

WPF CNC HMI Plugin

<https://github.com/graemepeek/UIControlDemo>

Set Output Type

The screenshot shows the Visual Studio IDE with the 'LaserControl' project selected in the Solution Explorer. The 'Properties' window is open, displaying the 'Application' tab. The 'Assembly name' is set to 'UILaserControl', the 'Default namespace' is 'UILaserControl', the 'Target framework' is '.NET Framework 4.6', and the 'Output type' is 'Class Library'. The 'Resources' section is also visible, showing options for managing application resources.

Solution Explorer:

- Solution 'LaserControl' (1 of 1 project)
 - LaserControl
 - Properties
 - References
 - LaserControl1.config.xml
 - LaserControl1.xaml
 - LaserControl1.xaml.cs
 - LaserControlVM.cs

Application Properties:

- Configuration: N/A Platform: N/A
- Assembly name: UILaserControl
- Default namespace: UILaserControl
- Target framework: .NET Framework 4.6
- Output type: Class Library
- ☐ Auto-generate binding redirects
- Startup object: (Not set)
- Assembly Information...
- Resources
 - Specify how application resources will be managed:
 - ☒ Icon and manifest
 - A manifest determines specific settings for an application. To embed a custom manifest, first add it to your project and then select it from the list below.
 - Icon: (Default Icon) Browse...
 - Manifest: Embed manifest with default settings
 - ☐ Resource file: Browse...

Set Path of CNC C# HMI



The screenshot shows the Visual Studio IDE with the 'LaserControl' project selected in the Solution Explorer. The 'Debug' tab is active in the Properties window. The 'Start action' section is expanded, and the 'Start external program' option is selected. The path 'E:\Sync\BTF\15. CNC\Training 2022\NET HMI\HMI\Beckhoff.App.' is entered in the text field, and the 'Browse...' button is highlighted with a red box. A green callout box with the text 'Browse to location of HMI exe' points to the 'Browse...' button.

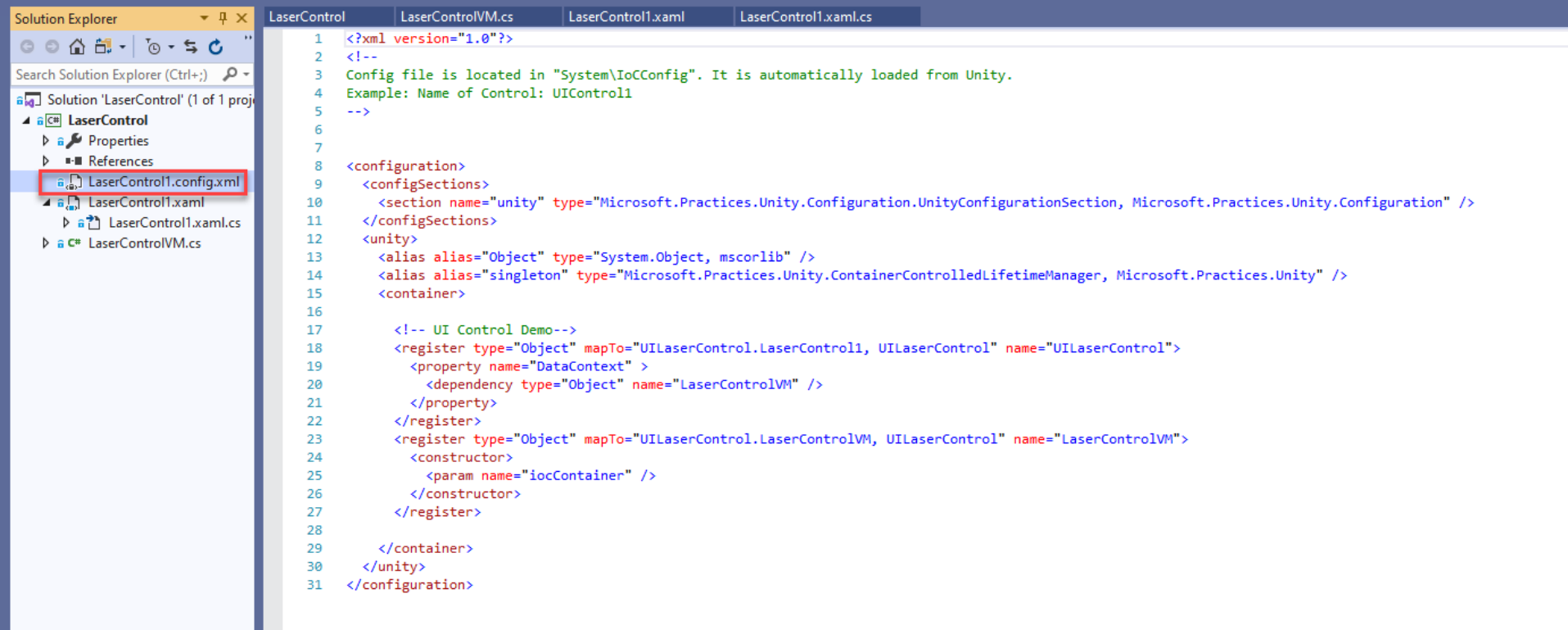
Solution Explorer:

- Solution 'LaserControl' (1 of 1 project)
 - LaserControl
 - Properties
 - References
 - LaserControl1.config.xml
 - LaserControl1.xaml
 - LaserControl1.xaml.cs
 - LaserControl1VM.cs

Debug Properties:

- Configuration: Active (Debug) Platform: Active (Any CPU)
- Start action
 - ☐ Start project
 - ☒ Start external program: E:\Sync\BTF\15. CNC\Training 2022\NET HMI\HMI\Beckhoff.App. Browse...
 - ☐ Start browser with URL:
- Start options
 - Command line arguments:
 - Working directory: Browse...
 - ☐ Use remote machine
 - Authentication mode: Windows Authentication
- Debugger engines
 - ☐ Enable native code debugging
 - ☐ Enable SQL Server debugging

Xaml Config File



This file sets the name of the control the CNC HMI will look for.
In this case UILaserControl



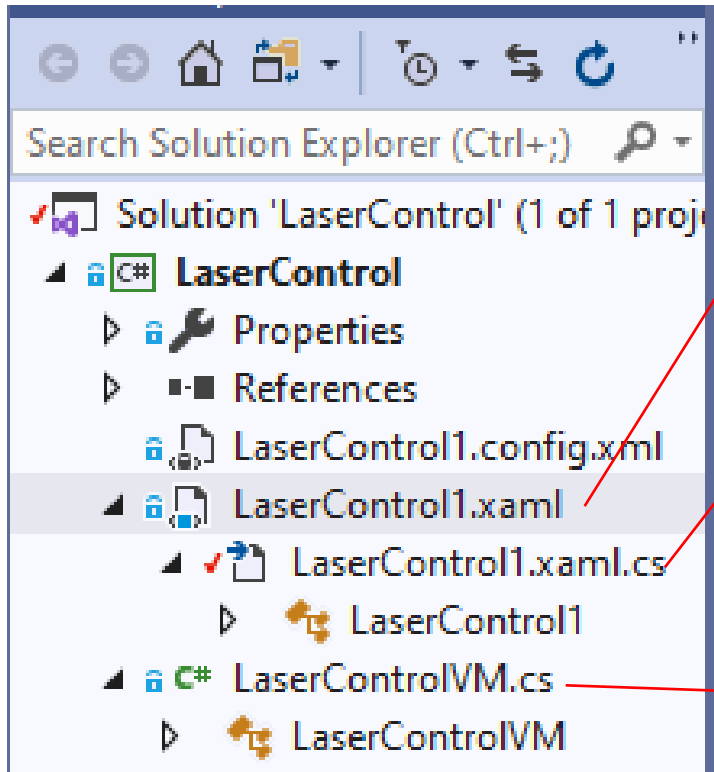
Copy Config File to HMI directory

HMI 2.4.2.x > TcApplication > System > locConfig

· UIControlDemo > bin > Debug

Copy the XAML config file from ../bin/debug folder to ../System/locConfig folder

Project Files



LaserControl1.Xaml holds WPF form

LaserControl1.Xaml.cs holds form event code (button clicks etc)

LaserControlVM.Xaml is view model module which handles C# code for ADS

Xaml.cs file

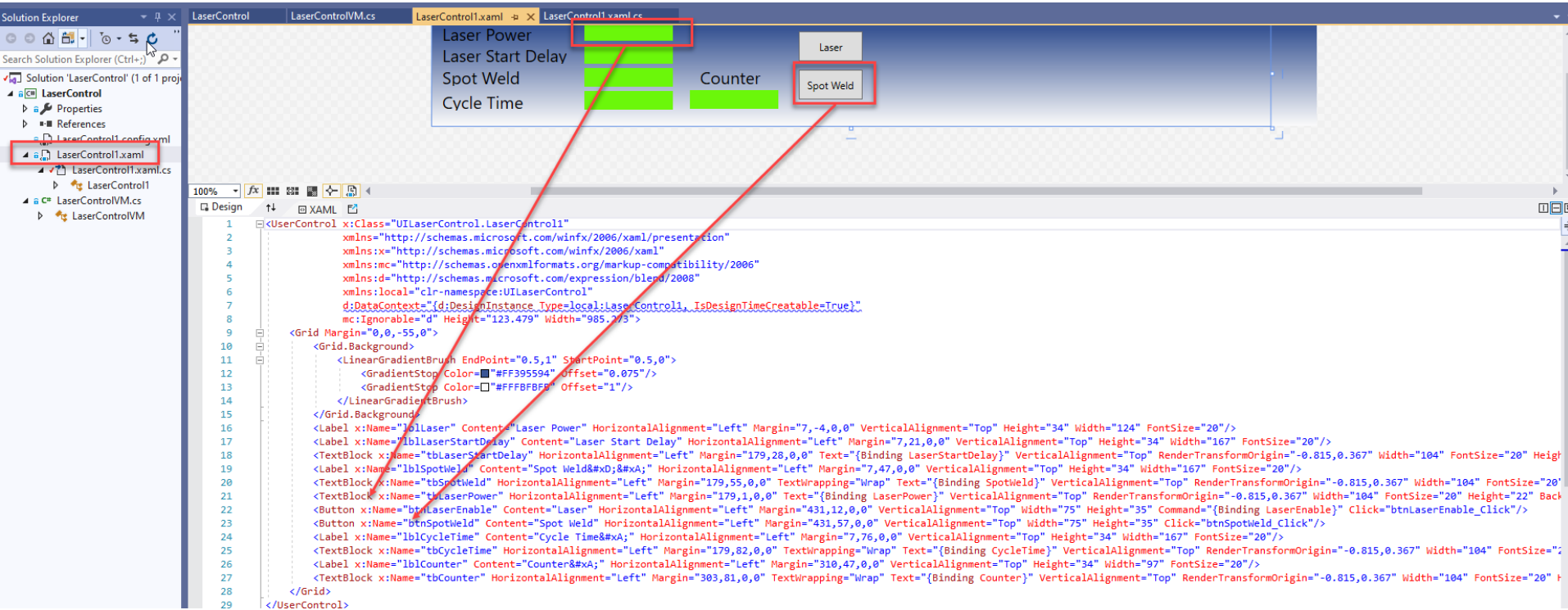
The screenshot displays the Visual Studio IDE with the 'LaserControl' solution open. The Solution Explorer on the left shows the project structure, with 'LaserControl1.xaml.cs' selected and highlighted by a red box. The main editor window shows the code for 'LaserControl1.xaml.cs'. The code is organized into two sections, each enclosed in a red box. The first section, labeled 'btnLaserEnable_Click', contains logic to toggle the laser enable state and update the button's background color. The second section, labeled 'btnSpotWeld_Click', contains logic to toggle the spot weld enable state and update the button's background color. Both sections use a 'ReadSymbol' method to read the state from a PLC client and a 'WriteSymbol' method to write the state back to the PLC client. The background color is updated using 'Brushes.Red' and 'Brushes.Green'.

```
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65  
66  
67  
68  
69  
70  
71  
72  
73  
74  
75  
76  
77  
78  
79  
80  
81  
82  
83  
84  
85
```

```
    _spotweld = _plcClient.ReadSymbol<bool>("Global_HMI.bSpotWeldEnable");  
    if (_spotweld)  
    {  
        btnSpotWeld.Background = Brushes.Red;  
    }  
    else  
    {  
        btnSpotWeld.Background = Brushes.Green;  
    }  
}  
  
1reference  
private void btnLaserEnable_Click(object sender, RoutedEventArgs e)  
{  
    _laserenable = !_laserenable; // Invert laser enable state  
    _plcClient.WriteSymbol("Global_HMI.bLaserEnable", _laserenable);  
    if (_laserenable)  
    {  
        btnLaserEnable.Background = Brushes.Red;  
    }  
    else  
    {  
        btnLaserEnable.Background = Brushes.Green;  
    }  
}  
  
1reference  
private void btnSpotWeld_Click(object sender, RoutedEventArgs e)  
{  
    _spotweld = !_spotweld; // Invert spotweld enable state  
    _plcClient.WriteSymbol("Global_HMI.bSpotWeldEnable", _spotweld);  
    if (_spotweld)  
    {  
        btnSpotWeld.Background = Brushes.Red;  
    }  
    else  
    {  
        btnSpotWeld.Background = Brushes.Green;  
    }  
}
```



WPF Form Control



The screenshot displays the Visual Studio IDE with the WPF form control for the LaserControl application. The top part shows the Design view, and the bottom part shows the XAML code.

Design View:




- Laser Power:** A green rectangular button.
- Laser Start Delay:** A green rectangular button.
- Spot Weld:** A green rectangular button.
- Cycle Time:** A green rectangular button.
- Counter:** A green rectangular button.
- Spot Weld:** A green rectangular button.

XAML Code:

```
<?xml version="1.0" encoding="utf-8" ?>
<UserControl x:Class="UI.LaserControl.LaserControl1"
    xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
    xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
    xmlns:mc="http://schemas.openxmlformats.org/markup-compatibility/2006"
    xmlns:d="http://schemas.microsoft.com/expression/blend/2008"
    xmlns:local="clr-namespace:UI.LaserControl"
    d:DataContext="{d:DesignInstance Type=local:LaserControl1, IsDesignTimeCreatable=True}"
    mc:Ignorable="d" Height="123.479" Width="989.775">
    <Grid Margin="0,0,-55,0">
        <Grid.Background>
            <LinearGradientBrush EndPoint="0.5,1" StartPoint="0.5,0">
                <GradientStop Color="#FF395594" Offset="0.075"/>
                <GradientStop Color="#FFF8F8F8" Offset="1"/>
            </LinearGradientBrush>
        </Grid.Background>
        <Label x:Name="lblLaserPower" Content="Laser Power" HorizontalAlignment="Left" Margin="7,-4,0,0" VerticalAlignment="Top" Height="34" Width="124" FontSize="20"/>
        <Label x:Name="lblLaserStartDelay" Content="Laser Start Delay" HorizontalAlignment="Left" Margin="7,21,0,0" VerticalAlignment="Top" Height="34" Width="167" FontSize="20"/>
        <TextBlock x:Name="tbLaserStartDelay" HorizontalAlignment="Left" Margin="179,28,0,0" Text="{Binding LaserStartDelay}" VerticalAlignment="Top" RenderTransformOrigin="-0.815,0.367" Width="104" FontSize="20" Height="22" BackGroundColor="White" FontColor="Black"/>
        <Label x:Name="lblSpotWeld" Content="Spot Weld" HorizontalAlignment="Left" Margin="7,47,0,0" VerticalAlignment="Top" Height="34" Width="167" FontSize="20"/>
        <TextBlock x:Name="tbSpotWeld" HorizontalAlignment="Left" Margin="179,55,0,0" TextWrapping="Wrap" Text="{Binding SpotWeld}" VerticalAlignment="Top" RenderTransformOrigin="-0.815,0.367" Width="104" FontSize="20" Height="22" BackGroundColor="White" FontColor="Black"/>
        <TextBlock x:Name="tbLaserPower" HorizontalAlignment="Left" Margin="179,1,0,0" Text="{Binding LaserPower}" VerticalAlignment="Top" RenderTransformOrigin="-0.815,0.367" Width="104" FontSize="20" Height="22" BackGroundColor="White" FontColor="Black"/>
        <Button x:Name="btnSpotWeld" Content="Spot Weld" HorizontalAlignment="Left" Margin="431,57,0,0" VerticalAlignment="Top" Width="75" Height="35" Command="{Binding LaserEnable}" Click="btnSpotWeld_Click"/>
        <Label x:Name="lblCycleTime" Content="Cycle Time" HorizontalAlignment="Left" Margin="7,76,0,0" VerticalAlignment="Top" Height="34" Width="167" FontSize="20"/>
        <TextBlock x:Name="tbCycleTime" HorizontalAlignment="Left" Margin="179,82,0,0" TextWrapping="Wrap" Text="{Binding CycleTime}" VerticalAlignment="Top" RenderTransformOrigin="-0.815,0.367" Width="104" FontSize="20" Height="22" BackGroundColor="White" FontColor="Black"/>
        <Label x:Name="lblCounter" Content="Counter" HorizontalAlignment="Left" Margin="310,47,0,0" VerticalAlignment="Top" Height="34" Width="97" FontSize="20"/>
        <TextBlock x:Name="tbCounter" HorizontalAlignment="Left" Margin="303,81,0,0" TextWrapping="Wrap" Text="{Binding Counter}" VerticalAlignment="Top" RenderTransformOrigin="-0.815,0.367" Width="104" FontSize="20" Height="22" BackGroundColor="White" FontColor="Black"/>
    </Grid>
</UserControl>
```



Copy Control Dll File to HMI directory

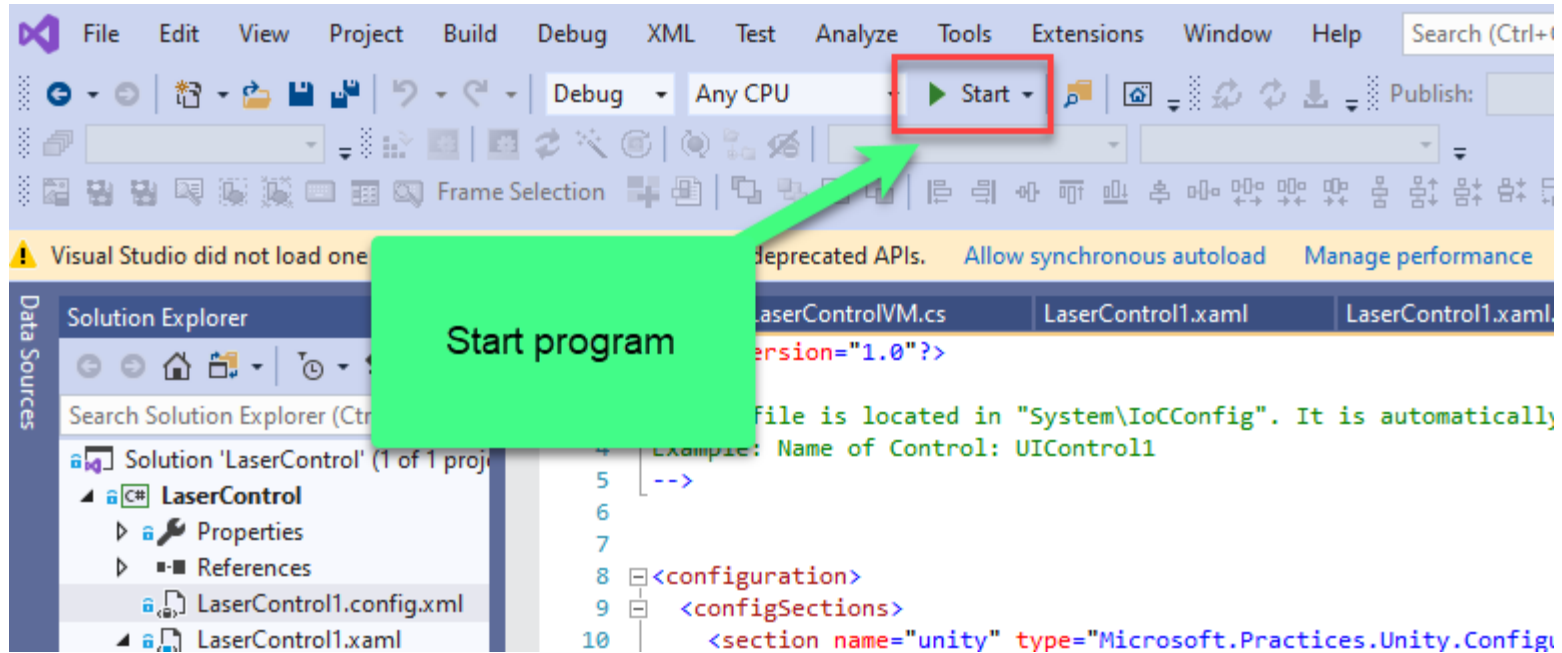
name	Date modified	type	size
 UILaserControl.dll	3/13/2023 6:29 PM	Application exten...	16 KB
 UILaserControl.pdb	3/13/2023 6:29 PM	Program Debug D...	44 KB
 LaserControl1.config.xml	1/12/2023 1:15 PM	XML Source File	2 KB

· UIControlDemo > bin > Debug

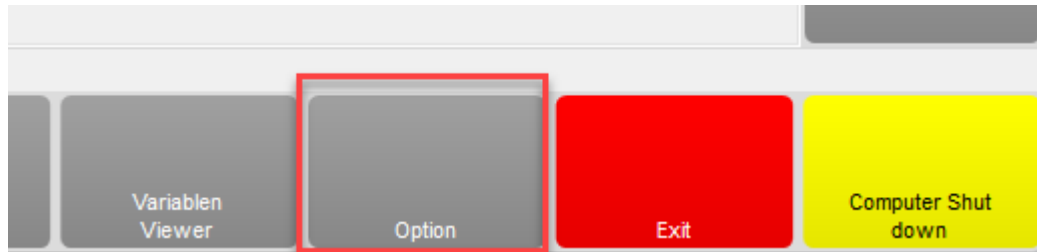
Copy the control dll file from ../bin/debug folder to ../Plugins folder

In this example it is called UILaserControl.dll

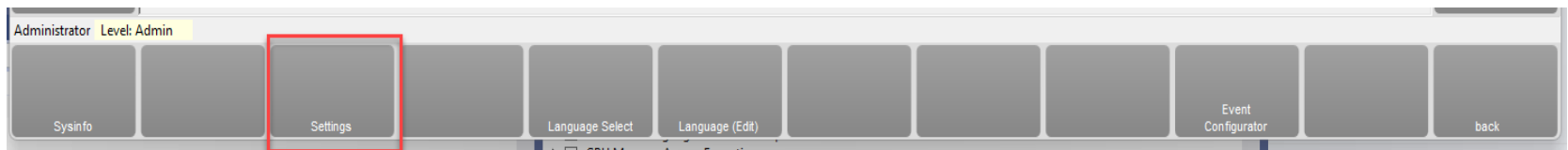
Run program within CNC HMI



Setup Calling of UI within CNC HMI

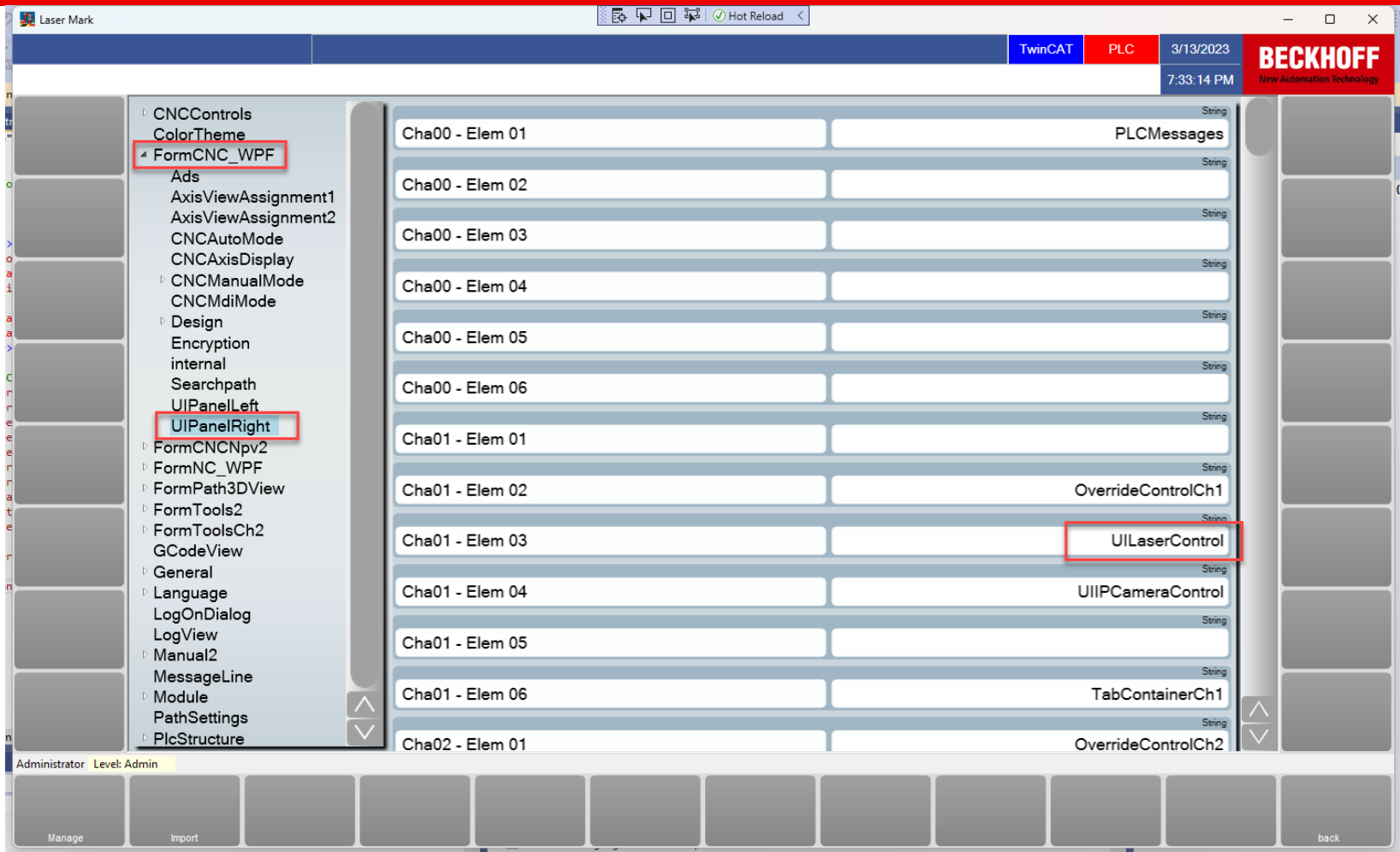


Select Option button



Select Settings button

Add the Control to Right Panel



In this example our control is called `UILaserControl`, taken from XAML config file.





Questions ?