

Quick Start Guide



PC-Bot 914

Disclaimer

Working with electronics and installing the plastics will require care and patience. **PROPER GROUNDING PROCEDURES** before handling the electronics. Touching the robot chassis (which is common grounded throughout) and at the same time touching something that is grounded in your home/office like metal pipes or the kitchen tap.

It is also expected that, working in a small area inside the unit that you perform careful and safe handling of the hardware so as not to cause short circuits. We ask that you make sure you give yourself enough working area and time for installation so as not to damage either the plastics or the electronics.

Liability

In no event will White Box Robotics, Inc. or Frontline Robotics, Inc. be liable for any damage, including loss of data or profits, cost of cover, or other incidental, consequential or indirect damages arising from the installation maintenance, use, performance, failure or interruption of White Box Robotics, Inc. or Frontline Robotics Inc. products, whatever the cause and on any theory of liability. This limitation applies even if White Box Robotics, Inc. or Frontline Robotics Inc. has been advised of the possibility of such damage.

Unpacking the Robot

The following image shows how the PC-BOT should have arrived in the shipping box.



STEP 1 – Un-packing the robot

Remove the peripheral equipment wrapped in bubble wrap.



STEP 2 – Un-packing the robot cont.

Carefully remove the side and front/back supporting foam.



STEP 3 - Un-packing the robot cont.

Reach into the box and grab the handles on the PC-BOT. They are somewhat hidden from above. Lift the robot straight up and out of the box.

WARNING! This robot is heavy. People with back problems should not attempt to lift this robot. Always use proper lifting technique when lifting heavy items. Keep you knees bent and your back straight and lift gently.



The following image shows where the handles are located, you'll have to feel for them when the robot is in the box. There are two handles front and back.



Setting-up the robot

STEP 1 – Charging the robot batteries

Now that the robot is out of the box, you should plug the charger in to charge the batteries. The charger connector is found behind the left rear vent door on the back of the robot.



Flip the door open as shown in the above picture.

Unpack the charger and plug the charger jack into the lower connector on the robot labeled “Charger”.



The charger LED will first be GREEN after the AC cord is plugged into the wall. It will then change to ORANGE when it is charging the batteries on the PC-BOT. It will then switch back to GREEN when the batteries are fully charged (it typically takes 2 -2.5 hours to charge the batteries from the auto-shutoff point).



Charging and shutdown

If the battery level goes below **11.2V** the robot will auto-shutdown. Either while you are running the robot, and especially when you are finished with it for the day, **PLEASE REMEMBER TO RE-CHARGE THE BATTERIES.**

STEP 2 – Removing the head panel

The head and front/back torso body panels are attached with ball studs and sockets. This allows for easy removal of the panels without tools. Gently remove the head by grabbing under the separation (between the head and torso plastics) and pulling straight up.

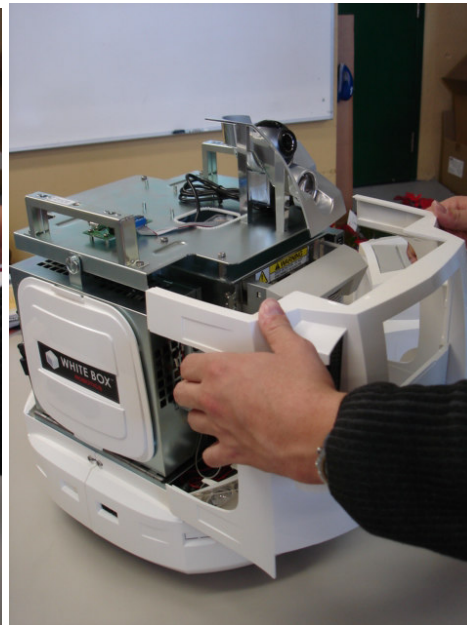


STEP 3 – Removing the body panels

The torso body panels are removed in the same way as shown, except pulled backwards or forwards depending on the torso body panel. You can use your thumbs to lever while pulling on the body panels with your finger tips.



Both body panels are removed in the same way.



STEP 4 – Plug in the monitor, keyboard and mouse

When viewing the back of the robot, you will see the External Power Supply jack (power supply not included) and Charger jack on the left side, and on the right side the back panel of the Mini-ITX.



Plug the monitor, keyboard and mouse into the Mini-ITX back panel in order to setup your robot, like the network etc.



STEP 5 – Start your system



Switch on the Main Power switch (RED) AND M3 Power switch (GREEN) on the front of the robot. **WAIT 5 seconds** and the M2-ATX Power Supply will cycle the power to the PC automatically.

The M3 Power switch is used to turn on the M3 Controller. If this switch is OFF, the M3 will not be able to drive the motors or read the sensors.

When the battery voltage drops to **11.2V** (i.e. when the batteries need recharging, the M2-ATX will cycle the power to the PC again to auto-shutdown before the power is cut (45 seconds later) and the batteries are protected from total discharge.

This is the same as the user pushing the PC ON switch on the CPU and shutting down the computer.



On the other side of the front of the robot, you can still use the PC ON and PC Reset switch just like on a regular computer.



NOTE: If the robot is sitting on a desk, it might be advisable to turn the M3 Switch OFF so that the robot cannot drive off the table.



STEP 6 – Connecting Peripheral Devices

You should connect the Wireless device to the USB board mounted on the head if this is not already done.



In this location the head can still be placed back on the robot and not interfere with the Wireless USB Network Adapter or its antennae.

Reference Documents and Links

White Box Robotics Webpage: <http://www.whiteboxrobotics.com/>

The Official Enthusiast Site for the 914 PC-BOT: <http://www.914pcbots.com/community/>

Support Documents – (Quick Start Guides, Basic Unit Computer Installation, Plastics Assembly, etc.)
<http://www.whiteboxrobotics.com/2006/PCBOTs/support.html>

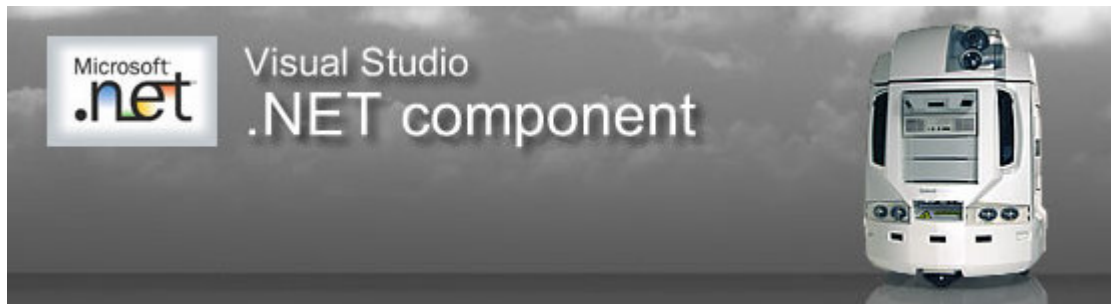
Technical Specifications

Wiring and Power: http://www.whiteboxrobotics.com/2006/PCBOTs/pdf/PC-Bot_Tech_Spec-WiringPowerv1.1.pdf

I/O Board Block Diagram: http://www.whiteboxrobotics.com/2006/PCBOTs/pdf/PC-Bot_Tech_Spec-IOBoardBlockDiagramv1.1.pdf

Infra-red Sensors: http://www.whiteboxrobotics.com/2006/PCBOTs/pdf/PC-Bot_Tech_Spec-Infra-redSensorsv1.1.pdf

PC-BOT Software Section

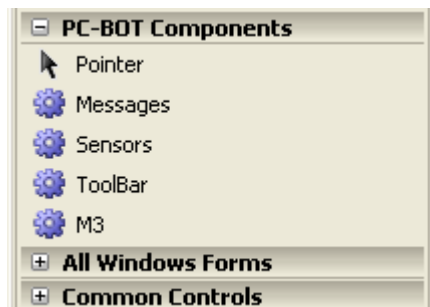


Disclaimer:

This handbook is intended to introduce the basics of using Visual Studio Express as development software for the White Box Robotics 914 PC-BOT and is not meant to replace the actual Visual Studio manuals. You will still need to go through the tutorials and read the documentation listed on the Microsoft Visual Studio Express webpage: <http://msdn.microsoft.com/vstudio/express/>

Introduction

There are five PC-BOT components for Visual Studio 2005. Drive, Messages, Sensors, M3, and ToolBar.

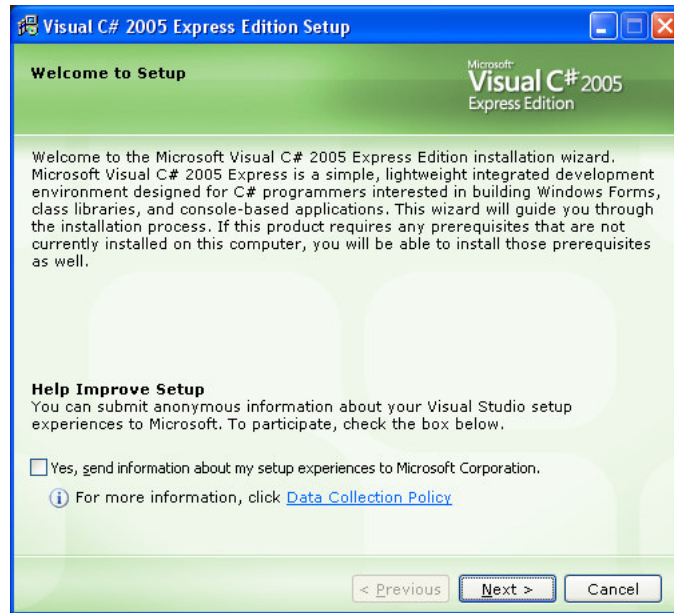


A Visual Studio Developer can drag and drop these components in to any Windows forms project. The developer may write their code in any of the .NET supported languages (Visual Basic, C#, J#, C++)

Step 1

Download and install Visual Studio Express (its free) from the Microsoft website:
<http://msdn.microsoft.com/vstudio/express/>

Click the 'Download' button and choose the tool you wish to create your projects under. The sample software was created under C# so this is what the guide will use.

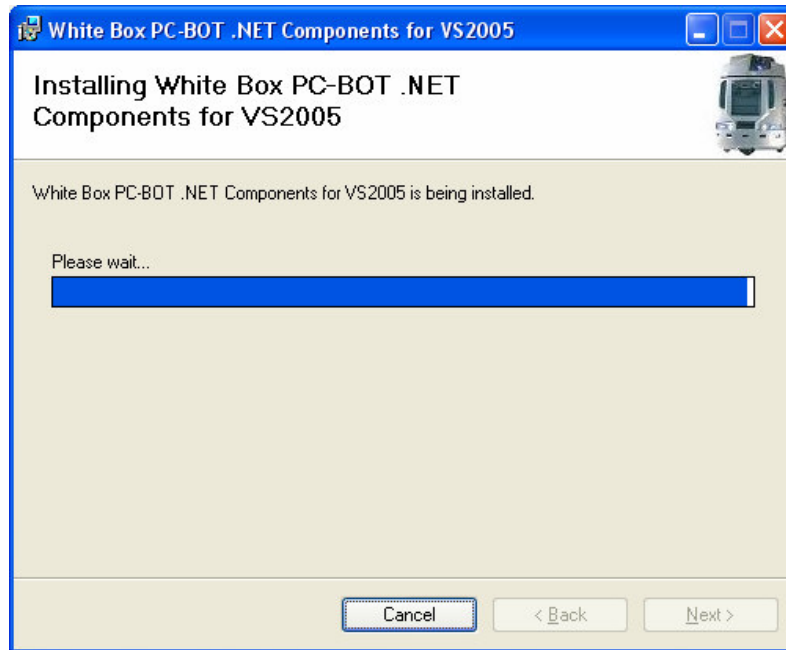


Step 2

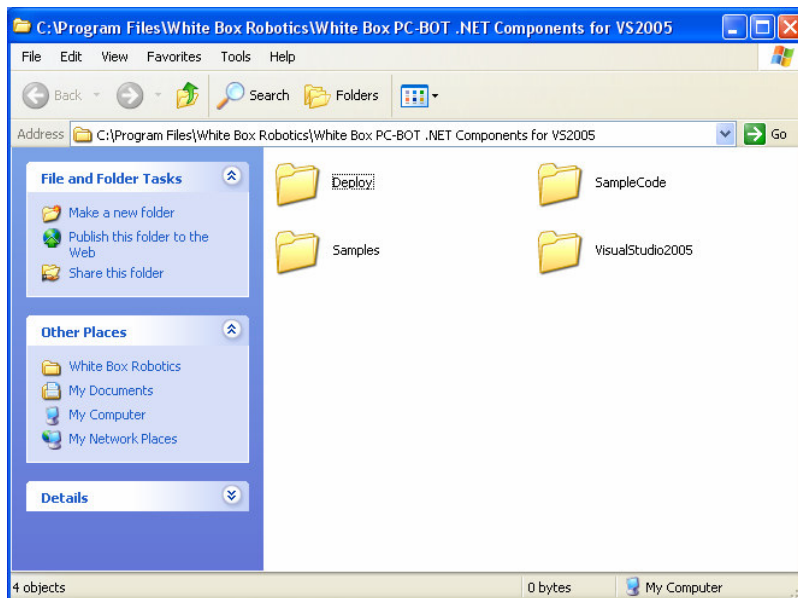
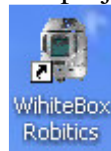
Download and install the 'Additional components' listed further down the webpage for the tool you selected.

Step 3

Unless it is already installed, download and install the PC-BOT dotNET Setup.msi package from the White Box Robotics webpage.



When the installation is finished you will find a desktop icon and Start – Programs group has been created. These are shortcuts to the sample software projects that were created in Visual Studio.

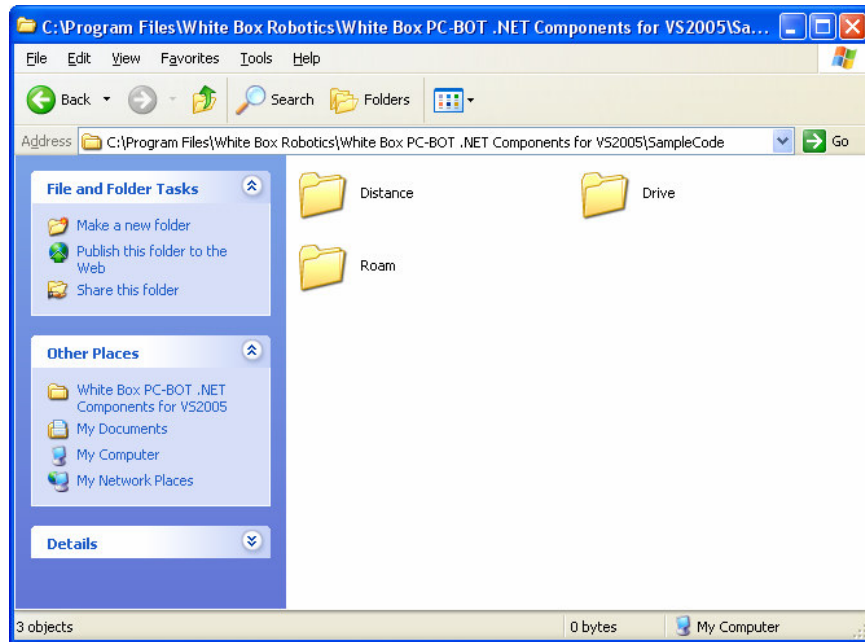


The **SampleCode** folder has the **sample Visual Studio projects**:

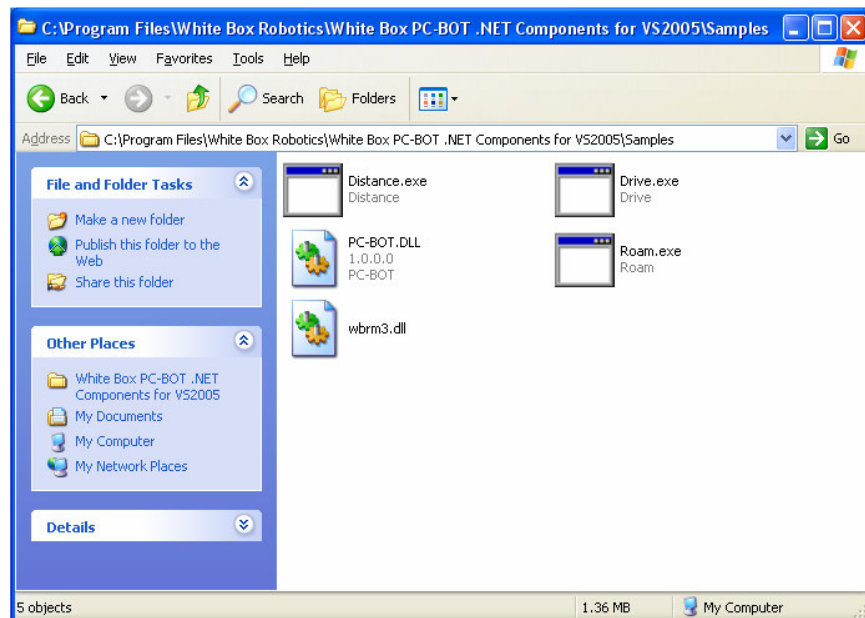
Distance – Used to move the robot set distances and rotate set degrees

Drive – Used to drive the robot by clicking and dragging with the mouse on the robot.

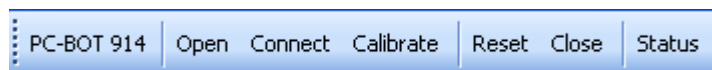
Roam – Used to demonstrate the automatic avoid movement using the IR sensors.



The **Samples** folder has the **.EXE applications** created after building the Visual Studio projects. Just double click to open them.



After running any of the applications, the user must first **‘Open’** the M3 module, then **‘Connect’** to the M3 module BEFORE driving the robot.

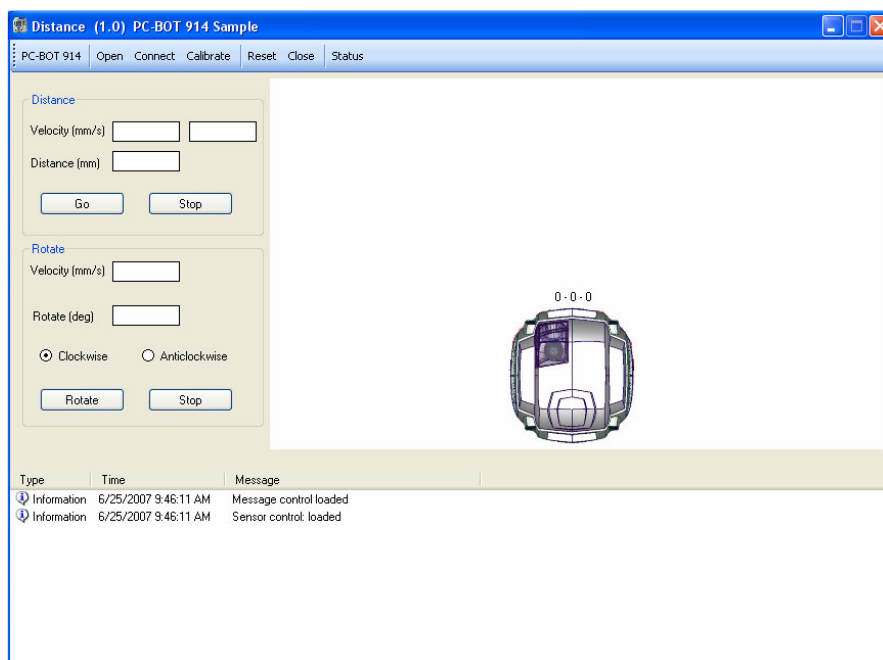


‘Reset’ will reset the counted steps on the motor axis (i.e. reset the virtual encoders), and **‘Close’** will close the M3 module, requiring that **‘Open’** be used again to command the M3.

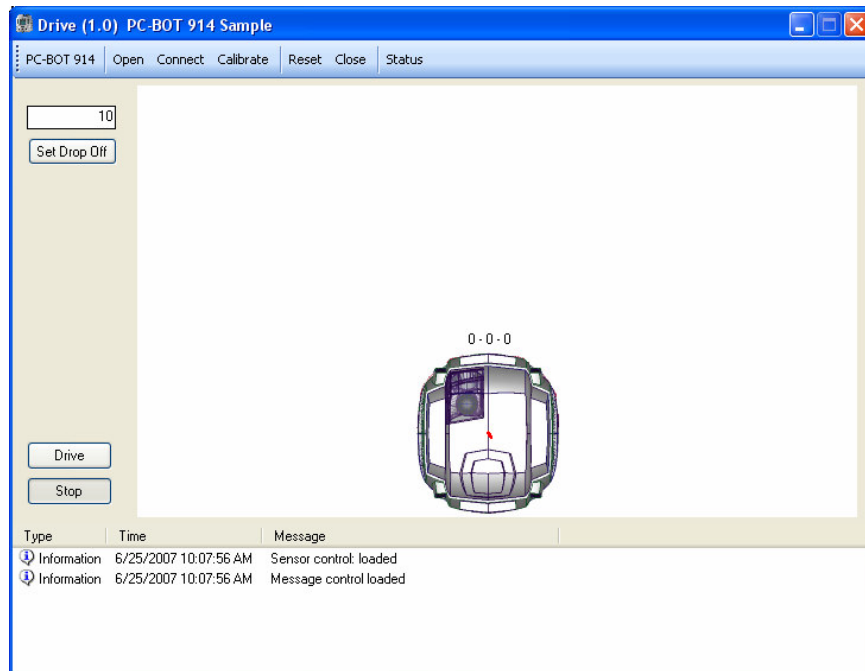
‘Calibrate’ will calibrate the downward looking sensors for the ground type and colour the robot is driving on and help with drop-off detection.

‘Status’ will list the status of the M3 module.

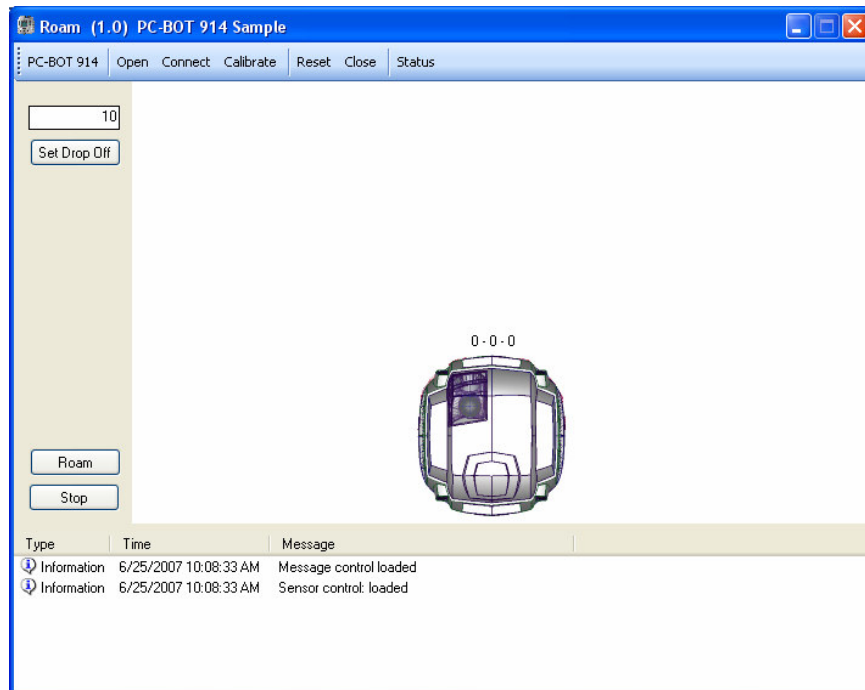
Distance Application



Drive Application

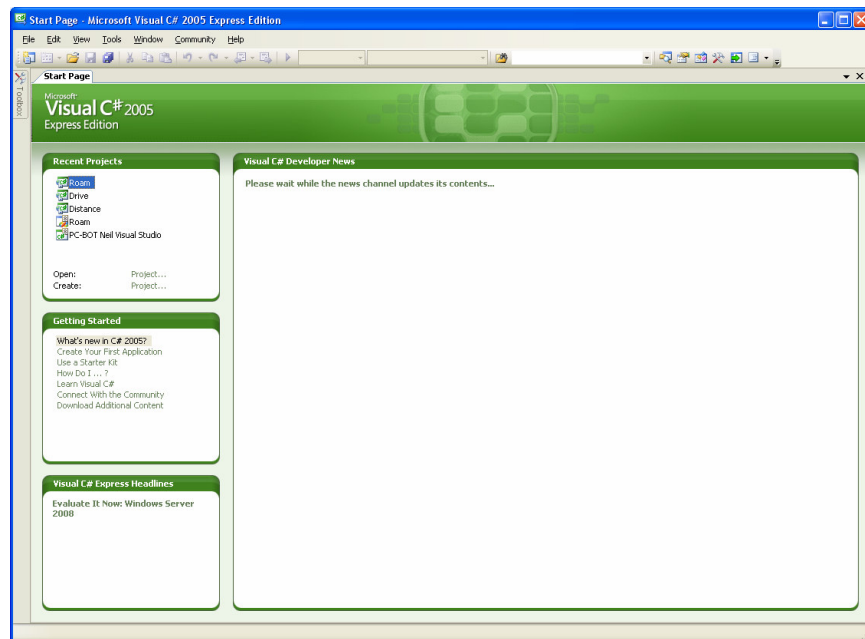


Roam Application



Step 4

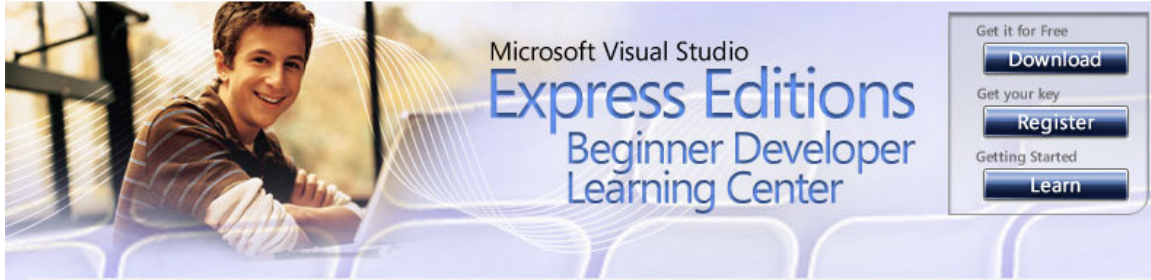
Open the 'Microsoft Visual C# Express Edition' from Start → All Programs.



To learn about developing Visual C# projects/applications there are a few resources you can use to learn. The 'Getting Started' section after opening Visual C# Express Edition has a number of links.

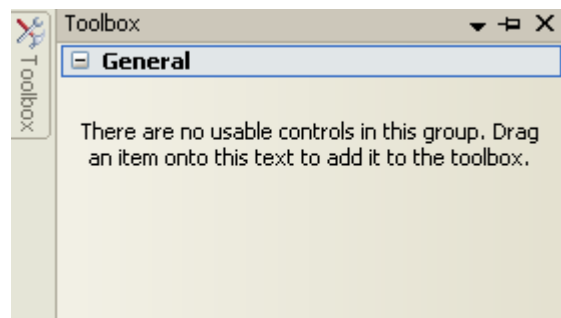


The Microsoft webpage also offers many learning tutorials for Visual Studio, see:
<http://msdn.microsoft.com/vstudio/express/beginner/>



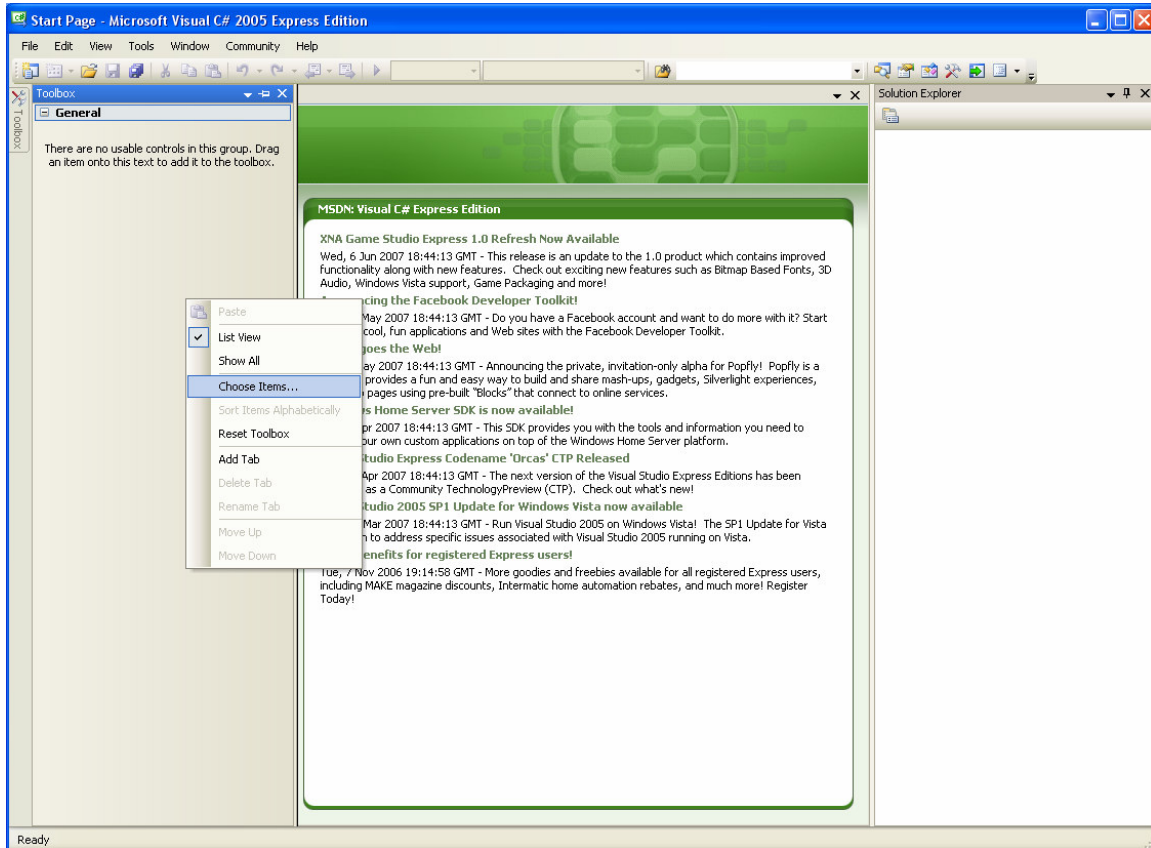
Step 5

Click on the Toolbox tab on the left side of the screen. It will expand but be empty to begin with.



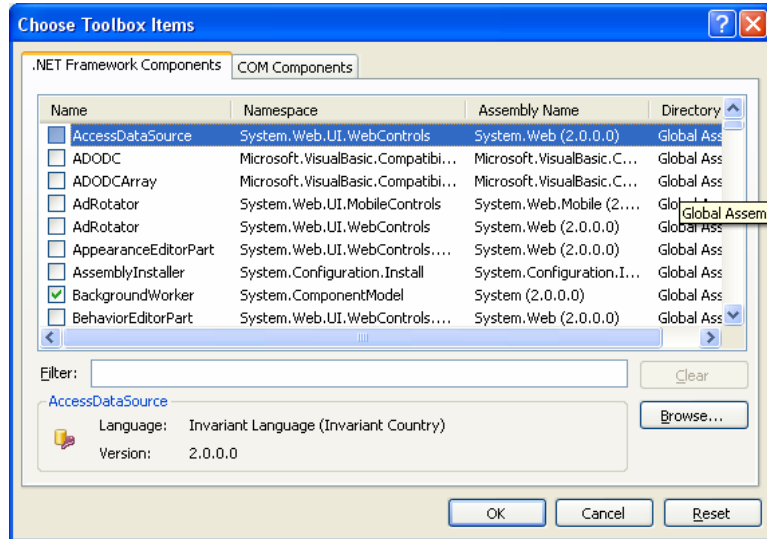
Step 6

Right click on the grey area of toolbox window, opening a menu and select 'Choose Items...'

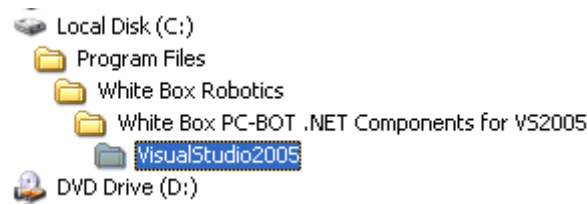


Step 7

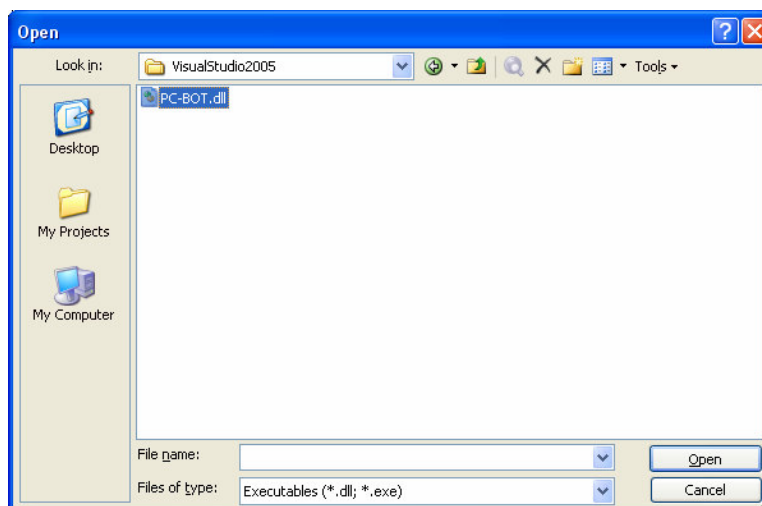
Under the .NET Framework Components tab, click the 'browse' button.



Go to C:\Program Files\White Box Robotics\White Box PC-BOT .NET Components for VS2005\VisualStudio2005\

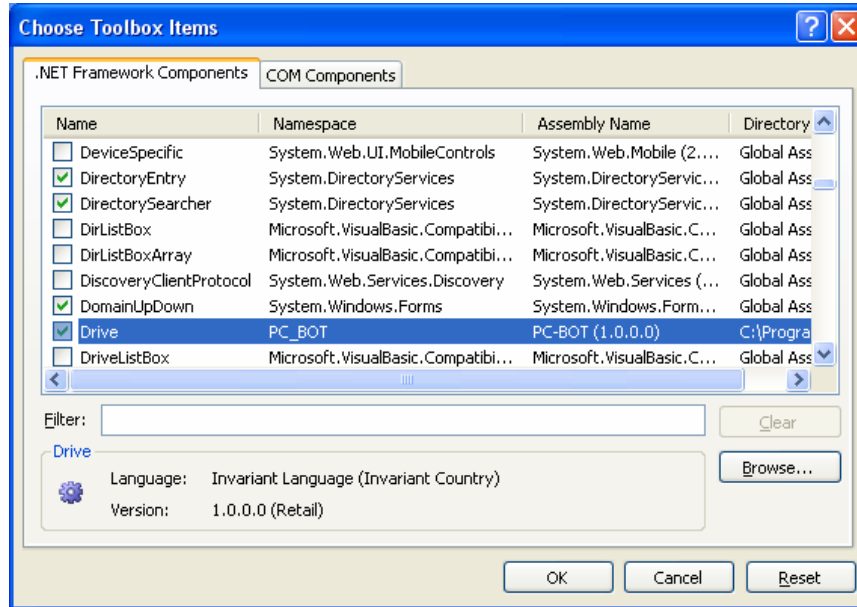


Choose the PC-BOT.dll and click 'Open'.



Step 8

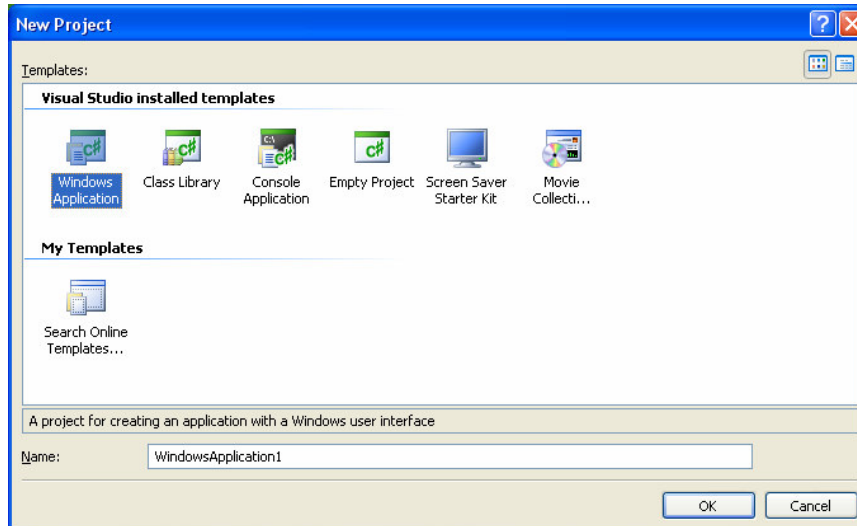
You should see one of the PC-BOT .NET components highlighted after clicking ‘Open’



Click OK as all the PC-BOT components to the Visual Studio Toolbox.

Step 9

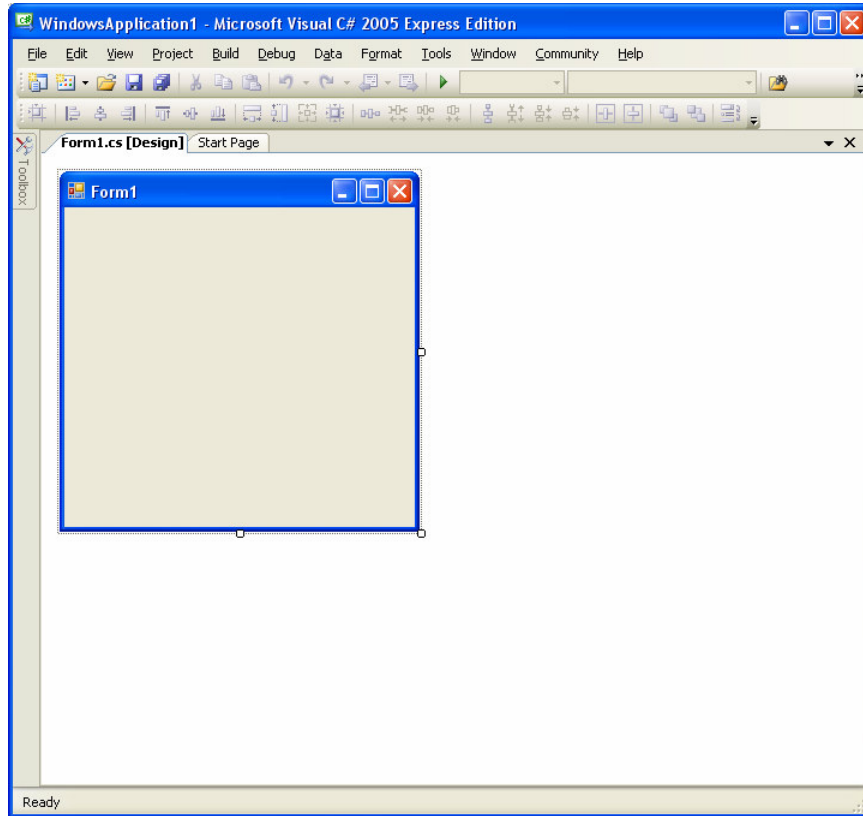
Start a new Visual Studio project. In the menu bar, go to File → New Project.



Choose the ‘Windows Application’ template and click OK.

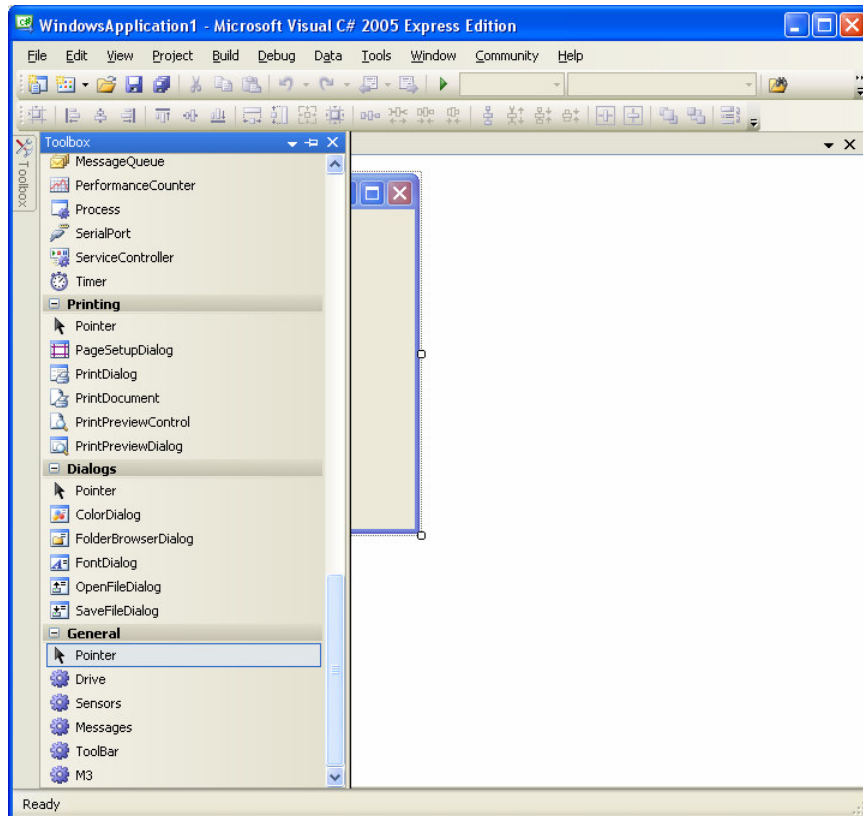
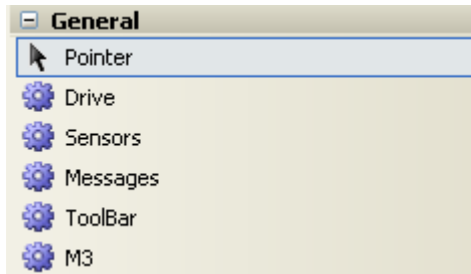
Step 10

You should see the following Windows Application window which will be initially empty.



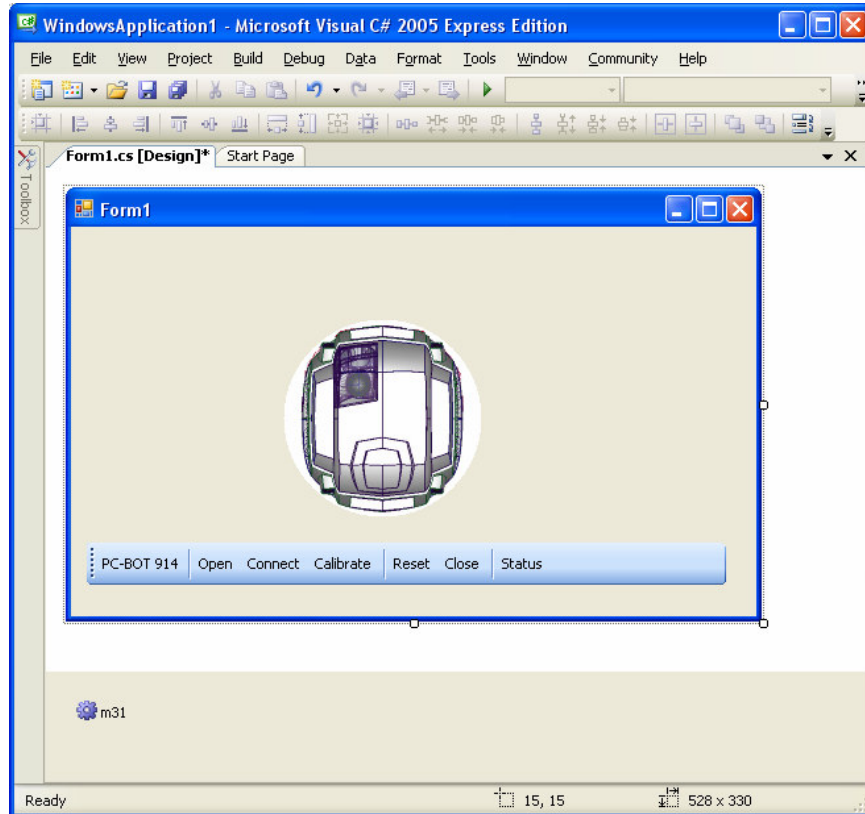
Step 11

Click on the Toolbox tab on the left side of the screen, it should be full of components to build your applications. Scroll to the bottom where you will find the PC-BOT components.



Step 12

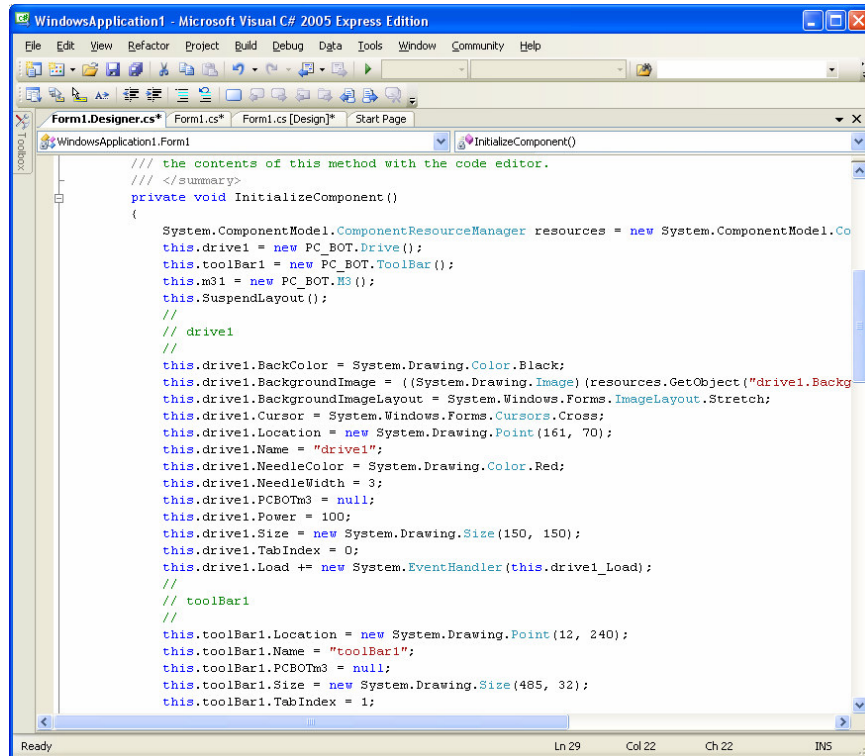
Drag and drop any of the PC-BOT components to the Windows Application Form screen and see what happens. For this example application the 'Drive', 'Toolbar' and 'M3' components were put in the Form.



Step 13

You can select any of the components in the Form page and either double-click on them or right click once and choose 'View code' to see the underlying code. The user will need to go through the tutorials listed before in this guide to understand how this works and how to develop your own code.

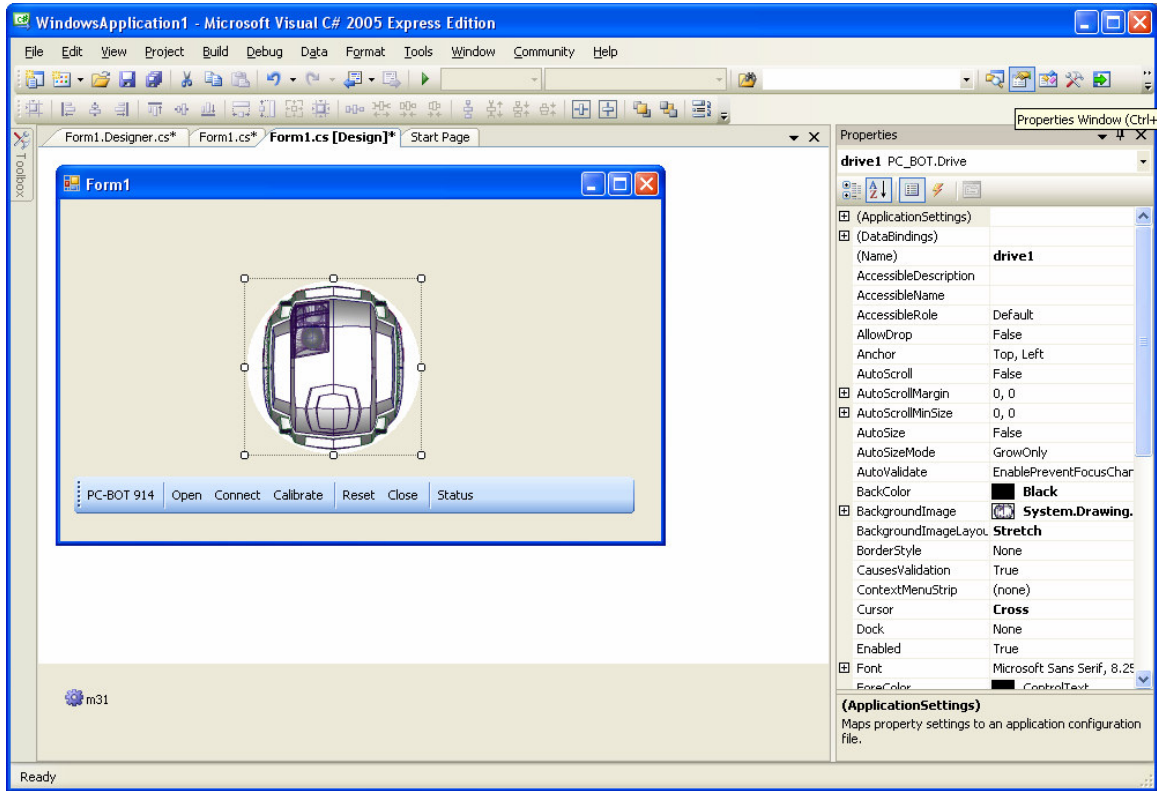
The user should also read the PC-BOT_914_dotNET_v1.0.pdf document found on the White Box Robotics Webpage as a technical guide to the PC-BOT .NET components specifically.



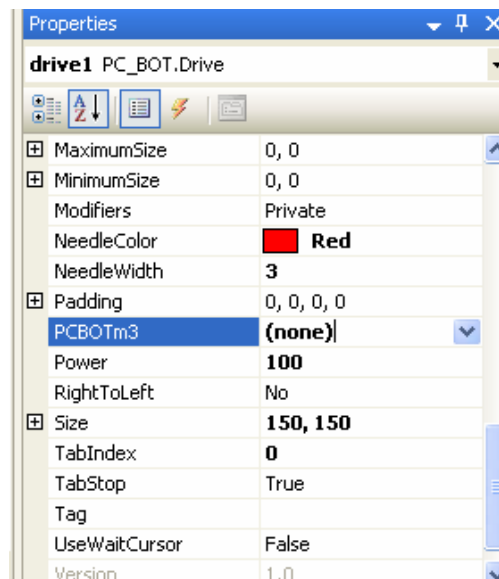
```
WindowsApplication1 - Microsoft Visual C# 2005 Express Edition
File Edit View Refactor Project Build Debug Data Tools Window Community Help
Form1.Designer.cs* Form1.cs* Form1.cs [Design]* Start Page
WindowsApplication1.Form1
InitializeComponent()
/// the contents of this method with the code editor.
/// </summary>
private void InitializeComponent ()
{
    System.ComponentModel.ComponentResourceManager resources = new System.ComponentModel.Co
    this.drive1 = new PC_BOT.Drive ();
    this.toolBar1 = new PC_BOT.ToolBar ();
    this.m31 = new PC_BOT.M3 ();
    this.SuspendLayout ();
    //
    // drive1
    //
    this.drive1.BackColor = System.Drawing.Color.Black;
    this.drive1.BackgroundImage = ((System.Drawing.Image)resources.GetObject("drive1.Backg
    this.drive1.BackgroundImageLayout = System.Windows.Forms.ImageLayout.Stretch;
    this.drive1.Cursor = System.Windows.Forms.Cursors.Cross;
    this.drive1.Location = new System.Drawing.Point(161, 70);
    this.drive1.Name = "drive1";
    this.drive1.NeedleColor = System.Drawing.Color.Red;
    this.drive1.NeedleWidth = 3;
    this.drive1.PCBOTm3 = null;
    this.drive1.Power = 100;
    this.drive1.Size = new System.Drawing.Size(150, 150);
    this.drive1.TabIndex = 0;
    this.drive1.Load += new System.EventHandler(this.drive1_Load);
    //
    // toolBar1
    //
    this.toolBar1.Location = new System.Drawing.Point(12, 240);
    this.toolBar1.Name = "toolBar1";
    this.toolBar1.PCBOTm3 = null;
    this.toolBar1.Size = new System.Drawing.Size(485, 32);
    this.toolBar1.TabIndex = 1;
}
```

Step 14

Click on the 'Form1.cs[Design]*' tab to return to the GUI view of the components. Click on the 'Properties Window' button in the upper right side of the window to display the properties of any of the selected components.



On **EACH** of the components you put in the Form1 windows, you need to connect them to the M3 component. In the 'Properties Window' scroll down until you see "PC-BOTm3". By default it is set to (none).

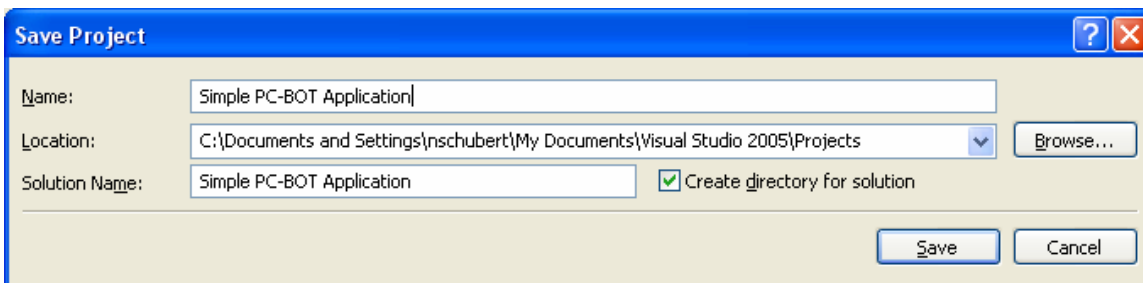


Click on the 'none' and change it to 'm31'.



Step 15

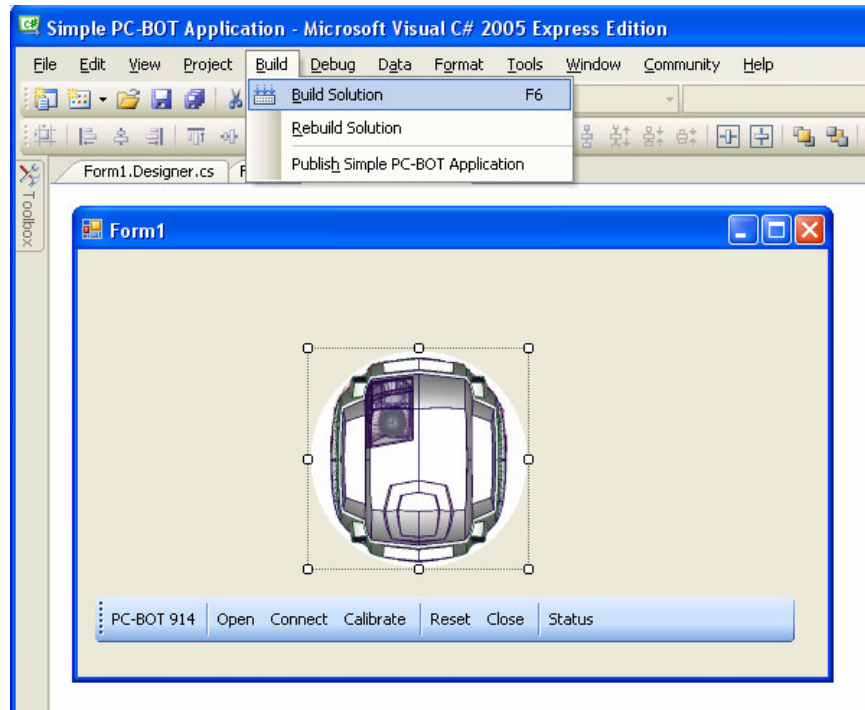
Now let's build the example project. First save the project, go to the menu bar File → Save All. Choose a name for your application such as 'Simple PC-BOT Application'.



Notice where the project will be built and choose a different location if you want. Click Save.

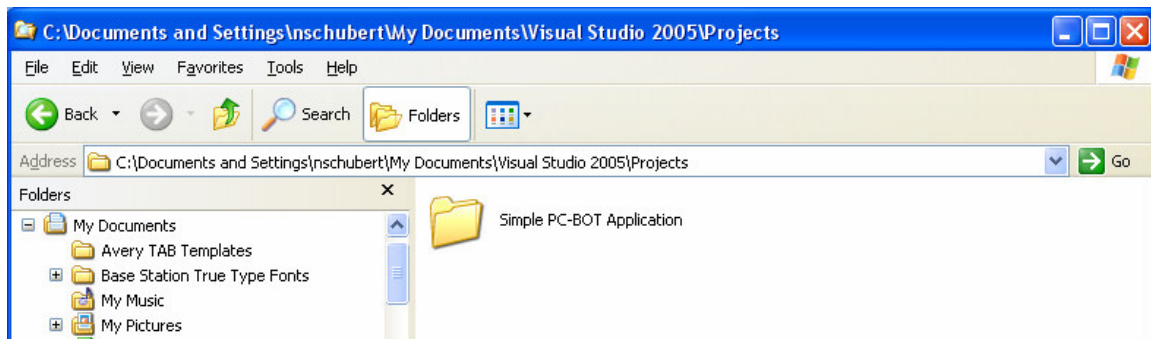
Step 16

In the menu bar of Visual Studio Express, choose Build → Build Solution.

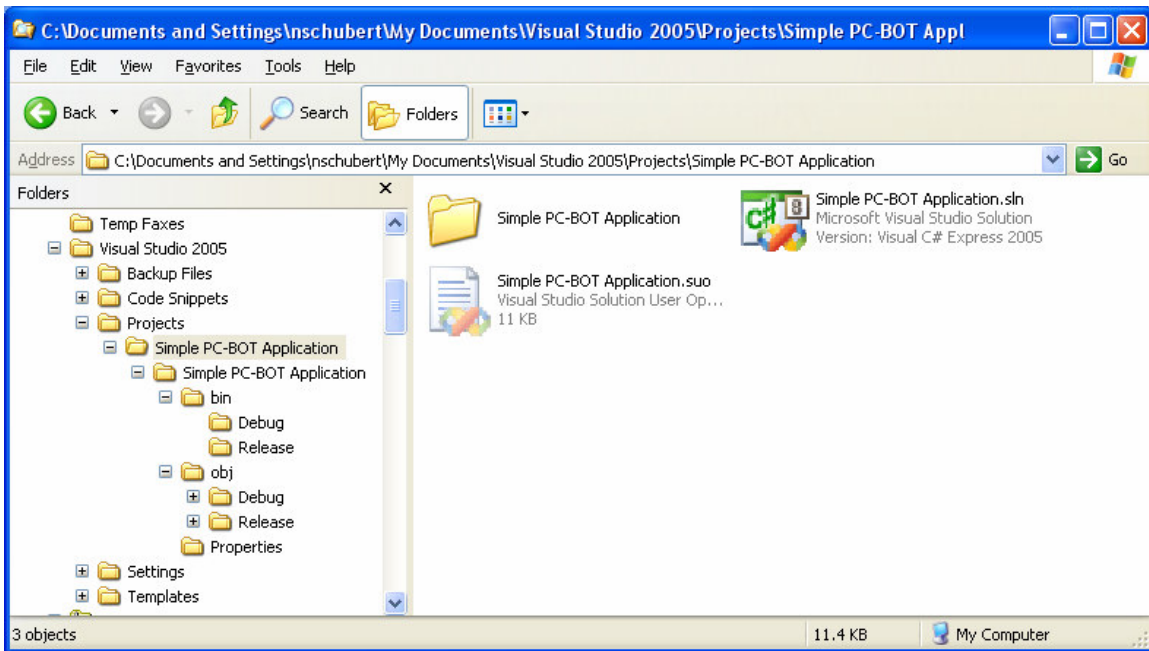


Step 17

Open a folder up and go to the location where you saved the project.

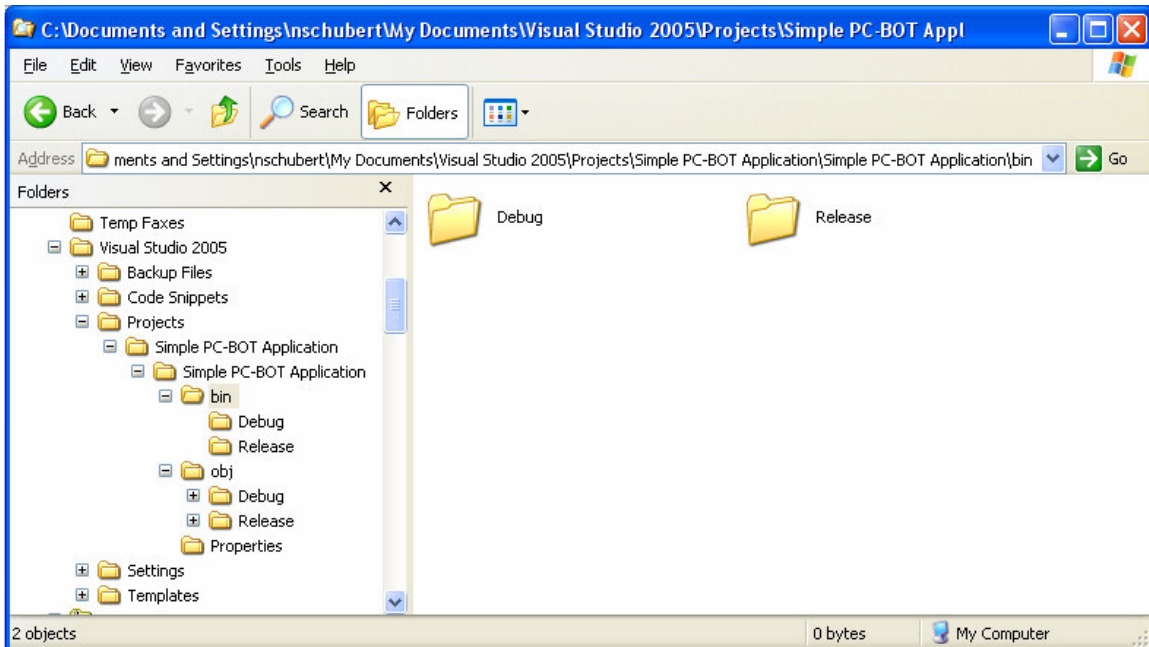


Open the Simple PC-BOT Application folder and see the project files and folders within.



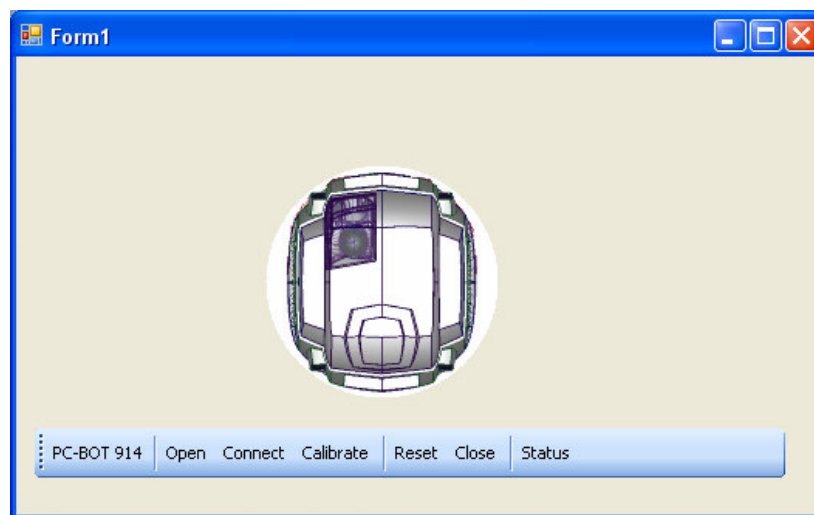
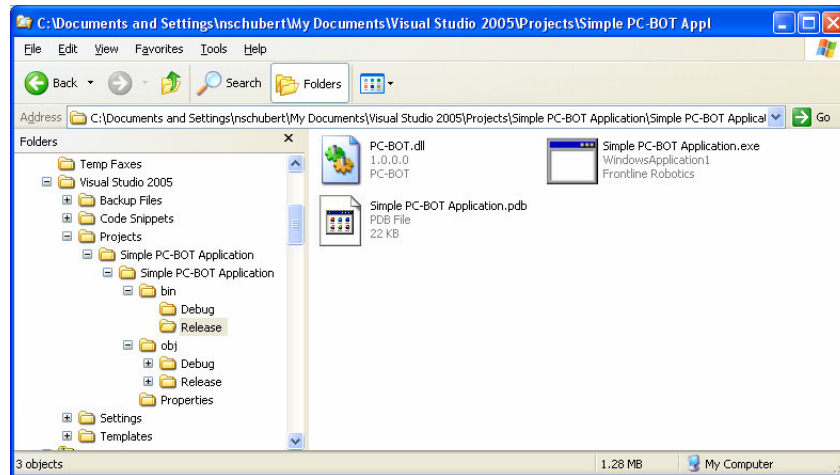
Step 18

Open the next 'Simple PC-BOT Application' folder and then the 'bin' folder. You will see a Debug and Release folder.

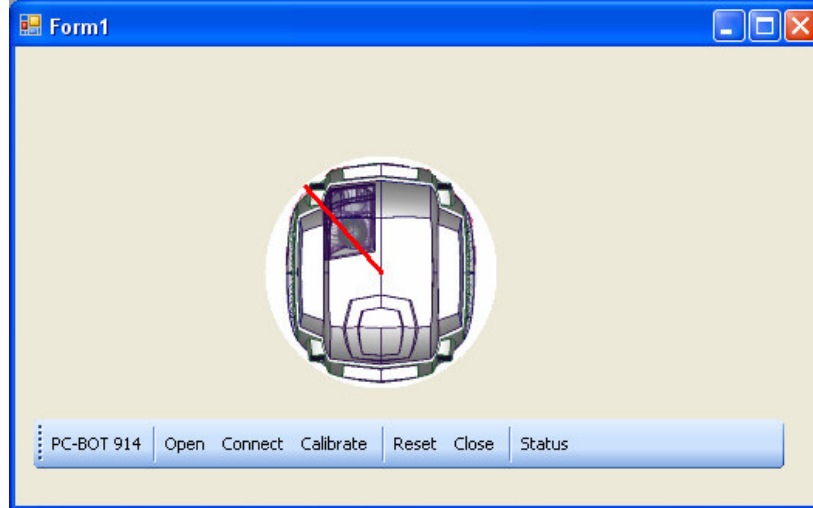


Step 19

Open the 'Release' folder and you will find the newly created Simple PC-BOT Application. Double click it to view and use it.



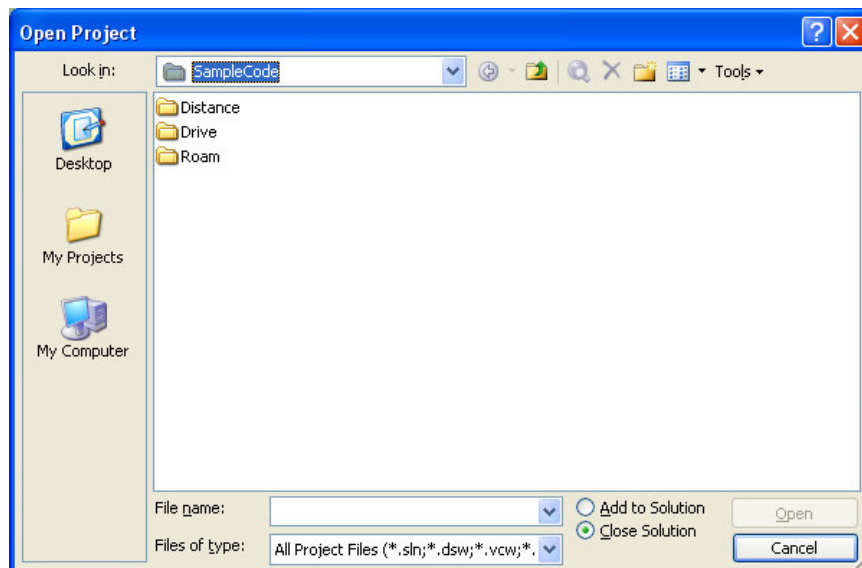
Same as with the sample applications included with the PC-BOT .NET components installed, you will need to first click on 'Open' then 'Connect' before trying to drive your robot motors by clicking and dragging the PC-BOT image.



Step 20

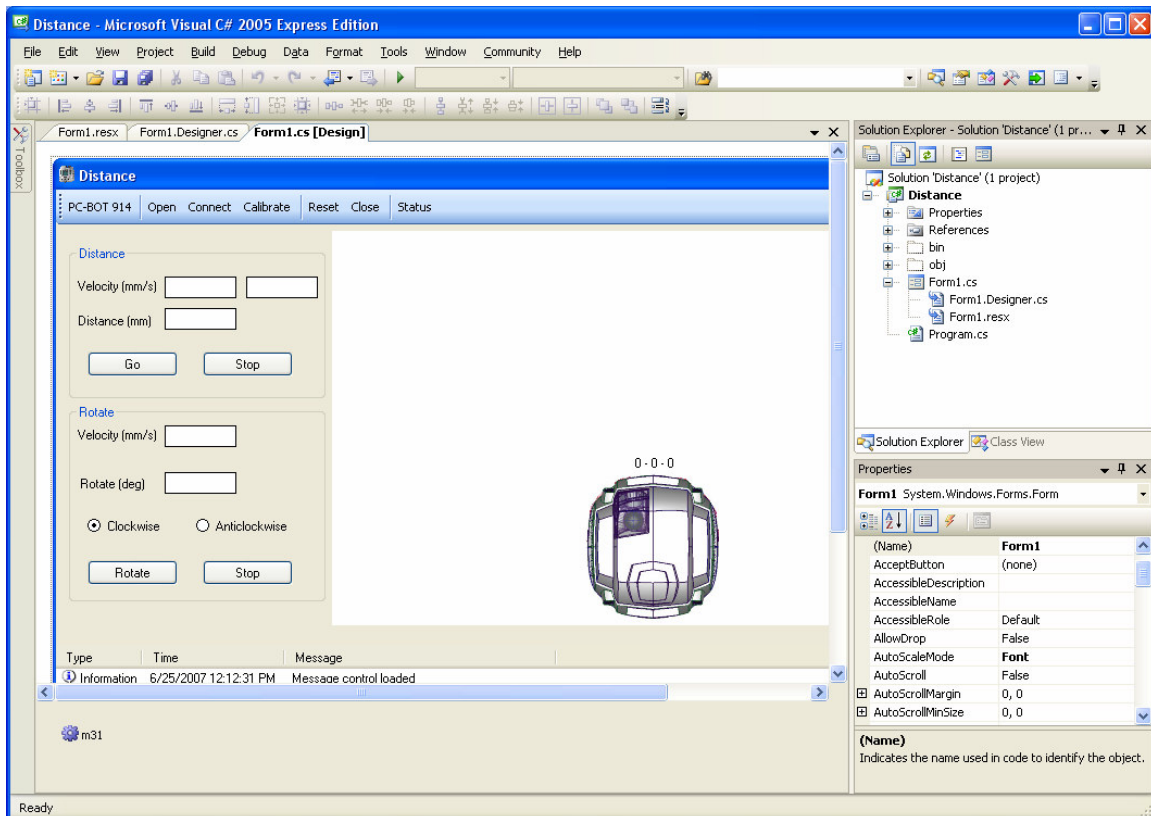
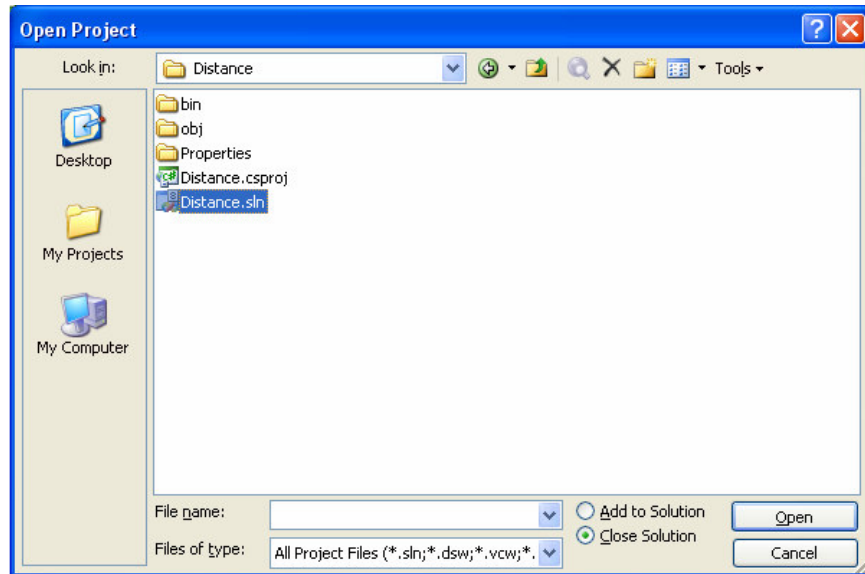
Open the PC-BOT Visual Studio Express sample projects in the menu bar by File → Open Project...

Go to C:\Program Files\White Box Robotics\White Box PC-BOT .NET Components for VS2005\ folder



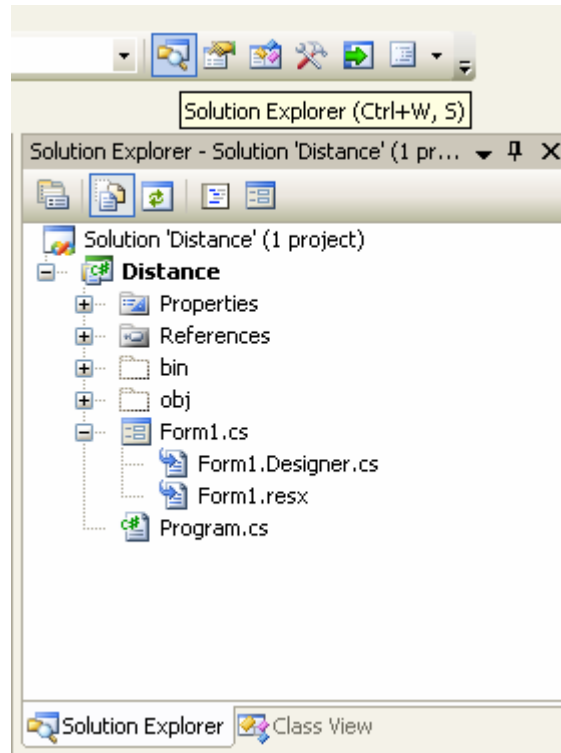
Step 21

Open any of the folders listed, so for example open the 'Distance' folder. Select the 'Distance.sln' file, and click Open.



Step 22

Sometimes the Form tabs do not open automatically when the project is opened. Click on 'Solution Explorer' in the top right part of the window and right click and open any of the Form1.cs and listed files to open them.



In order to truly understand these sample applications the user will have to go through the online tutorials from Microsoft for Visual Studio as well as the technical documents listed on the White Box Robotics webpage.

<http://msdn.microsoft.com/vstudio/express/beginner/>

<http://www.whiteboxrobotics.com/>

Controlling the PC-BOT using RealVNC

Step 1: Plug in the battery charger, monitor, keyboard and mouse into the robot and turn it ON.

Step 2: Plug in the wireless USB Network Adapter that came with the robot.

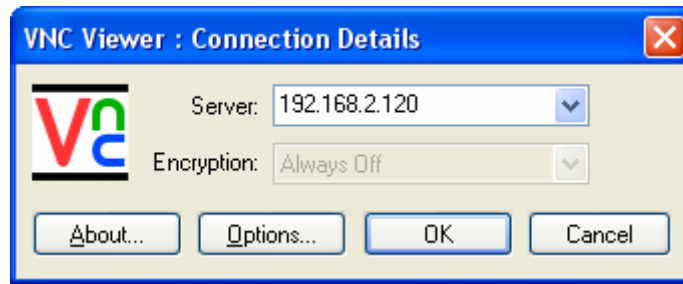
Step 3: Once Windows has loaded setup the wireless connection for use with your own router. If possible assign a fixed IP address to the robot so that you will know which one to type in when using RealVNC to remote desktop into it.

Step 4: Install the complete RealVNC application from <http://www.realvnc.com/products/free/4.1/download.html> onto the robot computer. During installation setup the VNC server with whatever settings and passwords you like.

Step 5: Once you know what IP address will be used, disconnect monitor, keyboard and mouse but leave the battery charger attached until you actually want to drive the robot.

Step 6: Install the complete RealVNC application from <http://www.realvnc.com/products/free/4.1/download.html> onto the controlling computer (your computer). (The robot which already has the RealVNC application installed on it will act as a server once the robot's power is turned ON.)

Step 7: Go to 'All Programs' -> RealVNC -> VNC Viewer 4 -> Run VNC Viewer



Step 8: Choose 'OK' after selecting the correct IP Address (use the IP address of the wireless device on the robot).

Step 9: You should see the windows desktop of the robot. You can run any of the applications keeping in mind the delay when displayin graphics or video.

Step 10: Make sure the robot is in a safe place before proceeding with running applications that cause the robot to drive.

NOTE: As environments and lighting can vary so much, we cannot guarantee proper operation when the robot is moving autonomously. Care should be taken to ensure its safety.

Reference Documents and Web links for Microsoft Visual Studio and .NET

Microsoft Visual Studio Webpage:

<http://msdn2.microsoft.com/en-us/vstudio/default.aspx>

Microsoft Visual Studio Express (free version) Webpage

<http://msdn.microsoft.com/vstudio/express/default.aspx>

Microsoft Visual Studio Express tutorials and documentation

<http://msdn.microsoft.com/vstudio/express/beginner/>

White Box Robotics .NET Support section

http://www.whiteboxrobotics.com/PCBOTs/support_dotnet.html

Microsoft Robotics Studio webpage

Microsoft
ROBOTICS STUDIO

<http://msdn2.microsoft.com/en-us/robotics/default.aspx>

