LABVIEW HANDOUT 1

CHAPTER 1: THE WHILE LOOP AND THE WAVEFORM CHART

In this exercise, you will be introduced to the LabVIEW graphical programming environment. The following concepts will be explained by using a hands-on approach:

Front Panel Window, Block Diagram Window, Block Diagram Editing, the While Loop Structure, Placement of Mathematical Operators on the Block Diagram, Use of the Help Window, Front Panel Editing, the Waveform Chart, Running the Program, Data-Type Representations, and Automatic Creation of Features.
Open a Blank VI. Tile the Front Panel and the Block Diagram using CTRL-T. Bring up the Functions Palette on the Block Diagram:

View>>Functions Palette

Functions Palette>>View>>Change Visible Categories>>Select All>>OK
Functions Palette >> View >> Options >> Controls/Functions Palettes >> Formatting >> Palette >> Category (Standard) >> OK
On the **Block Diagram**, explore the functions on the **Functions Palette**. Place a **While Loop** on the **Block Diagram**:

**Functions Palette >> Programming >> Structures >> While Loop**

![Diagram showing the placement of a While Loop on the Block Diagram](image)
The initial value of the Loop Iteration Terminal is zero, and increments by one integer each iteration. The Loop Condition Terminal is set to Stop if True by default. Bring up the Tools Palette on the Block Diagram.

View>>Tools Palette

Explore the various tools, and enable Automatic Tool Selection. Show the behavior of the cursor as you touch parts of the While Loop. Move the Loop Iteration Terminal and change the size of the While Loop.
Place a **Sine Function** icon in the **While Loop**:

**Functions**\(\rightarrow\)**Mathematics\(\rightarrow\)**Elementary & Special Functions\(\rightarrow\)**Trigonometric Functions\(\rightarrow\)**Sine
Use **Context Help** to show the description of **Sine** and **While Loop**. You can get more help by left-clicking onto **Detailed Help**. Wire the **Loop Iteration Terminal** to the input of the **Sine Function**.

The red **Coercion Dot** on the **Sine Function** icon indicates a mismatch between the two icons: The blue wire from the **Loop Iteration Terminal** is an **Unsigned Integer**, whereas the **Sine Function** expects a **Floating Point Number** as its input. The **Coercion Dot** can be eliminated by inserting a **Double Precision Float Conversion** icon. Right-click the blue wire, then:
Insert >> Numeric Palette >> Conversion >> To Double Precision Float
Attach a **Stop Button** to the **Loop Condition Terminal** by right-clicking the input (left-hand side) of the icon and choosing **Create Control**.

Find the **Stop Button** on the **Front Panel** and change its size by dragging one of the corners. Right-click on the **Stop Button** on the **Front Panel** and uncheck **Visible Items>>Label** to remove the label. Change the size of the font to 36 point by left double-clicking on the word **Stop** on the button and using the **Applications Font** button:
Place a **Waveform Chart** on the **Front Panel**.

**View>>Controls>>Modern>>Graph>>Waveform Chart**
Explore its controls by enabling the pop-up menu by right-clicking on the **Waveform Chart** and clicking on **Properties**.

![Waveform Chart Properties](image)

Change the x-axis label to x (radians) and the y-axis label to sin(x) by double-clicking on the label. On the **Block Diagram**, move the **Waveform Chart** inside the **While Loop** and wire the output of the **Sine Function** to the **Waveform Chart**. Run the program by clicking on the arrow button and watch the output on the **Waveform Chart**.

![Block Diagram](image)

![Waveform Chart](image)
Place a **Wait** icon on the block diagram to slow down the iteration rate:

**Functions**>>**Programming**>>**Timing**>>**Wait (ms)**

Wire a constant to the input (left-hand side) of the **Wait** icon: Right-click on the input, then **Create**>>**Constant**.
Type 100 into the constant. Rerun the program.

On the **Waveform Chart**, right-click the legend line box to change to the line style to **Lines and Points**.
To improve the look of the sine wave, divide the input to the Sine Function by 5. On the wire leading to the Sine Function from the DBL operator, insert a Divide operator:

Right-Click>>Insert>>Numeric Palette>>Divide

Place a constant for the divisor by Right-Click>>Create>>Constant. Note that it is a double precision floating point number. You can change the representation of any constant by Right-Click>>Representation.
Rerun the program.

To account for the division by 5, the x-axis calibration must be changed. On the Waveform Chart:

Right-click>>Properties>>Chart Properties: Waveform Chart>>Scales>>Multiplier>>0.2>>OK
Clear the chart using **Right-Click>>Data Operations>>Clear Chart**. Rerun the program. Clean up the appearance of the **Block Diagram** and make it as compact as possible. You can use the **Clean Up Wiring** function by right-clicking on the wires. Place your name on the **Front Panel** by simply double-clicking anywhere on the **Front Panel** and typing your name. Print out the program using Microsoft Word by taking a screen shot of the **Front Panel** and **Block Diagram** as follows:
Untitle 1 Block Diagram

1: 'DIVIDE'
2: 'SINE'
3: 'WAVEFORM CHART'
4: 'WAIT (ms)' 100
5: 'STOP'

Untiitled 1 Front Panel

Waveform Chart

Plot 0

-1 -0.75 -0.5 -0.25 0 0.25 0.5 0.75 1

sin(x)

x (radians) 0 2π

STOP  Your Name