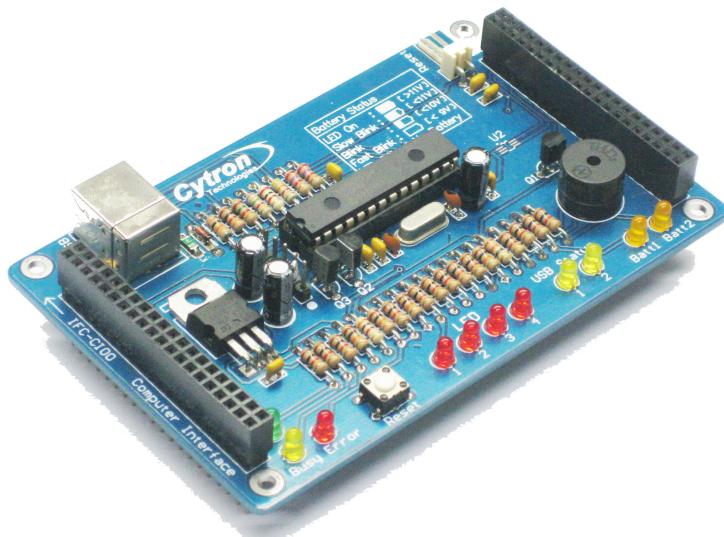




IFC-CI00

Interface Free Controller

Computer Interface



User's Manual

V1.0

March 2010

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1. INTRODUCTION AND OVERVIEW

1.1 Introduction of Interface Free Controller

IFC (Interface Free Controller) offer a new concept of developing microcontroller embedded system and also robotics system. With IFC, no more frustration in determine hardware interface and configuring peripheral in software. Checking few hundreds pages of data sheet can be waved. With the concept of interfacing card, user may stack as many as 64 cards in a system to get infinite combination of peripherals. The design aim is to offer 3 simple steps in microcontroller system development – Configure card's address, Stack IFC cards, Write Program and Run!

Furthermore, with functions based software library, user save valuable time during software development by concentrating on algorithm development. No more flipping or scrolling PIC data sheet looking for ADCON0, T1CON or even TRISA. With just a programming hand book, user may simply copy the header file, call comprehensive functions and it's ready to rock.

Computer Interface Card (IFC-CI00) is another main card for IFC system and may replace IFC-MB00. It is designed for advance user to interface the IFC system and computer where computer will become main controller. As computer is able to interface with powerful sensors such as laser range finder and video camera, integrating with IFC will offer low level control to motors, solenoid, relay, etc. It will become a virtual Com Port through USB connection. User is free to send the command (refer to Card Library Function) to the IFC system. This card has been designed with capabilities and features of:

- Industrial grade PCB.
- Every component is soldered properly and tested before board is shipped.
- 1 Reset button
- 4 Output LEDs
- Power, busy and error LED
- USB Status LEDs
- Battery Status LEDs
- 1 buzzer
- 5V operation
- **Dimension** 11.1cm x 6.9cm
- Sample source code is provided for Microsoft Visual C# 2008

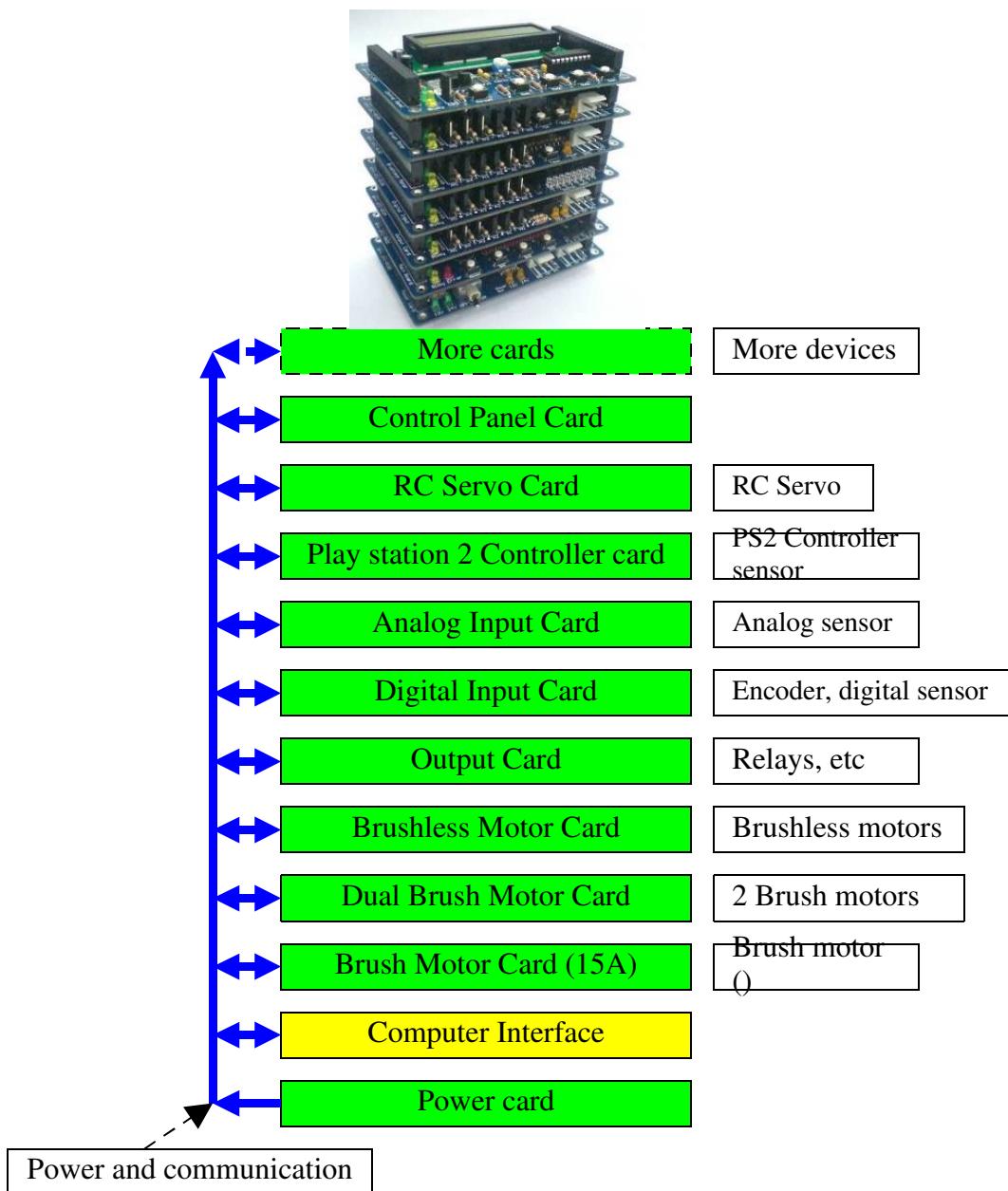
This document explains the usage of IFC-CI00 (Computer Interface).

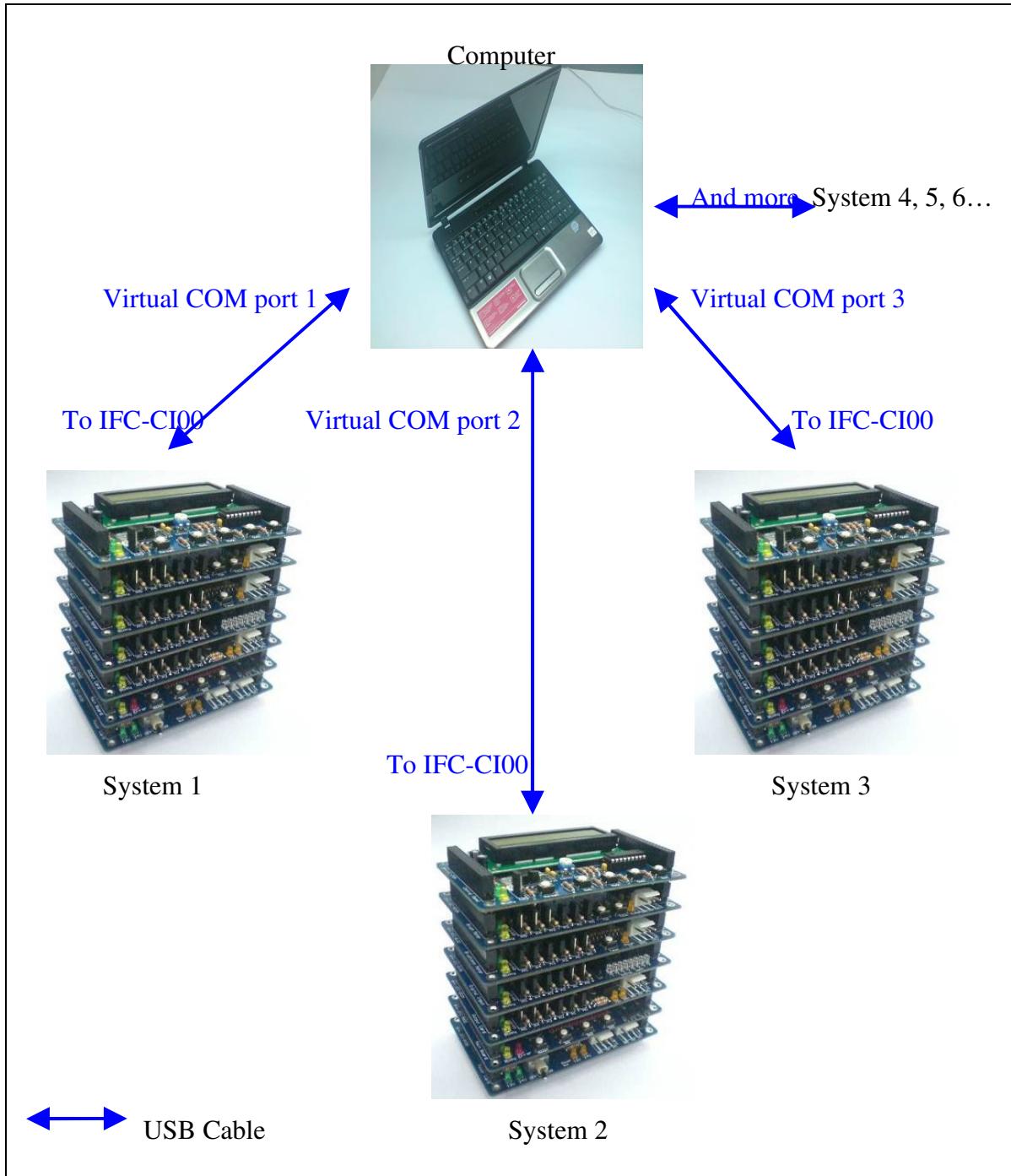
Caution: High current inductance load such as brush motor, may affect the USB signal of this card. User is advised not to drive high current (above 5A) motor or inductance load with IFC-CI00 as bridge to computer.

1.2 System Overview

With serial communication perception, IFC offer million of possibilities to develop embedded system creatively and easily. In IFC, several cards are stacked to get a complete embedded system. The minimum card requires is Power Card and Main Board or Computer Interface Card.

Newly designed in IFC systems is Computer Interface card (IFC-CI00). IFC-CI00 is designed to replace IFC-MB00 to let computer as the main processor in IFC System. Some advance sensors like Laser Range Finder and webcam is difficult to access by using microcontroller therefore IFC-CI00 was designed to cover the limitation and that we call unlimited potential of IFC system. Just plug a USB cable from computer to IFC-CI00 card and a virtual COM Port will be created on your computer. Besides, user can plug more than one IFC-CI00 cards in one computer.

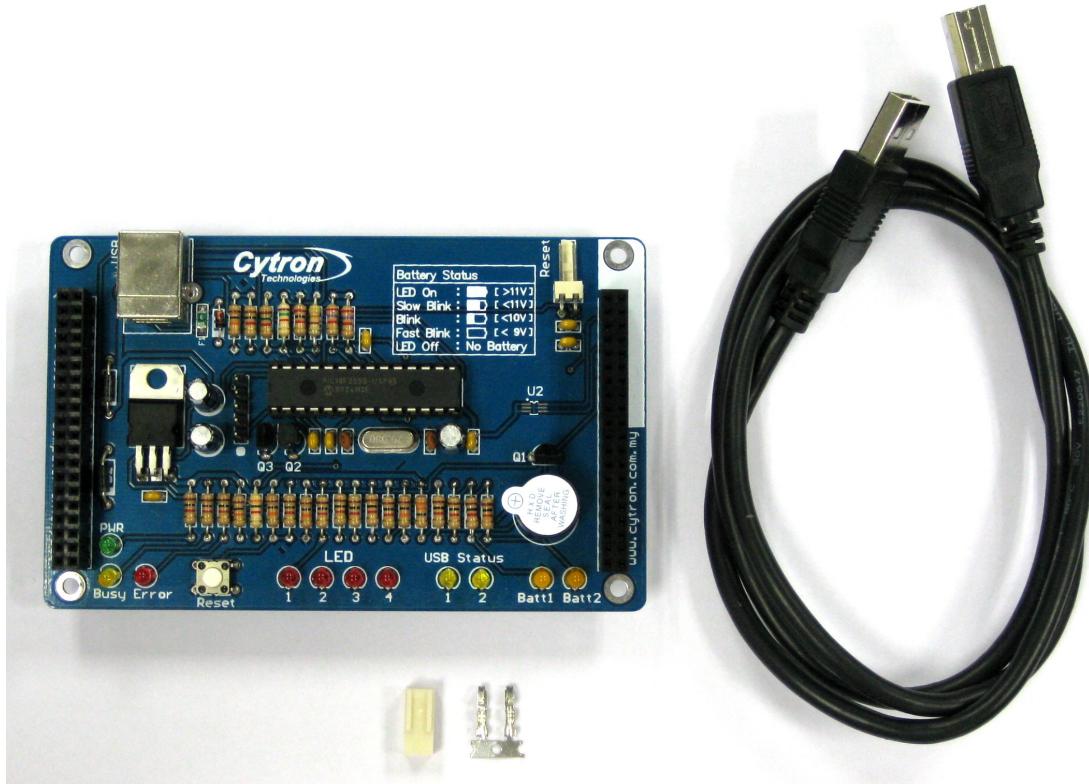




More than one IFC-CI00 can be plugged to a computer as shown as above. USB hub can be used to expand your USB port if needed. Please do remind that each IFC slave card MUST has a UNIQUE address in every system (except IFC-CP04) but the address can be repeated or same for other slave card which placed in another system as shown as above. It is NOT allow more than one IFC-CI00 card in a system. Please refer to chapter 7.3 for software setting for the cards' address.

2. PACKAGING LIST

Please check the parts and components according to the packing list. If there are any parts missing, please contact us at sales@cytron.com.my immediately.



1. 1 x IFC-CI00 with:
 - 1 x 2510H
 - 2 x 2510H Iron Pin
 - 1 x USB Cable (B Type)

3. PRODUCT SPECIFICATION

3.1 Programming Tool

No programming tool used in IFC-CI00. User may control IFC system easily by plug a USB cable from PC/laptop to IFC-CI00 card.

3.2 Input and Output device

The input and output device on CI00 are as below:

- 3 status indicator LEDs: Power and busy LED:
 - Power LED (PWR) will turn ON when power is supplied to BH02.
 - Busy LED (Busy) will turn ON or blinking when IFC slave card is communicating with IFC-CI00.
 - Error LED (Error) will turn ON if the one or more IFC slave cards' address is not compatible to the program.
- 4 programmable indicator LEDs
- 2 battery status LEDs
- 2 USB status LEDs
- 1 buzzer

3.3 Operation Voltage

The operation voltage of IFC-CI00 is 12V. User need to stack a Power Card, IFC-PC00, and connect a 12V battery on Power Card to supply 12V to the Computer Interface card. If 24V is needed, 2 x 12V batteries are connected on Power Card to supply 24V.

3.4 Batteries Status LEDs

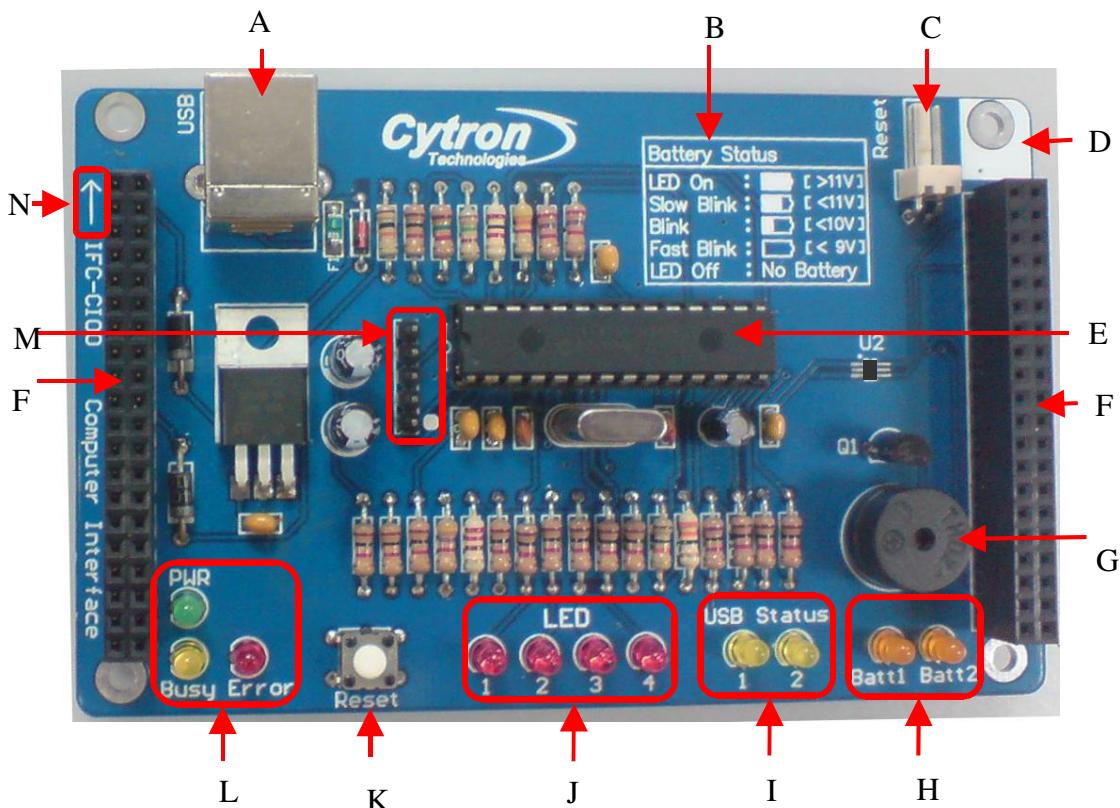
‘Batt1’ and ‘Batt2’ is representing Battery 1’s status and Battery 2’s status respectively. The information of the status is printed on IFC-CI00 card as shown on table below. Please do remind that this indicator only valid for 12V battery. Do not let the LED reaches to fast blink status, please charge the battery if one of the LEDs is blinking to save your battery’s life time.

Battery Status	
LED On	: >11V
Slow Blink	: <11V
Blink	: <10V
Fast Blink	: <9V
LED Off	: No Battery

3.5 USB Status LEDs

These two LEDs are used to indicate the USB status. If IFC-CI00 first plugs in a new USB port, the given IFC-CI00’s driver should be installed. Only LED 2 will blink and LED 1 off (Address State) when installation until the driver is successfully installed. After the driver is installed properly, these two LEDs will alternate blink at the time (Configured State), ready to use! Both LEDs will blink at the same time in USB Suspend State. Both LEDs will off if IFC-CI00 does not connect to computer.

4. BOARD OR PRODUCT LAYOUT



Label	Function	Label	Function
A	USB connector type-B	H	Batteries status LED indicator
B	Battery status table	I	USB status LED indicator
C	Reset extension connector	J	Output LED
D	Orientation marking	K	Reset button
E	28 pin PIC microcontroller	L	Status indicator LED
F	Side connector	M	Manufacturing Test Points
G	Buzzer	N	Arrow

A – USB connector type-B which connected to PC or laptop

B – Explanation for two batteries' status using two LEDs which labeled in 'H'. Each LED represents each battery's status.

C – This reset extension connector is used for extending the reset button out of the IFC system.

D – The orientation marking on IFC-CI00. Every IFC card will have this orientation marking, this is to help user in ensuring the cards are stack correctly.

E – 28 pin PIC microcontroller which used as controller for this card.

F – This side connector is used for card stacking and communication between cards.

G – Active High 5V buzzer.

H – ‘Batt1’ and ‘Batt2’ is representing Battery 1’s status and Battery 2’s status respectively. The information of the status is printed on IFC-CI00 card as shown on table below. Please do remind that this indicator only valid for 12V battery. Do not let the LED reaches to fast blink status, please charge the battery if one of the LEDs is blinking to save your battery’s life time.

Battery Status	
LED On	: >11V
Slow Blink	: <11V
Blink	: <10V
Fast Blink	: <9V
LED Off	: No Battery

I – These two LEDs are used to indicate the USB status. If IFC-CI00 first plugs in a new USB port, the given IFC-CI00’s driver should be installed. Only LED 2 will blink and LED 1 off (Address State) when installation until the driver is successfully installed. After the driver is installed properly, these two LEDs will alternate blink at the time (Configured State), ready to use! Both LEDs will blink at the same time in USB Suspend State. Both LEDs will off if IFC-CI00 does not connect to computer.

J – 4 active High LEDs

K – This reset button is used for resetting all IFC slave cards but it would NOT reset IFC-CI00 itself.

L – 3 status indicator LEDs to indicate status for power ON (PWR), busy in communication with other cards (Busy) and program error (Error). PWR LED will ON when power supplied to the board. Busy LED will ON when the card is busy in communication with other slave card like Output Card, Control Panel and Digital Input card. Error LED will ON when the address set on slave card did not match with the address in main program.

M – Reserved for Manufacturing Test Point. Please DO NOT short or connect wire to any of these pins.

N – An arrow mark to help user in ensuring the cards are stack correctly. Every IFC card will have this arrow mark; user needs to ensure that the arrow points to the same direction when IFC cards are stack together.

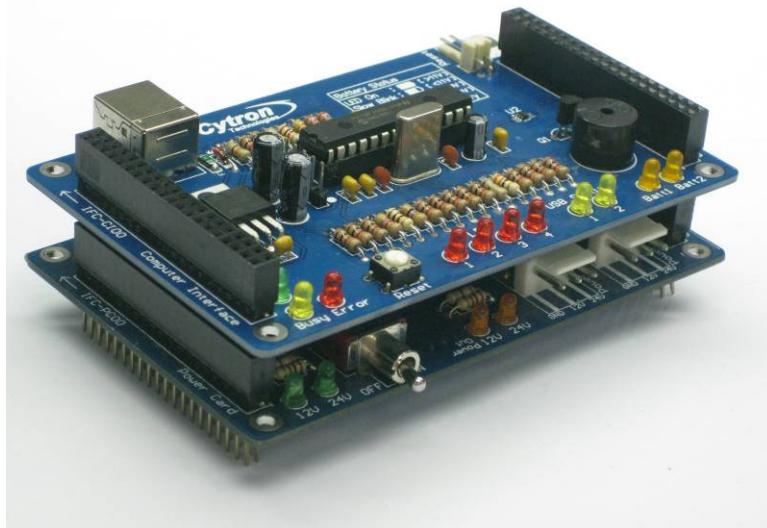
5. INSTALLATION (HARDWARE)

For the hardware installation of IFC-CI00, user will first need the Power Card (IFC-PC00) and Computer Interface (IFC-CI00) of IFC system. IFC-CI00 is replacing IFC-MB00 in IFC system. IFC-CI00 and IFC-MB00 cannot be used together in same system. The details about IFC-PC00 card are available in IFC-MB00A User's Manual.

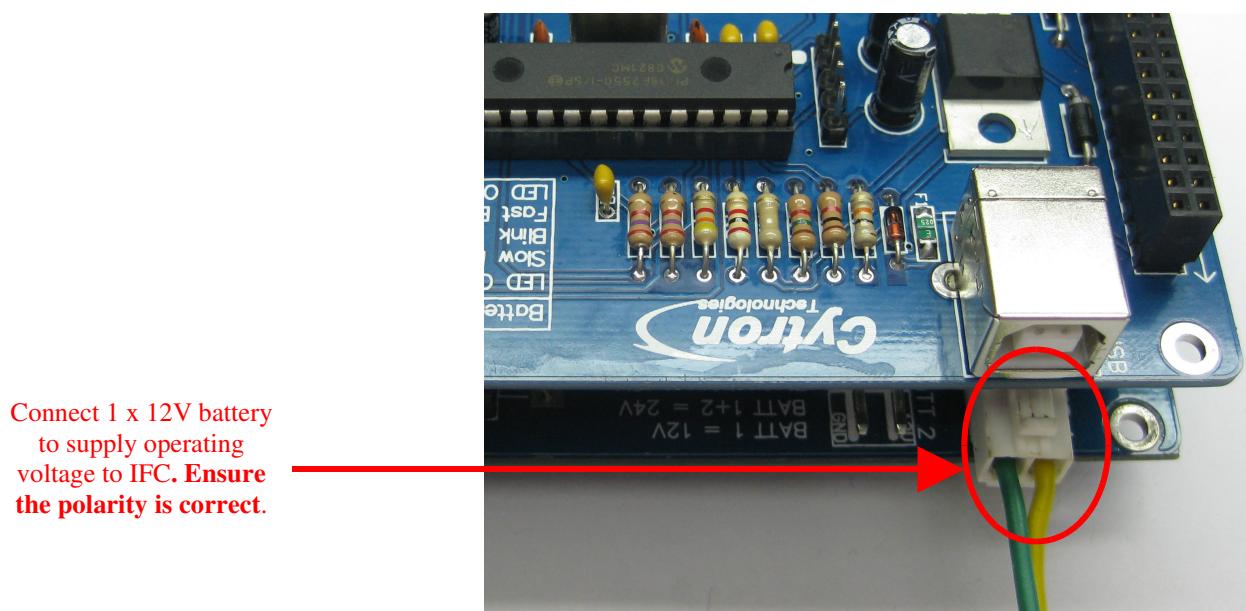
Main power supply:

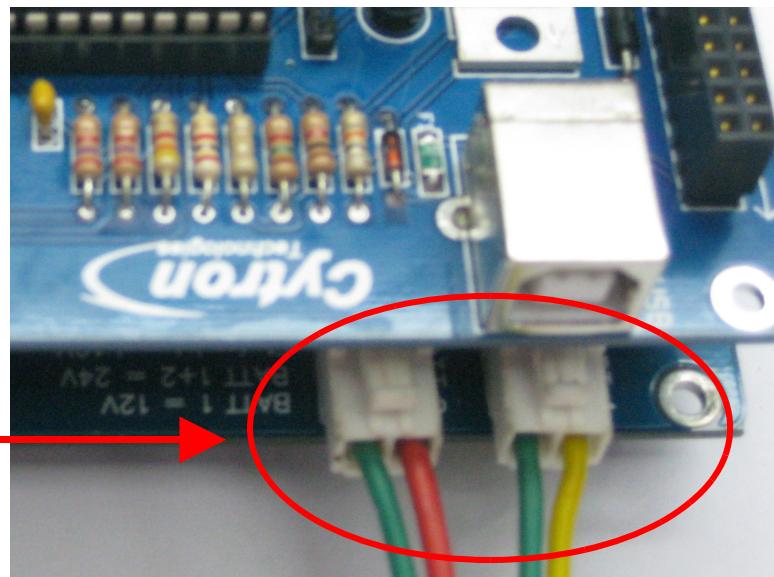
- 1 x 12V battery.
- If 24V is needed, 2 x 12V batteries must be connected to Power card to provide 24V.

1. Stack IFC-PC00 and IFC-CI00 card together.



2. Connect battery to Power Card, IFC-PC00.

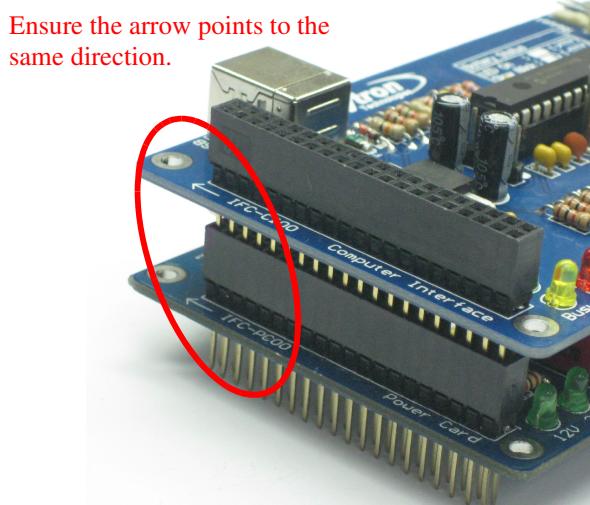




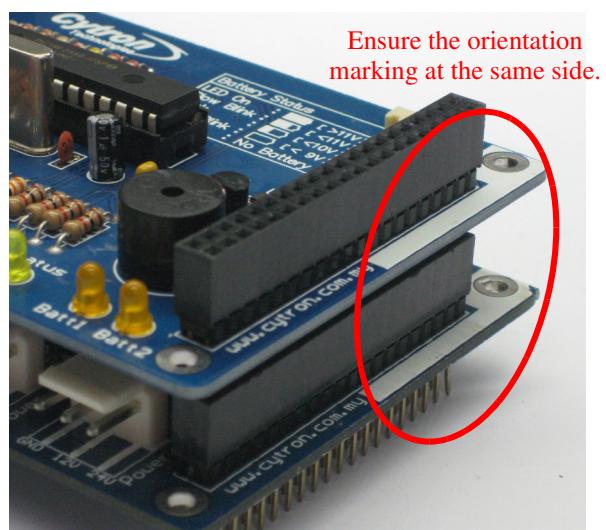
If 24V is needed in the system, connect 2 x 12V batteries to PC00.

Ensure the polarity is correct.

3. Ensure every card is being stack properly in correct orientation.



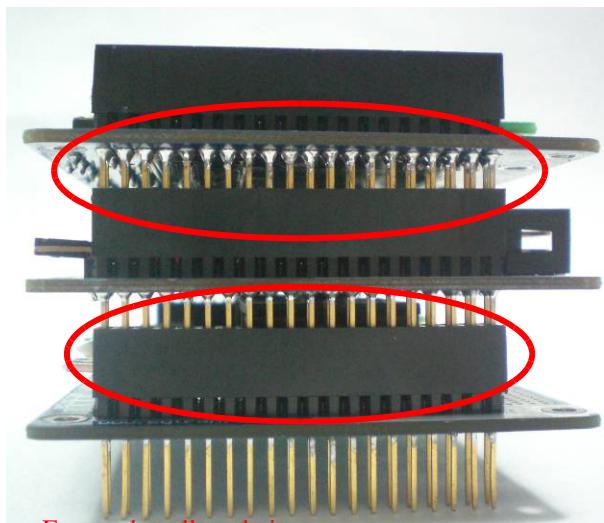
Ensure the arrow points to the same direction.



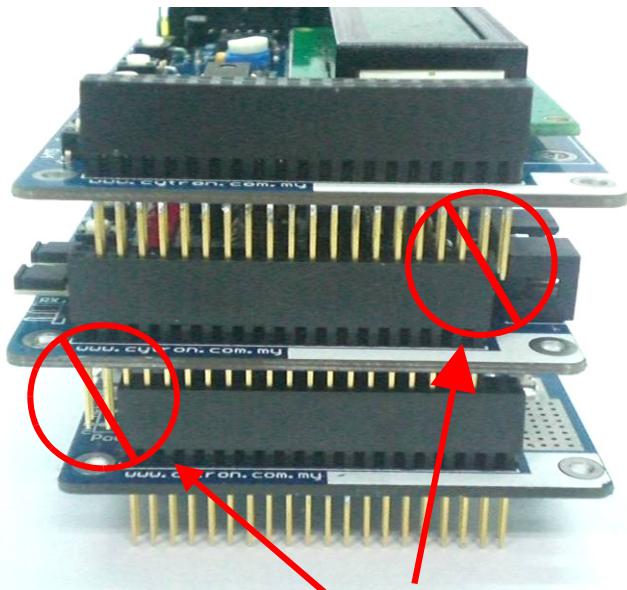
Ensure the orientation marking at the same side.

Cautions: Please ensure that all card pins are not shifted when stacking. IFC system will NOT function if the pins are shifted.

4. Besides stack every card in correct orientation, user must also require to ensure all card pins are not shifted when stacking. Figures show the example of stacking cards in proper location and example of stacking cards with shifted pins.

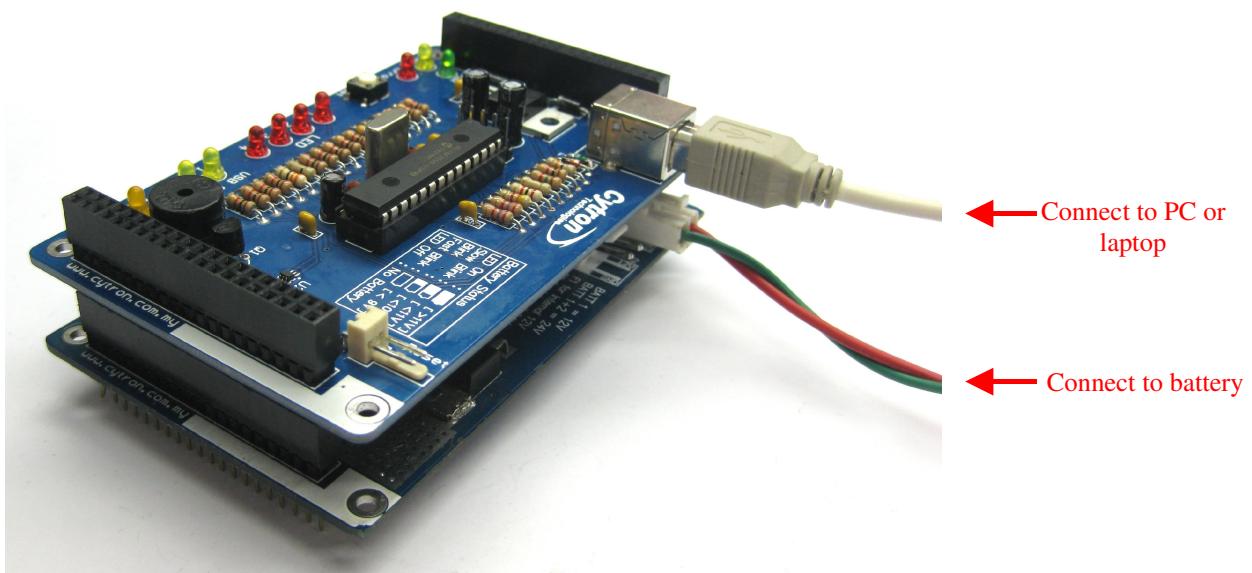


Ensure that all card pins
are not shifted when
stacking.

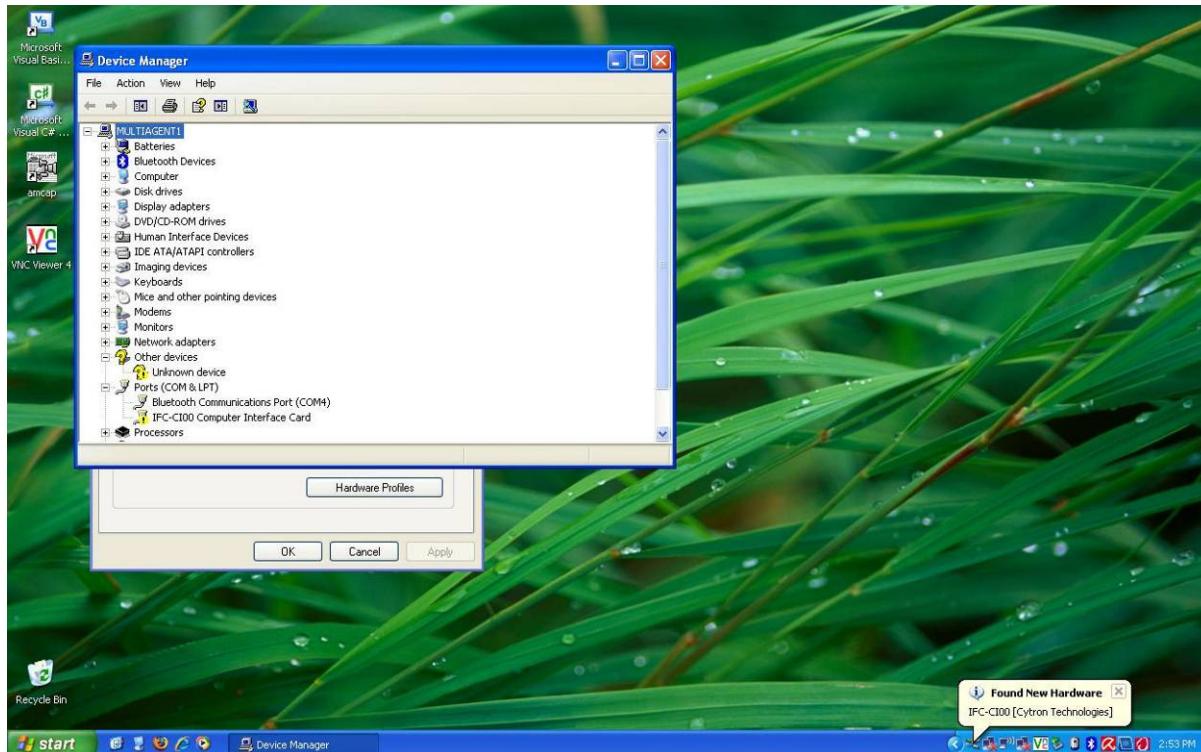


Examples of stacking
cards with shifted pins.
Please AVOID this!

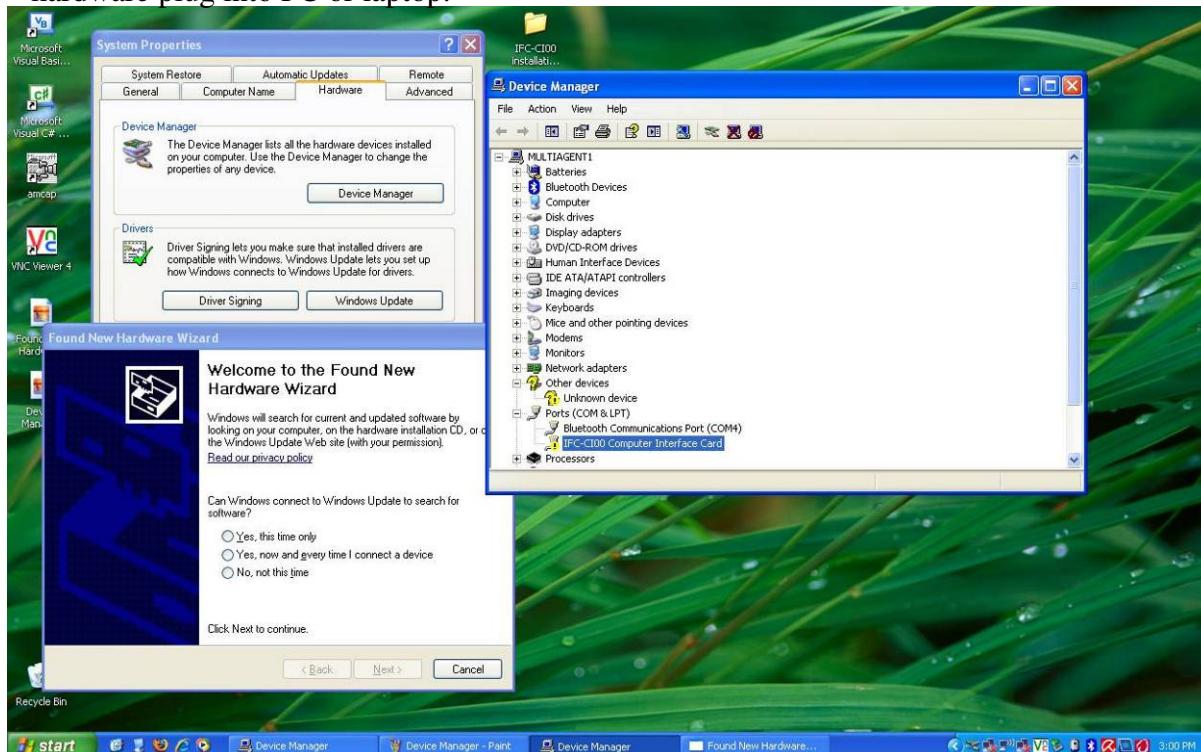
5. Connect USB cable (B type) to IFC-CI00 USB socket as shown in following figure, another end (A type) to PC/laptop.



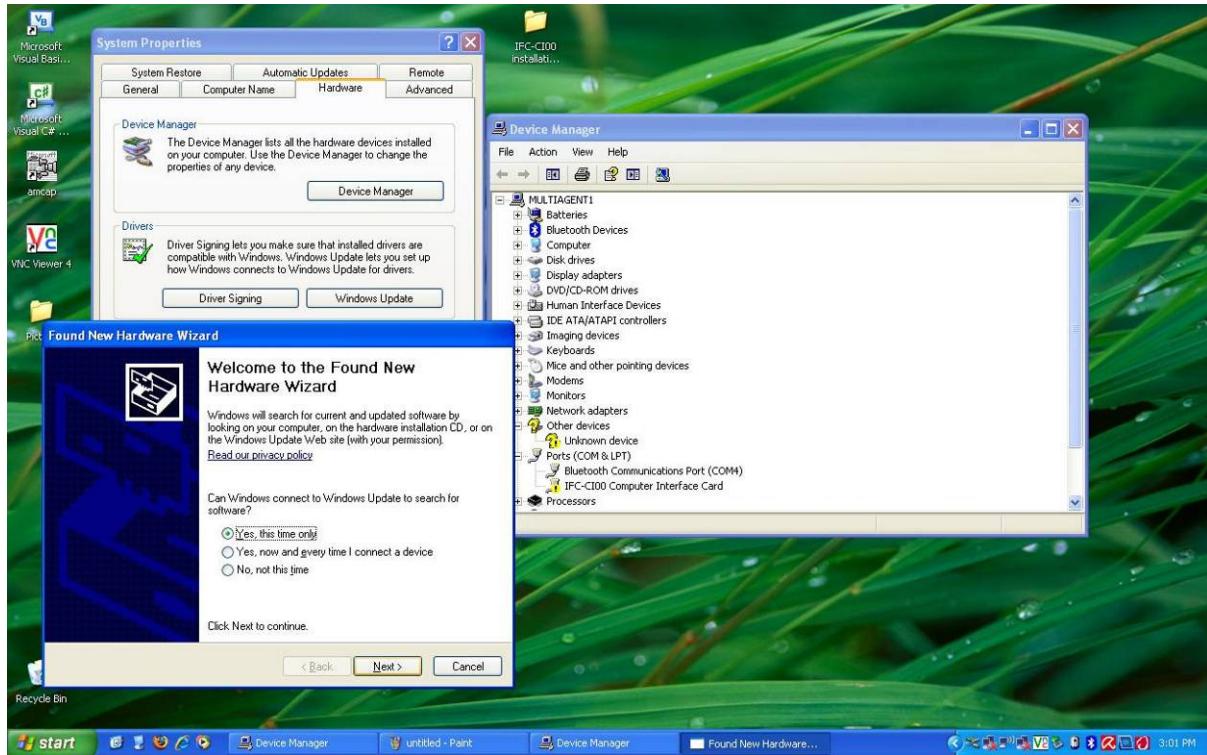
6. Computer will detect “Found New Hardware” when the first time user connects USB cable from IFC-CI00 USB socket to PC/laptop. Only USB status LED 2 will blink and LED 1 off until the driver is installed then both LEDs will alternate blink (ready to use). To ensure the COM Port connect to IFC-CI00, go to *My Computer*> right click and select *Properties* or while holding the windows key, press the *Pause / Break* key then click *Hardware>Device Manager*. Device Manager Window appears and user can see IFC-CI00 Computer Interface Card at the Ports (COM & LPT).



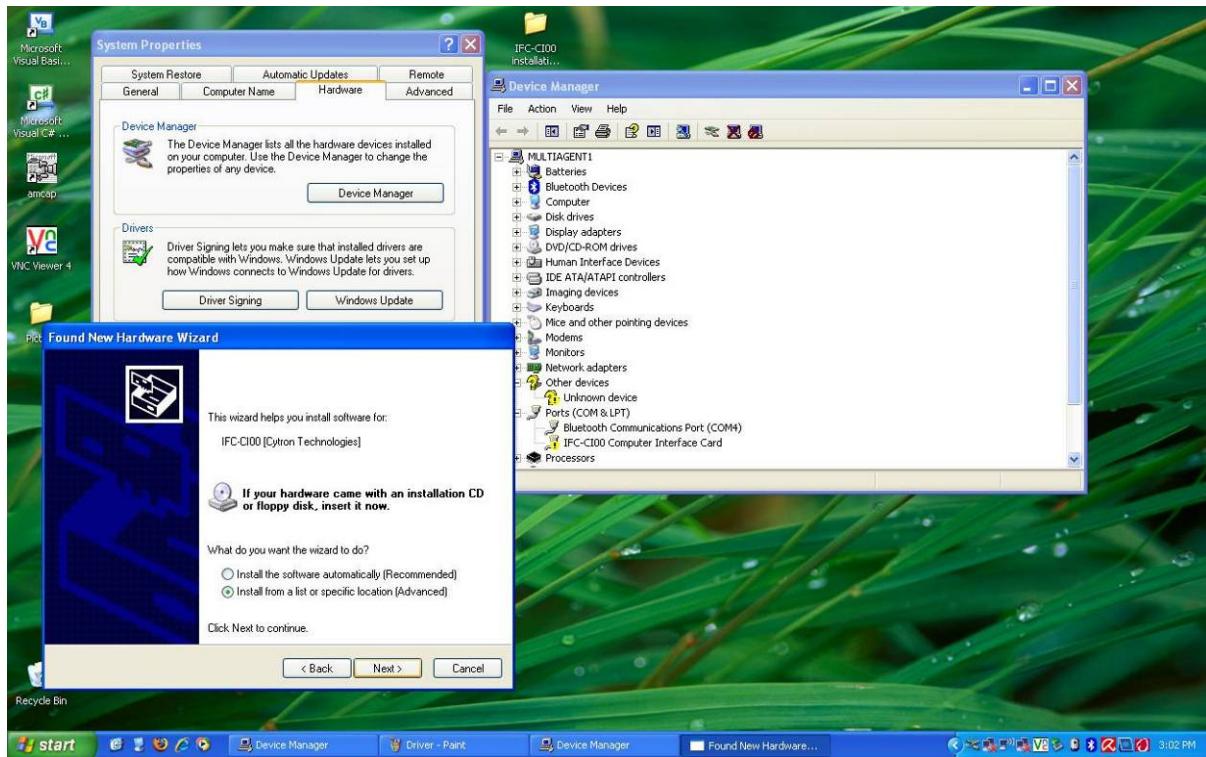
7. Yellow mark at IFC-CI00 Computer Interface port is because the driver is not installed yet. Window Found New Hardware Wizard will launch when it detect new hardware plug into PC or laptop.



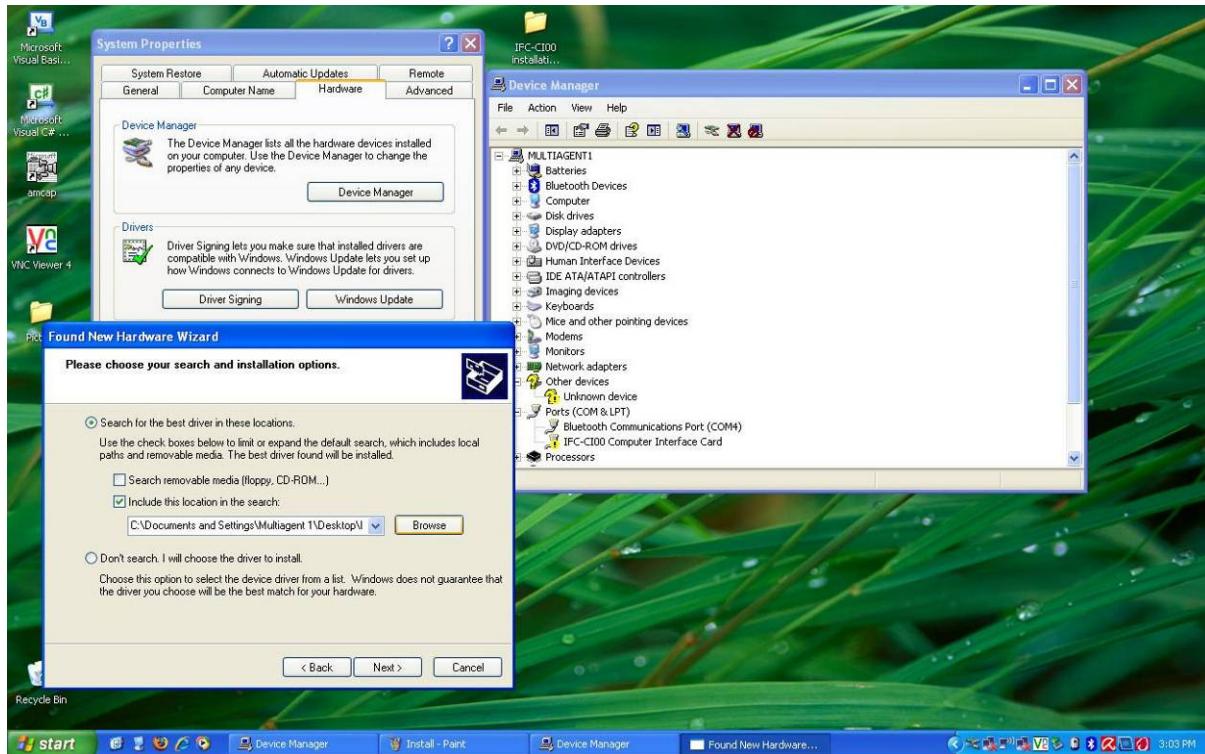
8. Select “Yes, this time only” from the options available and then click “Next” to proceed with the installation.



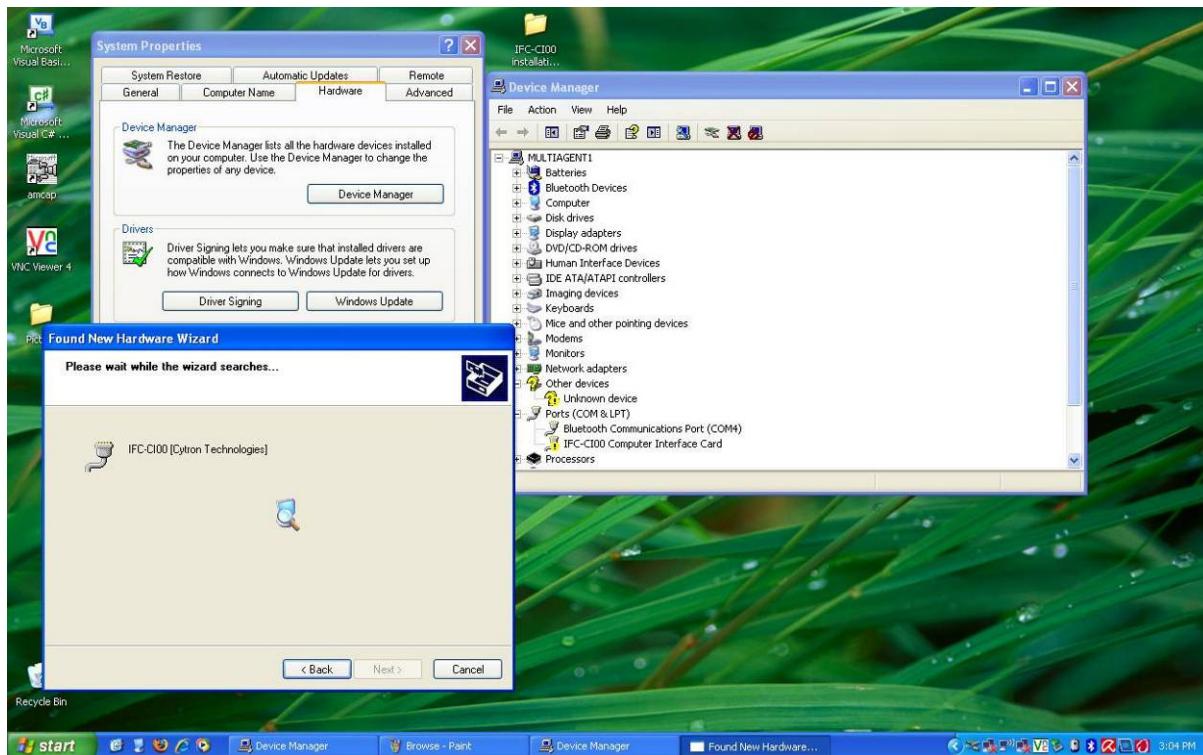
9. Select “Install from a list or specific location (Advanced)” as shown below and then click “Next”.



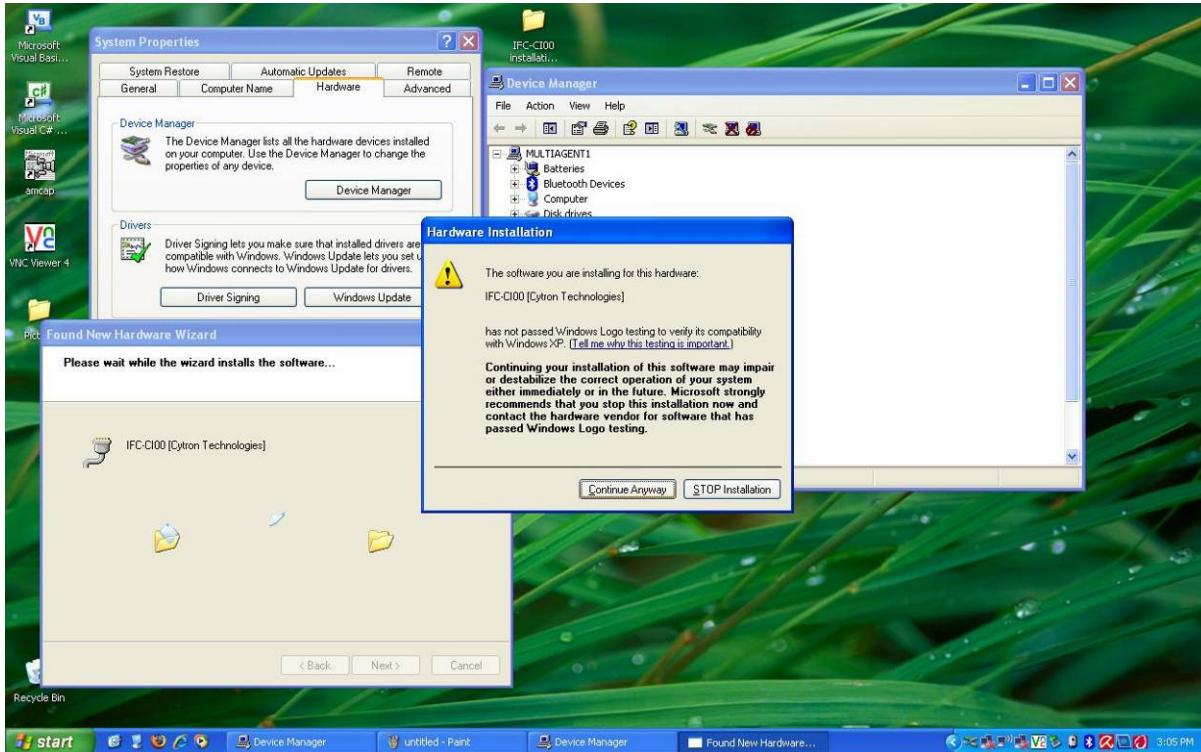
10. Select “Search for the best driver in these locations” and click browse button to browse the location. Location is a location for folder where users copy the IFC-CI00 installation Driver. Click next to proceed.



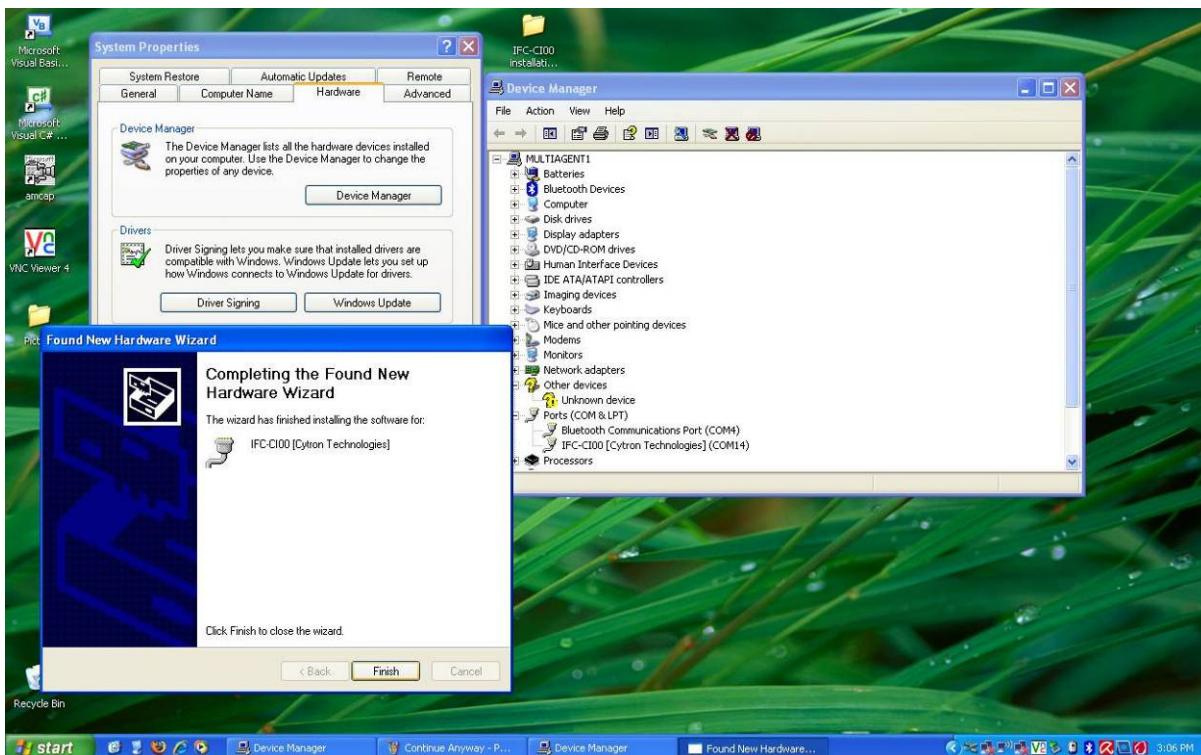
11. Wait while the wizard search IFC-CI00 hardware.



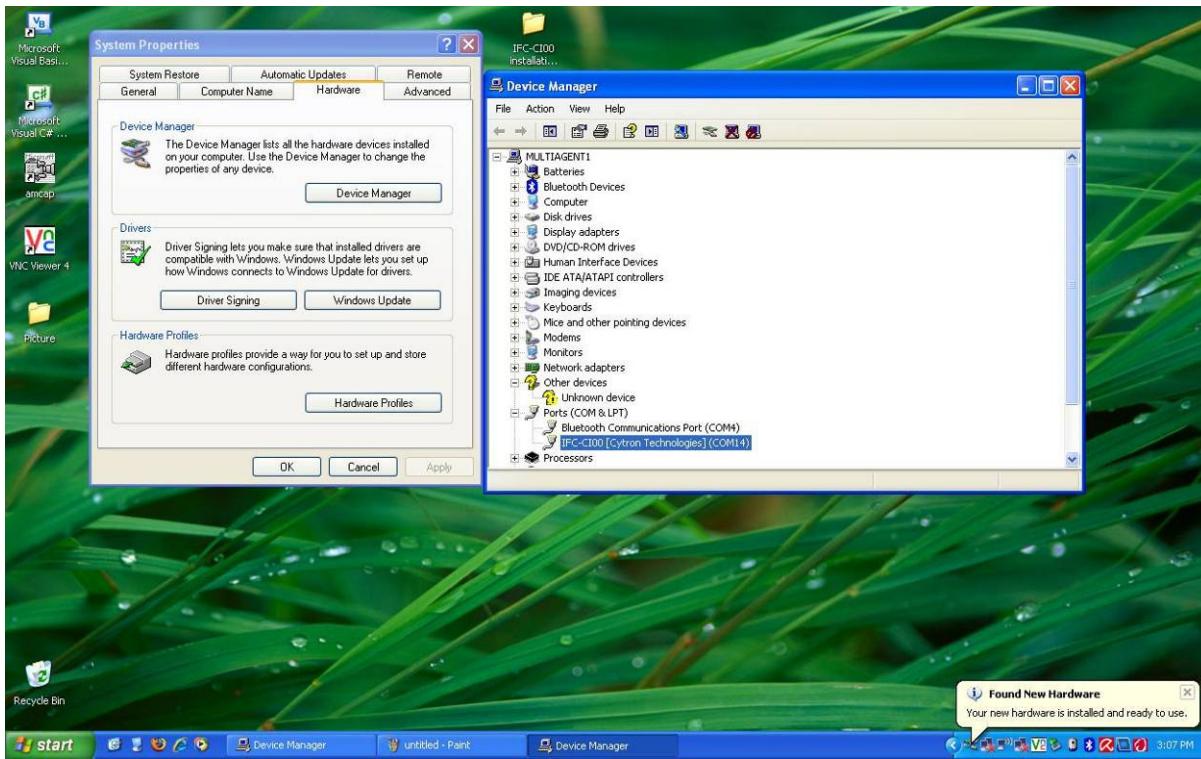
12. If following screen displayed, click on “Continue Anyway” to continue with the installation.



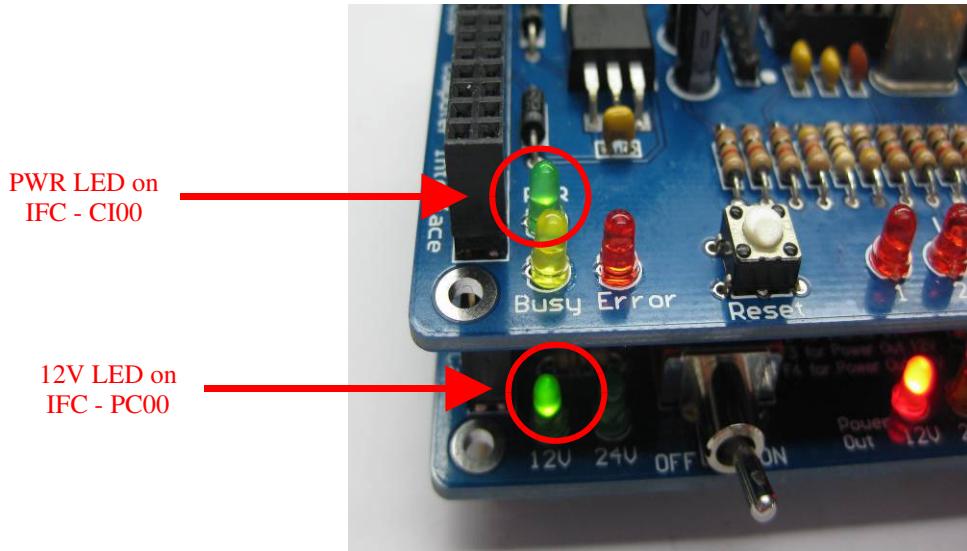
13. Windows will display a message that the installation was successful. Click “Finish” to complete the installation. Both USB status LEDs will alternate blink at this time (device ready to use).



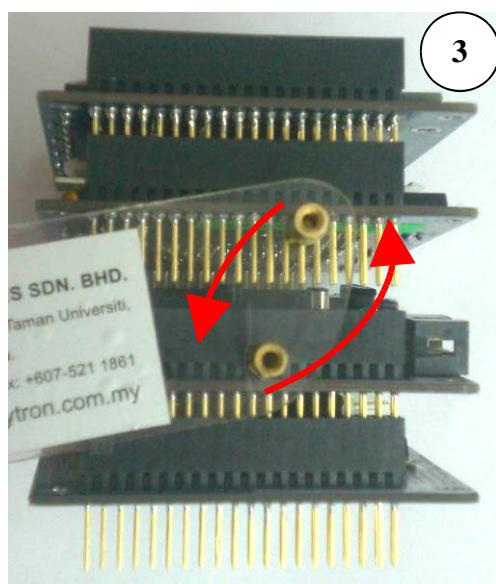
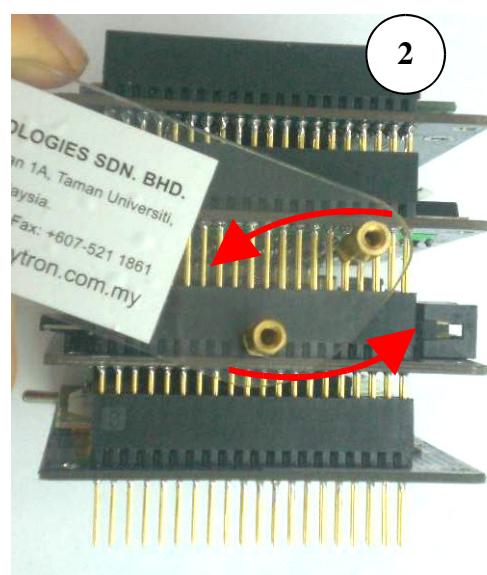
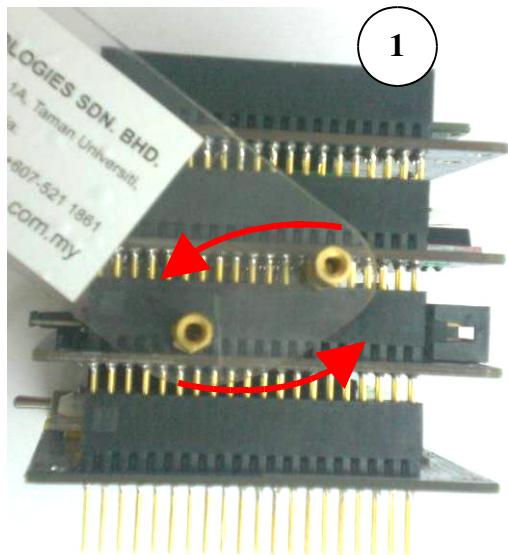
14. After installation is complete, IFC-CI00 is ready to use. At device manager, user will see the COM Port for IFC-CI00. From the example below, COM Port for IFC-CI00 is COM14.



15. Turn ON the power on Power Card by pushing the toggle switch to “ON” label, the PWR LED of IFC-CI00 and IFC-PC00 will turn ON as shown in Figure.



To open the cards, user can use the IFC card's opener to open the stacked cards. Figure shows the method to open cards with the opener. Please ensure the power is **OFF** before inserting or removing IFC card.



Caution: Please use the opener to open IFC cards to avoid damage to pins or cards.

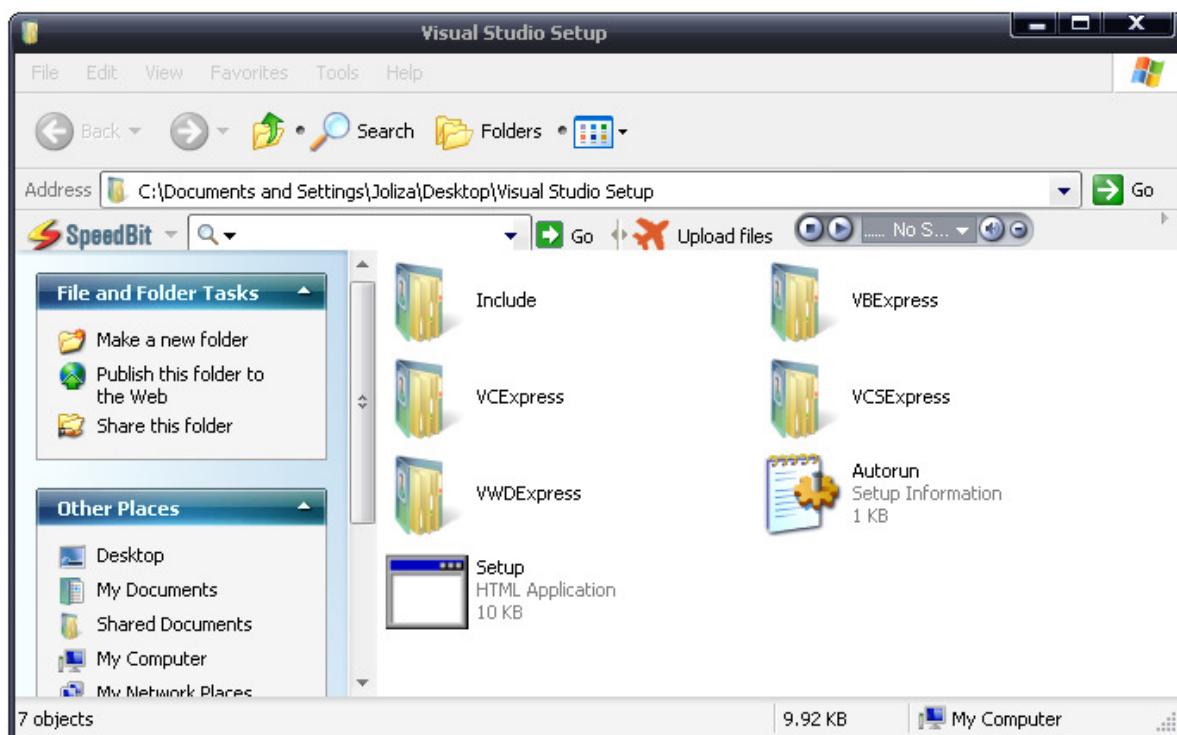
6. INSTALLATION (SOFTWARE)

Visual Studio C # 2008 Express Editions is required to be installed in order for user to create graphical user interface and write program. Visual C# (C Sharp) is a relatively new language introduced by Microsoft along with Visual Studio. C# is fully object-oriented, compatible with many other languages using the .NET Framework. C# is designed to allow the programmer to develop applications that run under Windows and/or in a Web browser without the complexity generally associated with programming. With very little effort, the programmer can design a screen that holds standard elements such as buttons, check boxes, radio buttons, text boxes, and list boxes.

6.1 Visual C# Installations

If user have already purchased and installed Visual Studio 2008 and C#, user can skip this section. If users haven't installed C#, this section will explain the method to install these software and next section will briefly discuss on method to use it.

1. Click the executable file that was supplied. (The file was named Setup HTML Application)



2. Click Visual C # 2008 Express Editions to install that software.



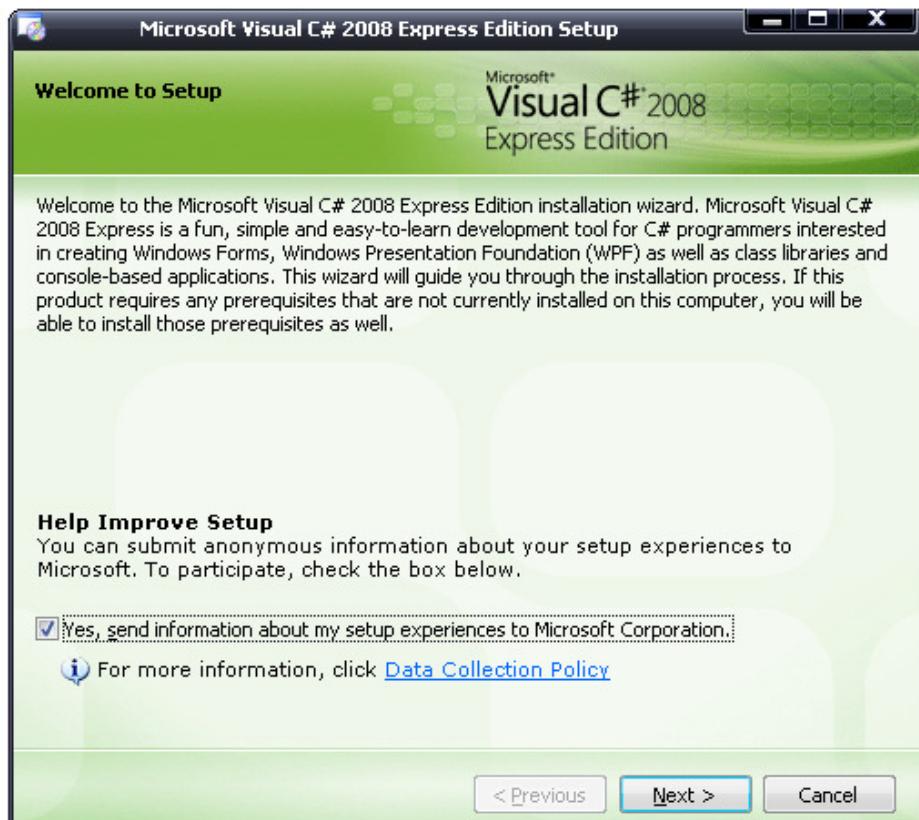
Setup will copy required resources to user temp directory.



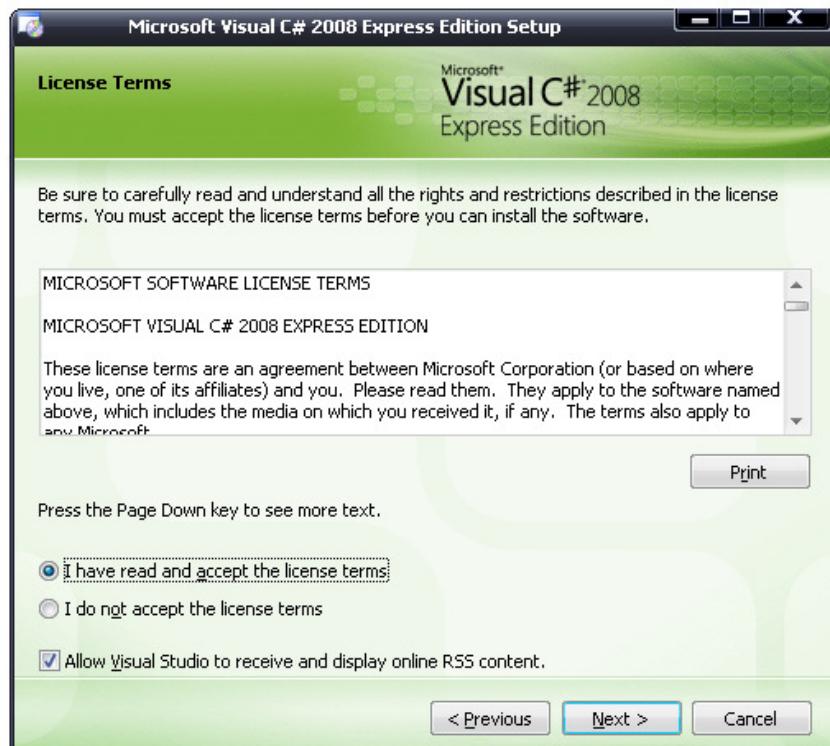
4. Wait for one or two minute while setup is loading installation components.



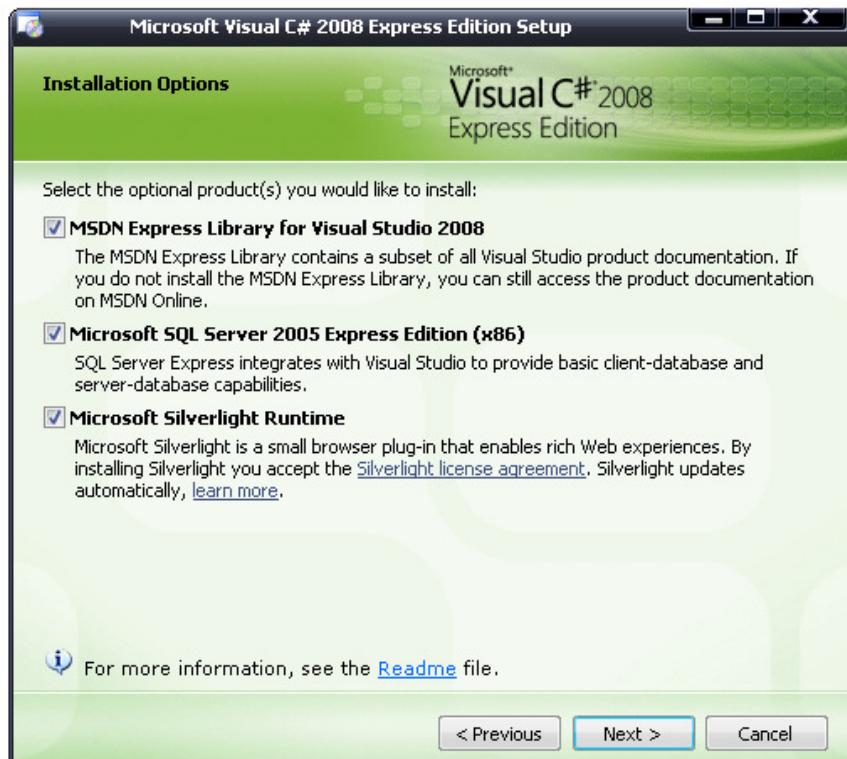
5. After loading installation is complete, user should see a screen similar to that shown in figure below. Then click next.



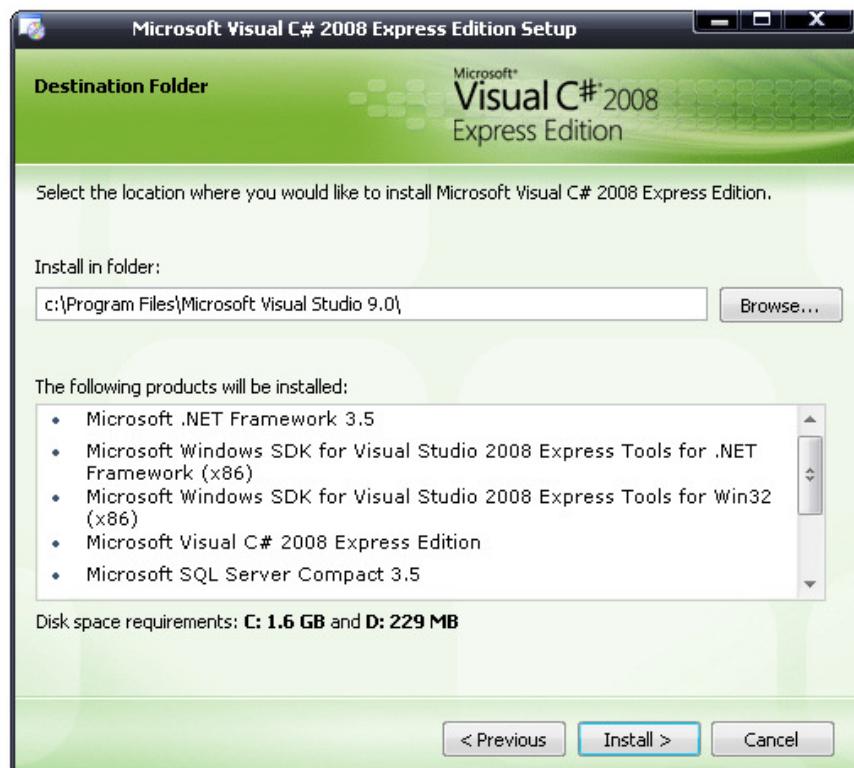
6. Choose 'I have read and accept the license terms' and click next to proceed to the next phase of the installation.



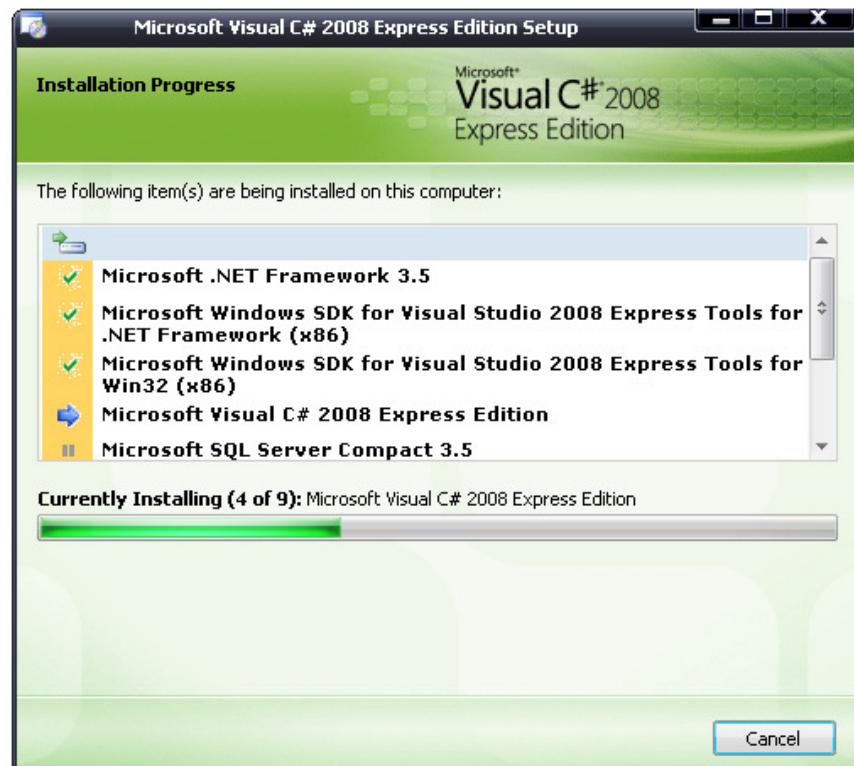
7. Select optional product and click next to start installation.



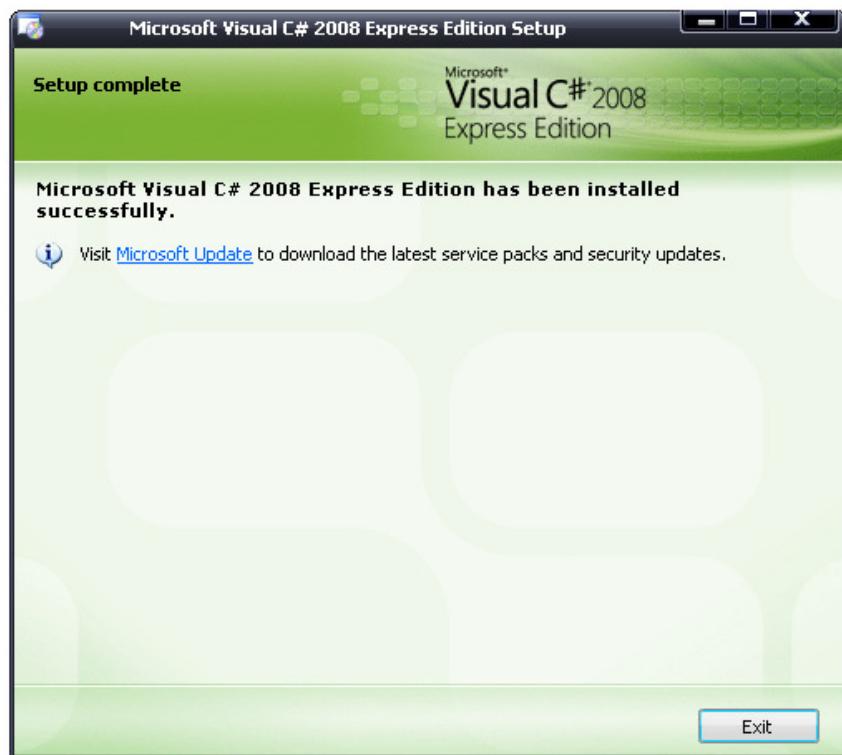
8. Select the location where user would like to install Microsoft Visual C# 2008 Express Editions. Browse to other location if user doesn't like to install in default destination. Click install.



The following items are being installed on user computer. Wait for awhile.



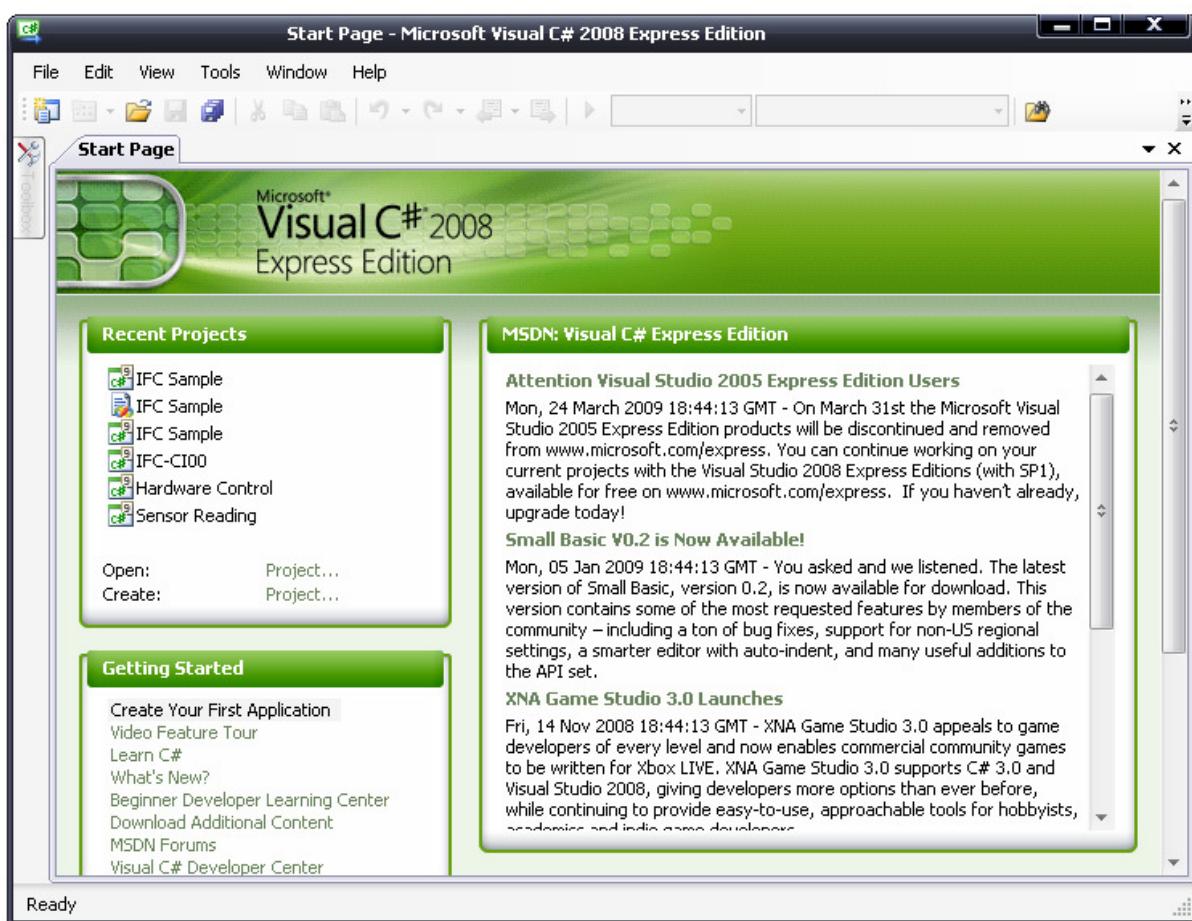
After installation complete, click exit.



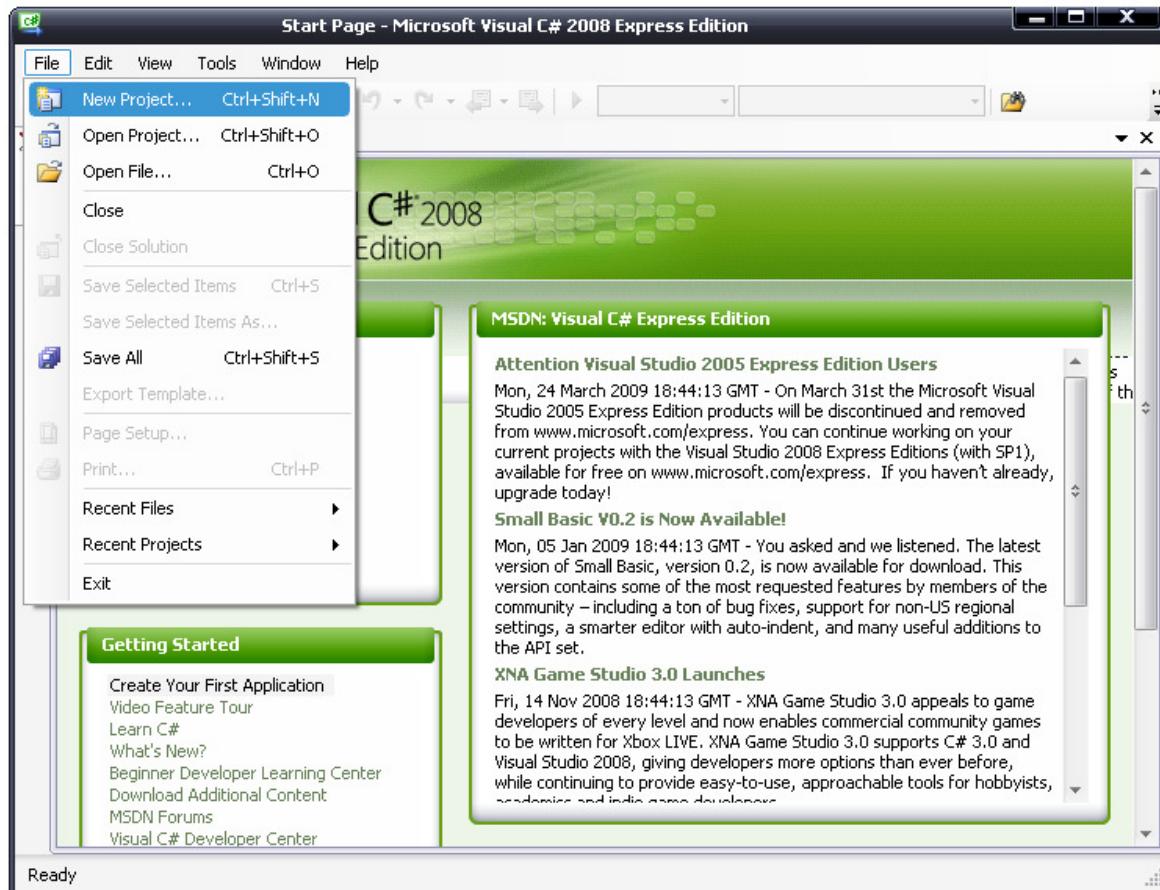
6.2 Using Visual C#

To start Visual C# 2008 Express Editions, please follow the steps below:

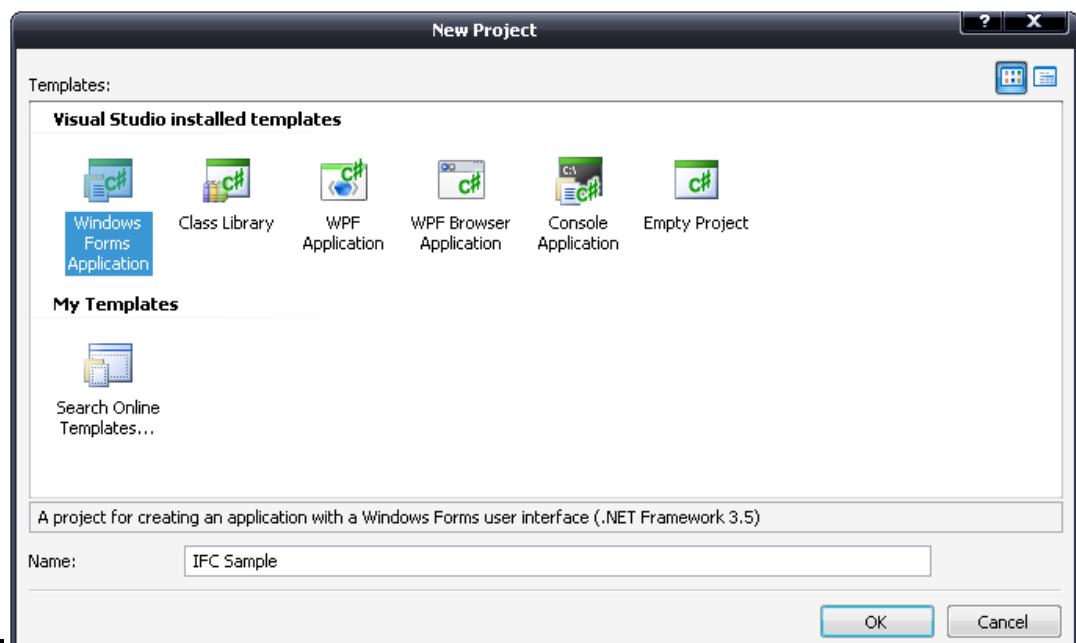
1. To start project, create a main project folder. For example IFC-CI00. Users are recommended to copy all dll file/folder and xml file/folder from the CD provided into main project folder. It is because all dll file and xml file should be place in the same folder with the project file.
2. Click on the icon installed on the desktop after installation or select *Start>All Programs>Microsoft Visual C# 2008 Express Edition*. User should see a C# Express startup screen shown in figure below.



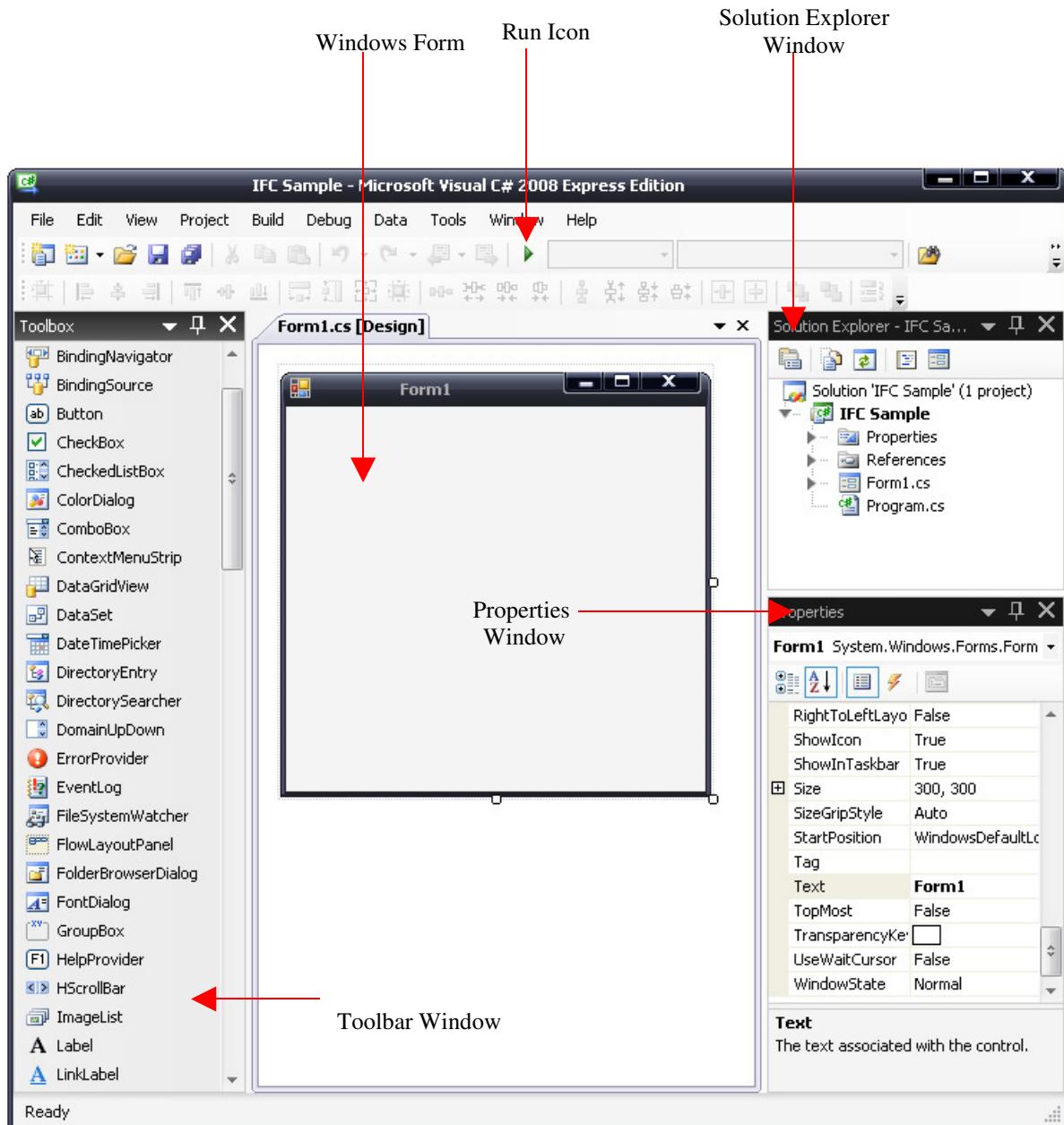
3. To create a project, move the cursor to *File* menu option from the main menu program menu bar. The screen should look like what is shown in figure below.



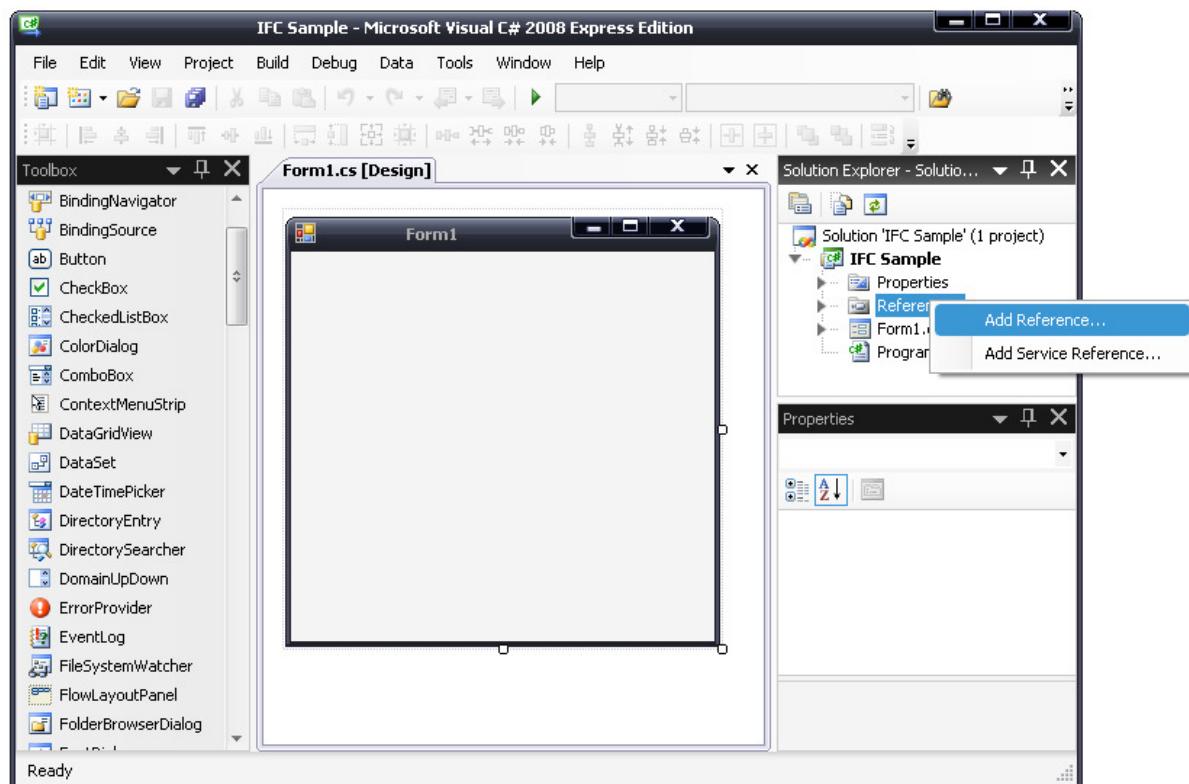
4. Select **New Project** from the menu. The program screen changes as shown in figure below. In figure below, users are given a number of predefined project templates from which to choose. These templates define the types of programs that user may develop with C#. From the templates shown below, select the Windows Application template. User should also type the name of the project. For example IFC Sample. Then click **OK**.



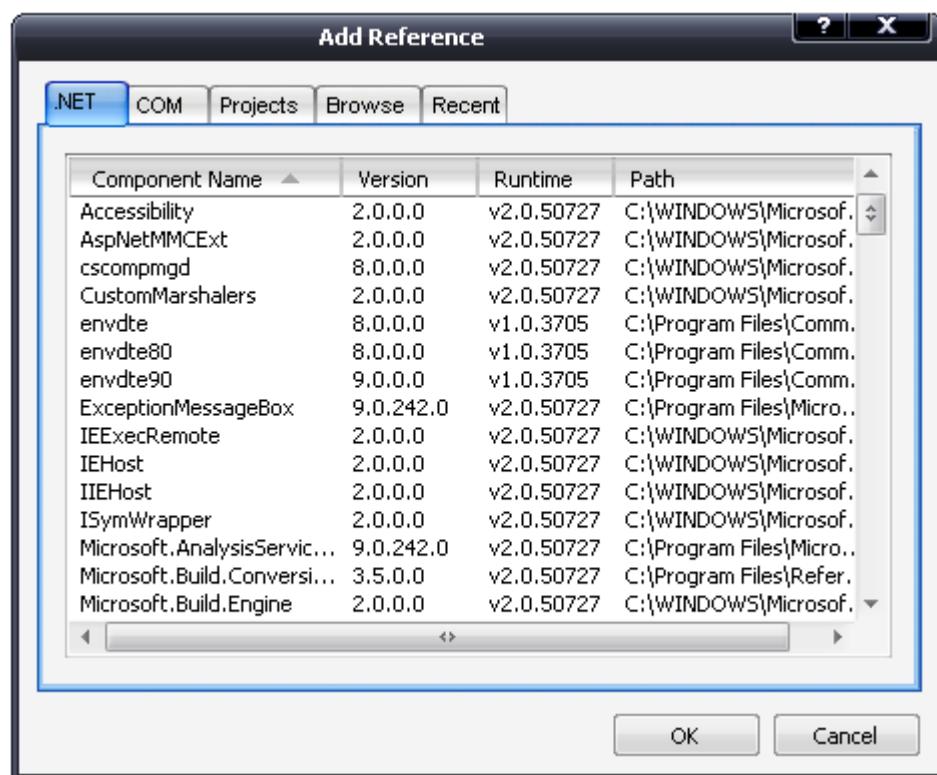
5. Figure below show the place user will spend time for programming. It's called the *Integrated Development Environment* or *IDE* because every programming tool user need to write C# programs is available there.



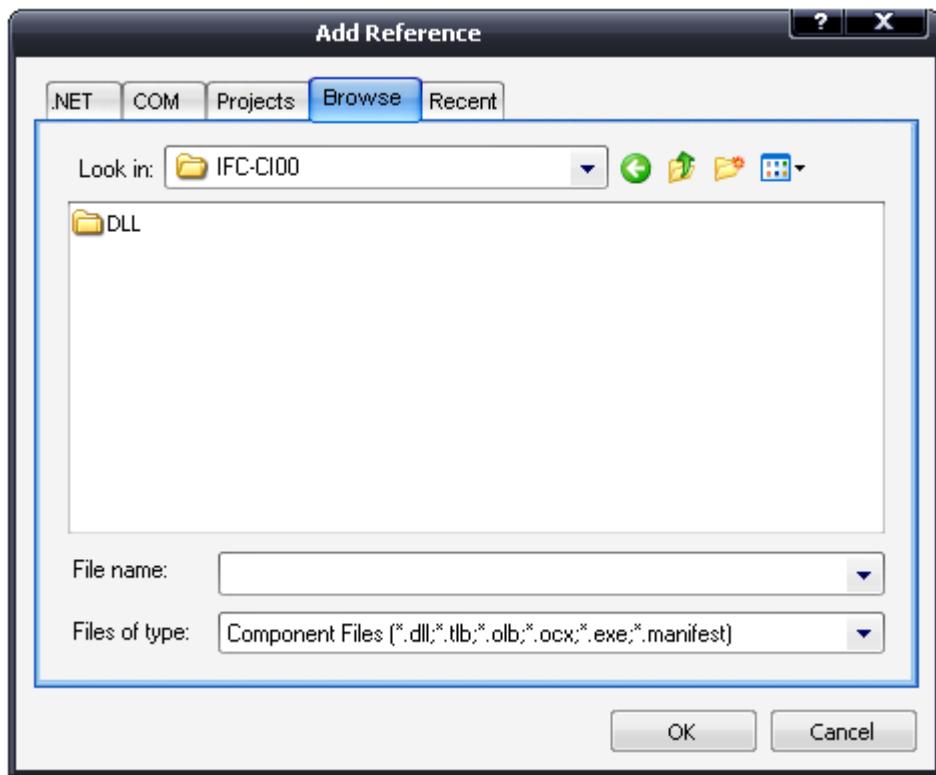
6. To add references in project, right click on *Reference* at Solution Explorer Window, then click on *Add References...*, figure below shown the example for add references.



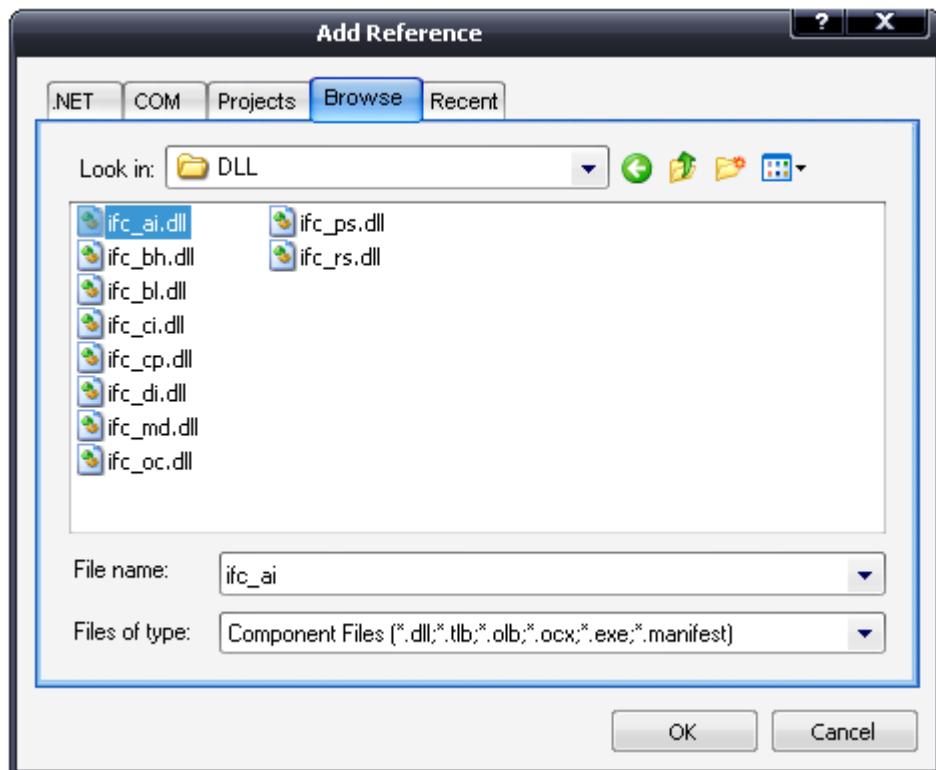
7. After clicking *Add References...*, an *Add Reference* window pop up.



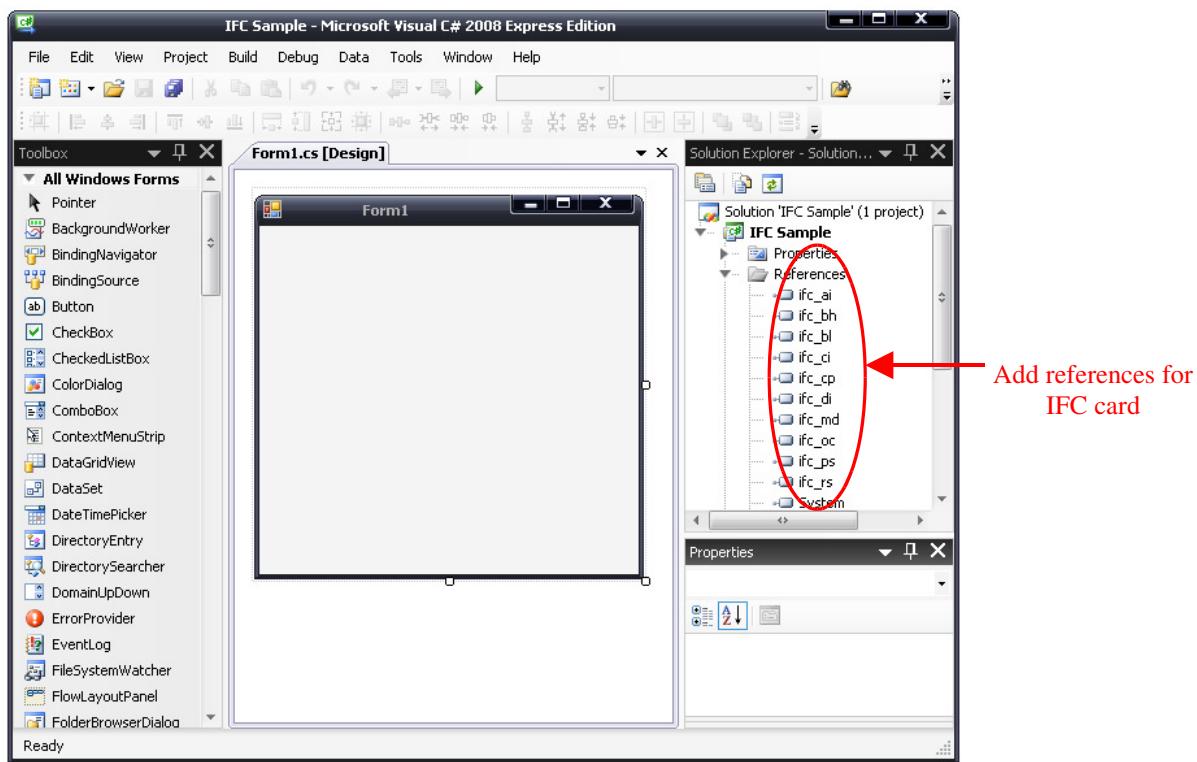
8. Click *Browse* to browse user main project folder (IFC-CI00). Then browse sub folder of main project folder (IFC-CI00) which consist dll file. Do make sure the *Files of type* is *Component Files (*.dll; *.tlb; *.olb; *.ocx; *.exe; *.manifest)*



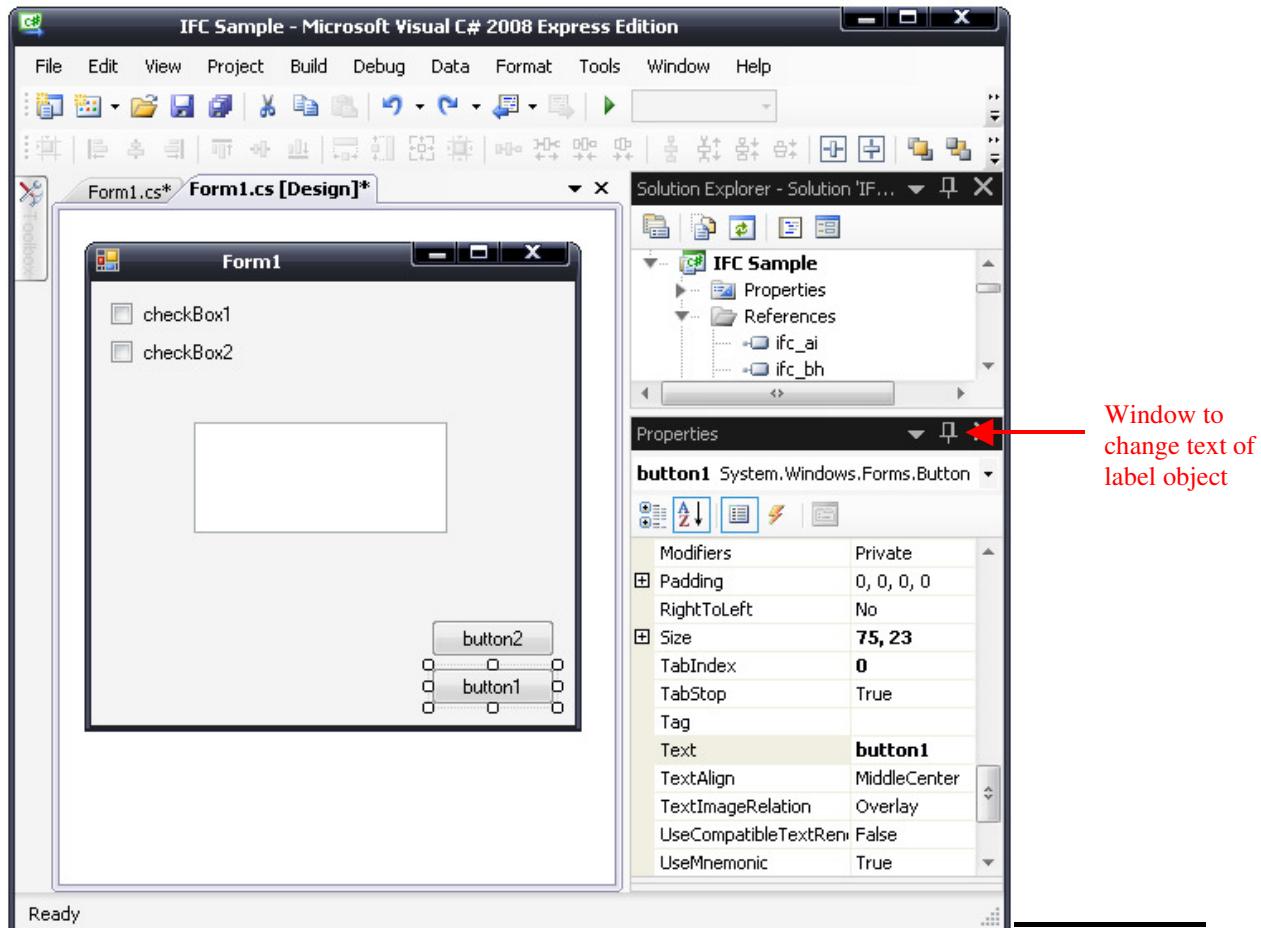
9. Click on one of dll file and click *OK* to add reference in project.



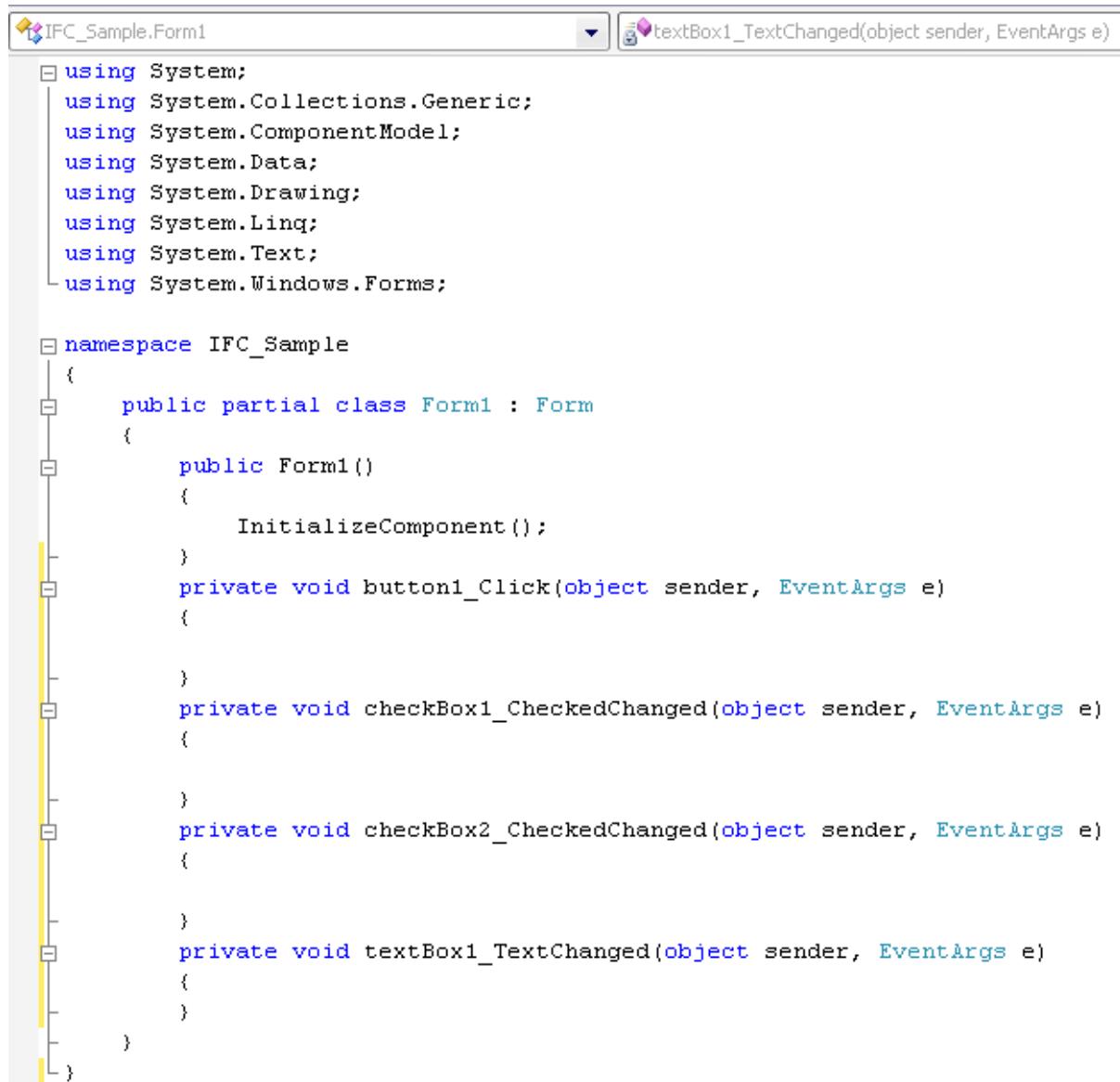
10. User may repeat the similar *Add reference* steps to add others dll files.



11. After added all the necessary files, user may start create project with adding objects to a Windows Form. Don't forget to change the text of label objects at Properties Window.



12. To view code, user click view code in Solution Explorer or click *View menu option>Code* from the menu bar. To click view code in Solution Explorer, make sure user click Form1.cs in the Solution Explorer first and small icon will appear at the top of Solution Explorer. Below is example of source code. Programming writing is at this place.



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

namespace IFC_Sample
{
    public partial class Form1 : Form
    {
        public Form1()
        {
            InitializeComponent();
        }

        private void button1_Click(object sender, EventArgs e)
        {

        }

        private void checkBox1_CheckedChanged(object sender, EventArgs e)
        {

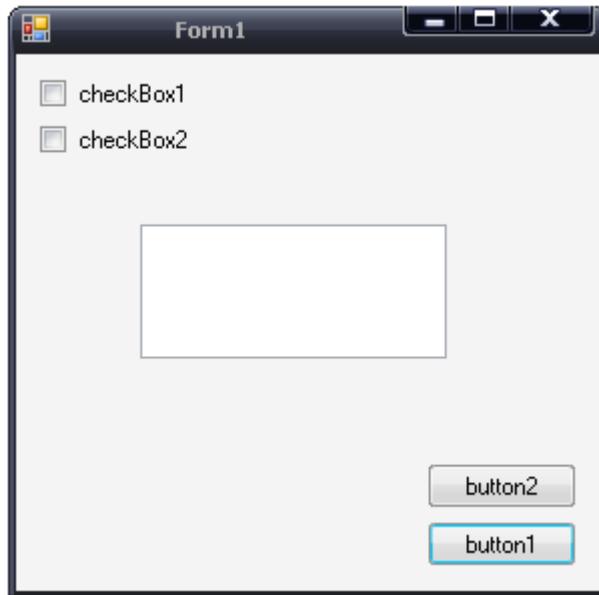
        }

        private void checkBox2_CheckedChanged(object sender, EventArgs e)
        {

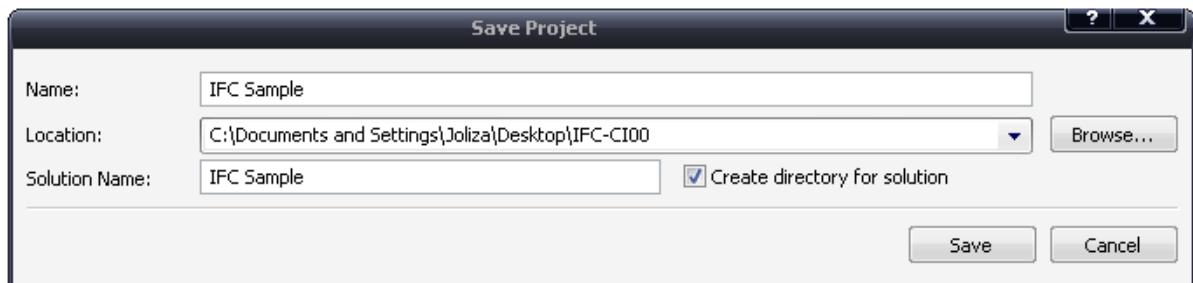
        }

        private void textBox1_TextChanged(object sender, EventArgs e)
        {
        }
    }
}
```

13. To run program, there are two simple ways. The easiest is to press F5 key on keyboard. The second way is to click the Run Program icon. The program should appear on the screen in a few moments if the program not getting error message.



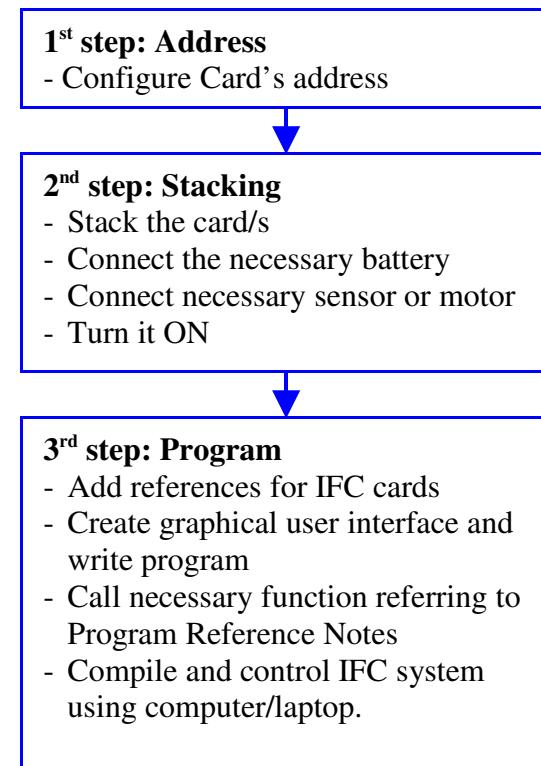
14. To save project, select *File>Save All*. Save project windows will appear. Browse the location of folder want to save. The location of folder must be under the main project folder (IFC-CI00). Then, click save.



15. Please refer chapter 7 on Getting Started with IFC Sample and other setup for using IFC-CI00.

7. GETTING STARTED

IFC is being design with the aim of 3 simple steps. Configure card address, Stack it, Create program and run. There must be at least a power card (IFC-PC00) and a Computer Interface Card (IFC-CI00 replacing IFC-MB00 in IFC system) for this system to function. Since IFC offer many possibilities to create your own system, this section will show several examples of operating it. There should be only one power card and one Computer Interface Card in IFC system; however, there is not limitation (maximum 64 cards) for the amount of slave cards in one system.



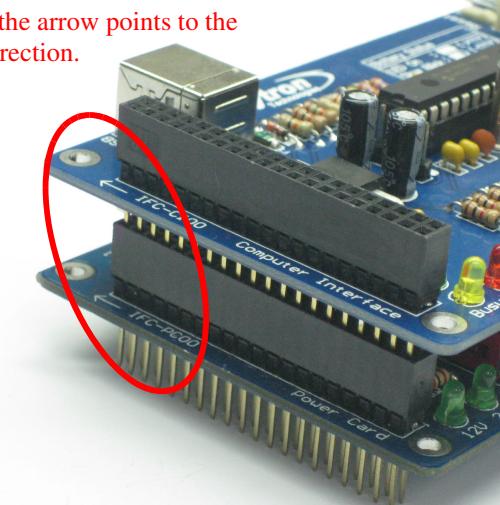
There are 2 basic setups in this chapter for IFC-CI00. First setup includes 2 cards, IFC-PC00 and IFC-CI00, and second setup includes one extra card, which is IFC-CP04. Please refer to following section of this chapter for setup details.

7.1 Basic setup (IFC-PC00 + IFC-CI00)

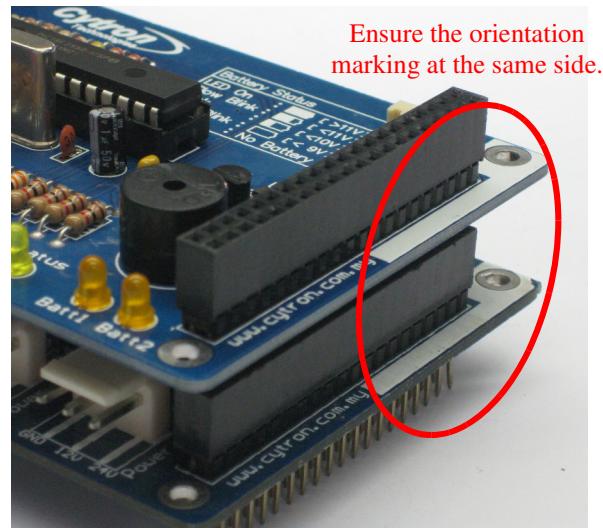
This is the basic and minimum setup for IFC to function. Though without other card, this basic setup can still perform some task such as ON/OFF LED and controlling buzzer. Following steps show the installation of this system and method to operate it.

- a. 1st step should be configuring card address; however, since this is the minimum system, no configuration on card address is necessary.
- b. 2nd step is to stack both these cards. Power card (IFC-PC00) should be at the bottom, while Computer Interface card (IFC-CI00) at the top or 2nd layer as shown in following figure.

Ensure the arrow points to the same direction.

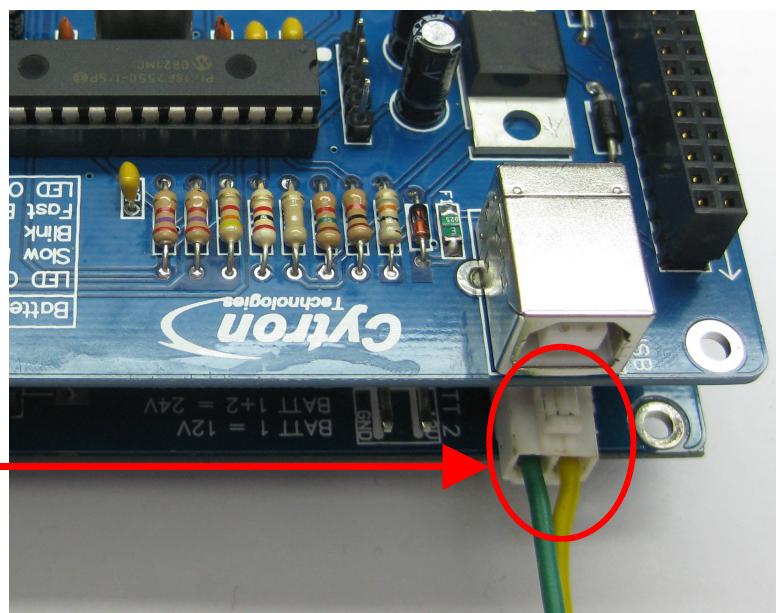


Ensure the orientation marking at the same side.

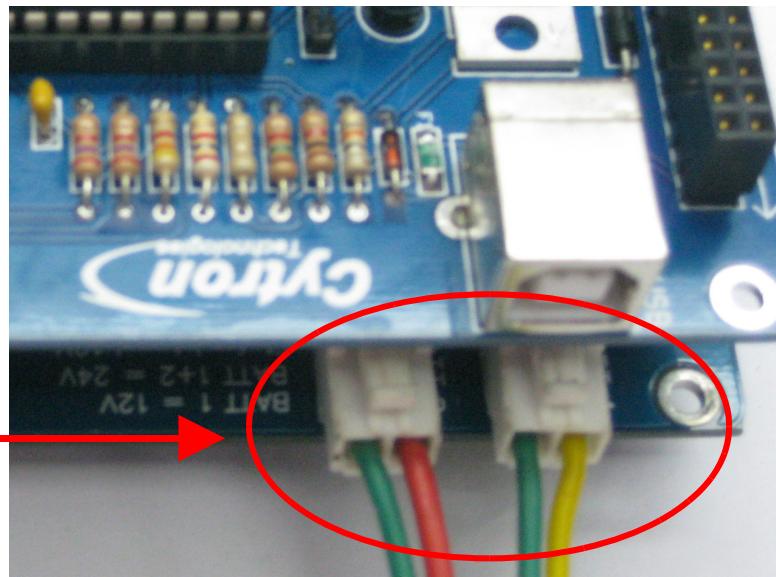


- c. Connect the battery to Power card as shown; please ensure the **polarity is correct**.

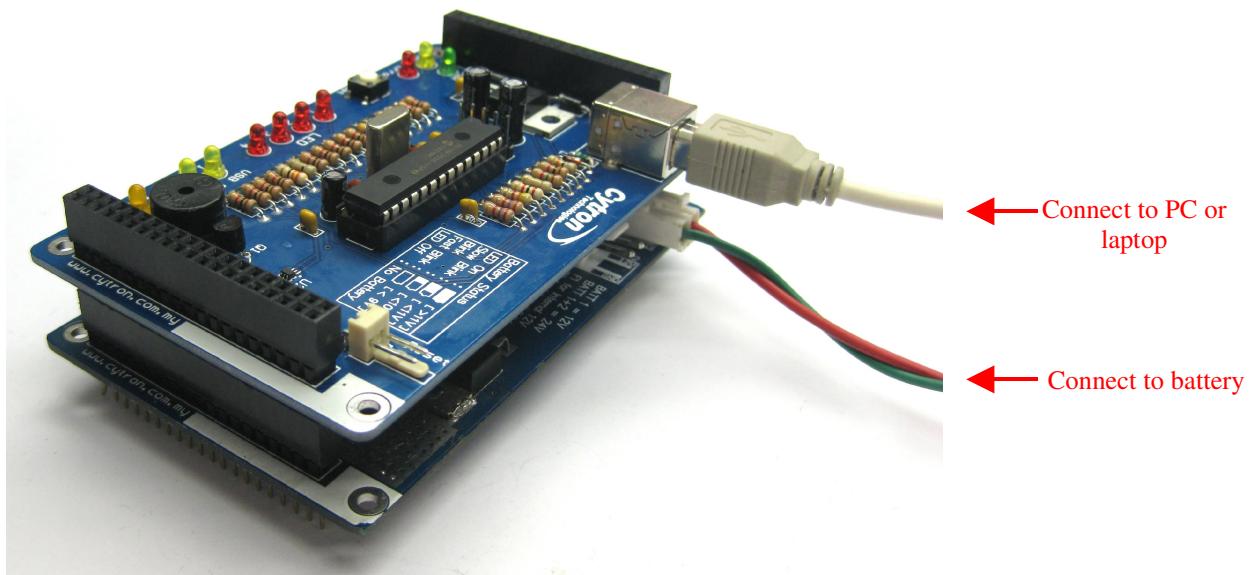
Connect 1 x 12V battery to supply operating voltage to IFC. Ensure the polarity is correct.



If 24V is needed in the system, connect 2 x 12V batteries to PC00.
Ensure the polarity is correct.



- d. Connect USB cable (B type) to IFC-CI00 USB socket as shown in following figure, another end (A type) to PC/laptop.

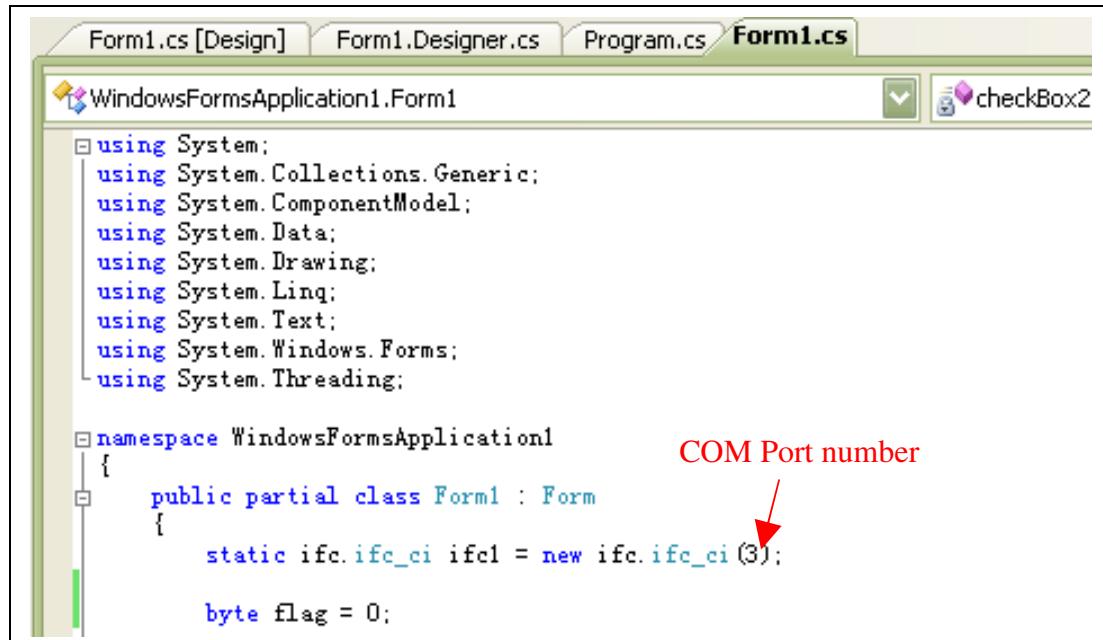


- e. Turn on the IFC power by pushing the toggle switch to “ON”. There should be at least 2 LED (PWR LED on Computer Interface and 12V LED on Power Card) light up.

- f. 3rd step is to create project and write program. IFC comes with comprehensive function to save program development time. Functions library will come with the interfacing card in the form of reference file (*.dll). In order to call these functions, particular reference files must be add under a project.
- g. If users want to create own project, user can follow the step in chapter 6.2. If users want to test provided sample program, users are recommended to copy all sample program folder (IFC-CI00) on desktop.
- h. On user desktop, user should now have a folder called “IFC-CI00”. Go in there and double click “IFC-CI00 Sample” folder then “IFC-CI00” folder, user should get csproj file as shown as below. Click the IFC-CI00.csproj icon.



- i. Before run the program, please refer chapter 5.0 to make sure your IFC-CI00 driver is installed and determine the COM port number at device manager. User may modify the COM port number if needed in Form1.cs file as shown as below.



```

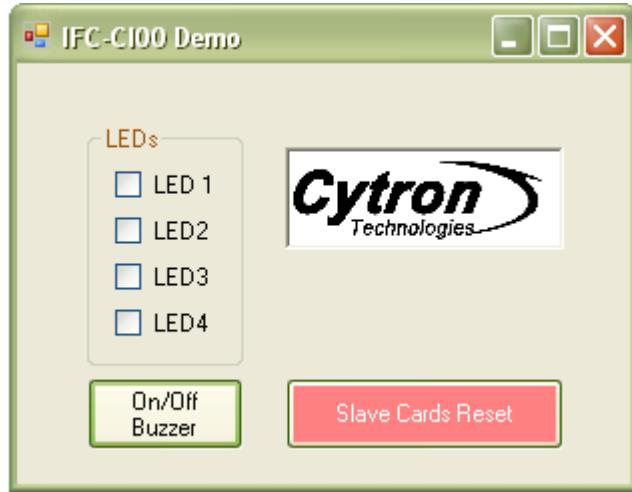
Form1.cs [Design] Form1.Designer.cs Program.cs Form1.cs
WindowsFormsApplication1.Form1
checkBox2

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

namespace WindowsFormsApplication1
{
    public partial class Form1 : Form
    {
        static ifc.ifc_ci ifc1 = new ifc.ifc_ci(3); // COM Port number
        byte flag = 0;
    }
}

```

- j. Run program with press F5 key on keyboard or click the Run Program icon . The program should appear on the screen in a few moments. Test the sample program to play with IFC-CI00.

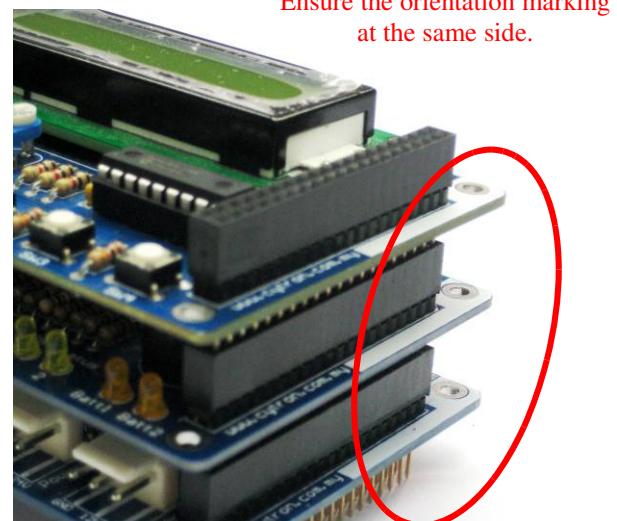
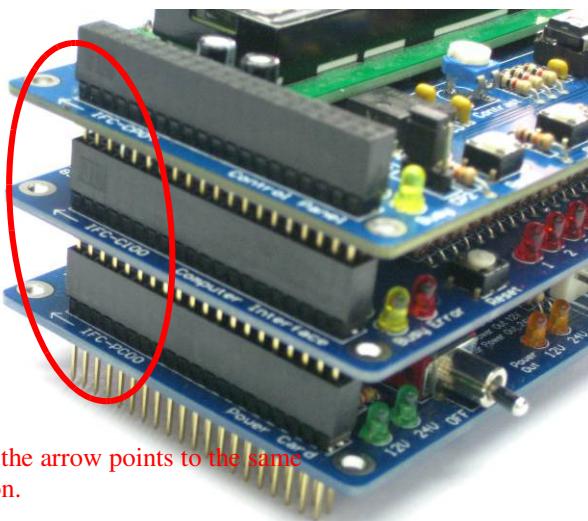


- k. If it has error occurred when running, click the Stop Program icon  to stop it. User should unplug the USB plug, plug it in again and run the program by clicking Run Program icon .
- l. When Slave Cards Reset is pressed, only all the slave cards will be reset. IFC-CI00 is never reset unless user switches off the power or unplug from USB port.
- m. User is free to modify the sample program to play with the IFC-CI00. After modifying the sample program, users need to run program once again.
- n. To remove a card from IFC system, the power should be switched OFF first.
- o. Please use proper tool to remove the card. User may refer last section in chapter 5.0 Installation (hardware) for the method to open card with provided IFC card opener.

7.2 Basic Setup with Control Panel (IFC-PC00 + IFC-CI00 + IFC-CP04)

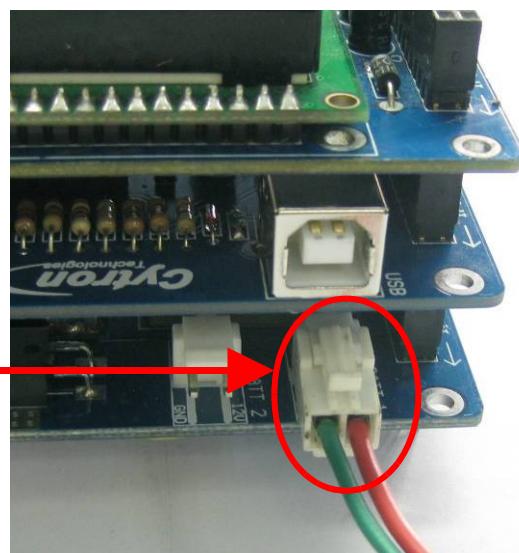
Adding a control panel card (IFC-CP04) which comes with a 2 x16 character LCD and 4 programmable push buttons will offer more interesting demonstration. Following steps show the installation of this system and method to operate it.

- a. 1st step, configure the address of card. Control Panel has a mini jumper to configure address.
- b. 2nd step is to stack all three cards together. Power card (IFC-PC00) should be at the bottom, while Computer Interface card (IFC-CI00) at 2nd layer and Control Panel (IFC-CP04) at top layer as shown in following figure.

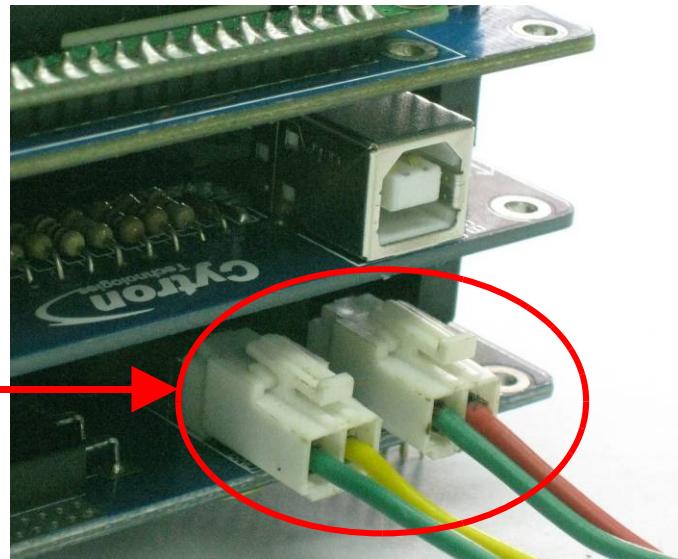


- c. Connect the battery to Power card as shown; please ensure the **polarity is correct**.

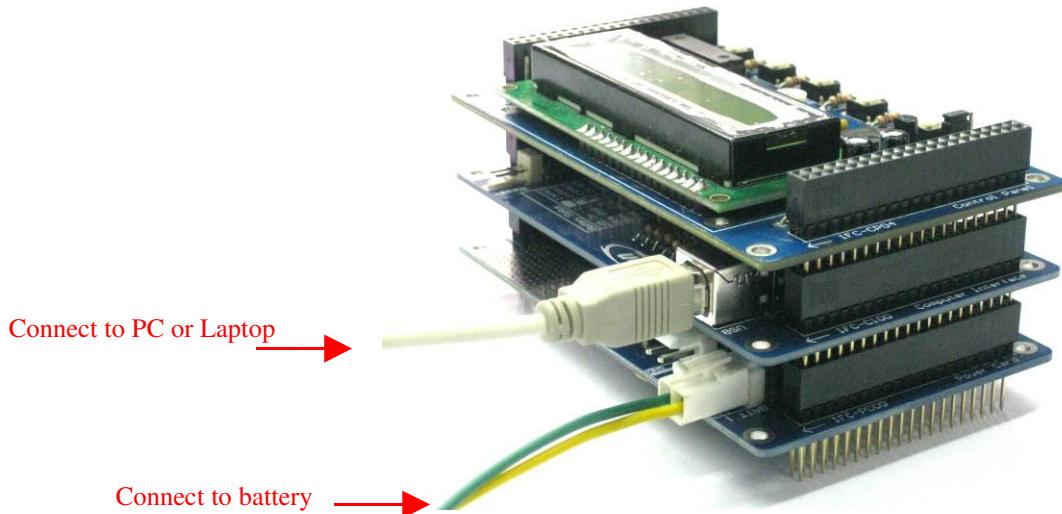
Connect 1 x 12V battery to supply operating voltage to IFC. Ensure the polarity is correct.



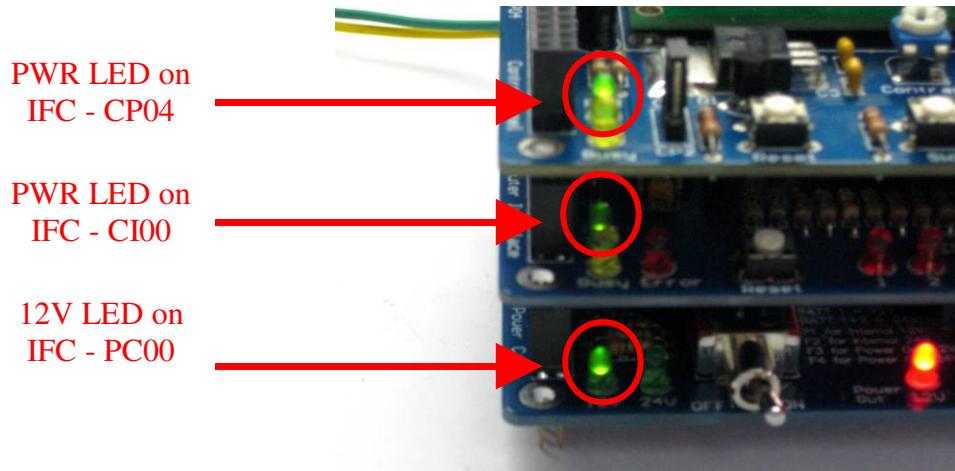
If 24V is needed in the system, connect 2 x 12V batteries to PC00. Ensure the polarity is correct.



- d. Connect USB cable (B type) to IFC-CI00 USB socket as shown in following figure, another end (A type) to PC/laptop.



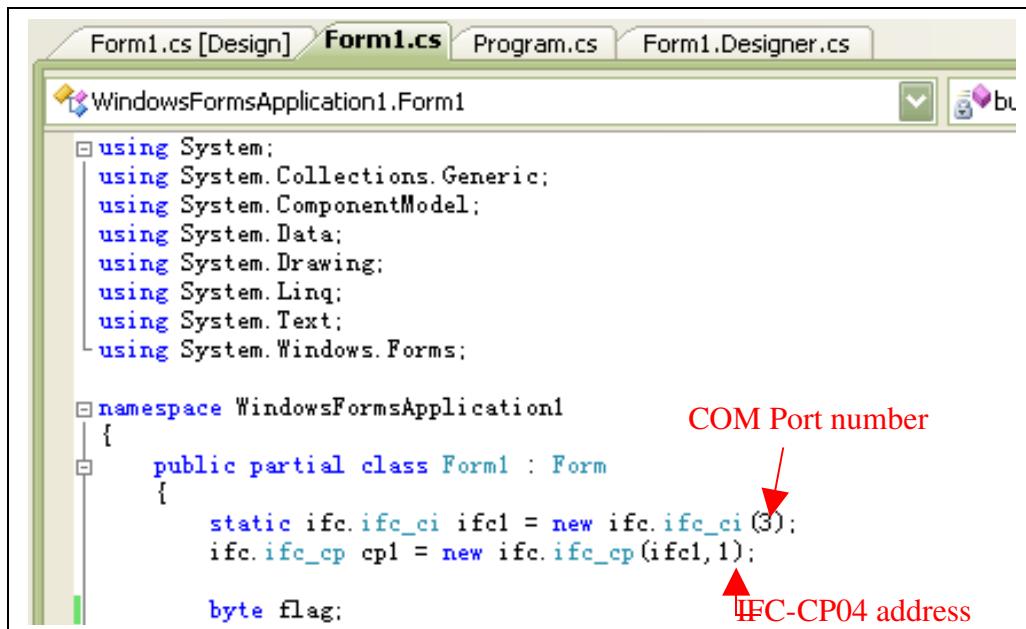
- e. Turn ON the IFC power by pushing the toggle switch to “ON”. There should be at least 3 LED (12V LED on Power Card, PWR LED on Computer Interface card and PWR LED on Control Panel) light up as show.



- f. 3rd step is to create graphical user interface and write program. IFC comes with comprehensive function to save program development time. Functions library will come with the interfacing card in the form of reference file (*.dll). In order to call these functions, particular reference files must be included under a project.
- g. If users want to create own project, user can follow the step in chapter 6.2. If users want to test provided sample program, users are recommended to copy whole “IFC-CI00” folder on desktop if you have not done it.
- h. On user desktop, user should now have a folder called “IFC-CI00” now. Go in there and double click “IFC-CI00 Demo with IFC-CP04” folder then “IFC-CI00 Demo with IFC-CP04” folder again, user should get csproj file as shown as below. Click the IFC-CI00 Demo with IFC-CP04.csproj icon.



- i. Before run the program, please refer chapter 5.0 to make sure your IFC-CI00 driver is installed and determine the COM port number at device manager. User may modify the COM port number if needed in Form1.cs file as shown as below.



```

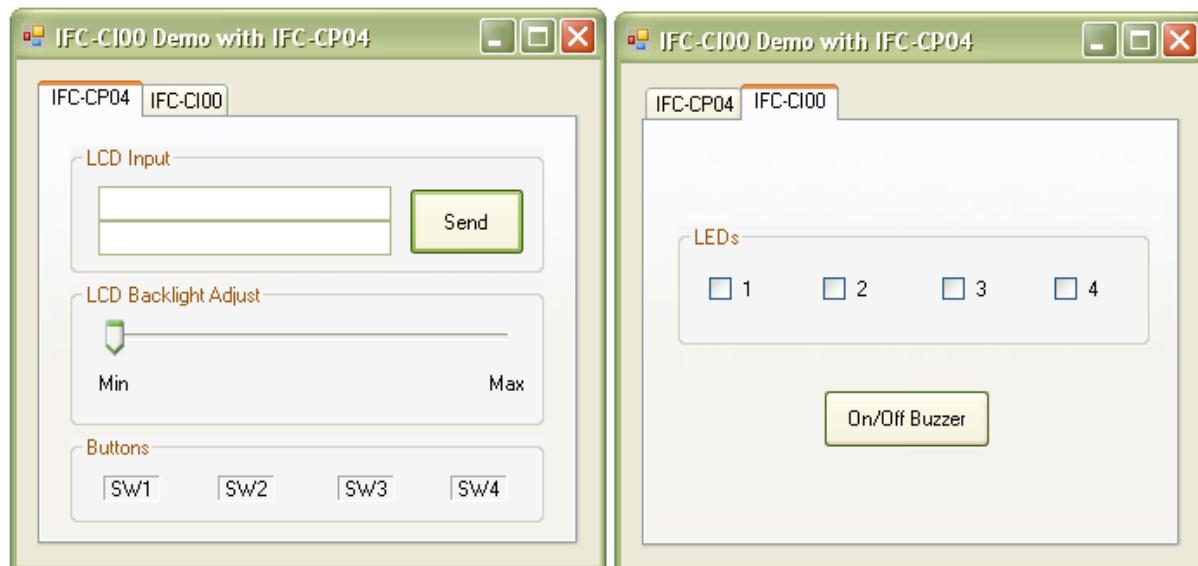
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Windows.Forms;

namespace WindowsFormsApplication1
{
    public partial class Form1 : Form
    {
        static ifc.ifc_ci ifc1 = new ifc.ifc_ci(3);
        ifc.ifc_cp cp1 = new ifc.ifc_cp(ifc1,1);

        byte flag;
    }
}

```

- j. Run program with press F5 key on keyboard or click the Run Program icon . The program should appear on the screen in a few moments. Try to play with the panel like keying the characters then click send and scroll the slide bar the adjust the LCD backlight. Try to press the buttons on IFC-CP04 and the corresponding buttons will become red color on the panel.



- k. If it has error occurred when running click the Stop Program icon  to stop it. User should unplug the USB plug, plug it in again and run the program by clicking Run Program icon . Make sure the address for IFC-CP04 is switched to CP1.
- l. IFC-CI00 is never reset unless user switches off the power or unplug from USB port.
- m. User is free to modify the sample program to play with the IFC-CI00. After modifying the sample program, users need to run program once again.
- n. To remove a card from IFC system, the power should be switched OFF.
- o. Please use proper tool to remove the card. User may refer last section in chapter 5.0 Installation (hardware) for the method to open card with provided IFC card opener.

Note 1: User can refer to IFC-CP04 Card Library Functions for the program function list. It will help user in writing program for IFC-CP04 with IFC-CI00.

7.3 Setup for IFC System

More than one IFC-CI00 can be plugged to a computer and USB hub can be used to expand your USB port if needed. Please do remind that each IFC slave card MUST has a UNIQUE address in every system (except IFC-CP04) but the address can be repeated or same for other slave card which placed in another system. It is NOT allow more than one IFC-CI00 card in a system. The following listing shows an example to declare IFC system and slave cards' address. Please refer the figures in chapter 1.1 for a clearly view. Please do make sure that all slave cards' dll file has been added to References before run your program (refer to chapter 6.2 No.6).

```

public partial class Form1 : Form
{
    static ifc.ifc_ci ifc1 = new ifc.ifc_ci(3); //IFC-CI00 for system 1
    static ifc.ifc_ci ifc2 = new ifc.ifc_ci(4); //IFC-CI00 for system 2
    static ifc.ifc_ci ifc3 = new ifc.ifc_ci(5); //IFC-CI00 for system 3

    //system 1
    ifc.ifc_cp cp1 = new ifc.ifc_cp(ifc1, 1);
    ifc.ifc_cp cp2 = new ifc.ifc_cp(ifc1, 2);
    ifc.ifc_oc oc1 = new ifc.ifc_oc(ifc1, 0);
    ifc.ifc_oc oc2 = new ifc.ifc_oc(ifc1, 1);
    ifc.ifc_di di1 = new ifc.ifc_di(ifc1, 2);

    //system 2
    ifc.ifc_cp cp3 = new ifc.ifc_cp(ifc2, 1);
    ifc.ifc_ps ps1 = new ifc.ifc_ps(ifc2, 0);
    ifc.ifc_md md1 = new ifc.ifc_md(ifc2, 1);
    ifc.ifc_di di2 = new ifc.ifc_di(ifc2, 2);
    ifc.ifc_bh bh1 = new ifc.ifc_bh(ifc2, 3);
    ifc.ifc_bh bh2 = new ifc.ifc_bh(ifc3, 4);

    //system 3
    ifc.ifc_cp cp4 = new ifc.ifc_cp(ifc3, 1);
    ifc.ifc_bh bh3 = new ifc.ifc_bh(ifc3, 0);
    ifc.ifc_bh bh4 = new ifc.ifc_bh(ifc3, 1);
    ifc.ifc_bl bl1 = new ifc.ifc_bl(ifc3, 2);
    ifc.ifc_bl bl2 = new ifc.ifc_bl(ifc3, 3);
    ifc.ifc_oc oc3 = new ifc.ifc_oc(ifc3, 4);
  
```

Depend on your COM port number

Address for slave card

8. WARRANTY

- Product warranty is valid for 6 months.
- Warranty only applies to manufacturing defect.
- Damage caused by misuse is not covered under warranty.
- Warranty does not cover freight cost for both ways.

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