	PWM.SetPWMPulseCount	sets the PWM step value for a specific channel.
pac_GetPWMPulseCount	PWM.GetPWMPulseCount	reads the PWM step value from a specific channel.

2.7.1. pac_SetPWMDuty

This function sets the duty cycle value for a specified channel.

Syntax

C++

```
BOOL pac_SetPWMDuty(
          HANDLE port,
          int slot,
          short chIndex,
          float duty
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

chIndex

[in] Specify the channel to set the duty cycle value.

duty

[in] The duty cycle value to write to the PWM module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
int iSlot=1;
short iChannel=2;
float fValue = 1.23;
BOOL iRet = pac_SetPWMDuty (hPort, iSlot, iChannel, fValue);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort;
hPort = PACNET.UART.Open("");
int iSlot=1;
short iChannel=2;
float fValue = 1.23F;
bool iRet = PACNET.PWM.SetPWMDuty(hPort, iSlot, iChannel, fValue);
PACNET.UART.Close(hPort);
```

2.7.2. pac_GetPWMDuty

This function reads the duty cycle value for a specific channel.

Syntax

C++

```
BOOL pac_GetPWMDuty(
          HANDLE port,
          int slot,
          short chIndex,
          float *duty
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

chIndex

[in] Get the duty cycle value from the channel.

duty

[out] The duty cycle value to read from the PWM module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
int iSlot=1;
short iChannel=2;
float fValue;
BOOL iRet = pac_GetPWMDuty (hPort, iSlot, iChannel, &fValue);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort = PACNET.UART.Open("");
int iSlot=1;
short iChannel=2;
float fValue=0;
bool iRet = PACNET.PWM.GetPWMDuty(hPort, iSlot, iChannel, ref fValue);
PACNET.UART.Close(hPort);
Console.WriteLine("The duty value is " + fValue.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//          The duty value is 1.23
```

2.7.3. pac_SetPWMFrequency

This function sets the frequency value for a specific channel.

Syntax

C++

```
BOOL pac_SetPWMFrequency (
        HANDLE port,
        int slot,
        short chIndex,
        unsigned long freq
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

chIndex

[in] Specify the channel to set the frequency value.

freq

[in] The frequency value to set to the PWM module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
int iSlot=1;
short iChannel=2;
unsigned long ulfreq= 1;
BOOL iRet = pac_SetPWMFrequency (hPort, iSlot, iChannel, ulfreq);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort;
hPort = PACNET.UART.Open("");
int iSlot=1;
short iChannel=2;
uint ulfreq = 1;
bool iRet = PACNET.PWM.SetPWMFrequency(hPort, iSlot, iChannel, ulfreq);
PACNET.UART.Close(hPort);
```

2.7.4. pac_GetPWMFrequency

This function reads the frequency value for a specific channel.

Syntax

C++

```
BOOL pac_GetPWMFrequency (
        HANDLE port,
        int slot,
        short chIndex,
        unsigned long *freq
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

chIndex

[in] Specify the channel to get the frequency value.

freq

[in] The frequency value to read from the PWM module.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
int iSlot=1;
short iChannel=2;
unsigned long ulfreq;
BOOL iRet = pac_GetPWMFrequency (hPort, iSlot, iChannel, &ulfreq);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort = PACNET.UART.Open("");
int iSlot=1;
short iChannel=2;
uint ulfreq = 0;
bool iRet = PACNET.PWM.GetPWMFrequency(hPort, iSlot, iChannel, ref ulfreq);
PACNET.UART.Close(hPort);
Console.WriteLine("The frequency value is " + ulfreq.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The frequency value is 1
```

2.7.5. pac_SetPWMMode

This function sets the continuous mode for a specific channel.

Syntax

C++

```
BOOL pac_SetPWMMode(
          HANDLE port,
          int slot,
          short chIndex,
          long mode
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

chIndex

[in] Specify a channel to set the continuous mode.

mode

[in] 0: Disable the PWM continuous mode (pulse count mode)

1: Enable the PWM continuous mode

(If the PWM continuous mode is enabled, the step value for PWM will be automatically set to 1)

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
int iSlot=1;
short iChannel=2;
long mode = 0;
BOOL iRet = pac_SetPWMMode (hPort, iSlot, iChannel, mode);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort;
hPort = PACNET.UART.Open("");
int iSlot=1;
short iChannel=2;
int mode = 0; // Disable the PWM continuous mode
bool iRet = PACNET.PWM.SetPWMMode(hPort, iSlot, iChannel, mode);
PACNET.UART.Close(hPort);
```

2.7.6. pac_GetPWMMode

This function reads the continuous mode from a specific channel.

Syntax

C++

```
BOOL pac_GetPWMMode(
        HANDLE port,
        int slot,
        short chIndex,
        long *mode
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

chIndex

[in] Specify a channel to read the continuous mode.

mode

[out]	0: Disable the PWM continuous mode (pulse count mode)
	1: Enable the PWM continuous mode

(If the PWM continuous mode is enabled, the step value for PWM will be automatically set to 1)

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
int iSlot=1;
short iChannel=2;
long mode;
BOOL iRet = pac_GetPWMMode (hPort, iSlot, iChannel, &mode);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort = PACNET.UART.Open("");
int iSlot=1;
short iChannel=2;
int mode=0;
bool iRet = PACNET.PWM.GetPWMMode(hPort, iSlot, iChannel, ref mode);
PACNET.UART.Close(hPort);
Console.WriteLine("The mode value is " + mode.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//          The mode value is 1
```

2.7.7. pac_SetPWMDITriggerConfig

This function sets the hardware trigger for a specific channel.

Syntax

C++

```
BOOL pac_SetPWMDITriggerConfig(
        HANDLE port,
        int slot,
        short chIndex,
        short config
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

chIndex

[in] Specify a channel to set the the hardware trigger.

config

[in] 0: Disable the hardware trigger

1: Enable the trigger start

2: Enable the trigger stop

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
int iSlot=1;
short iChannel=2;
short mode = 0;
BOOL iRet = pac_SetPWMDITriggerConfig (hPort, iSlot, iChannel, mode);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort;
hPort = PACNET.UART.Open("");
int iSlot=1;
short iChannel=2;
short mode = 0;
bool iRet = PACNET.PWM.SetPWMDITriggerConfig(hPort, iSlot, iChannel, mode);
PACNET.UART.Close(hPort);
```

2.7.8. pac_GetPWMDITriggerConfig

This function reads the hardware trigger from a specific port.

Syntax

C++

```
BOOL pac_GetPWMDITriggerConfig(
        HANDLE port,
        int slot,
        short chIndex,
        short *config
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

chIndex

[in] Specify a channel to read the hardware trigger.

config

[out] 0: The hardware trigger disabled

1: The hardware trigger start is enabled

2: The hardware trigger stop is enabled

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
int iSlot=1;
short iChannel=2;
short mode;
BOOL iRet = pac_GetPWMDITriggerConfig (hPort, iSlot, iChannel, &mode);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort = PACNET.UART.Open("");
int iSlot=1;
short iChannel=2;
short mode=0;
bool iRet = PACNET.PWM.GetPWMDITriggerConfig(hPort, iSlot, iChannel, ref mode);
PACNET.UART.Close(hPort);
Console.WriteLine("The return value is " + mode.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The return value is 1
```

2.7.9. pac_SetPWMStart

This function sets the status of the PWM output port.

Syntax

C++

```
BOOL pac_SetPWMStart(
        HANDLE port,
        int slot,
        short enStatus
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

enStatus

[in] Bit 0 corresponds to PWM channel 0, and bit 1 corresponds to PWM channel 1, etc. When the bit is 0, it denotes that the PWM output port is off, and 1 denotes that the PWM output port is on.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
int iSlot=1;
short Status = 0x01;
BOOL iRet = pac_SetPWMStart (hPort, iSlot, Status);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort;
hPort = PACNET.UART.Open("");
int iSlot=1;
short Status = 0x01;
bool iRet = PACNET.PWM.SetPWMStart(hPort, iSlot, Status);
PACNET.UART.Close(hPort);
```

2.7.10. pac_SetPWMSynChannel

This function sets the PWM synchronization status for a specific channel.

Syntax

C++

```
BOOL pac_SetPWMSynChannel(
        HANDLE port,
        int slot,
        short chIndex,
        short enStatus
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

chIndex

[in] Specify a channel to set the synchronization status.

config

[in] 0: Disable the PWM synchronization

1: Enable the PWM synchronization

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
BYTE iSlot=1;
int iChannel=2;
short mode = 0;
BOOL iRet = pac_SetPWMSynChannel(hPort, iSlot, iChannel, mode);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort;
hPort = PACNET.UART.Open("");
int iSlot=1;
short iChannel=2;
short mode = 0; // Disable the PWM synchronization
bool iRet = PACNET.PWM.SetPWMSynChannel(hPort, iSlot, iChannel, mode);
PACNET.UART.Close(hPort);
```

2.7.11. pac_GetPWMSynChannel

This function reads the PWM synchronization status ffom a specific channel.

Syntax

C++

```
BOOL pac_GetPWMSynChannel (
         HANDLE port,
         int slot,
         short chIndex,
         short *enStatus
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

chIndex

[in] Specify a channel to read the synchronization status.

config

[out] 0: The PWM synchronization status is disabled

1: The PWM synchronization status is enabled

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
BYTE iSlot=1;
int iChannel=2;
short mode;
BOOL iRet = pac_GetPWMSynChannel (hPort, iSlot, iChannel, &mode);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort = PACNET.UART.Open("");
int iSlot=1;
short iChannel=2;
short mode=0;
bool iRet = PACNET.PWM.GetPWMSynChannel(hPort, iSlot, iChannel, ref mode);
PACNET.UART.Close(hPort);
Console.WriteLine("The return value is " + mode.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//          The return value is 1
```

2.7.12. pac_SyncPWMStart

This function starts the PWM synchronization.

Syntax

C++

```
BOOL pac_SyncPWMStart(
         HANDLE port,
         int slot,
         short enStatus
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

enStatus

[in] 0: Stops the PWM synchronization

1: Starts the PWM synchronization

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
int iSlot=1;
short Status = 0;
BOOL iRet = pac_SyncPWMStart(hPort, iSlot, Status);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort;
hPort = PACNET.UART.Open("");
int iSlot=1;
short Status = 0; // Stops the PWM synchronization
bool iRet = PACNET.PWM.SyncPWMStart(hPort, iSlot, Status);
PACNET.UART.Close(hPort);
```

2.7.13. pac_SavePWMConfig

This function saves the PWM configuration.

Syntax

C++

```
BOOL pac_SavePWMConfig(
        HANDLE port,
        int slot,
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
int iSlot=1;
BOOL iRet = pac_SavePWMConfig (hPort, iSlot);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort;
hPort = PACNET.UART.Open("");
int iSlot=1;
bool iRet = PACNET.PWM.SavePWMConfig(hPort, iSlot);
PACNET.UART.Close(hPort);
```

2.7.14. pac_GetPWMDIOStatus

This function reads the status of the PWM output port and the digital input port.

Syntax

C++

```
BOOL pac_GetPWMDIOStatus(
          HANDLE port,
          int slot,
           unsigned char pwmBitArr[],
          unsigned char diBitArr[]
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

pwmBitArr

[out] The array[0] corresponds to PWM channel 0, and the array[1] corresponds to PWM channel 1, etc. When the array is 0, it denotes that the PWM is inactive and 1 denotes that the PWM is active.

diBitArr

[out] The array[0] corresponds to DI channel 0, and the array[1] corresponds to DI channel 1, etc. When the bit is 0, it denotes that the DI is inactive and 1 denotes that the DI is active.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
int iSlot=1;
unsigned char pwm[32];
unsigned char di[32];
BOOL iRet = pac_GetPWMDIOStatus(hPort, iSlot, pwm, di);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort;
hPort = PACNET.UART.Open("");
int iSlot=1;
byte[] pwm = new byte[32];
byte[] di = new byte[32];
bool iRet = PACNET.PWM.GetPWMDIOStatus(hPort, iSlot, pwm, di);
PACNET.UART.Close(hPort);
```

2.7.15. pac_SetPWMPulseCount

This function sets the PWM step value for a specific channel.

Syntax

C++

```
BOOL pac_SetPWMPulseCount (
        HANDLE port,
        int slot,
        short chIndex,
        long cnt
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

chIndex

[in] Specify the channel to set the PWM step value.

cnt

[in] The PWM steps (0x0001 to 0xFFFF)

(When set to more than 1 step, the PWM continuous

mode will be automatically set to disabled)

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open("");
int iSlot=1;
short iChannel=2;
long lcnt = 1;
BOOL iRet = pac_SetPWMPulseCount(hPort, iSlot, iChannel, lcnt);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort;
hPort = PACNET.UART.Open("");
int iSlot=1;
short iChannel=2;
short lcnt = 1;
bool iRet = PACNET.PWM.SetPWMPulseCount(hPort, iSlot, iChannel, lcnt);
PACNET.UART.Close(hPort);
```

2.7.16. pac_GetPWMPulseCount

This function reads the PWM step value from a specific channel.

Syntax

C++

```
BOOL pac_GetPWMPulseCount(
          HANDLE port,
          int slot,
          short chIndex,
          long *cnt
);
```

Parameters

hPort

[in] The serial port HANDLE opened by uart_Open(), if the module is 87k modules in local.

slot

[in] The slot in which module is to receive the command. Default is local.

If the IO module is remote, please use the macro, PAC_REMOTE_IO(0...255).

chIndex

[in] Specify a channel to read the PWM step value.

cnt

[out] The PWM steps (0x0001 to 0xFFFF)

(When set to more than 1 step, the PWM continuous

mode will be automatically set to disabled)

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
Example 1:
// If the module is 87k local
HANDLE hPort;
hPort = uart_Open(“”);
int iSlot=1;
short iChannel=2;
long lcnt;
BOOL iRet = pac_GetPWMPulseCount(hPort, iSlot, iChannel, &lcnt);
uart_Close(hPort);
```

[C#]

```
IntPtr hPort = PACNET.UART.Open("");
int iSlot=1;
short iChannel=2;
int lcnt = 0;
bool iRet = PACNET.PWM.GetPWMPulseCount(hPort, iSlot, iChannel, ref lcnt);
PACNET.UART.Close(hPort);
Console.WriteLine("The return value is " + lcnt.ToString());
Console.ReadLine();

// The example displays the following output to the console:
//            The return value is 1
```

2.8. Backplane Timer API

Backplane timer API supports to hardware timer including timerout/timer1/timer2.

Supported PACs

The following list shows the supported PACs for each of the backplane timer functions.

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_GetBPTimerTimeTick_ms	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_GetBPTimerTimeTick_us	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_SetBPTimer	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_SetBPTimerOut	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_SetBPTimerInterruptPriority	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_KillBPTimer	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y

Backplane Timer Functions

The following functions are used to retrieve or set the backplane timer.

PACSDK Functions	PACNET Functions	Description
pac_GetBPTimerTimeTick_ms	BPTimer.GetBPTimerTimeTick_ms	returns the number of milliseconds that have elapsed since the system was started, excluding any time that the system was suspended.
pac_GetBPTimerTimeTick_us	BPTimer.GetBPTimerTimeTick_us	returns the number of microsecond that have elapsed since the system was started, excluding any time that the system was suspended.
pac_SetBPTimer	BPTimer.SetBPTimer	creates a hardware timer with the specified time-out value.
pac_SetBPTimerOut	BPTimer.SetBPTimerOut	creates a hardware timer with the specified time-out value of high/low wave.
pac_SetBPTimerInterruptPriority	BPTimer.SetBPTimerInterruptPriority	sets the priority for a real-time thread of the backplane timer.
pac_KillBPTimer	BPTimer.KillBPTimer	destroys the specified timer event identified by type, set by an earlier call to pac_SetBPTimer.

2.8.1. pac_GetBPTimerTimeTick_ms

This function returns the number of milliseconds that have elapsed since the system was started, excluding any time that the system was suspended.

Syntax

C++

```
DWORD pac_GetBPTimerTimeTick_ms(void);
```

Parameters

This function has no parameters.

Return Value

The number of milliseconds indicates success.

Examples

This function has no examples.

2.8.2. pac_GetBPTimerTimeTick_us

This function returns the number of microsecond that have elapsed since the system was started, excluding any time that the system was suspended.

Syntax

C++

```
DWORD pac_GetBPTimerTimeTick_us (void);
```

Parameters

This function has no parameters.

Return Value

The number of microseconds indicates success.

Examples

This function has no examples.

2.8.3. pac_SetBPTimer

This function creates a hardware timer with the specified time-out value.

A time-out value is specified, and every time a time-out occurs, the system posts an interrupt signal to the system and pass the message to an application-defined callback function.

Syntax

C++

```
BOOL pac_SetBPTimer (
        int type,
        unsigned int uElapse,
        PAC_TIMEROUT_CALLBACK_FUNC f
);
```

Parameters

type

[in] Specify the type of the timer.

1 (Timer 1): 1 microsecond timer

2 (Timer 2): 10 microsecond timer

Others: Not applicable

uElapse

[in] Specify the elapsed time.

Timer 1: A value of a timerout signal as integer from 0~65535, in 1 microsecond.

Timer 2: A value for a timerout signal as integer from0~65535, in 10 microseconds.

f

Specify the address of the application-supplied f callback function.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
int CALLBACK TIMER()    //Interrupt Function
{
/*Add the user control code here*/
return 0;    // Interrupt done
}
// Set timer1 with 200 microsecond interval
pac_SetBPTimer(1, 200, TIMER);
```

[C#]

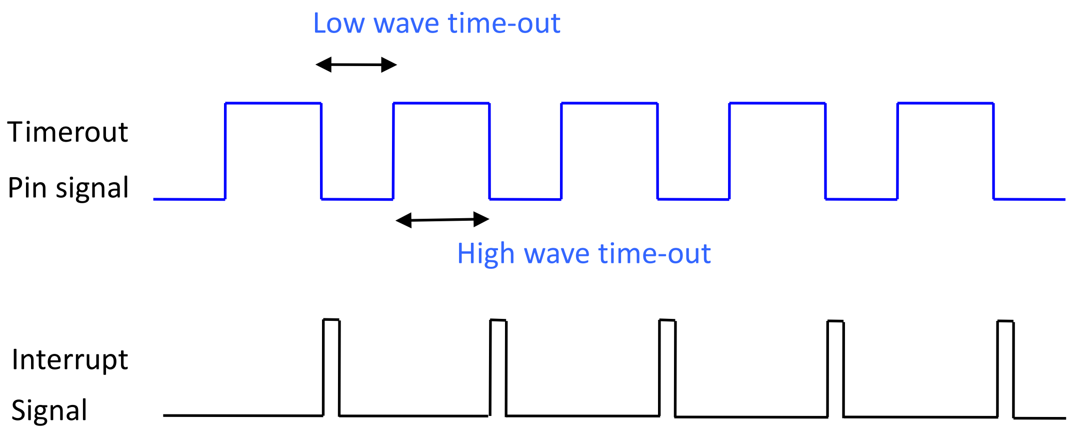
```
static void Main(string[] args)
{
        PACNET.PAC_CALLBACK_FUNC f = new PACNET.PAC_CALLBACK_FUNC (myfunction);
        // Set timer1 with 200 microsecond interval
        PACNET.BPTimer.SetBPTimer(1, 200, f);
}
static int myfunction()    //Interrupt Function
{
        /*Add the user control code here*/

        return 0;    // Interrupt done
}
```

2.8.4. pac_SetBPTimerOut

This function creates a hardware timer with the specified time-out value of high/low wave.

The time-out value of high/low wave are specified, and every time the time-out of high wave and low wave occur, the system posts an interrupt signal to the system and pass the message to an application-defined callback function.

The timerout pin on each slot will be triggered while a timerout signal has been outputted. The timeourput pin can be used to acquire the synchronized data on each slot.



Syntax

C++

```
BOOL pac_SetBPTimerOut (
        unsigned int uHighElapse,
        unsigned int uLOwElapse,
        pac_TIMEROUT_CALLBACK_FUNC f
);
```

Parameters

uHighElapse

[in] Specify the elapsed time value for a high wave of the timerout signal as integer from 0~65535, in microseconds.

uLOwElapse

[in] Specify the elapsed time value for a low wave of the timerout signal as integer from 0~65535, in microseconds.

f

Specify the address of the application-supplied f callback function.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, The return value is FALSE.

Examples

[C]

```
int CALLBACK TIMER()    //Interrupt Function
{
/*Add the user control code here*/
return 0;    // Interrupt done
}
// Set timer1 with 200 microsecond interval
pac_SetBPTimerOut (200, 300, TIMER);
```

2.8.5. pac_SetBPTimerInterruptPriority

This function sets the priority for a real-time thread of the backplane timer.

Syntax

C++

```
BOOL pac_SetBPTimerInterruptPriority (
        int type,
        int nPriority
);
```

Parameters

type

[in] Specify the backplane timer.

0: Timerout

1: Timer 1

2: Timer 2

nPriority

[in] Specify the priority to set for the thread

This value can range from 0 through 255, with 0 as the highest priority.

Return Value

If the function succeeds, the return value is TRUE.

If the function fails, the return value is FALSE.

Examples

[C]

```
int CALLBACK TIMER()    //Interrupt Function
{
/*Add the user control code here*/
return 0;    // Interrupt done
}
// Set timer1 with 200 microsecond interval
pac_SetBPTimer (1, 200, TIMER);
// Set the priority of timer 1 to 100
pac_SetBPTimerInterruptPriority(1, 100);
```

[C#]

```
static void Main(string[] args)
{
        PACNET.PAC_CALLBACK_FUNC f = new PACNET.PAC_CALLBACK_FUNC(myfunction);

        // Set timer1 with 200 microsecond interval
        PACNET.BPTimer.SetBPTimer(1, 200, f);
        // Set the priority of timer 1 to 100
        PACNET.BPTimer.SetBPTimerInterruptPriority(1, 100);
}
static int myfunction()    //Interrupt Function
{
        /*Add the user control code here*/
        return 0;    // Interrupt done
}
```

2.8.6. pac_KillBPTimer

This function destroys the specified timer event identified by type, set by an earlier call to pac_SetBPTimer.

Syntax

C++

```
void pac_KillBPTimer (
          int type
);
```

Parameters

type

[in] Specify the timer.

0 (Timerout)

1 (Timer 1): 1 microsecond timer

2 (Timer 2): 10 microsecond timer

Return Value

This function does not return any value.

Examples

[C]

```
// Destroy the timer 1
pac_KillBPTimer(1);
```

2.9. Error Handling API

The error handling functions enable you to receive and display error information for your application.

Supported PACs

The following list shows the supported PACs for each of the error handling functions.

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_GetLastError	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	Y
pac_SetLastError	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	Y
pac_GetErrorMessage	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	Y
pac_ClearLastError	Y	Y	Y	Y	Y	-	-	-	-	-	Y

Error Functions

The following functions are used to retrieve or set the error code.

PACSDK Functions	PACNET Functions	Description
pac_GetLastError	ErrHandling.GetLastError	last-error code value.
pac_SetLastError	ErrHandling.SetLastError	sets the last-error code.
pac_GetErrorMessage	ErrHandling.GetErrorMessage	retrieves a message string.
pac_ClearLastError	ErrHandling.ClearLastError	clears the last-error code.

2.9.1. pac_GetLastError

This function retrieves the calling thread’s last-error code value.

Syntax

C++

```
DWORD pac_GetLastError();
```

Parameters

This function has no parameters.

Return Value

The Return Value section of each function page notes the conditions under which the function sets the last-error code.

Examples

This function has no examples.

Remarks

You should call the pac_GetLastError function immediately when a function's return value indicates that such a call will return useful data. That is because some functions call pac_SetLastError(0) when they succeed, wiping out the error code set by the most recently failed function.

For an example, please refer to pac_GetErrorMessage in this chapter.

To obtain an error string for XPAC error codes, use the pac_GetErrorMessage function. For a complete list of error codes, see Appendix A. System Error Code.

The following table lists the system error codes ranges for each function reference.

Error Type	Explanation	Range
PAC_ERR_SUCCESS	No error, success	0x00000
PAC_ERR_UNKNOWN	A error which is undefined	0x00001
Basic	Defined common error conditions	0x10000 ~
Memory	About memory access	0x11000 ~
Watchdog	About watchdog	0x12000 ~
Interrupt	About interrupt	0x13000 ~
UART	About uart protocol	0x14000 ~
IO	About IO modules	0x15000 ~
Users	For user	0x20000 ~

2.9.2. pac_SetLastError

This function sets the last-error code.

Syntax

C++

```
void pac_SetLastError(
        DWORD errno
);
```

Parameters

errno

[in] Specify the last-error code.

Return Value

This function does not return any value.

Examples

This function has no examples.

Remarks

Applications can optionally retrieve the value set by this function by using the pac_GetLastError function.

The error codes are defined as DWORD values. If you are defining an error code, ensure that your error code does not conflict with any PacSDK-defined error codes.

We recommend that your error code should be greater than 0x20000.

For more information about the definition of error codes, please refer to pac_GetLastError in this document.

2.9.3. pac_GetErrorMessage

This function retrieves a message string.

Syntax

C++

```
void pac_GetErrorMessage(
        DWORD dwMessageID,
        LPTSTR lpBuffer
);
```

Parameters

dwMessageID

[in] Specify the 32-bit message identifier for the requested message.

lpBuffer

[out] A pointer to a buffer that receives the error message.

Return Value

This function does not return any value.

Examples

[C]

```
int main(int argc, char* argv[])
{
    if(argc < 3)
    {
            printf("usage: ReadMemory [ address ] [ dwLength ] [ mem_type ]\n\n");
            printf("where\n");
            printf("      address:\n");
            printf("            - the memory address where read from.\n");
            printf("      dwLength:\n");
            printf("            - number of characters to be read.\n");
            printf("      mem_type:\n");
            printf("            - 0      SRAM\n");
            printf("            - 1      EEPROM\n");
    }
    else
    {
            BYTE buffer[4096];
            BOOL err;
            char strErr[32];
            memset(buffer, 0, 4096);
            if(atoi(argv[3]) == 0)
            {
                    printf("The size of SRAM is %d\n", pac_GetMemorySize(atoi(argv[3])));
                    err = pac_ReadMemory(atoi(argv[1]), buffer, atoi(argv[2]), atoi(argv[3]));
                    if(err == FALSE)
                    {
                            pac_GetErrorMessage(pac_GetLastError(), strErr);
                            printf("Read SRAM failure!. The error code is %x\n", pac_GetLastError());
                            printf("%s", strErr);
                            return 0;
                    }
```

```
                printf("%s\n", buffer);
            }
            else
            {
                printf("The size of EEPROM is %d\n", pac_GetMemorySize(atoi(argv[3])));
                err = pac_ReadMemory(atoi(argv[1]), buffer, atoi(argv[2]), atoi(argv[3]));
                if(err == FALSE)
                {
                    pac_GetErrorMessage(pac_GetLastError(), strErr);
                    printf("Read EEPROM failure!. The error code is %x\n",
pac_GetLastError());
                    printf("%s", strErr);
                    return 0;
                }
                printf("%s\n", buffer);
            }
    }
    return 0;
}
```

[C#]

```
static void Main(string[] args)
{
        string[] strArray = new string[3];
        Console.WriteLine("pac_WriteDO for 8000 modules\n\n");
        Console.WriteLine("usage: pac_WriteDO [ Slot ] [ total channel ] [ DO's value ]\n\n");
        Console.WriteLine("where\n");
        Console.WriteLine("Slot:\n");
        Console.WriteLine(" -Enter the number of slot for local modules\n");
        strArray[0] = Console.ReadLine();
        Console.WriteLine("total channel:\n");
        Console.WriteLine(" -Enter the number of DO's channel\n");
        strArray[1] = Console.ReadLine();
        Console.WriteLine("DO's value:\n");
        Console.WriteLine(" -Enter the value. 1 is to turn on the DO channel; 0 is off.\n");
        strArray[2] = Console.ReadLine();

        bool err;
        err = PACNET.PAC_IO.WriteDO(IntPtr.Zero, Convert.ToInt32(strArray[0]),
Convert.ToInt32(strArray[1]), Convert.ToUInt32(strArray[2]));
        if (err == false)
        {
                uint errorCode = PACNET.ErrHandling.GetLastError();
                Console.WriteLine("Write DO's Error: "
+PACNET.ErrHandling.GetErrorMessage(errorCode) + "The error code is " +
errorCode.ToString() + "\n");
        }
        else
                Console.WriteLine("Write DO sucessfully.");
        Console.ReadLine();
}
```

Remarks

The pac_GetErrorMessage function can be used to obtain error message strings for the XPac error codes returned by pac_GetLastError, as shown in the following example.

```
TCHAR Buffer[32];
pac_GetErrorMessage(pac_GetLastError(), Buffer);
MessageBox( NULL, Buffer, L"Error", MB_OK | MB_ICONINFORMATION );
```

2.9.4. pac_ClearLastError

This function clears the last-error code.

Syntax

C++

```
void pac_ClearLastError(
          DWORD errno
);
```

Parameters

errno

[in] Specify the last-error code.

Return Value

This function does not return any value.

Examples

This function has no examples.

Remarks

The pac_ClearLastError function clears the last error, that is, the application is treated as success.

2.10. Misc API

Supported PACs

The following list shows the supported PACs for each of the Misc functions.

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
AnsiString	Y	Y	Y	-	-	Y	Y	Y	Y	Y	Y
WideString	Y	Y	Y	-	-	Y	Y	Y	Y	Y	Y
pac_AnsiToWideString	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WideToAnsiString	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_DoEvent/pac_DoEvents	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetCurrentDirectory	-	-	-	-	-	Y	Y	Y	Y	Y	Y
pac_GetCurrentDirectoryW	-	-	-	-	-	Y	Y	Y	Y	Y	Y

Misc Functions

The following functions are used to do convertion.

PACSDK Functions	PACNET Functions	Description
AnsiString	MISC.AnsiString	converts a unicode string to an ANSI byte array.
WideString	MISC.WideString	converts an ANSI byte array to a Unicode string.
pac_AnsiToWideString	N/A	converts an ANSI string to a Unicode string.
pac_WideToAnsiString	N/A	converts a Unicode string to an ANSI string.
pac_DoEvent/pac_DoEvents	MISC.DoEvents	handles all events.

2.10.1. AnsiString

This function converts a unicode string to an ANSI byte array.

Syntax

C#

```
byte[] AnsiString(
         string str
);
```

Parameters

str

[in] Points to the Unicode string to be converted.

Return Value

Returns the ANSI byte array.

Examples

[C#]

```
byte[] result = new byte[32];
IntPtr hPort = PACNET.UART.Open("COM1,115200,N,8,1");
PACNET.Sys.ChangeSlot(Convert.ToByte(1));
PACNET.UART.SendCmd(hPort, PACNET.MISC.AnsiString("$00M"), result);
string str = PACNET.MISC.WideString(result);
```

Remarks

In .NET, if we want to convert a Unicode string to ANSI or vice versa, we should convert through byte array.

2.10.2. WideString

This function converts an ANSI byte array to a Unicode string.

Syntax

C#

```
string WideString(
        byte[] CharStr
);
```

Parameters

CharStr

[in] Points to the ANSI byte array to be converted.

Return Value

Returns the Unicode string.

Examples

[C#]

```
byte[] result = new byte[32];
IntPtr hPort = PACNET.UART.Open("COM1,115200,N,8,1");
PACNET.Sys.ChangeSlot(Convert.ToByte(1));
PACNET.UART.SendCmd(hPort, PACNET.MISC.AnsiString("$00M"), result);
string str = PACNET.MISC.WideString(result);
```

Remarks

In .NET, if we want to convert a Unicode string to ANSI, or vice versa, we should convert through byte array.

2.10.3. pac_AnsiToWideString

This function converts an ANSI string to a Unicode string.

Syntax

C++

```
void pac_AnsiToWideString(
        LPCSTR astr,
        LPWSTR wstr
);
```

Parameters

astr

[in] Points to the ANSI string to be converted.

wstr

[out] A pointer to a buffer location that receives the converted Unicode string.

Return Value

This function does not return any value.

Examples

[C]

```
char ansiString[128] = "This is an ansi string";
TCHAR uniString[128];
pac_AnsiToWideString(ansiString, uniString);
MessageBox(NULL, uniString, NULL, MB_OK);     // The string "This is an ansi string" will show in
the messagebox correctly
```

[C]

```
byte[] ansiString = ASCIIEncoding.ASCII.GetBytes("This is an ansi string");
string uniString;
uniString = PACNET.MISC.WideString(ansiString);
Console.WriteLine(uniString);
Console.ReadLine();

// The example displays the following output to the console:
//            This is an ansi string
```

Remarks

The maximum size of the string buffer is 2 Kbytes.

2.10.4. pac_WideToAnsiString

This function converts a Unicode string to an ANSI string.

Syntax

C++

```
void pac_WideToAnsiString(
        LPCWSTR wstr,
        LPSTR astr
);
```

C++

```
void pac_WideStringToAnsi(
        const TCHAR *wstr,
        LPSTR astr
);
```

Parameters

wstr

[in] Points to the Unicode string to be converted.

astr

[in] A pointer to a buffer location that receives the converted ANSI string.

Return Value

This function does not return any value.

Examples

[C]

```
TCHAR uniString[128] = TEXT("This is a unicode string");
char ansiString[128];
pac_WideStringToAnsi(uniString, ansiString);
printf("%s", ansiString);
// The string "This is a unicode string" will show the console mode correctly
```

[C]

```
string uniString = "This is a unicode string";
byte[] ansiString = new byte[128];
ansiString = PACNET.MISC.AnsiString(uniString);
Console.WriteLine(Encoding.ASCII.GetString(ansiString));
Console.ReadLine();
// The string "This is a unicode string" will show the console mode correctly.
```

Remarks

The maximum size of the string buffer is 2 kbytes.

2.10.5. pac_DoEvent/pac_DoEvents

This function handles all events.

When you run a Windows Form, it creates the new form, which then waits for events to handle. Each time the form handles an event, it processes all the code associated with that event. All other events wait in the queue. While your code handles the event, your application does not respond. If you call pac_DoEvents in your code, your application can handle the other events.

Syntax

C++

```
void pac_DoEvent();
```

C++

```
void pac_DoEvents();
```

Parameters

This function has no parameters.

Return Value

This function does not return any value.

Examples

[C]

```
int counter = 0;
char buf[10];
bFlag = true;
while(bFlag)
{
        pac_DoEvents();
        sprintf(buf, %d", counter);
        SetDlgItemText(IDC_EDIT1, buf);
        counter++;
}
```

Appendix A. System Error Codes

This following table provides a list of system error code. There are turned by the pac_GetLastError function when many functions fail. To retrieve the description text for the error in your application, use the pac_GetErrorMessage function.

Error Code	Error Message
0x00001	Unknow Error
0x10001	Slot registered error
0x10002	Slot not registered error
0x10003	Unknown Module
0x10004	Module doesn't exist
0x10005	Invalid COM port number
0x10006	Function not supported
0x10007	Module doesn't exist
0x10008	Slot not registered error
0x11001	EEPROM accesses invalid address
0x11002	SRAM accesses invalid address
0x11003	SRAM accesses invalid type
0x11004	NVRAM accesses invalid address
0x11005	EEPROM write protection
0x11006	EEPROM write fail
0x11007	EEPROM read fail
0x12001	The input value is invalid
0x12002	The wdt doesn't exist
0x12003	The wdt init error
0x13001	Create interrupt's event failure
0x14001	Uart check sum error
0x14002	Uart read timeout
0x14003	Uart response error
0x14004	Uart under input range
0x14005	Uart exceed input range
0x14006	Uart open filed
0x14007	Uart get Comm Modem status error
0x14008	Uart get wrong line status

0x14009	Uart internal buffer overflow
0x15001	IO card does not support this API function
0x15002	API unsupport this IO card
0x15003	Slot's value exceeds its range
0x15004	Channel's value exceeds its range
0x15005	Gain's value exceeds its range
0x15006	Unsupported interrupt mode
0x15007	I/O value is out of the range
0x15008	I/O channel is out of the range
0x1500A	DI/O channel can't overwrite
0x1500B	AI/O channel can't overwrite
0x16001	Backplane Timer registed
0x16002	Backplane Timer not registed

Appendix B. API Comparison

The following tables give a brief summary of the capabilities of each API function, where “Y” means supported and “-“ means unsupported

System Information Functions

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_GetModuleName	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetRotaryID	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetSerialNumber	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetSDKVersion	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ChangeSlot	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_CheckSDKVersion	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ModuleExists	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetOSVersion	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
Pac_GetCPUVersion	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
Pac_EnableLEDs	-	Y	-	-	Y	-	-	-	-	-	-
pac_GetModuleType	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_BuzzerBeep	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetBuzzerFreqDuty	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetBuzzerFreqDuty	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_StopBuzzer	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetDIPSwitch	Y	Y	-	Y	Y	Y	Y	Y	-	-	-

pac_GetSlotCount	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_GetBackplaneID	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_GetBatteryLevel	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_EnableRetrigger	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_GetMacAddress	-	-	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReBoot	-	-	-	Y	Y	Y	Y	Y	Y	Y	Y
Pac_EnableLED	-	-	-	-	-	Y	Y	Y	Y	Y	Y
pac_BackwardCompatible	-	-	-	-	-	Y	Y	Y	-	-	-
pac_GetEbootVersion	-	-	-	-	-	Y	Y	Y	Y	Y	Y
pac_GetComMapping	-	-	-	-	-	Y	Y	Y	Y	-	-
pac_RegistryHotPlug (Beta testing)	-	-	-	-	-	-	-	-	-	-	-
pac_UnregistryHotPlug (Beta testing)	-	-	-	-	-	-	-	-	-	-	-

Interrupt Functions

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_RegisterSlotInterrupt	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_UnregisterSlotInterrupt	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_EnableSlotInterrupt	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetSlotInterruptPriority	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_InterruptInitialize	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetSlotInterruptEvent	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetSlotInterruptEvent	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetTriggerType	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetSlotInterruptID	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_InterruptDone	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y

Memory Access Functions

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_GetMemorySize	Y	Y	-	Y	Y	Y	Y	Y	Y▲	Y	Y
pac_ReadMemory	Y	Y	-	Y	Y	Y	Y	Y	Y▲	Y	Y
pac_WriteMemory	Y	Y	-	Y	Y	Y	Y	Y	Y▲	Y	Y
pac_EnableEEPROM	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SDExists	-	-	-	-	-	Y	Y	-	Y	Y	Y
pac_SDMount	-	-	-	-	-	Y	Y	-	Y	Y	Y
pac_SDOnside	-	-	-	-	-	Y	Y	-	Y	Y	Y
pac_SDUnmount	-	-	-	-	-	Y	Y	-	Y	Y	Y

▲ WP-5xxx only supports the memory type 1 (EEPROM), not type 0 (SRAM).

Watchdog Functions

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_EnableWatchDog	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_DisableWatchDog	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_RefreshWatchDog	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetWatchDogState	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetWatchDogTime	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetWatchDogTime	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y

UART Functions

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
uart_Open	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_Close	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_SendExt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_Send	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_RecvExt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_Recv	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_SendCmdExt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_SetTimeOut	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_EnableCheckSum	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_SetTerminator	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_BinSend	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_BinRecv	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_BinSendCmd	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_GetLineStatus	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
uart_GetDataSize	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
uart_SetLineStatus	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y

PAC_IO Functions

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_GetBit	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteDO/pac_WriteDO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteDOBit	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadDO/pac_ReadDO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadDI/pac_ReadDI_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadDIO/pac_ReadDIO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadDILatch	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ClearDILatch	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadDIOLatch	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ClearDIOLatch	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadDICNT/pac_ReadDICNT_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ClearDICNT/pac_ClearDICNT_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteAO/pac_WriteAO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAO/pac_ReadAO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAI	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAIHex	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAIAllExt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAIAll	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAIAllHexExt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadAIAllHex	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

pac_ReadCNT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ClearCNT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadCNTOverflow	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteModuleSafeValueDO/pac_WriteModuleSafeValueDO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadModuleSafeValueDO/pac_ReadModuleSafeValueDO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteModulePowerOnValueDO/pac_WriteModulePowerOnValueDO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadModulePowerOnValueDO/pac_ReadModulePowerOnValueDO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteModuleSafeValueAO/pac_WriteModuleSafeValueAO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadModuleSafeValueAO/pac_ReadModuleSafeValueAO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WriteModulePowerOnValueAO/pac_WriteModulePowerOnValueAO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ReadModulePowerOnValueAO/pac_ReadModulePowerOnValueAO_MF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetModuleWDTStatus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetModuleWDTConfig	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetModuleWDTConfig	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_ResetModuleWDT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_RefreshModuleWDT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

pac_InitModuleWDTInterrupt	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetModuleWDTInterruptStatus	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetModuleWDTInterruptStatus	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetModuleLastOutputSource	-	-	-	Y	Y	Y	Y	Y	Y	Y	Y

PWM Functions

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_SetPWMDuty	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMDuty	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetPWMFrequency	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMFrequency	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetPWMMode	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMMode	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetPWMDITriggerConfig	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMDITriggerConfig	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetPWMStart	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetPWMSynChannel	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMSynChannel	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SyncPWMStart	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SavePWMConfig	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMDIOStatus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_SetPWMPulseCount	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetPWMPulseCount	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Backplane Functions

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_GetBPTimerTimeTick_ms	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_GetBPTimerTimeTick_us	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_SetBPTimer	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_SetBPTimerOut	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_SetBPTimerInterruptPriority	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y
pac_KillBPTimer	Y	Y	-	Y	Y	Y	Y	Y	-	Y	Y

Error Handling Functions

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
pac_GetLastError	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	Y
pac_SetLastError	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	Y
pac_GetErrorMessage	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	Y
pac_ClearLastError	Y	Y	Y	Y	Y	-	-	-	-	-	Y

Misc Functions

Functions\Models	XP-8000	XP-8000-Atom	PC	XP-8000-CE6	XP-8000-Atom-CE6	WP-8x4x	WP-8x3x	WP-8x5x	WP-5xxx	VP-25Wx	VP-23Wx
AnsiString	Y	Y	Y	-	-	Y	Y	Y	Y	Y	Y
WideString	Y	Y	Y	-	-	Y	Y	Y	Y	Y	Y
pac_AnsiToWideString	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_WideToAnsiString	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_DoEvent/pac_DoEvents	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pac_GetCurrentDirectory	-	-	-	-	-	Y	Y	Y	Y	Y	Y
pac_GetCurrentDirectoryW	-	-	-	-	-	Y	Y	Y	Y	Y	Y

Appendix C. What’s New in PACSDK

PACSDK is the next version of XPACSDK and WinPACSDK. It builds on the features of XPACSDK and WinPACSDK library by providing the following:

C.1. PACSDK.dll modifications and updates

The new PACSDK.dll provides support for two platforms, one being designed for the WinPAC series (ARM platforms) and the other for the PC and XPAC series (x86 platforms). However, there are a number of modifications and updates that are included in the new PACSDK, which are listed below.

(**Note**: Compared to the previous WinPAC/XPAC SDK, these modification and updates need to be made to the previously implemented WinPAC/XPAC programs so that it will work with the new SDK)

1. pac_EnableLED

The original **pac_EnableLED (bool bFlag)** function can be used only for the WinPAC series in the previous SDK, and the original **pac_EnableLED (int pin, bool bFlag)** function can be used only for the XPAC series in the previous SDK.

Consequently, this API function cannot be integrated to the PACSDK.dll because of the conflicting parameters. As a result, the function in PACSDK.dll has been changed.

pac_EnableLED (bool bFlag) is been reserved and a new API function has been added :

pac_EnableLEDs (int pin,BOOL bFlag) .

2. Add I/O WDT, PowerOn/Safe Value API for pure DIO modules

The new PACSDK.dll provides the support of I/O WDT, Power On and Safe value functions for pure DIO DCON modules. (Refer to Note 1) These functions aren't supported for the previous SDK, DCON_PC.dll and XPacSDK.dll.

- pac_GetModuleLastOutputSource
- pac_GetModuleWDTStatus
- pac_GetModuleWDTConfig
- pac_SetModuleWDTConfig
- pac_ResetModuleWDT
- pac_RefreshModuleWDT
- pac_InitModuleWDTInterrupt
- pac_SetModuleWDTInterruptStatus
- pac_GetModuleWDTInterruptStatus
- pac_ReadModuleSafeValueDO
- pac_WriteModuleSafeValueDO
- pac_ReadModuleSafeValueAO
- pac_WriteModuleSafeValueAO
- pac_ReadModulePowerOnValueDO
- pac_WriteModulePowerOnValueDO
- pac_ReadModulePowerOnValueAO
- pac_WriteModulePowerOnValueAO

Notes

1. The each of API function is used for the DCON module which is provided with Power ON or Safe value function.
2. I-7K/I-87K series modules provided with Power ON or Safe Value function can support the API functions above. I-8K series module provide the functions is only I-8041RW.

3. Add I/O accessing API functions for the Multi-function modules

The new PACSDK.dll provides the support of I/O accessing functions (including Write/Read DIO, AIO, Read DI counter and I/O WDT, Power On and Safe value function for the Multi-function DCON modules. (Refer to Note 2 regarding of the definition of Multi-function modules) These functions aren't supported for the previous SDK, DCON_PC.dll and XPACSDK.dll.

- pac_WriteAO_MF (Note 5)
- pac_WriteModulePowerOnValueAO_MF
- pac_WriteModuleSafeValueAO_MF
- pac_WriteDO_MF
- pac_ReadDIO_MF
- pac_ReadDI_MF
- pac_ReadDO_MF
- pac_ReadDIO_DIBit_MF
- pac_ReadDIO_DOBit_MF
- pac_ReadDIBit_MF
- pac_ReadDOBit_MF
- pac_ReadDICNT_MF
- pac_ClearDICNT_MF
- pac_ReadModulePowerOnValueDO_MF
- pac_WriteModulePowerOnValueDO_MF
- pac_ReadModuleSafeValueDO_MF
- pac_WriteModuleSafeValueDO_MF

Notes

1. The functions pac_WriteDO, pac_ReadDIO, pac_ReadDI, pac_ReadDO, pac_ReadDIO_DIBit, pac_ReadDIO_DOBit, pac_ReadDIBit, pac_ReadDOBit, pac_ReadDICNT and pac_ClearDICNT, which were supported in the previous SDK, are used to read and write the DIO channels for pure DIO DCON modules, which are defined as modules that only have DI, DO or DIO channels.
2. In addition to provide support for the API functions described above, the PACSDK also provides the support for the Multi-function API that is used to read and write the DIO channels for the Multi-function DCON modules, which are defined as modules that mainly act as AIO or Counters but are equipped with DIO channels. Such as the I-87005W/I-87016W/I-87082W/I-7016/I-7088, etc.
3. The functions mentioned above (i.e., pac_WriteDO/ pac_ReadDIO, etc.) cannot be used to access Multi-function DCON modules. Only the pac_xxx_MF API allows access to Multi-function DCON modules.
4. In both the DCON_PC.dll and the XPACSDK.dll, PAC_IO API functions only support access to high profile I-87K/I-8K series modules and I-7K series modules. In the PACSDK.dll, the processing can be modified to send DCON commands without needing to determine the module name, which means that a the new PAC_IO API functions can support access to the I-87K/I-8K (High profile and Low profile series modules), I-7K series modules, I-8000 series modules units, tM series modules, and other OEM/ODM DCON modules.
5. The comparison table of pac_WriteAO / pac_WriteAO_MF Functions and available modules are as following:

Since November 1, 2012

pac_Write AO	**pac_WriteAO_MF**
I-87024W/CW/DW/RW, I-87024	I-87026PW
I-87028CW/UW	
I-87022	
I-87026	
I-7021,I -7021P	
I-7022	
I-7024, I-8024R	

4. Add Misc. API function for PACSDK

The new PACSDK.dll provides 2 miscellaneous API functions below.

- pac_GetCurrentDirectory
- pac_GetCurrentDirectoryW

5. Add the reserved memory section for XPAC series

In order to reserve some memory sections of EEPROM and SRAM for the use by the system, the reserved section of the pac_ReadMemory and pac_WriteMemory function must be changed.

The reserved section is same with the WinPAC SDK. The definition of the items included in the reserved section is

EEPROM

0 ~0x1FFF (8KB) for users

0x2000~0x3FFF (8KB) is reserved for the system

SRAM

The size of the input range for the SRAM is only 0 ~0x6FFFF (448KB), with another 64KB of SRAM is reserved for use by the system.

In the previous XPAC SDK (XPacSDK.dll), all memory space (0~0x3FFF, 16KB) of EEPROM is available for the use by the user, and all memory space (0~0x80000, 512KB) of SRAM is available for the use by the user.

6. Using the new SDK (PACSDK) in a C program

To use the new PACSDK in a C-based program, some code needs to be changed in the program.

- Replace the previous header file by PACSDK.h

  #include "WinPacSDK.h"

  #include "XPacSDK.h"

  Changed as

  #include " PACSDK.h"

  WinPacSDK.h used for both WinPAC or ViewPAC series program and XPacSDK.h used for the XPAC series program are must be replaced by PACSDK.h

- Replace the previous library file by PACSDK.lib

  WinpacSDK.lib *// WinPAC or ViewPAC series*

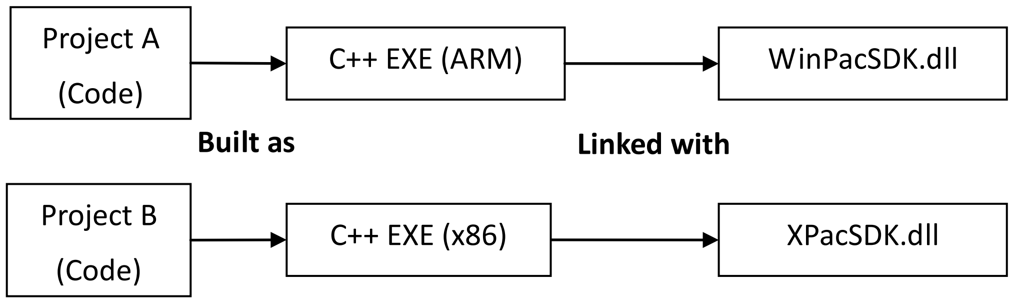
  XPacSDK.lib *// XPAC series*

  Changed as

  PACSDK.lib

  WinPacSDK.lib used for WinPAC or ViewPAC series and XPacSDK.lib used for XPAC series are replaced by PACSDK.lib

The original flowchart for a C program that is calling the previous SDK is illustrated below



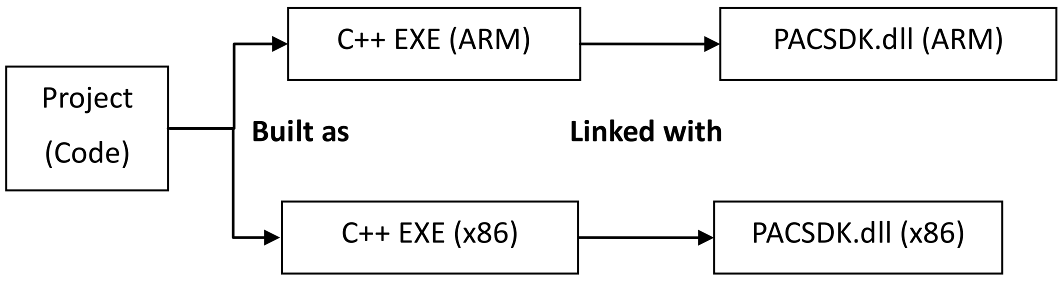
Even if Project A applied to WinPAC series modules and Project B applied to XPAC series modules are functionally identical. The source code using the previous SDK cannot be exactly the same because of using the different header file and the few function names and error code defined in the previous SDK are different. So Project A and Project B are regarded as separate programs, cannot share the source code

The results of the above are

Project A is built as an ARM-based executable program and it must be run with WinPacSDK.dll.

Project B is built as an x86-based executable program and it must be run with XPacSDK.dll.

The flowchart for a C program that is now calling the new SDK (PACSDK.dll) is as follows:



The benefits of using the new SDK:

A program applied to WinPAC series modules and the other program applied to XPAC series modules are functionally identical, because using the same header file and the API functions and error code on the library are exactly the same, the source code can be shared for two programs.

The Project with the shared source code can be built as two different platform executable programs selecting the different Platform settings in the development environment while build the project.

The results of the above are

Project is built as an ARM-based executable program which runs with the ARM-based PaCSDK.dll and it's also built as an x86-based executable program which runs with x86-based PaCSDK.dll.

C.2. PACNET SDK modifications and updates

The .NET Compact Framework environment allows multiple high-level languages (C#, VB) to be used on different platforms without needing to be rewritten for specific architectures. The new PACNET.dll replaces the previous .NETCF SDK, WinPacNet.dll and XPacNet.dll files which means that NET CF programs linking to the PACNET.dll on a WinPAC device can be migrated to a XPAC device without needing to rewrite the code or rebuild the project and vice versa.

1. API function classification

All API functions for the WinPacNet.dll or the XPacNet.dll are placed in a single WinPacNet.WinPAC.xxx/XPacNET.XPac.xxx class, but the API functions for the PACNET.dll are classified as PACNET.sys, PACNET.Memory, and PACNET.Interrupt, etc.

The classifications applied to the API functions for the PACNET.dll as defined in the API user manual are as follows.

Classification in the API Manual	Class Name in PACNET.dll
2.1. System Information API	Sys
2.1. System Information API	Sys.Buzzer
2.2. Interrupt API	Interrupt
2.3. Memory Access API	Memory
2.4. Watchdog API	Sys.WDT
2.5. UART API	UART
2.6. PAC_IO API	PAC_IO
2.7. PWM API	PWM
2.8. Backplane Timer API	BPTimer
2.9. Error Handling API	ErrHandling
2.10. Misc API	MISC

2. API functions modification

LED control API function (pac_EnableLED)

Refer to "pac_EnableLED" reference of PACSDK.dll modifications and updates for more details.

The modification in PACNET SDK, XPacNet.XPac.pac_EnableLED(pin, bFlag) function defined in XPacNet.dll has been changed as PACNET.Sys.pac_EnableLEDs(pin, bFlag) in PACNET.dll.

Add Registry API for XPAC series

Refer to "Add Registry API for XPAC series" reference of PACSDK.dll modifications and updates for more details.

The suite of the Registry API functions is placed in PACNET.PAC_Reg class.

Add I/O WDT, PowerOn/Safe Value API for pure DIO modules

Refer to "Add I/O WDT, PowerOn/Safe Value API for pure DIO modules" reference of PACSDK.dll modifications and updates for more details.

The suite of the I/O WDT, PowerOn/Safe Value API functions for pure DIO modules is placed in PACNET.PAC_IO class.

Add I/O WDT, PowerOn/Safe Value API for the Multi-function modules

Refer to "Add I/O WDT, PowerOn/Safe Value API for Multi-function modules" reference of PACSDK.dll modifications and updates for more details.

The suite of the I/O WDT, PowerOn/Safe Value API functions for Multi-function modules is also placed in PACNET.PAC_IO class.

Add Misc. API function for PACSDK

Refer to "Add Misc. API function for PACSDK" reference of PACSDK.dll modifications and updates for more details.

The suite of misc. API function is placed in PACNET.MISC class.

3. Enumerate the error codes

Add a function to enumerate all the error codes for PACSDK

The code snippet is as follows (The code is applicable to every C#/VB demo file)

```
uint ec = PACNET.ErrHandling.pac_GetLastError();
MessageBox.Show(((PACNET.ErrCode)ec).ToString() + "\nError Code: 0x" +
ec.ToString("X"));
```

The sample code is used to show the error code number and its ***enumerated definition***.

If the last error code, 0x10001 is happened on the user’s program.

The message box with “PAC_ERR_UNKNOWN Error Code:0x10001” caption will be shown.

4. Using the new SDK (PACNET) in a C# or VB.net program

To use the new PACNET in a C# or VB.net program, some code needs to be changed in the program.

In a C# program

- Modify the code for using XPAC series devices, “using XPacNET” to “using PACNET”.

  ```
  using XPacNet;
  ```

  Changed as

  ```
  using PACNET;
  ```

- Modify the code for using WinPAC series devices, “using WinPacNet” to “using PACNET”.

  ```
  using WinPacNet;
  ```

  Changed as

  ```
  using PACNET;
  ```

In a VB.net program

- Modify the code for using XPAC series devices, “Imports XPacNET” to “Imports PACNET”.

  ```
  Imports XpacNet
  ```

  Changed as

  ```
  Imports PACNET
  ```

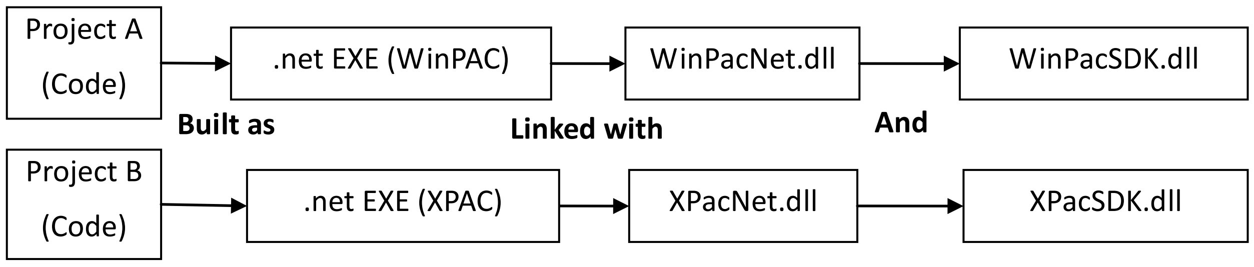
- Modify the code for using WinPAC series devices, “Imports WinPacNet” to “Imports PACNET”.

  ```
  Imports WinPacNet
  ```

  Changed as

  ```
  Imports PACNET
  ```

With the previous .NETCF library (WinPacNet.dll or XPacNet.dll), the flowchart was as follows:

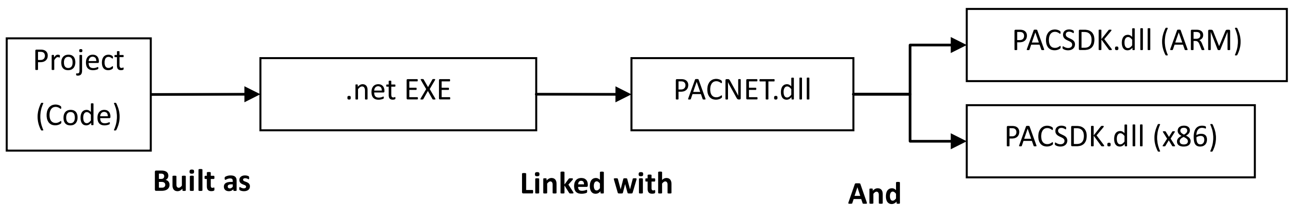


Project A applied to WinPAC series modules and Project B applied to XPAC series modules are functionally identical, but the source code cannot be exactly the same because of using the different .NET CF library and few function name and error code are different. So Project A and Project B are regarded as separate programs, no relevance.

Project A for WinPAC series is built as an executable program which must be run with WinPacNet.dll and WinPacSDK.dll.

Project B for XPAC is built as an executable program which must be run with XpacNet.dll and XPacSDK.dll.

With the new .NETCF library (PACNET.dll) and the flowchart becomes:



The benefits of using the new SDK:

A program applied to WinPAC series modules and the other program applied to XPAC series modules are functionally identical, because of using the same .NET CF library and the API functions and error code on the library are exactly the same, the source code can be shared for two programs.

One shared source code can be built as an executable programs and link the same .NET CF library (PACNET.dll). The only change is that links different platform native SDK. (PACSDK.dll (ARM) is used on WinPAC series and PACSDK.dll(x86) is used for XPAC series)

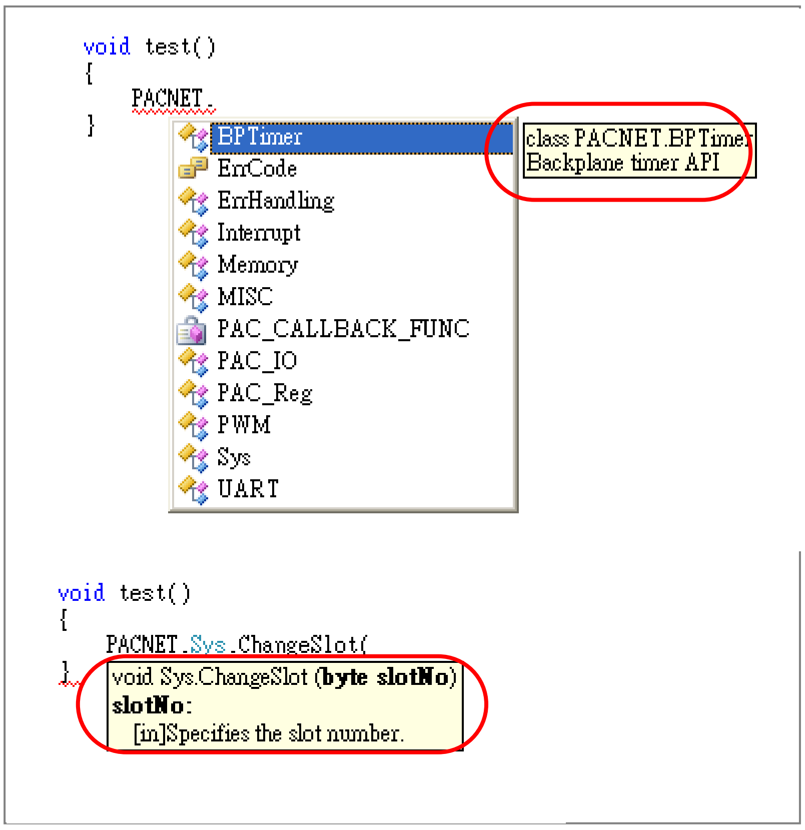
Notes

PACNET.dll has been developed using the .Net CF V2.0 environment and can be used on all XPAC and WinPAC series devices.

5. Show a tooltip for the classes of PACNET.dll

When developing the programs in VS2005/VS2008 IDE, typing a reference to a system class or namespace or roll over class, the tooltips pop up on your cursor line giving not only the parameters and variables of methods, but also some descriptions for these methods, classes and namespaces.

Those description of tooltips are same on the PAC API manual. (Refer to the following figure)



```
void test()
{
    PACNET.
}
```

```
class PACNET.BPTimer
Backplane timer API
```

```
void test()
{
    PACNET.Sys.ChangeSlot(
}
```

```
void Sys.ChangeSlot (byte slotNo)
slotNo:
  [in]Specifies the slot number.
```

C.3. Error code modifications and updates

1. For WinPAC series

Modify

The error code, PAC_ERR_EEP_ACCESS_RESTRICTION and PAC_ERR_SRAM_INVALID_TYPE defined in WinPacSDK.h are modified as PAC_ERR_EEP_INVALID_ADDRESS and PAC_ERR_MEMORY_INVALID_TYPE defined in PACSDK.h.

- Error code (PAC_ERR_MEMORY_BASE + 1)

  PAC_ERR_EEP_ACCESS_RESTRICTION

  Changed to

  PAC_ERR_EEP_INVALID_ADDRESS

- Error code (PAC_ERR_MEMORY_BASE + 3)

  PAC_ERR_SRAM_INVALID_TYPE

  Changed to

  PAC_ERR_MEMORY_INVALID_TYPE

Add

//Basic

PAC_ERR_MODULE_UNEXISTS	(PAC_ERR_BASE + 7)
PAC_ERR_INVALID_SLOT_NUMBER	(PAC_ERR_BASE + 8)

//Interrupt

PAC_ERR_INTR_BASE	0x13000
PAC_ERR_INTR_CREATE_EVENT_FAILURE	(PAC_ERR_INTR_BASE + 1)

//UART

PAC_ERR_UART_INTERNAL_BUFFER_OVERFLOW	(PAC_ERR_UART_BASE+9)

//IO

PAC_ERR_IO_DO_CANNOT_OVERWRITE	(PAC_ERR_IO_BASE+10)
PAC_ERR_IO_AO_CANNOT_OVERWRITE	(PAC_ERR_IO_BASE+11)

2. For XPAC series

Modify

The error code,PAC_ERR_INTR_CRATE_EVENT_FAILURE defined in XPacSDK.h is misspelled, and it is corrected in PACSDK.h as PAC_ERR_INTR_CREATE_EVENT_FAILURE

//Interrup

- Error code (PAC_ERR_INTR_BASE + 1)

  PAC_ERR_INTR_CRATE_EVENT_FAILURE

  Changed to

  PAC_ERR_INTR_CREATE_EVENT_FAILURE

//Basic

- PAC_ERR_MODULE_UNEXISTS

  Original Errorcode: PAC_ERR_BASE + 4

  Changed to

  PAC_ERR_BASE + 7

Add

//Basic

PAC_ERR_INVALID_MAC	(PAC_ERR_BASE + 4)
PAC_ERR_INVALID_COMPORT_NUMBER	(PAC_ERR_BASE + 5)
PAC_ERR_FUNCTION_NOT_SUPPORT	(PAC_ERR_BASE + 6)
PAC_ERR_INVALID_SLOT_NUMBER	(PAC_ERR_BASE + 8)

//Memory Access

PAC_ERR_NVRAM_INVALID_ADDRESS	(PAC_ERR_MEMORY_BASE + 4)
PAC_ERR_EEP_WRITE_PROTECT	(PAC_ERR_MEMORY_BASE + 5)
PAC_ERR_EEP_WRITE_FAIL	(PAC_ERR_MEMORY_BASE + 6)
PAC_ERR_EEP_READ_FAIL	(PAC_ERR_MEMORY_BASE + 7)

//UART

PAC_ERR_UART_INTERNAL_BUFFER_OVERFLOW	(PAC_ERR_UART_BASE+9)

//IO

PAC_ERR_IO_DO_CANNOT_OVERWRITE	(PAC_ERR_IO_BASE+10)
PAC_ERR_IO_AO_CANNOT_OVERWRITE	(PAC_ERR_IO_BASE+11)

Appendix D. Using the Multi-function DCON module

1. On WinPAC devices

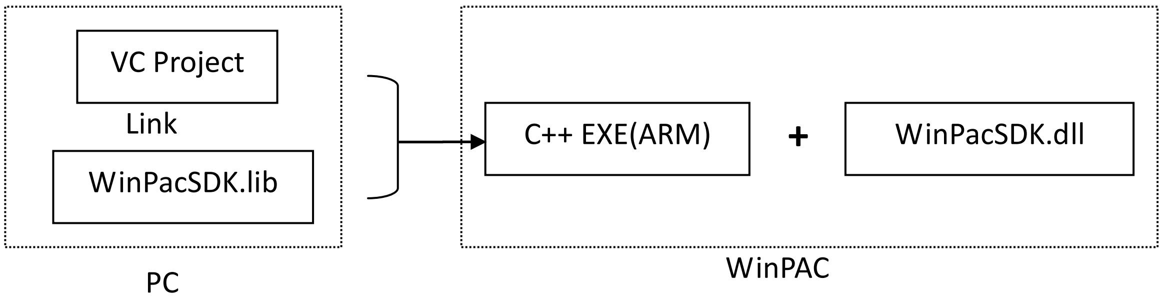
i. The users have used WinPAC series devices and their programs is based on the old SDK (WinPacSDK.dll/WinPacNet.dll) working with the old DCON modules (***Note 2***) on WinPAC device and without using multi-function DCON modules (***Note 1***).

The user's program can continue to use the old library without needing to be modified.

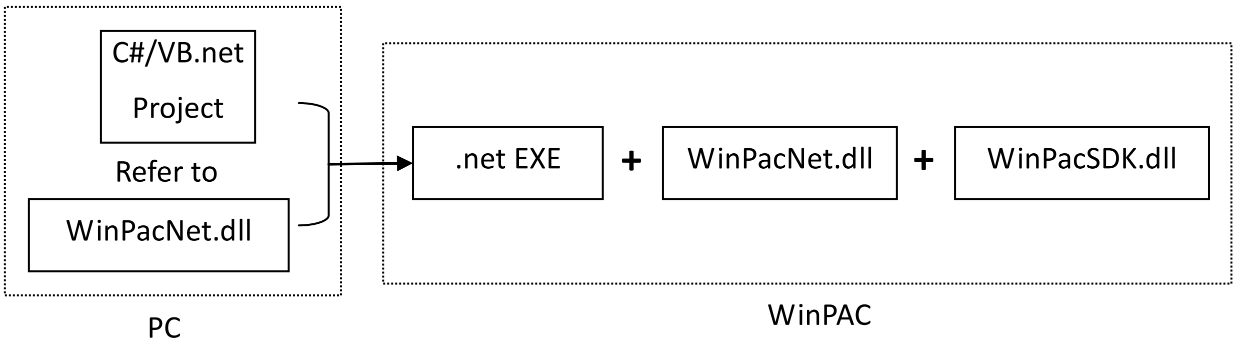
(The Old SDK will continue to maintain (Fix the bugs) and released regularly, but will not add new features)

Use the old SDK as following flowchart:

The VC project required to link WinPacSDK.lib while building, and the built executable file placed in the WinPAC series device must work with WinPacSDK.dll



The C#/VB.net project required to refer to WinPacNet.dll while building, and the built executable file placed in the WinPAC series device must work with WinPacNet.dll and WinPacSDK.dll.



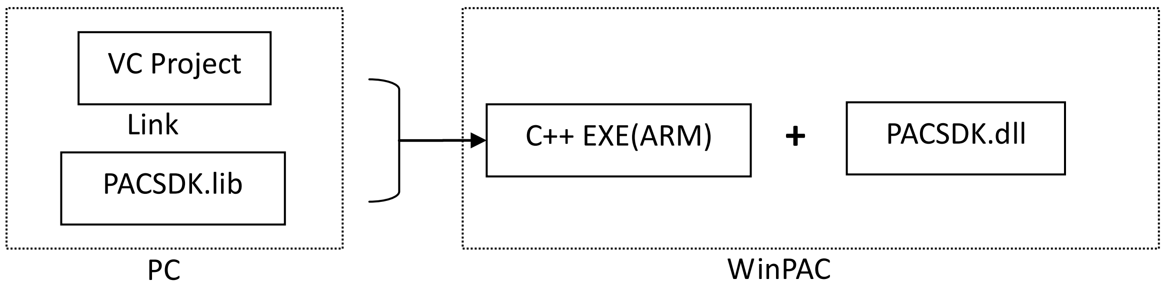
ii. The users have used WinPAC series devices and their programs is based on the old SDK (WinPacSDK.dll) working with the old DCON modules and multi-function DCON modules on WinPAC device. The new PACSDK.dll provides pac_xxx_MF API functions that allow access to Multi-function modules, **so the code must be updated in order to use the new PACSDK.dll in the program.**

(Refer to How-to document, w6-10_How_to_update_to_PACSDK_library_from_WinPacSDK_library_EN.pdf for more details)

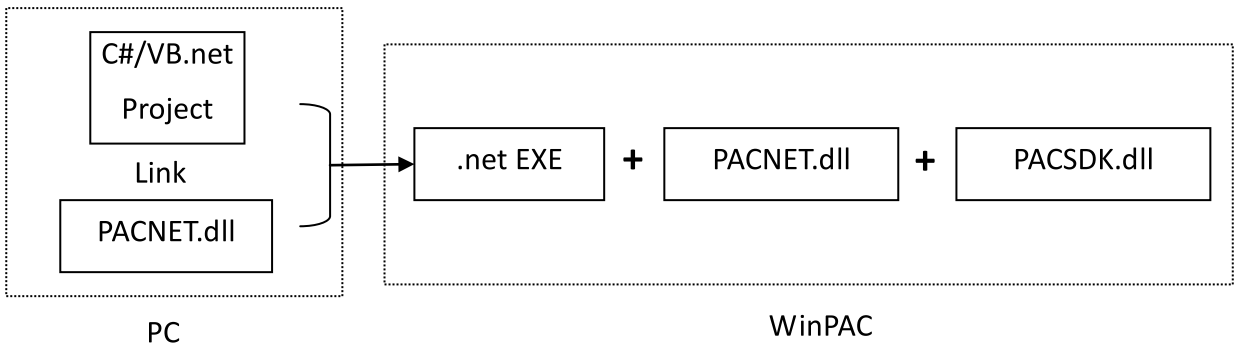
iii. The users have never used WinPAC series devices. Their program will be based on the new SDK working with an old DCON module or a Multi-function module. Our API Manual give instructions for the PACSDK.dll and the demo programs included on the shipped CD/FTP are linked with the new PACSDK.dll, so users should refer to the demo programs and follow the API instructions when developing new programs based on the new PACSDK.dll, rather than those for the WinPACSDK.

Use the new SDK as following flowchart:

The VC project required to link PACSDK.lib while building, and the built executable file placed in the WinPAC series device must work with PACSDK.dll



The C#/VB.net project required to refer to PACNET.dll while building, and the built executable file placed in the WinPAC series device must work with PACNET.dll and PACSDK.dll.



Notes

1. Multi-function DCON modules are defined as modules that mainly act as AIO or Counters but are equipped with DIO channels. Such as the I-87005W/I-87016W/I-87082W/I-7016/I-7088, etc.
2. Old DCON module definition: Non multi-function DCON modules are defined as Old DCON modules.

2. On XPAC devices

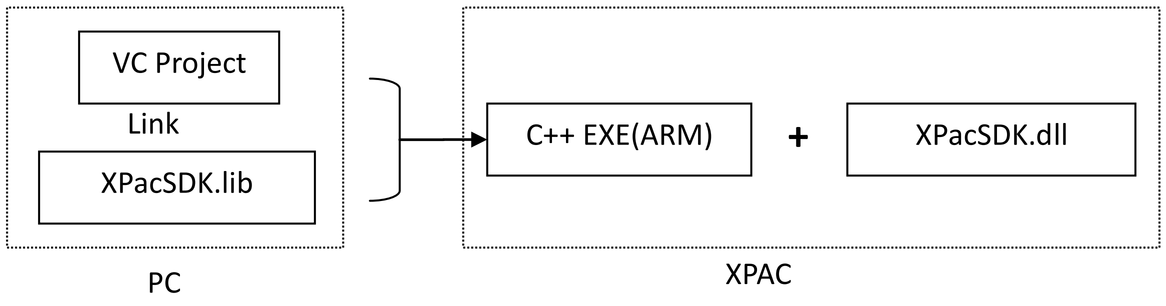
i. The users have used XPAC series devices and their programs is based on the old SDK (XPacSDK.dll/XPacNet.dll) working with the old DCON modules (*Note 2*) on XPAC device and without using multi-function DCON modules (*Note 1*).

The user's program can continue to use the old library without needing to be modified.

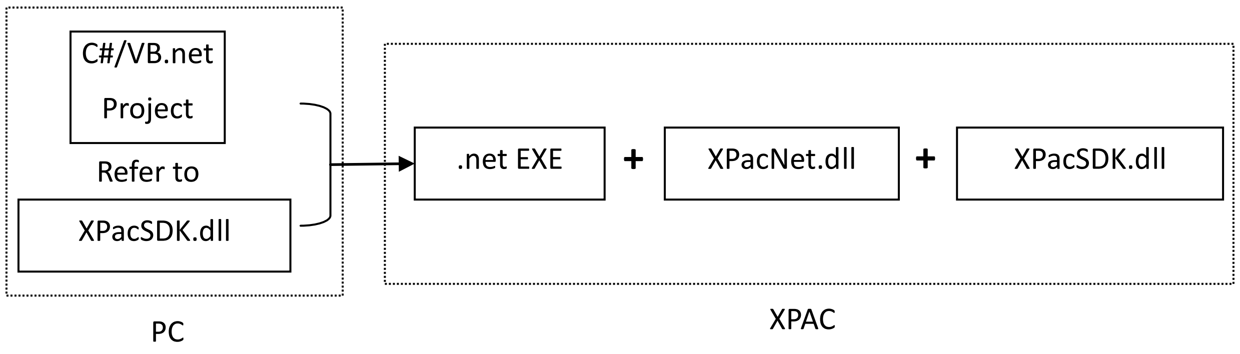
(The Old SDK will continue to maintain (Fix the bugs) and released regularly, but will not add new features)

Use the old SDK as following flowchart:

The VC project required to link XPacSDK.lib while building, and the built executable file placed in the XPAC series device must work with XPacSDK.dll



The C#/VB.net project required to refer to XPacNet.dll while building, and the built executable file placed in the XPAC series device must work with XPacNet.dll and XPacSDK.dll.

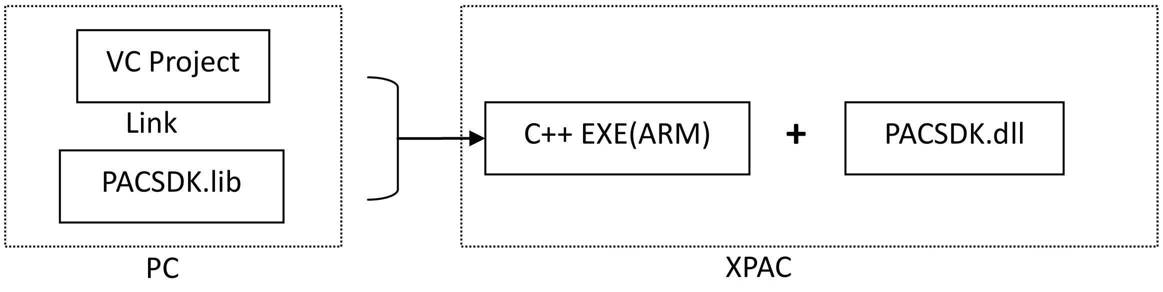


ii. The users have used XPAC series devices and their programs is based on the old SDK (XPacSDK.dll) working with the old DCON modules and multi-function DCON modules on XPAC device. The new PACSDK.dll provides pac_xxx_MF API functions that allow access to Multi-function modules, **so the code must be updated in order to use the new PACSDK.dll in the program.**

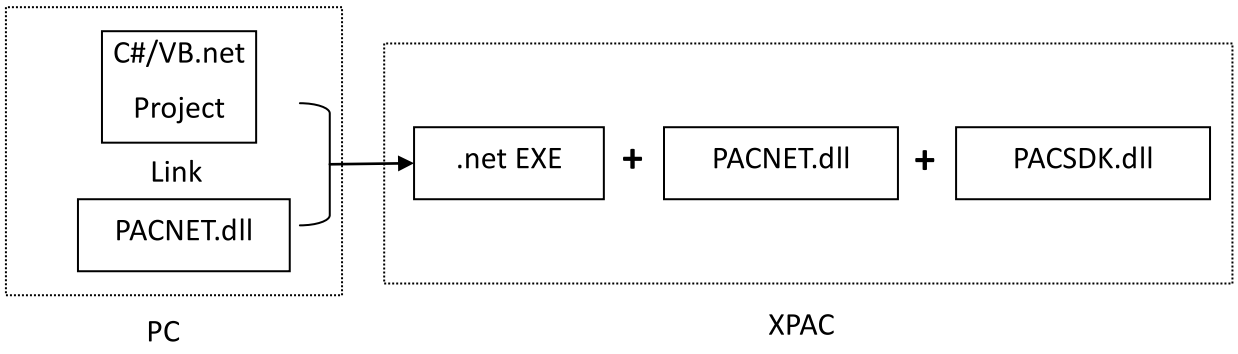
iii. The users have never used XPAC series devices. Their program will be based on the new SDK working with an old DCON module or a Multi-function module. Our API Manual give instructions for the PACSDK.dll and the demo programs included on the shipped CD/FTP are linked with the new PACSDK.dll, so users should refer to the demo programs and follow the API instructions when developing new programs based on the new PACSDK.dll, rather than those for the XPACSDK.

Use the new SDK as following flowchart:

The VC project required to link PACSDK.lib while building, and the built executable file placed in the XPAC series device must work with PACSDK.dll



The C#/VB.net project required to refer to PACNET.dll while building, and the built executable file placed in the XPAC series device must work with PACNET.dll and PACSDK.dll.



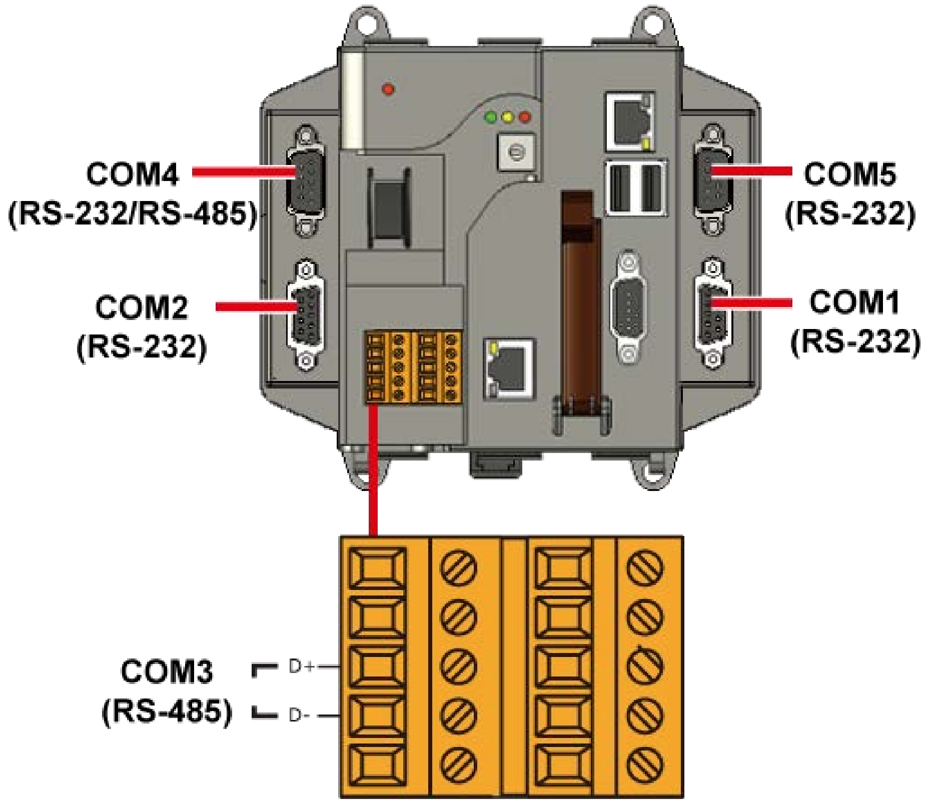
Appendix F. Comparison of Defined Slots and COM Ports

Each PAC has its own definition and corresponding communication ports and slots whose parameters are defined as below. As a result, apply the corresponding slot and COM port number on the API functions in writing programs.

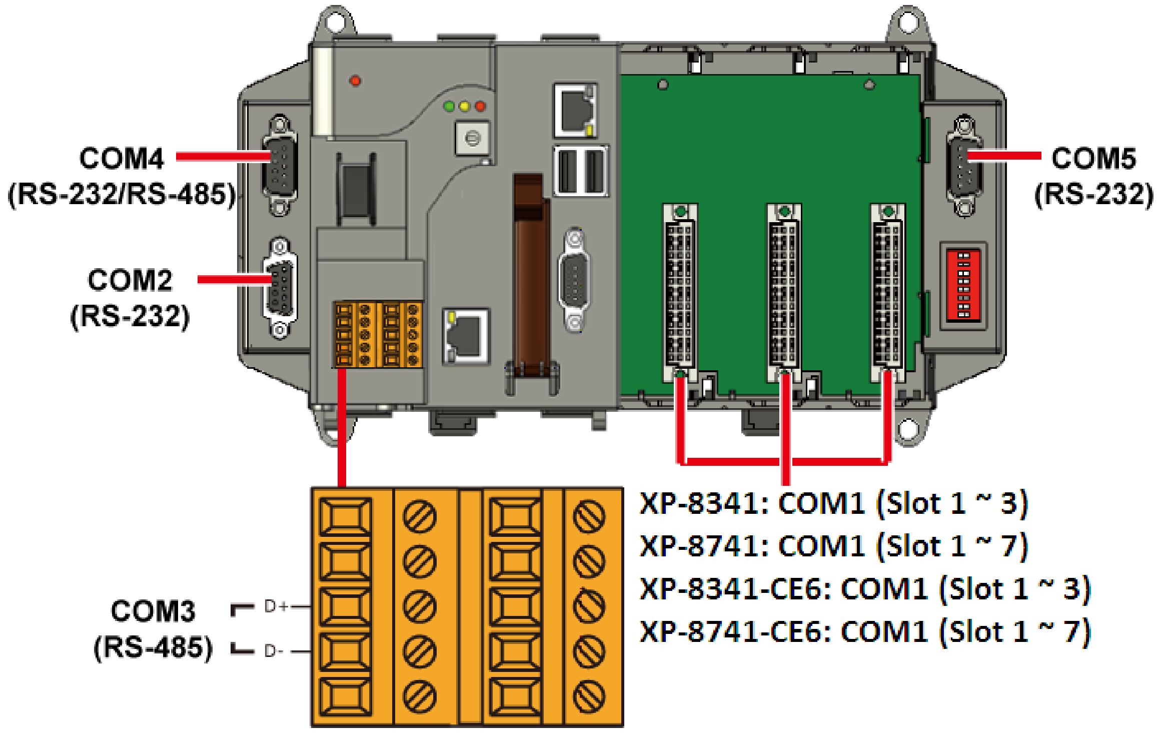
	XP-8041 XP-8041-CE6	XP-8341 XP-8341-CE6/ XP-8741 XP-8741-CE6	XP-8141-Atom XP-8141-Atom-CE6	XP-8341-Atom XP-8341-Atom-CE6/ XP-8741-Atom XP-8741-Atom-CE6	WP-81x1	WP-84x1/ WP-88x1	WP-5141 WP-5141-OD	VP-2xW1
Slot number	N/A	1 ~ 3/1 ~ 7	1	1 ~ 3/1 ~ 7	0	0 ~ 3/0 ~ 7	N/A	0 ~ 2
COM0	N/A	N/A	N/A	N/A	Backplane*	Backplane*	N/A	Backplane*
COM1	RS-232	Backplane*	Backplane*	Backplane*	RS-232	RS-232	RS-232	N/A
COM2	RS-232	RS-232	RS-232	RS-232	RS-485	RS-485	RS-485	RS-485
COM3	RS-485	RS-485	RS-485	RS-485	N/A	RS-232/RS-485	RS-232	RS-232
COM4	RS-232/RS-485	RS-232/RS-485	RS-232/RS-485	RS-232/RS-485	N/A	RS-232	N/A	N/A
COM5	RS-232	RS-232	RS-232	RS-232	N/A	N/A	N/A	N/A

Backplane: It's RS232 interface used for accessing the I-87K module only.

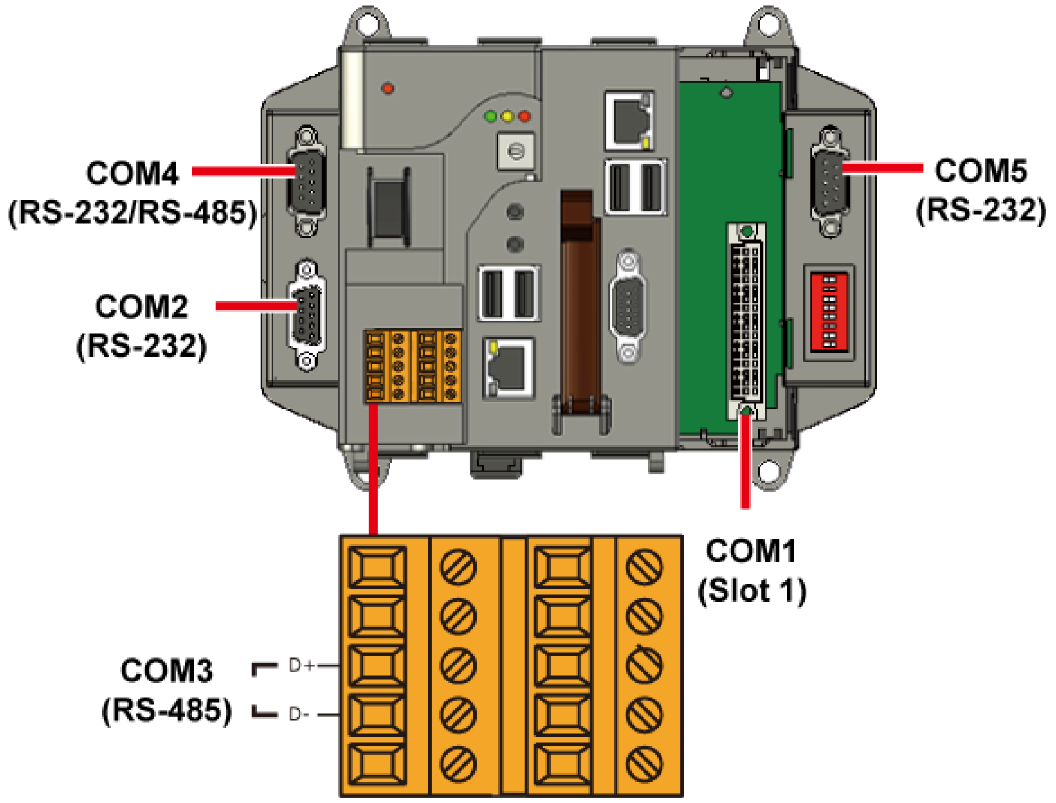
F.1. XP-8041|XP-8041-CE6



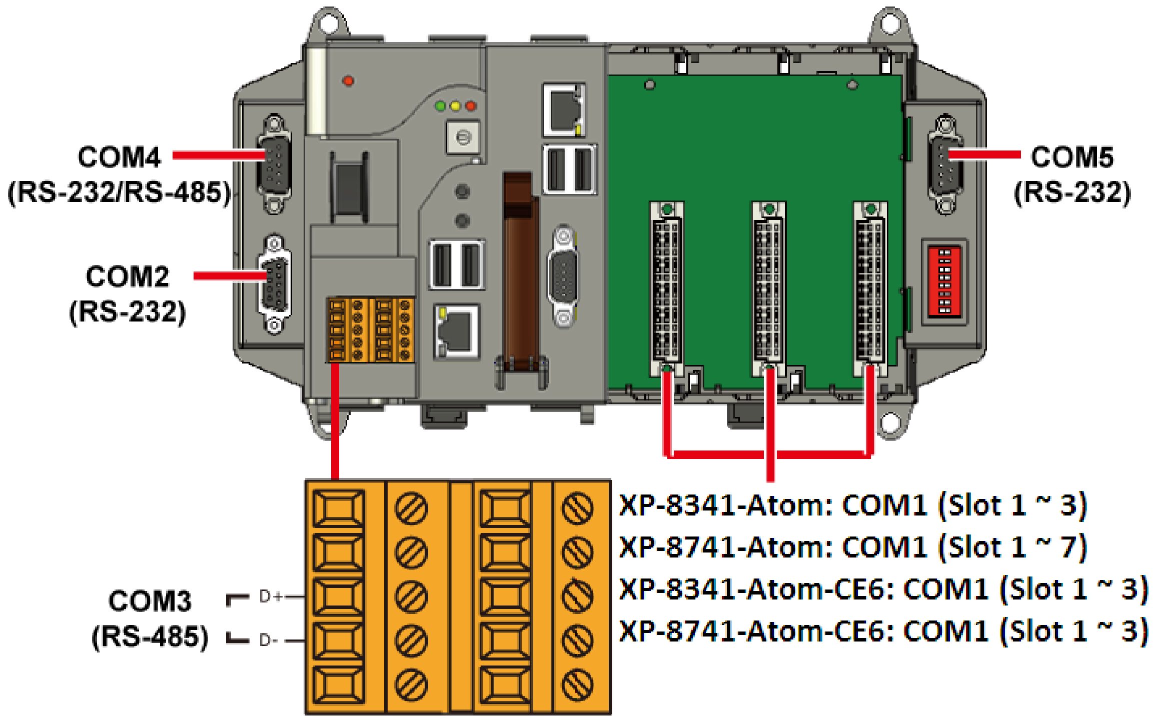
F.2. XP-8341|XP-8741/XP-8341-CE6|XP-8741-CE6


COM4
(RS-232/RS-485)
COM2
(RS-232)
COM5
(RS-232)
COM3
(RS-485)
D+
D-
XP-8341: COM1 (Slot 1 ~ 3)
XP-8741: COM1 (Slot 1 ~ 7)
XP-8341-CE6: COM1 (Slot 1 ~ 3)
XP-8741-CE6: COM1 (Slot 1 ~ 7)

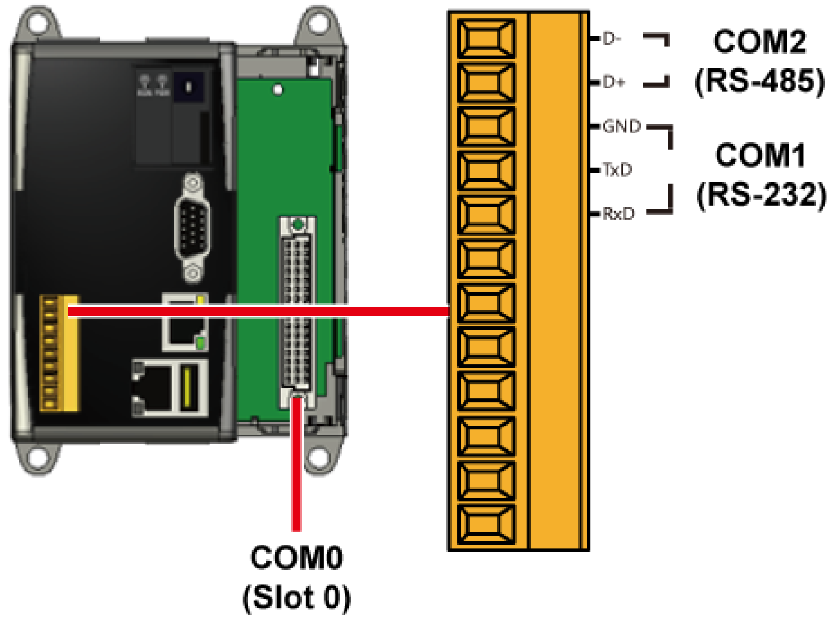
F.3. XP-8141-Atom|XP-8141-Atom-CE6



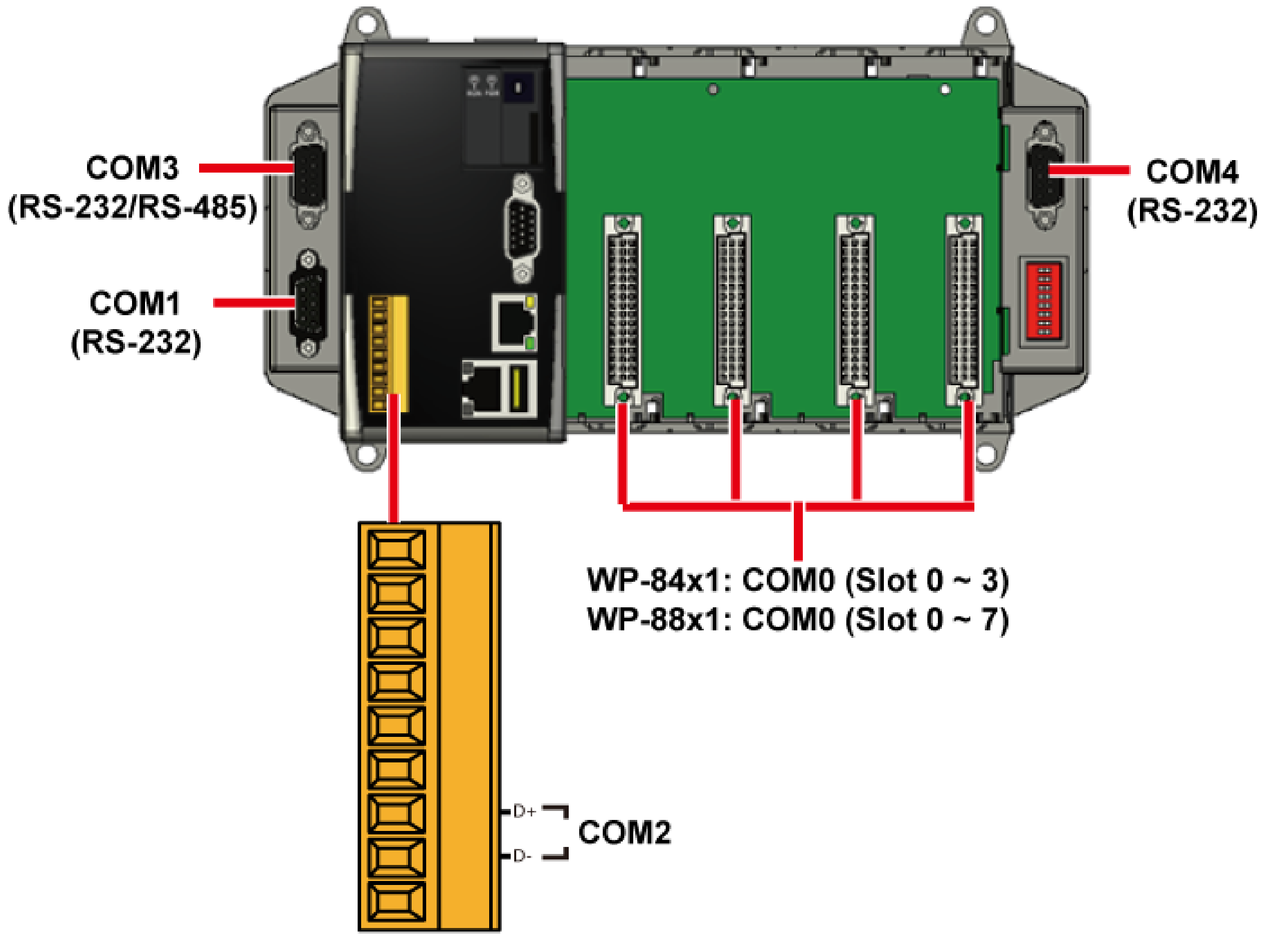
F.4. XP-8341-Atom|XP-8741-Atom/XP-8341-Atom-CE6|XP-8741-Atom-CE6


COM4
(RS-232/RS-485)
COM2
(RS-232)
COM5
(RS-232)
COM3
(RS-485)
D+
D-
XP-8341-Atom: COM1 (Slot 1 ~ 3)
XP-8741-Atom: COM1 (Slot 1 ~ 7)
XP-8341-Atom-CE6: COM1 (Slot 1 ~ 3)
XP-8741-Atom-CE6: COM1 (Slot 1 ~ 3)

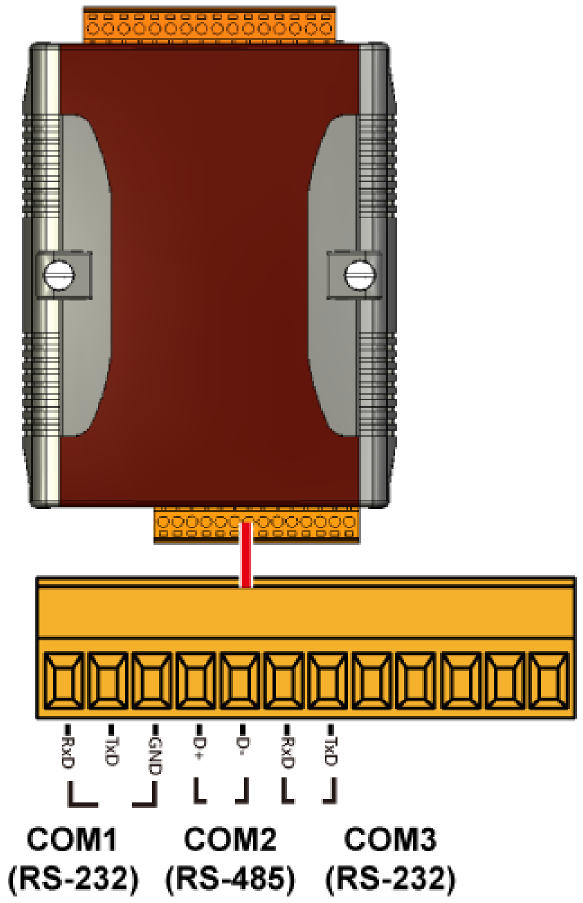
F.5. WP-81x1



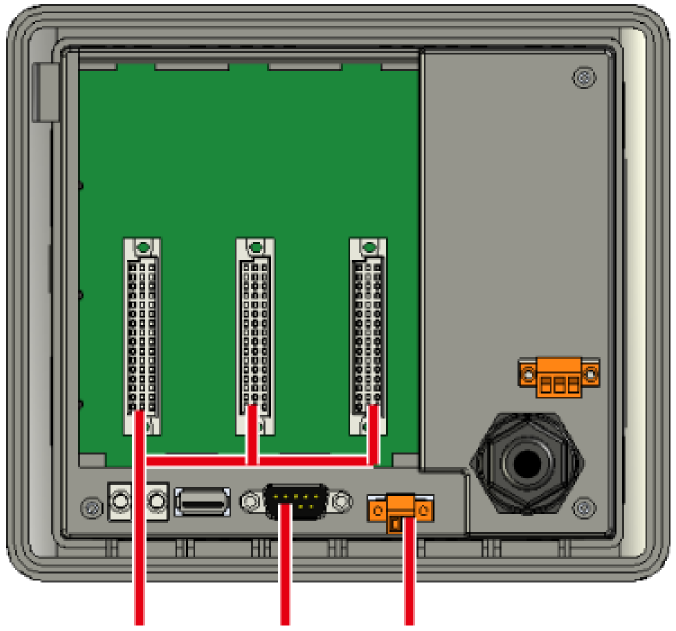
F.6. WP-84x1/WP-88x1



F.7. WP-5141/WP-5141-OD



F.8. VP-2xW1


COM0
(Slot 0 ~ 2)
COM3
(RS-232)
COM2
(RS-485)