

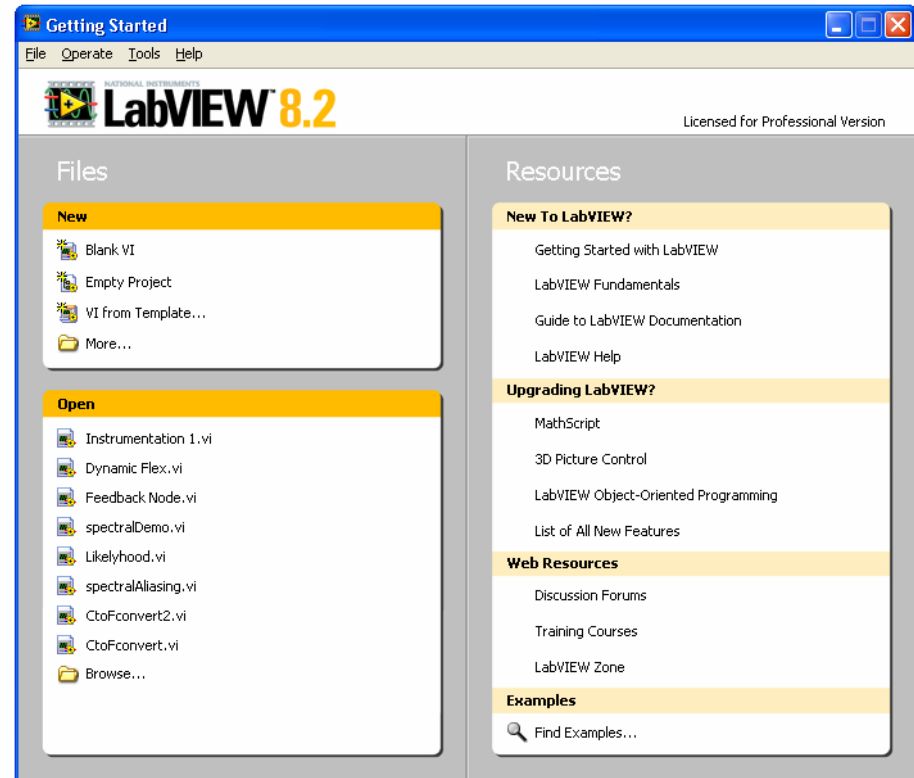
AOE 3054 LabView Programming

Starting LabView

- Let's begin by opening LabView
 - From the Start Menu, Locate and start LabView 8.2

• If this is your first time running LabView you may get a 'Windows Security Alert' dialog. If so, select the 'Unblock' button.

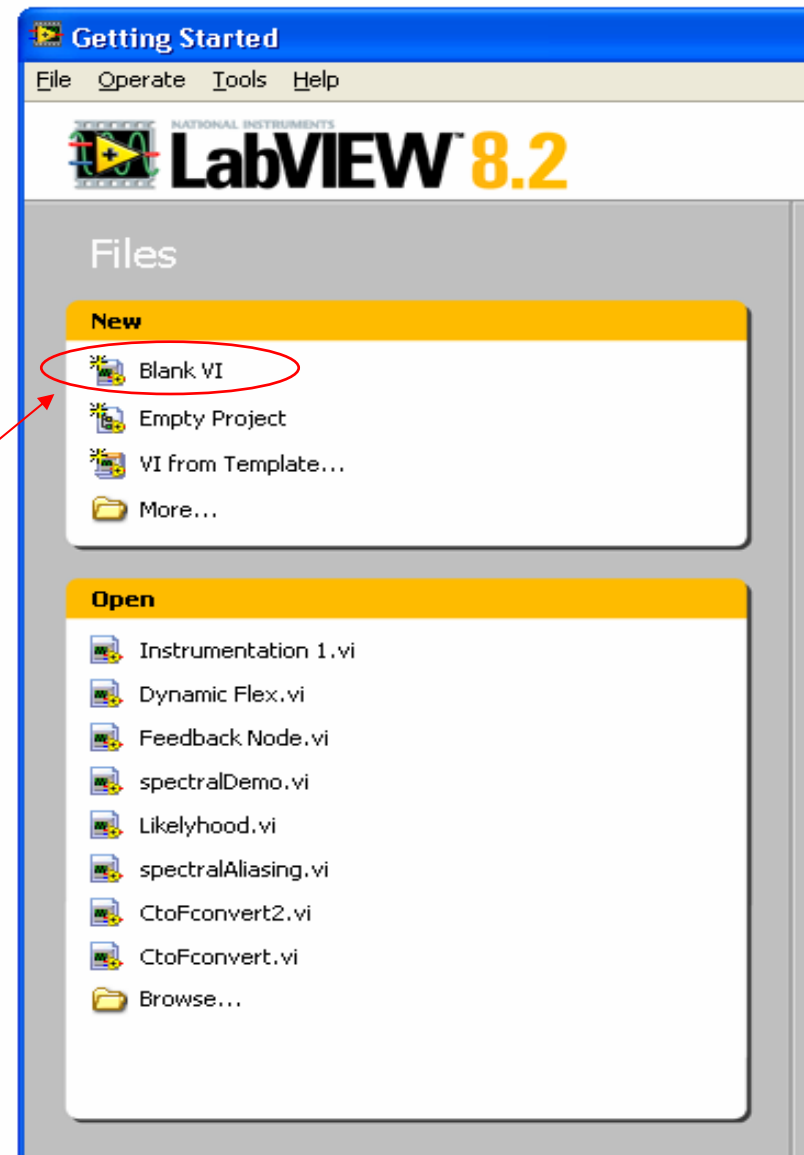
• You may also get a 'Welcome to Labview' dialog. In that case just select the 'Continue' button.



LabVIEW Programs

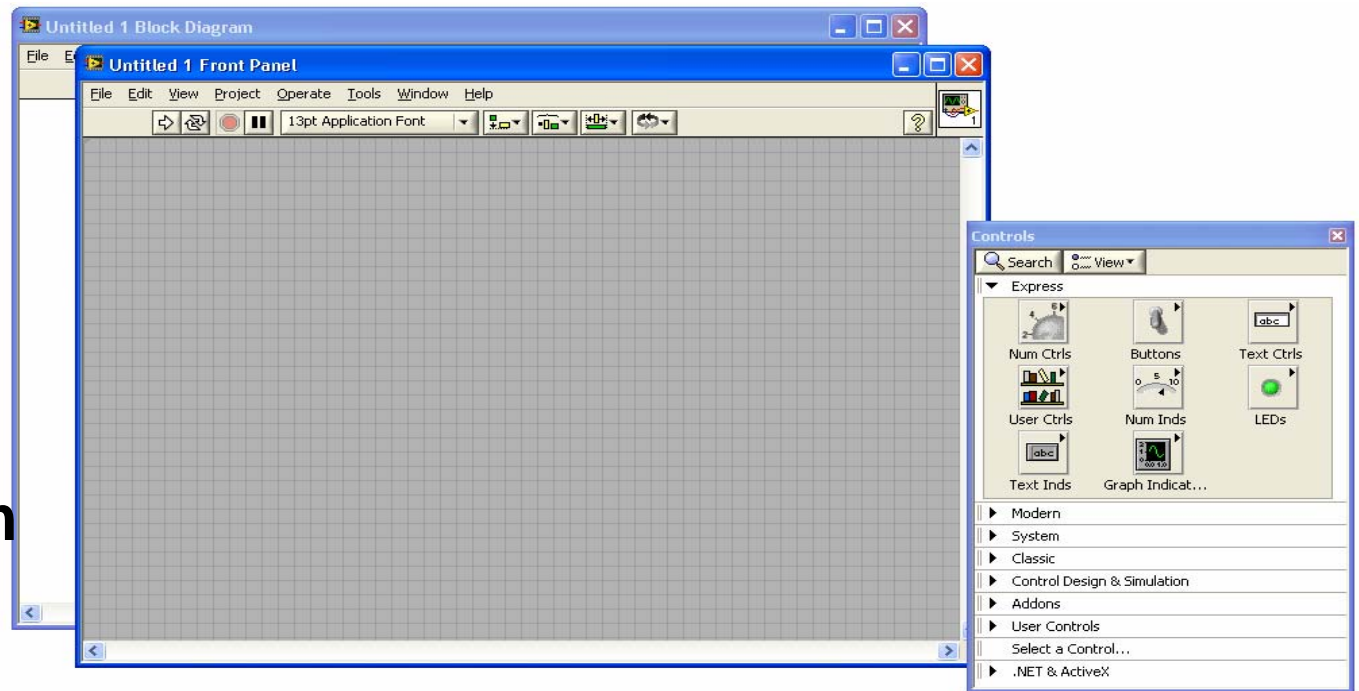
- National Instruments uses programs that are called VI's. This stands for **Virtual Instrument**. It considers each program a tool as one would use a meter or oscilloscope.

- To begin a new program (or VI) click the New... **Blank VI** icon



Programming Environment

- What appears is the *programming environment*.
- It consists of two windows, the **Front Panel** and the **Block diagram** windows.

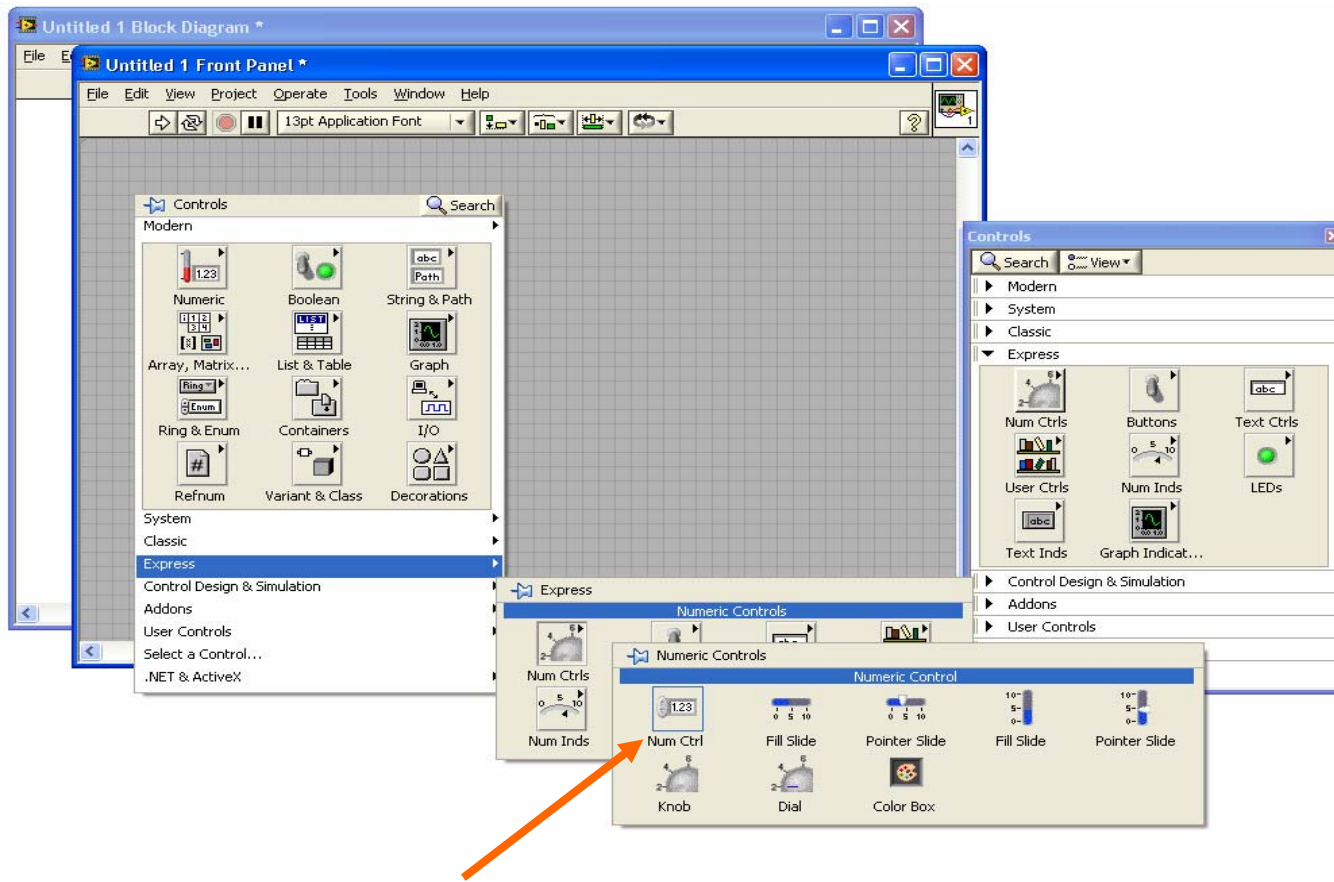


- The front panel is where we put the controls (buttons, knobs, etc) and indicators (Lights, displays or graphs).
- The Block Diagram is where the graphical program will be.
- The controls window will also appear which contains objects which can be moved to the front panel.

Programming-The C to F Converter

- Let's first do a simple program to convert Temperature from C° to F°. First we need to add a numerical control. To access the controls pallet you can either use the control pallet window, already open or open a new one by right clicking on the front panel.
 - Right click on the Front Panel,
 - Select Num Ctrls,
 - Num Ctrl.

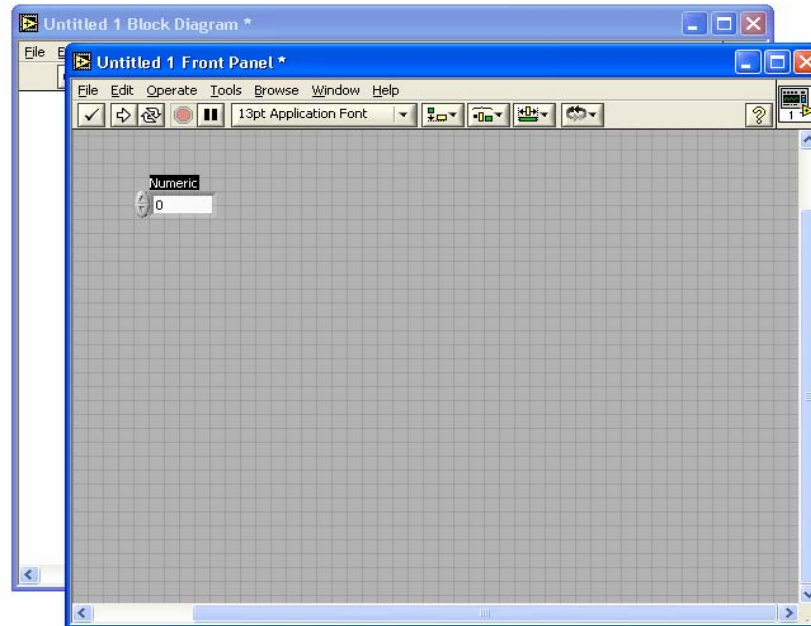
Select Numeric Control



Controls Pallets hold all kinds of front panel objects. The **express pallet** is the third menu choice in the popup list. From it you can get to the commonly used controls.

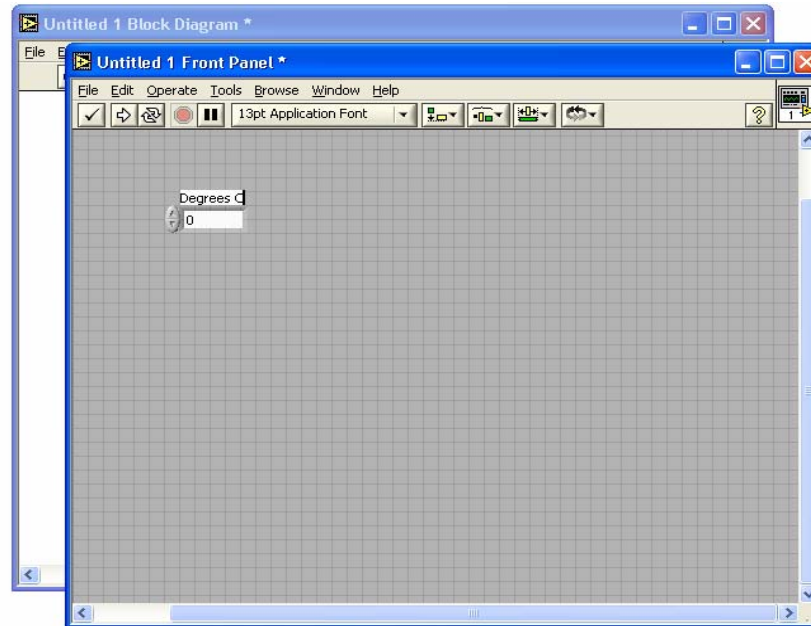
- Clicking this will attach to the pointer a control outline and you can select where you want it placed on the Front Panel.
- Place one in the upper left portion of the panel

Rename the control “Degrees C”



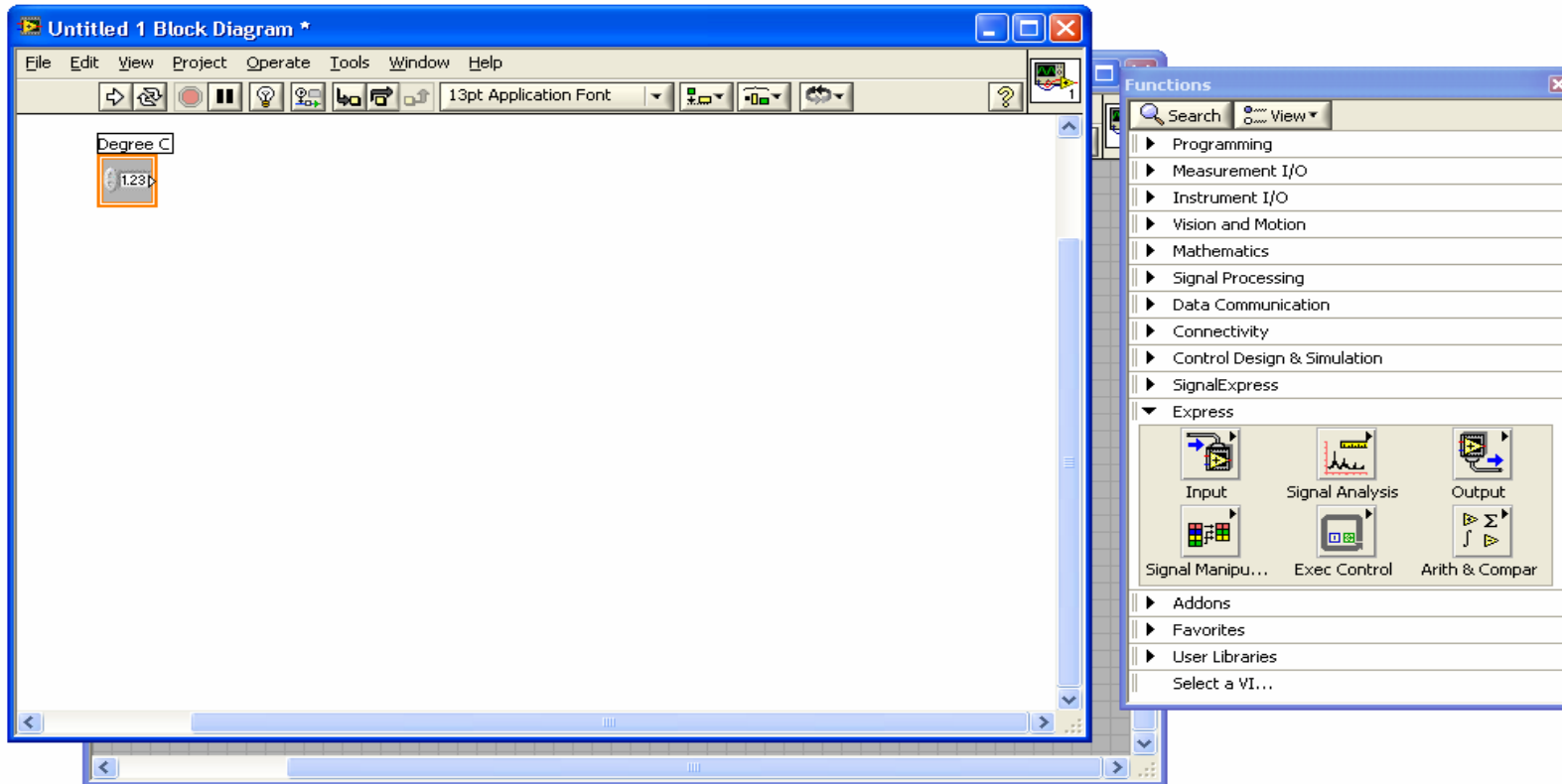
- After you drop the control, it highlights the name ready for you to rename it.
- Just drop the control and start typing the name “Degrees C”. You can always go back and double click the name to change it. Changing the name as you place it will speed up programming time when you are doing large programs.

Rename the control “Degrees C”



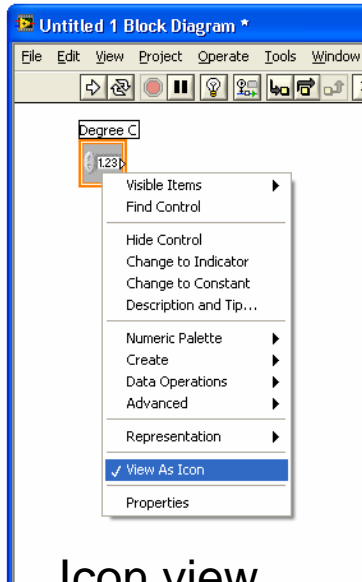
- After you drop the control, it highlights the name ready for you to rename it.
- Just drop the control and start typing the name “Degrees C”. You can always go back and double click the name to change it. Changing the name as you place it will speed up programming time when you are doing large programs.

Observe the Block Diagram

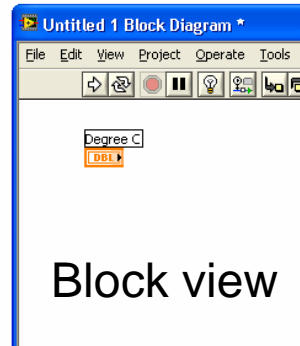


- Notice the Block diagram has a terminal for the control you just placed on the front panel, and the controls pallet changes to the functions pallet.

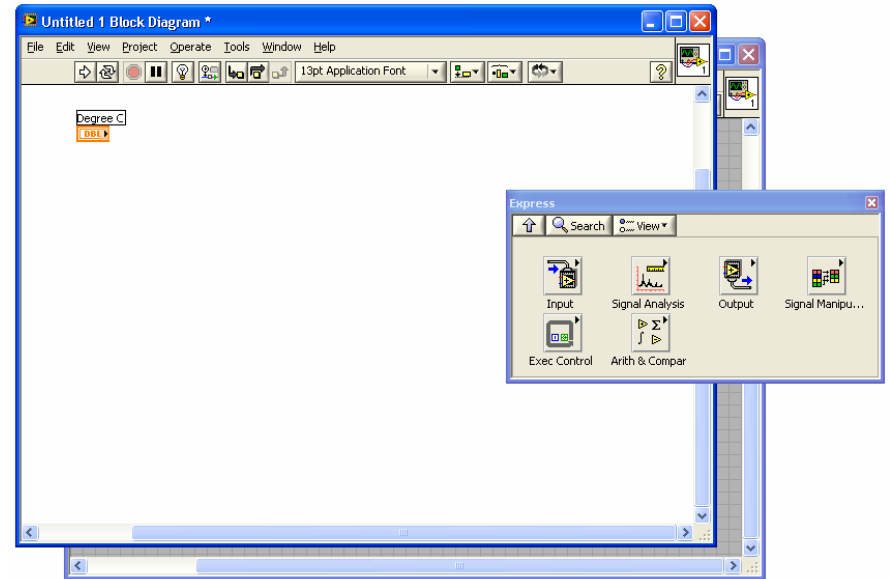
Viewing options



Icon view



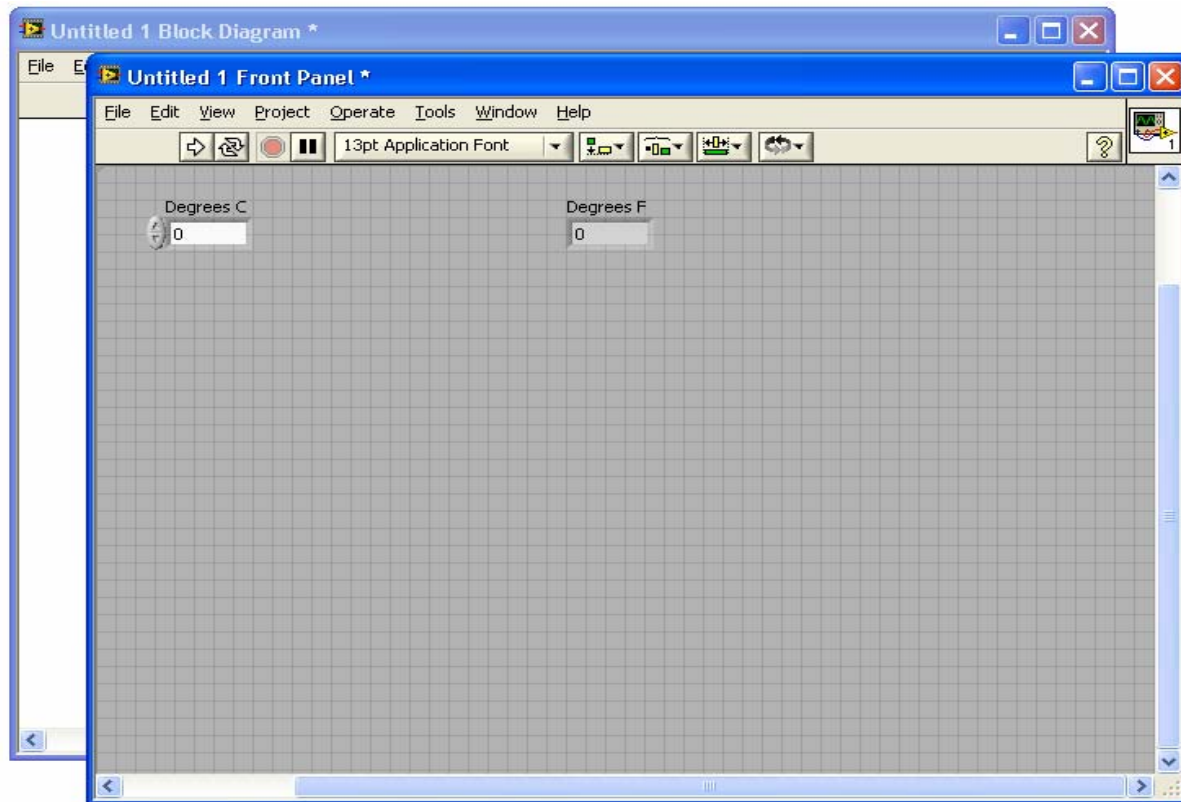
Block view



By default Labview displaces objects on the block diagram as icons. By right clicking on an object you display the object as a smaller block which makes larger programs easier to see.

Clicking the tack at the top of the express menu will allow you to keep this menu on the screen when in the block diagram

Add an indicator



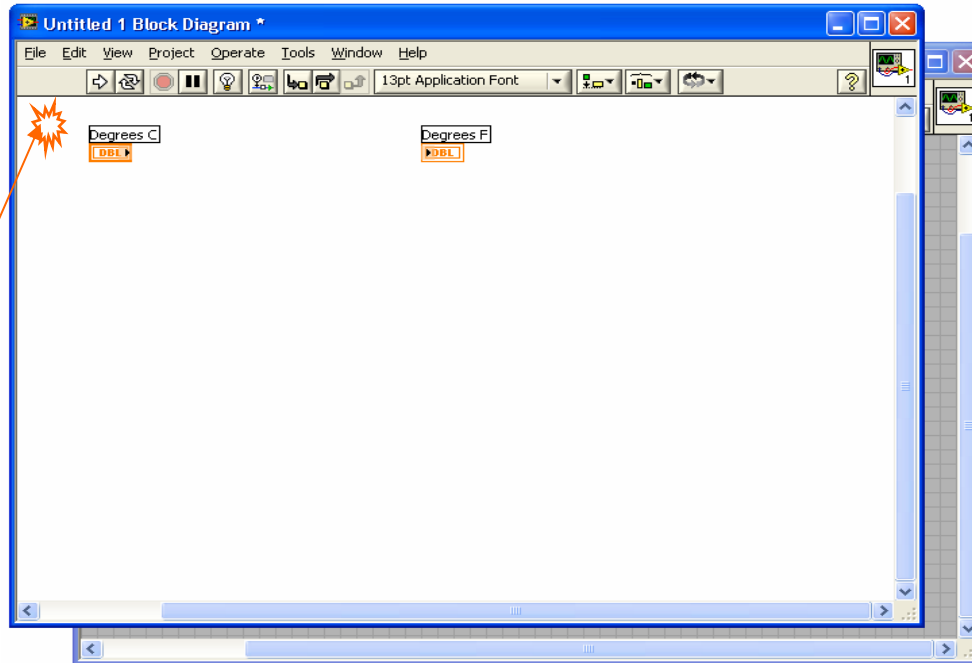
- Similarly, place a numeric indicator using the same process only select it from the indicators pallet and label it Degrees F
- Be careful: An 'indicator' is not the same as the 'control' we just added, and is found in a different part of the pallet

Block Diagram Program

- Now go to the Block Diagram Page.
- Right clicking in LabView is the key to doing most anything.
- From the Diagram a right click will open a similar tool pallet, but specific to block diagram programming.

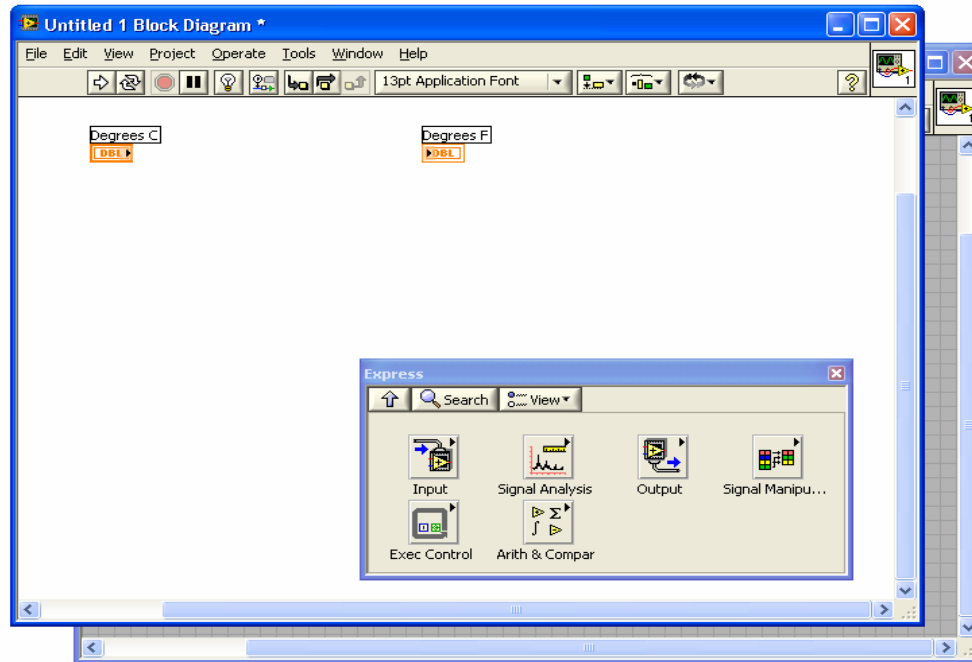
Block Diagram-Right Click

Right Click for
function pallet
to appear

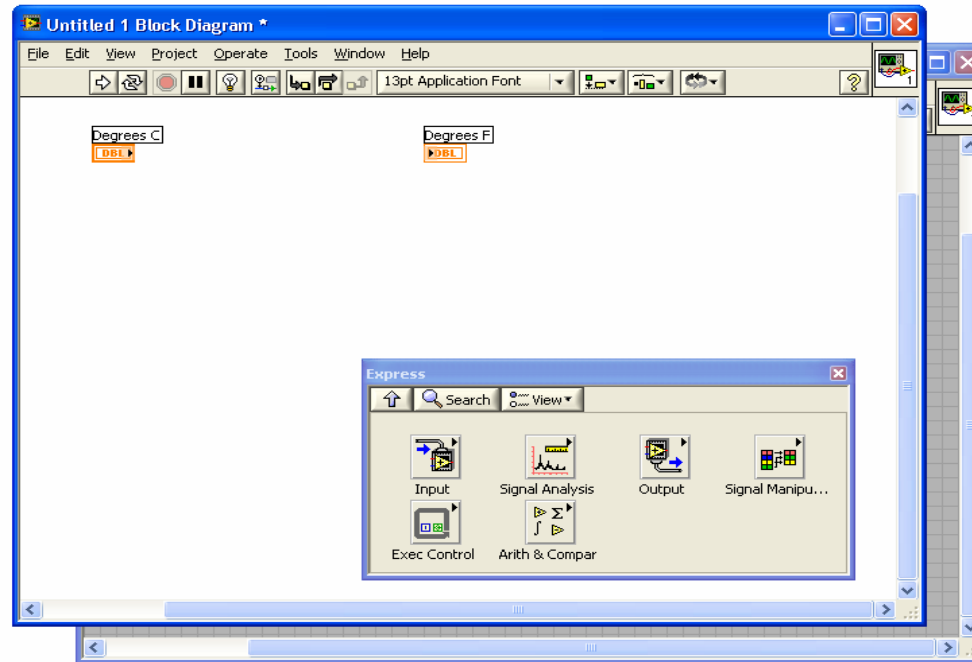


Block Diagram-Right Click

Click the tack on the express pallet to keep this pallet on the screen.



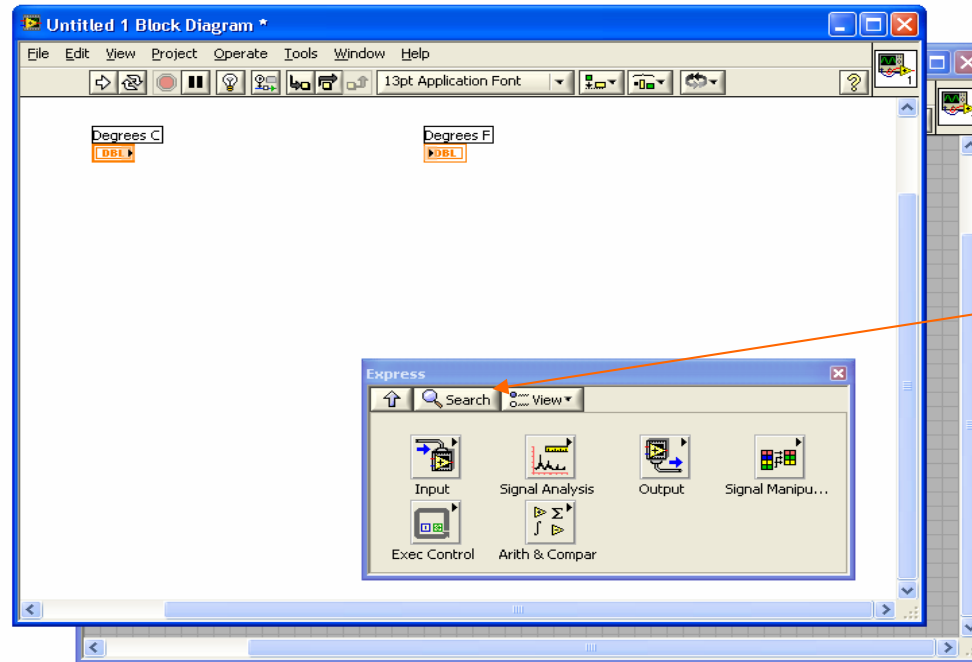
Block Diagram-Right Click



Like the *express controls pallet*, one exists for Functions. The common functions are accessed from this main pallet.

Functions are grouped into categories. We will see more as we go.

Block Diagram-Right Click



Search button

Also try the search button on this menu as it allows you to search the vast toolbox.

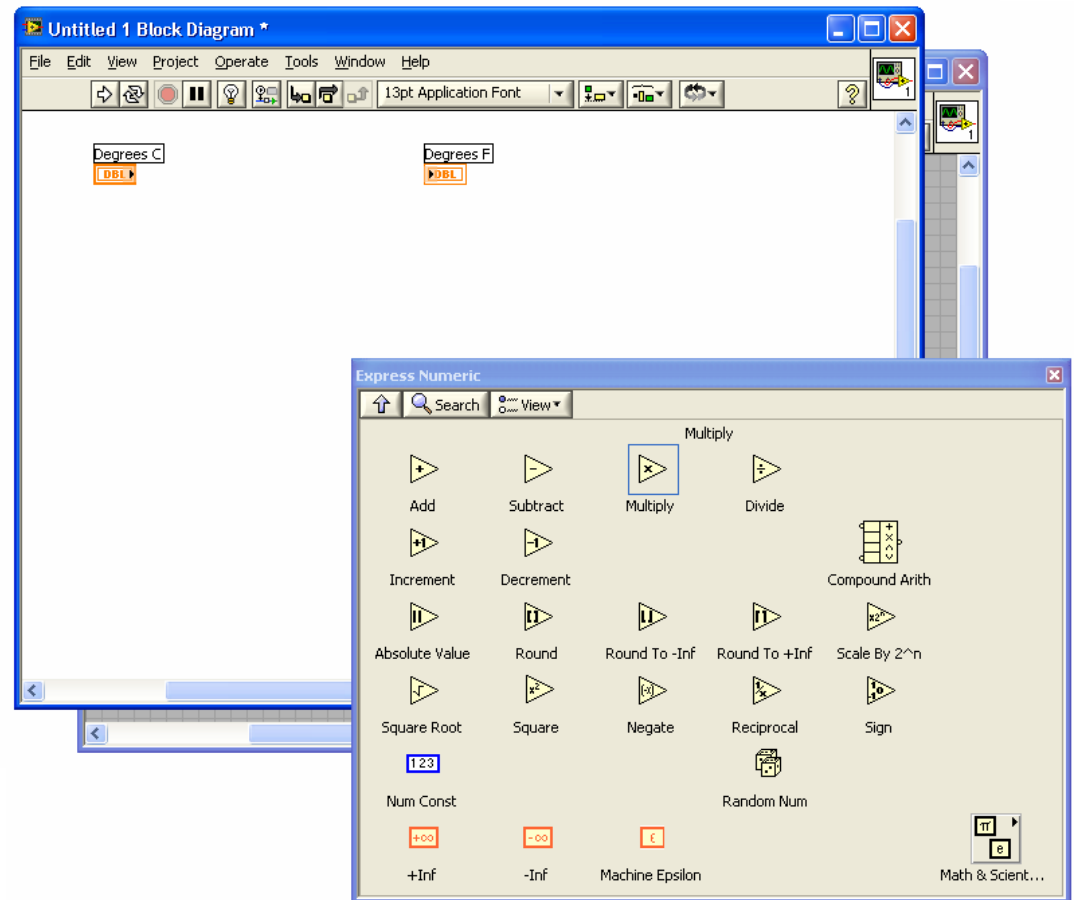
Multiply

Lets add a multiply function.

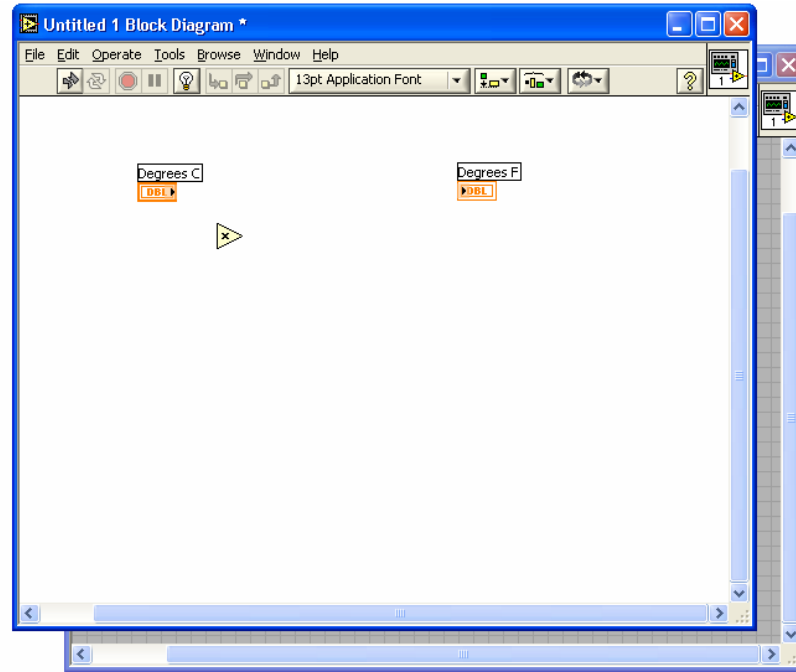
First click the Arithmetic and Comparison button.

Next click on the Numeric button.

Now we can select the Multiply icon.

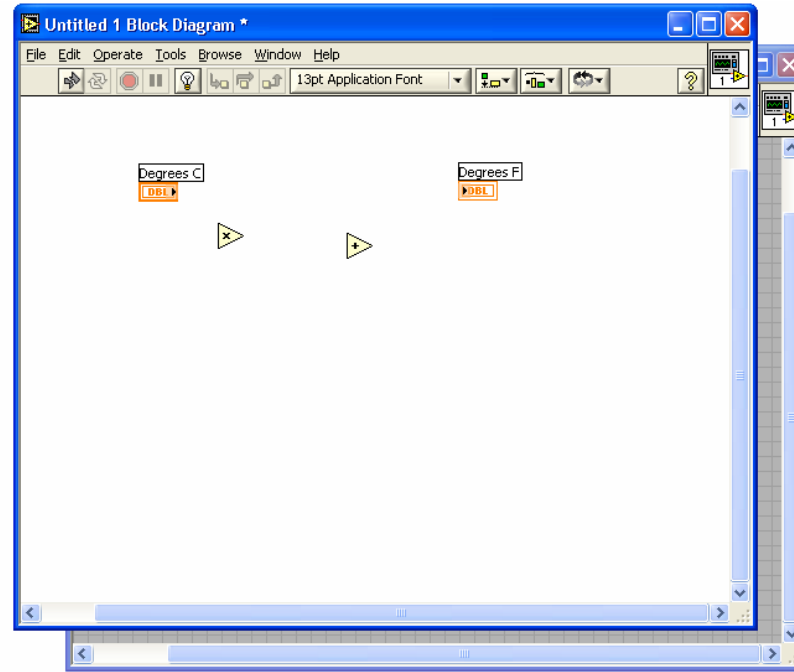


Multiply



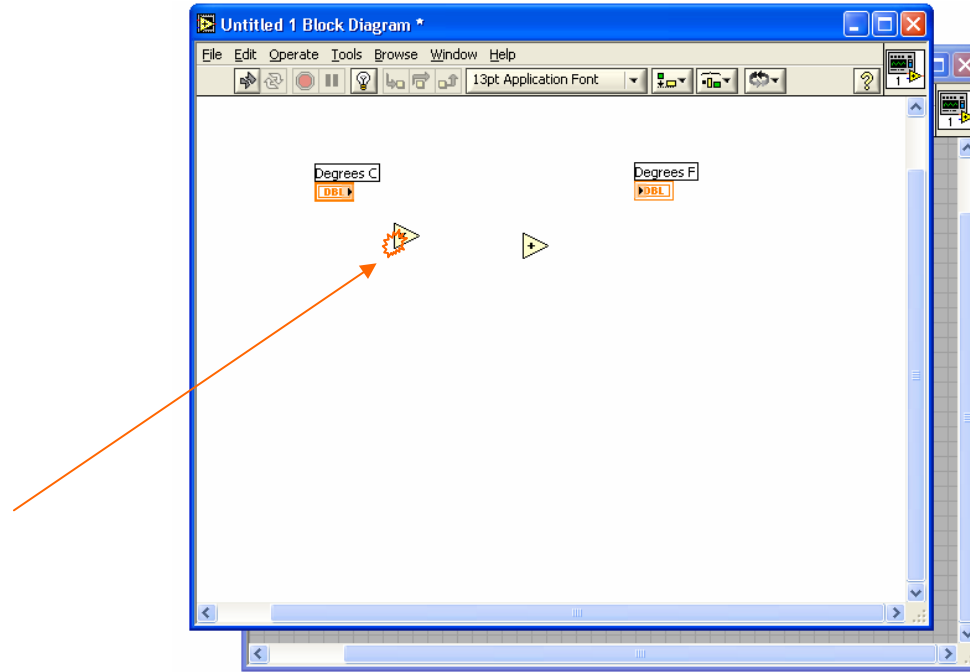
And place it near the Degrees C Terminal.

Add



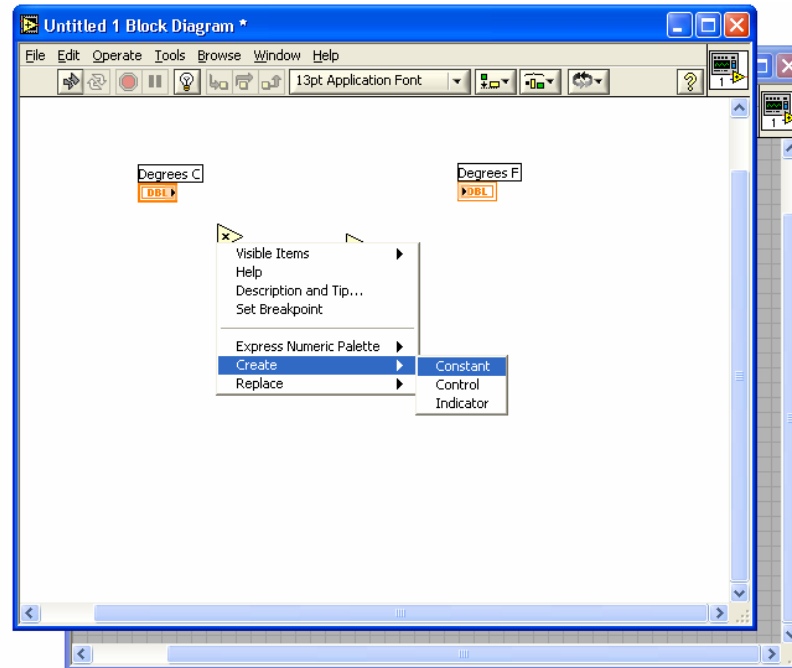
In the same manner place an addition function on the block diagram.

Constants



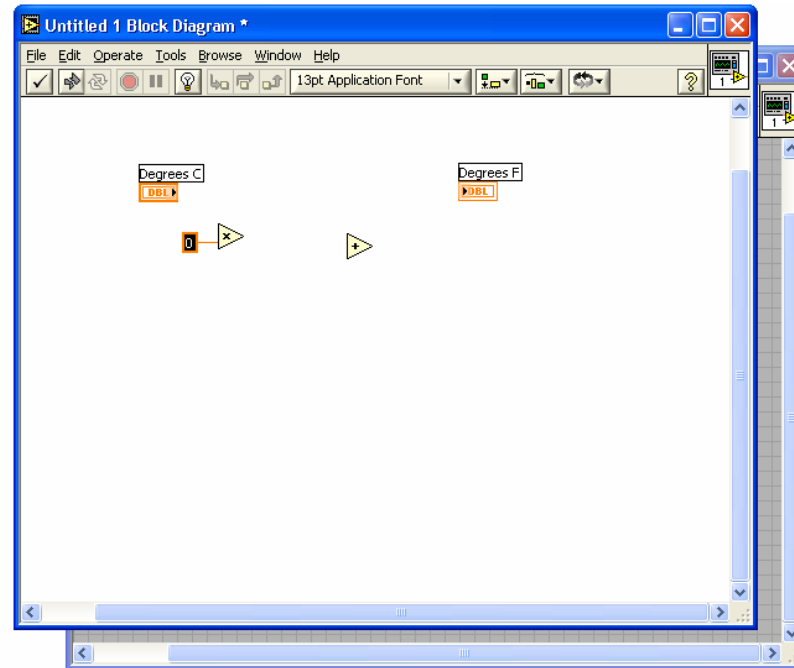
Now hover over the lower terminal on the multiply function and right click.

Constants



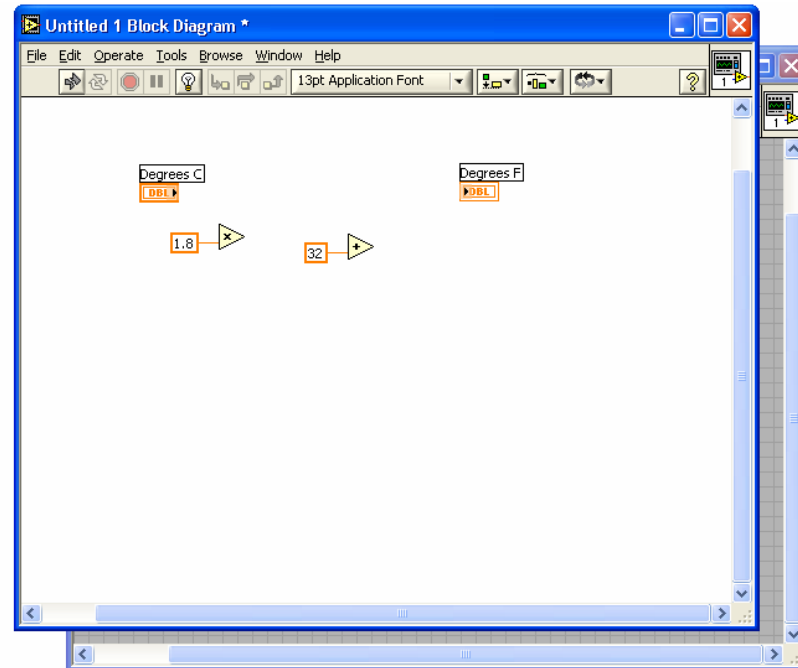
Hover over the menu item “Create” then select “Constants”.

Constants



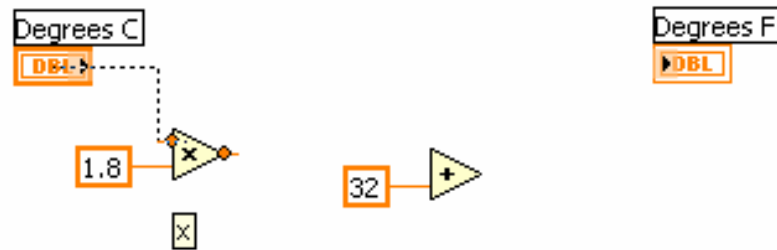
Then enter 1.8 for the constant value. Entering this now will save you having to select it again later.

Constants



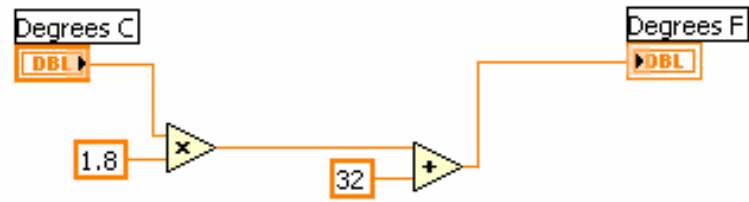
Now add a constant of 32 to the addition function.

Wiring

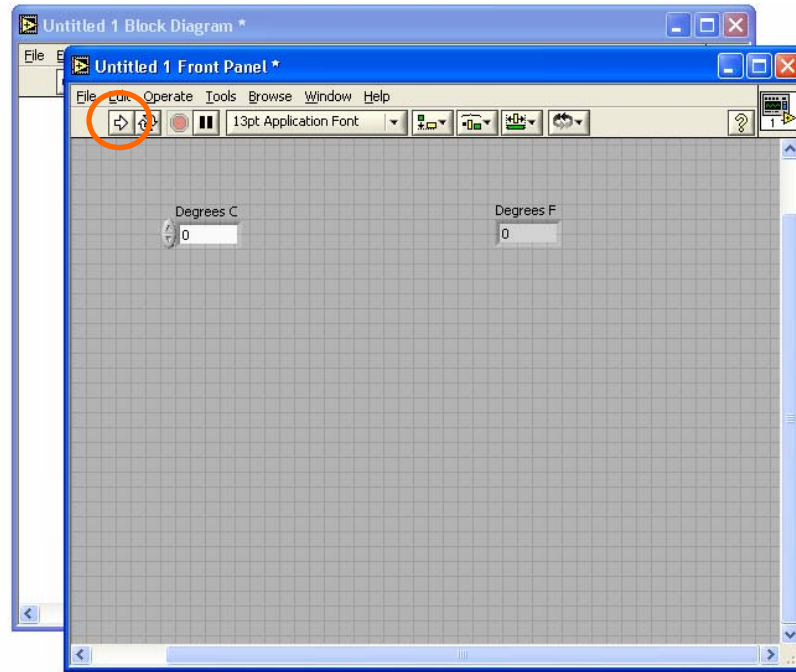


- Wiring the vi determines the flow of the data calculations. To wire the C to F converter, hover over the terminal on the right of the Degrees C Control.
- The cursor automatically will switch to the wiring tool that looks like a spool of wire. If it does not, select Auto from the tools pallet.
- Click and hover over the remaining terminal on the multiply function. Then click to set the wire in place. You can also click-drag to connect the terminals.

Complete Wiring



Ready to Run

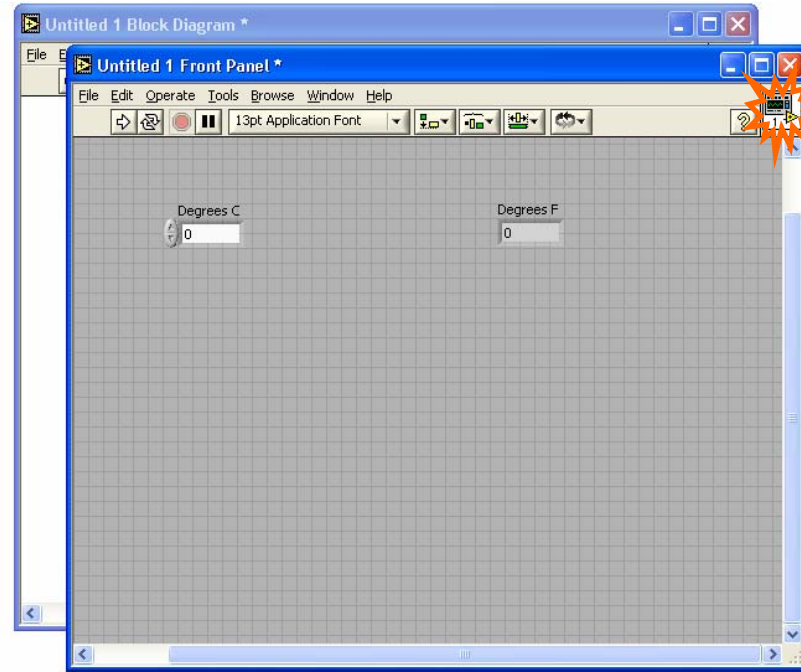


Now, switch to the Front Panel, enter a temperature in C such as 23 in the Degrees C Control and click the run button. Check the answer produced by your code (should be 73.4)

Sub-VI's

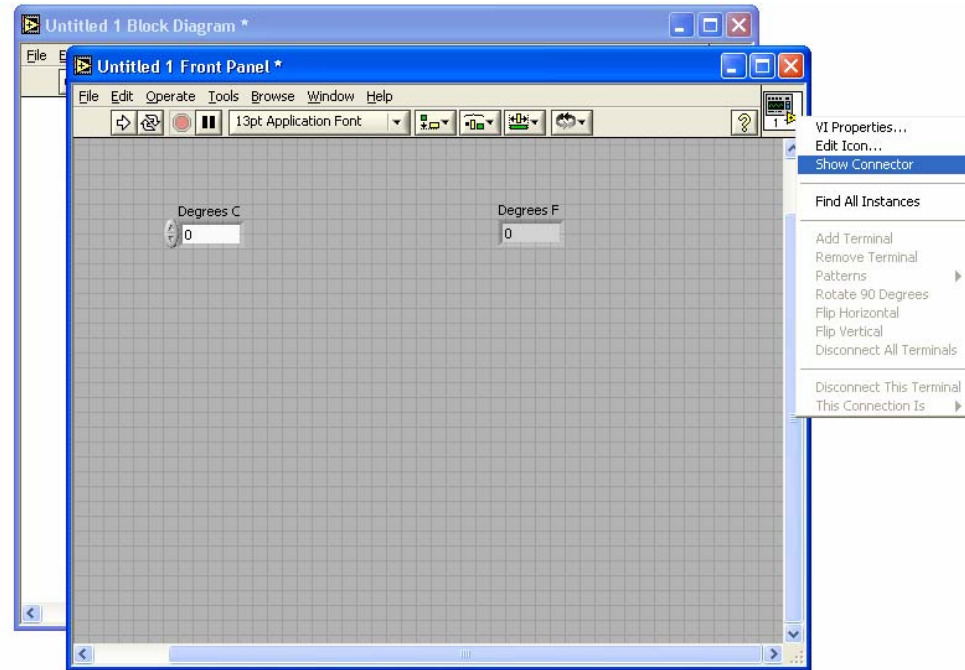
- Any VI can be used by another VI.
- To transfer the information, we must set up a means to give the VI data and to get data from it.
- Terminals can be assigned to **Front Panel** objects.
- For **inputs**, use *controls*.
- For **outputs**, use *indicators*.

Add Terminals



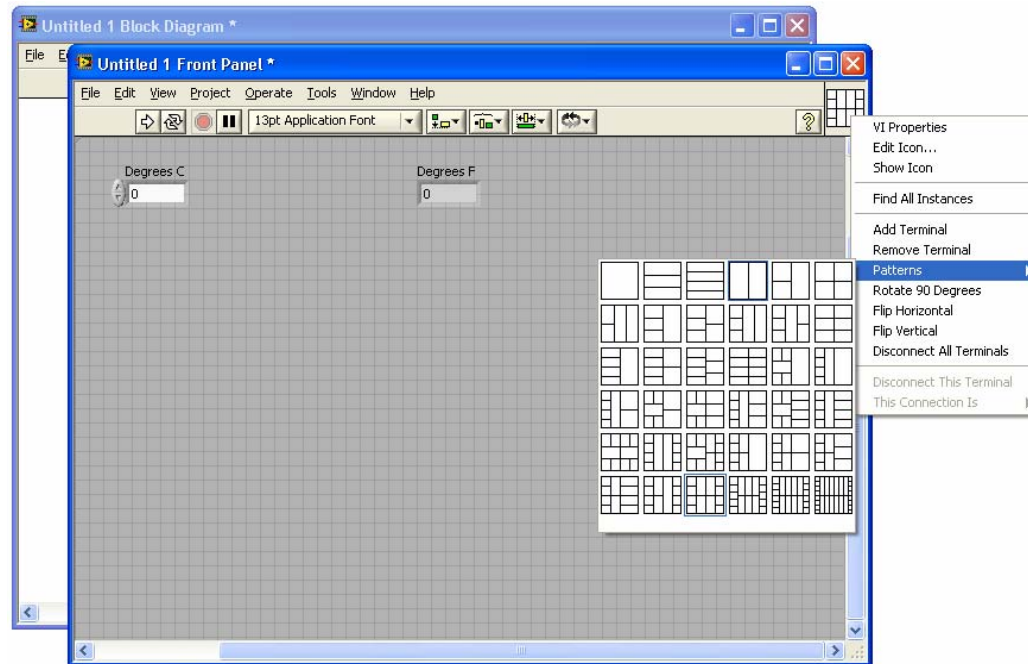
Right Click the Icon for the VI in the upper right corner.

Add Terminals



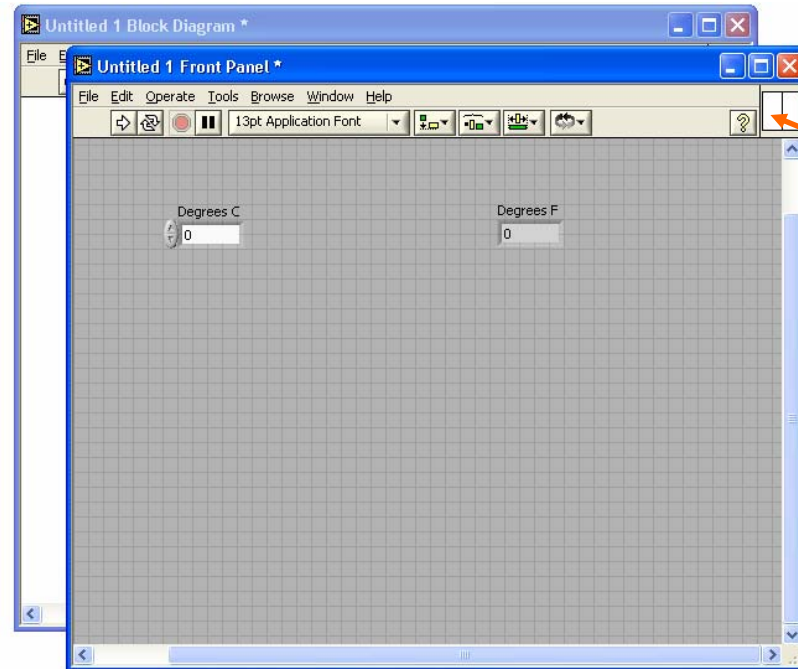
Select **Show Connector**.

Set terminal pattern



- Depending on the number of inputs and outputs your VI will use you can select an appropriate terminal pattern by right clicking on the terminal again.
- Our VI has one input and one output so we select the appropriate terminal pattern from the list.

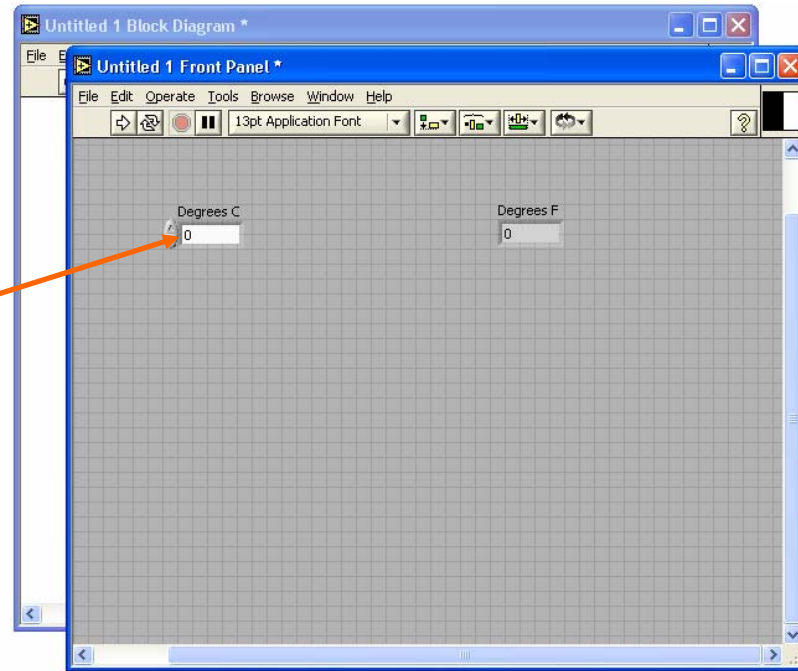
Add Terminals



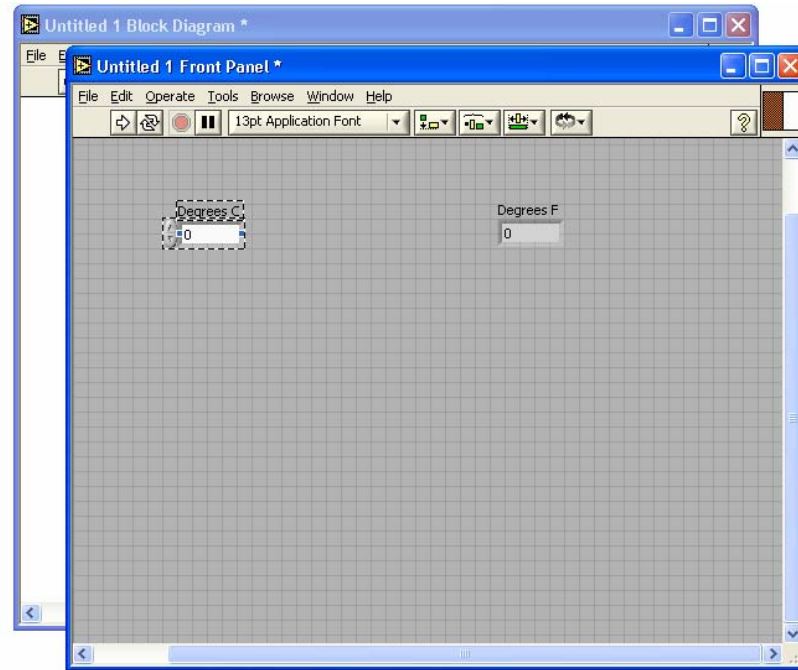
Click the terminal on the left.

Add Terminals

Then click the control you want to associate it with

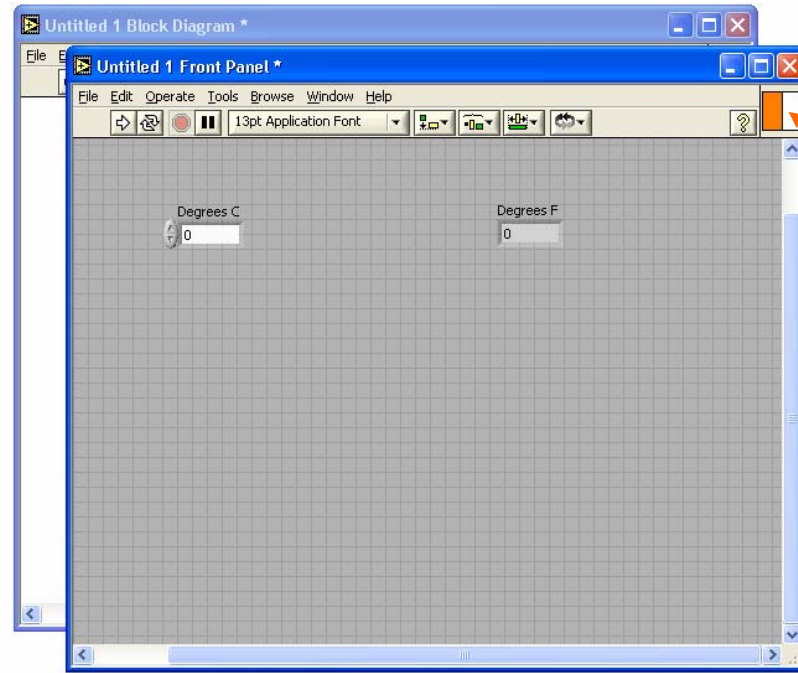


Add Terminals



This control is now associated with the terminal on the left. Whatever you connect to that terminal in another vi will be used as the input data for this vi.

Add Terminals

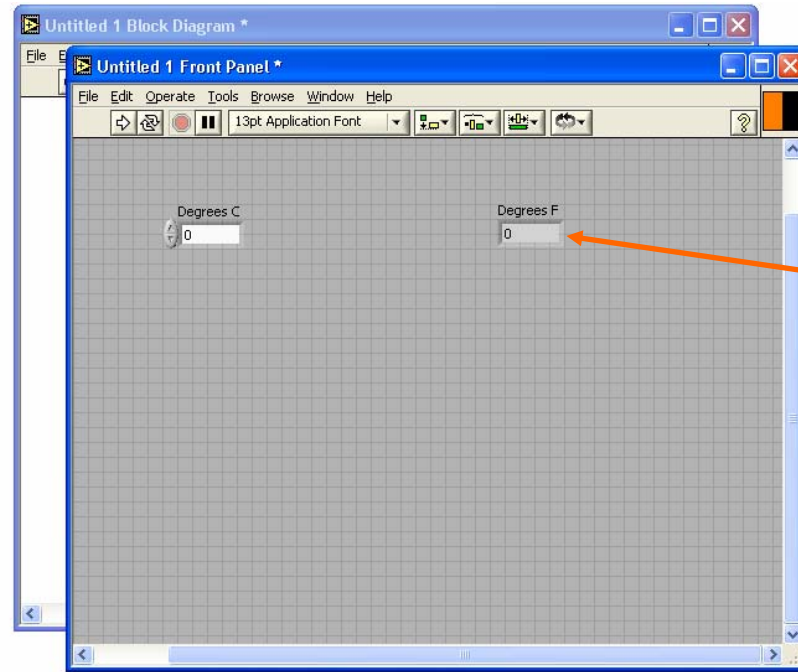


Click the right terminal.

For program flow and consistency, always try to put inputs on the left and outputs on the right.

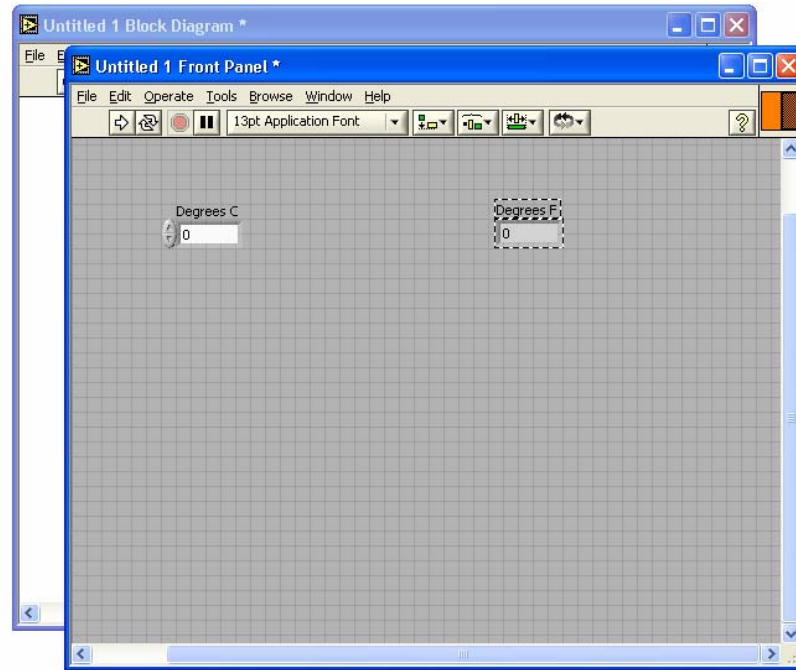
So, now let's hook up the output.

Add Terminals



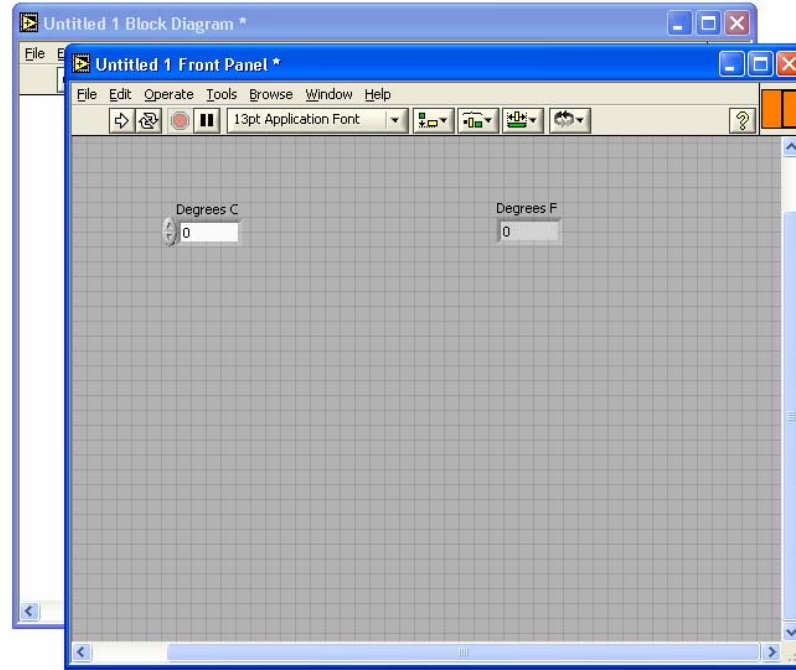
Then select the indicator as the output.

Add Terminals



This indicator is now associated with the terminal on the right. Data from this terminal is sent to the VI using this sub-VI.

Add Terminals

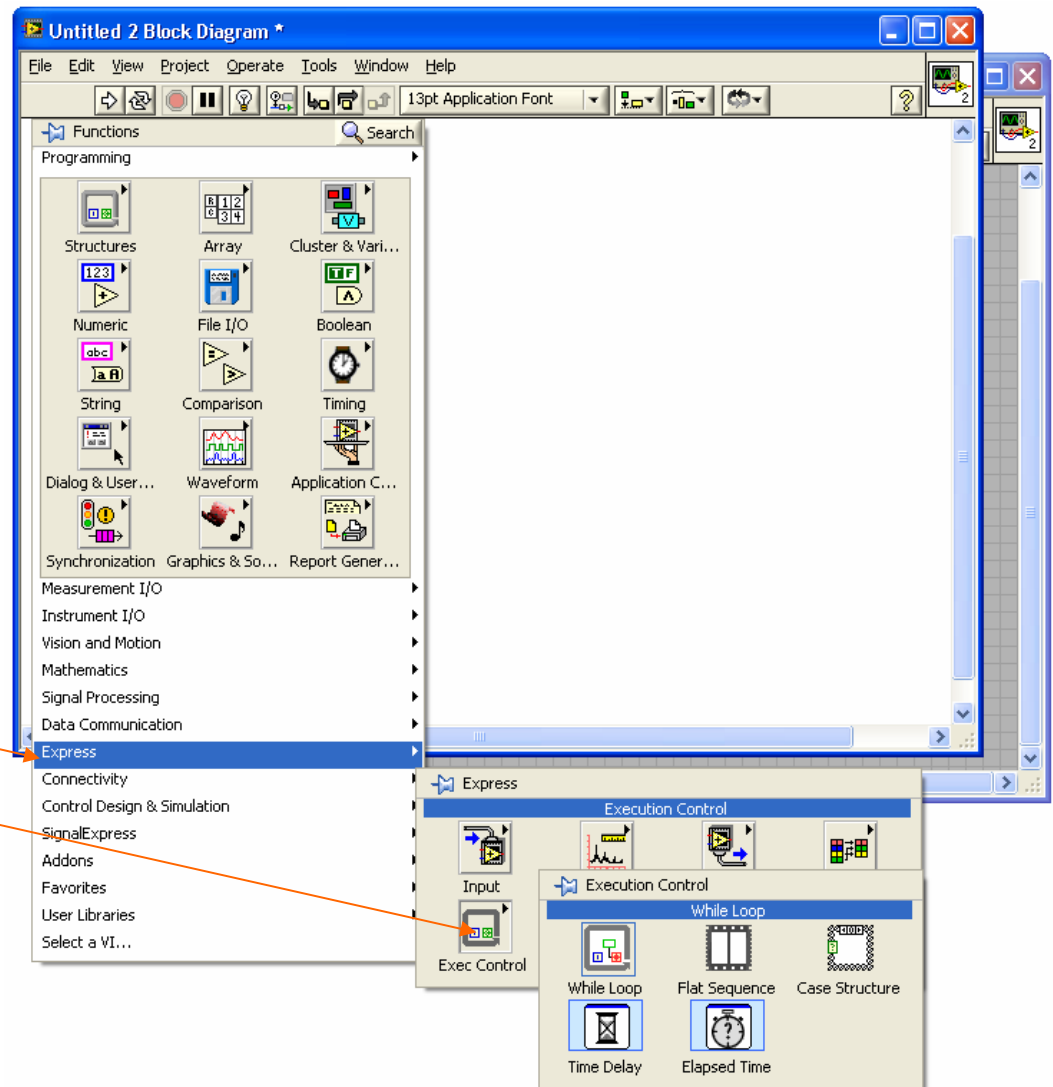


Save The VI

- From the **file** menu, select **Save...**
- Appropriately name the VI and save in a convenient location.
- Close the VI.
- Closing the Front panel closes both windows.
- Closing the block diagram leaves the front panel and the VI open.

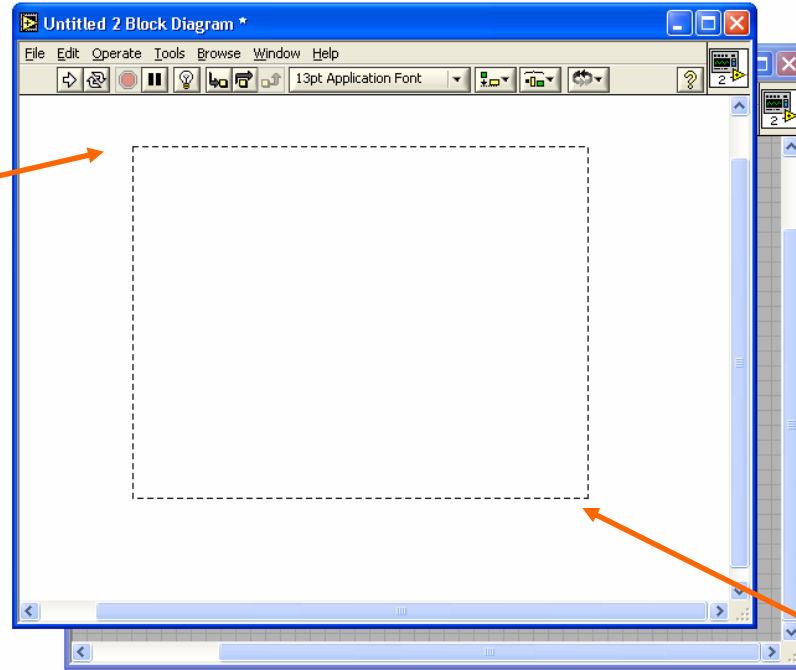
Using the sub VI's

- Open a new Blank VI from the File>New... menu
- On the Block Diagram, open the functions pallet and choose a while loop (appears in the Express pallet under Exec Cntl group).



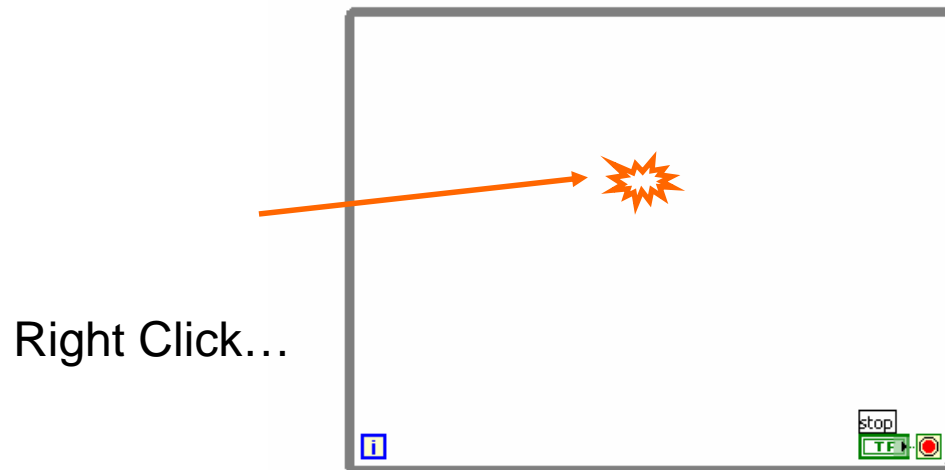
Place the While Loop

Click in one corner...



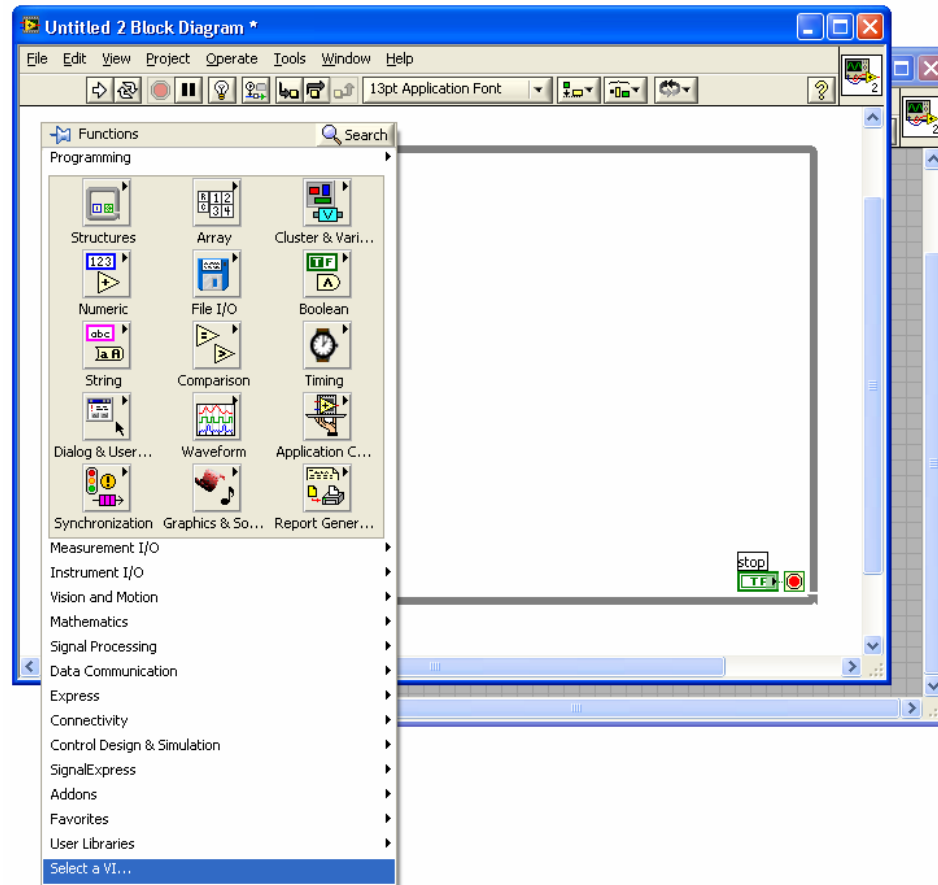
Then click in the other corner.

Sub-VI's



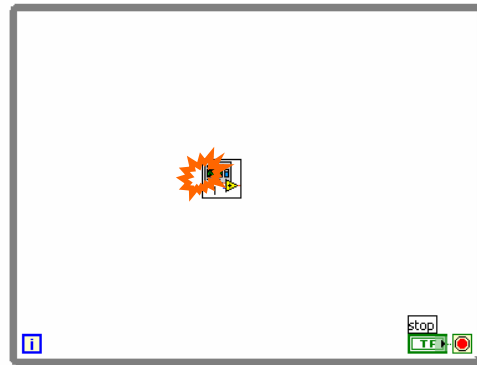
Add our sub-VI that we created before.

Custom VI's



And Select Custom VI's.

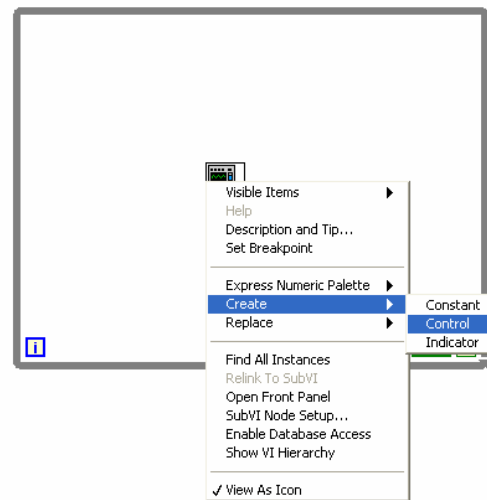
Place the Sub-VI



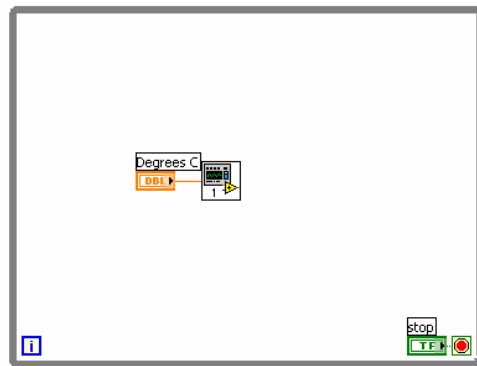
Right-Click over the
Left terminal and
select create control.

- Locate the vi inside the while loop and click to place it.
- Hover over the terminals on the left and right to see what is available.

Create Control

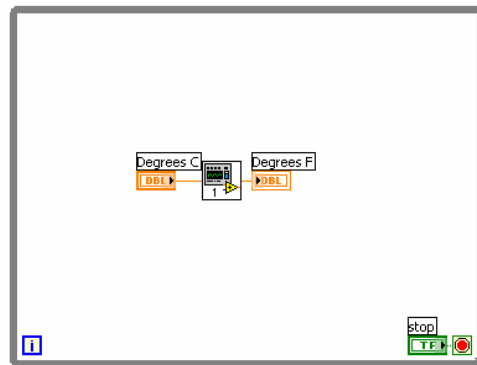


Add Indicator



Do the same for the output on the right terminal, except select **create Indicator**.

Complete wiring

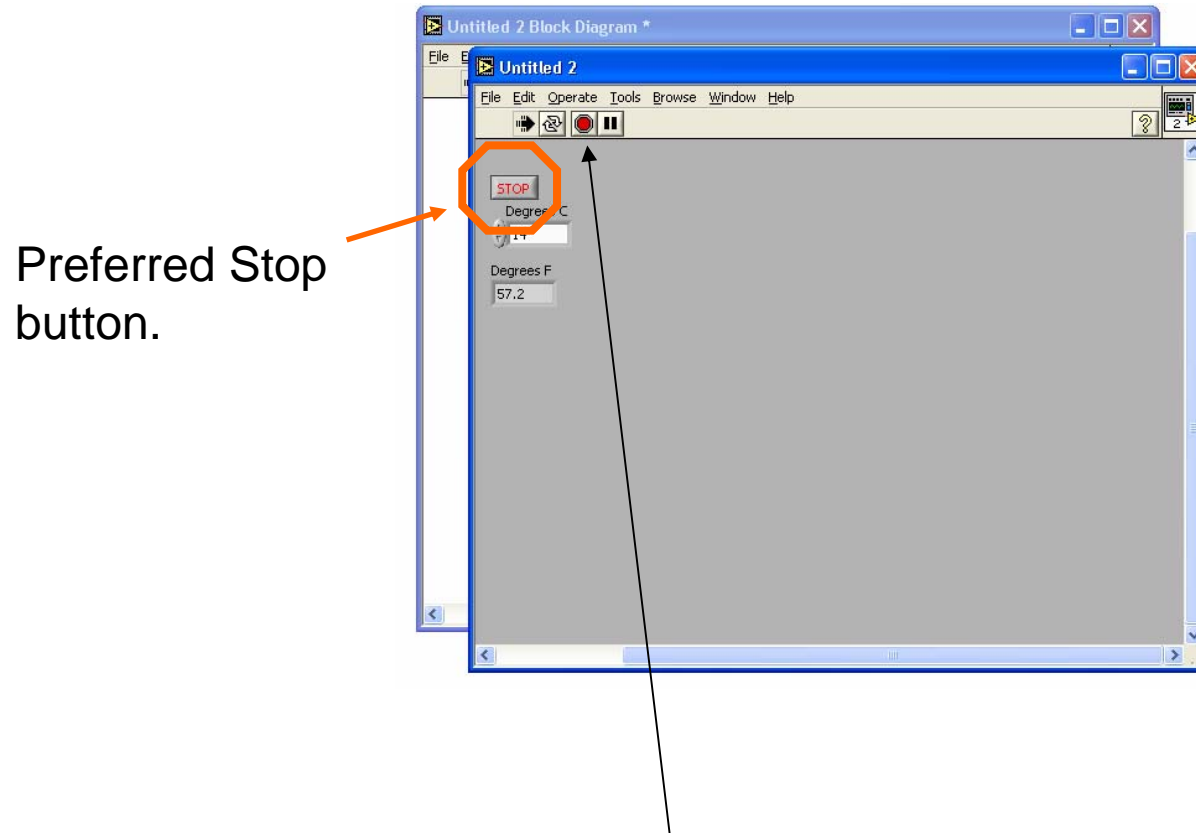


Switch to the Front Panel.

Run the VI

- Run the VI as before.
- Notice, the VI keeps running.
- You can change the input control and the output will change as appropriate.
- Stop the VI with the Stop Button on the panel.
- Do not use the abort button to stop a normal while loop.
- The abort button is for when programming went wrong and the program will not respond otherwise.

Stopping VI's



Use this stop only when nothing else works! The abort button will halt execution immediately, which might not be good if the code needs to close com ports or save files before exiting.

What was learned about LabView?

- Create new VI's from the beginning.
- Use of numeric controls and indicators.
- Block Diagram Wiring and Data Flow.
- Creating and Using Sub-VI's.
- While loops.