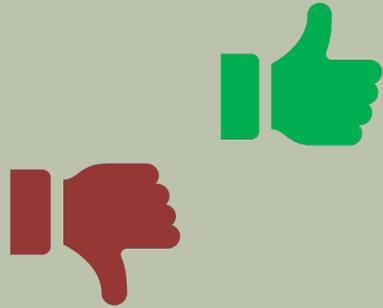


<https://www.halvorsen.blog>



LabVIEW

Programming Guidelines

Hans-Petter Halvorsen



Contents

In this tutorial I assume you are already familiar with LabVIEW

- Blog:

<https://www.halvorsen.blog/documents/programming/labview/>

- LabVIEW Fundamentals Playlist:

https://www.youtube.com/playlist?list=P_Ldb-TcK6Aqj0NeLk7K66_mvc-HNKS1-PJ

Programming Guidelines

- Typically engineers often create simple LabVIEW VIs that eventually grow out of control, because they don't have the proper structure and best practices.
- The solution to this problem is organizing your code and data in a way that enables modularity, readability, and reuse.

Topics – some examples

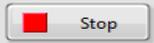
- Intuitive GUI (Front Panels)
 - Add Units
 - Use Controls and Indicators from the same Palette
 - Resizing the Window size
 - Don't use “strong” Colors
- Structured Code (Block Diagram)
 - SubVIs
 - Avoid Spaghetti Code
 - Resizing the Window size
 - Use Labels
 - Always use Project Explorer
 - State Machine

What is Wrong with this GUI?

Temperature [°C]

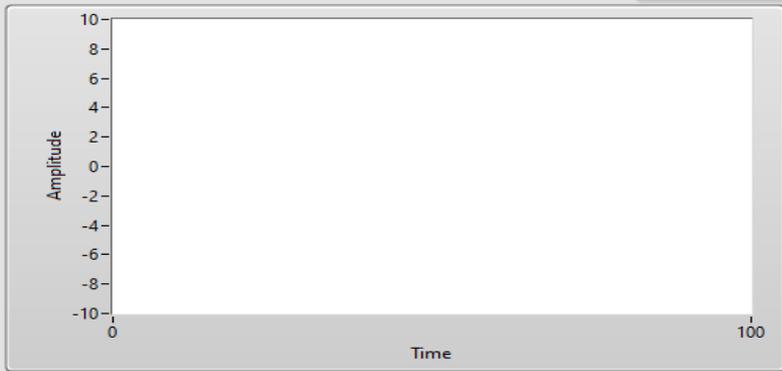
0.0

Stop Button



Waveform Chart

Plot 0

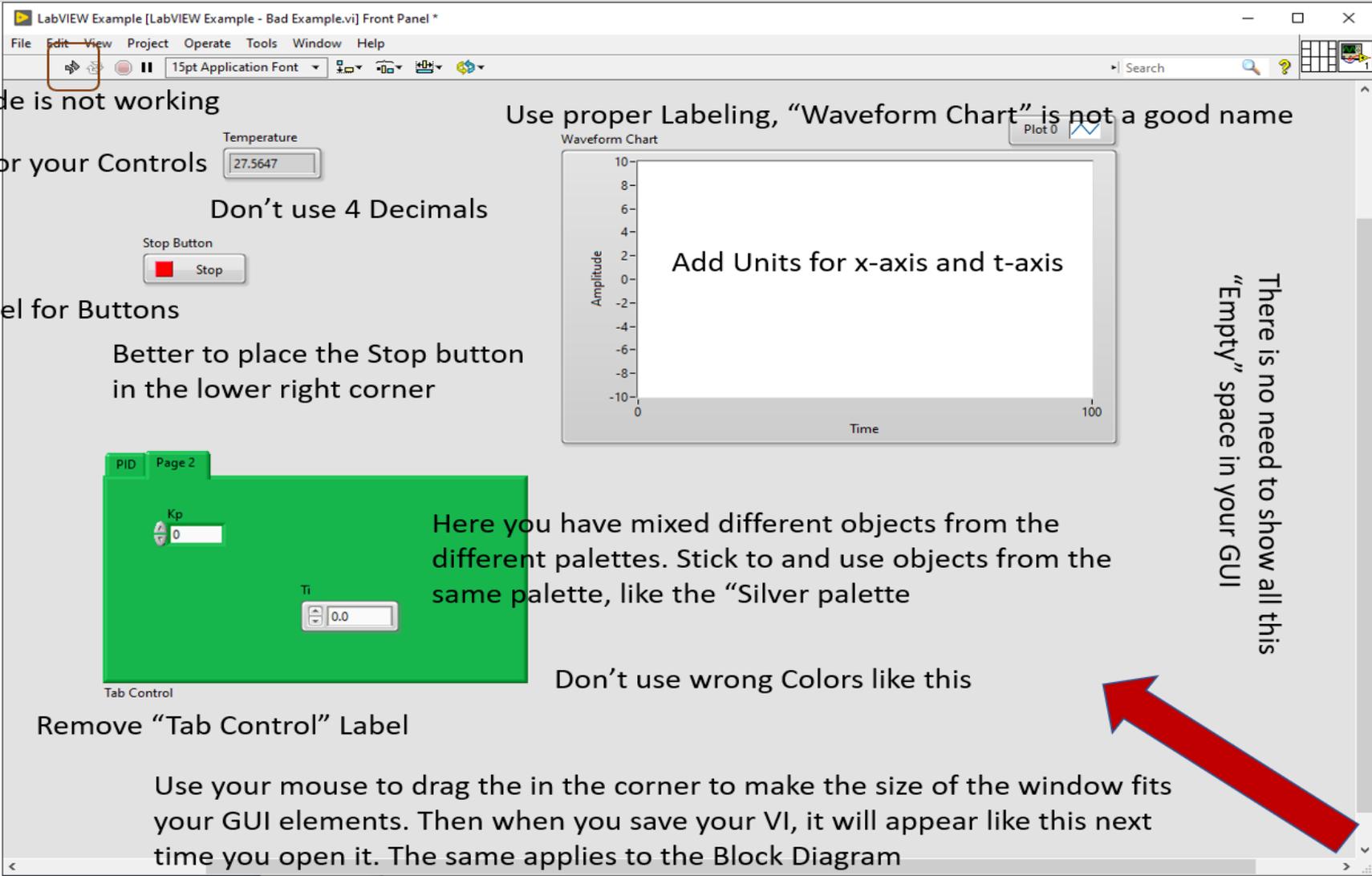


PID Page 2

Kp 0

Ti 0.0

Tab Control



Your Code is not working

Use proper Labeling, "Waveform Chart" is not a good name

Add Units for your Controls

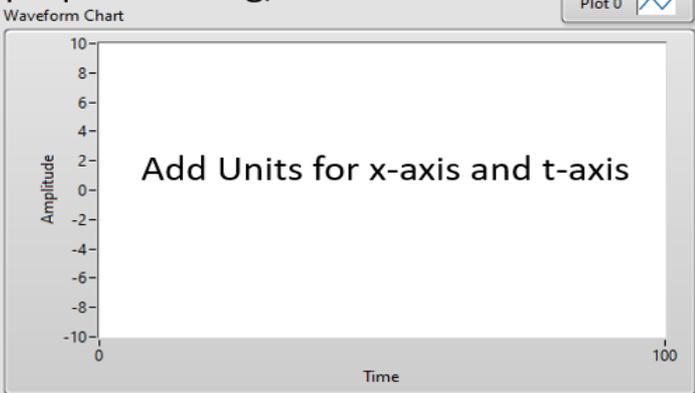
Temperature
27.5647

Don't use 4 Decimals

Stop Button
Stop

Remove Label for Buttons

Better to place the Stop button
in the lower right corner



There is no need to show all this
"Empty" space in your GUI



Here you have mixed different objects from the
different palettes. Stick to and use objects from the
same palette, like the "Silver palette

Don't use wrong Colors like this

Remove "Tab Control" Label

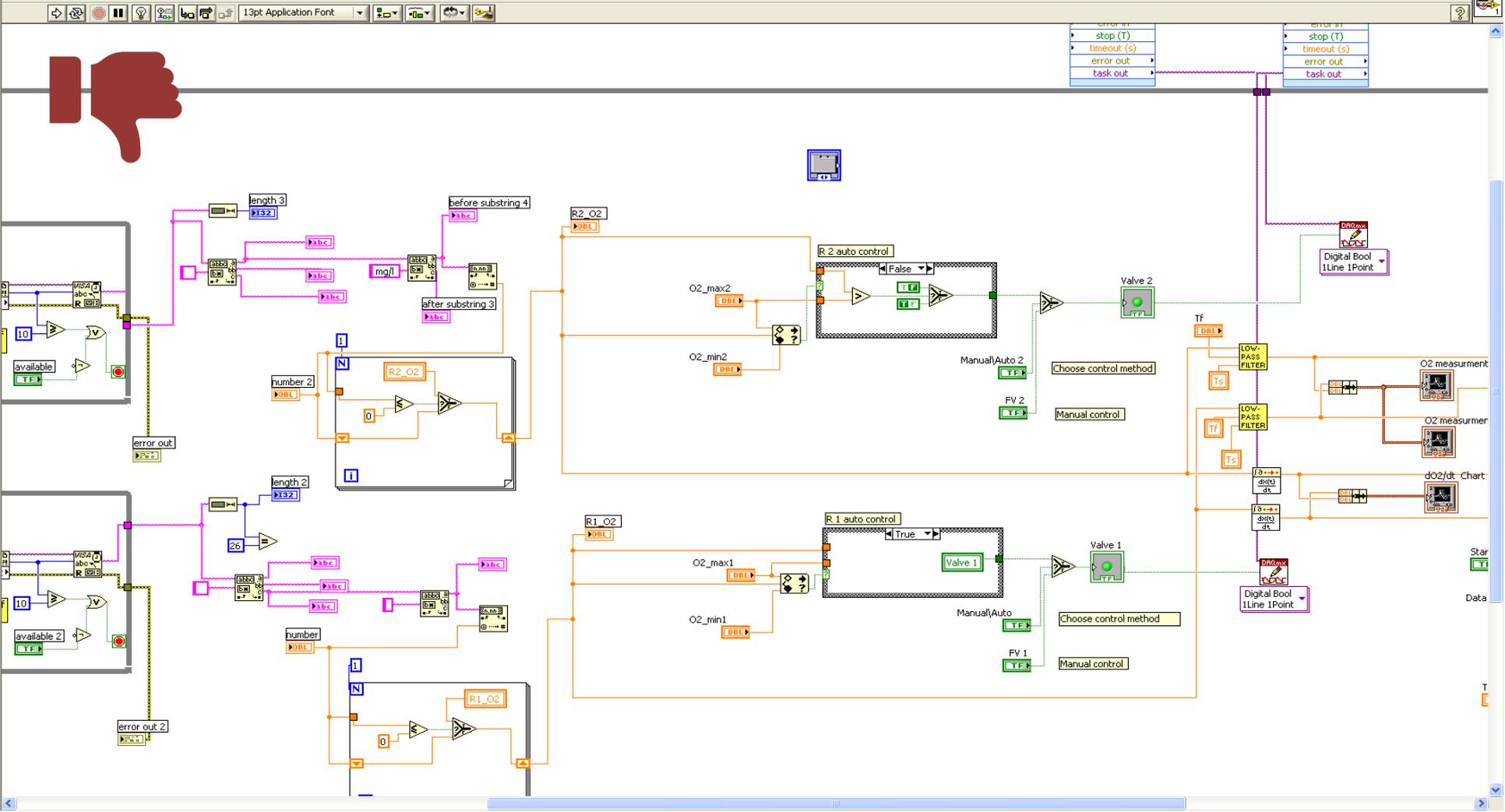
Use your mouse to drag the in the corner to make the size of the window fits
your GUI elements. Then when you save your VI, it will appear like this next
time you open it. The same applies to the Block Diagram

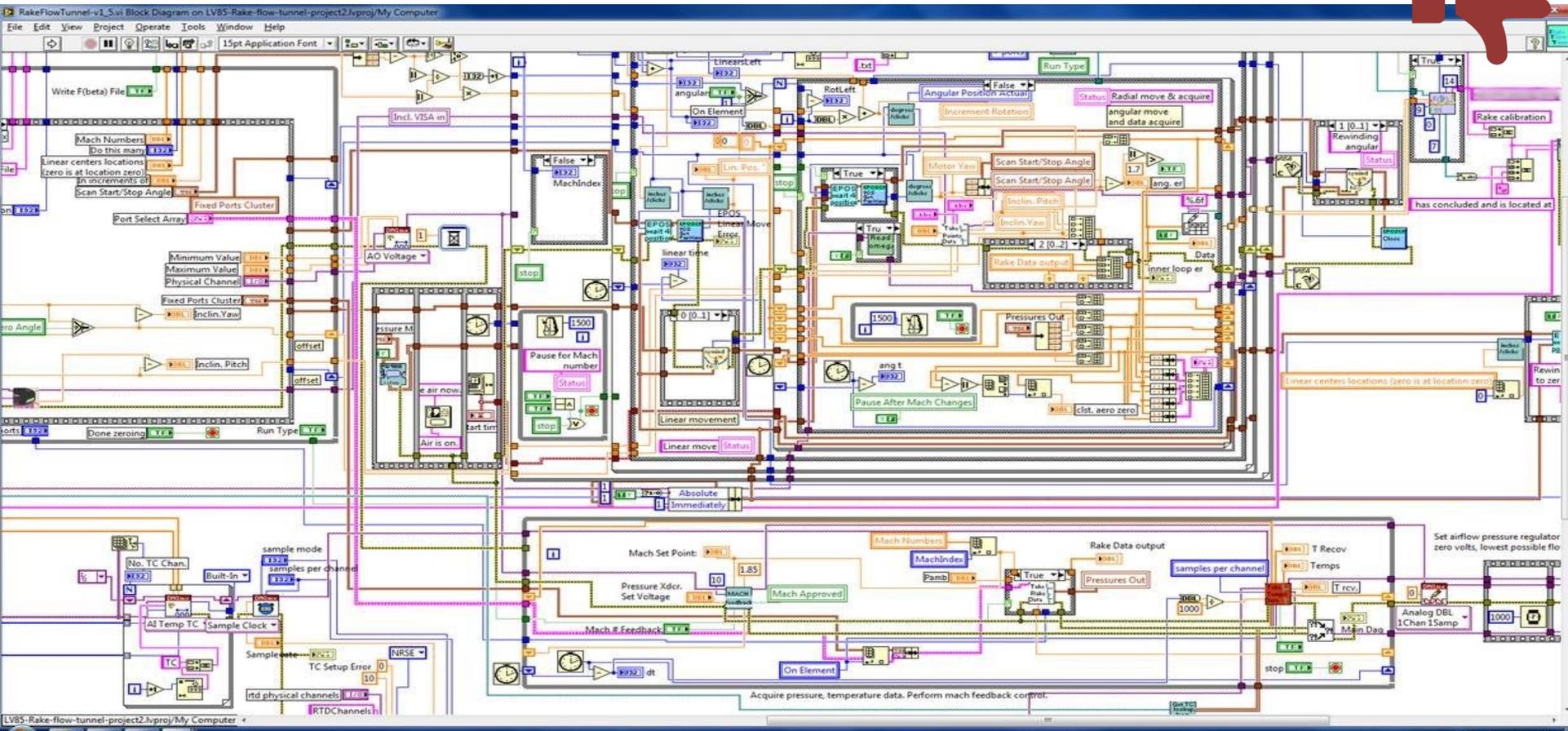
<https://www.halvorsen.blog>



Structure your Code

Hans-Petter Halvorsen







Spaghetti Code

Since LabVIEW is a graphical programming language with lots of wires, etc., it is extremely important to have a good and clear structure in your program!

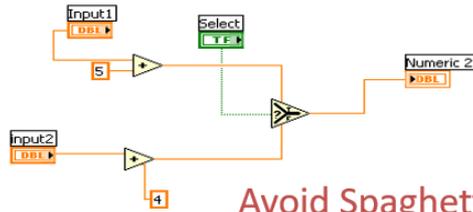
Structure your Code



Bad vs. Good Code

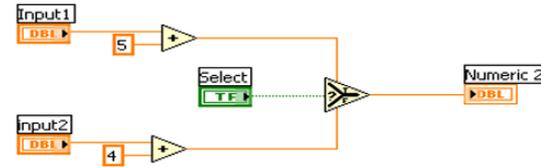


Bad Examples:



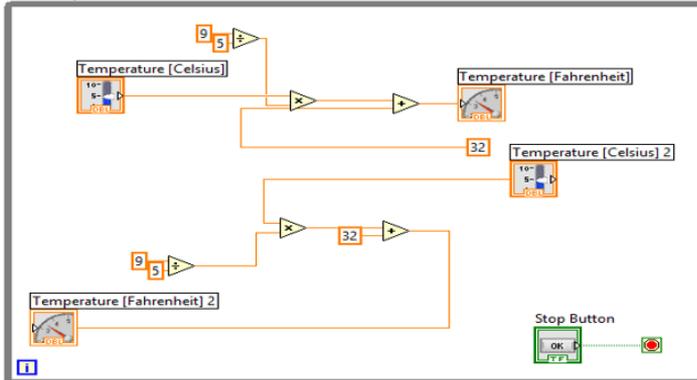
Avoid Spaghetti Code!

The Flow should go from left to right

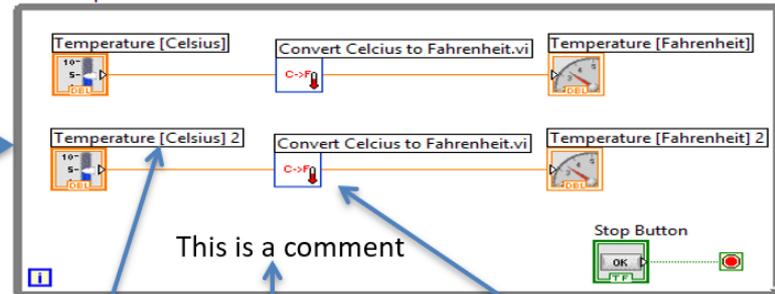


Make your code readable for others!

While Loop



While Loop

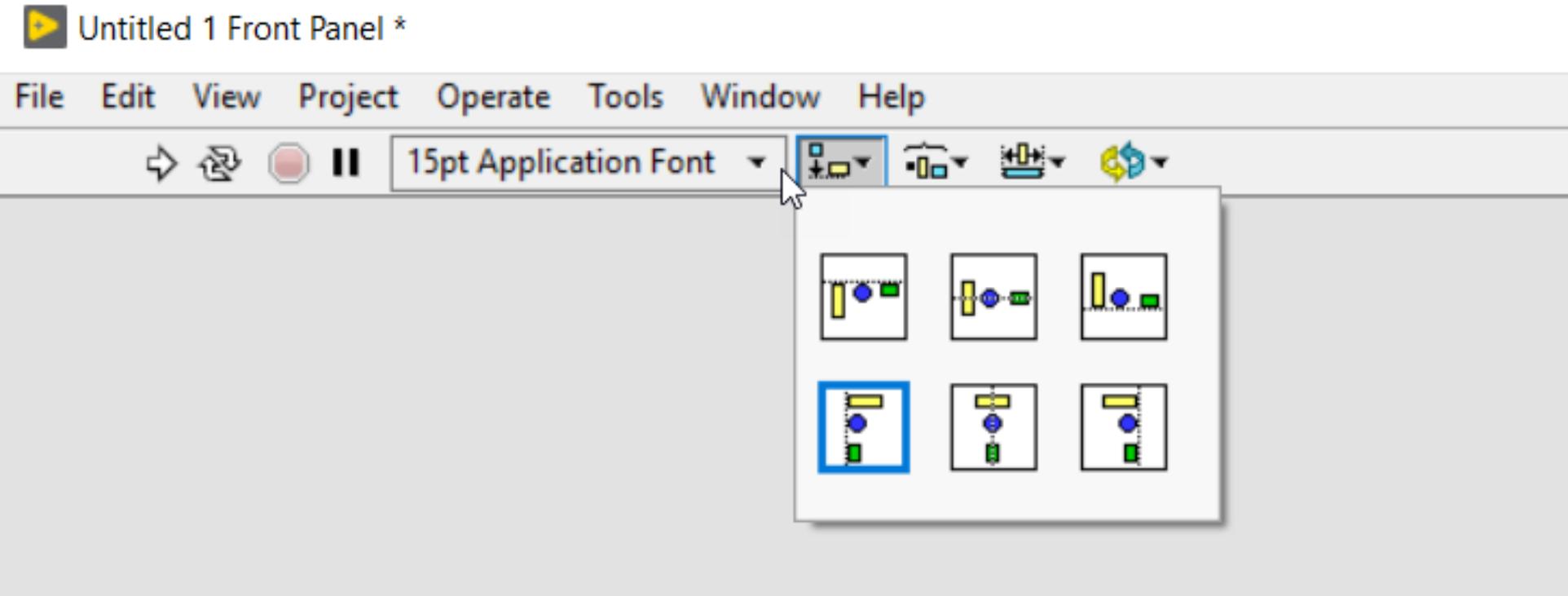


This is a comment

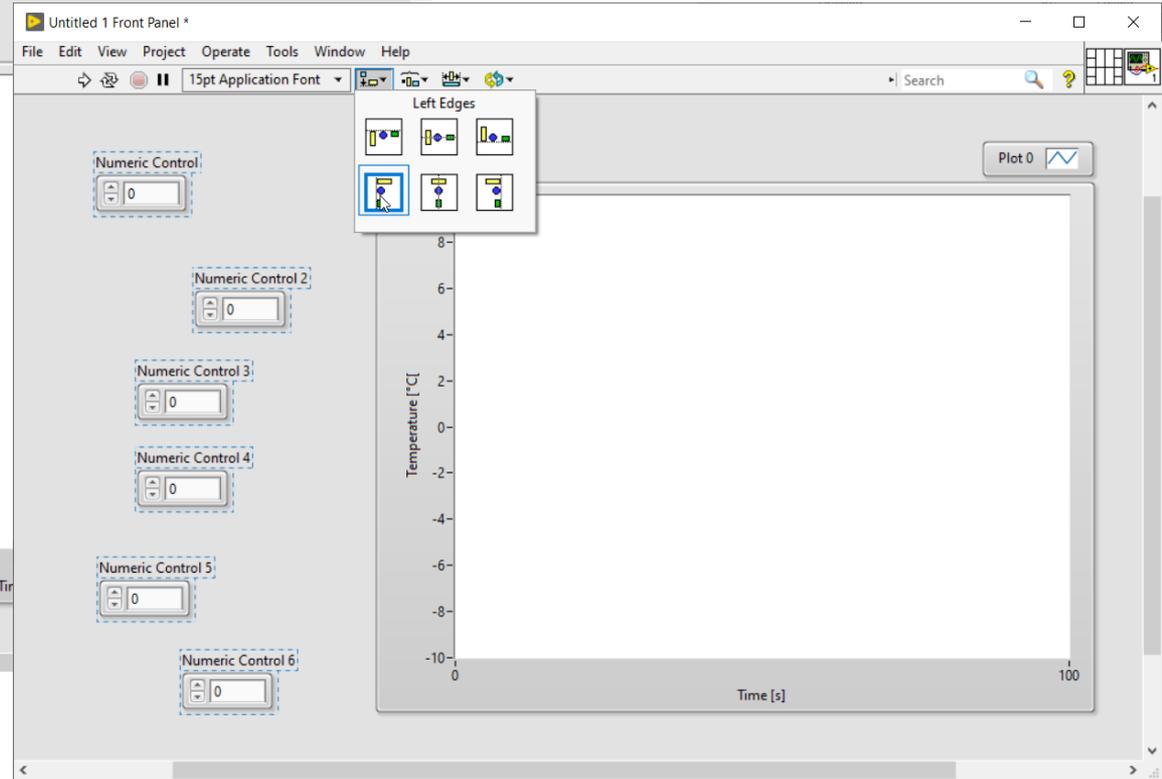
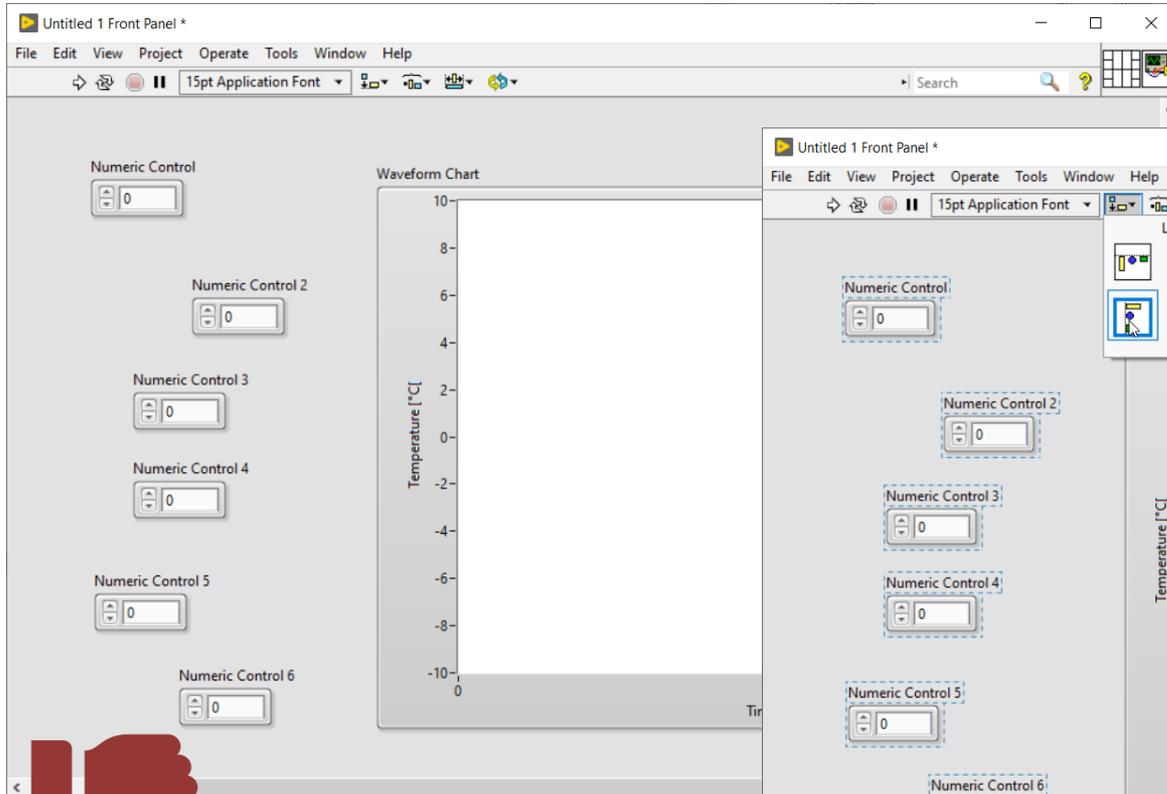
Use SubVIs!!!

Use Labels and Comment your Code

Alignment Tools



Alignment Tools





Numeric Control

Numeric Control 2

Numeric Control 3

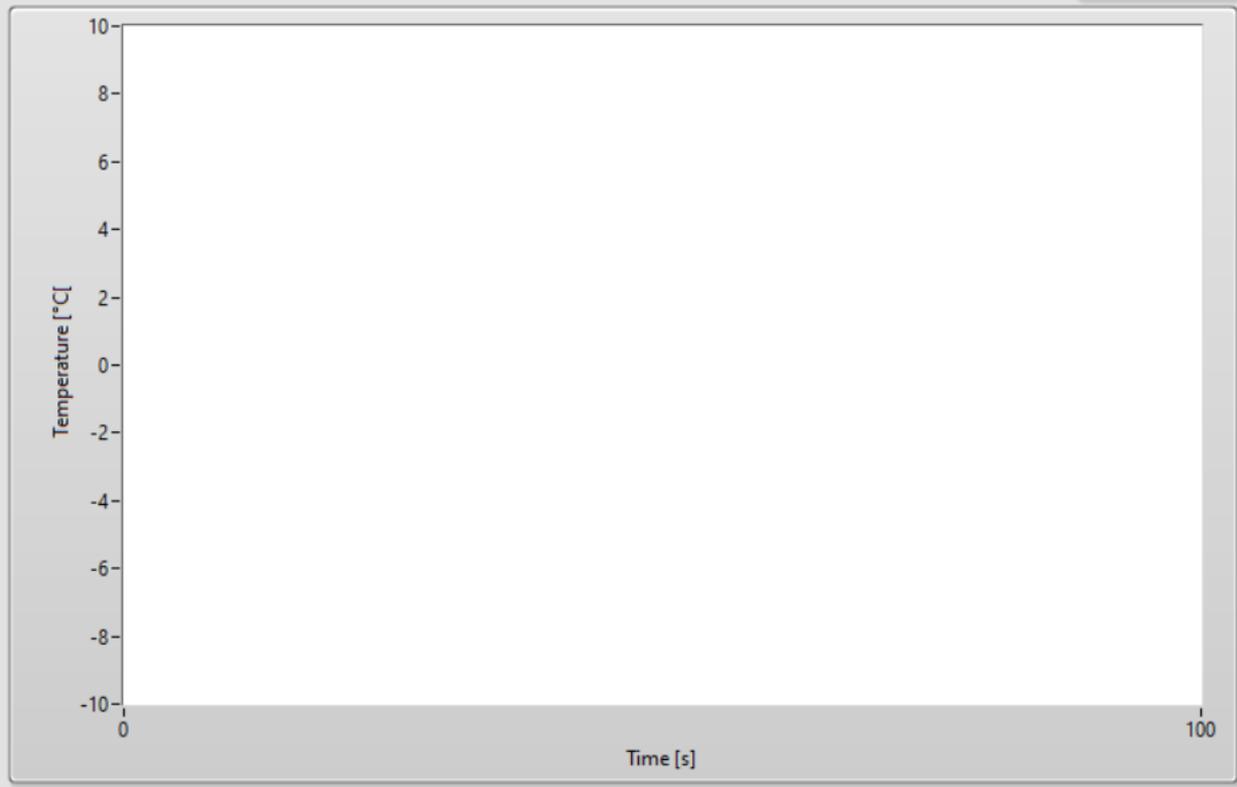
Numeric Control 4

Numeric Control 5

Numeric Control 6

Waveform Chart

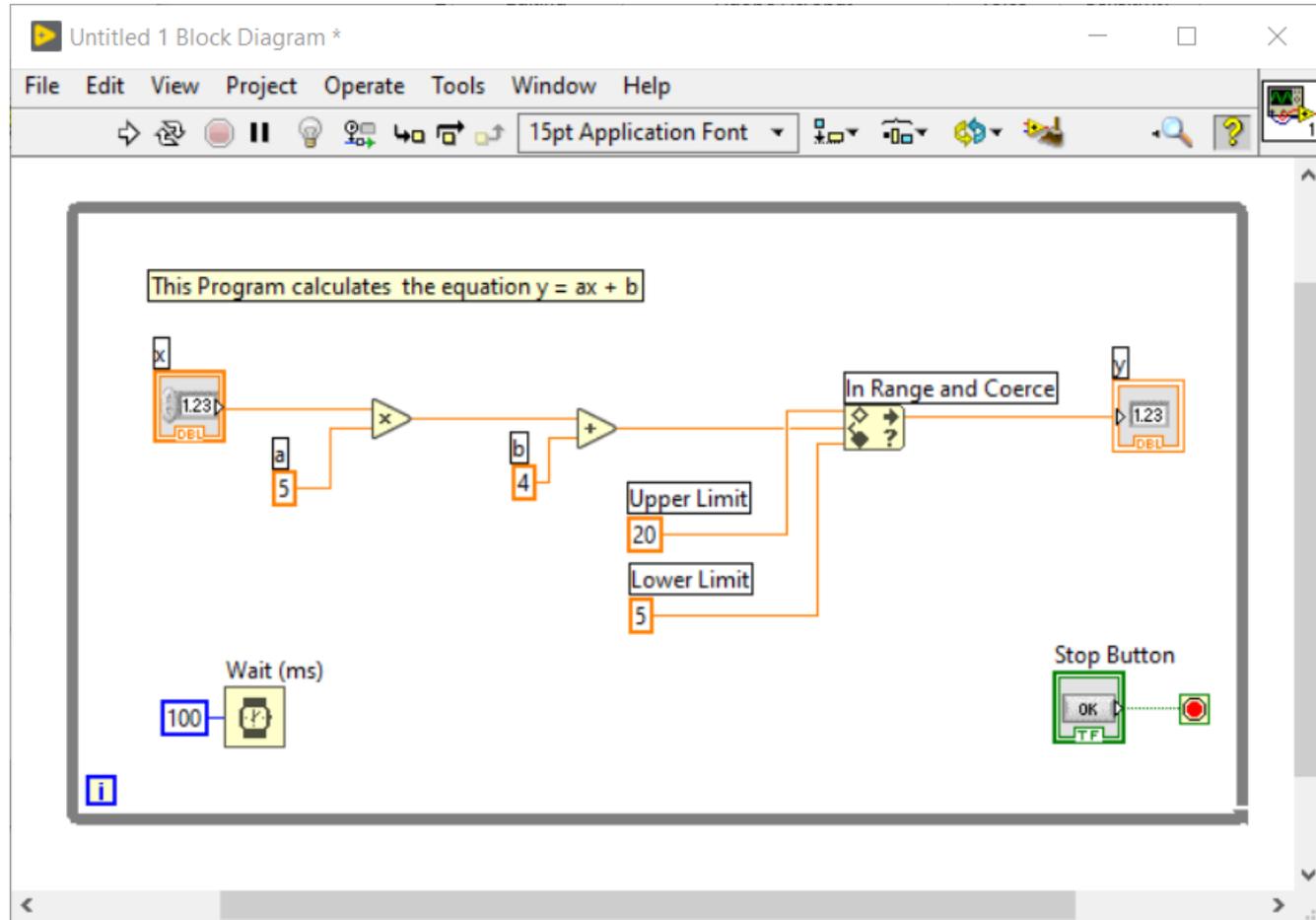
Plot 0



Use Comments and Labels

Use Comments and Labels

Use Labels for SubVIs and built-in Functions



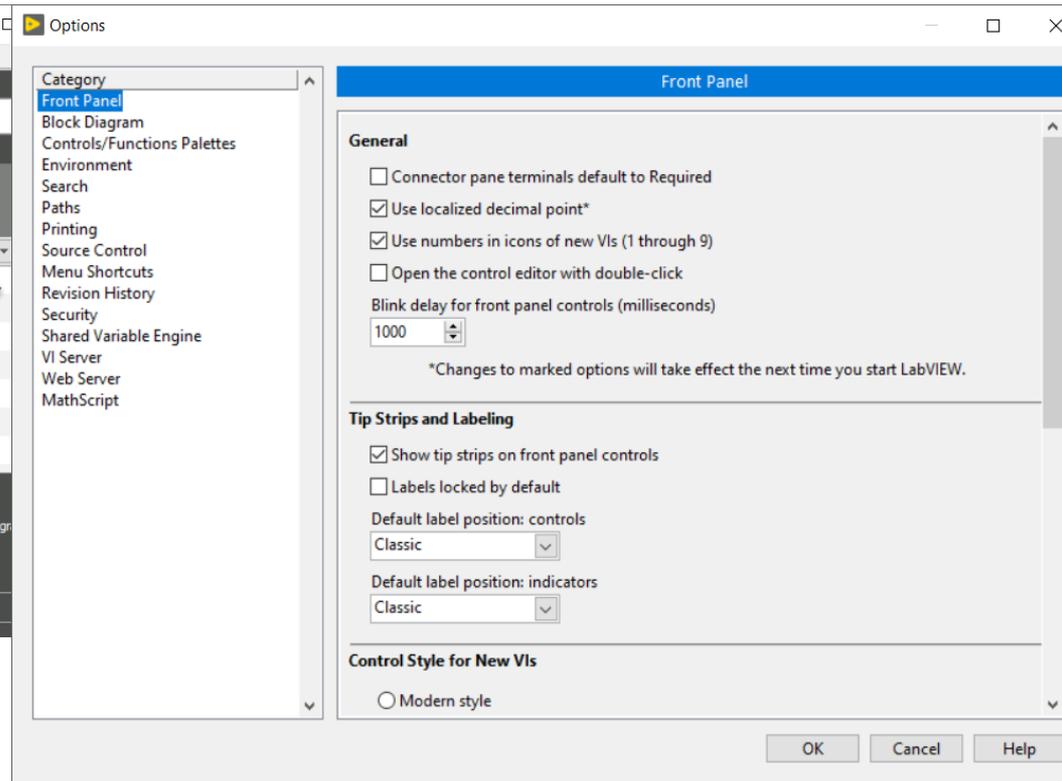
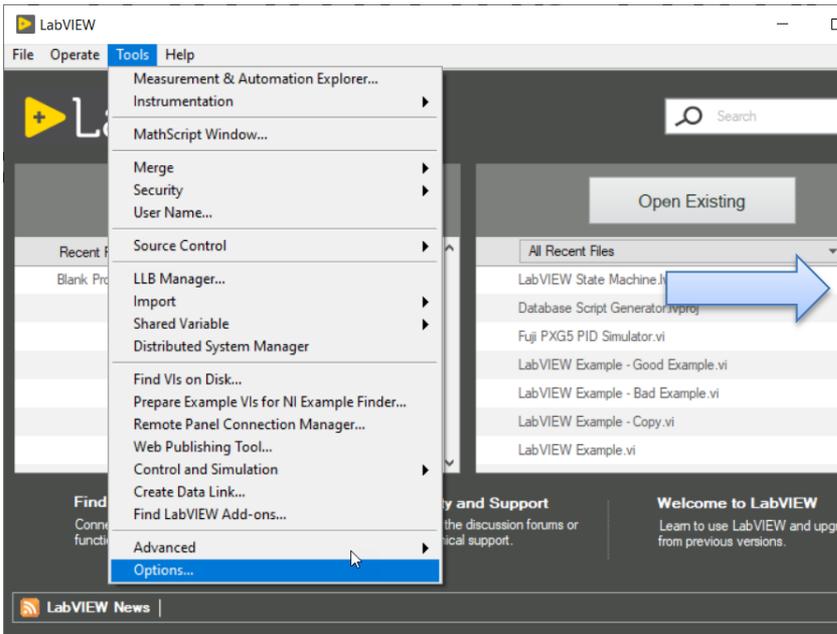
<https://www.halvorsen.blog>



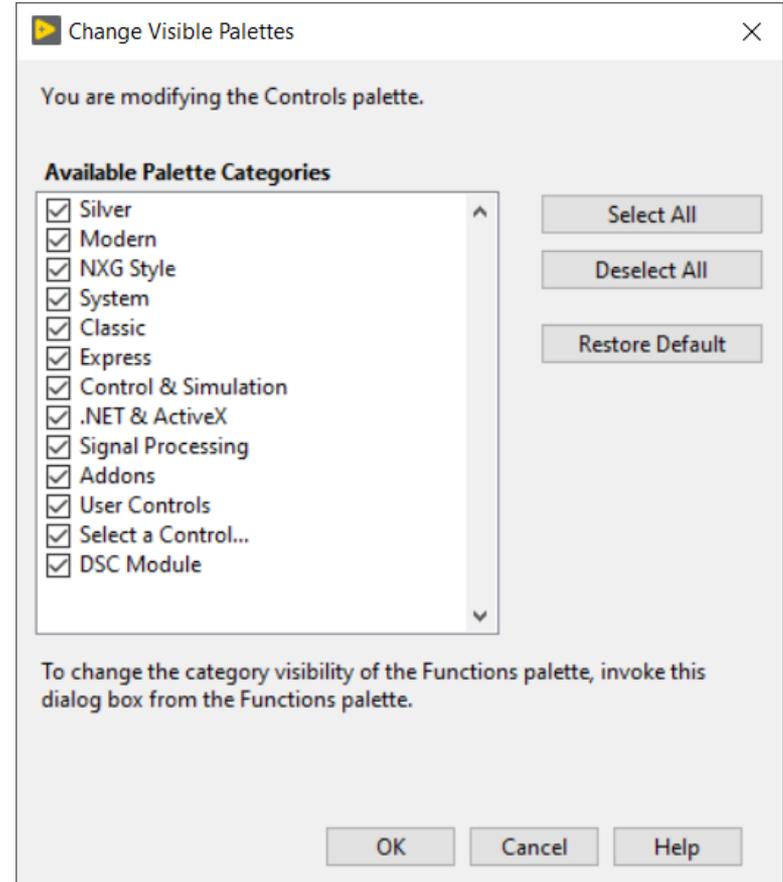
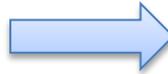
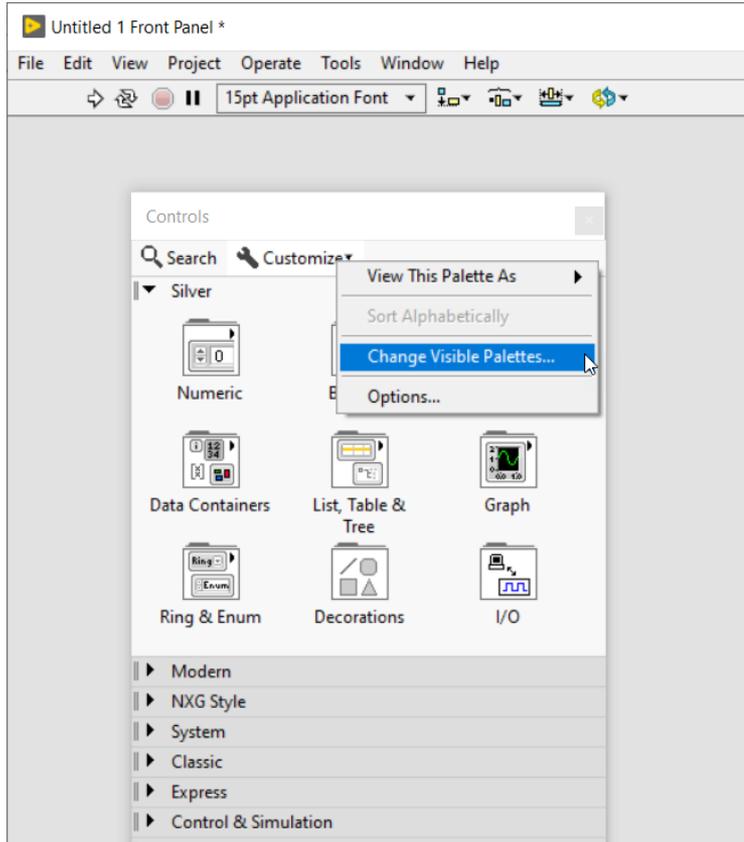
Customizing LabVIEW IDE

Hans-Petter Halvorsen

Customizing LabVIEW IDE



Change Visible Palettes



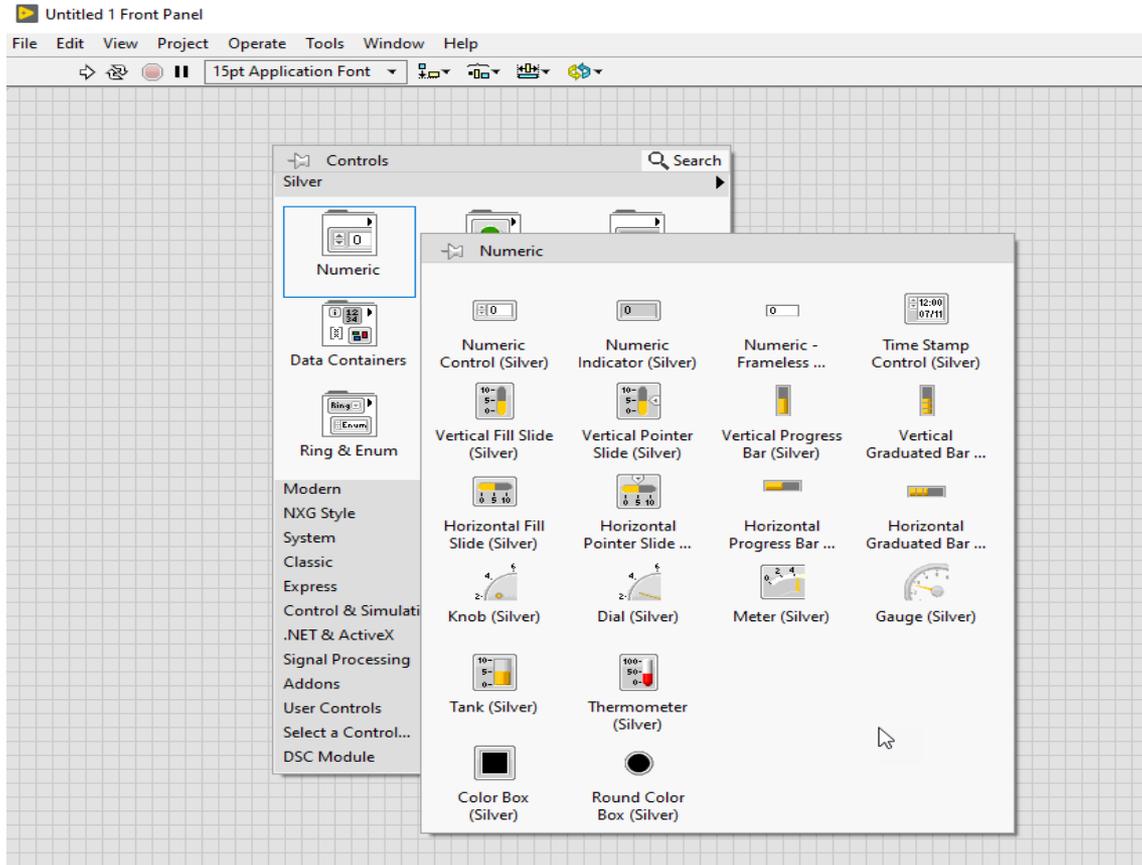
<https://www.halvorsen.blog>



LabVIEW Palettes

Hans-Petter Halvorsen

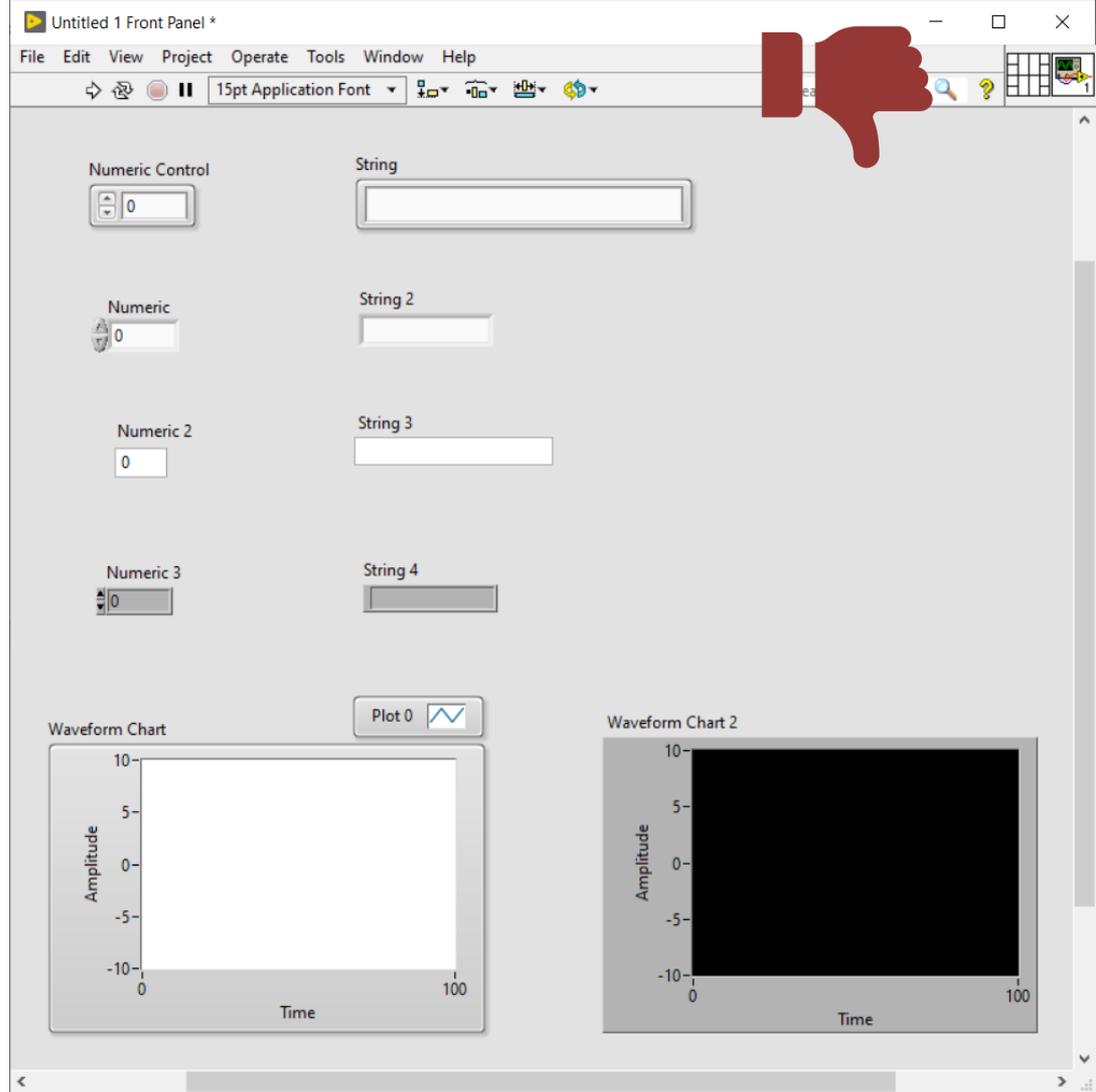
LabVIEW Palettes



LabVIEW Palettes

- In LabVIEW we have different palettes for creating user interface objects, like Modern, System, Silver, Classic, etc.
- You decide which of those you want to use, but please don't mix controls from different palettes. Stick to one of them.
- Personally, I think "Silver" or the newest "Fuse Design" have a modern and fresh look

Don't mix
Controls from
different
Palettes



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Make Current Value Default

Hans-Petter Halvorsen

Make Current Value(s) Default

Numeric Control

- Visible Items ▶
- Find Terminal
- Change to Indicator
- Change to Array
- Make Type Def.
- Description and Tip...
- Create ▶
- Replace ▶
- Data Operations ▶**
 - Reinitialize to Default Value**
 - Make Current Value Default**
 - Cut Data
 - Copy Data
 - Paste Data
- Advanced ▶
- Fit Control to Pane
- Scale Object with Pane
- Representation ▶
- Data Entry...
- Display Format...
- Properties

Untitled 1 Front Panel *

File	Edit	View	Project	Operate	Tools	Window	Help
Undo Move							Ctrl+Z
Redo							Ctrl+Shift+Z
Cut							Ctrl+X
Copy							Ctrl+C
Paste							Ctrl+V
Delete							
Select All							Ctrl+A
Make Current Values Default							
Reinitialize Values to Default							
Customize Control...							
Import Picture to Clipboard...							
Set Tabbing Order...							
Remove Broken Wires							Ctrl+B
Clean Up Panel							Ctrl+U
Remove Breakpoints from Hierarchy							
Create VI Snippet from Selection							
Create SubVI							
Create Simulation Subsystem							
Enable Panel Grid Alignment							Ctrl+#
Align Items							Ctrl+Shift+A
Distribute Items							Ctrl+D
VI Revision History...							Ctrl+Y
Run-Time Menu...							
Adjust Pane Origin							
Find and Replace...							Ctrl+F
Show Search Results							Ctrl+Shift+F

Numeric Control

Numeric Control 2

Numeric Control 3

Numeric Control 4

Numeric Control 5

Numeric Control 6

<https://www.halvorsen.blog>



Resizing the Window Size

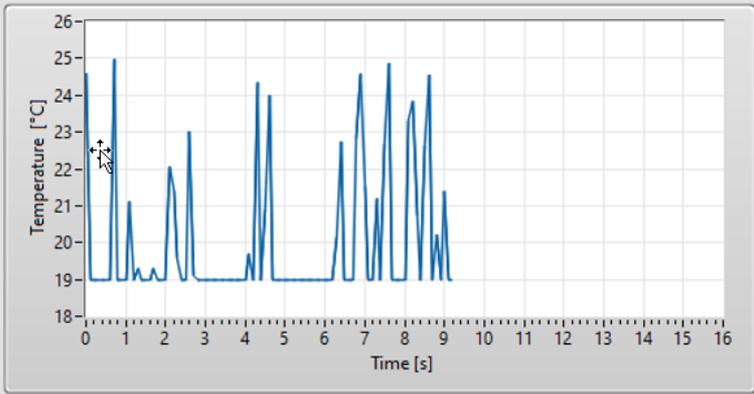
Hans-Petter Halvorsen

Resizing the Window Size

- You don't need to show lots of "empty" space
- Resize the window size so it fits your GUI (Front Panel) and your code (Block Diagram)
- The Save it (Ctrl +S). It will be like this next time you open your application!

Temperature [°C]

19.0



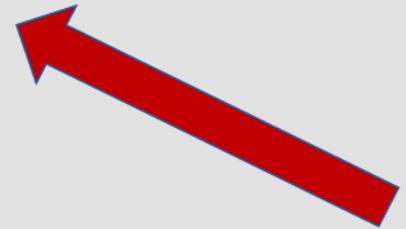
Stop



There is no need to show all this "Empty" space in your GUI

There is no need to show all this "Empty" space in your GUI

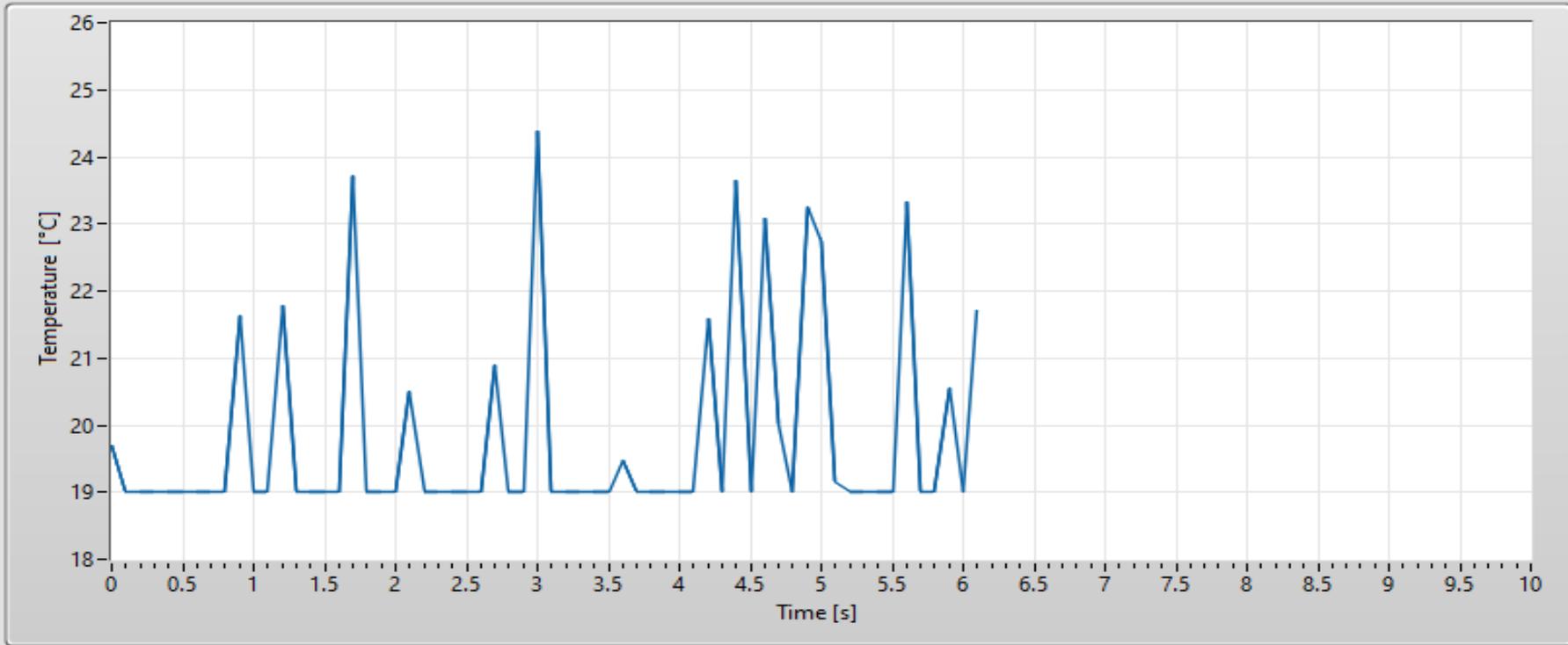
Use your mouse to drag the in the corner to make the size of the window fits your GUI elements. Then when you save your VI, it will appear like this next time you open it. The same applies to the Block Diagram





Temperature [°C]

21.7



■ Stop

<https://www.halvorsen.blog>

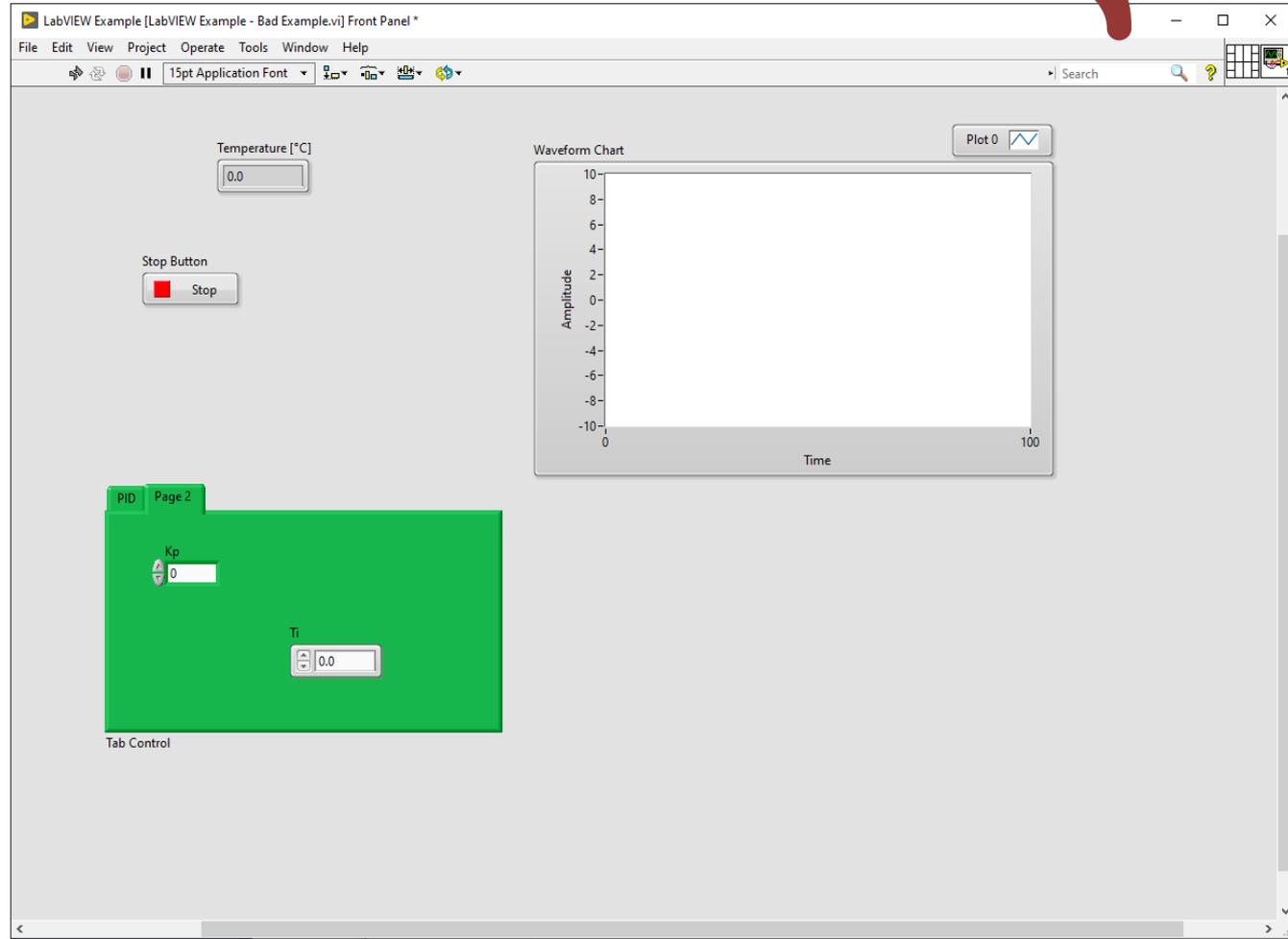


Don't use “strong” Colors

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Colors

- Don't use more colors than you need
- It should look like an ordinary Windows Application



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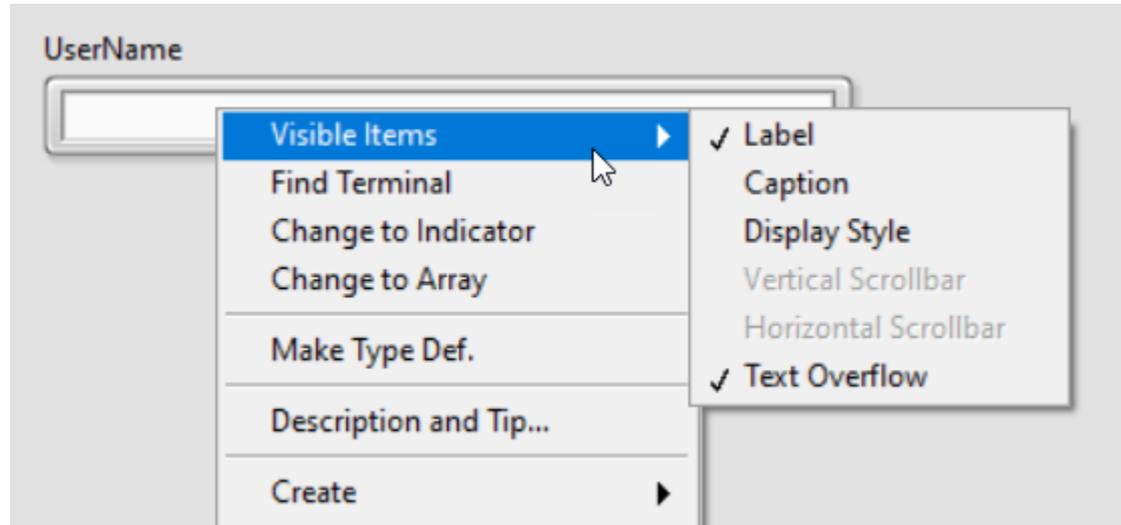


Labels and Captions

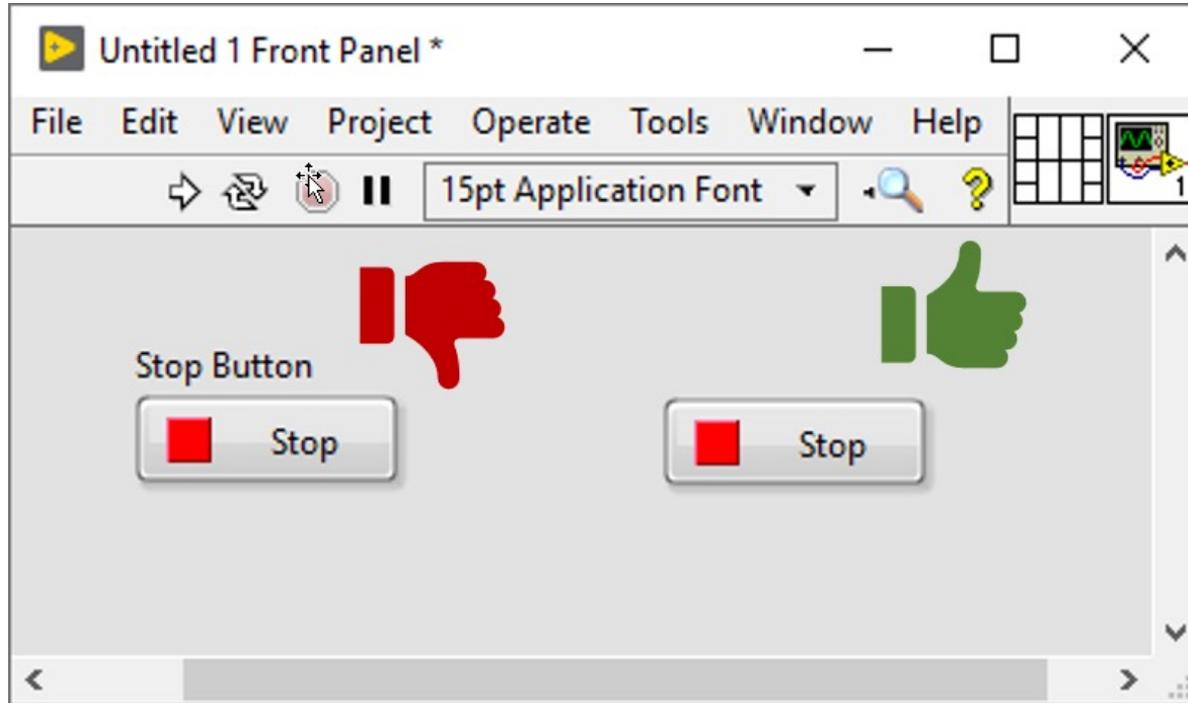
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Labels and Captions

- Hide Labels
- Use Captions in your GUI (Front Panel)

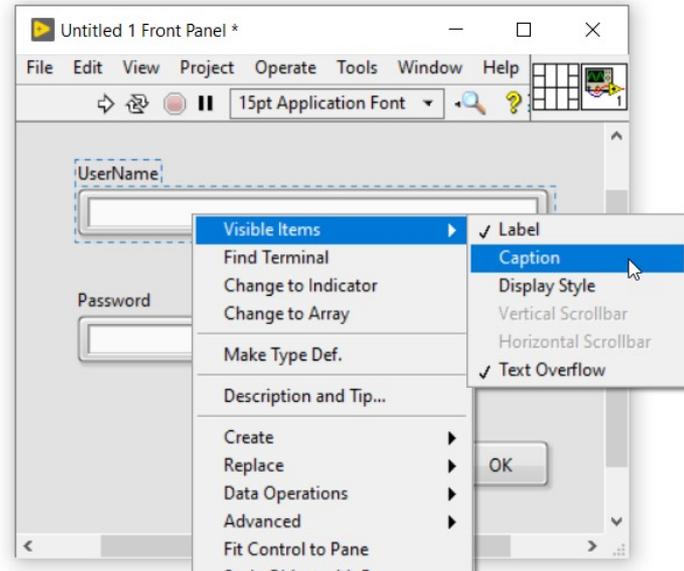


Hide Labels when not needed



Labels vs Captions

- Labels -> Code (Block Diagram)
- Captions -> GUI (Front Panel)



Labels vs Captions



Untitled 1 Block Diagram *

File Edit View Project Operate Tools Window Help

15pt Application Font

UserName

abc

Password

abc

Untitled 1 Front Panel *

File Edit View Project Operate Tools Window Help

15pt Application Font

User Name:

Enter Password:

OK

This block diagram shows two objects, 'UserName' and 'Password', each with a label 'abc' and a text box containing 'abc'. The 'Front Panel' window shows the corresponding GUI with labels 'User Name:' and 'Enter Password:' above empty text boxes, and an 'OK' button at the bottom right.

Labels -> Code (Block Diagram)
Captions -> GUI (Front Panel)

Untitled 1 Front Panel *

File Edit View Project Operate Tools Window Hel

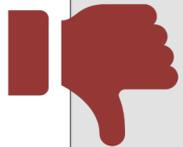
15pt Application Font

UserName

Password

OK

This front panel window shows a GUI with labels 'UserName' and 'Password' above empty text boxes, and an 'OK' button at the bottom right.



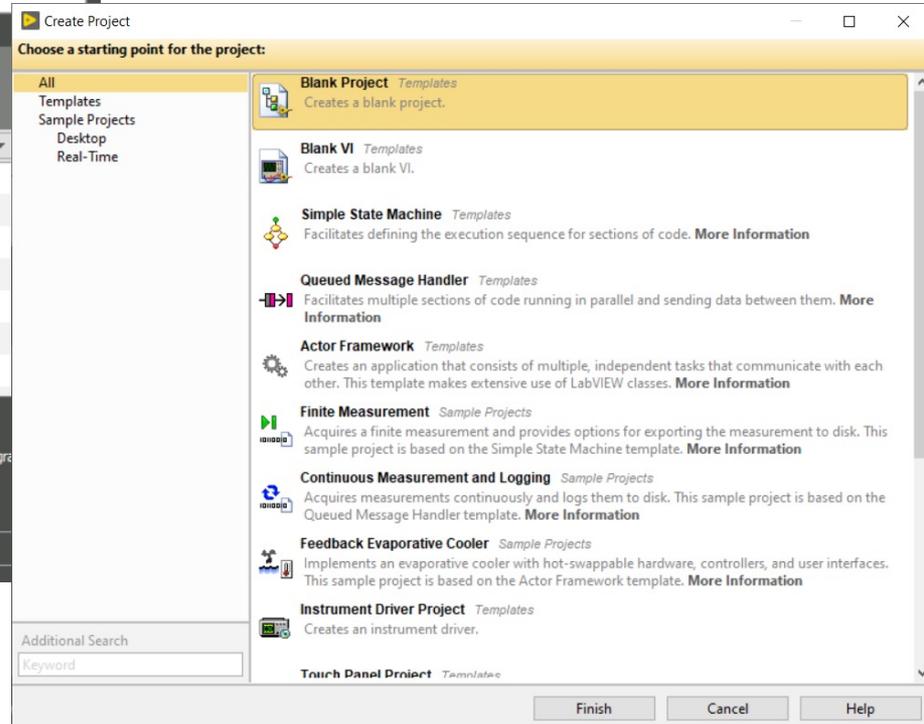
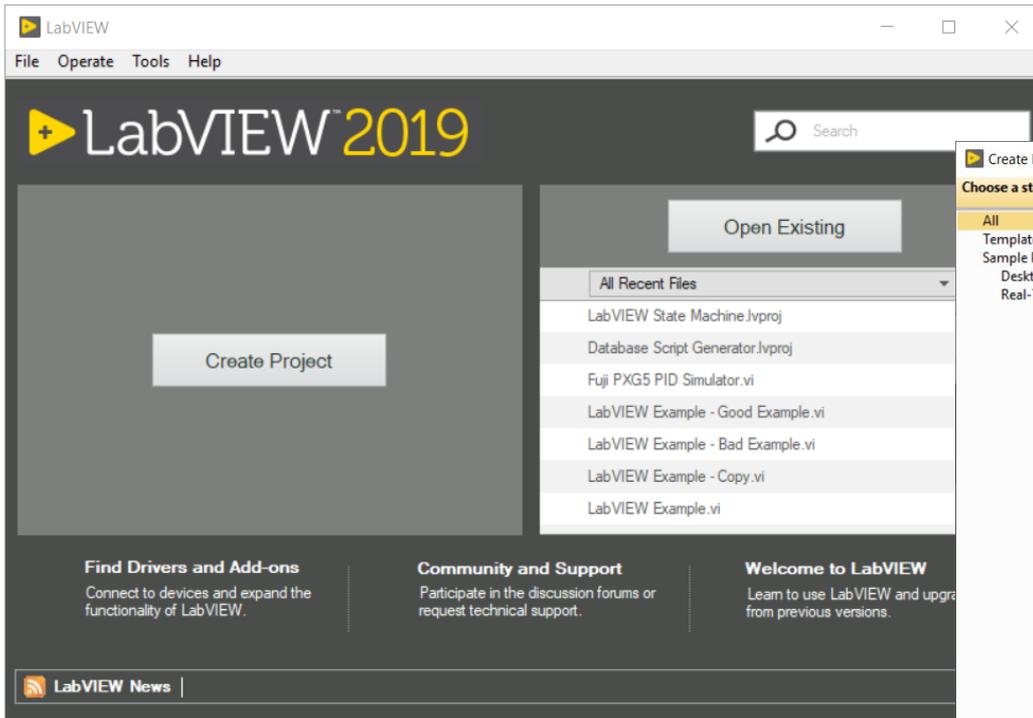
<https://www.halvorsen.blog>



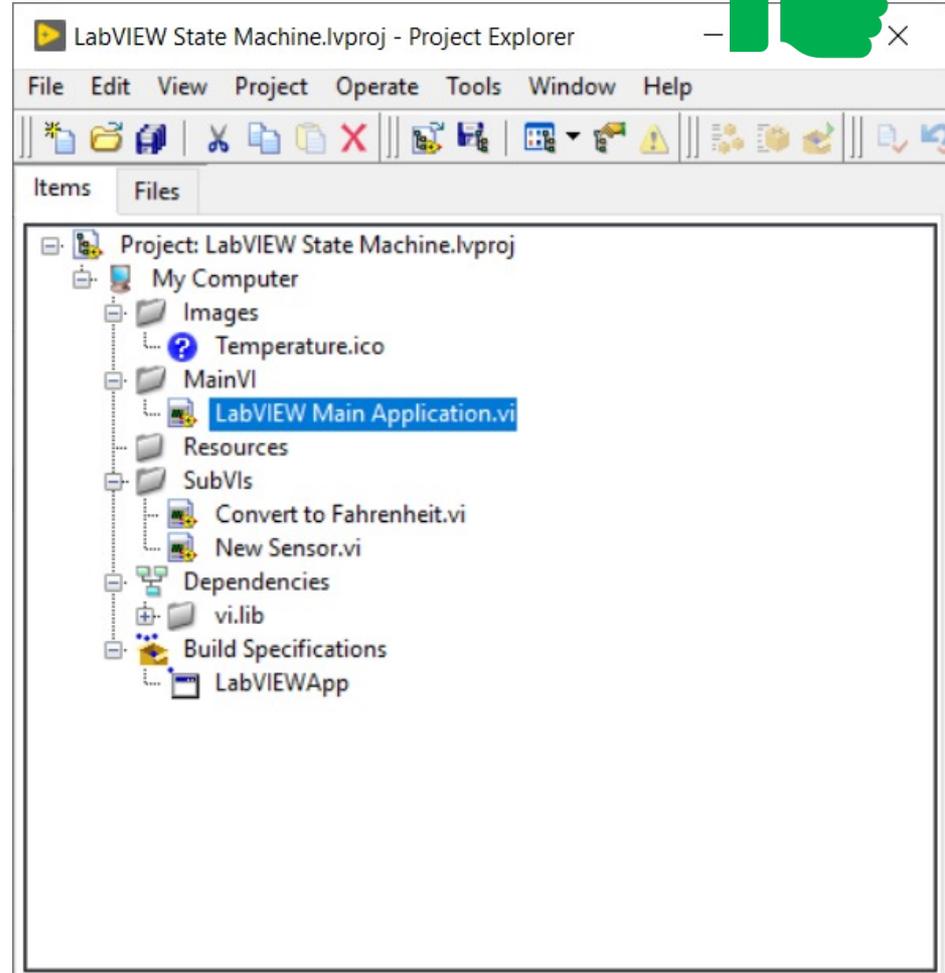
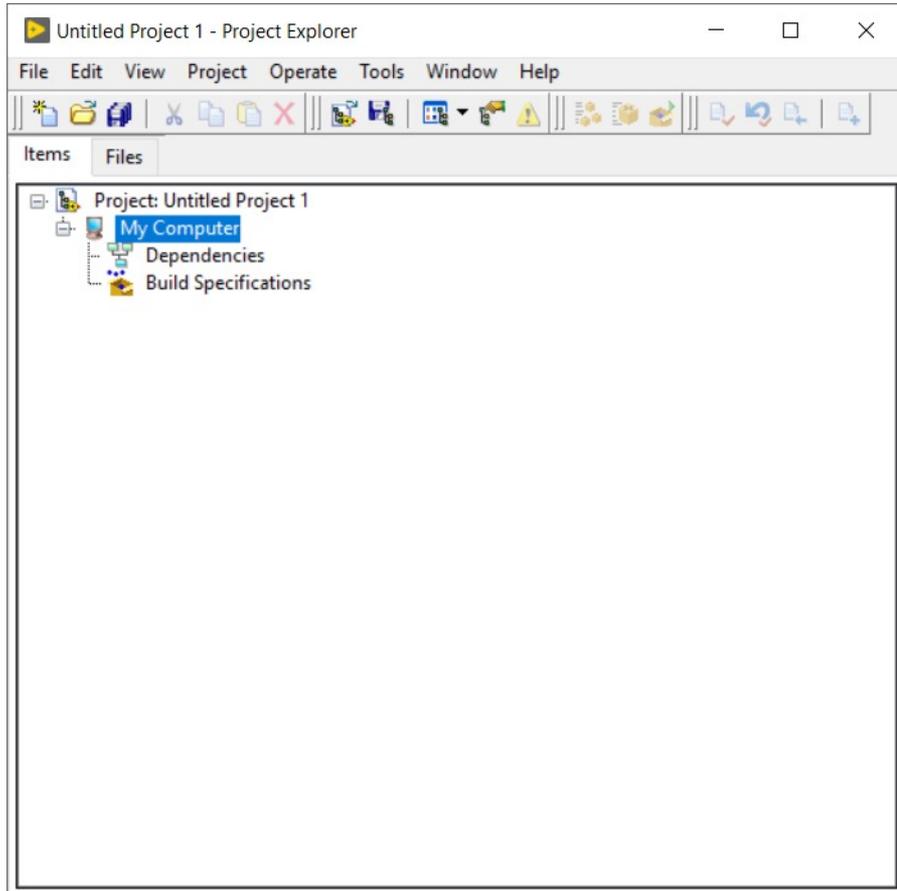
Project Explorer

Hans-Petter Halvorsen

Project Explorer



Project Explorer



Project Explorer

- You should always use the Project Explorer even for simple applications
- Like the “Solutions Explorer” in Visual Studio it Keeps all your Files for a specific project in one place

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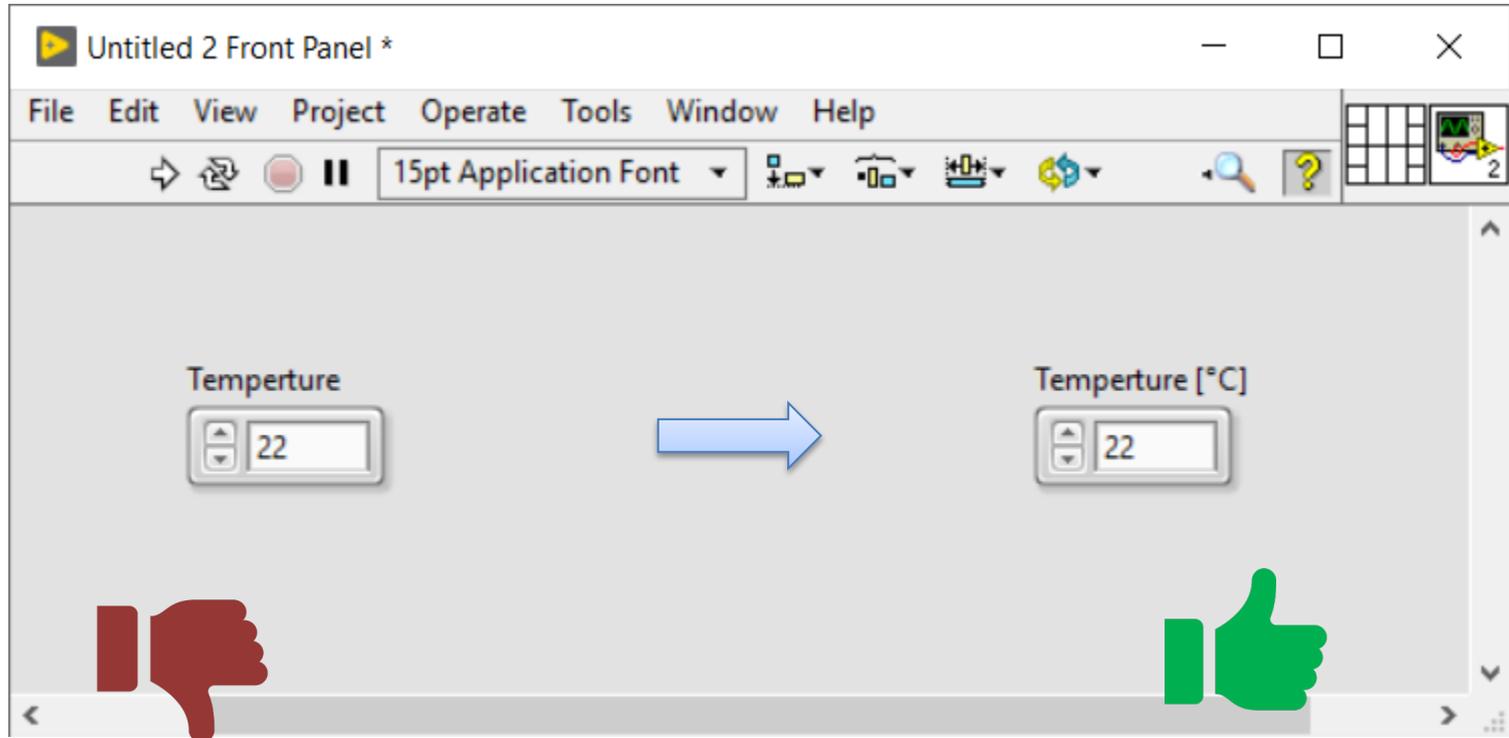
Units

Hans-Petter Halvorsen

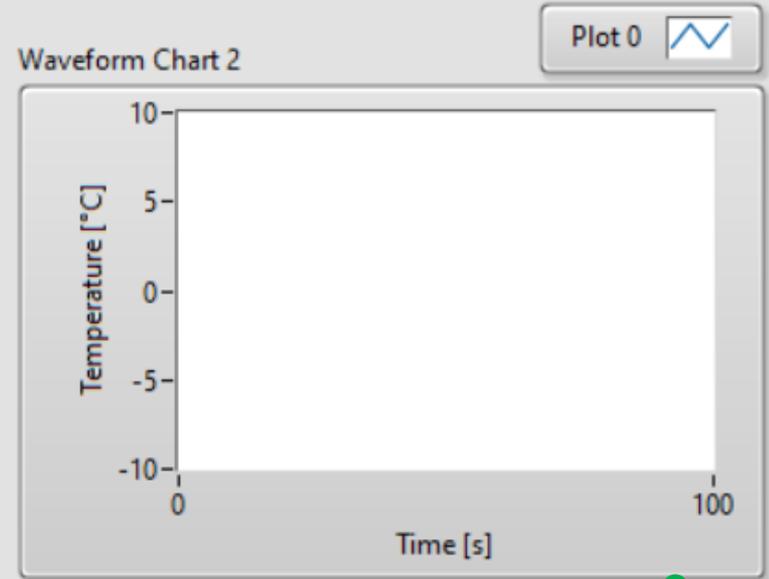
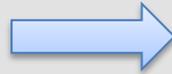
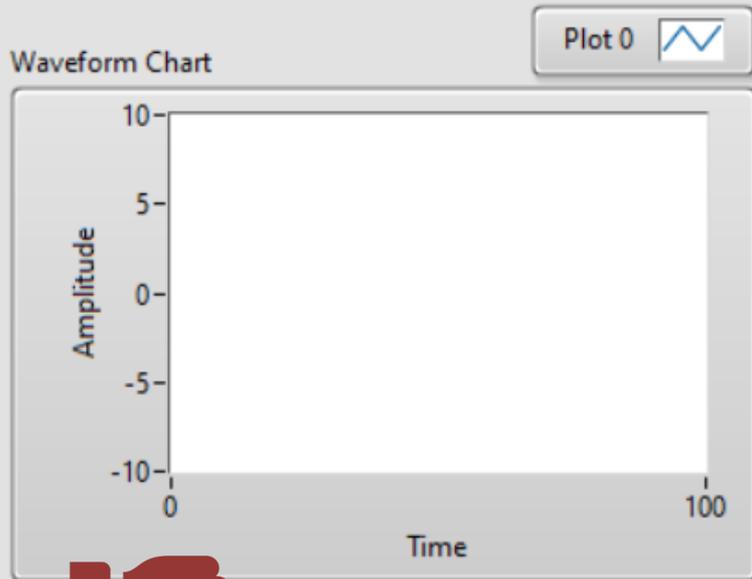
Add Units

- A value without a Unit is useless
- Make sure to always add a Unit in Controls, Indicators or in Plots/Charts

Add Units



Add Units in Charts (both x axis and y axis)



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Number of Decimals

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Number of Decimals

Make sure to read the Datasheet and use common sense

The screenshot shows a software window titled "Untitled 2 Front Panel *". The menu bar includes "File", "Edit", "View", "Project", "Operate", "Tools", "Window", and "Help". The toolbar contains icons for navigation, a font size dropdown set to "15pt Application Font", and other tool icons. The main workspace contains two "Temperature [°C]" labels. The left one has a numeric input field with the value "22.3567" and a red thumbs-down icon below it. A blue arrow points from this field to the right one, which has the value "22.3" and a green thumbs-up icon below it. The bottom of the window has a scrollbar and navigation arrows.

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SubVIs

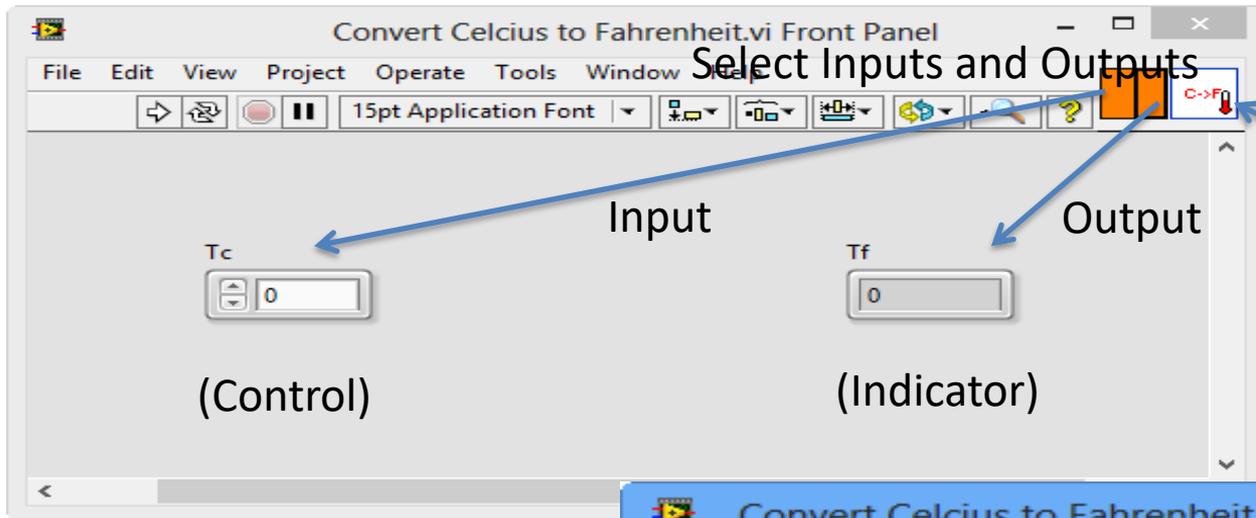
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SubVIs

- A SubVI is the same as a function or a method used in other languages
- Hundreds or thousands of SubVIs are included with LabVIEW
- But even better: You can create and use your own SubVIs

Why create and use SubVIs?

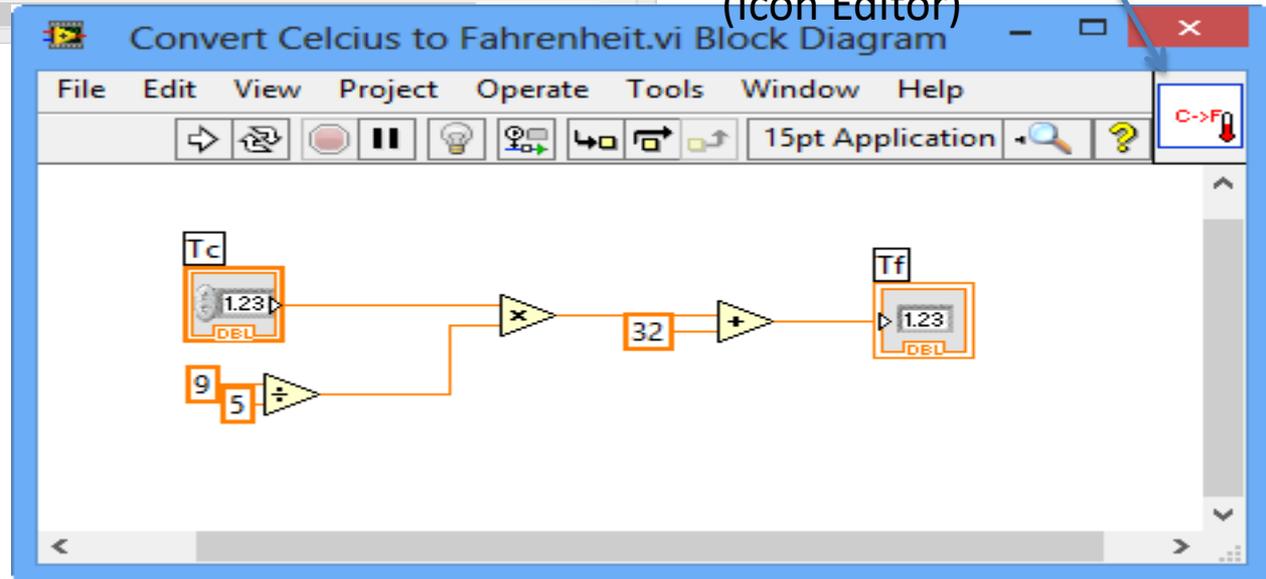
- You need to use the same operation many times in your code
- Reuse your code
- Hide complicated code
- Easier to maintain your code
- Easier to find bugs and repair them
- ...



SubVIs

Icon that makes it easier to understand what the SubVI is doing

Create a nice icon as well (Icon Editor)



A SubVI is the same as a function or a method used in other languages

$$T_F = \frac{9}{5} T_C + 32$$

Icon Editor

Use the Icon Editor in order to create a descriptive icon for your SubVI.

Icon Editor (Convert Celcius to Fahrenheit.vi)

Templates | **Icon Text** | Glyphs | Layers

Line 1 text Line 1 color

Line 2 text Line 2 color

Line 3 text Line 3 color

Line 4 text Line 4 color

Font: Center text vertically

Alignment: 10 Capitalize text

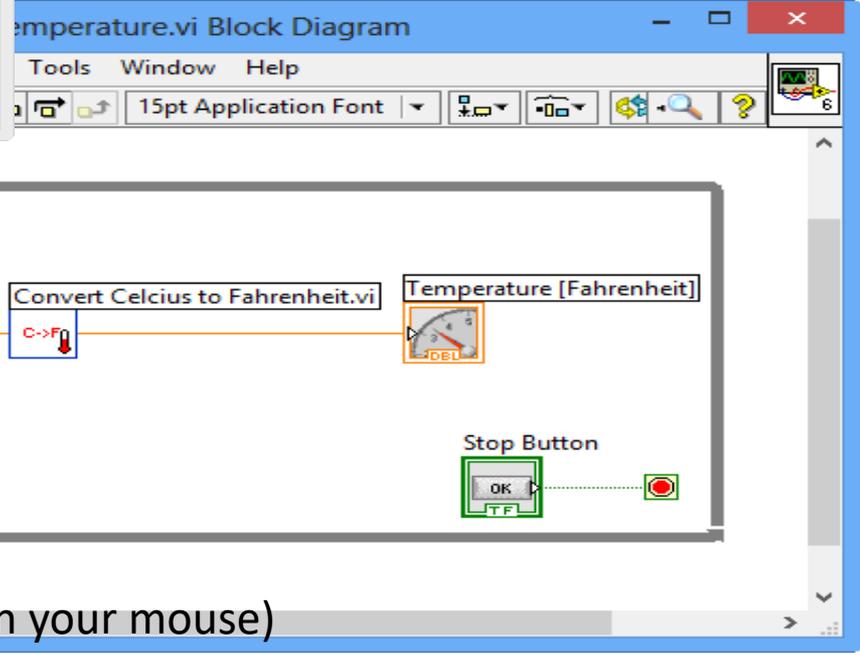
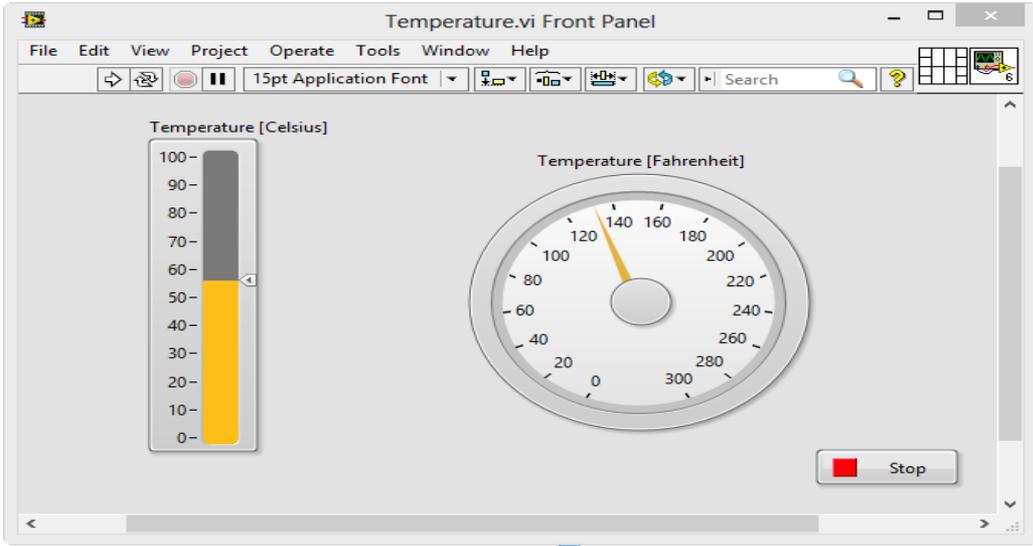
Color palette:

Preview:

Color values: R: 0 X: 0
G: 65 Y: 0
B: 220 Z: 2

Buttons: OK Cancel Help

Using SubVIs



SubVI created in previous slide
(just drag it on the Block Diagram with your mouse)

LabVIEW SubVIs Video

- For details, see the Video “LabVIEW SubVIs”:
https://youtu.be/yN_JRbM_mys

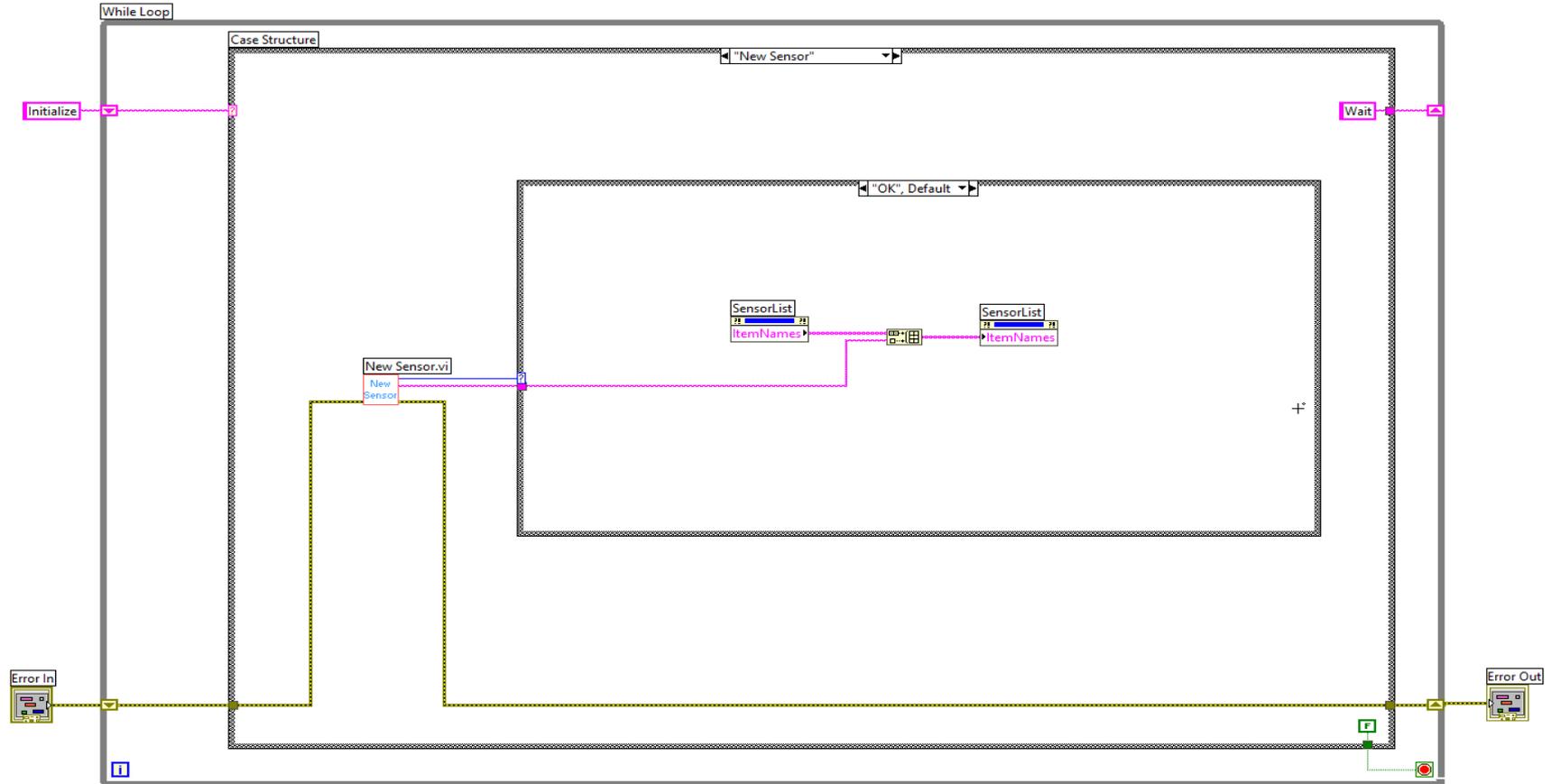
<https://www.halvorsen.blog>



LabVIEW State Machine

Hans-Petter Halvorsen

State Machine



State Machine

- Typically engineers often create simple LabVIEW VIs that eventually grow out of control, because they don't have the proper structure and best practices. The solution to this problem is organizing your code and data in a way that enables modularity, readability, and reuse. Using a state machine approach is a good way to make it right from the early beginning.
- The state machine is one of the fundamental architectures LabVIEW developers frequently use to build applications.
- In LabVIEW software, you can create a basic state machine with a While loop, a Shift Register, a Case Structure, and some form of case selector.

State Machine

- I will show a State Machine that I have already made.
- For details, see the Video “LabVIEW Applications using State Machine”:
<https://youtu.be/-b9St8wNhpQ>
- Here I will through how to create and use a State Machine in detail.

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Web: <https://www.halvorsen.blog>

YouTube: <https://www.youtube.com/IndustrialITandAutomation>

